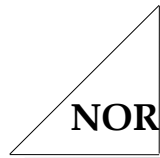


Hancock Judicial Center Project

45 Merrill Lane - Ellsworth, Maine

PROJECT MANUAL

01 May 2026



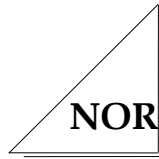
NORTH PEAK ARCHITECTURE

Mark G. Carter • Architect •

Maine Licensed Architect

Hancock Judicial Center Project

45 Merrill Lane – Ellsworth, Maine



NORTH PEAK ARCHITECTURE

Mark G. Carter • Architect •

Maine Licensed Architect

P.O. Box 338 • Lyman, Maine 04002

mgcarter14@gmail.com

Mechanical / Electrical Engineering



Armstrong Engineering

94 Presque Isle Street – US Rt. #1A

Fort Fairfield, Maine 04742

Civil Engineering & Landscape Architecture **Sebago Technics, Inc.**

75 John Roberts Road – Suite 4A

South Portland, Maine 04106

Structural Engineering **SRG Engineering, Inc.**

P.O. Box 925

Gray, Maine 04039

TABLE OF CONTENTS

DIVISION 00 – PROCUREMENT & CONTRACTING REQUIREMENTS Number of Pages

<u>Section</u>	
00 12 13	Notice to Contractors 2
00 21 13	Instructions to Bidders 3
00 22 13	Instructions to Filed Sub-Bidders.....5
00 41 13	Contractor Bid Form 2
00 41 16	Subcontractor Bid Form.....3
00 43 13	Contractor Bid Bond 2
00 43 16	Subcontractor Bid Bond.....2
00 52 13	State of Maine Construction Contract.....4
00 52 16	State of Maine Construction Subcontract.....4
00 61 13.13	Contractor Performance Bond 2
00 61 13.16	Contractor Payment Bond 2
00 61 13.23	Subcontractor Performance Bond 2
00 61 13.26	Subcontractor Payment Bond.....2
00 62 76	State of Maine Construction Contract Application for Payment 1
00 63 63	State of Maine Construction Contract Change Order.....1
00 71 00	Definitions 6
00 72 13	General Conditions 22
00 72 14	Supplementary Conditions.....8
00 73 46	Wage Determination 1
00 73 46.10	Wage Determination Schedule 1

DIVISION 01 – GENERAL REQUIREMENTS

01 05 00	Available Project Information 1
	Boring / Test Pit Logs & Gradation Report 17
01 10 00	Alternates & Allowances 1
01 15 00	Temporary Facilities 2
01 70 00	Project Closeout 1

DIVISION 03 - CONCRETE

03 30 00	Cast in Place Concrete 19

DIVISION 04 - MASONRY

04 20 00	Masonry 4

DIVISION 05 - METALS

05 10 00	Structural Steel 7
05 20 00	Steel Joists.....5
05 30 00	Metal Decking 6
05 40 00	Cold-Formed Metal Framing.....1
05 51 00	Metal Fabrications 3
05 55 00	Metal Stair Treads & Nosings 1

DIVISION 06 – WOOD, PLASTICS & COMPOSITES

06 10 00	Rough Carpentry 2
06 20 00	Finish Carpentry & Casework.....3

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

07 10 00	Waterproofing	1
07 21 00	Thermal Insulation	1
07 22 00	Roof & Deck Insulation	1
07 27 00	Air Barriers	1
07 31 13	Asphalt Singles & Roof Specialties	1
07 42 13	Metal Wall Panels & Metal Roofing	2
07 50 00	Membrane Roofing	3
07 60 00	Flashing & Sheet Metal	1
07 72 33	Roof Hatches	1
07 84 00	Firestopping	1
07 92 00	Joint Sealants	1

DIVISION 08 - OPENINGS

08 11 00	Metal Doors and Frames	1
08 14 00	Wood Doors and Frames	1
08 31 13	Access Panels	1
08 33 13	Coiling Counter Doors	1
08 36 13	Sectional Doors	2
08 41 13	Aluminum Entrances and Storefront	1
08 52 13	Metal-Clad Wood Windows	1
08 71 00	Door & Misc. Hardware	8
08 81 00	Glazing & Security Film	2

DIVISION 09 - FINISHES

09 29 00	Gypsum Board and Gypsum Sheathing System	3
09 30 13	Ceramic Tiling	2
09 51 00	Acoustical Ceilings	1
09 65 00	Resilient Flooring	2
09 68 00	Carpeting	2
09 91 00	Painting & Wall Covering	4

DIVISION 10 - SPECIALTIES

10 14 00	Signage	1
10 21 00	Toilet Compartments	1
10 28 00	Washroom Accessories	2
10 44 00	Fire Protection Specialties	1
10 51 13	Lockers & Misc. Specialties	2

DIVISION 12 - FURNISHINGS

12 24 00	Window Shades	2
12 67 00	Bench Seating	1

DIVISION 14 – CONVEYING EQUIPMENT

14 20 00	Elevators	10

DIVISION 21 – FIRE SUPPRESSION

21 11 00	Automatic Sprinkler System	2

DIVISION 22 - PLUMBING

22 00 00	Plumbing Systems	15

DIVISION 23 – HEATING, VENTILATING & AIR CONDITIONING (HVAC)

23 00 00	Heating, Ventilating & Air Conditioning	133

DIVISION 26 - ELECTRICAL

26 00 00	Electrical Power & Lighting	51

DIVISION 31 - EARTHWORK

31 10 00	Site Clearing	4
31 22 00	Grading	2
31 23 00	Excavation, Backfill, and Compaction	11
31 23 15	Rock Excavation	5
31 25 00	Erosion and Sedimentation Controls	4

DIVISION 32 – EXTERIOR IMPROVEMENTS

32 11 10	Gravel Base Courses	3
32 12 20	Bituminous Paving	5
32 13 50	Concrete Walks and Pads	4
32 16 19	Concrete Slipform Curbing	3
32 16 40	Stone Curbs	2
32 30 00	Site Improvements	5
32 31 13	Chain Link Fences and Gates	5
32 92 10	Topsoil	4
32 92 20	Seeding	5
32 93 00	Plants	15

DIVISION 33 – UTILITIES

33 10 50	Water Distribution Systems	7
33 32 13	Pumping Station – Sanitary Sewage	7
33 36 50	Sanitary Sewer Systems	6
33 41 00	Storm Drainage Systems	5
33 46 00	Sub-drainage Systems	4
33 51 20	Gas Storage and Distribution Systems	2

---END OF TABLE OF CONTENTS---

Notice to Contractors

Hancock Judicial Center Project

This proposed construction project consists of a new, multi-story, 64,000 square foot Courthouse Facility in Ellsworth, Maine. The building construction includes concrete foundations and floor slabs, structural steel framing, brick masonry veneer & granite details, membrane & pitched roofing, interior finishes, elevators, plumbing, HVAC, & electrical systems. The site development includes utility & drainage systems, drives, parking lots, site improvements, and landscaping.

The contract shall designate the Substantial Completion Date on or before 01 March, 2028 and the Contract Final Completion Date on or before 15 March, 2028.

1. Submit bids on a completed Contractor Bid Form (section 00 41 13), provided in the Bid Documents, include bid security and scan each item as an attachment to an email addressed to: BGS.Architect@Maine.gov, so as to be received no later than **1:30 p.m. on 16 June, 2026**. The email subject line shall be marked "Bid for Hancock Judicial Center".

Bid submissions will be opened and read aloud at 2:00 p.m. on the date noted above at the Bureau of General Services office, accessible as a video conference call. Those who wish to participate in the call must submit a request for access to BGS.Architect@Maine.gov.

Any bid received after the noted time will not be considered a valid bid and will remain unopened. Any bid submitted by any other means will not be considered a valid bid. In certain circumstances, the Bureau of General Services may require the Bidder to surrender a valid copy of the bid form or the bid security document. The Owner reserves the right to accept or reject any or all bids as may best serve the interest of the Owner.

2. Questions and comments on the bid opening process shall be addressed to: Division of Planning, Design & Construction, Bureau of General Services, 77 State House Station, Augusta, Maine 04333-007, BGS.Architect@Maine.gov.
3. Questions and comments regarding the project design specifications or drawings shall be directed in writing to the Consultant during the bid period prior to the question and comment deadline of 5:00 p.m. on 01 June 2026.

North Peak Architecture
Mark G. Carter – Architect
P.O. Box 338
Lyman, Maine 04002
mgcarter14@gmail.com

4. Bid Security is required on this project. The Bidder shall include a satisfactory Bid Bond (sections 00 43 13 and 00 43 16) or a certified or cashier's check for 5% of the bid amount with the completed bid form submitted to the Owner. The Bid Bond form is available on the BGS website.

5. Performance and Payment Bonds are required for this project.
The selected Contractor and Filed Sub-bid contractors shall furnish their respective 100% contract Performance Bonds (section 00 61 13.13 and 00 61 13.23) and 100% contract Payment Bonds (section 00 61 13.16 and 00 61 13.26) in their contract amounts to cover the execution of the Work. Bond forms are available on the BGS website.
6. Filed Sub-bids are required on this project for the following subcontractors:
- Plumbing & HVAC – Divisions 22 & 23;
Electrical – Division 26**
- The Bidder shall include in the bid all Filed Sub-bids identified in the Bid Documents and shown on the Contractor Bid Form (section 00 41 13).
Filed Sub-bids are due at the Maine Construction Bid Depository at **3:00 p.m. on 09 June, 2026**.
Bids submitted after the noted time will not be accepted.
7. There are Pre-Qualified General Contractors on this project.
The Pre-Qualified General Contractors are identified for this project, the name of each company, with their city and state, are listed below:
- A / Z Corporation** – Brewer, Maine
Bowman Constructors – Newport, Maine
Landry / French Construction – Scarborough, Maine
PC Construction – Portland, Maine – So. Burlington, Vermont
Wright–Ryan Construction – Portland, Maine
8. A pre-bid conference (on-site or off-site) will NOT be conducted for this project.
9. Bid Documents – full sets only – will be available in PDF form (no cost) on or about 01 May, 2026 and may be obtained, via email request, from:
- North Peak Architecture
Mark G. Carter – Architect
P.O. Box 338
Lyman, Maine 04002
- mgcarter14@gmail.com
10. Bid Documents may also be examined at:
- | | |
|-------------------------------------|-------------------------------------|
| AGC Maine | Construction Summary of Maine |
| 188 Whitten Road | 734 Chestnut Street |
| Augusta, ME 04332 | Manchester, NH 03104 |
| Phone 207-622-4741 Fax 207-622-1625 | Phone 603-627-8856 Fax 603-627-4524 |

00 21 13
Instructions to Bidders

1. Bidder Requirements

- 1.1 A bidder is a Contractor which is evidently qualified, or has been specifically pre-qualified by the Bureau of General Services, to bid on the proposed project described in the Bid Documents.
- 1.2 Contractors and Subcontractors bidding on projects that utilize Filed Sub-bids shall follow the requirements outlined in these Bid Documents for such projects. See Section 00 22 13 for additional information.
- 1.3 Contractors and Subcontractors are not eligible to bid on the project when their access to project design documents prior to the bid period distribution of documents creates an unfair bidding advantage. Prohibited access includes consultation with the Owner or with design professionals engaged by the Owner regarding cost estimating, constructability review, or project scheduling. This prohibition to bid applies to open, competitive bidding or pre-qualified contractor bidding or Filed Sub-bidding. The Bureau may require additional information to determine if the activities of a Contractor constitute an unfair bidding advantage.
- 1.4 Each bidder is responsible for becoming thoroughly familiar with the Bid Documents prior to submitting a bid. The failure of a bidder to review evident site conditions, to attend available pre-bid conferences, or to receive, examine, or act on addenda to the Bid Documents shall not relieve that bidder from any obligation with respect to their bid or the execution of the work as a Contractor.
- 1.5 Prior to the award of the contract, General Contractor bidders or Filed Sub-bidders may be required to provide documented evidence to the Owner or the Bureau showing compliance with the provisions of this section, their business experience, financial capability, or performance on previous projects.
- 1.6 The selected General Contractor bidder will be required to provide proof of insurance before a contract can be executed.
- 1.7 Contracts developed from this bid shall not be assigned, sublet or transferred without the written consent of the Owner.
- 1.8 By submitting a bid the Contractor attests that it has not been declared ineligible to bid on State of Maine projects. The Director of the Bureau of General Services may disallow award of this contract to any Contractor if there is evidence that the Contractor or any of its Subcontractors, through their own fault, have been terminated, suspended for cause, debarred from bidding, agreed to refrain from bidding as part of a settlement, have defaulted on a contract, or had a contract completed by another party.
- 1.9 The Contractor attests that it is not presently indicted for or otherwise criminally or civilly charged by a Federal, State or local government entity with commission of any of the following offenses and has not within a three-year period preceding this bid been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction, or contract under a public transaction, violation of Federal or State anti-trust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property.

00 21 13
Instructions to Bidders

- 1.10 The Contractor shall not make any award or permit any award (subgrant or contract) at any tier to any party which is debarred or suspended or is otherwise excluded from or ineligible for participation in Federal assistance programs or State of Maine projects.
2. Authority of Owner
 - 2.1 The Owner reserves the right to accept or reject any or all bids as may best serve the interest of the Owner.
 - 2.2 Subject to the Owner's stated right to accept or reject any or all bids, the Contractor shall be selected on the basis of the lowest dollar value of an acceptable Base Bid, or any combination of Base Bid plus Alternate Bids, as well as other limited cost modifications the Owner determines may best serve the interests of the Owner. An acceptable bid is a duly submitted bid from a responsive and responsible bidder.
 - 2.3 The Owner reserves the right to require Bid Bonds or Performance and Payment Bonds for any project of any contract value.
3. Submitting Bids and Bid Requirements
 - 3.1 Each bid shall be submitted on the forms provided in the Bid Documents.
 - 3.2 Each bid shall be valid for a period of thirty calendar days following the Project bid closing date and time. The bid expiration date may be extended in unusual circumstances by mutual consent of the Bidder and the Owner. The bid amount shall not be modified due to the bid expiration date extension.
 - 3.3 Any provision contained in a bid which shows cost escalation, or any modification of schedule or other requirements shall not be accepted. Such a provision causes the bid to be invalid, or, at the discretion of the Owner and BGS, that element of the bid submission may be disregarded for the purpose of awarding the contract without that provision.
 - 3.4 Bidders shall include a Bid Bond or other approved bid security with the bid form submitted to the Owner when the bid form indicates such bid security is required. The bond value shall be 5% of the bid amount. The form of bond is shown in section 00 43 13.
 - 3.5 Bidders recognize that inclusion of contract bonds and the cost of those bonds is dependent on the awarded contract dollar value. Therefore, a Base Bid, or any combination of Base Bid plus Alternate Bids, as well as other limited cost modifications, resulting in a contract award shall include the cost of Performance and Payment Bonds in the submitted bid amount when the construction contract value is over \$125,000.00. Similarly, the cost of Performance and Payment Bonds is excluded in the submitted bid amount when the construction contract value is \$125,000.00 or less unless bonds are specifically required by the Bid Documents. When required for the project, the selected Contractor shall provide these bonds before a contract can be executed, pursuant to 14 M.R.S.A., Section 871, Public Works Contractors' Surety Bond Law of 1971, subsection 3. The form of bonds is shown in section 00 61 13.13 and 00 61 13.16.

00 21 13
Instructions to Bidders

- 3.6 Bidders may modify bids in writing, by the same means as the original bid submission, prior to the bid closing time. Such written amendments shall not disclose the amount of the initial bid. If so disclosed, the entire bid is considered invalid.
- 3.7 Bidders implicitly acknowledge all Addenda issued when they submit the bid form. By usual practice the Consultant shall not issue Addenda less than 72 hours prior to the bid closing time, to allow ample time for bidders to incorporate the information. However, some information, such as extending the bid due date and time, may be issued with shorter notice. Addenda shall be issued to all companies who are registered holders of Bid Documents.
- 3.8 A bid may be withdrawn without penalty if a written request by the bidder is presented to the Owner prior to the bid closing time. Such written withdrawal requests are subject to verification as required by the Bureau.
- A bid may be withdrawn without penalty after the bid closing time if, in the determination of the Bureau, evidence provided by the Contractor shows an apparent unintended error such as a miscalculation, or an erroneous number on estimating documents, was the cause of an inaccurate bid. The Bureau may allow withdrawal in consideration of the bid bond or, without utilizing a bid bond, if the Bureau considers documented evidence provided by the Contractor shows factual errors had been made on the bid form.
- 3.9 In the event State of Maine Offices unexpectedly close on the published date of a public bid opening in the location of that bid opening, prior to the time of the scheduled deadline, the new deadline for the public bid opening will be the following business day at the originally scheduled hour of the day, at the original location. Official closings are posted on the State of Maine government website.
- 3.10 The Owner may require, in a Notice of Intent to Award letter to the apparent low bidder, a Schedule of Values, Project Schedule, and List of Subcontractors and Suppliers as both a demonstration of capability of the Bidder and as a condition of award.
- 3.11 Projects which require a State of Maine wage determination will include that schedule as part of the Bid Documents. See section 00 73 46, if such rates are required.
- 3.12 Projects which require compliance with the Davis-Bacon Act are subject to the regulations contained the Code for Federal Regulations and the federal wage determination which is made a part of the Bid Documents. See section 00 73 46, if such rates are required.
- 3.13 The Owner is exempt from the payment of Maine State sales and use taxes as provided in 36 M.R.S. §1760 (1). The Contractor and Subcontractors shall not include taxes on exempt items in the construction contract.

Instructions to Filed Sub-bidders**1. Filed Sub-bidder Requirements**

- 1.1 A Filed Sub-bidder is a Subcontractor, and in some cases a General Contractor electing to bid in a Subcontractor capacity, which is evidently qualified to bid on a defined portion of the proposed project.
- 1.2 Each Filed Sub-bidder is responsible for all necessary familiarity with all relevant portions of the Bid Documents. Failure of the Filed Sub-bidder to acknowledge Addenda, for example, may result in disqualification of the Filed Sub-bid.
- 1.3 A Filed Sub-bidder may need to meet certain qualifications as a prerequisite to bidding.
- 1.4 By submitting a bid the Filed Sub-bidder attests that they have not been declared ineligible to bid on State of Maine projects. The Director of the Bureau of General Services may disallow award of this contract to any Filed Sub-bidder if there is evidence that they, through their own fault, have been terminated, suspended for cause, debarred from bidding, agreed to refrain from bidding as part of a settlement, or has defaulted on a contract or had a contract completed by another party.
- 1.5 The Filed Sub-bidder attests that it is not presently indicted for or otherwise criminally or civilly charged by a Federal, State or local government entity with commission of any of the following offenses and has not within a three-year period preceding this bid been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction, or contract under a public transaction, violation of Federal or State anti-trust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property.
- 1.6 The Filed Sub-bidder shall not make any award or permit any award (subgrant or contract) at any tier to any party which is debarred or suspended or is otherwise excluded from or ineligible for participation in Federal assistance programs or State of Maine projects.

2. Description of the Bid Depository

- 2.1 The Maine Construction Bid Depository (Bid Depository) is operated and managed by the Associated General Contractors of Maine (AGC Maine). The Bid Depository is located at the office of the Associated General Contractors of Maine, 188 Whitten Road, Augusta, Maine 04430, telephone 207-622-4741.
- 2.2 The Bid Depository is a system that maintains a high quality of bidding practices by documenting the receipt of Subcontractor sealed bid envelopes at a particular place, date and time prior to the submission of General Contractor bids to an Owner for a particular project. The bid envelopes are logged in and safeguarded, unopened, then distributed to the appropriate General Contractors and the Owner.
- 2.3 Filed sub-bids from major Subcontractors allow the General Contractor an ample period of time to compile bids in a complete and accurate manner prior to the Contractor bid closing date. The intent of this system is to protect the best interests of Owners, General Contractors, Subcontractors, Architects and Engineers.

Instructions to Filed Sub-bidders

3. The Maine Construction Bid Depository Advisory Committee

- 3.1 The Maine Construction Bid Depository Advisory Committee (Advisory Committee) is maintained to provide Owners advice and counsel concerning the administration of the bid depository filed bid system.
- 3.2 The Advisory Committee consists of two Architects, two Engineers, two Subcontractors and two General Contractors selected by the AGC Maine Building Committee, in consultation with the Maine chapters of the American Institute of Architects (AIA), American Council of Engineering Companies (ACEC), and Associated Builders and Contractors (ABC). Additionally, two at-large members are selected by the Advisory Committee.
- 3.3 Meetings of the Advisory Committee shall be called as necessary by AGC Maine, acting as secretariat, or by a quorum of the committee membership. A quorum consists of any three members of the committee.
- 3.4 If an aggrieved party believes the Bid Depository procedures were violated, they may request an opinion from the Advisory Committee. Formal complaints concerning the administration of the filed bid system must be submitted in writing to the Owner, with a copy of the complaint submitted to the Architect. Upon receipt of the complaint, the Owner should seek advice and counsel from the Bid Depository Advisory Committee before responding to the complaint.

4. Owner's Use of the Bid Depository

- 4.1 The Owner shall determine if the Filed Sub-bid process will be employed in the project.
- 4.2 The Owner shall determine which sections will be designated for each distinct Filed Sub-bid.
- 4.3 The fee for the use of the Bid Depository is paid by the Owner.

5. Submitting Filed Sub-bids

- 5.1 Each bid should be placed in official envelopes provided by the Bid Depository and on official forms obtained from the Bid Depository or Architect.
- 5.2 Three types of official envelopes should be used.
 - a) A sealed large *white* envelope containing the following small pink and green envelopes, and a bid bond, separate from the pink and green envelopes;
 - b) A sealed *pink* envelope addressed to each General Contractor to whom the Filed Sub-bidder intends to bid, containing a complete bid form;
 - c) A sealed *green* envelope addressed to the Bid Depository containing a copy of each bid, and a listing of any General Contractors intentionally omitted by the Subcontractor.

Instructions to Filed Sub-bidders

- 5.3 Each Filed Sub-bid shall include only those sections or combined sections required by the Bid Documents, including all Addenda issued from the Architect's office more than 72 hours prior to Filed Sub-bid closing time.
- 5.4 Filed Sub-bids that do not comply in materials, forms or content may be rejected by the Bid Depository or the Owner.
- 5.5 Filed Sub-bids may be delivered or mailed to the Bid Depository. Filed Sub-bidders assume the risk of delivery by any method.
- 5.6 Filed Sub-bidders may bid any amount to any General Contractor.
- 5.7 Filed Sub-bidders may bid to any or all General Contractors.
- 5.8 General Contractors may select any valid Filed Sub-bid, regardless of relative cost.
- 5.9 General Contractors may use their own forces or a subsidiary company for one or more complete trade sections. The General Contractor is required to submit the Filed Sub-bid as any Filed Sub-bidder would, according to the instruction of this section regarding the Bid Depository, even if bidding only to their own company. Such a bid shall include a statement of the General Contractor's qualifications to perform the work (such as names, relevant certifications and licenses, experience and references of key personnel, and a list of equipment, as appropriate), inserted in the *green* envelope. The Owner shall determine the validity of those stated qualifications and may require further documentation.
- 5.10 General Contractors intending to use their own forces or a subsidiary company shall notify the Bid Depository. The General Contractor is also advised to notify Subcontractors of their intent to submit Filed Sub-bids to clarify the expectations concerning the General Contractor receiving Filed Sub-bids.
- 5.11 Filed Sub-bids may be modified by bidders prior to the Filed Sub-bid closing time. Such written amendments shall not disclose the amount of the initial Filed Sub-bid. If so disclosed, the entire Filed Sub-bid will be declared void.
- 5.12 Filed Sub-bidders acknowledge all Addenda issued in a timely manner as a consequence of submitting the bid form. The Architect shall not issue Addenda affecting Filed Sub-bid trades less than 72 hours prior to the Filed Sub-bid closing time. Addenda will be issued to all companies who are registered holders of Bid Documents.
- 5.13 Filed Sub-bidders shall include a Bid Bond with each bid form submitted to a General Contractor. The bond value shall be 5% of the bid amount. The form of bond is shown in section 00 43 16.
- 5.14 Filed Sub-bidders shall include the cost of Performance and Payment Bonds in the bid amount. If selected by a selected General Contractor, the Filed Sub-bidder shall provide these bonds before a contract will be executed. The form of bonds are shown in section 00 61 13.23 and 00 61 13.26.
- 5.15 In the event a Filed Sub-bidder has failed to bid to a General Contractor as intended, the Filed Sub-bidder shall take the following actions:

Instructions to Filed Sub-bidders

- a) Notify the Bid Depository in writing, not later than 24 hours prior to the closing date for General Contractors, in this manner: "*<name of Filed Sub-bidder> now intends to, but previously did not bid to <name of subject General Contractor> on the <name of project>. Please consider our bid addressed to <name of another General Contractor> as if it were also submitted to <name of subject General Contractor>.*"
 - b) Notify the subject General Contractor of the situation, in writing.
- 5.16 Filed Sub-bids may be withdrawn without penalty if documented in writing by bidders prior to the Filed Sub-bid closing time. Such written withdrawals are subject to whatever verification is required by the Bid Depository. After the Filed Sub-bid closing time, no such request will be considered until after the General Contractor closing time.
6. Receiving Filed Sub-bids
 - 6.1 The Bid Depository will provide a receipt, when requested, for each large white envelope submitted.
 - 6.2 The Bid Depository date-and-time-stamps each large white envelope, and collects all such envelopes for the project.
 - 6.3 Filed Sub-bids received by the Bid Depository after the designated closing date and time shall be date-and-time-stamped and returned, unopened.
 - 6.4 The large *white* envelopes containing Filed Sub-bids are opened in the presence of any interested party immediately after the closing time by an official representative of the Bid Depository. The Bid Depository creates a log of all submissions, noting bid bonds, if required, and prepares distribution of Filed Sub-bids to General Contractors and Owners.
 - 6.5 The *pink* envelopes are picked up by the General Contractor. The Bid Depository may require the General Contractor to sign acknowledgement of receipt of the envelopes. The Bid Depository may mail envelopes to the General Contractor upon request, at the risk and expense of the General Contractor.
 - 6.6 In a similar fashion to the above, the *green* envelopes are transmitted to the Owner. Bonds, if required, are also transmitted to the Owner.
7. General Contractor Bids Containing Filed Sub-bids
 - 7.1 Each bidding General Contractor shall submit a bid form containing the information received from Filed Sub-bidders. If a GC bid contains a dollar amount different from that filed by a Filed Sub-bidder, the bid amount filed shall be substituted for the amount submitted by the General Contractor. The General Contractor bid shall be corrected prior to the selection of a General Contractor.
 - 7.2 In the event the Owner determines that a General Contractor bid includes an invalid Filed Sub-bid, the Owner may substitute a valid apparent low dollar amount Filed Sub-bid submitted to that

Instructions to Filed Sub-bidders

General Contractor. Any action such as this would not be done until after the General Contractor bid closing.

- 7.3 The Owner may request substitution of a Filed Sub-bidder that has submitted a lower bid to the General Contractor than the Filed Sub-bidder designated by the General Contractor on their bid form. This, or other circumstances where the Owner requests a change in Filed Sub-bidder, is subject to the agreement of General Contractor and Filed Sub-bidder.

**00 41 13
Contractor Bid Form**

Hancock Judicial Center Project

Bid Form submitted by EMAIL only to email address below:

BGS.Architect@Maine.gov

Bid Administrator:

David Machon, Project Manager
Bureau of General Services
111 Sewall Street, Cross State Office Building, 4th floor
77 State House Station
Augusta, Maine 04333-0077

Bidder:

Signature: _____

Printed name & title: _____

Company name: _____

Mailing address: _____

City, State, zip code: _____

Phone number: _____

Email address: _____

State of incorporation,
if a corporation _____

List of all partners,
if a partnership _____

The Bidder agrees, if the Owner offers to award the contract, to provide any and all bonds and certificates of insurance, as well as Schedule of Values, Project Schedule, and List of Subcontractors and Suppliers if required by the Owner, and to sign the designated Construction Contract within twelve (12) calendar days after the date of notification of such acceptance, except if the twelfth day falls on a State of Maine government holiday or other closure day, or a Saturday, or a Sunday, in which case the aforementioned documents must be received before 12:00 noon on the first available business day following the holiday, other closure day, Saturday or Sunday.

As guarantee thereof, the Bidder submits, together with this bid, a Bid Bond or other acceptable instruments as and if required by the Bid Documents.

1. The Bidder, having carefully examined the Hancock Judicial Center Project Manual dated 01 February 2026, prepared by North Peak Architecture, as well as Specifications, Drawings, and any Addenda, the form of contract, and the premises and conditions relating to the work, propose to furnish all labor, equipment, and materials necessary for and reasonably incidental to the construction and completion of this project for the **BASE BID** amount of:

_____ Dollars

\$ _____

2. **Allowances** are included on this Project.
The following Allowances shall be **included with the Division 26, Electrical File Sub-bidder** and thus part of the Base Bid amount above:

1. Power Company Charges..... \$ 50,000.00
2. Telecommunications Company Charges..... \$ 30,000.00

3. **Alternates** are included on this Project
Alternate Bids as listed:

1. **DEDUCT**
to use Slip-Form concrete site curbing in lieu of Granite Site Curbing \$ _____
2. **DEDUCT**
to delete the requirement for priming structural steel \$ _____
3. **DEDUCT**
to use Asphalt Shingles for pitched roofs in lieu of Standing Seam Metal \$ _____
4. **DEDUCT**
to use Double Pane Glass in lieu of Triple Pane Glass \$ _____
5. **DEDUCT**
to delete Clean-Agent Suppression Systems \$ _____
6. **ADD**
to use Granite Veneer in lieu of Metal Siding at specific exterior wall areas... \$ _____

4. Bid Security is required on this project.
The Bidder shall include with this bid form a satisfactory Bid Bond (section 00 43 13) or a certified or cashier's check for 5% of the bid amount with this completed bid form submitted to the Owner.
5. Filed Sub-bids are required on this project
The bid amount includes the following Filed Sub-bids which were submitted to the Bidder and to the Maine Construction Bid Depository.

<u>Name of the Filed Sub-bidder</u>	<u>Division/Section</u>	<u>Dollar amount</u>
_____	Plumbing & HVAC Div 22 & Div 23	_____
_____	Electrical Division 26	_____

Hancock Judicial Center Project

☐ All Contractors

☐ All Contractors *Except* those listed below

☐ *Only* Contractors listed below

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There are approximately 20 lines visible. The paper has a slight shadow on the right side, suggesting it's resting on a surface. There is no handwriting or other markings on the paper.

File Sub-bidder:

Signature: _____

Printed name & title: _____

Company name: _____

Mailing address: _____

City, State, zip code: _____

Phone number: _____

Email address: _____

State of incorporation,
if a corporation _____

List of all partners,
if a partnership _____

The Filed Sub-bidder agrees, if selected as a Subcontractor of the selected General Contractor, to enter into the designated Contractor-Subcontractor contract according to the terms of this bid, and sign the contract within seven calendar days after the date of notification of such selection, and to provide the General Contractor with a 100% Performance Bond and a 100% Payment Bond for the Subcontractor portion of the work, and to provide any and all affidavits of insurance specified in the Bid Documents.

1. The Filed Sub-bidder, having carefully examined the Hancock Judicial Center Project Manual dated 01 February, 2026, prepared by North Peak Architecture, as well as Specifications, Drawings, and any Addenda, the form of contract, and the premises and conditions relating to the work, proposes to furnish all labor, equipment and materials necessary for and reasonably incidental to the construction and completion of this project, a propos the "Filed Sub-bidder" scope of work, for the total Filed Sub-bid **Base Bid** amount of:

_____ Dollars

\$ _____

This Filed Sub-bid includes the following Specifications Sections and dollar amounts for each section. The sum of all filled-in dollar amount lines below shall equal the total Filed Sub-bid Base Bid amount shown above. The Filed Sub-bidder shall indicate a dollar amount only for those lines on which they are submitting a bid.

Div. 22 00 00 Plumbing Systems &
Div. 23 00 00 Heating, Ventilating, & Air Conditioning..... \$ _____

Div. 26 00 00 Electrical Systems \$ _____

2. Allowances shall be included on this project for the following Filed Sub-bid trades:
(see also section 01 10 00)

Filed Sub-bid: 26 00 00 Electrical Systems

Allowance:..... Utility Company Charges \$50,000.00
Allowance:..... Telecommunications Company Charges \$30,000.00

3. Alternate Bids (as applicable):

1. **DEDUCT**
to use Slip-Form concrete site curbing in lieu of Granite Site Curbing \$ _____
2. **DEDUCT**
to delete the requirement for priming structural steel \$ _____
3. **DEDUCT**
to use Asphalt Shingles for pitched roofs in lieu of Standing Seam Metal \$ _____
4. **DEDUCT**
to use Double Pane Glass in lieu of Triple Pane Glass \$ _____
5. **DEDUCT**
to delete Clean-Agent Suppression Systems \$ _____
6. **ADD**
to use Granite Veneer in lieu of Metal Siding at specific exterior wall areas .. \$ _____

4. Bid Security is required on this project:
The Filed Sub-bidder shall include a satisfactory Bid Bond (section 00 43 16) or a certified or cashier's check for 5% of the bid amount with this completed bid form.
5. Filed Sub-bids are required on this project.
The Bid Documents show all Filed Sub-bids which are required for this project.

00 43 13
Contractor Bid Bond

Bond No.: insert bond number

We, the undersigned, insert company name of Contractor, select type of entity of insert name of municipality in the State of insert name of state as principal, and insert name of surety as Surety, are hereby held and firmly bound unto select title of obligee in the penal sum of five percent of the bid amount, for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns, signed this insert date, i.e.: 8th day of select month, select year, which is the same date as that of the first specified bid due date, or subsequent bid due date revised by addendum.

The condition of the above obligation is such that whereas the principal has submitted to the Owner, or State of Maine, to a certain bid, attached hereto and hereby made a part hereof, to enter into a contract in writing, for the construction of insert name of project as designated in the contract documents

Now therefore:

If said bid shall be rejected, or, in the alternate,

If said bid shall be accepted and the principal shall execute and deliver a contract in the form of contract attached hereto, properly completed in accordance with said bid, and shall furnish a bond for the faithful performance of said contract, and for the payment of all persons performing labor or furnishing material in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said bid, then this obligation shall be void.

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

The Surety, for value received hereby stipulates and agrees that the obligation of said Surety and its bonds shall be in no way impaired or affected by any extension of the time within which the Obligee may accept such bid and said Surety does hereby waive notice of any such extension.

00 43 13
Contractor Bid Bond

In witness whereof, the principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set above.

Signed and sealed this *insert date, i.e.: 8th* day of *select month, select year*, which is the same date as that of the first specified bid due date, or subsequent bid due date revised by addendum.

Contractor

(Signature)

insert name and title

insert company name

insert address
insert city state zip code

Surety

(Signature)

insert name and title

insert company name

insert address
insert city state zip code

If Contractor is a partnership, all partners shall execute the bond. A power of attorney document indicating that it still is in full force and effect shall be provided by the person executing this bond.

00 43 16
Subcontractor Bid Bond

Bond No.: insert bond number

We, the undersigned, insert company name of Subcontractor, select type of entity of insert name of municipality in the State of insert name of state as principal, and insert name of surety as Surety, are hereby held and firmly bound unto select title of obligee in the penal sum of five percent of the bid amount, for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns, signed this insert date, i.e.: 8th day of select month, select year, which is the same date as that of the first specified Subcontractor bid due date, or subsequent bid due date revised by addendum.

The condition of the above obligation is such that whereas the principal has submitted to the Owner, or State of Maine, to a certain Subcontractor bid, attached hereto and hereby made a part hereof, to enter into a subcontract in writing with any Contractor listed in said Subcontractor bid, provided the designated Contractor has entered into a written agreement with the Owner, for the construction of insert name of project as designated in the contract documents.

Now therefore:

If said Subcontractor bid shall be rejected, or, in the alternate,

If said Subcontractor bid shall be accepted and the principal shall execute and deliver a subcontract to the Contractor designated by the Owner in the form of subcontract attached hereto, properly completed in accordance with said Subcontractor bid, and shall furnish a bond for the faithful performance of said subcontract, and for the payment of all persons performing labor or furnishing material in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said Subcontractor bid, then this obligation shall be void.

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

The Surety, for value received hereby stipulates and agrees that the obligation of said Surety and its bonds shall be in no way impaired or affected by any extension of the time within which the Obligee may accept such Subcontractor bid and said Surety does hereby waive notice of any such extension.

00 43 16
Subcontractor Bid Bond

In witness whereof, the principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set above.

Signed and sealed this insert date, i.e.: 8th day of select month, select year, which is the first specified Subcontractor bid due date, or subsequent bid due date revised by addendum.

Subcontractor

(Signature)

insert name and title

insert company name

insert address
insert city state zip code

Surety

(Signature)

insert name and title

insert company name

insert address
insert city state zip code

If Subcontractor is a partnership, all partners shall execute the bond. A power of attorney document indicating that it still is in full force and effect shall be provided by the person executing this bond.

State of Maine CONSTRUCTION CONTRACT

Large Construction Project

*This form is used when the Contract value is \$50,000 or greater.
The Project Manual, Specifications and Drawings, and any Addenda are considered part of this Contract.*

Agreement entered into by and between the contracting entity name hereinafter called the **Owner** and Contractor company name hereinafter called the **Contractor**.

BGS Project No.: number assigned by BGS

Other Project No.: _____

For the following Project: title of project as shown on bid documents at facility or campus name, municipality, Maine.

The Specifications and the Drawings have been prepared by Consultant firm name, acting as Professional-of-Record and named in the documents as the Consultant Architect or Engineer.

The *Owner* and *Contractor* agree as follows:

ARTICLE 1 COMPENSATION AND PAYMENTS

1.1 The Owner shall pay the Contractor to furnish all labor, equipment, materials and incidentals necessary for the construction of the Work described in the Specifications and shown on the Drawings the Contract Amount as shown below.

Base Bid	<u>\$0.00</u>
<u>Alternate Bid number and name or "no Alternates"</u>	<u>\$0.00</u>
<u>Alternate Bid number and name or "no Alternates"</u>	<u>\$0.00</u>
<u>Alternate Bid number and name or "no Alternates"</u>	<u>\$0.00</u>
<u>Alternate Bid number and name or "no Alternates"</u>	<u>\$0.00</u>
<u>Alternate Bid number and name or "no Alternates"</u>	<u>\$0.00</u>
Total Contract Amount	<u>\$0.00</u>

1.2 The Contractor's requisition shall contain sufficient detail and supporting information for the Owner to evaluate and support the payment requested.

1.2.1 Payments are due and payable twenty-five working days from the date of receipt of a Contractor requisition which is approved by the Owner.

1.2.2 Provisions for late payments are governed by 5 M.R.S. Chapter 144, *Payment of Invoices Received from Business Concerns*, and interest shall be calculated at 1% per month.

ARTICLE 2 COMMENCEMENT AND COMPLETION DATES

2.1 The Work of this Contract shall commence no sooner than the date this document is executed by the approval authority, or a subsequent date designated in the contract documents.

2.2 The Substantial Completion Date shall be insert date.

2.3 The Work of this Contract shall be completed on or before the Contract Final Completion Date of insert date.

2.4 The Contract Expiration Date shall be insert date. (This date is the Owner's deadline for internal management of contract accounts. The Contract Expiration Date does not directly relate to any contract obligation of the Contractor.)

ARTICLE 3 INELIGIBLE BIDDER

3.1 By signing this contract the Contractor attests that it has not been declared ineligible to bid on State of Maine projects. The Bureau of General Services may disallow award of this contract to any Contractor if there is evidence that the Contractor or any of its Subcontractors, through their own fault, have been terminated, suspended for cause, debarred from bidding, agreed to refrain from bidding as part of a settlement, have defaulted on a contract, or had a contract completed by another party.

3.2 By signing this contract the Contractor attests that it is not presently indicted for or otherwise criminally or civilly charged by a Federal, State or local government entity with commission of any of the following offenses and has not within a three-year period preceding this bid been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction, or contract under a public transaction, violation of Federal or State anti-trust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property.

3.3 The Contractor shall not make any award or permit any award (subgrant or contract) at any tier to any party which is debarred or suspended or is otherwise excluded from or ineligible for participation in Federal assistance programs or State of Maine projects.

ARTICLE 4 CONTRACTOR'S RESPONSIBILITIES

4.1 On this project, the Contractor shall furnish the Owner the appropriate contract bonds in the amount of 100% of the Contract Sum. Contract bonds are mandated if the Contract Sum exceeds \$125,000, or if bonds are specifically required by the Contract Documents.

4.2 The Contractor shall comply with all laws, codes and regulations applicable to the Work.

4.3 The Contractor shall acquire all permits and third-party approvals applicable to the Work not specifically identified as provided by the Owner. Costs for Contractor-provided permits and third-party approvals shall be included in the Contract Sum identified in Section 1.1 above.

4.4 The Contractor shall remain an independent agent for the duration of this Contract, shall not become an employee of the State of Maine, and shall assure that no State employee will be compensated by, or otherwise benefit from, this Contract.

4.5 The Contractor shall be responsible for any design cost, construction cost, or other cost incurred on the Project to the extent caused by the negligent acts, errors or omissions of the Contractor or their Subcontractors in the performance of Work under this Contract.

ARTICLE 5 OWNER'S RESPONSIBILITIES

5.1 The Owner shall provide full information about the objectives, schedule, constraints and existing conditions of the project. The Owner has established a budget with reasonable contingencies that meets the project requirements.

5.2 By signing this contract, the Owner attests that all State of Maine procurement requirements for this contract have been met, including the solicitation of competitive bids.

ARTICLE 6 INSTRUMENTS OF SERVICE

6.1 The Contractor's use of the drawings, specifications and other documents known as the Consultant's Instruments of Service is limited to the execution of the Contractor's scope of work of this project unless the Contractor receives the written consent of the Owner and Consultant for use elsewhere.

ARTICLE 7 MISCELLANEOUS PROVISIONS

7.1 This Contract shall be governed by the laws of the State of Maine.

7.2 The Owner and Contractor, respectively, bind themselves, their partners, successors, assigns and legal representatives to this Contract. Neither party to this Contract shall assign the Contract as a whole without written consent of the other party, which consent the Owner may withhold without cause.

7.3 Notwithstanding any other provision of this Agreement, if the Owner does not receive sufficient funds to fund this Agreement or funds are de-appropriated, or if the Owner does not receive legal authority from the Maine State Legislature or Maine Courts to expend funds intended for this Agreement, then the Owner is not obligated to make payment under this Agreement; provided, however, the Owner shall be obligated to pay for services satisfactorily performed prior to any such non-appropriation in accordance with the termination provisions of this Agreement. The Owner shall timely notify the Contractor of any non-appropriation and the effective date of the non-appropriation.

ARTICLE 8 CONTRACT DOCUMENTS

8.1 The Project Manual, Specifications and Drawings, and any Addenda, together with this agreement, form the contract. Each element is as fully a part of the Contract as if hereto attached or herein repeated.

8.2 Specifications: *indicate date of issuance of project manual*

8.3 Drawings: *note here or attach each sheet number and title*

8.4 Addenda: *note each addenda number and date, or "none"*

BGS Project No.: _____

The Contract is effective as of the date executed by the approval authority.

OWNER**CONTRACTOR**

Signature *Date*
name and title
name of contracting entity
address
telephone
email address

Signature *Date*
name and title
name of contractor company
address
telephone
email address
Vendor Number

Indicate the names of the review and approval individuals appropriate to the approval authority.

select proper approval authority			
Reviewed by:		Approved by:	
<i>Signature</i>	<i>Date</i>	<i>Signature</i>	<i>Date</i>
<i>insert name</i>		<i>John Kenney, P.E.</i>	
<i>Project Manager/ Contract Administrator</i>		<i>Director, Planning Design and Construction Division (PDCD)</i>	

00 52 16
Subcontract Agreement

State of Maine
CONSTRUCTION SUBCONTRACT

Agreement entered into by and between the Contractor company name hereinafter called the *Contractor*, and Subcontractor company name hereinafter called the *Subcontractor*.

The *Contractor* and the *Subcontractor* agree as follows:

ARTICLE 1 COMPENSATION AND PAYMENTS

1.1 The Contractor shall pay the Subcontractor to perform the subcontract Work described in the Specifications and shown on the Drawings and defined by attachments to this subcontract the Contract Sum of \$0.00.

ARTICLE 2 TIME OF COMPLETION

2.1 The Work of this Contract shall be completed according to the established construction schedule, on or before the Contract Final Completion Date of insert date.

ARTICLE 3 INELIGIBLE BIDDER

3.1 By signing this subcontract the Subcontractor attests that it has not been declared ineligible to bid on State of Maine projects. The Bureau of General Services may disallow award of this contract to any Subcontractor if there is evidence that the Subcontractor, through their own fault, have been terminated, suspended for cause, debarred from bidding, agreed to refrain from bidding as part of a settlement, have defaulted on a contract, or had a contract completed by another party.

3.2 By signing this contract the Subcontractor attests that it is not presently indicted for or otherwise criminally or civilly charged by a Federal, State or local government entity with commission of any of the following offenses and has not within a three-year period preceding this bid been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction, or contract under a public transaction, violation of Federal or State anti-trust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property.

3.3 The Subcontractor shall not make any award or permit any award (subgrant or contract) at any tier to any party which is debarred or suspended or is otherwise excluded from or ineligible for participation in Federal assistance programs or State of Maine projects.

ARTICLE 4 SUBCONTRACTOR'S RESPONSIBILITIES

4.1 The *Subcontractor* shall furnish all of the materials and perform all the Work described in the Specifications and shown on the Drawings for the project entitled: title of project shown on documents prepared by Architect - Engineer firm name, for the specification sections here described: list all sections- for this subcontract only- by number and name.

4.2 *Not used.*

00 52 16
Subcontract Agreement

4.3 The Subcontractor shall comply with all laws, codes and regulations applicable to the Work.

4.4 *Not used.*

4.5 The Subcontractor shall remain an independent agent for the duration of this subcontract, shall not become an employee of the State of Maine, and shall assure that no State employee will be compensated by, or otherwise benefit from, this subcontract.

ARTICLE 5 CONTRACTOR'S RESPONSIBILITIES

5.1 The Contractor shall share all relevant available information about the objectives, schedule, constraints and existing conditions of the project.

ARTICLE 6 INSTRUMENTS OF SERVICE

6.1 The Subcontractor's use of the Drawings, Specifications and other documents known as the Consultant's Instruments of Service is limited to the execution of the Subcontractor's scope of work of this project unless the Subcontractor receives the written consent of the Owner and Consultant for use elsewhere.

ARTICLE 7 MISCELLANEOUS PROVISIONS

7.1 This Contract shall be governed by the laws of the State of Maine.

7.2 The Contractor and Subcontractor, respectively, bind themselves, their partners, successors, assigns and legal representatives to this Contract. Neither party to this Contract shall assign the Contract as a whole without written consent of the other party, which consent the Contractor may withhold without cause.

7.3 Subcontract bonds are required for projects utilizing Filed Sub-bids. The Subcontractor shall furnish the Contractor the appropriate subcontract bonds in the amount of 100% of the contract amount.

7.4 The Contractor shall make payments on account of the subcontract as provided therein as follows: each month 95% of the value, based on contract prices of labor and materials incorporated in the Work and of materials suitably stored at the site thereof up to the first day of that month, as certified by the Architect or Engineer.

7.5 Final payment shall be due 60 days after completion and acceptance of the Work, provided the Subcontractor has submitted evidence satisfactory to the Contractor and the Owner that all payrolls, material bills and other indebtedness connected with the Work has been paid.

7.6 Other provisions. *There are no other provisions.*

ARTICLE 8 CONTRACT DOCUMENTS

8.1 The Project Manual, Specifications and Drawings, and any Addenda, together with this agreement, form the contract. Each element is as fully a part of the Contract as if hereto attached or herein repeated.

8.2 Specifications: *indicate date of issuance of project manual*

00 52 16
Subcontract Agreement

8.3 Drawings: *note each sheet number and title*

8.4 Addenda: *note each addenda number and date, or "none"*

00 52 16
Subcontract Agreement

The Agreement is effective as of the date last executed by the parties.

CONTRACTOR

SUBCONTRACTOR

(Signature) *(Date)*
name and title

name of contracting entity

(Signature) *(Date)*
name and title

name of contractor company

00 61 13.13
Contractor Performance Bond

Bond No.: insert bond number

We, the undersigned, insert company name of Contractor, select type of entity of insert name of municipality in the State of insert name of state as principal, and insert name of surety as Surety, are hereby held and firmly bound unto select title of obligee in the penal sum of the Contract Price \$ insert the Contract Price in numbers for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

The condition of the above obligation is such that if the principal shall promptly and faithfully perform the contract entered into this insert date, i.e.: 8th day of select month, select year, which is the same date as that of the notice of intent to award letter, or in the absence of such a letter, not later than the date the Owner signs the construction contract, for the construction of insert name of project as designated in the contract documents, then this obligation shall be null and void.

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

The Surety, for value received hereby stipulates and agrees that the obligation of said Surety and its bonds shall be in no way impaired or affected by any extension of the time which the Obligee may accept during the performance of the contract and said Surety does hereby waive notice of any such extension.

00 61 13.13
Contractor Performance Bond

In witness whereof, the principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set above.

Signed and sealed this *insert date, i.e.: 8th* day of *select month, select year*, which is the same date as that of the notice of intent to award letter, or in the absence of such a letter, not later than the date the Owner signs the construction contract.

Contractor

(Signature)

insert name and title

insert company name

insert address

insert city state zip code

Surety

(Signature)

insert name and title

insert company name

insert address

insert city state zip code

If Contractor is a partnership, all partners shall execute the bond. A power of attorney document indicating that it still is in full force and effect shall be provided by the person executing this bond.

00 61 13.16
Contractor Payment Bond

Bond No.: insert bond number

We, the undersigned, insert company name of Contractor, select type of entity of insert name of municipality in the State of insert name of state as principal, and insert name of surety as Surety, are hereby held and firmly bound unto select title of obligee in the penal sum of the Contract Price \$ insert the Contract Price in numbers for the use and benefit of claimants, defined as an entity having a contract with the principal or with a subcontractor of the principal for labor, materials, or both labor and materials, used or reasonably required for use in the performance of the contract, for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

The condition of the above obligation is such that if the principal shall promptly satisfy all claims and demands incurred for all labor and materials, used or required by the principal in connection with the work described in the contract entered into this insert date, i.e.: 8th day of select month, select year, which is the same date as that of the notice of intent to award letter, or in the absence of such a letter, not later than the date the Owner signs the construction contract, for the construction of insert name of project as designated in the contract documents, and shall fully reimburse the obligee for all outlay and expense with said obligee may incur in making good any default of said principal, then this obligation shall be null and void.

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

The Surety, for value received hereby stipulates and agrees that the obligation of said Surety and its bonds shall be in no way impaired or affected by any extension of the time which the Obligee may accept during the performance of the contract and said Surety does hereby waive notice of any such extension.

00 61 13.16
Contractor Payment Bond

In witness whereof, the principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set above.

Signed and sealed this insert date, i.e.: 8th day of select month, select year, which is the same date as that of the notice of intent to award letter, or in the absence of such a letter, not later than the date the Owner signs the construction contract.

Contractor

(Signature)

insert name and title

insert company name

insert address

insert city state zip code

Surety

(Signature)

insert name and title

insert company name

insert address

insert city state zip code

If Contractor is a partnership, all partners shall execute the bond. A power of attorney document indicating that it still is in full force and effect shall be provided by the person executing this bond.

00 61 13.23
Subcontractor Performance Bond

Bond No.: insert bond number

We, the undersigned, insert company name of Subcontractor, select type of entity of insert name of municipality in the State of insert name of state as principal, and insert name of surety as Surety, are hereby held and firmly bound unto insert company name of Contractor in the penal sum of the Contract Price \$ insert the Contract Price in numbers for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

The condition of the above obligation is such that if the principal shall promptly and faithfully perform the contract entered into this insert date, i.e.: 8th day of select month, select year, which is the same date as that of the notice of intent to award letter, or in the absence of such a letter, not later than the date the Owner signs the construction contract, for the construction of insert name of project as designated in the contract documents, then this obligation shall be null and void.

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

The Surety, for value received hereby stipulates and agrees that the obligation of said Surety and its bonds shall be in no way impaired or affected by any extension of the time which the Obligee or Contractor may accept during the performance of the contract and said Surety does hereby waive notice of any such extension.

00 61 13.23
Subcontractor Performance Bond

In witness whereof, the principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set above.

Signed and sealed this insert date, i.e.: 8th day of select month, select year, which is the same date as that of the notice of intent to award letter, or in the absence of such a letter, not later than the date the Owner signs the construction contract.

Subcontractor

(Signature)

insert name and title

insert company name

insert address

insert city state zip code

Surety

(Signature)

insert name and title

insert company name

insert address

insert city state zip code

If Subcontractor is a partnership, all partners shall execute the bond. A power of attorney document indicating that it still is in full force and effect shall be provided by the person executing this bond.

00 61 13.26
Subcontractor Payment Bond

Bond No.: insert bond number

We, the undersigned, insert company name of Subcontractor, select type of entity of insert name of municipality in the State of insert name of state as principal, and insert name of surety as Surety, are hereby held and firmly bound unto insert company name of Contractor as obligee, in the penal sum of the Contract Price \$ insert the Contract Price in numbers for the use and benefit of claimants, defined as an entity having a contract with the principal or with a subcontractor of the principal for labor, materials, or both labor and materials, used or reasonably required for use in the performance of the contract, for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

The condition of the above obligation is such that if the principal shall promptly satisfy all claims and demands incurred for all labor and materials, used or required by the principal in connection with the work described in the contract entered into this insert day, i.e.: 8th day of select month, select year, which is the same date as that of the notice of intent to award letter, or in the absence of such a letter, not later than the date the Owner signs the construction contract, for the construction of insert name of project as designated in the contract documents, and shall fully reimburse the obligee for all outlay and expense with said obligee may incur in making good any default of said principal, then this obligation shall be null and void.

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

The Surety, for value received hereby stipulates and agrees that the obligation of said Surety and its bonds shall be in no way impaired or affected by any extension of the time which the Obligee or Contractor may accept during the performance of the contract and said Surety does hereby waive notice of any such extension.

00 61 13.26
Subcontractor Payment Bond

In witness whereof, the principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set above.

Signed and sealed this *insert day, i.e.: 8th* day of *select month, select year*, which is the same date as that of the notice of intent to award letter, or in the absence of such a letter, not later than the date the Owner signs the construction contract.

Subcontractor

(Signature)

insert name and title

insert company name

insert address

insert city state zip code

Surety

(Signature)

insert name and title

insert company name

insert address

insert city state zip code

If Subcontractor is a partnership, all partners shall execute the bond. A power of attorney document indicating that it still is in full force and effect shall be provided by the person executing this bond.

State of Maine
CONSTRUCTION CONTRACT
Application for Payment

Enter Project name

Enter location / school / campus

Application Number: **1****Enter Contractor Company name**

address

city state zip code

Period Start Date: **19-May-2025**Period End Date: **30-Jun-2025**BGS Project No.: **BGS #**Other Project No.: **Other # or n/a**

1	Original Contract Amount		\$0
2	Net of Change Orders to Date (from table below)		\$0
3	Contract Sum to Date (line 1 plus or minus line 2)		\$0
4	Total Completed and Stored to Date (column G on Continuation Sheet)		\$0
5a	5% Retainage of Completed Work (columns D + E x 5%)	\$0	
5b	5% Retainage of Stored Materials (column F x 5%)	\$0	
5c	Total Retainage (column I)		\$0
6	Total Earned Less Retainage (line 4 minus line 5c)		\$0
7	Less Previous Approved Applications for Payment (line 6 from previous Application)		\$0
8	Current Payment Due (line 6 minus line 7)		\$0
9	Balance to Finish, Including Retainage (line 3 minus line 6)	\$0	

Change Order Summary	Additions	Deductions
Total Changes Approved in Previous Months	\$0	\$0
Total Changes Approved this Month	\$0	\$0
Subtotals	\$0	\$0
Net of Change Orders to Date		\$0

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 the previous Certificates for Payment were issued and payments received from the Owner, and that current payment shown herein is now due.

Contractor

Type company name here

Type person's name, title here

signature

date

In accordance with the Contract Documents, based on on-site observations and the data comprising this Application, the Consultant certifies to the Owner that to the best of the Consultant'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 _____

Consultant (Architect or Engineer)

Type firm name here

Type person's name, title here

signature

date

Owner

Type contracting entity name here

Type person's name, title here

signature

date

Owner's Rep / other - clear this text if not used

Type entity name here

Type person's name, title here

signature

date

Bureau of General Services / Other - clear this text if not used

Type entity name here

Type person's name, title here

signature

date

Bureau of General Services

Type entity name here

Type person's name, title here

signature

date

**State of Maine
CONSTRUCTION CONTRACT
Change Order**

Project name

location / school / campus

Change Order: **1**Issue Date of this Document: **21-Aug-2025****Contractor Company name**

address

city state zip code

BGS Project No.: **n**Other Project No.: **x****Cost Change**

Show Deduct as a negative number, e.g.: "\$850".

	Add	Deduct	Total
Net Amount of this Change Order	\$0	\$0	
Net Amount of Previous Change Orders	\$0	\$0	
Net of Change Orders to Date	\$0	\$0	\$0
Original Contract Amount			\$0
Revised Contract Amount			\$0

Time Change

Show Deduct as a negative number, e.g.: "-8".

	Add	Deduct	Total
Net Calendar Days Adjusted by this Change Order	0	0	
Net Calendar Days Adjusted by Previous Change Orders	0	0	
Net of Change Orders to Date	0	0	0
Original Contract Final Completion Date			30-Apr-2027
Revised Contract Final Completion Date*			30-Apr-2027

Consultant (Architect or Engineer)

Type firm name here

Type person's name, title here

signature

date

Contractor

Type company name here

Type person's name, title here

signature

date

Owner

Type contracting entity name here

Type person's name, title here

signature

date

Owner' Representative / Delete if not used

Type entity name here

Type person's name, title here

signature

date

Project Manager / Delete if not used

Type entity name here

Type person's name, title here

signature

date

Bureau of General Services

Division of Planning, Design & Construction

Type person's name, title here

signature

date

Attach the "List of Change Order Items" sheet, plus all supporting documentation for each Change Order Item.

Substantial Completion Date: the deadline for first beneficial use by Owner, as certified by Consultant.

* **Contract Final Completion Date**: the Contractor's final completion deadline for contract work.

Contract Expiration Date: the Owner's deadline for internal management of contract accounts;

Contract Expiration Date does not directly relate to any contract obligation of the Contractor.

4-May-2027

30-Apr-2027

31-Dec-2027

00 71 00
Definitions

1. Definitions

- 1.1 *Addendum*: A document issued by the Consultant that amends the Bid Documents. Addenda shall not be issued less than seventy-two hours prior to the specified bid opening time.
- 1.2 *Allowance*: A specified dollar amount for a particular scope of work or service included in the Work that is identified in the Bid Documents and included in each Bidder's Bid. The Contractor shall document expenditures for an Allowance during the Project. Any unused balance shall be credited to the Owner. The Contractor is responsible for notifying the Owner of anticipated expenses greater than the specified amount and the Owner is responsible for those additional expenses.
- 1.3 *Alternate Bid*: The Contractor's written offer of a specified dollar amount, submitted on the Bid Form, for the performance of a particular scope of work described in the Bid Documents. The Owner determines the low bidder based on the sum of the base Bid and any combination of Alternate Bids that the Owner selects.
- 1.4 *Architect*: A Consultant acting as, or supporting, the Professional-of-Record who is responsible for the design of the Project. Equivalent to "Consultant" in State of Maine contract forms.
- 1.5 *Architectural Supplemental Instruction (ASI)*: A written instruction from the Architect for the purpose of clarification of the Contract Documents. An ASI does not alter the Contract Price or Contract Time. ASIs may be responses to RFIs and shall be issued by the Architect in a timely manner to avoid any negative impact on the Schedule of the Work.
- 1.6 *Bid*: The Contractor's written offer of a specified dollar amount or amounts, submitted on a form included in the Bid Documents, for the performance of the Work. A Bid may include bonds or other requirements. A base Bid is separate and distinct from Alternate Bids, being the only cost component necessary for the award of the contract, and representing the minimum amount of Work that is essential for the functioning of the Project.
- 1.7 *Bid Bond*: The security designated in the Bid Documents, furnished by Bidders as a guaranty of good faith to enter into a contract with the Owner, should a contract be awarded to that Bidder.
- 1.8 *Bidder*: Any business entity, individual or corporation that submits a bid for the performance of the work described in the Bid Documents, acting directly or through a duly authorized representative. See also *Responsive and Responsible Bidder*.
- 1.9 *Bid Documents*: The drawings, procurement and contracting requirements, general requirements, and the written specifications -including all addenda, that a bidder is required to reference in the submission of a bid.
- 1.10 *Bureau*: The State of Maine Bureau of General Services, or BGS, in the Department of Administrative and Financial Services.
- 1.11 *Calendar days*: Consecutive days, as occurring on a calendar, taking into account each day of the week, month, year, and any religious, national or local holidays. Calendar days are used for changes in Contract Time.

00 71 00
Definitions

- 1.12 *Certificate of Substantial Completion*: A document developed by the Consultant that describes the final status of the Work and establishes the date that the Owner may use the facility for its intended purpose. The Certificate of Substantial Completion may also include a provisional list of items - a "punch list" - remaining to be completed by the Contractor. The Certificate of Substantial Completion identifies the date from which the project warranty period commences.
- 1.13 *Certificate of Occupancy*: A document developed by a local jurisdiction such as the Code Enforcement Officer that grants permission to the Owner to occupy a building.
- 1.14 *Change Order (CO)*: A document that modifies the contract and establishes the basis of a specific adjustment to the Contract Price or the Contract Time, or both. Change Orders may address correction of omissions, errors, and document discrepancies, or additional requirements. Change Orders should include all labor, materials and incidentals required to complete the work described. A Change Order is not valid until signed by the Contractor, Owner and Consultant and approved by the Bureau.
- 1.15 *Change Order Proposal (COP) (see also Proposal)*: Contract change proposed by the Contractor regarding the contract amount, requirements, or time. The Contractor implements the work of a COP after it is accepted by all parties. Accepted COPs are incorporated into the contract by Change Order.
- 1.16 *Clerk of the Works*: The authorized representative of the Consultant on the job site. Clerk of the Works is sometimes called the Architect's representative.
- 1.17 *Construction Change Directive (CCD)*: A written order prepared by the Consultant and signed by the Owner and Consultant, directing a change in the Work prior to final agreement with the Contractor on adjustment, if any, in the Contract Price or Contract Time, or both.
- 1.18 *Contract*: A written agreement between the Owner and the successful bidder which obligates the Contractor to perform the work specified in the Contract Documents and obligates the Owner to compensate the Contractor at the mutually accepted sum, rates or prices.
- 1.19 *Contract Bonds (also known as Payment and Performance Bonds)*: The approved forms of security, furnished by the Contractor and their surety, which guarantee the faithful performance of all the terms of the contract and the payment of all bills for labor, materials and equipment by the Contractor.
- 1.20 *Contract Documents*: The drawings and written specifications (including all addenda), Standard General Conditions, and the contract (including all Change Orders subsequently incorporated in the documents).
- 1.21 *Contract Expiration Date*: Date determined by the Owner as a deadline for internal management of contract accounts. This allows time after the Contract Final Completion Date for processing the final Requisition for Payment. The Contract Expiration Date does not directly relate to any contract obligation of the Contractor.
- 1.22 *Contract Final Completion Date*: Point of time when the Work is fully completed in compliance with the Contract Documents, as certified by the Consultant. Final payment to the Contractor is due upon Final Completion of the Project.
- 1.23 *Contract Price*: The dollar amount of the construction contract, also called *Contract Sum*.

00 71 00
Definitions

- 1.24 *Contract Time*: The designated duration of time to execute the Work of the contract, with a specific date for completion.
- 1.25 *Contractor*: Also called the "General Contractor" or "GC" the individual or entity undertaking the execution of the general contract work under the terms of the contract with the Owner, acting directly or through a duly authorized representative. The Contractor is responsible for the means, methods and materials utilized in the execution and completion of the Work.
- 1.26 *Consultant*: The Architect or Engineer acting as Professional-of-Record for the Project. The Consultant is responsible for the design of the Project.
- 1.27 *Drawings*: The graphic and pictorial portion of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.
- 1.28 *Engineer*: A Consultant acting as, or supporting, the Professional-of-Record who is responsible for the design of the Project. Equivalent to "Consultant" in State of Maine contract forms.
- 1.29 *Filed Sub-bid*: The designated major Subcontractor's (or, in some cases, Contractor's) written offer of a specified dollar amount or amounts, submitted on a form included in the Bid Documents, for the performance of a particular portion of the Work. A Filed Sub-bid may include bonds or other requirements.
- 1.30 *General Requirements*: The on-site overhead expense items the Contractor provides for the Project, typically including, but not limited to, building permits, construction supervision, Contract Bonds, insurance, field office, temporary utilities, rubbish removal, and site fencing. Overhead expenses of the Contractor's general operation are not included. Sometimes referred to as the Contractor's General Conditions.
- 1.31 *Owner*: The State agency which is represented by duly authorized individuals. The Owner is responsible for defining the scope of the Project and compensation to the Consultant and Contractor.
- 1.32 *Owner's Representative*: The individual or entity contracted by the Owner to be an advisor and information conduit regarding the Project.
- 1.33 *Overhead*: General and administrative expenses of the Contractor's principal and branch offices, including payroll costs and other compensation of Contractor employees, deductibles paid on any insurance policy, charges against the Contractor for delinquent payments, and costs related to the correction of defective work, and the Contractor's capital expenses, including interest on capital used for the work.
- 1.34 *Performance and Payment Bonds (also known as Contract Bonds)*: The approved forms of security, furnished by the Contractor and their surety, which guarantee the faithful performance of all the terms of the contract and the payment of all bills for labor, materials and equipment by the Contractor.
- 1.35 *Post-Bid Addendum*: Document issued by the Consultant that defines a potential Change Order prior to signing of the construction contract. The Post-Bid Addendum allows the Owner to negotiate

00 71 00
Definitions

contract changes with the Bidder submitting the lowest valid bid, only if the negotiated changes to the Bid Documents result in no change or no increase in the bid price.

A Post-Bid Addendum may also be issued after a competitive construction Bid opening to those Bidders who submitted a Bid initially, for the purpose of rebidding the Project work without re-advertising.

- 1.36 *Project*: The construction project proposed by the Owner to be constructed according to the Contract Documents. The Project, a public improvement, may be tied logistically to other public improvements and other activities conducted by the Owner or other contractors.
- 1.37 *Proposal (see also Change Order Proposal)*: The Contractor's written offer submitted to the Owner for consideration containing a specified dollar amount or rate, for a specific scope of work, and including a schedule impact, if any. A proposal shall include all costs for overhead and profit. The Contractor implements the work of a Proposal after it is accepted by all parties. Accepted Proposals are incorporated into the contract by Change Order.
- 1.38 *Proposal Request (PR)*: An Owner's written request to the Contractor for a Change Order Proposal.
- 1.39 *Punch List*: A document that identifies the items of work remaining to be done by the Contractor at the Close Out of a Project. The Punch List is created as a result of a final inspection of the work only after the Contractor attests that all of the Work is in its complete and permanent status.
- 1.40 *Request For Information (RFI)*: A Contractor's written request to the Consultant for clarification, definition or description of the Work. RFIs shall be presented by the Contractor in a timely manner to avoid any negative impact on the Schedule of the Work.
- 1.41 *Request For Proposal (RFP)*: An Owner's written request to the Contractor for a Change Order Proposal.
- 1.42 *Requisition for Payment*: The document in which the Contractor certifies that the Work described is, to the best of the Contractor's knowledge, information and belief, complete and that all previous payments have been paid by the Contractor to Subcontractors and suppliers, and that the current requested payment is now due. See *Schedule of Values*.
- 1.43 *Responsive and Responsible Bidder*: A bidder who complies, when submitting a bid on a given project, with the following *responsive* standards, as required by the Bid Documents:
 - submits specific qualifications to bid the project, if required;
 - attends mandatory pre-bid conferences, if required;
 - submits a bid prior to the close of the bid period;
 - submits a complete bid form;
 - submits a bid without indications of intent contrary to the stated requirements;
 - submits other materials and information, such as bid security, as required;
 and, meets the following minimums regarding these *responsible* standards:
 - sustains a satisfactory record of project performance;
 - maintains a permanent place of business in a known physical location;
 - possesses the financial means for short- and long-term operations;
 - possesses the appropriate technical experience and capabilities;
 - employs adequate personnel and subcontractor resources;

00 71 00
Definitions

maintains the equipment needed to perform the work;
complies with the proposed implementation schedule;
complies with the insurance and bonding requirements;
provides post-construction warranty coverage;
and other criteria which can be considered relevant to the contract.

- 1.44 *Retainage*: The amount, calculated at five percent (5%) of the contract value or a scheduled value, that the Owner shall withhold from the Contractor until the work or portion of work is declared substantially complete or otherwise accepted by the Owner. The Owner may, if requested, reduce the amount withheld if the Owner deems it desirable and prudent to do so. (See Title 5 M.R.S.A., Section 1746.)
- 1.45 *Sample*: A physical example provided by the Contractor which illustrates materials, equipment or workmanship and establishes standards by which the Work will be judged.
- 1.46 *Schedule of the Work*: The document prepared by the Contractor and approved by the Owner that specifies the dates on which the Contractor plans to begin and complete various parts of the Work, including dates on which information and approvals are required from the Owner.
- 1.47 *Schedule of Values*: The document prepared by the Contractor and approved by the Owner before the commencement of the Work that specifies the dollar values of discrete portions of the Work equal in sum to the contract amount. The Schedule of Values is used to document progress payments of the Work in regular (usually monthly) requisitions for payment. See *Requisition for Payment*.
- 1.48 *Shop Drawings*: The drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or a Subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.
- 1.49 *Specifications*: The portion of the Contract Documents consisting of the written requirements of the Work for materials, equipment, systems, standards, workmanship, and performance of related services.
- 1.50 *Subcontractor*: An individual or entity undertaking the execution of any part of the Work by virtue of a written agreement with the Contractor or any other Subcontractor. Also, an individual or entity retained by the Contractor or any other Subcontractor as an independent contractor to provide the labor, materials, equipment or services necessary to complete a specific portion of the Work.
- 1.51 *Substantial Completion Date*: Point of time when the Work or a designated portion of the Work is sufficiently complete in compliance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended purpose without unscheduled disruption. Substantial Completion is documented by the date of the Certificate of Substantial Completion signed by the Owner and the Contractor.
- 1.52 *Superintendent*: The representative of the Contractor on the job site, authorized by the Contractor to receive and fulfill instructions from the Consultant.
- 1.53 *Surety*: The individual or entity that is legally bound with the Contractor and Subcontractor to insure the faithful performance of the contract and for the payment of the bills for labor, materials and equipment by the Contractor and Subcontractors.

00 71 00
Definitions

- 1.54 *Work*: The construction and services, whether completed or partially completed, including all labor, materials, equipment and services provided or to be provided by the Contractor and Subcontractors to fulfill the requirements of the Project as described in the Contract Documents.

00 72 13
General Conditions

Table of Contents of this General Conditions Section

1. Preconstruction Conference	2
2. Intent and Correlation of Contract Documents.....	2
3. Additional Drawings and Specifications	3
4. Ownership of Contract Documents	3
5. Permits, Laws, and Regulations	3
6. Taxes	4
7. Labor and Wages.....	4
8. Indemnification	5
9. Insurance Requirements	5
10. Contract Bonds.....	7
11. Patents and Royalties	7
12. Surveys, Layout of Work	7
13. Record of Documents.....	7
14. Allowances	8
15. Shop Drawings	8
16. Samples	8
17. Substitutions	9
18. Assignment of Contract.....	9
19. Separate Contracts.....	9
20. Subcontracts	10
21. Contractor-Subcontractor Relationship	10
22. Supervision of the Work.....	11
23. Observation of the Work	11
24. Consultant's Status.....	12
25. Management of the Premises	12
26. Safety and Security of the Premises	13
27. Changes in the Work	14
28. Correction of the Work.....	16
29. Owner's Right to do Work.....	16
30. Termination of Contract and Stop Work Action	16
31. Delays and Extension of Time	17
32. Payments to the Contractor	18
33. Payments Withheld	19
34. Liens	19
35. Workmanship	19
36. Close-out of the Work	20
37. Date of Completion and Liquidated Damages	21
38. Dispute Resolution	21

00 72 13
General Conditions

1. Preconstruction Conference

- 1.1 The Contractor shall, upon acceptance of a contract and prior to commencing work, schedule a preconstruction conference with the Owner and Consultant. The purpose of this conference is as follows.
 - 1.1.1 Introduce all parties who have a significant role in the Project, including:
 - Owner (State agency or other contracting entity)
 - Owner's Representative
 - Consultant (Architect or Engineer)
 - Subconsultants
 - Clerk-of-the-works
 - Contractor (GC)
 - Superintendent
 - Subcontractors
 - Other State agencies
 - Construction testing company
 - Commissioning agent
 - Special Inspections agent
 - Bureau of General Services (BGS);
 - 1.1.2 Review the responsibilities of each party;
 - 1.1.3 Review any previously-identified special provisions of the Project;
 - 1.1.4 Review the Schedule of the Work calendar submitted by the Contractor to be approved by the Owner and Consultant;
 - 1.1.5 Review the Schedule of Values form submitted by the Contractor to be approved by the Owner and Consultant;
 - 1.1.6 Establish routines for Shop Drawing approval, contract changes, requisitions, et cetera;
 - 1.1.7 discuss jobsite issues;
 - 1.1.8 Discuss Project close-out procedures;
 - 1.1.9 Provide an opportunity for clarification of Contract Documents before work begins; and
 - 1.1.10 Schedule regular meetings at appropriate intervals for the review of the progress of the Work.

2. Intent and Correlation of Contract Documents

- 2.1 The intent of the Contract Documents is to describe the complete Project. The Contract Documents consist of various components; each component complements the others. What is shown as a requirement by any one component shall be inferred as a requirement on all corresponding components.
- 2.2 The Contractor shall furnish all labor, equipment and materials, tools, transportation, insurance, services, supplies, operations and methods necessary for, and reasonably incidental to, the construction and completion of the Project. Any work that deviates from the Contract Documents which appears to be required by the exigencies of construction or by inconsistencies in the Contract Documents, will be determined by the Consultant and authorized in writing by the Consultant, Owner and the Bureau prior to execution. The Contractor shall be responsible for requesting clarifying information where the intent of the Contract Documents is uncertain.
- 2.3 The Contractor shall not utilize any apparent error or omission in the Contract Documents to the disadvantage of the Owner. The Contractor shall promptly notify the Consultant in writing of

00 72 13
General Conditions

such errors or omissions. The Consultant shall make any corrections or clarifications necessary in such a situation to document the true intent of the Contract Documents.

3. Additional Drawings and Specifications

- 3.1 Upon the written request of the Contractor, the Owner shall provide, at no expense to the Contractor, up to five sets of printed Drawings and Specifications for the execution of the Work.
- 3.2 The Consultant shall promptly furnish to the Contractor revised Drawings and Specifications, for the area of the documents where those revisions apply, when corrections or clarifications are made by the Consultant. All such information shall be consistent with, and reasonably inferred from, the Contract Documents. The Contractor shall do no work without the proper Drawings and Specifications.

4. Ownership of Contract Documents

- 4.1 The designs represented on the Contract Documents are the property of the Consultant. The Drawings and Specifications shall not be used on other work without consent of the Consultant.

5. Permits, Laws, and Regulations

- 5.1 The Owner is responsible for obtaining any zoning approvals or other similar local project approvals necessary to complete the Work, unless otherwise specified in the Contract Documents.
- 5.2 The Owner is responsible for obtaining Maine Department of Environmental Protection, Maine Department of Transportation, or other similar state government project approvals necessary to complete the Work, unless otherwise indicated in the Contract Documents.
- 5.3 The Owner is responsible for obtaining any federal agency project approvals necessary to complete the Work, unless otherwise indicated in the Contract Documents.
- 5.4 The Owner is responsible for obtaining all easements for permanent structures or permanent changes in existing facilities.
- 5.5 The Contractor is responsible for obtaining and paying for all permits and licenses necessary for the implementation of the Work. The Contractor shall notify the Owner of any delays, variance or restrictions that may result from the issuing of permits and licenses.
- 5.6 The Contractor shall comply with all ordinances, laws, rules and regulations and make all required notices bearing on the implementation of the Work. In the event the Contractor observes disagreement between the Drawings and Specifications and any ordinances, laws, rules and regulations, the Contractor shall promptly notify the Consultant in writing. Any necessary changes shall be made as provided in the contract for changes in the work. The Contractor shall not perform any work knowing it to be contrary to such ordinances, laws, rules and regulations.
- 5.7 The Contractor shall comply with local, state and federal regulations regarding construction safety and all other aspects of the Work.

00 72 13
General Conditions

- 5.8 The Contractor shall comply with the Maine Code of Fair Practices and Affirmative Action, 5 M.R.S. §784 (2).

6. Taxes

- 6.1 The Owner is exempt from the payment of Maine State sales and use taxes as provided in 36 M.R.S. §1760 (1). The Contractor and Subcontractors shall not include taxes on exempt items in the construction contract.
- 6.2 Section 1760 further provides in subsection 61 that sales to a construction contractor or its subcontractor of tangible personal property that is to be physically incorporated in, and become a permanent part of, real property for sale to or owned by the Owner, are exempt from Maine State sales and use taxes. Tangible personal property is defined in 36 M.R.S. §1752 (17).
- 6.3 The Contractor may contact Maine Revenue Services, 24 State House Station, Augusta, Maine 04333 for guidance on tax exempt regulations authorized by 36 M.R.S. §1760 and detailed in Rule 302 (18-125 CMR 302).

7. Labor and Wages

- 7.1 The Contractor shall conform to the labor laws of the State of Maine, and all other laws, ordinances, and legal requirements affecting the work in Maine.
- 7.2 The Consultant shall include a wage determination document prepared by the Maine Department of Labor in the Contract Documents for state-funded contracts in excess of \$50,000. The document shows the minimum wages required to be paid to each category of labor employed on the project.
- 7.3 On projects requiring a Maine wage determination, the Contractor shall submit monthly payroll records to the Owner ("the contracting agency") showing the name and occupation of all workers and all independent contractors employed on the project. The monthly submission must also include the Contractor's company name, the title of the project, hours worked, hourly rate or other method of remuneration, and the actual wages or other compensation paid to each person.
- 7.4 The Contractor shall not reveal, in the payroll records submitted to the Owner, personal information regarding workers and independent contractors, other than the information described above. Such information shall not include Social Security number, employee identification number, or employee address or phone number, for example.
- 7.5 The Contractor shall conform to Maine statute (39-A M.R.S. §105-A (6)) by providing to the Workers' Compensation Board a list of all subcontractors and independent contractors on the job site and a record of the entity to whom that subcontractor or independent contractor is directly contracted and by whom that subcontractor or independent contractor is insured for workers' compensation purposes.
- 7.6 The Contractor shall enforce strict discipline and good order among their employees at all times, and shall not employ any person unfit or unskilled to do the work assigned to them.

00 72 13
General Conditions

- 7.7 The Contractor shall promptly pay all employees when their compensation is due, shall promptly pay all others who have billed and are due for materials, supplies and services used in the Work, and shall promptly pay all others who have billed and are due for insurance, workers compensation coverage, federal and state unemployment compensation, and Social Security charges pertaining to this Project. Before final payments are made, the Contractor shall furnish to the Owner affidavits that all such payments described above have been made.
- 7.8 The Contractor may contact the Maine Department of Labor, 54 State House Station, Augusta, Maine 04333 for guidance on labor issues.
- 7.9 The Contractor may contact the Maine Workers' Compensation Board, 27 State House Station, Augusta, Maine 04333 for guidance on workers' compensation issues.

8. Indemnification

- 8.1 The Contractor shall indemnify and hold harmless the Owner and its officers and employees from and against any and all damages, liabilities, and costs, including reasonable attorney's fees, and defense costs, for any and all injuries to persons or property, including claims for violation of intellectual property rights, to the extent caused by the negligent acts or omissions of the Contractor, its employees, agents, officers or subcontractors in the performance of work under this Agreement. The Contractor shall not be liable for claims to the extent caused by the negligent acts or omissions of the Owner or for actions taken in reasonable reliance on written instructions of the Owner.
- 8.2 The Contractor shall notify the Owner promptly of all claims arising out of the performance of work under this Agreement by the Contractor, its employees or agents, officers or subcontractors.
- 8.3 This indemnity provision shall survive the termination of the Agreement, completion of the project or the expiration of the term of the Agreement.

9. Insurance Requirements

- 9.1 The Contractor shall provide, with each original of the signed Contract, an insurance certificate or certificates acceptable to the Owner and BGS. The Contractor shall submit insurance certificates to the Owner and BGS at the commencement of this Contract and at policy renewal or revision dates. The certificates shall identify the project name and BGS project number, and shall name the Owner as certificate holder and as additional insured for general liability and automobile liability coverages. The submitted forms shall contain a provision that coverage afforded under the insurance policies will not be canceled or materially changed unless at least ten days prior written notice by registered letter has been given to the Owner and BGS.
- 9.2 The Owner does not warrant or represent that the insurance required herein constitutes an insurance portfolio which adequately addresses all risks faced by the Contractor or its Subcontractors. The Contractor is responsible for the existence, extent and adequacy of insurance prior to commencement of work. The Contractor shall not allow any Subcontractor to commence work until all similar insurance required of the Subcontractor has been confirmed by the Contractor.

00 72 13
General Conditions

- 9.3 The Contractor shall procure and maintain primary insurance for the duration of the Project and, if written on a Claims-Made basis, shall also procure and maintain Extended Reporting Period (ERP) insurance for the period of time that any claims could be brought. The Contractor shall ensure that all Subcontractors they engage or employ will procure and maintain similar insurance in form and amount acceptable to the Owner and BGS. At a minimum, the insurance shall be of the types and limits set forth herein protecting the Contractor from claims which may result from the Contractor's execution of the Work, whether such execution be by the Contractor or by those employed by the Contractor or by those for whose acts they may be liable. All required insurance coverages shall be placed with carriers authorized to conduct business in the State of Maine by the Maine Bureau of Insurance.
- 9.3.1 The Contractor shall have Workers' Compensation insurance for all employees on the Project site in accordance with the requirements of the Workers' Compensation law of the State of Maine. Minimum acceptable limits for Employer's Liability are:
- | | |
|--------------------------------|-------------------------|
| Bodily Injury by Accident..... | \$500,000 |
| Bodily Injury by Disease..... | \$500,000 Each Employee |
| Bodily Injury by Disease..... | \$500,000 Policy Limit |
- 9.3.2 The Contractor shall have Commercial General Liability insurance providing coverage for bodily injury and property damage liability for all hazards of the Project including premise and operations, products and completed operations, contractual, and personal injury liabilities. The policy shall include collapse and underground coverage as well as explosion coverage if explosion hazards exist. Aggregate limits shall apply on a location or project basis. Minimum acceptable limits are:
- | | |
|---|-------------|
| General aggregate limit..... | \$2,000,000 |
| Products and completed operations aggregate | \$1,000,000 |
| Each occurrence limit..... | \$1,000,000 |
| Personal injury aggregate | \$1,000,000 |
- 9.3.3 The Contractor shall have Automobile Liability insurance against claims for bodily injury, death or property damage resulting from the maintenance, ownership or use of all owned, non-owned and hired automobiles, trucks and trailers. Minimum acceptable limit is:
- | | |
|--------------------------------|-----------|
| Any one accident or loss | \$500,000 |
|--------------------------------|-----------|
- 9.3.4 For the portion of a project which is new construction, the Contractor shall procure and maintain Builder's Risk insurance naming the Owner, Contractor, and any Subcontractor as insureds as their interest may appear. Covered causes of loss form shall be all Risks of Direct Physical Loss, endorsed to include flood, earthquake, transit and sprinkler leakage where sprinkler coverage is applicable. Unless specifically authorized in writing by the Owner, the limit of insurance shall not be less than the initial contract amount, for the portion of the project which is new construction, and coverage shall apply during the entire contract period and until the work is accepted by the Owner.
- 9.3.5 The Contractor shall have Owner's Protective Liability insurance for contract values \$50,000 and above, naming the Owner as the Named Insured. Minimum acceptable limits are:
- | | |
|------------------------------|-------------|
| General aggregate limit..... | \$2,000,000 |
| Each occurrence limit..... | \$1,000,000 |

00 72 13
General Conditions

10. Contract Bonds

- 10.1 When noted as required in the Bid Documents, the Contractor shall provide to the Owner a Performance Bond and a Payment Bond, or "contract bonds", upon execution of the contract. Each bond value shall be for the full amount of the contract and issued by a surety company authorized to do business in the State of Maine as approved by the Owner. The bonds shall be executed on the forms furnished in the Bid Documents. The bonds shall allow for any subsequent additions or deductions of the contract.
- 10.2 The contract bonds shall continue in effect for one year after final acceptance of the contract to protect the Owner's interest in connection with the one year guarantee of workmanship and materials and to assure settlement of claims for the payment of all bills for labor, materials and equipment by the Contractor.

11. Patents and Royalties

- 11.1 The Contractor shall, for all time, secure for the Owner the free and undisputed right to the use of any patented articles or methods used in the Work. The expense of defending any suits for infringement or alleged infringement of such patents shall be borne by the Contractor. Awards made regarding patent suits shall be paid by the Contractor. The Contractor shall hold the Owner harmless regarding patent suits that may arise due to installations made by the Contractor, and to any awards made as a result of such suits.
- 11.2 Any royalty payments related to the work done by the Contractor for the Project shall be borne by the Contractor. The Contractor shall hold the Owner harmless regarding any royalty payments that may arise due to installations made by the Contractor.

12. Surveys, Layout of Work

- 12.1 The Owner shall furnish all property surveys unless otherwise specified.
- 12.2 The Contractor is responsible for correctly staking out the Work on the site. The Contractor shall employ a competent surveyor to position all construction on the site. The surveyor shall run the axis lines, establish correct datum points and check each line and point on the site to insure their accuracy. All such lines and points shall be carefully preserved throughout the construction.
- 12.3 The Contractor shall lay out all work from dimensions given on the Drawings. The Contractor shall take measurements and verify dimensions of any existing work that affects the Work or to which the Work is to be fitted. The Contractor is solely responsible for the accuracy of all measurements. The Contractor shall verify all grades, lines, levels, elevations and dimensions shown on the Drawings and report any errors or inconsistencies to the Consultant prior to commencing work.

13. Record of Documents

- 13.1 The Contractor shall maintain one complete set of Contract Documents on the jobsite, in good order and current status, for access by the Owner and Consultant.
- 13.2 The Contractor shall maintain, continuously updated, complete records of Requests for Information, Architectural Supplemental Instructions (or equivalent), Information Bulletins,

00 72 13
General Conditions

supplemental sketches, Change Order Proposals, Change Orders, Shop Drawings, testing reports, et cetera, for access by the Owner and Consultant.

14. Allowances

- 14.1 The Contract Price shall include all allowances described in the Contract Documents. The Contractor shall include all overhead and profit necessary to implement each allowance in their Contract Price.
- 14.2 The Contractor shall not be required to employ parties for allowance work against whom the Contractor has a reasonable objection. In such a case, the Contractor shall notify the Owner in writing of their position and shall propose an alternative party to complete the work of the allowance.

15. Shop Drawings

- 15.1 The Contractor shall administer Shop Drawings prepared by the Contractor, Subcontractors, suppliers or others to conform to the approved Schedule of the Work. The Contractor shall verify all field measurements, check and authorize all Shop Drawings and schedules required by the Work. The Contractor is the responsible party and contact for the Contractor's work as well as that of Subcontractors, suppliers or others who provide Shop Drawings.
- 15.2 The Consultant shall review and acknowledge Shop Drawings, with reasonable promptness, for general conformity with the design concept of the project and compliance with the information provided in the Contract Documents.
- 15.3 The Contractor shall provide monthly updated logs containing: requests for information, information bulletins, supplemental instructions, supplemental sketches, change order proposals, change orders, submittals, testing and deficiencies.
- 15.4 The Contractor shall make any corrections required by the Consultant, and shall submit a quantity of corrected copies as may be needed. The acceptance of Shop Drawings or schedules by the Consultant shall not relieve the Contractor from responsibility for deviations from Drawings and Specifications, unless the Contractor has called such deviations to the attention of the Consultant at the time of submission and secured the Consultant's written approval. The acceptance of Shop Drawings or schedules by the Consultant does not relieve the Contractor from responsibility for errors in Shop Drawings or schedules.

16. Samples

- 16.1 The Contractor shall furnish for approval, with reasonable promptness, all samples as directed by the Consultant. The Consultant shall review and approve such samples, with reasonable promptness, for general conformity with the design concept of the project and compliance with the information provided in the Contract Documents. The subsequent work shall be in accord with the approved samples.

00 72 13
General Conditions

17. Substitutions

- 17.1 The Contractor shall furnish items and materials described in the Contract Documents. If the item or material specified describes a proprietary product, or uses the name of a manufacturer, the term “or approved equal” shall be implied, if it is not included in the text. The specific item or material specified establishes a minimum standard for the general design, level of quality, type, function, durability, efficiency, reliability, compatibility, warranty coverage, installation factors and required maintenance. The Drawing or written Specification shall not be construed to exclude other manufacturers products of comparable design, quality, and efficiency.
- 17.2 The Contractor may submit detailed information about a proposed substitution to the Consultant for consideration. Particular models of items and particular materials which the Contractor asserts to be equal to the items and materials identified in the Contract Documents shall be allowed only with written approval by the Consultant. The request for substitution shall include a cost comparison and a reason or reasons for the substitution.
- 17.3 The Consultant may request additional information about the proposed substitution. The approval or rejection of a proposed substitution may be based on timeliness of the request, source of the information, the considerations of minimum standards described above, or other considerations. The Consultant should briefly state the rationale for the decision. The decision shall be considered final.
- 17.4 The duration of a substitution review process can not be the basis for a claim for delay in the Schedule of the Work.

18. Assignment of Contract

- 18.1 The Contractor shall not assign or sublet the contract as a whole without the written consent of the Owner. The Contractor shall not assign any money due to the Contractor without the written consent of the Owner.

19. Separate Contracts

- 19.1 The Owner reserves the right to create other contracts in connection with this Project using similar General Conditions. The Contractor shall allow the Owner's other contractors reasonable opportunity for the delivery and storage of materials and the execution of their work. The Contractor shall coordinate and properly connect the Work of all contractors.
- 19.2 The Contractor shall promptly report to the Consultant and Owner any apparent deficiencies in work of the Owner's other contractors that impacts the proper execution or results of the Contractor. The Contractor's failure to observe or report any deficiencies constitutes an acceptance of the Owner's other contractors work as suitable for the interface of the Contractor's work, except for latent deficiencies in the Owner's other contractors work.
- 19.3 Similarly, the Contractor shall promptly report to the Consultant and Owner any apparent deficiencies in their own work that would impact the proper execution or results of the Owner's other contractors.

00 72 13
General Conditions

- 19.4 The Contractor shall report to the Consultant and Owner any conflicts or claims for damages with the Owner's other contractors and settle such conflicts or claims for damages by mutual agreement or arbitration, if necessary, at no expense to the Owner.
- 19.5 In the event the Owner's other contractors sue the Owner regarding any damage alleged to have been caused by the Contractor, the Owner shall notify the Contractor, who shall defend such proceedings at the Contractor's expense. The Contractor shall pay or satisfy any judgment that may arise against the Owner, and pay all other costs incurred.

20. Subcontracts

- 20.1 The Contractor shall not subcontract any part of this contract without the written permission of the Owner.
- 20.2 The Contractor shall submit a complete list of named Subcontractors and material suppliers to the Consultant and Owner for approval by the Owner prior to commencing work. The Subcontractors named shall be reputable companies of recognized standing with a record of satisfactory work.
- 20.3 The Contractor shall not employ any Subcontractor or use any material until they have been approved, or where there is reason to believe the resulting work will not comply with the Contract Documents.
- 20.4 The Contractor, not the Owner, is as fully responsible for the acts and omissions of Subcontractors and of persons employed by them, as the Contractor is for the acts and omissions of persons directly or indirectly employed by the Contractor.
- 20.5 Neither the Contract Documents nor any Contractor-Subcontractor contract shall indicate, infer or create any direct contractual relationship between any Subcontractor and the Owner.

21. Contractor-Subcontractor Relationship

- 21.1 The Contractor shall be bound to the Subcontractor by all the obligations in the Contract Documents that bind the Contractor to the Owner.
- 21.2 The Contractor shall pay the Subcontractor, in proportion to the dollar value of the work completed and requisitioned by the Subcontractor, the approved dollar amount allowed to the Contractor no more than seven days after receipt of payment from the Owner.
- 21.3 The Contractor shall pay the Subcontractor accordingly if the Contract Documents or the subcontract provide for earlier or larger payments than described in the provision above.
- 21.4 The Contractor shall pay the Subcontractor for completed and requisitioned subcontract work, less retainage, no more than seven days after receipt of payment from the Owner for the Contractor's approved Requisition for Payment, even if the Consultant fails to certify a portion of the Requisition for Payment for a cause not the fault of the Subcontractor.
- 21.5 The Contractor shall not make a claim for liquidated damages or penalty for delay in any amount in excess of amounts that are specified by the subcontract.

00 72 13
General Conditions

- 21.6 The Contractor shall not make a claim for services rendered or materials furnished by the Subcontractor unless written notice is given by the Contractor to the Subcontractor within ten calendar days of the day in which the claim originated.
- 21.7 The Contractor shall give the Subcontractor an opportunity to present and to submit evidence in any progress conference or disputes involving subcontract work.
- 21.8 The Contractor shall pay the Subcontractor a just share of any fire insurance payment received by the Contractor.
- 21.9 The Subcontractor shall be bound to the Contractor by the terms of the Contract Documents and assumes toward the Contractor all the obligations and responsibilities that the Contractor, by those documents, assumes toward the Owner.
- 21.10 The Subcontractor shall submit applications for payment to the Contractor in such reasonable time as to enable the Contractor to apply for payment as specified.
- 21.11 The Subcontractor shall make any claims for extra cost, extensions of time or damages, to the Contractor in the manner provided in these General Conditions for like claims by the Contractor to the Owner, except that the time for the Subcontractor to make claims for extra cost is seven calendar days after the receipt of Consultant's instructions.

22. Supervision of the Work

- 22.1 During all stages of the Work the Contractor shall have a competent superintendent, with any necessary assistant superintendents, overseeing the project. The superintendent shall not be reassigned without the consent of the Owner unless a superintendent ceases to be employed by the Contractor due to unsatisfactory performance.
- 22.2 The superintendent represents the Contractor on the jobsite. Directives given by the Consultant or Owner to the superintendent shall be as binding as if given directly to the Contractor's main office. All important directives shall be confirmed in writing to the Contractor. The Consultant and Owner are not responsible for the acts or omissions of the superintendent or assistant superintendents.
- 22.3 The Contractor shall provide supervision of the Work equal to the industry's highest standard of care. The superintendent shall carefully study and compare all Contract Documents and promptly report any error, inconsistency or omission discovered to the Consultant. The Contractor may not necessarily be held liable for damages resulting directly from any error, inconsistency or omission in the Contract Documents or other instructions by the Consultant that was not revealed by the superintendent in a timely way.

23. Observation of the Work

- 23.1 The Contractor shall allow the Owner, the Consultant and the Bureau continuous access to the site for the purpose of observation of the progress of the work. All necessary safeguards and accommodations for such observations shall be provided by the Contractor.

00 72 13
General Conditions

- 23.2 The Contractor shall coordinate all required testing, approval or demonstration of the Work. The Contractor shall give sufficient notice to the appropriate parties of readiness for testing, inspection or examination.
- 23.3 The Contractor shall schedule inspections and obtain all required certificates of inspection for inspections by a party other than the Consultant.
- 23.4 The Consultant shall make all scheduled observations promptly, prior to the work being concealed or buried by the Contractor. If approval of the Work is required of the Consultant, the Contractor shall notify the Consultant of the construction schedule in this regard. Work concealed or buried prior to the Consultant's approval may need to be uncovered at the Contractor's expense.
- 23.5 The Consultant may order reexamination of questioned work, and, if so ordered, the work must be uncovered by the Contractor. If the work is found to conform to the Contract Documents, the Owner shall pay the expense of the reexamination and remedial work. If the work is found to not conform to the Contract Documents, the Contractor shall pay the expense, unless the defect in the work was caused by the Owner's Contractor, whose responsibility the reexamination expense becomes.
- 23.6 The Bureau shall periodically observe the Work during the course of construction and make recommendations to the Contractor or Consultant as necessary. Such recommendations shall be considered and implemented through the usual means for changes to the Work.
24. Consultant's Status
- 24.1 The Consultant represents the Owner during the construction period, and observes the work in progress on behalf of the Owner. The Consultant has authority to act on behalf of the Owner only to the extent expressly provided by the Contract Documents or otherwise demonstrated to the Contractor. The Consultant has authority to stop the work whenever such an action is necessary, in the Consultant's reasonable opinion, to ensure the proper execution of the contract.
- 24.2 The Consultant is the interpreter of the conditions of the contract and the judge of its performance. The Consultant shall favor neither the Owner nor the Contractor, but shall use the Consultant's powers under the contract to enforce faithful performance by both parties.
- 24.3 In the event of the termination of the Consultant's employment on the project prior to completion of the work, the Owner shall appoint a capable and reputable replacement. The status of the new Consultant relative to this contract shall be that of the former Consultant.
25. Management of the Premises
- 25.1 The Contractor shall place equipment and materials, and conduct activities on the premises in a manner that does not unreasonably hinder site circulation, environmental stability, or any long term effect. Likewise, the Consultant's directions shall not cause the use of premises to be impeded for the Contractor or Owner.

00 72 13
General Conditions

- 25.2 The Contractor shall not use the premises for any purpose other than that which is directly related to the scope of work. The Owner shall not use the premises for any purpose incompatible with the proposed work simultaneous to the work of the Contractor.
- 25.3 The Contractor shall enforce the Consultant's instructions regarding information posted on the premises such as signage and advertisements, as well as activities conducted on the premises such as fires, and smoking.
- 25.4 The Owner may occupy any part of the Project that is completed with the written consent of the Contractor, and without prejudice to any of the rights of the Owner or Contractor. Such use or occupancy shall not, in and of itself, be construed as a final acceptance of any work or materials.

26. Safety and Security of the Premises

- 26.1 The Contractor shall designate, and make known to the Consultant and the Owner, a safety officer whose duty is the prevention of accidents on the site.
- 26.2 The Contractor shall continuously maintain security on the premises and protect from unreasonable occasion of injury all people authorized to be on the job site. The Contractor shall also effectively protect the property and adjacent properties from damage or loss.
- 26.3 The Contractor shall take all necessary precautions to ensure the safety of workers and others on and adjacent to the site, abiding by applicable local, state and federal safety regulations. The Contractor shall erect and continuously maintain safeguards for the protection of workers and others, and shall post signs and other warnings regarding hazards associated with the construction process, such as protruding fasteners, moving equipment, trenches and holes, scaffolding, window, door or stair openings, and falling materials.
- 26.4 The Contractor shall restore the premises to conditions that existed prior to the start of the project at areas not intended to be altered according to the Contract Documents.
- 26.5 The Contractor shall protect existing utilities and exercise care working in the vicinity of utilities shown in the Drawings and Specifications or otherwise located by the Contractor.
- 26.6 The Contractor shall protect from damage existing trees and other significant plantings and landscape features of the site which will remain a permanent part of the site. If necessary or indicated in the Contract Documents, tree trunks shall be boxed and barriers erected to prevent damage to tree branches or roots.
- 26.7 The Contractor shall repair or replace damage to the Work caused by the Contractor's or Subcontractor's forces, including that which is reasonably protected, at the expense of the responsible party.
- 26.8 The Contractor shall not load, or allow to be loaded, any part of the Project with a force which imperils personal or structural safety. The Consultant may consult with the Contractor on such means and methods of construction, however, the ultimate responsibility lies with the Contractor.
- 26.9 The Contractor shall not jeopardize any work in place with subsequent construction activities such as blasting, drilling, excavating, cutting, patching or altering work. The Consultant must

00 72 13
General Conditions

approve altering any structural components of the project. The Contractor shall supervise all construction activities carried out by others on site to ensure that the work is neatly done and in a manner that will not endanger the structure or the component parts.

- 26.10 The Contractor may act with their sole discretion in emergency situations that potentially effect health, life or serious damage to the premises or adjacent properties, to prevent such potential loss or injury. The Contractor may negotiate with the Owner for compensation for expenses due to such emergency work.
- 26.11 The Contractor and Subcontractors shall have no responsibility for the identification, discovery, presence, handling, removal or disposal of, or exposure of persons to, hazardous materials in any form at the project site. The Contractor shall avoid disruption of any hazardous materials or toxic substances at the project site and promptly notify the Owner in writing on the occasion of such a discovery.
- 26.12 The Contractor shall keep the premises free of any unsafe accumulation of waste materials caused by the work. The Contractor shall regularly keep the spaces "broom clean". See the Close-out of the Work provisions of this section regarding cleaning at the completion of the project.

27. Changes in the Work

- 27.1 The Contractor shall not proceed with extra work without an approved Change Order or Construction Change Directive. A Change Order which has been properly signed by all parties shall become a part of the contract.
- 27.2 A Change Order is the usual document for directing changes in the Work. In certain circumstances, however, the Owner may utilize a Construction Change Directive to direct the Contractor to perform changes in the Work that are generally consistent with the scope of the project. The Owner shall use a Construction Change Directive only when the normal process for approving changes to the Work has failed to the detriment of the Project, or when agreement on the terms of a Change Order cannot be met, or when an urgent situation requires, in the Owner's judgment, prompt action by the Contractor.
- 27.3 The Consultant shall prepare the Construction Change Directive representing a complete scope of work, with proposed Contract Price and Contract Time revisions, if any, clearly stated.
- 27.4 The Contractor shall promptly carry out a Construction Change Directive which has been signed by the Owner and the Consultant. Work thus completed by the Contractor constitutes the basis for a Change Order. Changes in the Contract Price and Contract Time shall be as defined in the Construction Change Directive unless subsequently negotiated with some other terms.
- 27.5 The method of determining the dollar value of extra work shall be by:
- .1 an estimate of the Contractor accepted by Owner as a lump sum, or
 - .2 unit prices named in the contract or subsequently agreed upon, or
 - .3 cost plus a designated percentage, or
 - .4 cost plus a fixed fee.

00 72 13
General Conditions

- 27.6 The Contractor shall determine the dollar value of the extra work for both the lump sum and cost plus designated percentage methods so as not to exceed the following rates. The rates include all overhead and profit expenses.
- .1 Contractor - for any work performed by the Contractor's own forces, up to 20% of the cost;
 - .2 Subcontractor - for work performed by Subcontractor's own forces, up to 20% of the cost;
 - .3 Contractor - for work performed by Contractor's Subcontractor, up to 10% of the amount due the Subcontractor.
- 27.7 The Contractor shall keep and provide records as needed or directed for the cost plus designated percentage method. The Consultant shall review and certify the appropriate amount which includes the Contractor's overhead and profit. The Owner shall make payments based on the Consultant's certificate.
- 27.8 Cost reflected in Change Orders shall be limited to the following: cost of materials, cost of delivery, cost of labor (including Social Security, pension, Workers' Compensation insurance, and unemployment insurance), and cost of rental of power tools and equipment. Labor cost may include a pro-ratio share of a foreman's time only in the case of an extension of contract time granted due to the Change Order.
- 27.9 Overhead reflected in Change Orders shall be limited to the following: bond premium, supervision, wages of clerks, time keepers, and watchmen, small tools, incidental expenses, general office expenses, and all other overhead expenses directly related to the Change Order.
- 27.10 The Contractor shall provide credit to the Owner for labor, materials, equipment and other costs but not overhead and profit expenses for those Change Order items that result in a net value of credit to the contract.
- 27.11 The Owner may change the scope of work of the Project without invalidating the contract. The Owner shall notify the Contractor of a change of the scope of work for the Owner's Contractors, which may affect the work of this Contractor, without invalidating the contract. Change Orders for extension of the time caused by such changes shall be developed at the time of directing the change in scope of work.
- 27.12 The Consultant may order minor changes in the Work, not involving extra cost, which is consistent with the intent of the design or project.
- 27.13 The Contractor shall immediately give written notification to the Consultant of latent conditions discovered at the site which materially differ from those represented in the Drawings or Specifications, and which may eventually result in a change in the scope of work. The Contractor shall suspend work until receiving direction from the Consultant. The Consultant shall promptly investigate the conditions and respond to the Contractor's notice with direction that avoids any unnecessary delay of the Work. The Consultant shall determine if the discovered conditions warrant a Change Order.
- 27.14 The Contractor shall, within ten calendar days of receipt of the information, give written notification to the Consultant if the Contractor claims that instructions by the Consultant will constitute extra cost not accounted for by Change Order or otherwise under the contract. The Consultant shall promptly respond to the Contractor's notice with direction that avoids any

00 72 13
General Conditions

unnecessary delay of the Work. The Consultant shall determine if the Contractor's claim warrants a Change Order.

28. Correction of the Work

- 28.1 The Contractor shall promptly remove from the premises all work the Consultant declares is non-conforming to the contract. The Contractor shall replace the work properly at no expense to the Owner. The Contractor is also responsible for the expenses of others whose work was damaged or destroyed by such remedial work.
- 28.2 The Owner may elect to remove non-conforming work if it is not removed by the Contractor within a reasonable time, that time defined in a written notice from the Consultant. The Owner may elect to store removed non-conforming work not removed by the Contractor at the Contractor's expense. The Owner may, with ten days written notice, dispose of materials which the Contractor does not remove. The Owner may sell the materials and apply the net proceeds, after deducting all expenses, to the costs that should have been borne by the Contractor.
- 28.3 The Contractor shall remedy any defects due to faulty materials or workmanship and pay for any related damage to other work which appears within a period of one year from the date of substantial completion, and in accord with the terms of any guarantees provided in the contract. The Owner shall promptly give notice of observed defects to the Contractor and Consultant. The Consultant shall determine the status of all claimed defects. The Contractor shall perform all remedial work without unjustifiable delay in either the initial response or the corrective action.
- 28.4 The Consultant may authorize, after a reasonable notification to the Contractor, an equitable deduction from the contract amount in lieu of the Contractor correcting non-conforming or defective work.

29. Owner's Right to do Work

- 29.1 The Owner may, using other contractors, correct deficiencies attributable to the Contractor, or complete unfinished work. Such action shall take place only after giving the Contractor three days written notice, and provided the Consultant approves of the proposed course of action as an appropriate remedy. The Owner may then deduct the cost of the remedial work from the amount due the Contractor.
- 29.2 The Owner may act with their sole discretion when the Contractor is unable to take action in emergency situations that potentially effect health, life or serious damage to the premises or adjacent properties, to prevent such potential loss or injury. The Owner shall inform the Contractor of the emergency work performed, particularly where it may affect the work of the Contractor.

30. Termination of Contract and Stop Work Action

- 30.1 The Owner may, owing to a certificate of the Consultant indicating that sufficient cause exists to justify such action, without prejudice to any other right or remedy and after giving the Contractor and the Contractor's surety seven days written notice, terminate the employment of the

00 72 13
General Conditions

Contractor. At that time the Owner may take possession of the premises and of all materials, tools and appliances on the premises and finish the work by whatever method the Owner may deem expedient. Cause for such action by the Owner includes:

- .1 the contractor is adjudged bankrupt, or makes a general assignment for the benefit of its creditors, or
- .2 a receiver is appointed due to the Contractor's insolvency, or
- .3 the Contractor persistently or repeatedly refuses or fails to provide enough properly skilled workers or proper materials, or
- .4 the Contractor fails to make prompt payment to Subcontractors or suppliers of materials or labor, or
- .5 the Contractor persistently disregards laws, ordinances or the instructions of the Consultant, or is otherwise found guilty of a substantial violation of a provision of the Contract Documents.

- 30.2 The Contractor is not entitled, as a consequence of the termination of the employment of the Contractor as described above, to receive any further payment until the Work is finished. If the unpaid balance of the contract amount exceeds the expense of finishing the Work, including compensation for additional architectural, managerial and administrative services, such balance shall be paid to the Contractor. If the expense of finishing the Work exceeds the unpaid balance, the Contractor shall pay the difference to the Owner. The Consultant shall certify the expense incurred by the Contractor's default. This obligation for payment shall continue to exist after termination of the contract.
- 30.3 The Contractor may, if the Work is stopped by order of any court or other public authority for a period of thirty consecutive days, and through no act or fault of the Contractor or of anyone employed by the Contractor, with seven days written notice to the Owner and the Consultant, terminate this contract. The Contractor may then recover from the Owner payment for all work executed, any proven loss and reasonable profit and damage.
- 30.4 The Contractor may, if the Consultant fails to issue a certificate for payment within seven days after the Contractor's formal request for payment, through no fault of the Contractor, or if the Owner fails to pay to the Contractor within 30 days after submission of any sum certified by the Consultant, with seven days written notice to the Owner and the Consultant, stop the Work or terminate this Contract.

31. Delays and Extension of Time

- 31.1 The completion date of the contract shall be extended if the work is delayed by changes ordered in the work which have approved time extensions, or by an act or neglect of the Owner, the Consultant, or the Owner's Contractor, or by strikes, lockouts, fire, flooding, unusual delay in transportation, unavoidable casualties, or by other causes beyond the Contractor's control. The Consultant shall determine the status of all claimed causes.
- 31.2 The contract shall not be extended for delay occurring more than seven calendar days before the Contractor's claim made in writing to the Consultant. In case of a continuing cause of delay, only one claim is necessary.
- 31.3 The contract shall not be extended due to failure of the Consultant to furnish drawings if no schedule or agreement is made between the Contractor and the Consultant indicating the dates

00 72 13
General Conditions

which drawings shall be furnished and fourteen calendar days has passed after said date for such drawings.

- 31.4 This article does not exclude the recovery of damages for delay by either party under other provisions in the Contract Document.

32. Payments to the Contractor

- 32.1 As noted under *Preconstruction Conference* in this section, the Contractor shall submit a Schedule of Values form, before the first application for payment, for approval by the Owner and Consultant. The Consultant may direct the Contractor to provide evidence that supports the correctness of the form. The approved Schedule of Values shall be used as a basis for payments.
- 32.2 The Contractor shall submit an application for each payment ("Requisition for Payment") on a form approved by the Owner and Consultant. The Consultant may require receipts or other documents showing the Contractor's payments for materials and labor, including payments to Subcontractors.
- 32.3 The Contractor shall submit Requisitions for Payment as the work progresses not more frequently than once each month, unless the Owner approves a more frequent interval due to unusual circumstances. The Requisition for Payment is based on the proportionate quantities of the various classes of work completed or incorporated in the Work, in agreement with the actual progress of the Work and the dollar value indicated in the Schedule of Values.
- 32.4 The Consultant shall verify and certify each Requisition for Payment which appears to be complete and correct prior to payment being made by the Owner. The Consultant may certify an appropriate amount for materials not incorporated in the Work which have been delivered and suitably stored at the site. The Contractor shall submit bills of sale, insurance certificates, or other such documents that will adequately protect the Owner's interests prior to payments being certified.
- 32.5 In the event any materials delivered but not yet incorporated in the Work have been included in a certified Requisition for Payment with payment made, and said materials thereafter are damaged, deteriorated or destroyed, or for any reason whatsoever become unsuitable or unavailable for use in the Work, the full amount previously allowed shall be deducted from subsequent payments unless the Contractor satisfactorily replaces said material.
- 32.6 The Contractor may request certification of an appropriate dollar amount for materials not incorporated in the Work which have been delivered and suitably stored away from the site. The Contractor shall submit bills of sale, insurance certificates, right-of-entry documents or other such documents that will adequately protect the Owner's interests. The Consultant shall determine if the Contractor's documentation for the materials is complete and specifically designated for the Project. The Owner may allow certification of such payments.
- 32.7 Subcontractors may request, and shall receive from the Consultant, copies of approved Requisitions for Payment showing the amounts certified in the Schedule of Values.
- 32.8 Certified Requisitions for Payment, payments made to the Contractor, or partial or entire occupancy of the project by the Owner shall not constitute an acceptance of any work that does

00 72 13
General Conditions

not conform to the Contract Documents. The making and acceptance of the final payment constitutes a waiver of all claims by the Owner, other than those arising from unsettled liens, from faulty work or materials appearing within one year from final payment or from requirements of the Drawings and Specifications, and of all claims by the Contractor, except those previously made and still unsettled.

33. Payments Withheld

- 33.1 The Owner shall retain five percent of each payment due the Contractor as part security for the fulfillment of the contract by the Contractor. The Owner may make payment of a portion of this “retainage” to the Contractor temporarily or permanently during the progress of the Work. The Owner may thereafter withhold further payments until the full amount of the five percent is reestablished. The Contractor may deposit with the Maine State Treasurer certain securities in place of retainage amounts due according to Maine Statute (5 M.R.S. §1746).
- 33.2 The Consultant may withhold or nullify the whole or a portion of any Requisitions for Payment submitted by the Contractor in the amount that may be necessary, in his reasonable opinion, to protect the Owner from loss due to any of the following:
- .1 defective work not remedied;
 - .2 claims filed or reasonable evidence indicating probable filing of claims;
 - .3 failure to make payments properly to Subcontractors or suppliers;
 - .4 a reasonable doubt that the contract can be completed for the balance then unpaid;
 - .5 liability for damage to another contractor.

The Owner shall make payment to the Contractor, in the amount withheld, when the above circumstances are removed.

34. Liens

- 34.1 The Contractor shall deliver to the Owner a complete release of all liens arising out of this contract before the final payment or any part of the retainage payment is released. The Contractor shall provide with the release of liens an affidavit asserting each release includes all labor and materials for which a lien could be filed. Alternately, the Contractor, in the event any Subcontractor or supplier refuses to furnish a release of lien in full, may furnish a bond satisfactory to the Owner, to indemnify the Owner against any lien.
- 34.2 In the event any lien remains unsatisfied after all payments to the Contractor are made by the Owner, the Contractor shall refund to the Owner all money that the latter may be compelled to pay in discharging such lien, including all cost and reasonable attorney’s fees.

35. Workmanship

- 35.1 The Contractor shall provide materials, equipment, and installed work equal to or better than the quality specified in the Contract Documents and approved in submittal and sample. The installation methods shall be of the highest standards, and the best obtainable from the respective trades. The Consultant’s decision on the quality of work shall be final.

00 72 13
General Conditions

- 35.2 The Contractor shall know local labor conditions for skilled and unskilled labor in order to apply the labor appropriately to the Work. All labor shall be performed by individuals well skilled in their respective trades.
- 35.3 The Contractor shall perform all cutting, fitting, patching and placing of work in such a manner to allow subsequent work to fit properly, whether that be by the Contractor, the Owner's Contractors or others. The Owner and Consultant may advise the Contractor regarding such subsequent work. Notwithstanding the notification or knowledge of such subsequent work, the Contractor may be directed to comply with this standard of compatible construction by the Consultant at the Contractor's expense.
- 35.4 The Contractor shall request clarification or revision of any design work by the Consultant, prior to commencing that work, in a circumstance where the Contractor believes the work cannot feasibly be completed at the highest quality, or as indicated in the Contract Documents. The Consultant shall respond to such requests in a timely way, providing clarifying information, a feasible revision, or instruction allowing a reduced quality of work. The Contractor shall follow the direction of the Consultant regarding the required request for information.
- 35.5 The Contractor shall guarantee the Work against any defects in workmanship and materials for a period of one year commencing with the date of the Certificate of Substantial Completion, unless specified otherwise for specific elements of the project. The Work may also be subdivided in mutually agreed upon components, each defined by a separate Certificate of Substantial Completion.
36. Close-out of the Work
- 36.1 The Contractor shall remove from the premises all waste materials caused by the work. The Contractor shall make the spaces "broom clean" unless a more thorough cleaning is specified. The Contractor shall clean all windows and glass immediately prior to the final inspection, unless otherwise directed.
- 36.2 The Owner may conduct the cleaning of the premises where the Contractor, duly notified by the Consultant, fails to adequately complete the task. The expense of this cleaning may be deducted from the sum due to the Contractor.
- 36.3 The Contractor shall participate in all final inspections and acknowledge the documentation of unsatisfactory work, customarily called the "punch list", to be corrected by the Contractor. The Consultant shall document the successful completion of the Work in a dated Certificate of Substantial Completion, to be signed by Owner, Consultant, and Contractor.
- 36.4 The Contractor shall not call for final inspection of any portion of the Work that is not completely and permanently installed. The Contractor may be found liable for the expenses of individuals called to final inspection meetings prematurely.
- 36.5 The Contractor and all major Subcontractors shall participate in the end-of-warranty-period conference, typically scheduled close to one year after the Substantial Completion date.

00 72 13
General Conditions

37. Date of Completion and Liquidated Damages

- 37.1 The Contractor may make a written request to the Owner for an extension or reduction of time, if necessary. The request shall include the reasons the Contractor believes justifies the proposed completion date. The Owner may grant the revision of the contract completion date if the Work was delayed due to conditions beyond the control and the responsibility of the Contractor. The Contractor shall not conduct unauthorized accelerated work or file delay claims to recover alleged damages for unauthorized early completion.
- 37.2 The Contractor shall vigorously pursue the completion of the Work and notify the Owner of any factors that have, may, or will affect the approved Schedule of the Work. The Contractor may be found responsible for expenses of the Owner or Consultant if the Contractor fails to make notification of project delays.
- 37.3 The Project is planned to be done in an orderly fashion which allows for an iterative submittal review process, construction administration including minor changes in the Work and some bad weather. The Contractor shall not file delay claims to recover alleged damages on work the Consultant determines has followed the expected rate of progress.
- 37.4 The Consultant shall prepare the Certificate of Substantial Completion which, when signed by the Owner and the Contractor, documents the date of Substantial Completion of the Work or a designated portion of the Work. The Owner shall not consider the issuance of a Certificate of Occupancy by an outside authority a prerequisite for Substantial Completion if the Certificate of Occupancy cannot be obtained due to factors beyond the Contractor's control.
- 37.5 Liquidated Damages may be deducted from the sum due to the Contractor for each calendar day that the Work remains uncompleted after the completion date specified in the Contract or an approved amended completion date. The dollar amount per day shall be calculated using the Schedule of Liquidated Damages table shown below.

If the original contract amount is:	The per day Liquidated Damages shall be:
Less than \$100,000	\$250
\$100,000 to less than \$2,000,000	\$750
\$2,000,000 to less than \$10,000,000	\$1,500
\$10,000,000 and greater	\$1,500 plus \$250 for each \$2,000,000 over \$10,000,000

38. Dispute Resolution

38.1 Mediation

- 38.1.1 A dispute between the parties which arises under this Contract which cannot be resolved through informal negotiation, shall be submitted to a neutral mediator jointly selected by the parties.
- 38.1.2 Either party may file suit before or during mediation if the party, in good faith, deems it to be necessary to avoid losing the right to sue due to a statute of limitations. If suit is filed before good faith mediation efforts are completed, the party filing suit shall agree to stay all proceedings in the lawsuit pending completion of the mediation process, provided such stay is without prejudice.

00 72 13
General Conditions

38.1.3 In any mediation between the Owner and the Consultant, the Owner has the right to consolidate related claims between Owner and Contractor.

38.2 Arbitration

38.2.1 If the dispute is not resolved through mediation, the dispute shall be settled by arbitration. The arbitration shall be conducted before a panel of three arbitrators. Each party shall select one arbitrator; the third arbitrator shall be appointed by the arbitrators selected by the parties. The arbitration shall be conducted in accordance with the Maine Uniform Arbitration Act (MUAA), except as otherwise provided in this section.

38.2.2 The decision of the arbitrators shall be final and binding upon all parties. The decision may be entered in court as provided in the MUAA.

38.2.3 The costs of the arbitration, including the arbitrators' fees shall be borne equally by the parties to the arbitration, unless the arbitrator orders otherwise.

38.2.4 In any arbitration between the Owner and the Consultant, the Owner has the right to consolidate related claims between Owner and Contractor.

Supplemental General Conditions

Notice: The contract or delivery order to which this addendum is attached is made using federal assistance provided to the State of Maine by the US Department of Treasury under the American Rescue Plan Act ("ARPA"), Sections 602 and 603 of the Social Security Act, [Pub. L. No. 117-2 \(March 11, 2021\)](#).

1. Equal Opportunity

The Contractor shall comply with all federal anti-discrimination laws, including but not limited to Title VII of the Civil Rights Act, Department of Labor Regulations ([41 CFR Part 60](#)) and Federal Acquisition Regulatory Council (FAR) regulations (48 CFR Subchapter D) at subpart 22.8. The equal opportunity clause for federally assisted construction contracts at 41 CFR Part 60-1.4 is incorporated by reference.

2. Contract Work Hours and Safety Standards Act

If the Contract is in excess of \$100,000 and involves the employment of mechanics or laborers, Contractor shall comply with [40 U.S.C. 3702](#) and [3704](#), as supplemented by Department of Labor regulations ([29 CFR Part 5](#)). Under [40 U.S.C. 3702](#) of the Act, Contractor shall be required to compute the wages of every mechanic and laborer on the basis of a standard work week of 40 hours. Work in excess of the standard work week is permissible provided that the worker is compensated at a rate of not less than 1½ times the basic rate of pay for all hours worked in excess of 40 hours in the work week unless a higher rate is required by state or federal law. The requirements of [40 U.S.C. 3704](#) are applicable to construction work and provide that no laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous. These requirements do not apply to the purchases of supplies or materials or articles ordinarily available on the open market, or contracts for transportation or transmission of intelligence.

Contractor shall comply with the following required provisions:

- a. Overtime requirements: No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek unless a higher rate is required by state or federal law.
- b. Violation; liability for unpaid wages; liquidated damages: In the event of any violation of the clause set forth in paragraph (a) of this section the Contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such Contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (a) of this section, in the sum of \$29 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (a) of this section.
- c. Withholding for unpaid wages and liquidated damages: The State of Maine shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the Contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b) of this section.
- d. Subcontracts: The Contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (a) through (d) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any

Supplemental General Conditions

subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (a) through (d) of this section.

- e. The Contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid.
- f. Records to be maintained under this provision shall be made available by the Contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the Department of Treasury, and the Department of Labor, and the Contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

3. Environmental Compliance

- a. Contracts and subgrants of amounts in excess of \$150,000 must comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act ([42 U.S.C. 7401–7671q](#)) and the Federal Water Pollution Control Act as amended ([33 U.S.C. 1251–1387](#)). Violations must be reported to the Federal awarding agency and the Regional Office of the Environmental Protection Agency (EPA).
- b. The Contractor shall comply with all applicable standards, orders, or requirements issued under section 508 of the Clean Water Act ([33 U.S.C. 1368](#)), Executive Order 11738, Environmental Protection Agency regulations (40 CFR Part 15), and section 308 of the Federal Water Pollution Control Act ([33 U.S.C. 1318](#)), that relate generally to inspection, monitoring, entry reports, and information, and with all regulations and guidelines issued thereunder.
- c. The Contractor shall comply with all applicable standards, orders, or requirements issued under the [Resource Conservation and Recovery Act \(RCRA\)](#); [the Comprehensive Environmental Response Compensation and Liabilities Act \(CERCLA\)](#); and any applicable Federal, Codes or Local environmental regulation.

4. Protection for Whistleblowers

- a. In accordance with [41 U.S.C. § 4712](#), Contractor may not discharge, demote, or otherwise discriminate against an employee in reprisal for disclosing to any of the list of persons or entities provided below, information that the employee reasonably believes is evidence of gross mismanagement of a federal contract or grant, a gross waste of federal funds, an abuse of authority relating to a federal contract or grant, a substantial and specific danger to public health or safety, or a violation of law, rule, or regulation related to a federal contract (including the competition for or negotiation of a contract) or grant.
- b. The list of persons and entities referenced in the paragraph above includes the following:
 - i. A member of Congress or a representative of a committee of Congress;
 - ii. An Inspector General
 - iii. The Government Accountability Office;
 - iv. A Treasury employee responsible for contract or grant oversight or management;
 - v. An authorized official of the Department of Justice or other law enforcement agency;
 - vi. A court or grand jury; or

Supplemental General Conditions

- vii. A management official or other employee of Contractor, contractor, or subcontractor who has the responsibility to investigate, discover, or address misconduct.
- c. Contractor shall inform its employees in writing of the rights and remedies provided under this section, in the predominant native language of the workforce.

5. Domestic Preference for Procurements

Contractor should, to the greatest extent practicable under a Federal award, provide a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States (including but not limited to iron, aluminum, steel, cement, and other manufactured products). The requirements of this section must be included in all subawards including all contracts and purchase orders for work or products under this award. For purposes of this section: (1) “Produced in the United States” means, for iron and steel products, that all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States. (2) “Manufactured products” means items and construction materials composed in whole or in part of non-ferrous metals such as aluminum; plastics and polymer-based products such as polyvinyl chloride pipe; aggregates such as concrete; glass, including optical fiber; and lumber ([2 CFR 200.322](#)).

6. Procurement of recovered materials

The Contractor shall comply with [section 6002 of the Solid Waste Disposal Act](#), as amended by the Resource Conservation and Recovery Act. The requirements of Section 6002 include procuring only items designated in guidelines of the Environmental Protection Agency (EPA) at [40 CFR part 247](#) that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition, where the purchase price of the item exceeds \$10,000 or the value of the quantity acquired during the preceding fiscal year exceeded \$10,000; procuring solid waste management services in a manner that maximizes energy and resource recovery; and establishing an affirmative procurement program for procurement of recovered materials identified in the EPA guidelines ([2 CFR 200.323](#)).

7. Nondiscrimination

The Contractor shall ensure that no person is denied benefits of, or otherwise be subjected to discrimination in connection with the Contractor’s performance under this agreement, on the grounds of race, religion, color, national origin, sex, and handicap. Accordingly, and to the extent applicable, the Contractor covenants and agrees to comply with the following:

- a. [Title VI of the Civil Rights Act of 1964](#), which prohibits recipients of federal financial assistance from excluding from a program or activity, denying benefits of, or otherwise discriminating against a person on the basis of race, color, or national origin ([42 U.S.C. § 2000d et seq.](#)), as implemented by the Department of the Treasury’s Title VI regulations, [31 CFR Part 22](#), which are herein incorporated by reference and made a part of this contract (or agreement). Title VI also includes protection to persons with “Limited English Proficiency” in any program or activity receiving federal financial assistance, 42 U.S.C. § 2000d et seq., as implemented by the Department of the Treasury’s Title VI regulations, 31 CFR Part 22, and herein incorporated by reference and made a part of this contract or agreement.
- b. [The Fair Housing Act, Title VIII of the Civil Rights Act of 1968](#) (42 U.S.C. §§ 3601, et seq.), which prohibits discrimination in housing on the basis of race, color, religion, national origin, sex, familial status, or disability
- c. [Section 504 of the Rehabilitation Act of 1973](#) (29 U.S.C. § 794)
- d. [The Age Discrimination Act of 1975](#) (42 U.S.C. § 6101 et seq.) and regulations issued thereunder (45 CFR Part 90).
- e. [Title II of the Americans with Disabilities Act of 1990](#), as amended (42 U.S.C. §§ 12101 et seq.), which prohibits discrimination on the basis of disability under programs, activities, and services provided or made available by state and local governments or instrumentalities or agencies thereto.

8. Lobbying

Supplemental General Conditions

- a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
- b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure of Lobbying Activities," in accordance with its instructions.
- c. The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.
- d. The Interim Final Rule, New Restrictions on Lobbying, issued by the Office of Management and Budget to implement the provisions of section [319 of Public Law 101-121 \(31 U.S.C., Art 1352\)](#) is incorporated by reference.

9. Drug-Free Workplace

The Contractor will comply with the provisions of the [Drug-Free Workplace Act of 1988](#) (Public Law 100-690, title V, subtitle D; 41 U.S.C. 701 et seq.) and maintain a drug-free workplace.

10. Increasing Seat Belt Use in the United States

Pursuant to [Executive Order 13043, 62 FR 19217](#) (Apr. 18, 1997), Contractor is encouraged to adopt and enforce on-the-job seat belt policies and programs for its their employees when operating company owned, rented or personally owned vehicles.

11. Reducing Text Messaging While Driving

Pursuant to [Executive Order 13513, 74 FR 51225](#) (October 6, 2009), Contractor is encouraged to adopt and enforce policies that ban text messaging while driving, and to establish workplace safety policies to decrease accidents caused by distracted drivers.

12. Debarment and Suspension

If the Contract is in excess of \$25,000, this Contract is a covered transaction for purposes of [2 C.F.R. Part 180](#) and [2 C.F.R. Part 3000](#). As such, the Contractor is required to verify that none of the Contractor's principals (defined at [2 C.F.R. § 180.995](#)) or its affiliates (defined at [2 C.F.R. § 180.905](#)) are excluded (defined at [2 C.F.R. § 180.940](#)) or disqualified (defined at [2 C.F.R. § 180.935](#)). The Contractor must comply with 2 C.F.R. Part 180, subpart C and 2 C.F.R. Part 3000, subpart C, and must include a requirement to comply with these regulations in any lower tier covered transaction it enters into. This certification is a material representation of fact relied upon by The State of Maine. If it is later determined that the Contractor did not comply with 2 C.F.R. Part 180, subpart C and 2 C.F.R. Part 3000, subpart C, in addition to remedies available to The State of Maine, the federal government may pursue available remedies, including but not limited to suspension and/or debarment. The bidder or proposer agrees to comply with the requirements of 2 C.F.R. Part 180, subpart C and 2 C.F.R. Part 3000, subpart C while this offer is valid and throughout the period of any contract that may arise from this offer. The bidder or proposer further agrees to include a provision requiring such compliance in its lower tier covered transactions.

13. Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment

Contractor shall use no funds provided under this Contract to:

- a. Procure or obtain;

Supplemental General Conditions

- b. Extend or renew a contract to procure or obtain; or
- c. Enter into a contract (or extent or renew a contract) to procure or obtain equipment, services, or systems that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system. As described in Public Law 115-232, section 889, covered telecommunications equipment is telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities).
 - i. For the purpose of public safety, security of government facilities, physical security surveillance of critical infrastructure, and other national security purposes, video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities).
 - ii. Telecommunications or video surveillance services provided by such entities or using such equipment.
 - iii. Telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, in consultation with the Director of the National Intelligence or the Director of the Federal Bureau of Investigation, reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a covered foreign country.
- d. The Contractor shall insert the substance of this clause, including this paragraph, into all subcontracts and other contractual instruments ([2 CFR 200.216](#)).

Data for Infrastructure Projects and Capital Expenditure Projects

14.1 Programmatic Data for Infrastructure Projects (Expenditure Category 5 (EC 5)): For all projects listed under the Water, Sewer¹, and Broadband Expenditure Categories (see Appendix 1 of the Compliance and Reporting Guidance for a listing of expenditure categories), more detailed project-level information is required. The Contractor/ Sub-recipient acknowledges that they must provide the below-referenced data associated with the services tied to this service contract/sub-award. This information will be provided to the State of Maine Contracting Department (Owner/Department) by the Contractor/Sub-recipient. Contractors and Sub-recipients are only required to provide the specific information tied to the project associated with this contract/sub-award that fits into one or more listed ECs. Each project will be required to report expenditure data as described above, but will also report the following information:

- 1. All Water and Sewer projects (EC 5.1-5.18):
 - Projected/actual construction start date (month/year)
 - Projected/actual initiation of operations date (month/year)
 - Public Water System (PWS) ID Number
 - National Pollutant Discharge Elimination System (NPDES) Permit Number
 - Median Household Income of Service Area²

¹ Definitions for water and sewer Expenditure Categories can be found in the EPA's handbooks. For "clean water" expenditure category definitions, please see: <https://www.epa.gov/sites/production/files/2018-03/documents/cwdefinitions.pdf>. For "drinking water" expenditure category definitions, please see: <https://www.epa.gov/dwsrf/drinking-water-state-revolving-fund-national-information-management-system-reports>.

² *For median income and lowest quintile income of Census Tracts and other geographic areas, Contractor/Sub-recipient should refer to the most recent American Community Survey 5-year estimates available through the Census website.

Supplemental General Conditions

- Lowest Quintile Income of the Service Area²

2. All Broadband Projects (EC 5.19-5.21):

- Projected/actual construction start date (month/year)
- Projected/actual initiation of operations date (month/year)
- Location Details
- Confirm that the project is designed to, upon completion, reliably meet or exceed symmetrical 100 Mbps download and upload speeds.
 - If the project is not designed to reliably meet or exceed symmetrical 100 Mbps download and upload speeds, explain why not, and
 - Confirm that the project is designed to, upon completion, meet or exceed 100 Mbps download speed and between at least 20 Mbps and 100 Mbps upload speed, and be scalable to a minimum of 100 Mbps download speed and 100 Mbps upload speed.
- Confirm that the service provider for the project has, or will upon completion of the project, either participated in the Federal Communications Commission (FCC)'s Affordable Connectivity Program (ACP) or otherwise provided access to a broad-based affordability program that provides benefits to households commensurate with those provided under the ACP to low-income consumers in the proposed service area of the broadband infrastructure (applicable only to projects that provide service to households).
- Detailed Project Information:
 - Project technology type(s) (Planned/Actual)
 - Fiber
 - Coaxial Cable
 - Terrestrial Fixed Wireless
 - Other (specify)
 - Total miles of fiber deployed (Planned/Actual)
 - Total number of funded locations served (Planned/Actual)
 - Pre-SLFRF Investment
 - Total Number of Funded Locations Served receiving 25/3 Mbps or below
 - Total Number of Funded Locations Served receiving between 25/3 Mbps and 100/20 Mbps
 - Post-SLFRF
 - Total Number Receiving Minimum 100/100 Mbps
 - Total Number Receiving Minimum 100/20Mbps and scalable to 100/100 Mbps
 - Total number of funded locations served, broken out by type (Planned/Actual):
 - Residential
 - Total Housing Units
 - Business
 - Community Anchor Institution
- Location-by-Location Project Information

For each location served by a Project, the Owner/Department must collect from the Contractor/Sub-recipient and submit the following information to Treasury using a predetermined file format that will be provided by Treasury (collection of certain fields will begin in October 2022, as specified below):

 - Latitude/longitude at the structure where service will be installed (required starting October 2022) Technology used to offer service at the location (required starting October 2022)
 - Location type (required starting October 2022)
 - Residential
 - If Residential, Number of Housing Units
 - Business
 - Community anchor institution
 - Speed tier at the location post-SLFRF investment (collection to be phased in)

Supplemental General Conditions

- Maximum download speed offered
- Maximum download speed delivered
- Maximum upload speed offered
- Maximum upload speed delivered
- Latency
- Standardized FCC Identifiers
 - Fabric ID # (Broadband Serviceable Fabric Locations)
 - FCC Issued Provider ID #

3. Wage Rate Disclosures and Certifications for Capital Expenditure and Infrastructure Projects.

A. N/A

B. To the extent that the Contractor/Sub-recipient employs laborers and mechanics as defined by the Davis Bacon Act, the Contractor/Sub-recipient must provide a project employment and local impact report detailing:

- The number of employees of contractors and sub-contractors working on the project;
- The number of employees on the project hired directly;
- The number of employees on the project hired through a third party;
- The wages and benefits of workers on the project by classification; and
- Whether those wages are at rates less than those prevailing;
- Contractor/Sub-recipient must maintain sufficient records to substantiate this information upon request.

C. To the extent that the Contractor/Sub-recipient employs laborers and mechanics as defined by the Davis Bacon Act, the Contractor/Sub-recipient must provide a project workforce continuity plan, detailing:

- How the Contractor/Sub-recipient will ensure the project has ready access to a sufficient supply of appropriately skilled and unskilled labor to ensure high-quality construction throughout the life of the project, including a description of any required professional certifications and/or in-house training;
- How the Contractor/Sub-recipient will minimize risks of labor disputes and disruptions that would jeopardize timeliness and cost-effectiveness of the project;
- How the Contractor/Sub-recipient will provide a safe and healthy workplace that avoids delays and costs associated with workplace illnesses, injuries, and fatalities, including descriptions of safety training, certification, and/or licensure requirements for all relevant workers (e.g., OSHA 10, OSHA 30);
- Whether workers on the project will receive wages and benefits that will secure an appropriately skilled workforce in the context of the local or regional labor market;

00 72 14
Supplemental General Conditions

- Whether the project has completed a project labor agreement;
- Whether the project prioritizes local hires
- Whether the project has a Community Benefit Agreement, with a description of any such agreement.

00 73 46
Wage Determination Schedule

PART 1- GENERAL

1.1 Related Documents

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

1.2 Summary

- A. This Section includes the wage determination requirements for Contractors as issued by the State of Maine Department of Labor Bureau of Labor Standards or the United States Department of Labor.

1.3 Requirements

- A. Conform to the wage determination schedule for this project which is shown on the following page.

PART 2 - PRODUCTS (not used)

PART 3 - EXECUTION (not used)

State of Maine
Department of Labor
Bureau of Labor Standards
Augusta, Maine 04333-0045
Telephone (207) 623-7906

Wage Determination - In accordance with 26 MRS §1301 et. seq., this is a determination by the Bureau of Labor Standards, of the fair minimum wage rate to be paid to laborers and workers employed on the below titled project.

2026 Fair Minimum Wage Rates – Building 2 Hancock County (other than 1 or 2 family homes)

Occupational Title	Minimum Wage	Minimum Benefit	Total
Brickmasons and Blockmasons	\$43.02	\$7.64	\$50.66
Bulldozer Operator	\$30.62	\$5.38	\$36.00
Carpenter	\$27.65	\$4.49	\$32.14
Cement Masons and Concrete Finisher	\$24.42	\$2.52	\$26.94
Construction and Maintenance Painters	\$20.74	\$8.88	\$29.62
Construction Laborer	\$23.48	\$3.34	\$26.82
Conveyor Operators and Tenders	\$30.17	\$13.77	\$43.94
Crane and Tower Operators	\$40.43	\$8.63	\$49.06
Crushing Grinding and Polishing Machine Operators	\$26.15	\$3.24	\$29.39
Earth Drillers - Except Oil and Gas	\$25.04	\$3.77	\$28.81
Electrical Power - Line Installer and Repairers	\$48.12	\$15.63	\$63.75
Electricians	\$38.48	\$18.99	\$57.47
Elevator Installers and Repairers	\$67.34	\$39.76	\$107.10
Excavator Operator	\$34.12	\$6.49	\$40.61
Fence Erectors	\$30.90	\$2.18	\$33.08
Flaggers	\$21.39	\$0.86	\$22.25
Floor Layers - Except Carpet/Wood/Hard Tiles	\$29.00	\$8.65	\$37.65
Glaziers	\$23.73	\$4.62	\$28.35
Hazardous Materials Removal Workers	\$24.12	\$1.60	\$25.72
Heating and Air Conditioning and Refrigeration Mechanics and Installers	\$32.88	\$4.41	\$37.29
Heavy and Tractor - Trailer Truck Drivers	\$24.44	\$2.50	\$26.94
Highway Maintenance Workers	\$23.30	\$1.14	\$24.44
Industrial Machinery Mechanics	\$29.97	\$6.74	\$36.71
Industrial Truck and Tractor Operators	\$24.61	\$4.21	\$28.82
Insulation Worker - Mechanical	\$27.35	\$6.05	\$33.40
Light Truck or Delivery Services Drivers	\$26.79	\$5.14	\$31.93
Loading Machine and Dragline Operators	\$29.71	\$4.79	\$34.50
Millwrights	\$35.99	\$10.52	\$46.51
Mobile Heavy Equipment Mechanics - Except Engines	\$30.67	\$5.10	\$35.77
Operating Engineers and Other Equipment Operators	\$39.74	\$3.67	\$43.41
Paving Surfacing and Tamping Equipment Operators	\$30.74	\$10.67	\$41.41
Pile-Driver Operators	\$37.15	\$3.12	\$40.27
Pipe/Steam/Sprinkler Fitter	\$40.00	\$24.71	\$64.71
Pipelayers	\$28.75	\$3.64	\$32.39
Plumbers	\$27.44	\$4.18	\$31.62
Radio Cellular and Tower Equipment Installers	\$34.72	\$5.63	\$40.35
Reinforcing Iron and Rebar Workers	\$33.35	\$27.55	\$60.90
Riggers	\$31.25	\$7.68	\$38.93
Roofers	\$24.71	\$4.70	\$29.41
Sheet Metal Workers	\$24.97	\$5.69	\$30.66
Structural Iron and Steel Workers	\$32.94	\$25.00	\$57.94
Tapers	\$29.16	\$5.64	\$34.80
Telecommunications Equipment Installers and Repairers - Except Line Installers	\$37.09	\$10.21	\$47.30
Telecommunications Line Installers and Repairers	\$28.49	\$5.29	\$33.78
Tile and Marble Setters	\$28.91	\$5.46	\$34.37

Welders are classified as the trade to which welding is incidental (e.g. welding structural steel is Structural Iron and Steel Worker)

Apprentices – The minimum wage rates for registered apprentices are the rates recognized in the sponsorship agreement for registered apprentices working in the pertinent classification.

For any other specific trade on this project not listed above, contact the Bureau of Labor Standards for further clarification.

Title 26 §1310 requires that a clearly legible statement of all fair minimum wage and benefits rates to be paid the several classes of laborers, workers and mechanics employed on the construction on the public work must be kept posted in a prominent and easily accessible place at the site by each contractor and subcontractor subject to sections 1304 to 1313.

Appeal – Any person affected by the determination of these rates may appeal to the Commissioner of Labor by filing a written notice with the Commissioner stating the specific grounds of the objection within ten (10) days from the filing of these rates.

A true copy

Attest: 
Scott R. Cotnoir
Wage & Hour Director
Bureau of Labor Standards

Supersedes 02-03-2025
Effective 01-10-2026

SECTION 01 05 00

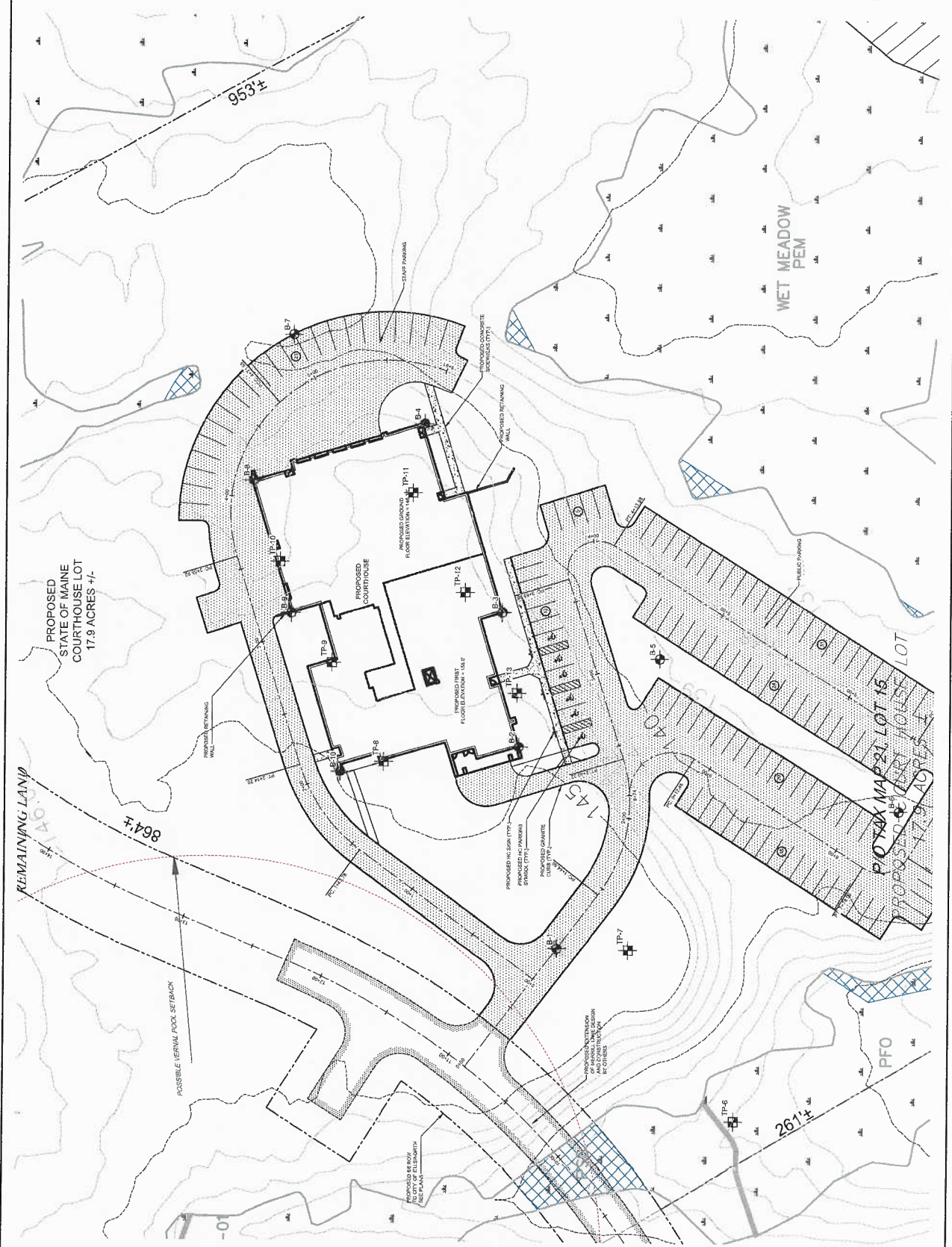
AVAILABLE PROJECT INFORMATION

Included Information

1. Attached Boring / Test Pit Logs and Gradation Report.
Work completed by S.W. Cole Engineering

Seventeen (17) Pages

--- END OF SECTION ---



LEGEND

APPROXIMATE BORING LOCATION

APPROXIMATE TEST PIT LOCATION

NOTES

1. THE CONTROL LOCATION PLAN WAS PREPARED FROM A 1"=40' SCALE PLAN OF THE SITE PREPARED BY JESARO TECH.
2. THE BORING LOCATIONS WERE SELECTED BY NORTH AND SOUTH AND ESTABLISHED IN THE FIELD BY THE PROJECT ENGINEER AND PHASED ON THE ABOVE REFERENCED PLAN.
3. THE TEST PITS WERE PERFORMED UNDER THE SUPERVISION OF S. W. COLE ENGINEERING, INC. IN DECEMBER 2005.
4. THIS PLAN SHOULD BE USED IN CONJUNCTION WITH THE ASSOCIATED S. W. COLE ENGINEERING, INC. GEOTECHNICAL REPORT.
5. THE PURPOSE OF THIS PLAN IS ONLY TO DEPICT THE LOCATION OF THE BORINGS AND TEST PITS AND NOT THE EXISTING CONDITIONS AND PROPOSED CONSTRUCTION AND IS NOT TO BE USED FOR CONSTRUCTION.



S.W. COLE
ENGINEERING, INC.

ADMINISTRATIVE OFFICE OF THE COURTS
EXPLORATION LOCATION PLAN
PROPOSED MAINE COURTHOUSE
HERSHILL CENTER
HERSHILL, MAINE

Job No.: 24-20811
Date: 07/24/2025

Scale: 1" = 30'
Sheet: 1



BORING LOG

BORING NO.: **B-1**
SHEET: 1 of 1
PROJECT NO. 24-2384.1
DATE START: 7/14/2025
DATE FINISH: 7/14/2025

CLIENT: Administrative Office of the Courts
PROJECT: Proposed Hancock Judicial Center
LOCATION: Merrill Lane, Ellsworth, Maine

Drilling Information

LOCATION: See Exploration Location Plan ELEVATION (FT): 145' +/- TOTAL DEPTH (FT): 9.1 LOGGED BY: Alex Allen
DRILLING CO.: Seaboard Drilling, LLC DRILLER: Ryan Hackett DRILLING METHOD: Hollow Stem Auger
RIG TYPE: Track Mounted Diedrich D-50 AUGER ID/OD: 2 1/4 in / 5 5/8 in SAMPLER: Standard Split-Spoon
HAMMER TYPE: Automatic HAMMER WEIGHT (lbs): 140 CASING ID/OD: N/A / N/A CORE BARREL: N/A
HAMMER CORRECTION FACTOR: 1.47 HAMMER DROP (inch): 30
WATER LEVEL DEPTHS (ft): No free water observed

GENERAL NOTES: Offset 5 feet northeast, auger refusal at 9.1 feet.

KEY TO NOTES AND SYMBOLS: Water Level
At time of Drilling
At Completion of Drilling
After Drilling
D = Split Spoon Sample
U = Thin Walled Tube Sample
R = Rock Core Sample
V = Field Vane Shear
Pen. = Penetration Length
Rec. = Recovery Length
bpf = Blows per Foot
mpf = Minute per Foot
WOR = Weight of Rods
WOH = Weight of Hammer
RQD = Rock Quality Designation
PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.
q_u = Unconfined Compressive Strength, kips/sq.ft.
Ø = Friction Angle (Estimated)
N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION					Graphic Log	Sample Description & Classification	H ₂ O Depth	Remarks
			Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD				
140	5		1D	X	0-2	24/8	1-2-1-7	1 1/2	Topsoil		
								0.4	Loose, brown silty SAND, some gravel		
								1.5	Medium dense to dense, brown gravelly SAND and SILT with occasional cobbles (Glacial Till)		
			2D	X	5-6.4	17/12	22-40-50/5"				

Auger Refusal at 9.1 feet
(Probable Bedrock)

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING NO.: **B-1**



BORING LOG

BORING NO.: **B-2**
SHEET: 1 of 1
PROJECT NO. 24-2384.1
DATE START: 7/14/2025
DATE FINISH: 7/14/2025

CLIENT: Administrative Office of the Courts
PROJECT: Proposed Hancock Judicial Center
LOCATION: Merrill Lane, Ellsworth, Maine

Drilling Information

LOCATION: See Exploration Location Plan ELEVATION (FT): 145' +/- TOTAL DEPTH (FT): 18.5 LOGGED BY: Alex Allen
DRILLING CO.: Seaboard Drilling, LLC DRILLER: Ryan Hackett DRILLING METHOD: Hollow Stem Auger
RIG TYPE: Track Mounted Diedrich D-50 AUGER ID/OD: 2 1/4 in / 5 5/8 in SAMPLER: Standard Split-Spoon
HAMMER TYPE: Automatic HAMMER WEIGHT (lbs): 140 CASING ID/OD: N/A / N/A CORE BARREL: N/A
HAMMER CORRECTION FACTOR: 1.47 HAMMER DROP (inch): 30
WATER LEVEL DEPTHS (ft): ∇ 15 ft Free water observed at 15 feet +/-

GENERAL NOTES:

KEY TO NOTES AND SYMBOLS: Water Level ∇ At time of Drilling ∇ At Completion of Drilling ∇ After Drilling
D = Split Spoon Sample
U = Thin Walled Tube Sample
R = Rock Core Sample
V = Field Vane Shear
Pen. = Penetration Length
Rec. = Recovery Length
bpf = Blows per Foot
mpf = Minute per Foot
WOR = Weight of Rods
WOH = Weight of Hammer
RQD = Rock Quality Designation
PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.
q_u = Unconfined Compressive Strength, kips/sq.ft.
Ø = Friction Angle (Estimated)
N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION					Graphic Log	Sample Description & Classification	H ₂ O Depth	Remarks
			Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data			
140	5		1D		0-2	24/12	2-2-3-4		0.3 Topsoil Loose, brown fine SAND and SILT		
			2D		2-4	24/16	6-8-11-11		2.0 Medium dense, brown fine sandy SILT		
			3D		5-7	24/18	5-14-17-15		5.5 Medium dense to dense, brown gravelly SAND and SILT with occasional cobbles (Glacial Till)		
135	10		4D		10-12	24/12	7-9-19-21				
130	15		5D		15-17	24/16	13-12-19-50			∇	

Auger Refusal at 18.5 feet
(Probable Bedrock)

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING NO.: **B-2**

BORING / WELL 10-12-2022 24-2384.1.GPJ SWCE TEMPLATE.GDT 7/28/25



BORING LOG

BORING NO.: **B- 3**
SHEET: 1 of 1
PROJECT NO. 24-2384.1
DATE START: 7/14/2025
DATE FINISH: 7/14/2025

CLIENT: Administrative Office of the Courts
PROJECT: Proposed Hancock Judicial Center
LOCATION: Merrill Lane, Ellsworth, Maine

Drilling Information

LOCATION: See Exploration Location Plan ELEVATION (FT): 143' +/- TOTAL DEPTH (FT): 16.6 LOGGED BY: Alex Allen
DRILLING CO.: Seaboard Drilling, LLC DRILLER: Ryan Hackett DRILLING METHOD: Hollow Stem Auger
RIG TYPE: Track Mounted Diedrich D-50 AUGER ID/OD: 2 1/4 in / 5 5/8 in SAMPLER: Standard Split-Spoon
HAMMER TYPE: Automatic HAMMER WEIGHT (lbs): 140 CASING ID/OD: N/A / N/A CORE BARREL: N/A
HAMMER CORRECTION FACTOR: 1.47 HAMMER DROP (Inch): 30
WATER LEVEL DEPTHS (ft): ∇ 15 ft Free water observed at 15 feet +/-

GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level ∇ At time of Drilling ∇ At Completion of Drilling ∇ After Drilling
D = Split Spoon Sample
U = Thin Walled Tube Sample
R = Rock Core Sample
V = Field Vane Shear
Pen. = Penetration Length
Rec. = Recovery Length
bpf = Blows per Foot
mpf = Minute per Foot
WOR = Weight of Rods
WOH = Weight of Hammer
RQD = Rock Quality Designation
PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.
q_u = Unconfined Compressive Strength, kips/sq.ft.
Ø = Friction Angle (Estimated)
N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION					Graphic Log	Sample Description & Classification	H ₂ O Depth	Remarks
			Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD				
			1D		0-2	24/10	2-2-2-3	1 1/2	Topsoil		
								0.4	Loose, brown silty SAND		
			2D		2-4	24/18	6-13- 19-23				
140								2.0	Dense, brown gravelly SAND and SILT with occasional cobbles (Glacial Till)		
	5		3D		5-7	24/12	18-36- 32-23				
135											
	10		4D		10-12	24/14	16-35- 31-21				
130											
	15		5D		15-16.2	14/8	23-21- 50/2"			∇	
								16.1	Probable weathered Bedrock		

Auger Refusal at 16.6 feet
(Probable Bedrock)

Stratification lines represent approximate
boundary between soil types, transitions may be
gradual. Water level readings have been made
at times and under conditions stated.
Fluctuations of groundwater may occur due to
other factors than those present at the time
measurements were made.

BORING NO.: **B- 3**



BORING LOG

BORING NO.: **B-6**
SHEET: 1 of 1
PROJECT NO. 24-2384.1
DATE START: 7/14/2025
DATE FINISH: 7/14/2025

CLIENT: Administrative Office of the Courts
PROJECT: Proposed Hancock Judicial Center
LOCATION: Merrill Lane, Ellsworth, Maine

Drilling Information

LOCATION: See Exploration Location Plan ELEVATION (FT): 140' +/- TOTAL DEPTH (FT): 12.0 LOGGED BY: Alex Allen
DRILLING CO.: Seaboard Drilling, LLC DRILLER: Ryan Hackett DRILLING METHOD: Hollow Stem Auger
RIG TYPE: Track Mounted Diedrich D-50 AUGER ID/OD: 2 1/4 in / 5 5/8 in SAMPLER: Standard Split-Spoon
HAMMER TYPE: Automatic HAMMER WEIGHT (lbs): 140 CASING ID/OD: N/A / N/A CORE BARREL: N/A
HAMMER CORRECTION FACTOR: 1.47 HAMMER DROP (inch): 30
WATER LEVEL DEPTHS (ft): No free water observed

GENERAL NOTES:

KEY TO NOTES AND SYMBOLS: Water Level
▽ At time of Drilling D = Split Spoon Sample Pen. = Penetration Length WOR = Weight of Rods S_v = Field Vane Shear Strength, kips/sq. ft.
▽ At Completion of Drilling U = Thin Walled Tube Sample Rec. = Recovery Length WOH = Weight of Hammer q_u = Unconfined Compressive Strength, kips/sq. ft.
▽ After Drilling R = Rock Core Sample bpf = Blows per Foot RQD = Rock Quality Designation Ø = Friction Angle (Estimated)
V = Field Vane Shear mpf = Minute per Foot PID = Photoionization Detector N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION					Graphic Log	Sample Description & Classification	H ₂ O Depth	Remarks
			Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD				
135	5		1D		0-2	24/10	2-3-2-5	1/2	Topsoil		
								0.4	Loose, brown silty SAND, some gravel		
								3.0	Dense, brown gravelly SAND and SILT with occasional cobbles (Glacial Till)		
130	10		2D		5-7	24/10	35-35-34-41				
			3D		10-12	24/14	14-15-15-17				

Bottom of Exploration at 12.0 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING NO.: **B-6**



BORING LOG

BORING NO.: **B-7**
SHEET: 1 of 1
PROJECT NO. 24-2384.1
DATE START: 7/14/2025
DATE FINISH: 7/14/2025

CLIENT: Administrative Office of the Courts
PROJECT: Proposed Hancock Judicial Center
LOCATION: Merrill Lane, Ellsworth, Maine

Drilling Information

LOCATION: See Exploration Location Plan ELEVATION (FT): 140' +/- TOTAL DEPTH (FT): 12.0 LOGGED BY: Alex Allen
DRILLING CO.: Seaboard Drilling, LLC DRILLER: Ryan Hackett DRILLING METHOD: Hollow Stem Auger
RIG TYPE: Track Mounted Diedrich D-50 AUGER ID/OD: 2 1/4 in / 5 5/8 in SAMPLER: Standard Split-Spoon
HAMMER TYPE: Automatic HAMMER WEIGHT (lbs): 140 CASING ID/OD: N/A / N/A CORE BARREL: N/A
HAMMER CORRECTION FACTOR: 1.47 HAMMER DROP (Inch): 30
WATER LEVEL DEPTHS (ft): ∇ 11 ft Free water observed at 11 feet +/-

GENERAL NOTES:

KEY TO NOTES AND SYMBOLS: Water Level
 ∇ At time of Drilling
 ∇ At Completion of Drilling
 ∇ After Drilling
D = Split Spoon Sample
U = Thin Walled Tube Sample
R = Rock Core Sample
V = Field Vane Shear
Pen. = Penetration Length
Rec. = Recovery Length
bpf = Blows per Foot
mpf = Minute per Foot
WOR = Weight of Rods
WOH = Weight of Hammer
RQD = Rock Quality Designation
PID = Photoionization Detector
 S_v = Field Vane Shear Strength, kips/sq.ft.
 q_u = Unconfined Compressive Strength, kips/sq.ft.
 ϕ = Friction Angle (Estimated)
N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION					Graphic Log	Sample Description & Classification	H ₂ O Depth	Remarks
			Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data			
135	5		1D		0-2	24/14	2-4-5-6		0.2 Topsoil Medium dense, brown SILT and SAND		
			2D		5-7	24/16	5-7-10-10	$q_c=5-6$ ksf	5.0 Very stiff, brown silty CLAY		
			3D		10-12	24/12	4-4-28-10		11.0 Dense, brown gravelly SAND and SILT (Glacial Till)	∇	

Bottom of Exploration at 12.0 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING NO.: **B-7**

BORING LOG

BORING NO.:	B- 8
SHEET:	1 of 1
PROJECT NO.	24-2384.1
DATE START:	7/14/2025
DATE FINISH:	7/14/2025

CLIENT: Administrative Office of the Courts
PROJECT: Proposed Hancock Judicial Center
LOCATION: Merrill Lane, Ellsworth, Maine

Drilling Information

LOCATION: See Exploration Location Plan ELEVATION (FT): 141.5' +/- TOTAL DEPTH (FT): 17.0 LOGGED BY: Alex Allen
 DRILLING CO.: Seaboard Drilling, LLC DRILLER: Ryan Hackett DRILLING METHOD: Hollow Stem Auger
 RIG TYPE: Track Mounted Diedrich D-50 AUGER ID/OD: 2 1/4 in / 5 5/8 in SAMPLER: Standard Split-Spoon
 HAMMER TYPE: Automatic HAMMER WEIGHT (lbs): 140 CASING ID/OD: N/A / N/A CORE BARREL: N/A
 HAMMER CORRECTION FACTOR: 1.47 HAMMER DROP (inch): 30
 WATER LEVEL DEPTHS (ft): ± 15 ft Free water observed at 15 feet +/-

GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:					
<u>Water Level</u>	D = Split Spoon Sample	Pen. = Penetration Length	WOR = Weight of Rods	S _v = Field Vane Shear Strength, kips/sq.ft.	
 At time of Drilling	U = Thin Walled Tube Sample	Rec. = Recovery Length	WOH = Weight of Hammer	q ₀ = Unconfined Compressive Strength, kips/sq.ft.	
 At Completion of Drilling	R = Rock Core Sample	bpf = Blows per Foot	RQD = Rock Quality Designation	Ø = Friction Angle (Estimated)	
 After Drilling	V = Field Vane Shear	mpf = Minute per Foot	PID = Photolionization Detector	N/A = Not Applicable	

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION						Graphic Log	Sample Description & Classification	H ₂ O Depth	Remarks
			Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data				
140 												

Auger Refusal at 17.0 feet
(Probable Bedrock)

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING NO.: **B- 8**

DRILLING / WELL 10-12-2022 24-2384.1.GPJ SWCE TEMPLATE.GDT 7/28/25

BORING LOG

BORING NO.:	B-9
SHEET:	1 of 1
PROJECT NO.	24-2384.1
DATE START:	7/14/2025
DATE FINISH:	7/14/2025

CLIENT: Administrative Office of the Courts
PROJECT: Proposed Hancock Judicial Center
LOCATION: Merrill Lane, Ellsworth, Maine

Drilling Information

LOCATION: See Exploration Location Plan **ELEVATION (FT):** 143' +/- **TOTAL DEPTH (FT):** 13.6 **LOGGED BY:** Alex Allen
DRILLING CO.: Seaboard Drilling, LLC **DRILLER:** Ryan Hackett **DRILLING METHOD:** Hollow Stem Auger
RIG TYPE: Track Mounted Diedrich D-50 **AUGER ID/OD:** 2 1/4 in / 5 5/8 in **SAMPLER:** Standard Split-Spoon
HAMMER TYPE: Automatic **HAMMER WEIGHT (lbs):** 140 **CASING ID/OD:** N/A / N/A **CORE BARREL:** N/A
HAMMER CORRECTION FACTOR: 1.47 **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): ▽ 10 ft Free water observed at 10 feet +/-

GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:					
<u>Water Level</u>	D = Split Spoon Sample	Pen. = Penetration Length	WOR = Weight of Rods	S _v = Field Vane Shear Strength, kips/sq.ft.	
▽ At time of Drilling	U = Thin Walled Tube Sample	Rec. = Recovery Length	WOH = Weight of Hammer	q _u = Unconfined Compressive Strength, kips/sq.ft.	
▽ At Completion of Drilling	R = Rock Core Sample	bpf = Blows per Foot	RQD = Rock Quality Designation	Ø = Friction Angle (Estimated)	
▽ After Drilling	V = Field Vane Shear	mpf = Minute per Foot	PID = Photolionization Detector	N/A = Not Applicable	

[illegible]

Auger Refusal at 13.6 feet
(Probable Bedrock)

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING NO.: **B- 9**

BORING / WELL 10-12-2022 24-2384.1.GPJ SWCE TEMPLATE.GDT 7/28/25



BORING LOG

BORING NO.: **B-10**
SHEET: 1 of 1
PROJECT NO. 24-2384.1
DATE START: 7/14/2025
DATE FINISH: 7/14/2025

CLIENT: Administrative Office of the Courts
PROJECT: Proposed Hancock Judicial Center
LOCATION: Merrill Lane, Ellsworth, Maine

Drilling Information

LOCATION: See Exploration Location Plan ELEVATION (FT): 145' +/- TOTAL DEPTH (FT): 11.2 LOGGED BY: Alex Allen
DRILLING CO.: Seaboard Drilling, LLC DRILLER: Ryan Hackett DRILLING METHOD: Hollow Stem Auger
RIG TYPE: Track Mounted Diedrich D-50 AUGER ID/OD: 2 1/4 in / 5 5/8 in SAMPLER: Standard Split-Spoon
HAMMER TYPE: Automatic HAMMER WEIGHT (lbs): 140 CASING ID/OD: N/A / N/A CORE BARREL: N/A
HAMMER CORRECTION FACTOR: 1.47 HAMMER DROP (inch): 30
WATER LEVEL DEPTHS (ft): No free water observed

GENERAL NOTES:

KEY TO NOTES AND SYMBOLS: Water Level
▽ At time of Drilling
▼ At Completion of Drilling
▼ After Drilling
D = Split Spoon Sample
U = Thin Walled Tube Sample
R = Rock Core Sample
V = Field Vane Shear
Pen. = Penetration Length
Rec. = Recovery Length
bpf = Blows per Foot
mpf = Minute per Foot
WOR = Weight of Rods
WOH = Weight of Hammer
RQD = Rock Quality Designation
PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.
q_u = Unconfined Compressive Strength, kips/sq.ft.
Ø = Friction Angle (Estimated)
N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION					Graphic Log	Sample Description & Classification	H ₂ O Depth	Remarks
			Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data			
140	5		1D		0-2	24/10	2-2-5-11		Topsoil		
									0.5 Medium dense, brown SILT and SAND		
			2D		2-4	24/16	10-12-15-17	q _p =9+ ksf	1.5 Hard to very stiff, brown silty CLAY		
			3D		5-7	24/14	8-11-22-21	q _p =5-6 ksf	6.0 Dense, brown gravelly SAND and SILT with occasional cobbles (Glacial Till)		
135	10		4D		10-10.1	1/0	50/1"				

Auger Refusal at 11.2 feet
(Probable Bedrock)

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING NO.: **B-10**



TEST PIT LOGS

PROJECT NO.: 24-2384
LOGGED BY: Nate Strout
CONTRACTOR:
C&C Lynch Excavation
EQUIPMENT:
Volvo EC160EL

CLIENT: Herrick & Salsbury, Inc.
PROJECT: Proposed Courthouse
LOCATION: Merrill Lane, Ellsworth, Maine

TEST PIT TP- 7

DATE: 12/16/2024 LOCATION: See Exploration Location Plan SURFACE ELEVATION (FT): 145' +/- COMPLETION DEPTH (FT): 5.0
WATER LEVEL DEPTHS (FT): No free water observed REMARKS:

Depth (feet)	Graphic Log	Stratum Description	H ₂ O Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
		Forest Duff					
0.8		Brown gravelly silty SAND with frequent cobbles and occasional boulders (Glacial Till)					
5		Refusal at 5.0 feet (Probable Bedrock)					

TEST PIT TP- 8

DATE: 12/16/2024 LOCATION: See Exploration Location Plan SURFACE ELEVATION (FT): 144.5' +/- COMPLETION DEPTH (FT): 8.5
WATER LEVEL DEPTHS (FT): No free water observed REMARKS:

Depth (feet)	Graphic Log	Stratum Description	H ₂ O Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
		Forest Duff					
0.9		Brown silty CLAY					q _p = 9+ KSF
5							q _p = 8 KSF
7.0		Brown gravelly SAND and SILT with occasional cobbles (Glacial Till)					
Bottom of Exploration at 8.5 feet							

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

KEY TO NOTES AND SYMBOLS:

Water Level
☒ At time of Digging
☒ At Completion of Digging
☒ After Digging

q_p = Pocket Penetrometer Strength, kips/sq.ft.



TEST PIT LOGS

CLIENT: Herrick & Salsbury, Inc.
PROJECT: Proposed Courthouse
LOCATION: Merrill Lane, Ellsworth, Maine

PROJECT NO.: 24-2384
LOGGED BY: Nate Strout
CONTRACTOR:
C&C Lynch Excavation
EQUIPMENT:
Volvo EC160EL

TEST PIT TP-9

DATE: 12/16/2024 LOCATION: See Exploration Location Plan SURFACE ELEVATION (FT): 144' +/- COMPLETION DEPTH (FT): 7.8
WATER LEVEL DEPTHS (FT): No free water observed REMARKS:

Depth (feet)	Graphic Log	Stratum Description	H ₂ O Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
0.5		Forest Duff					
		Brown silty CLAY					
5							
6.7		Brown gravelly SAND and SILT with occasional cobbles (Glacial Till)					

$q_p = 9+ \text{ KSF}$

Bottom of Exploration at 7.8 feet

TEST PIT TP-10

DATE: 12/16/2024 LOCATION: See Exploration Location Plan SURFACE ELEVATION (FT): 142' +/- COMPLETION DEPTH (FT): 6.8
WATER LEVEL DEPTHS (FT): No free water observed REMARKS:

Depth (feet)	Graphic Log	Stratum Description	H ₂ O Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
0.5		Forest Duff					
		Brown silty CLAY					
5							
5.1		Brown gravelly SAND and SILT with occasional cobbles (Glacial Till)		S-1		5.5-6.5	

$q_p = 9+ \text{ KSF}$

Bottom of Exploration at 6.8 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

KEY TO NOTES AND SYMBOLS:

Water Level
At time of Digging
At Completion of Digging
After Digging

q_p = Pocket Penetrometer Strength, kips/sq.ft.



TEST PIT LOGS

PROJECT NO.: 24-2384

LOGGED BY: Nate Strout

CLIENT: Herrick & Salsbury, Inc.

PROJECT: Proposed Courthouse

LOCATION: Merrill Lane, Ellsworth, Maine

CONTRACTOR:

C&C Lynch Excavation

EQUIPMENT:

Volvo EC160EL

TEST PIT TP-11

DATE: 12/16/2024 LOCATION: See Exploration Location Plan SURFACE ELEVATION (FT): 143' +/-

COMPLETION DEPTH (FT): 6.8

WATER LEVEL DEPTHS (FT): No free water observed

REMARKS:

Depth (feet)	Graphic Log	Stratum Description	H ₂ O Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
		Topsoil					
0.8		Brown sandy SILT					
2.3		Brown gravelly SAND and SILT with occasional cobbles (Glacial Till)					
5							

Bottom of Exploration at 6.8 feet

TEST PIT TP-12

DATE: 12/16/2024 LOCATION: See Exploration Location Plan SURFACE ELEVATION (FT): 143' +/-

COMPLETION DEPTH (FT): 6.9

WATER LEVEL DEPTHS (FT): No free water observed

REMARKS:

Depth (feet)	Graphic Log	Stratum Description	H ₂ O Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
		Topsoil					
0.8		Brown sandy SILT, trace gravel					
2.9		Brown gravelly SAND and SILT with occasional cobbles (Glacial Till)					
5				S-1		4-5	ID 31047B w = 10.1 %

Bottom of Exploration at 6.9 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

KEY TO NOTES AND SYMBOLS:

Water Level
✓ At time of Digging
✗ At Completion of Digging
✗ After Digging

q_p = Pocket Penetrometer Strength, kips/sq.ft.

TEST PIT 24-2384.GPJ SWICE TEMPLATE.GDT 12/19/24



TEST PIT LOGS

PROJECT NO.: 24-2384
LOGGED BY: Nate Strout
CONTRACTOR: C&C Lynch Excavation
EQUIPMENT: Volvo EC160EL

CLIENT: Herrick & Salsbury, Inc.
PROJECT: Proposed Courthouse
LOCATION: Merrill Lane, Ellsworth, Maine

TEST PIT TP-13

DATE: 12/16/2024 LOCATION: See Exploration Location Plan SURFACE ELEVATION (FT): 144' +/- COMPLETION DEPTH (FT): 6.8
WATER LEVEL DEPTHS (FT): No free water observed REMARKS:

Depth (feet)	Graphic Log	Stratum Description	H ₂ O Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
5		Topsoil					
	0.9	Brown sandy SILT, some gravel					
	2.6	Brown gravelly SAND and SILT with occasional cobbles (Glacial Till)					
				S-1		5-6	

Bottom of Exploration at 6.8 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

KEY TO NOTES AND SYMBOLS:

Water Level
▽ At time of Digging
▼ At Completion of Digging
▽ After Digging

q_p = Pocket Penetrometer Strength, kips/sq.ft.

KEY TO THE NOTES & SYMBOLS

Test Boring and Test Pit Explorations

All stratification lines represent the approximate boundary between soil types and the transition may be gradual.

Key to Symbols Used:

w	-	water content, percent (dry weight basis)
q _u	-	unconfined compressive strength, kips/sq. ft. - laboratory test
S _v	-	field vane shear strength, kips/sq. ft.
L _v	-	lab vane shear strength, kips/sq. ft.
q _p	-	unconfined compressive strength, kips/sq. ft. – pocket penetrometer test
O	-	organic content, percent (dry weight basis)
W _L	-	liquid limit - Atterberg test
W _P	-	plastic limit - Atterberg test
WOH	-	advance by weight of hammer
WOM	-	advance by weight of man
WOR	-	advance by weight of rods
HYD	-	advance by force of hydraulic piston on drill
RQD	-	Rock Quality Designator - an index of the quality of a rock mass.
γ _T	-	total soil weight
γ _B	-	buoyant soil weight

Description of Proportions:

Trace:	0 to 5%
Some:	5 to 12%
"Y"	12 to 35%
And	35+%
With	Undifferentiated

Description of Stratified Soils

Parting:	0 to 1/16" thickness
Seam:	1/16" to 1/2" thickness
Layer:	1/2" to 12" thickness
Varved:	Alternating seams or layers
Occasional:	one or less per foot of thickness
Frequent:	more than one per foot of thickness

REFUSAL: Test Boring Explorations - Refusal depth indicates that depth at which, in the drill foreman's opinion, sufficient resistance to the advance of the casing, auger, probe rod or sampler was encountered to render further advance impossible or impracticable by the procedures and equipment being used.

REFUSAL: Test Pit Explorations - Refusal depth indicates that depth at which sufficient resistance to the advance of the backhoe bucket was encountered to render further advance impossible or impracticable by the procedures and equipment being used.

Although refusal may indicate the encountering of the bedrock surface, it may indicate the striking of large cobbles, boulders, very dense or cemented soil, or other buried natural or man-made objects or it may indicate the encountering of a harder zone after penetrating a considerable depth through a weathered or disintegrated zone of the bedrock.

Report of Gradation

ASTM C-117 & C-136

Project Name **ELLSWORTH ME - PROPOSED HANCOCK COUNTY JUDICIAL CENTER - DESIGN PHASE GEOTECHNICAL ENGINEERING**
Client **STATE OF MAINE ADMINISTRATIVE OFFICE OF THE COURTS**
Exploration **3D**
Material Source **B-4, 5-7 FEET**

Project Number **24-2384.1**
Lab ID **33253B**
Date Received **7/22/2025**
Date Completed **7/23/2025**
Tested By **JULES MUYAMBI**

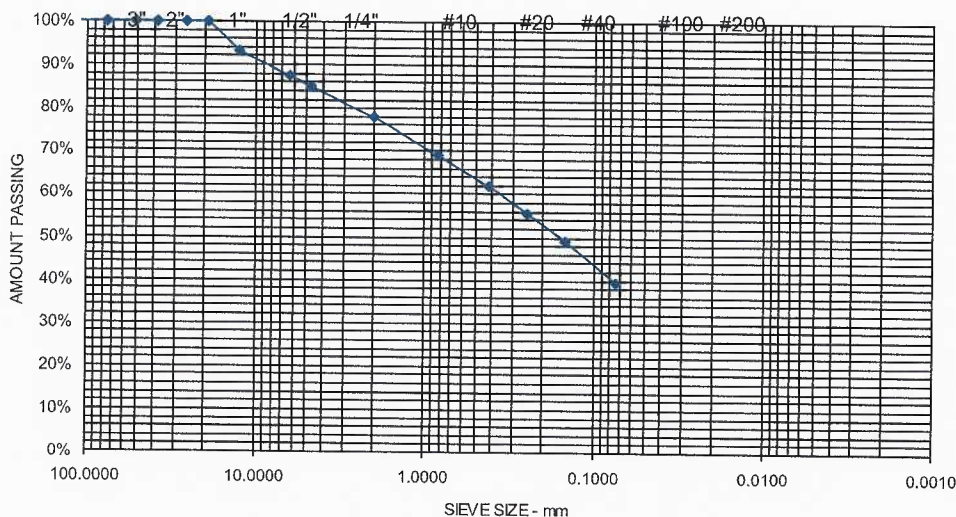
<u>STANDARD</u> <u>DESIGNATION (mm/μm)</u>	<u>SIEVE SIZE</u>	<u>AMOUNT PASSING (%)</u>

150	6"	100
125	5"	100
100	4"	100
75	3"	100
50	2"	100
38.1	1-1/2"	100
25.0	1"	100
19.0	3/4"	100
12.5	1/2"	93
6.3	1/4"	87
4.75	No. 4	85
2.00	No. 10	78
850	No. 20	69
425	No. 40	62
250	No. 60	56
150	No. 100	49
75	No. 200	39.5

14.8% Gravel

45.7% Sand

39.5% Fines



Comments:

SECTION 01 10 00

ALTERNATIVES & ALLOWANCES

PART 1. GENERAL

1.1 Additions to, or Deductions from the Base Bid

- a. The Contractor shall state in his Proposal the amount to be added to or deducted from the Contract Amount for the following Alternates as indicated on the Drawings and/or as specified hereafter.

1.2 Work and Materials

- a. Work and Materials involved in these Alternates & Allowances shall be governed by applicable parts of these Specifications unless stated otherwise in this Section.

PART 2. ALTERNATES

#1 DEDUCT ALTERNATE: Use Slip-Form concrete site curbing in lieu of Granite site curbing.

#2 DEDUCT ALTERNATE: Delete the requirement for Priming of structural steel in Section 05 10 00.

#3 DEDUCT ALTERNATE: Use Asphalt Shingles for the pitched roof areas in lieu of Standing Seam Metal Roofing.

#4 DEDUCT ALTERNATE: Use Double Pane insulation glass in lieu of Triple Pane glass in Sections 08 52 13 and 08 81 00.

#5 DEDUCT ALTERNATE: Delete the Clean-Agent Suppression System for the ground floor Files Room #015.

#6 ADD ALTERNATE: Use 8" x 16" x 4" (nominal) size granite veneer in lieu of metal siding panels at designated exterior wall areas. Include steel lintel angles for openings & wall details shall be similar to brick veneer details. Where veneer starts at foundation, add granite base course, same as at brick veneer walls. (See Elevation Drawings A5 & A6 for designated areas)

PART 3. ALLOWANCES

3.2 Electrical Allowances

- a. Electrical Subcontractors shall carry an allowance in their Filed Sub-bids for the local Power Company charges.

Allowance Amount Shall be: Fifty Thousand Dollars 00/100 (\$50,000.00)

- b. Electrical Subcontractors shall carry an allowance in their Filed Sub-bids for the local Telecommunications Company charges.

Allowance Amount Shall be: Thirty Thousand Dollars 00/100 (\$30,000.00)

--- END OF SECTION ---

SECTION 01 15 00

TEMPORARY FACILITIES

PART 1. GENERAL

1.1 Related Work Specified Elsewhere

- a. See also: General Conditions & Supplementary Conditions

1.2 Responsibilities

- a. The work of this Section is the responsibility of the General Contractor unless specifically stated otherwise in this Section.

PART 2. PRODUCTS, EXECUTION, & INFORMATION

2.1 Project Sign

- a. Provide and maintain a project sign. Design and location shall be as later provided by the Architect. Sign shall be produced by a professional sign company.
- b. Construct sign of a 4'x 8' piece of sign board. Install with lower edge approximately 5' above the ground, using 2-4x4 wood posts.
- c. Other signs will be allowed only to the extent permitted by the Owner and Architect.

2.2 Road (Merrill Lane)

- a. A new road (Merrill Lane), which provides access to the project site, is being constructed by the City of Ellsworth. Any maintenance associated with the road is the responsibility of the City of Ellsworth.

2.3 Storage

- a. Construction materials shall be covered above the ground and/or stored in permanent or temporary structures to protect them from exposure and weather damage.

2.4 Sanitary Facilities

- a. Provide ample, well maintained, temporary toilet facilities with proper enclosures for the use of workers employed on the Project.

2.5 Electric

- a. Utility electrical power is scheduled to be available on Merrill Lane by July 1, 2026. If power is delayed or required prior to this date, the City of Ellsworth will provide, maintain, and fuel a 110kw portable generator.

2.6 Water

- a. The anticipated schedule for public water to be available in the new Merrill Lane is July 1, 2026. All costs for public water usage shall be paid by the General Contractor.

2.7 Heat

- a. The interior of the building shall have a temperature of approximately 60 deg. F. for the spackling of gypsum drywall, installation of wood finish, installation of floor coverings, and interior decoration.

- b. The General Contractor shall provide and maintain any temporary heating equipment as may be required. The H&V Contractor shall permanently connect as many permanent heating system units as possible for us as temporary heat. The General Contractor shall assume full responsibility for the care and operation of the new equipment during its temporary use and to return the equipment to the H&V Contractor in perfect order. At the conclusion of the temporary heating period, the complete system shall be cleaned including new filters. Fuel required to operate heating system for temporary heat shall be provided by the General Contractor.
- c. The products of combustion from any temporary heating device shall not be allowed to enter the building. Any temporary heating device or system shall be properly and safely vented to the exterior.

2.8 Doors and Screens

- a. Install temporary batten-type or other suitable doors at exterior door openings. Keep doors locked during non-working hours. Install polyethylene screens at windows and other non-covered openings until permanent installations are made.

2.9 Temporary Stairs, Ladders, Ramps, Platforms, Hoists

- a. Provide and maintain all necessary means of access as above listed or as required for the proper execution of the work. Such work shall comply with the requirements of applicable Federal, State, and Local Laws and Requirements.

2.10 Fencing and Protection

- a. Provide fences, lights, and other safety devices required, or as necessary to conform to law. Provide and install construction fencing and signage to deter unauthorized entry and warn of hazards. Also see the Project Phasing Outline on the Drawings for specific fencing, barriers, and site access requirements.

2.11 Scaffolding and Shoring

- a. Each Contractor or Sub-contractor shall provide centering, platform scaffolding and other mobile type scaffolding as necessary for the proper completion of the work of his or her trade, assume all responsibilities for such work and make good any damages resulting from improper supports and/or failure of shoring in any respect.

2.12 Policing

- a. At all times during the construction phase, provide and maintain adequate access and egress to the property. Properly screen, barricade, guard and protect all areas affected by the work against hazards of any kind that may affect life, limb or property.
- b. Frequently, during the progress of the work, remove all debris from the building and premises to make and maintain the entire Project in a neat and orderly condition.

2.13 Jobsite Office Trailers

- a. The Contractors and/or Subcontractors are responsible for providing, providing services to, and maintaining any temporary trailers as may be required for their own use.
- b. In addition, the General Contractor shall provide a small office trailer, or an office trailer that has a separate space (with it's own entrance) for the use by the Owner's Representative. This provided space shall include heat, AC, lighting, & internet service.

2.14 Removal of Temporary Facilities

- a. Remove all temporary facilities at the completion of the work. Materials used for such facilities shall become the property of the Contractor.

--- END OF SECTION ---

SECTION 01 70 00
PROJECT CLOSEOUT

PART 1. GENERAL

1.1 Contractor's Responsibilities

- a. Before completion of the project, the Contractor shall be responsible for the following:
 - [1] Complete cleaning up of the site and the building including new glass.
 - [2] Transmission of all extra materials as may be specified.
 - [3] Transmission of any maintenance data and/or instruction manuals and As-Built documents to the Owner with copy to the Architect.
 - [4] Transmission of copies of all required guarantees and warranties including his own one (1) year guarantee for the entire project.
- b. Final inspection by the Architect will be made at such time that the Architect and the Owner agree that the work is substantially complete.

--- END OF SECTION ---

SECTION 03 30 00

CONCRETE

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK:

- A. Provide all cast-in-place concrete work.
- B. Provide all precast concrete work.
- C. Provide all metal inserts, anchor bolts and cast-in items required for construction.

1.02 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of following codes, specifications and standards (latest edition with current amendments), except where more stringent requirements are shown or specified:
 - 1. ACI 301 "Specifications for Structural Concrete for Buildings."
 - 2. ACI 318 "Building Code Requirements for Reinforced Concrete."
 - 3. ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures."
 - 4. Concrete Reinforcing Steel Institute, "Manual of Standard Practice."
 - 5. Other ACI and ASTM specifications noted herein.
- B. Testing and Services by Contractor: Performed by an approved testing laboratory at the Contractor's expense:
 - Material evaluation tests
 - Concrete mix designs
 - Tests not specifically indicated to be done at Owner's expense including retesting of rejected materials and installed work.
 - Furnish equipment including buckets, shovels, and wheelbarrows for proper sampling of concrete mix, molds for compression test specimens, facilities for storing and curing specimens at the job site, and labor to assist technician performing field tests.
- C. Materials and installed work may require testing and retesting at any time during the progress of the work as directed by the Engineer. Allow free access to material stockpiles and facilities. These tests will be done by an independent, approved laboratory at the Contractor's expense.
- D. Testing by Owner: Field tests will be by the Engineer's representative or by an independent testing laboratory. Tests are to be done for slump, air content and concrete temperature and compression test specimens will be taken. See Part 3, Execution.

- E. Field Testing for Small Placements: For placements of 15 cubic yards or less, variation from the ASTM requirement for sampling the middle portion of the batch for testing will be required. This is to prevent the first portion of a batch of defective concrete from being used in a small placement. Prior to small placements, meet with Engineer and determine an acceptable testing procedure based on the first portion of each batch.

1.03 SUBMITTALS:

- A. Product Data: Submit manufacturer's product data with application and installation instructions for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, waterstops, joint systems, curing compounds, dry-shake finish materials, and others as requested by Engineer.
- B. Shop Drawings; Reinforcement: Submit shop drawings for fabrication, bending, and placement of concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing, diagrams of bent bars, arrangement of concrete reinforcement. Include special reinforcement required at openings through concrete structures.
- C. Samples: Submit samples of materials as specified and as otherwise requested by Engineer, including names, sources and descriptions.
- D. Laboratory Test Reports and Mix Designs: Submit laboratory test reports for concrete materials and mix design test as specified.
- E. Material Certificates: Provide materials certificates in lieu of materials laboratory test reports when permitted by Engineer. Material certificates shall be signed by manufacturer and Contractor, certifying that each material item complies with, or exceeds, specified requirements.

PART 2 - PRODUCTS

2.01 FORM MATERIALS:

- A. Forms for Exposed Finish Concrete: Unless otherwise indicated, construct formwork complying with ACI 347, for exposed concrete surfaces with plywood, metal, metal-framed plywood faced or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings. Provide form material with sufficient stiffness to withstand pressure of newly placed concrete without bow or deflection.

- B. Forms for Unexposed Finish Concrete: Form concrete surfaces which will be unexposed in finished structure with plywood, lumber, metal or other acceptable material.
- C. Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain or adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces. Form coating shall not come in contact with any reinforcing. Form coating that comes in contact with reinforcing shall be removed in its entirety prior to placement of concrete.
- D. Form Ties: Factory-fabricated, adjustable-length, removable or snapoff metal form ties, designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal.

Unless otherwise indicated, provide ties so portion remaining within concrete after removal is at least 1" inside concrete.

Unless otherwise shown, provide form ties which will not leave holes larger than 1" diameter in concrete surface.

2.02 REINFORCING MATERIALS:

- A. Reinforcing Bars: ANSI/ASTM A 615, Grade 60, new deformed bars.
- B. Welded Wire Fabric (WWF): ANSI/ASTM A 185, welded steel wire fabric, sheet type.
- C. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI recommendations, unless otherwise acceptable.

For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.

2.03 CONCRETE MATERIALS:

- A. Portland Cement: ANSI/ASTM C 150, Type II, unless otherwise acceptable to Engineer.

Use one brand of cement throughout project, unless otherwise acceptable to Engineer.
- B. Normal Weight Aggregates: ANSI/ASTM C 33, and as herein specified. Provide aggregates from a single source for exposed concrete.

Local aggregates not complying with ANSI/ASTM C 33 but which have shown by special test or actual service to produce concrete of adequate strength and durability may be used when acceptable to the Engineer.

- C. Water: Potable, free of any substances that may be deleterious to concrete or reinforcing steel.
- D. Air-Entraining Admixture: ANSI/ASTM C 260.
- E. Mid-Range Water-Reducer: ANSI/ASTM C 494, Type A or F, and contain not more than 1% chloride ions.
- F. High-Range Water-Reducing Admixture (Super Plasticizer): ASTM C 494, Type F or G for structures needing 0.40 water cement ratio and contain not more than 1% chloride ions.
- G. Fibrous Concrete Reinforcement for Slabs on Grade: 100 percent virgin polypropylene fibers specially manufactured for use as concrete reinforcement. Fibrous concrete reinforcement shall be as manufactured by Fibermesh Company, or approved equivalent.

Physical Characteristics:

- 1. Specific gravity: 0.9
- 2. Tensile strength: 100 ksi
- 3. Fiber lengths: 3/4 inch

- H. Calcium chloride not permitted.

2.04 RELATED MATERIALS:

- A. Non-Shrink Grout: CRD-C 588, factory pre-mixed grout with minimum 1000 psi compressive strength in 1 day.

Products: Subject to compliance with requirements, provide one of the following:

Type D, Non-metallic

"Masterflow 713;" Master Builders.

"SonogROUT;" Sonneborn-Contech.

"Euco-NS;" Euclid Chemical Co.

"Five Star Grout;" U.S. Grout Co.

- B. Liquid Water-Repellent Penetrating Sealer: Liquid type penetrating sealer equivalent to Sikagard 701W as produced by the Sika Corporation or approved by Engineer. Note: Sikagard 701W is a chloride protectant sealer.
- C. Bonding Compound: Polyvinyl acetate, rewettable type.

- D. Bituminous Dampproofing: Equal to brush grade foundation coating by Euclid.
- F. Vapor Barrier: Minimum 15 mil multi-ply reinforced sheeting specifically designed for underslab application. Provide “VaporBlock” by Raven Engineered Films, “Moistop” by Fortifiber, or Stego Wrap.

2.05 PROPORTIONING AND DESIGN OF MIXES:

- A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. If trial batch method used, use an independent testing facility acceptable to Engineer for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing unless otherwise acceptable to Engineer.
- B. Submit written reports to Engineer of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until mixes have been reviewed by Engineer. Include the following in mix design submittals:

- Identification of aggregate source of supply.
- Results of compliance tests for aggregates.
- Scale weights of each aggregate.
- Absorbed water in each aggregate.
- Brand, type, and amount of each cement and each admixture.
- Proportions of each material required per cubic yard.

- C. Design Mixes to provide normal weight concrete with the following properties:

- 1. Interior Slabs:
 - 28 day compressive strength, 3000 PSI
 - Max. agg. size: 3/4"
 - No (0%) entrained air content by design
 - Max. water-cement ratio: 0.50
- 2. Exterior Slabs:
 - 28 day compressive strength, 4500 PSI
 - Max. agg. size: 1½"
 - 6 +/- 1% entrained air content by design
 - Max. water-cement ratio: 0.40
- 3. Walls, Piers, Footings:
 - 28 day compressive strength, 4000 PSI
 - Agg. size: 3/4"
 - Air content 6%± 1% by volume
 - Max. water-cement ratio: 0.45

4. Slump: All concrete placements:
Not less than 1", not more than 3". (Use a mid-range water reducer if a higher slump is desired. Maximum slump after admixture has been added is 6 inches.)

- 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 Engineer. Laboratory test data for reviewed mix design and strength results must be submitted to and accepted by Engineer before using in work.

2.06 CONCRETE MIXES:

- A. Job-Site Mixing: Not allowed.
- B. Ready-Mix Concrete: Comply with requirements of ANSI/ASTM C 94, and as herein specified.

Provide batch ticket for each batch discharged and used in work, indicating project identification name and number, date, mix type, mix time, quantity, and amount of water introduced.

Water may be added for retempering provided maximum permissible slump and maximum water cement ratio is not exceeded. Do not make additions without notifying the Engineer. Additional field tests and compressive test specimens may be required.

- C. Precast Concrete: Comply with requirements of ACI 218-253.

PART 3 - EXECUTION

3.01 FORMS:

- A. Design, erect, support, brace and maintain formwork to support vertical and lateral loads that might be applied until such loads can be supported by concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation and position and have correct finish.

Tolerances for formed surfaces are listed in a table at the end of this section.

- B. Design formwork to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.
- C. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too

steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, and recesses for easy removal.

- D. Admixtures: Comply with manufacturer's instructions for use of admixtures.
- E. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.
- F. Chamfer exposed corners and edges as indicated, using wood, metal, PVC or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.
- G. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses and chases from trades providing such items. Accurately place and securely support items built into forms.
- H. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt or other debris just before concrete is placed. Retighten forms and bracing after concrete placement as required to eliminate mortar leaks and maintain proper alignment.

3.02 PLACING REINFORCEMENT:

- A. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports, and as herein specified.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.
- C. Accurately position support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required.
- D. Tolerances for placing reinforcement are given in Table 2 at the end of this section.
- E. Place reinforcement to obtain at least minimum coverages for concrete protection. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

- F. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least two full meshed and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.

3.03 JOINTS:

- A. Construction Joints: Locate and install construction joints which are not shown on drawings, at or near center of beam and slab span, so as not to impair strength and appearance of the structure, as acceptable to Engineer.
- B. Provide keyways at least 1-1/2" deep (unless shown different on plans) in construction joints in walls and between walls and footings; accepted bulkheads designed for this purpose may be used for slabs, with Engineer's approval.
- C. Place construction joints perpendicular to the main reinforcement. Continue reinforcement across construction joints.
- D. Form isolation joints as detailed on the drawings.
- E. Form control joints by saw cuts as soon as the surface is firm enough so that it will not be torn or damaged by the blade, usually within 4 to 12 hours after the concrete hardens.
- F. Waterstop: (If indicated on plans) Make all joints and splices in waterstop watertight in accordance with manufacturer's instructions. Provide preformed joint sections for corners and intersections.

3.04 INSTALLATION OF EMBEDDED ITEMS:

- A. General: Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of these items.
- B. Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface. Provide and secure units sufficiently strong to support types of screed strips by use of strike-off templates or accepted compacting type screeds.

3.05 PREPARATION OF FORM SURFACES:

- A. Coat contact surfaces of forms with a form-coating compound before reinforcement is placed.

Thin form-coating compounds only with thinning agent of type, and in amount, and under conditions of form-coating compound manufacturer's directions. Do not allow excess form-coating material to accumulate in forms or to come into contact with concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

3.06 CONCRETE PLACEMENT:

- A. General: Comply with ACI 304, and these specifications. Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast-in. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work. Moisten wood forms immediately before placing concrete where form coatings are not used. Coordinate the installation of joint materials and moisture barriers with placement of forms and reinforcing steel.
- B. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation; in such cases hopper vertical chute or other approved means shall be used to prevent segregation.
- C. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 24" and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.
- D. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI recommended practices.
- E. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to rapidly penetrate placed layer and at least 6" into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.
- F. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.

- G. Bring slab surfaces to correct level with straightedge and strikeoff. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.
- H. Maintain reinforcing in proper position during concrete placement operations.
- I. Cold Weather Placing: Comply with ACI 306. Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures. When air temperature has fallen to or is expected to fall below 40°F (4°C), obtain a concrete mixture temperature of not less than 50°F (10°C), and not more than 80°F (27°C) at point of placement.

Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

Do not use calcium chloride salt and other materials containing antifreeze agents or chemical accelerators, unless otherwise accepted in mix designs.

- J. Hot Weather Placing: Comply with ACI 305 when hot weather conditions exist that would impair quality and strength of concrete. Contact Engineer to obtain copy of ACI 305 if needed.
- K. Maintain concrete temperature at time of placement below 90°F (32°C). Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing.

Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.

Wet forms thoroughly before placing concrete.

Use water-reducing retarding admixture (Type D) when required by high temperatures, low humidity, or other adverse placing conditions.

3.07 FINISH OF FORMED SURFACES:

- A. Rough Form Finish: For formed concrete surfaces not exposed-to-view in the finish work or by other construction, unless otherwise indicated. This is the concrete surface having texture imparted by form facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4" in height rubbed down or chipped off.
- B. Smooth Form Finish: For formed concrete surfaces exposed-to-view, or that are to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, dampproofing,

painting or other similar system. This is as-cast concrete surface obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas with fins or other projections completely removed and smoothed.

- C. Water Repellent/Chloride Protecting Penetrating Sealer: Provide water repellent/chloride protecting penetrating sealer to all concrete surfaces exposed to view in accordance with manufacturer's specifications. Water/chloride repellent penetrating sealer shall be Sikagard 701W solvent free silane-modified siloxane emulsion applied at a rate in accordance with manufacturer's specifications.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets surfaces occurring 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.
- E. Frost Protection: Coat exterior surfaces of below grade concrete retaining walls and basement walls with brushcoat bituminous dampproofing by Euclid. Comply with manufacturer's recommendations for application rates and methods.

3.08 SLAB FINISHES:

- A. Finished floor slab surfaces shall be true plane surfaces, with tolerance of 1/8" in 10' unless otherwise indicated on the drawings. Surfaces shall be pitched to drains. The dusting of finished surfaces with dry materials will not be permitted.

Except where otherwise specified, floor slabs shall be finished by tamping the concrete with special tools to force the coarse aggregate away from the surface, then screeding and floating with straight edges to bring the surfaces to the required finish level. While the concrete is still green but sufficiently hardened to bear a man's weight without deep imprint, it shall be wood-floated to a true, even plane with no coarse aggregate visible. Sufficient pressure shall be used on the wood floats to bring moisture to the surface. After surface moisture has disappeared, surfaces shall be steel-troweled to a smooth, even impervious finish, free from trowel marks. After having set sufficiently to ring the trowel, the surface shall be given a broom brushed finish.

- B. Contractor or subcontractors performing flatwork finishing of concrete slabs as outlined in this specification shall provide at least one (1) flatwork finisher or technician currently holding the following certifications:

- ACI Concrete flatwork finisher/technician

The contractor will submit to the engineer/owner a list of personnel that will provide these services on the project as well as a copy of the individual current ACI certification (wallet certificate).

A list of current ACI certified personnel may be found on the ACI website: ACI-INT.ORG.

3.09 CONCRETE CURING AND PROTECTION:

- A. General: Comply with ACI 308. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.

Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.

- B. Curing Methods: Perform curing of concrete by moist curing, by moisture-retaining cover curing, by curing compound, and/or combinations of methods.

- C. Provide moisture curing by following methods.

Keep concrete surface continuously wet by covering with water.

Continuous water-fog spray.

Covering concrete surface with absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4" lap over adjacent absorptive covers.

- D. Provide moisture-cover curing as follows:

Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3" and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

- E. Provide curing compound for slabs as follows:

Apply specified curing and sealing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours). Apply uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.

Do not use membrane curing compounds on surfaces which are to be covered with coating material applied directly to concrete, liquid floor hardener, waterproofing, dampproofing, membrane roofing, flooring, painting, and other coatings and finish materials, unless otherwise acceptable to Engineer.

F. Curing Formed Surfaces: Cure formed concrete surfaces, including undersides of beams, supported slabs and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

G. Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces by application of appropriate curing compound.

Final cure concrete surfaces to receive liquid floor hardener or finish flooring by use of moisture-retaining cover, unless otherwise directed.

H. Concrete slabs-on-grade are prone to cracking. Control joints are spaced to control the location of cracks that may occur due to curing shrinkage and the thermal movement of concrete. Welded wire fabric does not inhibit cracking; but holds concrete tightly together after cracking has occurred. In order to better control random cracking of concrete, the following measures are recommended:

- A. Limit the volume of water in the mix.
- B. Supply adequate curing measures. Wet cure or use curing sealers.
- C. Reduce joint spacing
- D. Provide a well-compacted a consistent subgrade.

2. Slab curling is a problem which has become more prevalent in recent years. The following measures in addition to those stated in Item H above are recommended to limit curling of concrete slabs-on-grade:

- A. Cure the slab properly.
- B. Use a lower amount of cement.
- C. Use a higher quantity of coarse aggregates in the mix.

3.10 REMOVAL OF FORMS:

A. Formwork not supporting weight of concrete such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50°F (10°C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.

3.11 MISCELLANEOUS CONCRETE ITEMS:

A. Filling-In: Fill-in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.

B. Construction Practices:

Reinforcement: Comply with requirements of CRSI.

Minimum Concrete Cover: 3" for concrete cast against soil; 2" for other concrete, unless otherwise shown.

Development Splicing: Provide development and tension lap splice lengths in accordance with the following (unless noted otherwise on plans):

Bar Size	Development Length*	Class B* Lap Splice
#4	20"	26"
#5	31"	40"
#6	44"	57"
#7	59"	77"
#8	78"	102"
#9	99"	129"
#10	126"	163"
#11	154"	200"

- *Based on Category 1, Lap Class B lap splice using 4000psi concrete, Grade 60, Uncoated New Deformed Bars-Per CRSI Manual.
- Where different bar sizes are spliced, use lap splice length required for the largest bar.

3.12 CONCRETE SURFACE REPAIRS:

- A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to Engineer.
- B. For exposed-to-view surfaces, blend white portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.
- C. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Engineer. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets; fins and other projections on surface; and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry pack mortar, or pre-cast cement cone plugs secured in place with bonding agent.

- D. Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.
- E. Repair of Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plan to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness, using a template having required slope.

Repair finished unformed surfaces that contain defects which affect durability of concrete. Surface defects, as such, include crazing, cracks in excess of 0.01" wide or which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, pop-outs, honeycomb, rock pockets, and other objectionable conditions.

Correct high areas in unformed surfaces by grinding, after concrete has cured at least 14 days.

Correct low areas in unformed surfaces during, or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to Engineer.

- F. Repair defective area, including honeycomb, rock pockets, voids over 1/4" in any dimension and holes left by tie rods and bolts except random cracks and single holes not exceeding 1" diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4" clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
- G. Repair isolated random cracks and single holes not over 1" in diameter by dry-pack method. Groove top of cracks and cut-out holes to sound concrete and clean of dust, dirt and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one part Portland cement to 1-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry pack after bonding compound has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.

Use epoxy-based mortar for structural repairs, where directed by Engineer.

- H. Repair methods not specified above may be used, subject to acceptance of Engineer.

3.13 QUALITY CONTROL TESTING DURING CONSTRUCTION:

- A. The Owner will employ a testing laboratory to perform initial field tests and to submit test reports. Testing agencies providing sampling and field testing of concrete as outlined in this specification shall provide field technicians currently holding the following certifications:

- ACI Concrete Field Testing Technician – Grade 1

The testing agency will submit to the engineer/owner a list of personnel that will provide these services on the project as well as a copy of the individual current ACI certification (wallet certificate).

A list of current ACI certified personnel may be found on the ACI website: WWW.ACI-INT.ORG.

- B. Sampling and testing for quality control during placement of concrete may include the following, as directed by Engineer. Tests will be made for each concrete load and for each set of compression test specimens or as often as required to ensure compliance with the specifications.

Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.

Slump: ASTM C 143; at point of discharge.

Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231 pressure for normal weight concrete.

Concrete Temperature: Test hourly when air temperature is 40° F (4°C) and below, and when 80°F (27°C) and above.

Compression Test Specimen: ASTM C 31; one set of 4 standard cylinders for each compressive strength test unless field-cured cylinders are required. Mold and store cylinders for laboratory cured test specimens except when field-cured test specimens are required.

Compressive Strength Tests: ASTM C 39; 1 specimen tested at 7 days, 2 specimens tested at 28 days, 1 specimen to “hold” if additional test needed after 28 days.

When frequency of testing will provide less than 5 strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 are used.

Concrete is satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive strength by more than 500 psi.

C. Frequency of Testing

Frequency of testing shall be as follows, unless directed otherwise by Engineer:

Conduct compression test specimen, slump, air content, and concrete temperature for every continuous 50 cubic yards of concrete placed; or daily if total placement is less than 50 cubic yards. Conduct intermediate tests for air, temperature and slump.

D. Test results will be reported in writing to Engineer and Contractor on same day that tests are made. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of break for both 7-day tests and 28-day tests.

E. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Engineer. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as stated in ACI 301. Contractor shall pay for such tests conducted, and any other additional testing as may be required, when unacceptable concrete is verified.

3.14 DEFECTIVE WORK ACCEPTANCE, AND REMEDIES:

A. Defective Work: Any work which fails to comply with the requirements of these specifications or does not comply with the acceptance requirements of Chapters 17 and 18 of ACI 301.

B. Remedies: Work which may be repaired to comply with these specifications using approved repair methods may be accepted. All repairs are at the Contractor's expense.

C. Remove and replace work which cannot be repaired or strengthened with approved methods. Removal and replacement are at the Contractor's expense.

- D. Inadequate concrete strength: If test results show inadequate concrete strength, the following may be required at the Contractor's expense:

Additional curing of areas with inadequate concrete.
Modifications to mix designs for remaining work.
Changes in member size or reinforcing for remaining work.
Replacement.

TABLE 1

TOLERANCES FOR FORMED SURFACES

1. Variation from plumb:
 - A. In the lines and surfaces of columns, piers, walls, and in arrises:

In any 10 ft. of length	1/4 in.
Maximum for the entire length	1 in.
 - B. For exposed corner columns, control-joint grooves, and other conspicuous lines:

In any 20 ft. length	1/4 in.
Maximum for the entire length	1/2 in.
2. Variation from the level or from the grades specified in the contract documents:
 - A. In slab soffits, ceilings, beam soffits and in arrises, measured before removal of supporting shores

In any 10 ft. of length	1/4 in.
In any bay or in any 20 ft. length	3/8 in.
Maximum for the entire length	3/4 in.
 - B. In exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines:

In any bay or in 20 ft. length	1/4 in.
Maximum for the entire length	3/4 in.
3. Variation of the linear building lines from established position in plan and related position of columns, walls, and partitions:

In any bay	1/2 in.
In any 20 ft. of length	1/2 in.
Maximum for the entire length	1 in.
4. Variation in the sizes and location of sleeves, floor

	openings, and wall openings.	$\pm 1/4$ in.
5.	Variation in cross-sectional dimensions of columns and beams and in the thickness of slabs and walls.	
	Minus	1/4 in.
	Plus	1/2 in.
6.	Footings*	
A.	Variations in dimensions in plan:	
	Minus	1/2 in.
	Plus	2 in.
B.	Misplacement or eccentricity:	
	2 percent of the footing width in the direction of misplacement but not more than	2 in.
C.	Thickness:	
	Decrease in specified thickness	5%
	Increase in specified thickness	No Limit
7.	Variation in steps:	
A.	In a flight of stairs:	
	Rise	$\pm 1/16$ in.
	Tread	$\pm 1/8$ in.

* Tolerances apply to concrete dimensions only, not to positioning of vertical reinforcing steel, dowels, or embedded items.

TABLE 2
TOLERANCES FOR PLACING REINFORCEMENT

Clear distance to formed surfaces	$\pm 1/4$ in.
Minimum spacing between bars	- 1/4 in.
Top bars in slabs and beams:	
Members 8 in. deep or less	$\pm 1/4$ in.
Members more than 8 in. but not over 2 ft. deep	$\pm 1/2$ in.
Members more than 2 ft. deep	± 1 in.
Crosswise of members	spaced evenly within 2 in.
Lengthwise of members	± 2 in.

END OF SECTION

SECTION 04 20 00

MASONRY

PART 1. GENERAL

1.1 Related Work Specified Elsewhere

- a. Cast in place Concrete - Section 03 30 00
- b. Furnishing loose lintels & bearing plates - Section 05 51 00, Metal Fabrications & Section 05 12 00, Structural Steel
- c. Sitework – Section 31 00 00

1.2 Handling

- a. Carefully handle all materials and units in transit and on the site. Keep units whole with sharp edges and undamaged faces. Handle individually or in suitable bundled groups.

1.3 Submittals

- a. Submit at least six brick or an actual brick sample board to the Architect for approval.
- b. Submit sample of granite for final selection of color and approval of quality.
- b. Submit project technical literature for all other products specified in this Section in accordance with the General Conditions.

1.4 General

- a. The Masonry Contractor shall be responsible for the proper removal and disposal of all masonry debris from the site.
- b. The Masonry Contractor shall be responsible for providing and maintaining complete and tight, temporary shelters and providing and maintaining necessary heating equipment to maintain the required working temperatures. Fuel costs for heating shall be the responsibility of the Masonry Contractor.

PART 2. PRODUCTS

2.1. Mortar

- a. Mortar shall have anti-efflorescence material qualities with documented testing.
- b. Masonry cement - Type S masonry cement by Dragon, Lehigh, or equal conforming to ASTM C-91.
- c. Sand - Clean, hard, sharp and free from deleterious materials. Materials must conform to ASTM C-144.
- d. Water - Potable.

2.2 Brick

- a. Face Brick shall have anti-efflorescence material qualities with documented testing.
- b. Brick - Conforming to ASTM C-67, C-216, Grade SW. – Standard modular size face brick - "Old Port – Narrow Flash Range" brick by Morin Brick Co.

2.3 Block

- a. Masonry block - Produced from Portland cement and aggregate conforming to ASTM C-33 for normal weight block and ASTM C-331 for Medium and lightweight block. Provide beam block for opening headers and courses as detailed. Provide bull-nose block for outside corners in finished areas.

2.4 Granite

- a. State of Maine quarried white/grey solid granite – Fabricated to shapes for windowsills, wall bands, & paving units. Quarried, cut, and surfaced stone shall be free of structural cracks and other detrimental defects. Color range and final surface finishes shall be approved by the Architect. All granite is for exterior applications. See Site & Architectural detailed drawings.

[1] Granite shall have a flush surface, "Thermal" finish.

[2] 24" x 48" x 1 ½" granite pavers shall be Woodbury Gray from Swensen Granite or approved equal. Coordinate with the entrance walk pavers specified in site improvements so the same product is used.

2.5 Reinforcing and Accessories

- a. Brick Ties - Minimum 3/16" dia. wire, two-part, adjustable, hot-dip galvanized after fabrication. Ties equal to: D/A 210 anchor with D/A 701 tie by Dur-O-Wall Inc.; DW-10HS anchor with Vee Wire Tie by Hohmann & Barnard, Inc.; Type 1044 anchor with 1100 triangular ties by Wire-Bond, or approved equal. Use two (2) stainless steel screws or approved corrosion proof fasteners at each anchor for attachment.
- b. Block Wall Reinforcement - Standard class galvanized (9 ga. wire) truss type reinforcement by Dur-O-Wall, Hohman and Barnard, National Wire, or approved equal. Place at 16" on center vertically. Use similar truss type reinforcing for double wythe brick walls and piers.
- c. Thru Wall and Base Flashing - 3 oz. pure sheet copper laminated to Kraft paper with asphalt and embedded fibrous reinforcing. Flashing shall have 0.00 perm rating, be very flexible, and have capability of bonding to mortar. Furnish flashing manufactured by Wasco/York, Afco, or Phoenix Building Products, Inc.
- d. Lintel Angle Flashing/Drip – 26 gauge stainless steel drip flashing with hemmed/angled drip edge.
- e. Mortar Mesh & Weeps – Dovetail shaped polyethylene mesh for the base of the air cavity and over lintels behind brick veneer. Provide "Mortar Net" product by Mortar Net USA Ltd. or approved equal. Weeps – Provide Mortar Net Weep Vents for head joints at brick base and opening lintels spaced 16" o.c. Color shall be selected by the Architect from samples submitted.
- f. Reinforcing Steel Bars – 60,000 psi new billet steel conforming to ASTM A-615 and ASTM A-305 deformations.

PART 3. EXECUTION

3.1 General

- a. Build all work plumb, true, and accurately to the dimensions indicated.
- b. Place bolts, anchors, plates, ties, lintels, masonry flashings and other accessories and metal work specified or indicated in position as the work progresses.
- c. Heat water and sand before laying masonry in weather colder than 40 deg. F. (4 Deg. C.). Do not lay in temperature below freezing unless heating is provided for under the direction of the Architect. Maintain masonry at minimum 50 deg. (10 deg. C.) for at least 72 hours.

- d. Adequately cover all work at the end of the work period and during storms and showers. When so covered, keep masonry warm as specified in "c" above.
- e. Before closing inaccessible spaces or shafts with masonry, remove rubbish and sweep out the areas to be enclosed.
- f. Keep the open space at expansion and/or control joints free of mortar using a continuous temporary wood or metal strip set in the space.
- g. Where fresh masonry joins work that is partially or totally set, clean the exposed surfaces of the set masonry and wet it lightly to obtain the best possible bond with new work. Remove all loose work. When horizontal runs are stopped off, rake back one-half or a full unit length in each course, depending on the type of bond.
- h. Consult other trades and make provisions that will permit the installation to their work in a manner to avoid cutting and patching. Build in work specified for other Sections of these Specifications as necessary or required as the work progresses. Set steel lintels in beds or mortar. Build in anchors and clips for windows if required.

3.2 Mortar

- a. For general masonry work:
1 part masonry cement
3 parts damp, loose sand [Measurement shall be by volume.]
- b. Mix sand and mortar cement dry. Add water to bring mortar to proper consistency for use. Keep mixed mortar tempered on the boards at all times. Use no mortar that has set more than one (1) hour.
- c. In cold weather, sand and water shall be heated sufficiently to maintain the temperature of mortar when used to above 50 degrees F.
- d. No additives, anti-freeze mixtures or admixtures will be allowed in the mortar.

3.3 Brick Veneer Work

- a. Wet brick having an absorption of more than 5%.
- b. Spread mortar for the bed joint thick with a shallow furrow and for only a few bricks at a time. Lay brick immediately before mortar can start to stiffen. Shove head joints. Plug nail holes with mortar immediately upon removal of nails. Do not move brick after laying. If brick have been improperly laid or spaced and correction is necessary, remove and relay with fresh mortar. Build in flashings specified at locations shown and over all masonry openings.
- c. Contractor shall **keep the cavity clear at all times.**
- d. In general, course joints in running bond and other bonds as shown on the Drawings as uniform as the type brick will allow. Keep head joints plumb. Tool joints with a rounded tool to give a firm, concave joint. Do tooling before mortar hardens and with sufficient force to press the mortar tight against the brick on both sides of the joint.
- e. Do not lay brick or any other unit having a film of frost on its surface. Do not build on any frozen work. Such work will be required to be removed and rebuilt.
- f. Provide flashing and weep holes where specifically indicated on the Drawings and at the following designated locations if not so indicated on the Drawings:
 - [1] At spandrel flashings.
 - [2] Where flashings or waterproofing membranes turn out & terminates at horiz. mortar joints.

[3] Over top of steel lintels or shelf angles.

Space weep holes as shown or not more than 16 inches on center. Weeps shall be a full head joint with "Mortar Net Weep Vents" as specified.

- g. Build in flashing, flashing blocks, access panels and other work at locations indicated on Drawings. Flashings over and under openings shall extend eight (8) inches beyond jambs. Note that base flashings and window and door head flashings must be set in and sealed with mastic.
- h. Set stainless steel drip flashing in two beads of sealant against the steel lintel angles. Drip edge shall be slightly beyond the face of the brick.
- h. Attach anchor portion of brick ties to studs with approved fasteners.

3.4 Block

- a. Lay hollow masonry units in running bond unless otherwise indicated. Use full mortar coverage on horizontal and vertical face shells. Bed webs also in starting course on footing, foundation walls, and around cells that are reinforced or filled with grout. Lay solid units with full head and bed joints. Make joints uniform, approximately 3/8 inches thick unless indicated otherwise. Install reinforcing specified in every course over door openings and every second course at all other locations. In general, tool block to standard concave joint same as brick.
- b. Provide continuous vertical expansion and control joints in concrete wall, partitions, and at locations indicated on Drawings. Form joints as detailed. Do not continue joint reinforcement across control joints unless it is so indicated on the Drawings. Control joints shall continue through bond beams, unless indicated otherwise. Rake out control joints on exposed faces of interior walls and partitions to a depth of 3/8 inches and neatly tool square.
- c. Where bond beams and block lintels are used, form them in place with special shaped units as specified herein or as shown on the Drawings. Install reinforcing as detailed and fill with 3000 psi concrete. Provide temporary support under lintels as necessary.
- d. At opening jambs, under beam bearing points, and a minimum of 8'-0" o.c. in walls - Fill one core with concrete and one (1) #5 steel reinforcing bar full height of wall.

3.5 Granite

- a. Set fabricated granite units in brick masonry walls and entrance pavers per drawing details.

3.6 Cleaning

- a. On completion of masonry work, clean exposed masonry with a weak solution of muriatic acid and clear water, removing all stains. Use caution with pressure washers to prevent damage to mortar joints. Clean masonry work of loose mortar and mortar spots, leaving the whole thoroughly clean. Do any pointing of joints as may be necessary, with mortar used for laying units.
- b. Clean down exposed concrete surfaces which have become dirty or spotted with concrete or mortar spatter. Leave such surfaces uniform in color and texture. On completion, leave all parts clean to the satisfaction of the Architect.

---END OF SECTION---

SECTION 05 10 00
STRUCTURAL STEEL

PART 1 - GENERAL

1.01 THIS SECTION INCLUDES THE FOLLOWING:

- A. Steel beams, and columns.
- B. Bearing plates, gusset plates, web stiffeners, and miscellaneous shapes.
- C. Bolted and welded connections for all steel covered under this section.
- D. Steel framing and supports for mechanical and electrical equipment.
- E. Elevator machine beam(s).

1.02 RELATED WORK SPECIFIED ELSEWHERE:

- A. Grouting under base and bearing plates - Section 033000, Cast-In-Place Concrete.

1.03 FURNISHED BUT INSTALLED ELSEWHERE:

- A. Anchor rods, loose bearing plates, loose steel lintels - Installed under Section 03300, Cast-In-Place Concrete.

1.04 STANDARD SPECIFICATIONS:

- A. Fabrication, Erection and Welding for this Section - In accordance with AISC 360-16 "Specifications for Structural Steel Buildings", adopted July 7, 2016; 15th edition, including "Commentary" all supplements issued thereto.
- B. ANSI/AISC 303-16 "Code of Standard Practice for Steel Buildings and Bridges-June 15, 2015".
 - 1. Exclude the word "structural" in reference to the "Design Drawings" in section 3.1 of the Code.
- C. Welding - In accordance with the American Welding Society 'Structural Welding Code', AWS D1.1- latest edition.
- D. Bolting of structural joints shall be in accordance with "AISC Specification for Structural Joints using High-Strength Bolts", latest edition.

1.05 QUALIFICATIONS:

- A. Welding procedures, welders, welding operations and tacking - Qualified in accordance with AWS Code.

- B. Structural steel shall be furnished by a fabricator who is a member of the American Institute of Steel Construction (AISC), be certified for SBD - Conventional Steel Building Structures, STD - Standard for Steel Building Structures, or be a member of the Steel Fabricators of New England (SFNE). Provide certification of at least one of the above to Engineer at the time of contract signing.

1.06 SUBMITTALS:

- A. Submit shop drawings in accordance with Section 01340, Quality Assurance; Submittals. Submit one set of ozalid transparencies (reproducible) and one set of prints for review. Print will be reviewed and the reproducible will be returned to Contractor for printing and distribution. Multiple copies will not be marked by Engineer and will be returned. Engineer will have 10 business days to review once received. Engineer will review submittals a maximum of two (2) review cycles as part of their normal services. If submittals are incomplete or otherwise unacceptable and resubmitted, General Contractor shall compensate Engineer for additional review cycles.

Drawings shall indicate shop and erection details, including cuts, copes, connections, holes, threaded fasteners, and welds.

Approval of Shop Drawings shall be for size and arrangement of principal and auxiliary members and for strength of connections. Any errors in dimensions shown on the Shop Drawings shall be the responsibility of the Contractor.

Prior to submission of Shop Drawings, Contractor shall verify all dimensions, site conditions, etc. relating to existing conditions. Any discrepancies which affect the structural design or details shall be brought to the attention of the Architect and Structural Engineer.

Electronic files of structural drawings **will not be provided** to the contractor for preparation of shop drawings. Reproduction of any portion of the Construction Documents for use as Shop Drawings and/or Erection Drawings is prohibited. Shop drawings and/or Erection Drawings created from reproduced Construction Documents will be returned without review.

- B. Provide setting drawings, templates and directions for the installation of anchor bolts and other devices.
- C. Submit copy of welder's certification for all welders performing or making shop and/or field welds. Certification must be current and specify the type and position of welds which the welder is qualified to perform.
- D. General Contractor shall submit a Submittal Schedule to the engineer within 30 days after they have received the Owner's Notice to Proceed.

- E. Shop drawings will not be reviewed as partial submittals. A complete submittal shall be provided and shall include; erection and piece drawings indicating all members, braced frames, moment frames and connections. **Incomplete submittals will not be reviewed.**
- F. Review of shop drawings will be made for the size and arrangement of the members and strength of the connections. Conformance of the Shop Drawings to the Contract Drawings remains the responsibility of the General Contractor. Engineer's review in no way relieves the General Contractor of this responsibility.

1.07 PRODUCT HANDLING:

- A. Deliver anchor bolts and other anchorage devices which are embedded in Cast-In-Place Concrete or Masonry construction to the project site in time to be installed before the start of concreting operations or masonry work.
- B. Store structural steel members at the project site above ground on platforms, skids, or other supports.
- C. Protect steel from corrosion.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Steel shapes - ASTM A992 Grade 50.
- B. Steel bars, and plates - ASTM A-36, unless noted otherwise on drawings.
- C. Hollow structural sections - ASTM A500, Grade B.
- D. Hollow Structural Pipe – ASTM A501 or ASTM A53.
- E. High strength bolts 3/4" - ASTM A-325, Type 1 or 2, unless otherwise noted on plan. Direct tension indicator washers or bolts may be used at Contractor's option.
- F. Anchor Rods (bolts) - ASTM F1554, Grade 36 weldable steel, unless noted otherwise on drawings. Anchor rods that are to be exposed to weather, located in unheated enclosures, or in contact with pressure treated lumbers shall be hot dipped galvanized. All anchor rods shall be headed or double nutted. "J" type anchor bolts are not permitted. Provide plate washer (3"x3"x3/8") between nut and base plate at each anchor bolt at braced-frame column locations. Weld plate washer to base plate and tack weld nut to plate washer. Provide standard washer between nut and base plate at non-braced frame columns.

- G. Shop paint - Stan-tite #86 Metal Primer, Tnemec 88 Red Metal Primer or equivalent approved by Engineer. Provide shop paint only on steel to be exposed after construction. Non-exposed steel to be non-primed and non-painted.
- H. Welding to be performed with 70 ksi wire or electrodes.
- I. Drilled Anchors – Expansion and adhesive by HILTI or POWERS/RAWL as indicated on the Drawings.
- J. Steel Coatings for Exterior Embedded Steel: Steel below grade/slab level, exterior steel which is embedded in concrete or as otherwise indicated on the drawings, shall be painted with TNEMIC FIBRETAR No 250 Coal Tar Epoxy. Paint embedded areas only. Do not paint surfaces which are to be welded until welding is complete.

PART 3 - EXECUTION

3.01 FABRICATION:

- A. Fabricate structural steel in accordance with the requirements of the drawings and this Section of the Specifications.
- B. Shop paint surfaces of all steel work that will be left finished exposed after construction; otherwise, all steel to be non-primed and non-painted.
- C. Thoroughly clean all metal of loose mill scale, rust, dirt, weld spatter, and other foreign matter by hand cleaning, meeting the requirements of Steel Structures Painting Council SSPC-SR-2. Grind smooth all sharp projections. Oil and grease deposits shall be removed by solvent wiping.
- D. After the steel has been cleaned, the paint primer shall be sprayed on the metal surfaces in accordance with the manufacturer's recommendations. Care shall be taken to insure that no running or sagging of the paint occurs.
- E. Paint thickness shall have a minimum dry film of 2.0 mils. Maximum coverage shall be 400 square feet per gallon.
- F. Parts inaccessible after assembly shall be given two coats of shop paint, preferably of different colors.
- G. After erection, the General Contractor shall retouch all portions of the shop coat chipped or damaged during erection and all field welds and connections, with the same paint as used for the shop coat.

- H. Camber, if any, is indicated on the drawings. Camber indicated is the required camber at time of erection. Contractor shall survey camber prior to placing metal deck.

3.02 ERECTION:

- A. The structural metal shall be erected plumb and true to the lines and elevations indicated on the drawings.
- B. Erection tolerances shall be within the limits specified in the applicable section of the "AISC Code of Standard Practice", latest edition.
- C. Temporary connections shall be adequate to take care of all dead load and erection imposed stresses.
- D. Temporary bracing shall be provided, wherever necessary to hold the steel in a horizontal and vertical plane until permanent bolting has been completed. Adhere to latest OSHA's latest safety standards including but not limited to: 29 CFR Part 1926. Contractor shall retain the services of a specialty structural engineer (Not the Engineer of Record) to design specialty shoring and bracing.
- E. Bolts for beam shear connections shall be installed in properly aligned holes and brought to snug tight condition, all plies of joint in firm contact, in accordance with Section 8(c) of the bolt specification of Section 1.03 C of this specification. Bolts used in hangers and flanges of beams for moment connections are to be "slip-critical" and shall be tightened according to AISC bolt specifications.
- F. Enlargement of holes by burning with a torch shall not be allowed. All steel with burnt hole enlargements shall be removed and replaced at the contractor's expense.
- G. Column base plates to have minimum of 4 anchor rods, per OSHA's latest standards.
- H. Comply with all latest applicable laws and ordinances for work related to the fabrication and erection of structural steel.
- I. All steel framing is non-self supporting and requires interaction with other elements such as shear walls, bracing, roof, and floor systems to provide the required stability and resistance to lateral forces. The steel framing shall be temporarily braced (design by contractor) by the contractor until all steel bracing, floor, roof decks, concrete walls, CMU walls, and wood/metal stud shear walls have been installed and all connections between these element have been made. Temporary bracing shall not be removed until steel bracing, shear walls, roof deck and floor decks are fully installed. All temporary and/or erection bracing shall be

the sole responsibility of the contractor. Contractor to determine the erection procedure and sequence and provide adequate temporary supports and bracing necessary to ensure the safety of the structure during construction.

- J. When installing expansion bolts or adhesive anchors, the contractor shall take measures to avoid drilling or cutting any existing reinforcement or damaging adjacent concrete. Holes shall be blown clean with compressed air and/or cleaned per manufacturer's recommendations prior to the installation of anchors.

3.03 QUALITY CONTROL AND TESTING DURING CONSTRUCTION:

- A. All materials and workmanship under this Section shall be subject to observation in the mill, shop or field by the Architect and/or Engineer, or by qualified personnel selected by the Architect and paid directly by the Owner.
- B. However, such observation, wherever conducted, shall not relieve the Contractor of his responsibility to furnish materials and workmanship in accordance with contract requirements, nor shall person(s) performing observation acceptance of materials or workmanship prevent later rejection of same by the Owner, Architect, and/or Engineer if defects are discovered.
- C. Inspection of welding for cantilevered beams and members, both beams and columns, shall be tested one hundred percent (100%) either by ultrasonic or by radiography in accordance with the latest edition of the AWS Structural Welding Code. Provide written report to Owner, Architect, and Engineer within 48 hours for each cantilevered member inspected.
- D. Inspection of bolting work shall be in accordance with "Specification for Structural Joints Using ASTM A325 or A490 Bolts" by the American Institute of Steel Construction, latest edition.
- E. The Contractor shall give proper notice to inspection agencies designated by the Architect and shall allow access and full facilities as required for this inspection.
- F. Testing and inspection reports shall be submitted to the Owner, Architect, and Engineer within 48 hours of completion of each test or inspection.
- G. Any field testing of structural steel (bolt torque, welds, etc.) shall be coordinated and costs paid by the Owner.

- H. Nonconforming Work: Contractor shall be responsible for correcting deficiencies in structural steel work which inspections laboratory test reports have indicated to be not in compliance with requirements. Additional tests shall be performed, at the Contractor's expense, as may be necessary to show compliance of corrected work. Any costs associated with the Engineer's review and disposition of faulty works shall be borne by Contractor.

END OF SECTION

SECTION 05 20 00

STEEL JOISTS

PART 1 - GENERAL

1.01 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 which 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. Extent of steel joists and joist girders is shown on the drawings, including basic layout and type of joists required.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

- A. Section 05 10 00: Structural Steel
- B. Section 05 30 00: Metal Decking
- C. Section 05 51 00: Metal Fabrications
- D. Section 09 91 00: Painting

1.04 QUALITY STANDARDS:

- A. Comply with all rules, regulations, laws and ordinances of Augusta, Maine and of all other authorities having jurisdiction and Quality Assurance and Submittals, Division 1. All labor, materials, equipment and services necessary to make work comply with such requirements shall be provided without additional cost to Owner.
- B. Codes and Standards: Comply with provisions of the following codes and standards, latest edition with current amendments, except as otherwise indicated or specified:
 - 1. Steel Joist Institute (SJI) Standard Specifications, Load Tables and Weight Tables for:

- a. K-Series Open Web Steel Joists
- b. LH-Series Open Web Steel Joists
- c. Joist Girders

2. AWS "Structural Welding Code"

- C. Qualifications of Field Welding: Qualify welding processes and welding operators in accordance with American Welding Society (AWS) "Standard Qualification Procedure." Submit copies of certification to Engineer prior to commencing work.
- D. Joists welded in place are subject to inspection and testing. Expense of removing and replacing any portion of steel joists for testing purposes will be borne by Owner if welds are found to be satisfactory. Remove and replace work found to be defective and provide new acceptable work at Contractor's expense.

1.05 SUBMITTALS:

- A. The Engineer shall receive all submittals a minimum of 10 business days to review prior to the start of fabrication. The Contractor shall have received and approved all submittals prior to review by the Engineer. Engineer will review submittals a maximum of two (2) review cycles as part of their normal services. If submittals are incomplete or otherwise unacceptable and resubmitted, General Contractor shall compensate Engineer for additional review cycles. All reviews 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 manufacturer's specifications and installation instructions for each type of joist and accessories. Include manufacturer's certification that joists comply with SJI "Specifications."
- C. Shop Drawings: Submit detailed drawings showing layout of joist girders, joist units, special connections, jointing and accessories. Include mark, number, type, location and spacing of joists and bridging.
 - 1. Provide templates or location drawings for installation of anchor bolts and bearing plates.
- D. Submittals Engineer will have 10 business days to review once received.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle steel joists as recommended in SJI "Specifications." Handle and store joists in a manner to avoid deforming members and to avoid excessive stresses.

PART 2 - PRODUCTS

2.01 GENERAL:

A. Materials:

1. Steel: Comply with SJI "Specifications".
2. Unfinished Threaded Fasteners: ASTM A 307, Grade A, regular hexagon type, low carbon steel.
3. Steel Prime Paint: Per SJI Specifications.

2.02 FABRICATION:

- A. General: Fabricate steel joists in accordance with SJI "Specification".
- B. Holes in Chord Members: Provide holes in chord members where shown for securing other work to steel joists; however, deduct area of holes from the area of chord when calculating strength of member.
- C. Extended Ends: Provide extended ends on joists where shown, complying with manufacturer's standards and requirements of applicable SJI "Specifications and Load Tables."
- D. Bridging: Provide horizontal or diagonal type bridging for "open web" joists, complying with SJI "Specifications" and as shown on plans.
1. Steel for bridging shall consist of angles conforming to the requirements of ASTM A36.
 2. Provide bridging anchors for ends of bridging lines terminating at walls or beams.
- E. End Anchorage: Provide end anchorages to secure joists to adjacent construction, complying with SJI "Specifications" unless otherwise indicated.
- F. Header Units: Provide header units to support tail joists at openings in floor or roof system not framed with steel shapes.
- G. Joist and Joist Girder Penetrations: Provide openings as required in joists and joist girders for HVAC duct penetrations.

- H. Shop Painting: Remove loose scale, heavy rust and other foreign materials from fabricated joists and accessories before application of shop paint.
 - 1. Apply one shop coat of primer paint to steel joists and accessories by spray, dipping, or other method to provide a continuous dry paint film thickness of not less than 1.50 mils.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Place and secure steel joists in accordance with SJI "Specifications", final shop drawings, and as herein specified.
- B. Placing Joists: Do not start placement of steel joists until supporting work is in place and secured. Place joists on supporting work, adjust and align in accurate location and spacing before permanently fastening.
 - 1. Provide temporary bridging, connections and anchors to ensure lateral stability during construction.
- C. Bridging: Install bridging simultaneously with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords where terminating at walls or beams.
- D. Uplift Loading: **Flat roof joists** to resist maximum gross uplift of 36 lbs. per square foot. **Sloped roof joists** to resist maximum gross uplift of 30 lbs. per square foot.

3.02 FASTENING JOISTS:

- A. Field weld joists to supporting steel framework with a minimum of 2" of weld on each side of the joist seat each end of joist. Coordinate welding sequence and procedure with placing of joists.
- B. Bolt joists to supporting steel framework in accordance with SJI "Specifications" for type of joists used.
 - 1. Provide unfinished threaded fasteners for bolted connections, unless otherwise indicated.
- C. Touch-Up Painting: Touch up shop applied prime coats wherever damaged or bare. Clean and touch up with shop primer specified above.

3.03 HANGING FROM STEEL JOISTS:

- A. Hanging of all equipment, pipes, etc., shall be done from the top chord of all steel joists as close as practical to the panel points.
- B. Pipe 1½" in diameter and smaller may be hung from the bottom chord of joists at panel points.

3.04 DAMAGED JOISTS

- A. Joists damaged during shipment, storage, or erection shall be replaced or repaired when possible. Obtain written approval from joist manufacturer regarding proposed repairs prior to making any repairs.

END OF SECTION

SECTION 05 30 00

METAL DECKING

PART 1 - GENERAL

1.01 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 which 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. Extent of metal deck is shown on the drawings.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

- A. Section 05 10 00: Structural Steel
- B. Section 05 20 00: Steel Joists
- C. Section 05 51 00: Metal Fabrications

1.04 QUALITY STANDARDS:

- A. Comply with all rules, regulations, laws and ordinances of Saco, Maine and of all other authorities having jurisdiction and Quality Assurance and Submittals, Division 1. All labor, materials, equipment and services necessary to make work comply with such requirements shall be provided without additional cost to Owner.
- B. Codes and Standards: Comply with provisions of the following codes and standards, latest edition with current amendments, except as otherwise indicated or specified:
 - 1. AISI "Specification for the Design of Cold Formed Steel Structural Members.
 - 2. AWS "Structural Welding Code".
 - 3. SDI "Design Manual for Floor Decks and Roof Decks".

- C. Qualifications of Field Welding: Qualify welding processors and welding operators in accordance with AWS "Standard Qualifications Procedure". Submit copies of qualifications to Engineer prior to commencing work.
- D. Welding Deck in place is subject to inspection and testing. Expense of removing and replacing portions of decking for testing purposes will be borne by the Owner if welds are found to be satisfactory. Remove work found to be defective and replace with new acceptable work at Contractor's expense.
- E. FM Listing: Provide metal roof deck units which have been evaluated by Factory Mutual System and are listed in "Factory Mutual Approved Guide" for Class I fire-rated construction.

1.05 SUBMITTALS:

- A. The Engineer shall receive all submittals a minimum of ten (10) business days 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. Engineer will review submittals a maximum of two (2) review cycles as part of their normal services. If submittals are incomplete or otherwise unacceptable and resubmitted, General Contractor shall compensate Engineer for additional review cycles.
- B. Product Data: Submit manufacturer's specifications and installation instructions for each type of decking and accessories. Include manufacturer's certification as may be required to show compliance with these specifications.
- C. Shop Drawings: Submit detailed drawings showing layout and types of deck panels, anchorage details, and conditions requiring closure panels, supplementary framing, sump pans, cant strips, cut openings, special jointing or other accessories.

1.06 HANDLING AND STORAGE:

- A. Handle decking with care. Use sufficient slings and buffers to prevent damage to pieces. Do unloading and hoisting by crane or by hand. Dumping of metal deck will not be permitted. Store metal deck off the ground, with one end elevated to provide drainage, and protected from the elements by a waterproof covering. Ventilate to avoid condensation.

PART 2 - PRODUCTS

2.01 GENERAL:

- A. Acceptable Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

1. Metal Roof Deck Units:

Roll Form Products, Inc.
Wheeling Corrugating Co.
United Steel Deck
Vulcraft

2. Composite Metal Floor Deck Units:

Roll Form Products, Inc.
Wheeling Corrugating Co.
United Steel Deck
Vulcraft

3. Metal Floor Form:

Roll Form Products, Inc.
Wheeling Corrugating Co.
United Steel Deck
Vulcraft

B. Materials:

1. Steel for Painted Metal Deck Units: ASTM A611, Grade C.
2. Steel for Galvanized Metal Deck Units: ASTM A446, Grade A.
3. Miscellaneous Steel Shapes: ASTM A36.
4. Sheet Metal Accessories: ASTM A526, commercial quality, galvanized.
5. Galvanizing: ASTM A525, G60.

- C. Galvanizing Repair Paint: High zinc-dust content paint for repair of damaged galvanized surfaces complying with Military Specifications MIL-P-21035 (Ships).

- D. Paint: Manufacturer's baked on, rust inhibitive paint, for application to metal surfaces which have been chemically cleaned and phosphate chemical treated.

- E. Flexible Closure Strips: Manufacturer standard vulcanized, closed-cell, synthetic rubber.

2.02 FABRICATION:

- A. General: Form all deck units in lengths to span 3 or more supports, with flush, telescoped or nested 2" laps at ends and interlocking or nested side laps, unless otherwise indicated. "Roof Deck Units: Provide deck configurations complying with SDI Roof Deck Specifications", of metal thickness, depth and width as shown.
- B. Metal Closure Strips: Fabricate metal closure strips, for cell raceways and openings between decking and other construction of not less than 0.045" min. (18 gauge) sheet steel. Form to provide tight fitting closures at open ends of cells or flutes and sides of decking.
- C. Roof Sump Pans: Fabricate from a single piece of 0.071" min. (14 gauge) galvanized sheet steel with level bottoms and sloping sides to direct water flow to the drains, unless otherwise shown. Provide sump pans of adequate size to receive roof drains and with bearing flanges not less than 3" wide. Recess pans not less than 1+" below roof deck surface, unless otherwise shown or required by deck configuration. Holes for drains will be cut in the field.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. General: Install deck units and accessories in accordance with manufacturer's recommendations and final shop drawings, and as specified herein. End laps shall be a minimum of 2" and occur over a support.
- B. Place deck units on supporting steel framework and adjust to final position with ends accurately aligned and bearing on supporting members before permanently fastened. Do not stretch or contact side lap interlocks.
- C. Place deck units in straight alignment for entire length of run of cells and with close alignment between cells at ends of abutting units.
- D. Place deck units flat and square, secured to adjacent framing without warp or excessive deflection.
- E. Coordinate and cooperate with the structural steel erector in locating decking bundles to prevent overloading of structural members.
- F. Do not use decking units for storage or working platforms until permanently installed.

- G. Fasten metal roof deck by welding to the supporting steel immediately after alignment. 1-1/2" deck shall be welded to each support as indicated on plans. Roof deck ends and end laps shall be welded at 6 inches on center. See plans for required welding pattern(s) and #10 TEK screws at sidelaps. Fasten metal floor deck by welding to the supporting steel immediately after alignment. 1" form deck shall be welded in a 36/4 pattern. Deck ends and end laps shall be welded at each flute. Provide (1) #10 TEK screw each sidelap. The temperature for welding electrodes shall be 180°.
1. If welding wire number 6013 is not used, deck shall be welded through welding washers that are the standard of the deck manufacturer.
- H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work.
- I. Mechanically fasten sidelaps of adjacent roof deck units between supports as shown on the drawings but not less than intervals of 36" o.c., using #10 TEK screws.
- J. Uplift Loading: Install and anchor flat roof and sloped roof deck units to resist maximum gross uplift of 47 lbs. per square foot.
- K. Cutting and Fitting: Cut and neatly fit deck units and accessories around other work projecting through or adjacent to the decking.
- L. Reinforcement at Openings: Provide additional metal reinforcement and closures pieces as required for strength, continuity of decking and support of other work shown.
- M. Joint Covers: Provide metal joint covers at abutting ends and changes in direction of floor deck units.
- N. Roof Sump Pans: Place over openings provided in roof decking and weld to top decking surface. Space welds not more than 12" on center with at least 1 weld in each corner. Cut opening in roof sump bottom to accommodate drain size indicated.
- O. Closure Strips: Provide metal closure strips at open uncovered ends and edges of roof decking, and in voids between decking and other construction. Weld into position to provide a complete decking installation.
- P. Provide flexible closure strips instead of metal closure strips, at the contractor's option, wherever their use will ensure complete closure. Install with adhesive in accordance with the manufacturer's instructions.

Q. Touch-Up Painting: After decking installation, wire brush, clean and paint scarred areas, welds and rust spots on top and bottom surfaces of decking units and supporting steel members.

1. Touch-up galvanized surfaces with galvanizing repair paint applied in accordance with manufacturer's instructions.
2. Touch-up painted surfaces with same type paint used on adjacent surfaces.
3. In areas where shop-painted surfaces are to be exposed, apply touch-up paint to blend into adjacent surfaces.

END OF SECTION

SECTION 05 40 00

COLD-FORMED METAL FRAMING

PART 1. GENERAL

1.1 Related Work Specified Elsewhere

- a. Gypsum Drywall – Section 09 29 00
- b. Wood Framing and Blocking – Section 06 10 00
- c. Acoustical Batt Insulation installed in partitions – Section 07 21 00

1.2 Submittals

- a. Submit Shop Drawings and/or satisfactory product data for all items of this Section as specified in the General Conditions and Supplements thereto.

PART 2. PRODUCTS

2.1 Materials

- a. Interior Metal Studs & Track – 20 gauge, 3 5/8" & 6" & 8" x 1 3/8 in. flange, galvanized, pressed sheet steel by Marinoware, Dietrich Metal Framing, or approved equal.
- b. Exterior Wall Studs & Track – 16 gauge x 1 5/8" flange, galvanized, pressed sheet steel by Marinoware, Dietrich Metal Framing, or approved equal.
- c. Screws – Corrosion resistant, self drilling screw fasteners designed for attachment of metal studs and cold-formed metal framing in general.

PART 3. EXECUTION

3.1 Installation

- a. Align runners accurately at floor and ceiling and securely anchor with suitable fasteners spaced no more than 24 in. apart. Provide extended-leg top channels that are not permanently fastened to studs, thus allowing a slip joint for structure deflection.
- b. Position studs vertically in the runners spaced no greater than 16 in. o.c. unless shown otherwise on the Drawings. Cut studs 1/2 in. short to allow for deflection of structure unless directed otherwise. Anchor all studs to floor runner flanges by positive screw engagement through each stud flange and runner flange. Use double studs at openings, screwed together back-to-back or as detailed. Locate next stud at doors no more than 6 in from jamb studs.
- c. Locate studs no more than 2 in. from door frame jambs, abutting partitions, partition corners, and other construction. Securely anchor studs to the jamb and head anchor clips to each door or borrow light frame by bolt or screw attachment. Over openings, use a cut-to-length section of runner track placed horizontally with a web flange adjacent to vertical studs. Position a cut-to-length stud at the vertical joint location over the door frame header extending to the ceiling runner.
- d. Reinforce separate rows of studs at pipe chases with channels or studs between the two stud lines, or other equivalent means.
- e. Provide horizontal channel reinforcement through and attached to each metal stud at just above door head level in stud partitions with doorways.

---END OF SECTION---

SECTION 05 51 00

METAL FABRICATIONS

PART 1. GENERAL

1.1 Related Work Specified Elsewhere

- a. Installation of anchor bolts in cast-in-place concrete – Section 03 30 00
- b. Installation of lintel and sill angles – Section 04 20 00

1.2 Submittals

- a. Submit Shop Drawings of all items specified in this Section in accordance with the General Conditions and Supplements thereto. Show all details of fastening and attachment as required for a complete installation.
- b. Submit Welder's Qualifications for both shop and field welding on this project.

PART 2. PRODUCTS

2.1 Metals - General

- a. Metals shall be made with structural properties to sustain loads safely and withstand strains and stresses to which they are normally subjected.
- b. Steel and Iron - Standard, well finished structural shapes, pipes, sheet steel, bar steel and bar iron conforming to ASTM A-36. Do welding in such a manner that will prevent permanent buckling. Welds exposed in the finish work shall be ground smooth.
- c. Cast Iron - to conform to ASTM Specification A-48-64. Unless designated otherwise, it shall be Class #30. Castings shall have sharp corners and edges and shall be clean, smooth, and true to pattern. Drainage castings shall conform to ASSHO M-105, Class 30.
- d. Aluminum - Of temper and type commensurate with the use specified. Finish shall be as specified for particular items.
- e. Sheet Metal - to conform to Federal Specification 00-5-636.
- f. Nuts, bolts, and lags - Standard types and sizes conforming to ASTM A-307. They shall be hot-dip galvanized after fabrication in accordance with ASTM A-153 for exterior uses.

2.2 Fabrication

- a. Insofar as possible, fit together and shop assemble work-ready for erection.
- b. Execute work in strict conformity with Drawings, Details, and approved Shop Drawings. Work shall present true surfaces when finished.
- c. Jointing of metals - Accurately make joints and intersections of metals. Fit joints tightly and make in true planes with adequate fastenings. Screw bolted work up tightly and nick threads to prevent loosening.
- d. Holes and connections - Provide holes and connections for the work of other trades and make connections thereto, unless otherwise indicated.

e. Welding

- [1] Welding and equipment - To conform to the American Welding Society (AWS) Code for Welding in Building Construction, latest edition (subject to State Laws and Regulations).
 - [2] Fabricators and welders shall be licensed operators.
 - [3] Welding not covered in the paragraphs immediately above, shall conform to the best modern practice, be of adequate strength and durability with jointing made tight, flush in true plane, with base metals clean and smooth.
- f. Shop Painting - Coat items of steel and items of cast iron for interior use with one (1) coat of the fabricator's standard primer paint.

2.3 Manufactured and Fabricated Items

a. Steel Pan Stairs

- [1] Stair work shall conform to the best practice for stair building and to applicable codes and ordinances.
- [2] Stairs shall be complete with pan-type treads.
- [3] Rest steel stairs upon structural steel frame or concrete floors as indicated on Drawings. Securely and rigidly anchor stairs in place. Conceal all supports insofar as practicable.
- [4] Stringers - Use 12 in. 10.6# stair channels with ends closed at top and bottom of runs. Use tube steel stringers or fabricate boxed stringers as detailed.
- [5] Risers and Treads - As detailed, of 12 gauge steel, reinforced as required. The risers are to be slanted and have plain face with a sanitary cove at level of finished tread below. Drop down treads 2 in. to receive concrete fill. Angles supporting ends of treads and risers shall be 1 in. x 1 in. x 3/16 in. or as detailed or required. Turn back lip of tread face to provide stability.
- [6] Intermediate landings - Made of 12 gauge steel or heavier. Reinforce on the underside with steel angles and tee stiffeners, spaces as required, welded or bolted to stringers and welded or tap screwed to pan. Top of metal pan shall be down 3 in. from finished floor to allow for concrete fill. Plates shall be level, flat and securely held in place and left without buckling or deflection. Ribbed pans will not be permitted. Support on structural channels as detailed.
- [7] Stair landing treads and supports - Design to support 100 psf live load.

b. Steel Pipe Handrail - Stairs and Ramps

- [1] Provide and install 1 1/4 in. I.D. (1 1/2 in. O.D.) standard weight I.P.S. (Schedule 40) Steel pipe railings. Provide radius returns to walls and other detailed terminations or transitions. Joints shall be welded and ground smooth.

c. Handrail Brackets & Post Caps

- [1] Brackets for steel pipe Wall Handrails - #1791 malleable iron bracket by Wagner or equal. 3" wall offset to center of handrail and 1 1/2" vertical offset from saddle to bracket arm.
- [2] Post Caps – Cast Steel for 2" x 2" square steel posts. Provide #PC12020 by Wagner or approved equal.

d. Ladders

[1] Steel ladders at the roof hatches shall be custom fabricated per the Drawing Details.

PART 3. EXECUTION

- a. Install items in strict accordance with Detailed Drawings, approved Shop Drawings, and manufacturer's recommendations.

---END OF SECTION---

SECTION 05 55 00

METAL STAIR TREADS & NOSINGS

PART 1. GENERAL

1.1 Related Work Specified Elsewhere

- a. Ceramic Tile Flooring – Section 09 30 13
- b. Concrete filled metal pan stairs – Section 05 51 00, Metal Fabrications

1.2 Submittals

- a. Submit product data, catalog cuts, actual material samples for color selection and details for all items of this Section in accordance with the General Conditions.

PART 2. PRODUCTS

2.1 Stair Nosings

- a. 3" wide, 83 degree angled nosing, bar abrasive, extruded aluminum stair tread nosings. Sections shall be one-piece, full width of stair tread and drilled/countersunk for attachment with stainless steel screw anchors in concrete. Provide type STSB-A by Nystrom or approved equal. Abrasive color shall be selected by the Architect from actual material samples submitted.

PART 3. EXECUTION

3.1 Installation

- a. Securely anchor nosings just prior to flooring installation. Cover & protect the finished surface of the nosings for the duration of construction. Nosings shall be left thoroughly clean and undamaged.

---END OF SECTION---

SECTION 06 10 00
ROUGH CARPENTRY

PART 1. GENERAL

1.1 Related Work Specified Elsewhere

- a. Finish Carpentry & Casework – Section 06 20 00
- b. Metal Studs and Drywall – Sections 05 40 00 & 09 29 00
- c. Finish Hardware – Section 08 71 00

PART 2. PRODUCTS

2.1 General

- a. Protect all lumber and keep dry, both in transit and at the job site.
- b. Lumber shall be well seasoned with not over 15% moisture content for treated lumber and not over 19% moisture for untreated lumber.

2.2 Lumber Requirements

- a. Lumber for rough carpentry:
 - [1] General Interior Framing & Blocking Lumber - Kiln Dried, Structural #2 or Better, Eastern Spruce, Fir, or Hemlock.
 - [2] Exterior Wall Framing – 2 x 6 Laminated Strand Lumber equal to 1.3E Timberstrand LSL 'Trus Joist' framing by Weyerhaeuser Co.
 - [3] LVL Wood Beams – 1 ¾" thickness GP LAM laminated veneer lumber by Georgia Pacific or SolidStart laminated stand lumber by Louisiana Pacific or equal.
 - [4] Pressure Treated Lumber - Structural #2 or Better Southern Pine, pressure treated with "NatureWood" wood preservative (waterborne, alkaline copper quaternary preservative).
 - [5] Strapping - Native Spruce, Fir, or Hemlock.
- b. Sheathing & Decking
 - [1] 1/2" "Advantech" sheathing board by Huber or approved equal.
 - [2] 5/8" Tongue & Groove "Advantech" sheathing board by Huber or approved equal.
 - [3] 3/4" Tongue & Groove "Advantech" subfloor decking board by Huber or approved equal.
- c. Underlayment – 1/4" Baltic birch 5-ply underlayment, zero-voids, plywood by Multi-Ply, Inc.
- d. Backer Boards – 3/4" AC plywood

PART 3. EXECUTION

3.1 Erection

- a. Accurately and properly fit, brace and secure all work in position and direction. Erect framing, fillers and blocking as directed on the Drawings or required by the work.
- b. Use pressure treated lumber where wood comes in contact with concrete or masonry and as indicated on the drawings. Use fasteners approved for treated lumber.
- c. Underlayment fasteners and nailing pattern shall be as marked on the panels and as recommended by the manufacturer.

3.2 Finish Hardware

- a. The finish hardware shall be received, checked against the invoices, stored, cared for, and installed under this Section of the Specifications. All keys shall be properly tagged, & indexed, and turned over to the Owner on acceptance of the Project.
- b. Install hardware in accordance with the manufacturer's instructions, accurately fitted, securely fixed and carefully adjusted.

---END OF SECTION---

SECTION 06 20 00

FINISH CARPENTRY & CASEWORK

PART 1. GENERAL

1.1 Related Work Specified Elsewhere.

- a. Wall blocking - Section 06 10 00 - Rough Carpentry

1.2 Submittals

- a. Submit drawings of all items of Millwork in accordance with the General Conditions and Supplements thereto. Drawings shall be full scale where necessary to show details of shape or joining. Submit catalog cuts and data on all items specified in this Section. Submit solid surface samples, and wood finish samples.

1.3 Quality Assurance

- a. Standards: Architectural Woodwork Institute (AWI) "Architectural Woodwork Quality Standards"
- b. All casework shall be fabricated by a custom millwork company or individual with a minimum of five continuous years of experience and principal business in architectural casework. A list of recent similar projects will be required. A sample cabinet may also be required.

PART 2. PRODUCTS

2.1 Materials

- a. Exterior Trim – Solid white PVC flat stock, sheeting, & moldings as shown, noted, and detailed on the Drawings. Attachment shall be by means of gluing and screw & plug system specifically designed for use with solid PVC product. Provide Proma, Azek, or Koma products or approved equal.
- b. Cabinet Materials
 - [1] Cabinet body: 3/4 " Melamine Board (high density particle board) with white melamine low pressure laminate on inside surface and premium, Plain-Sliced Maple veneer on exposed outer surface. Cabinet doors shall have maple veneer both sides.
 - [2] For concealed shelving (inside cabinets with doors) and drawers: 3/4 " Melamine Board high density particle board) with white melamine surface on both sides and all edges.
- c. Edge-banding tape – Maple
- d. Interior Hardwood trim (casework & general trim as detailed) – Custom profile, Premium Furniture Grade Maple moldings and flat stock.
- e. Maple Veneer Panels – 3/4" A-4 MDF board with Plain-Sliced Premium Maple Veneer. Panel veneers shall be sequence book-matched and for best grain patterns in overall installation.

- f. Granite Desktops, Counters, Seats, Sink Counters, & Lavatory Counters - Fabricated from Group 'B' natural granite. It is anticipated that there will be primarily two different granite color choices. Colors shall be as selected by the Architect from submitted samples and/or review of yard slabs. All exposed finish shall be polished. See Drawing Details.
- [1] SINKS for Granite Counters:
Undermounted Sinks, ADA compliant, 18 gauge - stainless steel single bowl (15" x 15" x 5" inside bowl dim.) model ECTRUAD151550 by Elkay or approved equal.
- [2] LAVATORY bowls for Granite Counters:
Undermounted Bathroom Sinks, ADA compliant, 19 1/4" oval, vitreous china with rear drain location and integral overflow. Color shall be White. Provide Kohler model K-2210 or approved equal.
- g. Cabinet Hardware & Accessories:
- [1] Drawer slides- 50 lb. full extension systems by Blum, Accuride, or approved equal.
- [2] Drawer and door pulls – Oil-rubbed bronze finish, tapered bow style w/ 3 3/4" centers. Provide #PO27OA by Liberty Hardware or approved equal.
- [3] Cabinet Shelf Clips for adjustable shelving - Metal "pin" type for holes in the cabinet sides and dividers, equal to #346 by Knappe and Vogt (bronze finish), or approved equal.
- [4] Cabinet Hinges - European type for full overlay 3/4 in. doors allowing up to 120 deg. opening and fully adjustable. Hinges shall be self closing, nickel plated or stainless steel as manufactured by Mepla, Inc., Hettich, Grass or Blum.
- [5] Courtroom Gate Hinges – Special continuous spring hinge by Midlake Custom Hinge Co. or approved equal. Finish shall be oil-rubbed bronze.
- [6] Electric Lifting Column for courtroom podiums – Model LG-13-2RS-16-230-HS-24V-B single unit lifting column by Progressive Automations or approved equal. Provide RT-17 (black) up/down button unit and associated control box for operation.
- h. Hardwood Handrails & Metal Brackets
- [1] Wood Handrails – Solid, furniture grade Maple handrails equal to W.M.Coffman #C-6040 or approved equal. Provide prefabricated radius sections, vertical transitional sections, wall returns, etc. for a smooth and continuous rail system as detailed on the Drawings.
- [2] Wood Handrail Wall Brackets – Flat saddle, steel or brass post-mount handrail brackets with 3 1/4" offset. Provide MB4302W by Wagner Co. or equal. Finish shall be oil-rubbed bronze.
- i. Shop Finish for all casework and hardwood trim – Stain and 3-coat clear semi-gloss polyurethane or lacquer finish. Stain color shall be coordinated and matched with factory-finished wood doors & frames (08 14 00) & field finished wood window sash (Section 09 91 00).

PART 3. EXECUTION

3.1 Fabrication

- a. Finish Carpentry & Casework shall conform to AWI Standards for Custom Grade Work.
- b. Mill assemble work as much as practical and deliver ready for installation.
- c. Make all work in accordance with measurements taken at the job site. Accurately assemble finished carpentry work and properly secure together and in place.
- d. All miter joints at door and window casings shall be biscuit joined, glued and nailed.
- e. Join mill assemblies with concealed nails and screws and where, practical, with mortised tenons. Countersink nails and screws in exposed faces. Fill nail holes with plastic wood and cover screws with glued wood plugs to match type and grain of base wood. Use waterproof glue of best quality.
- f. Granite Desktops, Counters, and Slashes shall be made from single pieces wherever possible. Where pieces must be joined, the result shall be a continuous, smooth surface with no apparent or readily visible seams. Edges shall be finished & shaped as detailed. All surface finish shall be "polished". Finished installation shall be precisely fit and free of blemishes or defects.
- g. Solid PVC exterior trim shall be cut and fit accurately by skilled finish carpenters. Scarf cut butt joints & cope molding corners. Properly apply with allowance for expansion and contraction of material.

3.2 Delivery and Storage

- a. Woodwork manufacturer and General Contractor shall jointly be responsible to assure that items of woodwork are not delivered until building or storage area is sufficiently dry so that woodwork will not be damaged by excessive changes in moisture content.

3.3 Cabinet Hardware

- a. Install hardware specified herein as required and in accordance with manufacturer's directions. Doors and shelves in cabinet work must operate properly before acceptance.

---END OF SECTION---

SECTION 07 10 00

WATERPROOFING

PART 1. GENERAL

1.1 Related Work Specified Elsewhere.

- a. Concrete foundation walls - Section 03300

1.2 Submittals

- a. Submit technical literature for products specified in this Section in accordance with the General Conditions, including manufacturer's application instructions.

PART 2. PRODUCTS

2.1 Waterproofing

- a. Membrane waterproofing for concrete foundation walls where noted and shown on the Drawings, including elevator pits - Perm-A-Barrier membrane waterproofing system by Grace Construction Products, Colphene 3000 by Soprema, or approved equal.

PART 3. EXECUTION

3.1 Membrane waterproofing

- a. Apply primer and membrane specified strictly in accordance with published specifications by the membrane manufacturer.
- b. Concrete substrate shall be dry and free from dirt, powders, oil films, or protrusions.
- c. On exterior walls, the top edge of the waterproofing membrane shall extend up to the finish grade line but not extend above it.
- d. Take precautions to avoid any punctures or damage to the membrane during insulation installation and/or backfilling. If any damage occurs, the membrane or seams shall be cleaned and patched per the manufacturer's instructions.

---END OF SECTION---

SECTION 07 21 00
THERMAL INSULATION

PART 1. GENERAL

1.1 Related Work Specified Elsewhere.

- a. Wood Stud Framing - Section 06 10 00
- b. Metal Stud Framing – Section 05 40 00
- c. Drywall & Gypsum Sheathing Installation – Section 09 29 00
- d. Air Barriers – Section 07 27 00

1.2 Submittals

- a. Submit technical literature for products specified in this Section in accordance with the General Conditions, including manufacturer's application instructions.

PART 2. PRODUCTS

- a. Batt Insulation for Exterior Walls – 5 ½" thickness, R22 or R23 unfaced wool insulation batts by RockWool or approved equal.
- b. Sound Insulation for Interior Walls – 3" or 3 ½" thickness unfaced wool sound insulation of width to be tight fit in metal stud cavities by RockWool or approved equal.
- c. Rigid Foam Insulation – Closed cell, tongue & groove, extruded polystyrene foam board equal to Foamular by UC Industries, Styrofoam SM by Dow, Amofoam by Amoco or approved equal. See drawing notes and details for thicknesses.
- d. Seam Tape for Rigid Foam Insulation – Non-metallic, 2" vapor barrier seam tape that is approved by the foam board manufacturer.
- e. Spray Foam – Professional grade, Closed-cell spray foam insulation system. Use non-expanding foam for sealing around exterior windows, doors, louvers & pipe penetrations.

PART 3. EXECUTION

3.1 Installation

- a. Insulate all areas indicated. Neatly and accurately cut the insulation as necessary to provide a tight unbroken layer.
- b. Apply acoustical batt insulation in partitions to the extent indicated on the Drawings and prior to wallboard application.
- c. All rigid insulation shall be accurately cut and fit tightly together and against perimeter terminations. Take advantage of tongue and groove wherever possible. Fill any gaps with spray foam insulation. Tape all joints. Seal all perimeters.
- d. Exterior wall insulation work shall be completed and then reviewed by the Architect prior to installation of the interior metal stud walls of the exterior wall package.

---END OF SECTION---

SECTION 7 22 00

ROOF & DECK INSULATION

PART 1. GENERAL

1.1 Related Work Specified Elsewhere.

- a. Membrane Roofing – Roof Vapor Barrier - Section 07 50 000
- b. Metal flashings - Section 07 60 00
- c. Asphalt Shingle Roofing – Section 07 31 13
- d. Metal Roofing – Section 07 42 13

1.2 Submittals

- a. Submit Technical literature and manufacturer's installation recommendations for insulation products and complete layout drawings for any tapered insulation system showing all thickness, pitches and attachment requirements, all in accordance with the General Conditions.
- b. The roof insulation manufacturer shall submit a letter to the roofing membrane manufacturer concurring in the use of and method of attachment of the insulation for the designed use.

PART 2. PRODUCTS

- a. Roof Insulation – Flat Board, Tapered Insulation System, & Nail-base board: “Multi-Max” by R-Max, “Energy-2” by NRG barriers, Johns-Manville Board or approved equal: 2.0 pcf density closed cell polyisocyanurate foam with chemically bonded fiberglass mat facers or nail-base board. See Roof Plan and Details for insulation types, thicknesses, and slopes.
- b. Fasteners - Non-corrosive screw fasteners with washers of type as recommended by insulation manufacturer for metal deck attachment. Deck penetration shall be 1 inch.

PART 3. EXECUTION

3.1 Installation

- a. Insulation shall be adequately protected from damage and exposure to moisture at the jobsite. Keep products dry-covered at all times, and raised above the ground on pallets. Apply only as much insulation as can be covered the same day by completed roof covering material.
- b. Decking shall be clean and dry prior to vapor barrier and insulation application.
- c. Install insulation strictly in accordance with the membrane manufacturer's recommendations for the type of insulation used. Construct slopes and details shown for crickets and around roof drains. Mechanically attach insulation with manufacturer's approved fasteners to decking at spacing and patterns as required by the insulation manufacturer.
- d. Multiple insulation layers shall have all joints staggered. All insulation board in each layer shall be cut square and straight and fit snugly having no gaps. Top layer insulation board edges shall be fastened properly and consistently to prevent loose edges or differential heights at edges.

---END OF SECTION---

SECTION 07 27 00

AIR BARRIERS

PART 1. GENERAL

1.1 Related Work Specified Elsewhere

- a. Rigid Insulation – Section 07 21 00
- b. Gypsum Sheathing – Section 09 29 00
- c. Windows – Section 08 52 13
- d. Exterior Door Frames – Section 08 11 00

PART 2. PRODUCTS

2.1 Materials

- a. Exterior Wall Air Barrier – Vapor permeable, water-resistant, self-adhesive sheet air barrier. NFPA 285 standard fire test method compliant. Provide Blueskin VP160 by Henry, Air-Shield SMP by W.R. Meadows, Inc. or approved equal.
- b. Flashing Tape – Minimum 4" width, flexible flashing tape, compatible with the air barrier sheeting, for flashing all wall openings. Product by 3M, Dupont, or equal.

PART 3. EXECUTION

3.1 Installation

- a. Install exterior air barrier directly over gypsum sheathing board. Lap joints per the manufacturer's recommendations and instructions. Assure full adherence, free of wrinkles and bulges. Wrap into wall openings and seal all perimeters. Use largest practical size sheets to minimize seams. Any seams shall be shingle-style lapped.
- b. Properly flash all windows, door frames, and other wall openings with flexible flashing tape using methods and sequences as recommended by the product manufacturer.

---END OF SECTION---

SECTION 07 31 13

ASPHALT SHINGLES & ROOF SPECIALTIES (See Alternates)

PART 1. GENERAL

1.1 Related Work Specified Elsewhere

- a. Roof Decking - Section 06 10 00, Rough Carpentry
- b. Drip Edge – Section 07 60 00, Flashing & Sheet Metal
- c. Metal Wall Panels & Metal Roofing

1.2 Submittals

- a. Submit data for all products specified in this Section per the General Conditions (incl. shingle samples for color selection)

PART 2. PRODUCTS

2.1 Materials

- a. Roof Shingles – 240 lbs. per square, laminated architectural asphalt shingles. Provide Landmark Pro series by CertainTeed Corporation, or approved equal, meeting ASTM E108 Class A fire resistance; and ASTM D3161 Type F wind resistance. Shingles shall carry a lifetime limited warranty against manufacturing defects. Provide starter strip & ridge cap units.
- b. Waterproofing Membrane - Provide “CertainTeed HT” ice and water shield or equal by Grace Construction Products.
- c. Roof Underlayment – Reinforced polyolefin construction synthetic roof underlayment sheeting with slip resistant surface equal to Titanium UDL 25.
- d. Pipe Flashing for sloped shingled roofs – Rubber boot seal with integral aluminum or synthetic base for flashing PVC vent pipes.

PART 3. EXECUTION

3.1 Installation

- a. Install waterproofing membrane sheets directly to the roof deck following manufacturer's application instructions. Use 8 feet of width along all eaves, 3 feet at rake ends, transitions, and penetrations.
- b. Install roof underlayment per the manufacturer's instructions, covering the entire roof.
- c. Install specified shingles using galvanized roofing nails of sufficient length to fully penetrate roof decking. Heads shall be driven flush with the shingle surface. Use a minimum of 4 fasteners per shingle. Shingles courses shall be laid straight. Utilize starter strips at eaves and rakes. Use prefabricated cap shingles for all ridges. Avoid walking on shingles as much as practical to prevent damage.

---END OF SECTION---

SECTION 07 42 13

METAL WALL PANELS & METAL ROOFING (See Alternates)

PART 1. GENERAL

1.1 Related Work Specified Elsewhere

- a. Roof & Deck Insulation – Section 07 22 00
- b. Air Barriers – Section 07 27 00
- c. Asphalt Singles – Section 07 31 13
- d. Sealants – Section 07 92 00

1.2 Submittals

- a. Submit technical literature for all products, accessories and materials specified and required for the project along with the manufacturer's installation details in accordance with the General Conditions.

1.3 Material Handling

- a. Carefully transport, handle, and store materials. Bent, scraped, or otherwise marred materials shall not be used on the project.

PART 2. PRODUCTS

2.1 Metal Roofing & Accessories / Trim

- a. Concealed fastener metal roofing (standing seam) system. 22 gauge "zincalume" steel (AZ50) prefinished with a Dura Tech 5000 paint system. Standard color shall be as selected by the Architect from submitted metal sample chips. Panels shall be 16" coverage with 2 striated ribs for stiffness and 2" height ribs. Attachment shall be mechanical seaming with concealed clips. Panel lengths shall be as long as possible to reduce or eliminate end lap seams. Provide all necessary fasteners, clips, drip edges, sealer strips, ridge caps, penetration flashings, etc. for a complete and water-tight roofing application. Provide Span-Lok HP Metal Roofing by AEP Span or approved equal.

Performance Criteria – UL580 (class 90 wind uplift), UL 790 (class A fire resistance), ASTM E1592 (wind uplift), ASTM E1680 (air infiltration), ASTM E1646 & E2140 (water infiltration), and UL2218 (class 4 impact resistance – hail).

- b. Waterproofing Membrane - Provide "CertainTeed HT" ice and water shield or equal by Grace Construction Products.
- c. Roof Underlayment – Reinforced polyolefin construction synthetic roof underlayment sheeting with slip resistant surface equal to Titanium UDL 25.

2.2 Metal Wall Panels & Accessories / Trim

- a. Concealed fastener, Horizontal Metal Siding System. 22 gauge "zincalume" steel (AZ50) prefinished with a Dura Tech 5000 paint system. Standard color shall be as selected by the Architect from submitted metal sample chips. Panels shall be 12" x 1 ½" with a 1" Reveal. Attachment shall be with concealed clips. Panel lengths shall be as long as possible to reduce or eliminate end lap seams. Provide all necessary fasteners, clips, sealer strips, sill flashing, trim & drips for windows and door, corner trims, edge terminations, etc. for a complete and water-tight siding application. Provide Prestige Series Siding by AEP Span or approved equal.

Performance Criteria: ASTM E1592 (wind uplift), ASTM E283 (air infiltration), ASTM E331 (water infiltration), and UL 263 (fire resistance).

2.3 Metal Soffit Panels & Accessories / Trim

- b. Concealed fastener, Flush Soffit Panels. 7" centered, 1" high, 0.032 Aluminum panels with a Wood Grain Finish. Color shall be as selected by the Architect from submitted metal sample chips. Attachment shall be with concealed clips. Panel lengths shall be as long as possible to reduce or eliminate end lap seams. Provide all necessary fasteners, clips, sealer strips, corner trims, edge terminations, etc. for a complete soffit application. Provide Flush Panel Series with Timber Series Wood Grain Finish by PAC-CLAD or approved equal.

2.4 Column Cover

- a. Main Entrance / Screening Area - 16" diameter, reveal joint aluminum column cover equal to PAC-1000R by PAC-CLAD. Provide recessed base section and trim ring for top. Finish shall be clear anodized.

PART 3. EXECUTION

3.1 Installation

- a. Prior to metal roofing installation, apply waterproofing membrane sheets directly to the roof deck following manufacturer's application instructions. Use 8 feet of width along all eaves, 3 feet at rake ends, transitions, and penetrations. Install roof underlayment per the manufacturer's instruction, covering the entire roof.
- b. Installation of the standing seam metal roofing system shall be in accordance with the Manufacturer's installation instructions and standards.
- c. Installation of the metal siding system and metal soffit panel system shall be in accordance with the Manufacturer's installation instructions and standards.
- d. Finished installations shall be uniform, square, true, neat and free of warps, buckles, 'oil-can' appearances, or marred surfaces.

---END OF SECTION---

SECTION 07 50 00

MEMBRANE ROOFING

PART 1. GENERAL

1.1 Related Work Specified Elsewhere

- a. Wood blocking and Nailers - Section 06 10 00, Rough Carpentry.
- b. Metal Flashings & Fascias - Section 07 60 00, Flashings
- c. Roof & Deck Insulation - Section 07 22 00
- d. Asphalt Shingle Roofing – Section 07 31 13 – see alternate
- e. Metal Roofing – Section 07 42 13 – see alternate
- f. Roof rain-water conductor piping – See Plumbing

1.2 Submittals

- a. Warranty: Roofing Contractor shall furnish Owner with a 10-year Membrane Systems Warranty and 80 mph Windspeed Warranty for roofing and flashing from date of completion of all portions of work under this Section. Specified companies who will not furnish such a Warranty are not eligible to bid on this Section of the Specifications.
- b. Submit data and literature for all products and materials specified in this Section, including sample warranty. Submit manufacturer's recommendations for installation of roofing system. Submittals shall be in accordance with the General Conditions and Supplements thereto.

PART 2. PRODUCTS

2.1 Roofing Materials

- a. Provide a complete fully adhered E.P.D.M. single ply membrane roof system as furnished by Carlisle Syntec Systems, Celotex Corp., Firestone, or approved equal.
- b. Membrane - Compound E.P.D.M. elastomer 60 mils thick.
- c. Flashing - 60 mil thick elastomeric type as furnished by the roof membrane manufacturer.
- d. Vapor Barrier – Min. 6 mil reinforced sheet vapor barrier by roofing system manufacturer. – Joints and Perimeters taped and sealed.
- e. Bonding Adhesive - Furnish by the membrane manufacturer. It shall be compatible with all material to which the membrane is to be bonded.
- f. Spicing cement - Furnish by the membrane manufacturer.
- g. Lap sealant for sealing the exposed edge of splices - Trowel or gun consistency as furnished by the membrane manufacturer.
- h. Prefabricated accessories (pipe stack seals, etc.) - Furnish by the membrane manufacturer.
- i. Roof Drains - Zurn model Z100-DP with Dura-Coated cast iron body, top-set deck plate, & low silhouette Poly-Dome.
- j. Traffic Mats – 30" x 30" rubber mats for placement in walking paths and around rooftop equipment and or roof hatches. (Quantity of 12)
- k. Roof Top Anchors – Fall protection tie-off roof anchors with 10 ½" bolt kit for membrane roofs. Zinc plated base with a stainless-steel post and OSHA compatible anchor ring at the top. Provide model 2100077 by DBI-SALA or approved equal.

PART 3. EXECUTION

3.1 Delivery and Storage

- a. Deliver materials in their original, unopened containers, clearly labeled with manufacturer's name, brand name, and such identifying numbers as are appropriate. Store adhesives between 60 Deg. and 80 Deg. F. Should they be exposed to lower temperatures, restore to room temperature for three to five days prior to use. Do not use materials damaged in handling or storage. Store cardboard containers in Dry area.

3.2 Preparation of Surfaces

- a. Surfaces on which the roofing system is to be applied shall be clean, smooth, dry, free of fines, sharp edges, loose and foreign materials, oil and grease.

3.3 Vapor Barrier

- a. Lay vapor barrier sheeting directly on metal decking prior to installing roof insulation specified in Section 07 22 00. Tape all seams, perimeters and penetrations with system approved tape product.

3.4 Membrane

- a. Membrane Attachment & Splicing - All surfaces of membrane and substrate shall be clean and dry. Follow the manufacturer's application and seaming procedures as submitted, and use only adhesives, cleaners, and seam sealants as provided and approved by the membrane manufacturer. Use sheeting size and layout to minimize seams.
- b. Perimeter Membrane Securement - Securement shall be provided at the perimeter of each roof level, roof section, curb flashing, skylight, expansion joint, interior wall, penthouse, etc., and at any inside change where slope exceeds 2 inches in one horizontal foot. Securement shall be by Rubber Fastening Strips mechanically fastened through the membrane into structural substrate. Fastening shall be max. 12 in. o.c., and all mechanical fastening shall be flashed over.
- c. Flash around perimeters and around other roof protrusions with flashing material specified and as furnished by the roofing manufacturer. Use the longest pieces practicable. The splice between the flashing and the main roof sheet should be completed before bonding the flashing to the vertical surface. This splice must be sealed at least three (3) inches beyond the fasteners which attach the horizontal membrane to the nailer. Bonding adhesives shall be applied to both the membrane and the surface to which it is being bonded. After the bonding adhesive has dried to the point where it does not string or stick to a dry finger touch, roll the flashing into the adhesive. Care must be taken to assure that the flashing is not bridging where there is any change in direction of the flashing. Apply the bonding adhesive so as not to lift or tear insulation surface.
- d. Flash projections passing through the membrane. Pipes shall be flashed with standard rubber stack flashings with stainless steel clamps around stack pipe as specified in this Section. Flashings and terminations shall be done in accordance with details shown on the Drawings and approved by the membrane manufacturer.
- e. Exercise care to ensure that water does not flow beneath any completed sections of roof. When inclement weather is threatening or at the end of the day's work, the loose edge of the membrane shall be temporarily sealed with the night cut-off sealer in accordance with the manufacturer's instruction. Apply sealer twelve (12) inches back from the edge of the sheet. Use a trowel if necessary to obtain the prescribed coverage. After embedding the membrane in the sealer, weight the edge, providing continuous pressure over the length of the cutoff. When work is resumed, pull the sheet free before the installation is continued.

3.5 Inspection

- a. Upon completion of the installation, an inspection shall be made by the representative of the roofing manufacturer to ascertain that the entire roofing system has been installed according to these Specifications, the approved Detail Drawings, and the manufacturer's approval. Warranty will be issued upon approval of the installation.

3.6 Workmanship

- a. Finish roofing work shall be neatly done with seams and flashings straight and consistent, membrane fully adhered and free of mars and wrinkles. Defective and/or damaged materials shall not be patched and used.

3.7 Clean-up

- a. Upon completion, remove debris, dirt stains and foreign matter resulting from the roofing work and also from the work of other trades when caused by work in this Section of the Specifications.

---END OF SECTION---

SECTION 07 60 00

FLASHING AND SHEET METAL

PART 1. GENERAL

1.1 Related Work Specified Elsewhere

- a. Wood Blocking - Section 06 10 00
- b. Membrane Roofing – Section 07 50 00
- c. Asphalt Shingle Roofing – Section 07 31 13 – see alternate
- d. Metal Roofing – Section 07 42 13 - see alternate

1.2 Submittals

- a. Submit technical literature for products specified in this Section (including actual metal samples of standard color selections) in accordance with the General Conditions, including manufacturer's application instructions.

PART 2. PRODUCTS

2.1 Materials

- a. Roof Edge, Drip Edge & Roof Transition Flashings and Fascias - Prefinished .040 Aluminum, custom fabricated profiles as determined by the Drawing Details and field measurements and conditions. Continuous retaining clips shall be of the same material. Paint finish shall be a warranted Kynar 500 system or equal. Selection of color shall be from a standard color palette.

PART 3. EXECUTION

3.1 Fabrication

- a. Shop-fabricate all metal profiles. Note details of shapes required by the Drawings.
- b. Construct items neatly and securely reinforced and stiffened as required to present and maintain true and regular surfaces.

3.2 Installation

- a. Allow for expansion and contraction at joints. Finished work shall be neatly and accurately done, free of waves, wrinkles, or stains.
- b. Precautions: Electrolytic Action - If two different types of metals adjoin or lap each other, furnish and apply a separation strip to avoid contact with dissimilar metals.

---END OF SECTION---

SECTION 07 72 33

ROOF HATCHES

PART 1. GENERAL

1.1 Related Work Specified Elsewhere

- a. Membrane Roofing & Membrane Flashing - Section 07 50 00
- b. Wood Blocking & Framing – Section 06 10 00

1.2 Submittals

- a. Submit technical diagrams/catalog cuts and installation procedures for approval in accordance with the General Conditions.

PART 2. PRODUCTS

2.1 Materials

- a. Pre-manufactured Roof Hatch – 2'-6" x 4'-6" fully insulated, thermally broken, hatch unit with single-leaf aluminum cover, latching mechanisms, automatic hold-open hardware, and gasket seals. Provide Type NB-50TB by Bilco Company or approved equal.
Quantity of one (1)

Provide Bil-Guard 2.0 roof safety railing system.

- b. Pre-manufactured Roof Hatch – 2'-6" x 3'-0" fully insulated, thermally broken, hatch unit with single-leaf aluminum cover, latching mechanisms, automatic hold-open hardware, and gasket seals. Provide Type S-50TB by Bilco Company or approved equal.
Quantity of one (1)

Provide Bil-Guard 2.0 roof safety railing system.

PART 3. EXECUTIONS

3.1 Installation

- a. Install roof hatch with recommended sealer and attachment means per manufacturers installation instructions. Membrane flashing by Roofing Contractor.

---END OF SECTION---

SECTION 07 84 00

FIRESTOPPING

PART 1. GENERAL

1.1 Related Work Specified Elsewhere

- a. Drywall Fireproofing – Section 09 29 00
- b. Mechanical - Ductwork and Piping penetrations – Divisions 22 00 00 & 23 00 00
- c. Electrical – Wiring and Conduit penetrations – Division 26 00 00

1.2 Submittals

- a. Submit product literature and application instructions per the General Conditions.

PART 2. PRODUCTS

2.1 General

- a. Firestopping materials and systems shall be all of one manufacturer. Provide fire-stop caulking, collars, sleeves, packing, or other tested means for the conditions encountered, as manufactured by 3M or approved equal.

PART 3. EXECUTION

3.1 Installation

- a. For all penetrations and perimeter sealing requirements, apply applicable firestopping system or material in strict accordance with the manufacturer's instructions and established UL system number. All work shall be done in a neat and workmanlike manner.
- b. Locations:
 - [1] All penetrations and perimeters through all Stairwells shall be sealed.
 - [2] All penetrations and perimeters through all Elevator Shafts shall be sealed.
 - [3] All penetrations through floor systems shall be sealed.
 - [4] All perimeters and penetrations through the Sally Port Garage and the Secure Parking Garage shall be sealed.
 - [5] All penetrations and perimeters through the Second Floor Mechanical room shall be sealed.

---END OF SECTION---

SECTION 07 92 00

JOINT SEALANTS

PART 1. GENERAL

1.1 Related Work Specified Elsewhere

- a. Masonry - Section 04 20 00
- b. Finish Carpentry – Section 06 20 00
- c. Metal Siding – Section 07 42 13
- d. Metal Door Frames – Section 08 11 00
- e. Metal Clad Wood Windows – Section 08 52 13

1.2 Submittals

- a. Submit product technical literature and samples for color selection in accordance with the General Conditions.

PART 2. PRODUCTS

2.1 Materials

- a. Sealant - A single component polyurethane conforming to Federal Specification TT-S-00230C, Type II, Class A and ASTM C-920, Type S, Grade NS, Class 25, use NT,M,G,A. Use primer as recommended by sealant manufacturer as necessary or required. Colors shall be as selected by the Architect.
- b. Back-up material for deep joints and where shown or noted on the Drawings - Closed cell polyethylene tubing 1/3 larger than the width of the space being filled.

PART 3. EXECUTION

3.1 Installation

- a. Do all caulking and sealing in accordance with the best practices. Start of work shall indicate acceptance of the surfaces by the approved subcontractor.
- b. Clean excess mortar and other debris and foreign matter from all joints.
- c. Fill large joints with backer rod (filler) specified.
- d. Apply, tool and finish caulking compound and sealant as required by the manufacturer.
- e. Apply sealant to joints with a caulking gun equipped with a nozzle of suitable size. Fill void completely and point compactly, neatly, and slightly concave. Remove excess material and carefully clean with a cleaner approved by the sealant or caulking compound manufacturer.
- f. Mask tape window and door frames prior to applying sealant. Application and workmanship shall be approved by the Architect.

--END OF SECTION---

SECTION 08 11 00

METAL DOORS AND FRAMES

PART 1. GENERAL

1.1 Related Work Specified Elsewhere

- a. Wood Doors & Frames - Section 08 14 00
- b. Finish Hardware - Section 08 71 00
- c. Glazing & Security Film - Section 08 81 00

1.2 Submittals

- a. Submit complete shop drawings and literature in accordance with the General Conditions.

PART 2. PRODUCTS

2.1 Metal Doors and Frames

- a. Furnish doors and frames as manufactured by Ceco, Fenestra, Steelcraft, Amweld, or approved equal. Furnish labeled U.L. doors & frames where scheduled. Furnish custom sizes and shapes where scheduled and detailed.

[1] Doors - 1 3/4 in. thick, sound deadened type, manufactured from 18 gauge cold rolled stretcher leveled, galvanized, prime quality steel. Provide minimum 14 gauge channel at top and bottom of doors. Where closers are scheduled, provide 12 gauge reinforcement welded within the door for closer attachment. Door preparation for hardware shall be as per templates submitted by the hardware supplier. Filler plates or extra cut-outs will not be permitted. Doors shall be bonderized and have one (1) coat of baked-on prime coat of paint. Provide louvers and glass cut-outs of sizes shown for doors so scheduled. Provide for specified door bottom seal and top cap for exterior doors. Exterior doors shall be G-60 or G90 Galvanized and fully insulated with urethane foam or approved equal. Doors shall be UL labeled where scheduled as fire rated.

[2] Hollow Metal Frames - Welded or Knocked-down type frame assemblies of minimum 16 gauge, cold-rolled prime quality steel (G60 or G90 galvanized for exterior frames). Furnish six (6) suitable wall anchors as required for the type of wall construction shown. Reinforce strike and hinge locations with 3/16 in. thick plate. Furnish three (3) rubber silencers for each strike jamb and two (2) for heads of double doors. Furnish anchor plates large enough for two (2) studs at each side of door frame. Provide for 1 1/2 pairs of butts per door. Templates for hardware shall be furnished by the hardware supplier as required. Frames shall be bonderized and have baked-on prime coat of paint. Frames shall be UL labeled where scheduled as fire rated. All exterior metal frames, frames in masonry openings, and frames with transoms or sidelights shall be welded frames. View windows (borrowed lites) shall also be welded frames.

[3] Detention Rated, High Security Doors and Frames – All Prisoner Areas – Reinforced doors for impact/abuse resistance with minimum 12 gauge steel face sheets and 12 gauge frame.

PART 3. EXECUTION

3.1 Installation

- a. Erect doors and frames plumb and true, with hardware left in proper working order. Do erection in accordance with door manufacturer's instructions.
- b. Prepare all doors for 1 1/2 pairs standard 4 1/2 x 4 1/2 in. butt hinges as shown or scheduled.

--END OF SECTION---

SECTION 08 14 00

WOOD DOORS & FRAMES

PART 1. GENERAL

1.1 Related Work Specified Elsewhere

- a. Metal Doors & Frames - Section 08 11 00
- b. Finish Hardware - Section 08 71 00
- c. Glazing & Security Film - Section 08 81 00

1.2 Submittals

- a. Submit complete detailed shop drawings, and literature in accordance with the General Conditions. Submit door veneer samples of stain options. Custom stain may be required to match the general building trim.

PART 2. PRODUCTS

2.1 Solid Core Flush Wood Doors

- a. Furnish commercial doors as manufactured by Graham Door, Mohawk Door, or approved equal.
- b. AWI Economy Grade - 1 3/4 inch thick solid particle board core type doors with Premium Grade Plain-sliced Maple Wood Veneer. Beading for door glazing shall be a solid maple profile that overlaps the cut-out edge of the door. Provide UL label fire doors as scheduled. Doors shall be prefinished (stain and premium multi-topcoat finish) and wrapped in a protective paper or plastic, to be removed just prior to project completion. Stain & Finish shall match the custom wood casework and trim for the project.
- c. Wood door frames shall be solid maple with same finish as doors.

PART 3. EXECUTION

3.1 Installation

- a. Finished door installation shall provide free operation and equal clearances to frames.
- b. Doors shall be pre-machined for hardware to prevent splitting of door edges and veneers.
- c. Doors warped or damaged in any way will not be accepted.

--END OF SECTION---

SECTION 08 31 13

ACCESS PANELS

PART 1. GENERAL

1.1 Related Work Specified Elsewhere

- a. Drywall Ceilings – Section 09 29 00
- b. Wood Blocking & Framing – Section 06 10 00

1.2 Submittals

- a. Submit technical diagrams/catalog cuts and installation procedures for approval in accordance the General Conditions.

PART 2. PRODUCTS

2.1 Ceiling Access Panels – Prisoner Areas

Pre-manufactured, hinged metal access panels. 24" x 24" Units shall have a 2" X 2" x 3/16" steel angle frame, masonry anchors, 10 gauge steel plate door, gasketing, welded heavy duty butt hinges, security screws, and key mortise lock cylinder. Paintable powder coat finish. Provide HS series (high security type) by Nystrom or equal by JL Industries or Williams Bros.

Quantity of ten (10)

Same as above except 60 min. fire rated for the prisoner Sally Port Ceiling

Quantity of one (1)

PART 3. EXECUTION

3.1 Installation

- a. Install access panels where shown on the Ceiling Plans and Floor Plans in coordination with the Mechanical trades for exact positioning.

---END OF SECTION---

SECTION 08 33 13
COILING COUNTER DOORS

PART 1. GENERAL

1.1 Related Work Specified Elsewhere

- a. Rough Carpentry – Section 06 10 00
- b. Masonry – Section 04 20 00
- c. Hollow Metal Frames – Section 08 14 00

1.2 Submittals

- a. Submit complete detailed shop drawings, and literature in accordance with the General Conditions.

PART 2. PRODUCTS

2.1 Rolling Counter Doors

- a. One (1) unit for the Disposition Window to fit 40" wide x 52" high hollow metal window frame.
- b. Four (4) units for the Signing Windows to fit 28" wide x 52" high hollow metal window frame.
- c. Face-of-frame mounted, manual operation, rolling shutter door with curtain, hood, & guide rails . Finish shall be stainless steel. Hood shall be as compact as possible for this small door size. Provide Hall-side thumb-turn lock. See also Drawing Details.
Provide units by Cornell, Cookson, or approved equal.

PART 3. EXECUTION

3.1 Installation

- a. Finished door installation shall operate freely and lock/latch securely. Shutter shall be counterbalanced properly to stay in any open position height. Units shall be free from scratches or blemishes.

--END OF SECTION--

SECTION 08 36 13

SECTIONAL DOORS

PART 1. GENERAL

1.1 Related Work Specified Elsewhere

- a. Door Openings – Masonry – Section 04 20 00
- b. Electrical Power – See Electrical Drawings and Specifications

1.2 Submittals

- a. Submit detailed shop drawings and product literature in accordance with the General Conditions.

1.3 Warrantee

- a. Provide a manufacturer's limited door and operators system warranty for 10 years against delamination of polystyrene foam from steel face and all other components for 1 year and covered under the General Conditions warrantee requirements.

PART 2. PRODUCTS

2.1 Sectional Doors (also called overhead doors or OHD on Drawings)

- a. Furnish and Install Heavy-Duty Thermacore 591 Series door by Overhead Door Company or approved equal.
 - [1] Door Sections - .016" hot dipped galvanized structural quality steel/polyurethane/steel sandwich type construction to include a thermal break and a calculated R value of 14.8.
 - [2] Interior and Exterior steel skins shall be embossed texture with a white polyester finish.
 - [3] Complete weather-stripping at head, jambs, sill and sections. Head, jambs & sill weatherstripping shall be heavy duty nylon brush type with aluminum retainer.
 - [4] Galvanized steel track system as recommended by manufacturer to suit loading required, door sizes and clearances available.
 - [5] 25,000 cycle torsion spring counter-balance.
 - [6] Commercial door operator - motor shall be sized by the manufacture to suit specific door size and application.
 - [7] Controls & Locking

Auto-reversing safety switch (sensing edge) integral with full width of door bottom.

Remote Operation – Provide one temporary remote operator for construction purposes. Permanent remote operators shall be provided by the Owner as part of the overall building security system.

Manual button operation on the interior – activated by Owner-provided card reader device.

Doors will be remotely opened and closed from the security control room of the building.

Doors shall automatically lock upon closing for security. Manual, Wired Remote, and Wireless remote operation shall activate integrated unlocking and door operator.

PART 3. EXECUTION

3.1 Installation

- a. Installation shall be in strict accordance with the manufacturer's instructions and be completed by a company-authorized installer.
- b. Hardware and accessories shall be mounted to masonry surfaces. Pre-drilling and appropriate fasteners shall be incorporated. Fasteners shall not crack or damage masonry substrates.

--END OF SECTION--

SECTION 08 41 13

ALUMINUM ENTRANCES & STOREFRONT

PART 1. GENERAL

1.1 Related Work Specified Elsewhere

- a. Door Hardware - Section 08 71 00
- b. Glazing & Security Film - Section 08 81 00
- c. Perimeter Sealant – Section 07 72 00

1.2 Submittals

- a. Submit complete Shop Drawings, product literature and metal finish sample for approval in accordance with the General Conditions.

PART 2. PRODUCTS

2.1 Doors & Framing

- a. Swinging aluminum entrance doors and frames - Medium stile, center rail doors with thermal break storefront framing by Tubelite, Efco, Vistawall or approved equal. Door head and frame head shall be reinforced for door closer installation. Finish shall be clear anodized.
- b. Windows – Thermal break aluminum storefront framing by Tubelite, Efco, Vistawall or approved equal. Finish shall be clear anodized.
- c. Door hardware: (balance of hardware supplied and installed under Section 08 71 00)

Interior Doors

Heavy Duty ball bearing hinges – brushed stainless steel finish

Exterior Doors

Heavy Duty ball bearing hinges – brushed stainless steel finish

Head & Jamb pile weatherstripping – brush bottom sweep weatherstripping
1/2" high half saddle type aluminum threshold equal to 431SA by Hager.

- d. Glazing – Door, sidelight, transom, and window glazing shall be either 1/4" glass or 1" insulating glass (see drawing details).

PART 3. EXECUTION

3.1 Installation

- a. Field verify all dimensions for door and window (storefront) openings. Allow sufficient space for backer rod and sealant at perimeters and movement due to expansion and contraction.
- b. Units shall be erected by skilled workmen. Set framing members plumb and level and anchor them securely to structural members. Install members to permit sufficient lateral and vertical movement under expansion and contraction without deflection or buckling.
- c. Doors and hardware shall be properly adjusted and operate smoothly.

--END OF SECTION---

SECTION 08 52 13

METAL-CLAD WOOD WINDOWS

PART 1. GENERAL

1.1 Related Work Specified Elsewhere

- a. Rough Openings - Section 06 10 00, Rough Carpentry
- b. Masonry Openings – Section 04 20 00, Unit Masonry
- c. Perimeter Sealing - Section 07 92 00, Sealants

1.2 Submittals

- a. Submit Shop Drawings, product specifications, performance ratings, and metal color chip samples for approval in accordance with the General Conditions.

PART 2. PRODUCTS

2.1 Aluminum-Clad Wood Windows

- a. Aluminum Clad Fixed (Picture) units by Loewen Windows or equal by Marvin Windows.
 - [1] Extruded aluminum exterior cladding w/ 20-year warranted commercial-grade Kynar paint finish. Standard color as selected by the Architect.
 - [2] Extruded aluminum casings, subsills, caps, and other trim as noted & detailed on the Drawings. Finish to match windows.
 - [3] Standard 4 9/16" jamb depth.
 - [4] Interior wood shall be unfinished, Douglas Fir.
 - [5] Divided Lites – Simulated Divided Lite (SDL) with 2" putty-style muntin profiles - patterns as detailed.
 - [6] Glass – Low E triple-pane Insulating glass w/Argon gas between glass layers.
 - [7] Twenty-year limited warrantee on Window Units and Insulating Glass.

PART 3. EXECUTION

3.1 Installation

- a. Install complete factory units in openings shown on Drawings in accordance with Detail Drawings and manufacturer's recommendations. Use attachment means necessary to satisfy Details given.
- b. Installation shall be by experienced finish carpenters.
- c. Seal perimeter as shown on the Drawings and as recommended by manufacturer.

---END OF SECTION---

SECTION 08 71 00

DOOR & MISC. HARDWARE

PART 1. GENERAL

1.1 Related Work Specified Elsewhere

- a. Installation of finish hardware - Section 06 05 00 - Rough Carpentry
- b. Metal Doors & Frames - Section 08 11 00
- c. Wood Doors & Frames - Section 08 14 00
- d. Aluminum Entrance Doors – Section 08 41 13

1.2 Warranty

- a. The finish hardware specified for this project shall be guaranteed against defects in material and workmanship for a period of (1) year from date of completion and acceptance of this building. In addition, door closers shall carry a guarantee of ten (10) years from same date.

1.3 Submittals

- a. Submit Hardware schedule and spec./data sheets on all products furnished under this Section of the Specifications for approval, according to the General Conditions.

PART 2. PRODUCTS

2.1 Finish Hardware

- a. **Hinges** - Standard Weight, Average Frequency, full mortise, ball bearing, five knuckle, flush design with oil rubbed bronze finish. Furnish FBB Line by Stanley or approved equal. Provide (3) hinges for each door leaf. Doors over 36" width and Prisoner Area Doors shall have Heavy Weight, High Frequency Hinges.
 - [1] Hinges for exterior doors shall be bronze or stainless steel and have non-removable pins.
 - [2] Hinges for interior doors shall be steel.
- b. **Locksets** - Heavy duty commercial, lever handle mortise locksets. ANSI A156.13, Series 1000 Grade 1 with oil rubbed bronze finish. Furnish 8200 Line by Sargent with "LNB" design lever handle or approved equal. UL rated for fire rated doors.
 - 1. Passage Set - no locking function
 - 2. Lockset - Key locking function
 - 3. Privacy Set - "bathroom" inside turn lever for manual locking
- c. **Dead Bolts - General** – 460 Series by Sargent or approved equal – Thumb turn on inside of door and key on outside of door – oil rubbed bronze finish.
- d. **Dead Bolts for Prisoner Areas** – Sargent or approved equal - High Security, Heavy Duty, Institutional Rated Deadbolt with key operation outside and no inside lever (must be flush with door on inside).
- e. **Dead Bolts for Individual Public Toilet Rooms** – Sargent or approved equal – Thumb turn on the inside of door and "occupied" / "unoccupied" indicator on the outside of door – oil rubbed bronze finish.

- f. **Electric Door Strikes**
 - 1. For mortise locksets - 24 volt electric strike - # 712 by HES.
 - 2. For rim exit devices – 24 volt surface mount – 9600 Series by HES.
- g. **Exit Devices** – Rim type, narrow design model 8500 by Sargent w/ opposite trim and special features as scheduled or equal by Von Duprin. Key cylinder dogging of push bar required for all devices. Provide UL fire rated devices for fire rated doors. Provide alarm type devices and electrified type where scheduled. Oil rubbed bronze finish for wood and hollow metal doors. Clear anodized finish for aluminum entrance doors.
- h. **Automatic Power Door Operator** – Horton Series 7100LE, surface applied, low energy, electric swing door operator.
 - [1] Side load header (6" x 4" enclosure size)
 - [2] Standard outswing arm
 - [3] Operator sized for a single 3'-6" x 7'-0" full glass aluminum door
 - [4] Operation shall be manual and/or automatic
 - [5] Two (2), 6" diameter, ADA signed, wireless, radio frequency type, pushbutton controls.
 - [6] Operator electrical requirement shall be 120V, 60-cycle, 1 phase, 15 amp.
 - [7] Aluminum enclosure and other exposed components finish shall be clear anodized for aluminum entrance doors and bronze anodized for wood and hollow metal doors.
 - [8] Hold-open feature
- i. **Door Closers** - ADA approved, non-handed for interior or exterior use, UL Listed, ANSI Certified A156.4 Grade 1, parallel arm and hold open feature. Closers shall be warranted for 10 years. Provide Series 4041 by LCN or Series 281 by Sargent. Finish for aluminum entrance doors shall be aluminum and finish for wood or hollow metal doors shall be bronze.
- j. **Magnetic Door Holder** – 1501 Series by Sargent or approved equal. Voltage and Current: 120VAC, 60 Hz., .020 amp.
- k. **Thresholds** – 1/2" high half-saddle type aluminum threshold equal to 431SA by Hager. Provide thresholds of equal width to the door frame.
- l. **Weatherstripping** - For head and jambs – Aluminum, concealed fastener, 45 deg angle nylon brush type with bronze anodized finish equal to # 29344DNB by Pemko. For door bottoms – Aluminum, nylon brush type sill protection sweep with integral rain drip and bronze anodized finish equal to # 3452DNB by Pemko.
- m. **Soundproofing** – For head and jambs – Silicon strip, adhesive-backed compression seal equal to Pemko #S88 (bronze). For door bottoms – Aluminum, semi-mortise automatic door bottom with sponge neoprene drop seal and bronze anodized finish equal to # 430DMRL by Pemko.
- n. **Kick Plates** – Aluminum door protection plates with bronze anodized finish. – 8" high x 35" wide by Hager or approved equal
- o. **Push/Pulls** – 1" diameter stainless steel push bar or stainless steel push plate (see schedule) - 12" centers 1" dia. stainless steel pull handle. Finish for aluminum entrance doors shall be brushed chrome and finish for hollow metal and wood doors shall be oil rubbed bronze.
- p. **Door Stops** – Concave Wall Stop with concealed mounting, rubber bumper, and oil rubbed bronze finish flange equal to #234W by Hager. Dome type floor stops with rubber bumper and oil rubbed bronze finish equal to #241F or #243F by Hager.
- q. **Door Silencers** – For all hollow metal door frames – 1/2" dia. rubber insert type equal to #307D by Hager or equal. For all wood door frames – 3/8" x 3/4" rubber insert type equal to #308D by Hager or equal. Color shall be dark brown. (not listed on schedule)
- r. **Peep Hole Door Viewers** – 200 degree viewer angle, solid brass unit equal to #1756 by Hager or equal. Finish shall be bronze. Furnish 2 per door (one at standard height, one at ADA height).

- s. **Keying** – Keying per schedule provided by the Owner. All keyways/key cylinders shall be a restricted keyway system equal to “Everest” Restricted key system by Schlage.
- t. **Functions** – Lock/latch functions shall be reviewed and confirmed with the Owner & Architect.
- u. **Natural Voice Speak-Thru for Interior Windows** – 5” diameter satin stainless steel speak-thru designed to allow audible transmission of voice at the windows of the Prisoner Interview Rooms, Signing Windows, & Disposition Room – Total of nine (9) units required. To be installed in ½” Lexan glazing and tamper proof from the prisoner-side of the window. Quickserv CSE-QS-NV by Covenant Security or approved equal.
- v. **Amplified Window Intercom Device** - for Clerk Transaction & Juror Check-in Windows – AC powered thru-window communication intercom with voice activation switch, duplex communication, background noise level monitoring, flexible gooseneck microphone, headset jack, push-to-override button, & conduit to run power from the window jamb. UL equivalent level II bullet resistant insert. Total of seven (7) units required. To be installed in ½” Lexan glazing. Safety-Comm by Covenant Security or approved equal.

2.2 Finish Hardware Schedule

GROUND FLOOR DOOR #	GROUND FLOOR DOORS HARDWARE SET
001, 006, 021	Hinges, Exit Device w/ lever handle lockset opposite trim, Electric Strike, Closer, Weatherstripping, Threshold, Wall stop
(fire rated) 002	Hinges, Exit Device w/ lever handle opposite trim (no locking function), Closer, Floor Stop
003	Hinges, Lockset, Electric Strike, Floor Stop, Kick Plates
004, 031	Hinges, Lockset, Floor Stop, Kick Plates
(fire rated) 005, 020, 034	Hinges, Lockset (always locked - key operated both sides), Electric Strike, Closer, Floor Stop
007, 037	Hinges, Lockset, Electric Strike, Floor Stop
008, 014	Hinges, Lockset, Electric Strike, Floor Stop, Kick Plates
009, 011	Hinges, Lockset, Electric Strike, Closer, Floor Stop
010, 012, 013, 029	Hinges, Privacy Set, Floor Stop
015	Hinges, Lockset, Electric Strike, Floor Stop, Soundproofing
016	Hinges, Lockset, Electric Strike, Floor Stop, Soundproofing, Kick Plates

017, 018	Hinges, Lockset, Electric Strike, Floor Stop, Kick Plates
(fire rated) 019	Hinges, Exit Device w/ rigid lever handle opposite trim (emergency exit only device – alarm will sound) Electric Strike, Closer, Floor Stop
(fire rated) 022, 030	Hinges, Lockset, Electric Strike, Closer, Floor Stop
023, 024, 025, 026, 027, 028	Hinges, High Security Institutional Heavy-Duty Deadbolt, Push Plate, Pull Handle, Kick Plates Function: Key operated deadbolt outside – no inside lever
032, 033	Hinges, Passage Set, Floor Stop
(fire rated) 035	Hinges, Lockset (always locked - key operated both sides), Electric Strike, Closer, Floor Stop, Peep Holes
036	Hinges, Lockset, Closer, Electric Strike, Peep Holes, Weather-stripping, Threshold Function: Always locked – key operated both sides

FIRST FLOOR DOOR #	FIRST FLOOR DOORS HARDWARE SET
(alum. entrance door) 101, 109	Exit Device, Pull Handle, Closer, Electric Strike (electric strike operated by card reader supplied by owner)
(alum. entrance door) 102	Exit Device, Pull Handle, Closer (door left normally locked)
(alum. entrance door) 103, 108	Exit Device, Pull Handle, Automatic Door Opener, Electric Strike (door is normally locked – electric strike is activated when auto door opener is activated)
(alum. entrance door) 104	Electrified Exit Device (lock & unlock remotely from 2 nd floor control room), Automatic Door Opener, Pull Handle
(alum. entrance door) 105	Electrified Exit Device (lock & unlock remotely from 2 nd floor control room), Pull Handle
(alum. entrance door) 106	Push Bar, Pull Handle, Closer
(alum. entrance door) 107	Push Bar, Pull Handle, Automatic Door Opener

110, 114, 115, 116, 117, 118, 119, 120, 121, 134, 135, 141, 157, 163, 178	Hinges, Lockset, Floor Stop
113	Hinges, Lockset, Closer, Floor Stop
(fire rated) 111	Hinges, Exit Device w/ Lever Handle Opposite Trim (not locking function), Closer, Magnetic Holder
112, 176	Hinges, Exit Device w/ no outside trim (emergency exit only device – alarm will sound), Closer, Weatherstripping, Threshold
133, 149, 152, 174	Hinges, Passage Set, Floor Stop
147	Hinges, Passage Set, Individual Toilet Deadbolt, Floor Stop
123	Hinges, Exit Device w/ rigid lever handle opposite trim (emergency exit only device – alarm will sound), Electric Strike, Closer, Floor Stop
124, 125, 127, 182, 183 184	Hinges, Exit Device w/ lever handle opposite trim lockable), Closer, Floor Stop
126, 181	Hinges, Push Bar, Pull Handle, Closer
128, 180	Hinges, Lockset (keyed both sides), Electric Strike, Closer, Floor Stop
129, 179	Hinges, Lockset (keyed both sides), Electric Strike, Peep Holes
130	Hinges, Lockset, Electric Strike, Closer
131, 132	Hinges, Passage Set, Individual Toilet Deadbolt, Wall Stop
(fire rated) 136, 177	Hinges, Exit Device w/ lever handle opposite trim – no locking function, Closer, Floor Stop
137, 167	Hinges, Lockset (keyed both sides), Electric Strike, Floor Stop
(fire rated) 138, 166	Hinges, Lockset, Electric Strike, Closer, Wall Stop
139, 140, 164, 165	Hinges, Push Plate, Pull Bar, Closer, Wall Stop

142, 143, 170, 171, 172	Hinges, Passage Set, Individual Toilet Deadbolt, Closer, Wall Stop
144, 145	Hinges, Push Bar, Pull Bar, Closer, Wall Stop
146, 161	Hinges, Exit Device w/ keyed lever handle opposite trim, Electric Strike, Closer, Floor Stop
148, 153, 175	Hinges, Lockset, Floor Stop, Peep Holes
150, 151, 173	Hinges, Privacy Set
154, 156, 158, 122	Hinges, Lockset, Electric Strike, Closer, Floor Stop
155	Hinges, Passage Set, Soundproofing, Floor Stop
159, 160,	Hinges, Lockset, Electric Strike, Closer, Dead-bolt, Floor Stop, Soundproofing
162	Hinges, Lockset, Electric Strike, Floor Stop, Kickplates
168	Hinges, Lockset, Floor Stop, Kickplates
169	Hinges, Passage Set, Closer, Floor Stop

SECOND FLOOR DOOR #	SECOND FLOOR DOORS HARDWARE SET
201, 203, 205, 206, 207, 208, 209, 210, 224, 225, 230, 231, 239, 246, 249, 253, 266	Hinges, Lockset Set, Floor Stop
(fire rated) 202	Hinges, Exit Device w/ Lever Handle Opposite Trim (not locking function), Closer, Magnetic Holder
204	Hinges, Lockset, Closer, Floor Stop
211	Hinges, Lockset, Electric Strike, Closer, Floor Stop

213	Hinges, Exit Device w/ rigid lever handle opposite trim (emergency exit only device – alarm will sound), Electric Strike, Closer, Floor Stop
214, 215, 216, 269, 271, 272	Hinges, Exit Device w/ lever handle opposite trim lockable), Closer, Floor Stop
217, 270	Hinges, Push Bar, Pull Handle, Closer
218, 268	Hinges, Lockset (keyed both sides), Electric Strike, Closer, Floor Stop
219, 267	Hinges, Lockset (keyed both sides), Electric Strike, Peep Holes
220	Hinges, Lockset, Electric Strike, Closer
221, 222, 212	Hinges, Passage Set, Individual Toilet Deadbolt, Wall Stop
223, 228, 263	Hinges, Passage Set, Floor Stop
(fire rated) 226, 265	Hinges, Exit Device w/ lever handle opposite trim – no locking function, Closer, Floor Stop
227, 264	Hinges, Lockset, Floor Stop, Peep Holes
229, 262	Hinges, Privacy Set
232, 233, 247, 248	Hinges, Lockset, Electric Strike, Closer, Floor Stop
234, 257	Hinges, Lockset (keyed both sides), Electric Strike, Floor Stop
(fire rated) 235, 236	Hinges, Lockset (keyed both sides), Electric Strike, Closer, Wall Stop
237, 238, 254, 255	Hinges, Push Plate, Pull Bar, Closer, Wall Stop
240, 241, 259, 260, 261	Hinges, Passage Set, Individual Toilet Deadbolt, Closer, Wall Stop
242, 243	Hinges, Push Bar, Pull Bar, Closer, Wall Stop
(fire rated) 244, 245	Hinges, Lockset, Electric Strike, Closer, Floor Stop

250	Hinges, Lockset, Electric Strike, Floor Stop
251	Hinges, Exit Device w/ keyed lever handle opposite trim, Electric Strike, Closer, Floor Stop
252	Hinges, Lockset, Electric Strike, Floor Stop, Kickplates
(fire rated) 256	Hinges, Lockset, Electric Strike, Closer, Floor Stop
258	Hinges, Lockset, Floor Stop, Kickplates

PART 3. EXECUTION

3.1 Installation & Adjustment

- a. 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.
- b. All items of finish hardware shall be installed in a workmanlike manner following the manufacturer's instructions. All mechanisms shall operate smoothly without friction or binding. All door closers, and other items requiring final adjustment, shall be adjusted by an experience workman to proper operation of all features.

3.2 Protection & Cleaning

- a. Exposed finish hardware shall be protected from damage to mechanism and finish by the General Contractor until completion of the project. The General Contractor shall also clean all items of finish hardware just prior to final inspection.

3.3 Instructions and Tools

- a. The finish hardware supplier shall furnish the Owner with installation, repair manuals, and adjustment tools for the Locksets, Exit Devices, and Door closers.

---END OF SECTION---

SECTION 08 81 00

GLAZING & SECURITY FILM

PART 1. GENERAL

1.1 Related Work Specified Elsewhere

- a. Metal Doors & Frames - Section 08 11 00
- b. Wood Doors & Frames – Section 08 14 00
- c. Aluminum Entrances & Storefront – Section 08 41 13
- d. Door Hardware – Section 08 71 00

1.2 Submittals

- a. Submit complete product literature and material samples for specified projects in accordance with the General Conditions.

PART 2. PRODUCTS

2.1 Glazing & Glazing Materials

- a. Single Pane Tempered Glass – Clear 1/4" thick plate or float. Any exposed edges shall be eased and polished.
- b. Exterior Triple-Pane Insulating Glass - 1" inch thick, Northern Low-E, Argon gas filled, sealed edge type. Units shall be manufactured according to the requirements of the "Sealed Insulating Glass Manufacturers Association" (SIGMA) as approved by the "Insulating Glass Certification Council" (IGCC).
Panels shall be clear tempered glass.
- c. Interior Fire-rated Clear Glass - 1/4" thick, 60 minute, impact rated, premium surface finish, tempered glass by Technical Glass Products, Glassopolis, Saftfirst, or approved equal.
- d. Interior Security Glazing – 1/2" thick Lexan with "Margard" finish
- e. Interior Obscure Glass – 1/4" tempered, Frosted Patterned Glass by Apex Tempered Glass or approved equal.
- f. Glazing compound for metal frames - Non-bleeding elastic material conforming to Federal Specification TT-G-00410C or ASTM C-834-76. Color shall match trim of unit being glazed. Use standard black color for metal frames to be painted.
 - [1] Tape - Tremco 440, Pecora Extru-Seal, Weatherban 1202, or approved equal, compatible with sealant hereinafter specified and complying with TT-C-598.
 - [2] Sealant - Dymanic by Tremco, Dynatrol I by Pecora, Dar-a-seal A by Grace, or Sonolastic NP-I by Sonneborn.
- g. Glazing gasketing for Aluminum frames – Integral neoprene gasketing – see Section 08 41 13.

2.2 Security Film

- a. Security Window Film – Film material shall consist of an optically clear polyester film, consisting of co-extruded mico-layers, with a durable acrylic abrasion resistant coating over one surface, and a UV stabilized pressure sensitive adhesive on the other. The clear film shall have a nominal thickness of 8 mils. Provide Scotchshield Safety and Security Window Film Ultra 800 by 3M.
- b. Locations for Security Window Film

Exterior Window Panes:

As indicated on the Building Elevations Drawings by (SF)

Interior Window Panes:

View Windows at Security Room 105

Security Partition at Main Entrance Screening

Six Clerk Windows

PART 3. EXECUTION

3.1 Installation

- a. Wood and metal lites - Remove beads carefully and bed glass in glazing tape on both sides (glazing compound for exterior side of exterior glass), pressing firmly to fill all voids between glass and beads. Place setting blocks at quarter points, replace beads, and clean adjacent surfaces.
- b. Aluminum frames – Carefully remove stops, position glass and support/space with glazing blocks as required, install stops without scraping or marring the aluminum finish.
- c. Security Film - Examine the interior glass surfaces to receive security film and verify they are free from defects and imperfections, which will affect the final appearance. Any deficiencies must be corrected prior to application.

[1] The window and window framing shall be cleaned with a neutral cleaning solution, and the glass surface scraped with a stainless steel razor blade to ensure removal of any foreign contaminants, without damage to the glass.

[2] The film shall be applied in strict accordance with the manufacturer's instructions by personnel experience in this product's application. The film is wet-applied, so the window sills shall be protected from water / water damage during installation.

3.2 Responsibilities

- a. The glazing subcontractor shall be responsible for glass broken due to faulty setting and shall replace same at his own expense.
- b. Surfaces and areas glazed shall be cleaned and immediately wiped dry. Use solvents as recommended by the glazing material manufacturer. All work with glazing tape, compounds and sealants shall be neatly done.

---END OF SECTION---

SECTION 09 29 00

GYPSUM BOARD & GYPSUM SHEATHING

PART 1. GENERAL

1.1 Related Work Specified Elsewhere

- a. Finish Carpentry & Trim – Section 06 20 00
- b. Wood Studs & Framing – Section 06 10 00
- c. Thermal & Acoustical Batt Insulation– Section 07 21 00
- d. Air Barrier – Section 07 27 00
- e. Painting – Section -09 91 00
- f. Metal Studs & Framing – Section 05 40 00

1.2 Submittals

- a. Submit Shop Drawings and/or satisfactory product data for all items of this Section as specified in the General Conditions and Supplements thereto.

PART 2. PRODUCTS

2.1 Storage and Handling

- a. Deliver materials in their original packages, containers, or bundles bearing the brand name and the manufacturer or the supplier for whom the product is manufactured.
- b. Keep materials dry, preferably by storing inside of the building under the roof.

2.2 Materials

- a. Interior Wall Board - General - 5/8 in. thick, Fire Rated, tapered edge gypsum board by U.S. Gypsum, National Gypsum, Georgia-Pacific or equal. Lengths shall be as long as possible to eliminate butt joints (up to 16 ft. long.)

Provide Abuse-Resistant board for Prisoner Areas. Provide Fiberock brand by USG or approved equal.

[1] Screws - Bugle head type. Lengths shall be 1/2 in. longer than the thickness of the board or boards being attached.

[2] Corner Treatment - "Ultraflex" flex trim by Drywall Systems International, or approved equal, for all, outside corners, angles and transitions.

[3] Tape Joint System - As provided by the Gypsum Board Manufacturer.

- b. Exterior Gypsum Sheathing - 5/8" thickness" DensGlass" Fireguard Sheathing Board by Georgia Pacific Gypsum.

PART 3. EXECUTION

3.1 Installation of Interior Gypsum Wall Board

- a. Preparation - Examine and inspect materials to which gypsum board is to be applied. Remedy all defects prior to installation of wall board. Any defects in the finished installation due to misaligned framing or other cause will be the responsibility of those doing the work performed under this Section. Start of work shall imply the acceptance of conditions. Refer to General Notes on Drawings for special requirements. Confirm that acoustical insulation has been installed.

- b. Cutting - Cut gypsum wall board by scoring and breaking or by sawing, working from the face side. Scribe neatly where board meets projecting surfaces.
- c. Placing - Bring boards into contact with each other, but do not force into place. Maximum allowable gap at end joint is 1/4 inch. Neatly fit and stagger all end joints. Arrange joints on opposite sides of partitions so as to occur on different studs. Make joint layout at openings so that no end joint will align with edges at openings. Where double layers of wall board are required, stagger vertical joints one stud. Note requirements for extending wall board to floor or roof above. Hold top edge of board down 1/2 in. from deck above.
 - [1] Space screws not less than 3/8 in. from edges and ends of wall board. Locate screws a maximum of 12 in. o.c. in field and 8 in. o.c. at edges. Refer to ASA Specification for screw attachment procedure.
 - [2] Hold the board in firm contact with the member into which the screws are being driven. Attachment shall proceed from central portion of board toward ends and edges. Drive screws home with heads slightly below the surface of the board. Take care to avoid breaking the paper face. Remove improperly driven screws.
- d. For any areas requiring a two-hour fire rating. Provide such rating as necessary by laminating 5/8 in. gypsum board to the thickness shown or required by the gypsum board manufacturer to attain the necessary fire rating. Attach each layer with progressively longer screws as specified herein. Stagger joints at least 6 inches. Joint treatment is required only on top layer.
- e. Joint Treatment - Apply field joints and corners in strict accordance with the direction of the wall board manufacturer. Use specified tape and a minimum of three (3) coats of cement. Finish coat shall be with wide, flat trowel to feather both sides of joint. Use cement in accordance with recommendations of the manufacturer. Sand each coat as necessary to prepare for following coat. Make finish coat smooth and to a plane surface. Protect external corners with metal corner beads. Treat screw head dimples as outlined above for joints, but without tape.
- f. Accessories
 - [1] Install flex trim on all outside corners and transitions.
 - [2] Use square 'L'- beads where gypsum board abuts dissimilar materials and is not covered by casing or other concealment. Beads shall be the taped edge type with tear-away strip.
 - [3] Use expansion joints and other metal trim, where indicated on the Drawings or required by the work.
- g. Patching - After trim has been applied and prior to decoration, correct damage and defects as required.

3.2 Installation of Gypsum Sheathing

- a. Examine sub-framing and verify that surface of framing and furring members to receive sheathing does not vary more than 1/8" from the placement of faces of adjacent members.
- b. Install Sheathing boards using screw type specified and recommended by the board manufacturer. Use the maximum board-lengths possible to minimize number of joints.
- c. Attach sheathing to wood stud framing with screws spaced 8" o.c. at perimeter where there are framing supports; and 16" o.c. along intermediate framing in field. Drive fasteners to bear tight against and flush with surface of sheathing. Do not countersink. Locate fasteners minimum 3/8" from edges and ends of sheathing panels, tight against and flush with surface of sheathing.

---END OF SECTION---

SECTION 09 30 13

CERAMIC TILING

PART 1. GENERAL

1.1 Reference Standard

- a. The "TCA Handbook" as referred to herein means the latest edition of the Handbook for Ceramic Tile Installation as published by the Tile Council of America.

1.2 Guarantee

- a. The Tile Contractor shall guarantee the work of this Section against defects of materials and workmanship for a period of one (1) year after the final acceptance of the Project.

1.3 Responsibility & Qualifications

- a. It is the intent and purpose of this Specification to insure a first-class, professional installation. The Tile Contractor must examine the work of other trades over which tile is to be applied and report any obviously inferior or incomplete work to the Architect before installation of any tile.
- b. Only individuals or companies having a minimum of five years experience in ceramic tile installations shall be approved for the work specified in this Section.

1.4 Submittals

- a. Submit samples, product data, literature, and recommended application instructions for all materials specified in this Section in accordance with the General Conditions.

1.5 Extra Materials Required

- a. Furnish 12 extra tiles of each type specified for future use by the Owner.

PART 2. PRODUCTS

2.1 Floor Tile

- a. Commercial grade, rectified porcelain tile. Provide "Chamonix" line by DEL CONCA USA. See the Drawing Flooring Plans for the locations of the various tile sizes. Colors shall be selected by the Architect.
 - [1] Floor Tiles: 24" x 48" and 12" x 24"
 - [2] Wall Tiles (public toilet rooms where noted): 12" x 24" with 12" high brick pattern band approx. 4'-5' above floor.
 - [3] Base Tile: 4" x 24' bullnose

2.2 Other Materials

- a. Uncoupling Underlayment – Laticrete "Strata Mat", Schluter "Ditra" or approved equal.
- b. Mortar – Latex-modified LFT/SF (large format tile / slump free) mortar by Laticrete, Mapei, or approved equal.

- c. Grout – Commercial grade epoxy grout by Mapei, Proma, or approved equal.
- d. Transition Strips – See Drawing Details and Specification Notes.
- e. Release Agent – Epoxy grout release agent applied to tile prior to grouting to aid in cleaning away excess grout if recommended by the tile and grout manufacturer.

PART 3. EXECUTION

3.1 Underlayment

- a. Set uncoupling underlayment sheets in a full bed of mortar, compressing to assure equal bedding and contact. Follow the manufacture's recommendations for mortar thickness, trowel edge type, and setting of the membrane sheets.

3.2 Tiling

- a. Completely fill any voids in the underlayment sheet with mortar. Using a notched trowel, comb out a uniform thickness of setting mortar in one direction.
- b. Back-butter a thin coat of mortar on the back of the tile using a flat-trowel.
- c. After setting each tile, clean mortar slightly away from the tile perimeter to avoid having excess mortar in the joint lines that could interfere with grouting.
- d. Set tiles with a narrow mortar joint using tile spacers and a "Tuscan Leveling System" or equal to eliminate lippage
- e. Tile layout shall be planned and aligned with straight grout lines, smooth, and consistent surfaces. Improperly set tiles shall be removed and new tiles set.

3.3 Grouting

- a. All grout lines shall be free of base mortar and loose material prior to commencement of grouting.
- b. Epoxy grout materials shall be mixed, slacked, and applied in strict accordance with the manufacturer's recommendations and instructions. Clean all grout from the tile surfaces to leave the tile completely free of grout spots and film.

3.4 Protection, Cleaning, and Drilling

- a. Cutting and drilling of tile is necessary to receive work of other trades that occur within the tiled areas. Cutting and drilling is considered as the Tile Contractor's responsibility.
- b. Tile, joints and accessories must be properly cleaned and left in condition acceptable to the Architect.

--- END OF SECTION ---

SECTION 09 51 00
ACOUSTICAL CEILINGS

PART 1. GENERAL

1.1 Related Work Specified Elsewhere

- a. Drywall soffits and ceilings - Section 09 29 00, Gypsum Drywall

1.2 Submittals

- a. Submit catalog cuts, samples, and data for all specified products in accordance with the General Conditions.

1.3 Extra Materials

- a. Furnish to the Owner, six (6) full cartons of specified ceiling tile for future use.

PART 2. PRODUCTS

2.1 Materials

- a. Acoustical Ceiling Tile & Grid System

- [1] 24" x 24" Acoustical Units - 5/8 in. thick, tegular edge, fine fissured, 0.75NRC, white lay in mineral fiber units. Units shall be ORION #62152 by USG Ceilings or approved equal.
- [2] Exposed grid mounting system - Standard steel tee sections with 15/16 in. wide exposed faces and flat white enameled finish. Main tees shall be heavy duty, minimum of 1 ½" deep. Cross tees shall have offset overlap onto main tee. Provide Donn DX by USG or approved equal. Supporting wires shall be of size and spacing recommended by the manufacturer.

PART 3. EXECUTION

3.1 Installation

- a. Install tile and grid system(s) specified with competent workmen as recommended by the manufacturer. Ceilings shall be level and true. Tile and grid cuts shall be accurate and neat. Layout shall conform to detailed reflected ceiling plans.
- b. Installer shall coordinate his work with electrician in areas having lights recessed in ceilings. Provide full support for light fixtures to main runners of suspension system.

3.2 Cleaning

- a. On completion, clean all material and accessories. Leave ceilings free of finger marks, dirt, in perfect condition and acceptable to the Architect.
- b. Replace abraded or damaged materials as directed by the Architect.

---END OF SECTION---

SECTION 09 65 00

RESILIENT FLOORING

PART 1. GENERAL

1.1 Related Work Specified Elsewhere

- a. Carpet Flooring – Section 09 68 00
- b. Ceramic Tile Flooring – Sections 09 30 13

1.2 Submittals

- a. Submit samples indicating color, gauge, maker's names of all materials of this Section in accordance with the General Conditions.

1.3 Extra Materials

- a. Provide two (2) full boxes of Resilient Plank Flooring
Provide one (2) extra Resilient Tread/Riser sections of widest tread width use on the project
Provide 24 lin. ft. of extra resilient base

PART 2. PRODUCTS

2.1 Materials

- a. Resilient Plank – Wood-look, heavy commercial traffic rated, direct glue, 6" x 48" high-performance luxury vinyl plank tile with 20 mil wear layer thickness.
Provide Terrain II 20 mil – 4110V by Shaw Contract or approved equal. Color shall be selected by the Architect from submitted and/or requested samples.
- b. Resilient Stair Tread/Risers & Landing Sheet Vinyl – Direct glue, single-piece, vinyl tread & riser sections with embossed surfaces for slip resistance. Integral nosings shall have a contrasting color. Tread/riser sections shall be full width of the stairs. Landing vinyl flooring shall have a slip-resistant embossed texture to coordinate with the stair treads. Provide "Takiron" Pathways tread/risers & sheet flooring by CBC Flooring or approved equal.
- c. Vinyl Base – 3/8 in. thick, 4 1/2 in. solid vinyl wall base equal to "Mandalay" MW-XX-H45 by Johnsonite.
- d. Transition strips and platform nosing strips - Vinyl or rubber profiles to transition between flooring materials. See Drawing Details. Furnish materials by Johnsonite or approved equal.
- e. Adhesives - Waterproof type adhesives & tapes, as supplied by the flooring manufacturer for installation of products specified on the given surfaces.

PART 3. EXECUTION

3.1 Installation

- a. Lay flooring on concrete & wood subfloors. Notify Architect in writing of any defects in floor. Start of work implies acceptance of subfloors.
- b. Fill all cracks, hollows and joints in floors with an approved crack filler.

- c. Test concrete slabs-on-grade using a Relative Humidity Testing System prior to installation of flooring, to verify that the concrete humidity level is within the acceptable limits of the adhesives and flooring products being used.
- d. Scrape and vacuum all floors prior to installation of flooring tiles. Raised “dimple” spots from particles under the tiles will not be acceptable.
- e. Install vinyl tread/risers and vinyl tiles with manufacturer approved adhesives and procedures.
- f. Lay all flooring tiles to be true, level, smooth, and even, with tight joints and in accordance with the manufacturer’s instructions. Only flooring tile that is installed with flush & tight joints, true lines, and aligned pattern shall be acceptable.
- g. Fit flooring tile tightly to all permanent fixtures. Gaps around door frames, walls or other fixtures will not be acceptable.
- h. Install vinyl base with approved adhesive. Fit carefully at corners and end stops. Install base around all fixed cabinets and casework. Do not use sections less than 12” in length.
- i. Install reducer, transition, or terminations strips of style and type noted and detailed at all flooring transitions.

3.2 Cleaning

- a. Clean off surplus adhesive, dirt, or mars from all surfaces with approved cleaning materials.
- b. Wash & dry flooring and surfaces with the products and procedures recommended in the manufacturer’s maintenance instructions.

---END OF SECTION---

SECTION 09 68 00

CARPETING

PART 1. GENERAL

1.1 Related Work Specified Elsewhere

- a. Resilient Flooring - Section 09 65 00
- b. Ceramic Tile Flooring – Sections 09 30 13

1.2 Work Included

- a. Furnish all materials and labor as necessary for a complete carpet installation for all areas so scheduled.
- b. Include all costs of transportation, storage, insurance, handling, etc. as necessary.
- c. Verify all dimensions & job conditions.

1.3 Submittals

- a. Submit small and full-size samples for final selection of carpet products specified in accordance with the General Conditions.

1.4 Extra Materials

- a. Provide twenty-four (24) full, extra carpet tiles for the Owner's future use.

PART 2. PRODUCTS

2.1 Carpet Tile Flooring

- a. Light and Shadows Collection – “Stucco” pattern by Milliken Floors

Construction	Tufted, Textured Loop
Yarn	100% Nylon
Average Density	8,024
Special Treatment	“StainSmart” stain resist / soil release
Backing.....	PVC-Free “WellBAC” Comfort Plus Cushion
Modular	19.7” x 19.7” x 0.41”
Foot Traffic TARR	Severe Traffic End-Use
Installation	Ashlar

2.3 Guarantee

- a. Installer shall furnish a written guarantee against defects in materials and workmanship for one year from date of final acceptance.
- b. Carpet to carry a manufacturer's written warranty: Useful life for Wear, Edge Ravel, Delamination, Run Resistance, Tuftbind, and Static.

2.4 Adhesive

- a. Type as recommended by the carpet manufacturer for direct glue-down conditions over concrete floor or wood subfloor.

2.5 Accessories

- a. Coordinate with installation of resilient transition strips as specified in Section 09 65 00, Resilient Flooring.

PART 3. EXECUTION

3.1 Material Delivery, Storage, & Handling

- a. All carpet shall be delivered in original mill wrappings.
- b. Material stored on the site shall be protected against any damage or loss.
- c. Carpeting Contractor shall be responsible for damage to the work of other trades caused by storage, handling, or installation of carpeting.

3.2 Installation

- a. General Contractor is required to leave new floors "Broom Clean". Carpeting contractor shall do all further preparation and cleaning as necessary to assure proper bond of carpet adhesive. Carpet contractor shall patch, fill, and smooth areas of demolition and damage to prepare the floor prior to commencement of installation.
- b. Test concrete slabs-on-grade using a Relative Humidity Testing System prior to installation of flooring, to verify that the concrete humidity level is within the acceptable limits of the adhesives and flooring products being used.
- c. All carpeting shall be installed with adhesive, following manufacturer's recommendations and instructions. Carpet shall be rolled to insure proper contact to the floor and all bubbles or buckles shall be removed. Tiles shall be carefully laid for tight seams and straight edge lines in both directions.
- d. Make neat cuts for all floor outlets, pipes, ducts, etc. where required.

3.3 Cleaning

- a. Clean and remove all debris and unusable material from site.
- b. All usable scraps shall be packaged and labeled by color and left for the Owner's use.
- c. Trim all loose pieces of face yarn with a sharp instrument.
- d. Clean all spots with the proper remover and vacuum all areas clean.

---END OF SECTION---

SECTION 09 91 00

PAINTING & WALL COVERING

PART 1. GENERAL

1.1 Related Work Specified Elsewhere

- a. Prime coating for any structural steel and other factory finished items is specified in their respective Sections.
- b. Gypsum Wallboard – Section 09 29 00

1.2 Submittals

- a. Submit technical literature for all products specified. Submit paint chip samples (fan) and/or specific product brochures with color samples. Paint colors shall be as selected by the Architect. Submit full sample binder for selection of wall covering. Submittals shall be in accordance with the General Conditions.

PART 2. PRODUCTS

2.1 Materials

- a. Deliver all paint products to the site in the manufacturer's sealed and labeled containers.
- b. Apply and use materials only as specified by the manufacturer's direction label on containers and the associated product literature.
- c. Approved Manufacturers: Benjamin Moore Paint Products or Sherwin Williams Paint Products

2.2 Paint Products

a. Interior Drywall Primer	Sherwin Williams ProMar 200 Zero-VOC Latex Primer
b. Interior Drywall Finish	Sherwin Williams ProMar 200 Zero-VOC Latex Eggshell (Ceilings Flat)
c. Interior/Exterior Metal Primer	Sherwin Williams Pro Industrial Pro-Cryl Universal Primer
d. Interior/Exterior Metal Finish	Sherwin Williams Pro Industrial DTM Acrylic Satin
e. Interior Masonry Block Filler/Primer	Sherwin Williams Pro Industrial Heavy Duty Block Filler
f. Interior Masonry Block Finish	Sherwin Williams Pro Industrial Water Based Catalyzed Epoxy B73 Series Eggshell
g. Exterior PVC Trim Primer <i>Note: Paint for solid PVC trim must be product as approved</i>	Sherwin Williams Extreme Bonding Primer

by the trim manufacturer

h. Exterior PVC Trim Finish	Sherwin Williams Resilience Exterior Latex Satin K43 Series
i. Stain for Interior wood:	Cabot Wood Stains or equal
j. Clear finish for interior wood:	Polyurethane semi-gloss by Minwax or equal

2.3 Special Products/Systems

a. Epoxy Floor Coating

- [1] For epoxy floor finishes, the floor preparation and product application shall be done by a company experienced (minimum of 5 years), trained, and approved by the product manufacturer.
- [2] The work shall be free from defects of materials and installation, including but not limited to, any delamination or other failure to adhere to the substrate. The warrantee period shall be one (1) year. Any defects occurring during the warrantee period shall be repaired, in a manner satisfactory to the Owner and Architect, at no additional cost to the Owner.
- [3] The applicator shall submit a sample of the system for verification purposes, finish texture, and color.
- [4] Floor coating system shall be a three-coat system including an epoxy primer/low modulus binder and two (2) coats of 100% solids epoxy coating. The finish floor shall be a minimum of 20-30 mils in thickness with a non-skid texture.
- [5] Any cracks and non-expansion joints shall be routed and filled with an epoxy joint filler, being part of the flooring system.
- [6] Concrete subflooring preparation shall include verification of acceptable moisture content, removal of all projections, debris, dirt, and contaminants that may affect the surface coatings bond. Effectively remove concrete laitance by steel shot blasting or other method so approved by the flooring manufacturer and achieve minimum surface profile of CSP-3.
- [7] Follow all manufacturer requirements and recommendations for the curing period. Protect the finish floor until the floor is fully cured.

2.4 Wall Covering

a. Vinyl Wall Covering – “Adrian” series by DESIGNTEX

- [1] 54” width – average bolt size 30 yards – straight hung, random match
- [2] 30 oz./ linear yard – 100% vinyl emboss geometric pattern
- [3] Type II wallcovering classification - Class A Fire Rating – ASTM E84
- [4] 10 year product warranty

- b. Wall preparation, adhesive, and installation procedure and detail as recommended by the manufacturer.

PART 3. EXECUTION

3.1 Surfaces to be Painted

- a. See Drawings and Schedules for type and location of various surfaces requiring paint. Include all field painting necessary to complete work shown and specified.
- b. Paint or finish any material introduced on the job which requires painting or finishing as part of this contract.

3.2 Preparation of Surfaces - General

- a. Wood - Sandpaper to smooth and even surface and then dust off. After priming or stain coat has been applied, fill nail and other holes and cracks with plastic wood or putty. For natural finish, color putty to match wood. Sandpaper between coats if surfaces are not smooth.
- b. Steel and Iron - remove grease, rust scale and dust. Touch up any chipped or abraded places on items that have been shop coated. Where steel and iron have a heavy coating of scale, remove it by wire brush or sand blasting as necessary to produce a satisfactory surface for painting. Clean iron with benzine and galvanized iron with a solution of 4 oz. of copper sulfate to one gallon of water or with undiluted white vinegar.
- c. Masonry & Concrete - Make sure surfaces are thoroughly dry. Test, if there is any question. The General Contractor is required to patch and rub surfaces. The painter shall remove dust and do minor smoothing or cleaning. Call major cracks, holes, or stains to the attention of the General Contractor. The painter shall not proceed if surface is not in proper condition.
- d. General - Before painting, remove hardware, accessories, plates, lighting fixtures and similar items or provide ample protection of such items.
- e. Cleaning - The cleaning up prior to painting is required to be done with vacuum cleaners. Painter shall not apply paint or varnish when potentially dusty conditions prevail.

3.3 Schedule of Painting:

<u>Surfaces to be Treated</u>	<u>Preparation & Pretreatment</u>	<u>1st Coat</u>	<u>2nd Coat</u>	<u>3rd Coat</u>
Drywall	Dry clean	Primer	Latex Interior Eggshell	Latex Interior Eggshell
Concrete Block	Dry clean	Block Filler / Primer	Epoxy Eggshell	Epoxy Eggshell
Metal	Sand & Clean	Primer	DTM Acrylic Satin	DTM Acrylic Satin
Concrete Floors Epoxy Finish	See Spec	Epoxy Primer	Epoxy Finish Coat	Epoxy Finish Coat & Non-skid
Exterior PVC Trim	Dry clean	Extreme Bonding Primer	Exterior Latex Satin	Exterior Latex Satin
Wood for Natural Finish	Dryclean & Stain	Polyurethane Semi-gloss	Polyurethane Semi-gloss	Polyurethane Semi-gloss *

** touch sand prior to final coat of polyurethane/ varnish and tack to insure smooth final finish*

3.4 Application

- a. Skilled mechanics shall do all painting in a workmanlike manner. Spread materials evenly, flow on smoothly, free from brush marks, hairs, runs, or sags. Follow manufacturer's specific recommendations for the application of all materials.
- b. Do not apply paint or enamel until the proceeding coat is thoroughly dry and hard. In general, and unless otherwise specified, allow exterior oil paints to dry at least 72 hours between coats and interior coats to dry at least 24 hours between coats. Each undercoat shall differ in shade from the proceeding coat and shall be applied through one section to the building before the next coat is begun. Obtain tentative acceptance from the Architect before proceeding with successive coats.
- c. In general, all painting shall be brush and roller applied with the exception that metal surfaces shall be masked and sprayed.
- d. Do no exterior painting in rainy or damp weather until the surface is thoroughly dry, or when the temperature is below 50 deg. F., or above 90 deg. F.
- e. Do not thin transparent finish in any manner or apply in a temperature below 70 deg. F., nor in any place not properly closed and protected from drafts and from dust. Flow evenly without runs, sags, or brush marks.
- f. Adequately protect work adjacent to surfaces to be painted with drop cloths or other approved means.
- g. Rectify any damage caused by paint or painting operations by this sub-contractor and perform all necessary touch-up.
- h. Care shall be taken to thoroughly cover surfaces with number of painting coats schedules. If, in the opinion of the Architect, surfaces are not covered adequately due to application, additional coats shall be applied at no additional cost to the Owner.
- i. Wall covering shall be applied by experienced tradesmen. Use the adhesives and application methods recommended by the wall covering manufacturer. Seams shall be aligned, straight, tight, and as invisible as possible. Finished installation shall be free of loose edges, wrinkles or bubbles.
- j. See para. 2.3 for specifics of epoxy floor finish preparation and application.

---END OF SECTION---

SECTION 10 14 00

SIGNAGE

PART 1. GENERAL

1.1 Related Work Specified Elsewhere

- a. Door Hardware – Section 08 71 00

1.2 Submittals

- a. Submit product technical data, layout drawings for all proposed signs, sample metal door tag, sample interior sign, and samples of interior sign color selections for review and approval in accordance with the General Conditions.

PART 2. PRODUCTS

2.1 Building Plaque

- a. 20" x 16" cast bronze plaque with raised polished letters and border, darker "leatherette" finish background (recessed), and four rosette fastener covers - by Matthews International or other approved manufacturer.

Text and layout provided by the Architect. Anticipated number of lines of text is 10.

2.2 Other Building Signage

All other building signage is by the Owner (Not in this Contract)

PART 3. EXECUTION

3.1 Installation

- a. Coordinate mounting location with the Architect.

---END OF SECTION---

SECTION 10 21 00

TOILET COMPARTMENTS

PART 1. GENERAL

1.1 Related Work Specified Elsewhere

- a. Wall Blocking – Section 06 10 00, Rough Carpentry
- b. Metal Lockers – Section 10 51 13

1.2 Submittals

- a. Submit product technical data, detailed drawings & color selection samples for review and approval in accordance with the General Conditions.

PART 2. PRODUCTS

2.1 Toilet Partitions

a. Solid Phenolic Partitions and Screens

- [1] Gap-free design, Class A fire-resistant solid phenolic panels w/ matte finish laminate faces. 70" - 72" panel height with 4 ½" – 6 ½" floor clearance.
- [2] Provide at least 40 laminate options to choose from including wood grains and patterns.
- [3] Floor mounted, adjustable base, overhead braced design for both stalls and urinal screens.
- [4] Stainless steel commercial hardware including base shoes, full length wall attachment, full length door hinges, full length continuous door stops (privacy design), color-coded "vacant" / "in use" indicator ADA latches, and low profile coat/bag hooks

PART 3. EXECUTION

3.1 Installation

- a. Install partition systems using all stainless-steel fasteners in accordance with the manufacturer's detailed drawings and installation instructions.
- b. Finished installation shall be cleaned and free of scratches or other blemishes.

---END OF SECTION---

SECTION 10 28 00

WASHROOM ACCESSORIES

PART 1. GENERAL

1.1 Related Work Specified Elsewhere

- a. Rough Carpentry – Section 06 10 00
- b. Door Hardware - Section 08 71 00

1.2 Submittals

- a. Submit Shop Drawings and/or satisfactory cuts and details for all items of this Section per the General Conditions and Supplements thereto.

PART 2. PRODUCTS

2.1 Public & Staff Toilet Room Accessories

- a. Grab Bars – Quantity of 19 each size
1.25" dia. stainless steel with snap flange and satin finish.
Furnish BoBrick # B5806 or equal.
Provide equal quantity of 42" length and 36" length
Mount 34" above finish floor to centerline of bar
- b. Mirrors –
Quantity of 1 – 18" x 36"
Quantity of 34 – 24" x 36"
Satin finish stainless steel framed mirror.
Furnish BoBrick # B-290 or equal.
Mount 40" above finish floor to bottom edge of mirror
- c. Toilet Tissue Dispenser (double roll) – Quantity of 35
Furnish BoBrick # B-2740 or equal.
- d. Paper Towel Dispenser and Waste Receptacle – Quantity of 31
Recess mounted – Key locked, 22-gauge satin stainless steel dispenser for 350 C-fold or 475 multi-fold towels with integral waste receptacle
Furnish BoBrick # B-4369 or equal.
- e. Coat Hooks – satin stainless steel – Quantity of 26
Furnish Bobrick B-7671 or equal
- f. Infant Changing Station – Quantity of 4
Wall mounted KB300-01SS Grey, baby changing station by KoalaKare or approved equal.

2.2 Staff Shower Room – Privacy Curtain

- a. Single curtain for an opening size of 3'-4" wide x 7'-8" high. Hospital-style privacy curtain shall have a white mesh top section and patterned fabric bottom section. Ceiling track shall be white. Provide curtain and track by INPRO or approved equal. Fabric color/pattern shall be selected by the Architect from samples submitted.

2.3 Prisoner Area Toilet Room Accessories

- a. Grab Bars – Quantity of 2 each size
1.5" dia. stainless steel with exposed tamper-proof screw mounting & bar shelf
Furnish BoBrick # 813660 or equal
Provide equal quantity of 42" length and 36" length
Mount 34" above finish floor to centerline of bar.
- b. Mirrors – Quantity of 10
11.25" x 17.25" stainless steel mirror and integral frame
Exposed tamper-proof screw mounting
Furnish BoBrick #B-942 or equal
- c. Toilet Tissue Holder – Quantity of 10
Stainless steel, wall recessed roll holder for anchoring in concrete block wall
Furnish BoBrick #B-952 or equal

PART 3. EXECUTION

3.1 Installation

- a. Install all toilet accessories and specialty products securely to wall blocking with appropriate fasteners and at correct locations and mounting heights. After installation, all products shall be free of scratches or damage.

---END OF SECTION---

SECTION 10 44 00

FIRE PROTECTION SPECIALTIES

PART 1. GENERAL

1.1 Related Work Specified Elsewhere

- a. Washroom Accessories - Section 10 28 00

1.2 Submittals

- a. Submit Shop Drawings and/or satisfactory cuts and details for all items of this Section as specified in the General Conditions and Supplements thereto.

PART 2. PRODUCTS

2.1 Fire Extinguishers – (quantity of 15)

- a. 10 lb. Multi-purpose ABC dry chemical Extinguisher equal to Cosmic Model 10E by JL Industries or approved equal.

2.2 Fire Extinguisher Cabinets - (quantity of 15)

- a. Recessed steel cabinet with full glass door, white painted finish, and red letters “fire extinguisher” positioned vertically on the glass. Provide model 1016F10 by JL Industries or approved equal.

PART 3. EXECUTION

3.1 Installation

- a. Install all recessed wall cabinets and wall brackets securely to wall blocking with appropriate fasteners and at correct locations and mounting heights.

---END OF SECTION---

SECTION 10 51 13

LOCKERS & MISCELLANEOUS SPECIALTIES

PART 1. GENERAL

1.1 Related Work Specified Elsewhere

- a. Rough Carpentry - Section 06 10 00

1.2 Submittals

- a. Submit complete shop drawings and literature in accordance with the General Conditions.

PART 2. PRODUCTS

2.1 Gun Lockers

- a. Entrance Screening Area Handgun Locker – Quantity of one (1)
Recess wall mounted, high security handgun lockers with proprietary non-commercial key locks. Provide 2 keys for each locker door. Locker unit shall have six (6), 10" wide x 5" high doors stacked 3 vertically & 2 horizontally, and wall flange.
Provide model HGF-06 by Southwest Solutions or approved equal.
- b. Marshals' Locker Rooms Handgun Locker – Quantity of two (2)
Recess wall mounted, high security handgun lockers with proprietary non-commercial key locks. Provide 2 keys for each locker door. Locker unit shall have ten (10), 10" wide x 5" high doors stacked 5 vertically & 2 horizontally, and wall flange.
Provide model HGF-10 by Southwest Solutions or approved equal.
- c. Sally Port Combination Gun Locker – Quantity of one (1)
Recess wall mounted, high security shot gun and handgun locker with combination locks. Unit shall have eight (8) handgun doors and five (5) long-gun doors. Master combination lock opens the entire unit. 34" wide x 74" high unit with wall flange to be anchor-mounted flush in a concrete block wall. Provide model SG85C by Southwest Solutions or approved equal.

2.2 Gun Clearing Trap

- a. Provide a quantity of one (1) floor mounted gun clearing trap to be located in the Sally Port – Model AT-123 by Action Target or approved equal.

2.3 Cell Phone Lockers

- a. Cell Phone Locker units for outside of Jury Rooms

Outside Jury Room #123: Recessed mounted unit with 35 doors (3 wide x 5 high), master keyed locks, padded inner shelf, and wall flange. Provide model 19178-35 by Salsbury Industries or approved equal.

Outside Jury Room #220: Recessed mounted unit with 20 doors (3 wide x 5 high), master keyed locks, padded inner shelf, and wall flange. Provide model 19158-20 by Salsbury Industries or approved equal.

2.4 Personal Lockers

- a. 15" wide x 18" deep x 72" high metal locker units with 4" high metal base. The interior of each unit shall have a top shelf and coat hanging hooks. The exterior shall have a recessed lock-hasps handle, ventilation slats and number tag. Lockers shall have door bumpers or other means of quiet operation. Painted finish color shall be selected from range of stock colors. Provide units by Lyon or approved equal.

2.5 Knox Boxes

- a. Provide a quantity of two (2) recess mounted model 3200 KNOXBOX units. Mounting shall be in a brick veneer wall. See Drawing Plans for locations – one at the Public Main Entrance and one at the North Staff Entrance. Color shall be Dark Bronze.

2.6 Prisoner Area Floor Stools & Benches

- a. Stools - Provide a quantity of five (5) stainless steel floor mounted institutional grade stools for prisoner interview rooms and disposition room. Through-bolt the base flange to the 3" thick concrete floor slabs.
Provide KryptoMax model KM-FMS by G2 Automated Technologies LLC or approved equal.
- b. Prisoner Dock (in jury courtrooms) Bench Seats – Provide a quantity of eight (8) stainless steel detention grade bench seats with backs. 72" long x 15" deep x 35.75" overall height. Through-bolt the base flange to the 3" thick concrete floor slabs.
Provide KryptoMax model KM-FDB-72in-BRC by G2 Automated Technologies LLC or approved equal.

2.7 Column Protection for Secure Garage Parking

- a. Provide a quantity of two (2) steel column wrap units equal to DAMO SHIELD by DAMOTECH. 36" high guards made from 1/4" structural steel mounted to the concrete floor. Corrosion resistant painted finish. Provide unit diameter size as small as practical for the application.

PART 3. EXECUTION

3.1 Installation

- a. All locker units shall be securely mounted to walls and or wall openings following the manufacturer's installation instructions. All doors shall operate correctly and the units shall be cleaned and free of damage or defects.
- b. All specialty items shall be securely mounted and installed per the manufacturer's installation instructions. Verify any required mounting heights and/or locations.

--END OF SECTION---

SECTION 12 24 00

WINDOW SHADES

PART 1. GENERAL

1.1 Related Work Specified Elsewhere

- a. Finish Carpentry - Section 06 20 00
- b. Windows – Section 08 52 13

1.2 Submittals

- a. Submit product data, catalog cuts, and fabric samples, in accordance with the General Conditions.

PART 2. PRODUCTS

2.1 Manual Shades

- a. **Roll Shades** (5% openness factor):

Manual "FlexShade" by Draper or approved equal. Commercial roll shades with nylon bead clutch operator, universal brackets with finish bracket caps & bronze bead operator chain

Fabric: Phifer – SheerWeave # 2390 sun control fabric with an openness factor of 5%.
Color as selected by the Architect.

EXTERIOR WINDOWS:

Quantity of 4 – approx. opening 58" w x 66" h
Quantity of 5 – approx. opening 58" w x 78" h
Quantity of 16 – approx. opening 58" w x 86" h
Quantity of 2 – approx. opening 110" w x 62" h
Quantity of 8 – approx. opening 110" w x 78" h
Quantity of 19 – approx. opening 110" w x 86" h

CLERK'S PRIVATE OFFICE:

Quantity of 2 – approx. opening 64" w x 48" h

- b. **Roll Shades** (1% openness factor):

Manual "FlexShade" by Draper or approved equal. Commercial roll shades with nylon bead clutch operator, universal brackets with finish bracket caps & bronze bead operator chain

Fabric: Phifer – SheerWeave # 2500 sun control fabric with an openness factor of 1%.
Color as selected by the Architect.

Each shade shall have "CLOSED" in black letters facing the Main Lobby

CLERK AREAS & JUROR CHECK-IN PUBLIC WINDOWS:

Quantity of 5 – approx. opening 42" w x 50" h
Quantity of 2 – approx. opening 42" w x 42" h

PART 3. EXECUTION

3.1 Installation

- a. Install hardware and shades per manufacturer's instructions. Field measurement of openings shall be required. All shades shall operate smoothly and properly and be left clean.

---END OF SECTION---

SECTION 12 67 00

BENCH SEATING

PART 1. GENERAL

1.1 Related Work Specified Elsewhere

- a. Finish Carpentry - Section 06 20 00
- b. Carpet Flooring – Section 09 68 00

1.2 Submittals

- a. Submit product data & drawings, wood finish samples, and fabric samples, in accordance with the General Conditions.

1.3 Warranty

- a. Seating shall have a written, manufacturer's 25-year warranty.

PART 2. PRODUCTS

2.1 Bench Seating by Ratigan Schottler Manufacturing, Sauder Seating, or approved equal.

- a. Benches shall be Open-End Style with contoured backs and contoured seats. Refer to the Courtroom Detail Plans – Drawing A37 – for seating layouts.
- b. Backs and Seats Construction – All Premium Furniture-Grade Solid Maple hardwood construction, including seats, backs, and supports.
- c. Intermediate supports shall be single piece, extended the full height of the back and of solid 1 ½" butcher block construction. Maximum spacing 6'-0".
- d. Padded (upholstered) seats shall have the highest quality, durable, flame-resistant / stain resistant fabric covering and 3-layer high density foam padding – 3" minimum thickness.
- e. Hardwood factory-finish shall match the stain color of the general millwork in the courtrooms.
- f. Fabric color, style, & pattern shall be selected by the Architect from samples submitted by the seating manufacturer. It is required that a wide variety of highest quality fabric be available to choose from.

2.2 Extra Materials

- a. Provide an extra 6 square yards of selected upholstery fabric for future maintenance and repairs by the Owner.

PART 3. EXECUTION

3.1 Installation

- a. Coordinate the exact installation timing with the General Contractor. Bench seating units shall be delivered and installed without damage to the product or any of the finishes in the building. All benches shall be securely anchored to concrete floor slabs with a minimum of two concealed anchor points at each leg support.

---END OF SECTION---

SECTION 14 20 00

ELEVATORS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Electric Traction Elevators.
- B. Products Supplied under this section, but Not Installed under this Section:
 - 1. Hoist Beam & Steel Safety Tube
 - 2. Inserts mounted in block walls for rail attachments
- C. Work Supplied Under Other Sections:
 - 1. Temporary lighting, including temporary lighting in hoistway for machine space with switch located in hoistway on the strike jamb side of top landing door.
 - 2. Main line disconnects for each elevator. One fused three phase permanent power in building electrical distribution room
 - 3. One non-fused three phase permanent power in hoist way at top landing.
 - 4. 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.
 - 5. Removable barricades at all hoistway openings, in compliance with OSHA 29 CFR 1926.502 in addition to any local code requirements.
 - 6. 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.
 - 7. 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.
 - 8. Control space lighting with switch. Coordinate switch with lighting for machine space as allowable by code.
- D. Industry and government standards:
 - 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.
 - 6. IBC – International Building Code
 - 7. NFPA 101 – Life Safety Code

1.02 DESCRIPTION OF ELEVATOR

- A. Elevator Equipment: KONE gearless electric traction elevator (specification base) or equal by ThyssenKrupp Elevator.
- B. Equipment Control: KCM831
- C. Drive: Non Regenerative
- D. Quantity of Elevators: Four (4)
 - Elevator #1 – Prisoner Elevator – 3-stops in line 28'-0" travel
 - Elevator #2 – Prisoner Elevator – 3-stops in line 28'-0" travel
 - Elevator #3 – Staff Elevator – 3-stops in line 28'-0" travel
 - Elevator #4 – Public Elevator – 2 stops in line 16'-4" travel
- E. Openings: Front Openings (left or right depending on elevator)
- F. Rated Capacity: 3,500 lbs.
- G. Rated Speed: 150 fpm
- H. Shaft Dimensions (concrete block – CMU) 8'-6" wide x 6'-11" deep x 5'-0" pit depth
- I. Cab Height: 8'-0"
- J. Entrance Dimensions: 3'-6" x 7'-0" Doors – In-Line
- K. Main Power Supply: 208 three-phase
- L. Operation: Simplex
- M. Machine Location: Inside the hoistway mounted on car guide rail
- N. Control Space Location: Integrated Control – Top Landing Jamb
- O. Elevator Equipment shall conform to the requirements of seismic zone: Non-seismic
- P. Maintenance Service Period: 12 months

1.03 PERFORMANCE REQUIREMENTS

- A. Car Performance
 - 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): 3.3 ft/sec³
 - 4. Acceleration (maximum) 1.3 ft/sec²
 - 5. In Car Noise: = 55 dB(A)
 - 6. Leveling Accuracy: ± 0.2 inches
 - 7. Starts per hour (maximum): 120

1.04 SUBMITTALS

- A. Provide a complete submittal as described and in accordance with the General Conditions.
- B. Product Data: Submit manufacturer's product literature for each proposed system.
 - 1. Cab design, dimensions and layout.
 - 2. Layout, finishes, and accessories and available options.
 - 3. Controls, signals and operating system.
 - 4. 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. Operation and maintenance data:
 - 1. Provide manufacturer's standard maintenance and operation manual.
- E. Diagnostic Tools
 - 1. Prior to seeking final acceptance for the completed project as specified by the Contract Documents, the Elevator Contractor shall deliver to the Owner any specialized tool(s) that may be required to perform diagnostic evaluations, adjustments, and/or parametric software changes and/or test and inspections on any piece of control or monitoring equipment installed. This shall include any specialized tool(s) required for monitoring, inspection and/or maintenance where the means of suspension other than conventional wire ropes are furnished and installed by the Elevator Contractor. Any and all such tool(s) shall become property of the Owner. Any diagnostic tool provided to the Owner by the Elevator Contractor shall be configured to perform all levels of diagnostics, systems adjustment and parametric software changes which are available to the Elevator Contractor. In those cases where diagnostic tools provided to the Owner require periodic recalibration/or re-initiation, the Elevator Contractor shall perform such tasks at no additional cost to the Owner for a period equal to the term of the maintenance agreement from the date of final acceptance of the completed project. During those intervals in which the Owner might find it necessary to surrender a diagnostic tool for re-calibration, re-initiation, or repair, the Elevator Contractor shall

provide a temporary replacement for the tool at no additional cost to the Owner. The Elevator Contractor shall deliver to the Owner, printed instructions for the proper use of any tool that may be necessary to perform diagnostic evaluations, system adjustment, and/or parametric software changes on any unit of microprocessor-based elevator control equipment and means of suspension other than standard elevator steel cables furnished and install by the Elevator Contractor. Accompanying the printed instructions shall be any and all access codes, password, or other proprietary information that is necessary to interface with the microprocessor-control equipment.

1.05 QUALITY ASSURANCE

- A. Manufacturer: Minimum of fifteen years experience in the fabrication, installation and service of elevators. The manufacturer shall have a documented quality assurance program.
- B. Inspection and Testing: In accordance with requirements of local jurisdiction, obtain required permits, inspections and tests.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Comply with manufacturer's recommendations for delivery, storage and handling.
- B. 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.
- C. Delivered elevator materials shall be stored in a protected environment in accordance with manufacturer recommendations. A minimum storage area of 10 feet by 20 feet is required adjacent to the hoistway.

1.07 WARRANTY

- A. Provide manufacturer warranty for a period of one year. The warranty period is to begin upon Substantial Completion of the Contract. Warranty covers defects in materials and workmanship. Damage due to ordinary use, vandalism, improper or insufficient maintenance, misuse, or neglect do not constitute defective material or workmanship.

1.08 MAINTENANCE SERVICE

- A. The elevator manufacturer shall provide maintenance service consisting of regular examinations and adjustments of the elevator equipment for a period of twelve (12)] months after date of substantial completion. Replacement parts shall be produced by the original equipment manufacturer.
- B. Maintenance service be performed during regular working hours of regular working days and shall include regular time call back service.
- C. Maintenance service shall not include adjustments, repairs or replacement of parts due to negligence, misuse, abuse or accidents.

PART 2 PRODUCTS

2.02 MANUFACTURER

- A. Provide AC gearless machine room-less elevator systems subject to compliance with the design and performance requirements of this specification. Elevator manufacturers may include but are not limited to one of the following:
KONE gearless electric traction elevator or equal by ThyssenKrupp Elevator or Otis Elevator.

1.02 EQUIPMENT: CONTROL COMPONENTS AND CONTROL SPACE

- A. Controller: Provide microcomputer based control system to perform all of the functions.
 - 1. All high voltage (110V 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 cardrack 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: Locate controller(s) in the front wall integrated with the top landing entrance frame, machine side of the elevator. A separate control space should not be required.

2.01 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.
 - 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.

2.03 EQUIPMENT: HOISTWAY ENTRANCES

- A. Hoistway Entrances
 - 1. Sills: extruded.

2. Doors: Hollow metal construction with vertical internal channel reinforcements.
3. Fire Rating: Entrance and doors shall be UL fire-rated for 1-1/2 hour.
4. Entrance Finish: Brushed Stainless Steel
5. Entrance Markings Jamb Plates: Provide standard entrance jamb tactile markings on both jambs, at all floors. Plate Mounting: Refer to manufacturer drawings.

2.04 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. Finishes
 1. Car Wall Panels: Non-removable vertical panels w/ wood-grain plastic laminate selected from standard manufacturer's catalog of choices.
 2. Car Front Finish: Brushed stainless steel.
 3. Car Door Finish: Brushed stainless steel.
 4. Ceiling: Round LED Down Light Drop Ceiling - LF-88: Satin Finished Stainless Steel three panel suspended ceiling with two holes per panel for Round LED lights.
 5. Handrail: Stainless Steel Rails to be located on side and back wall of car enclosure.
 6. Flooring: By others
 7. Threshold: Aluminum
- E. 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.

2.02 EQUIPMENT: SIGNAL DEVICES AND FIXTURES

- A. Car Operating Panel: Provide vandal resistant car operating panel with all push buttons, key switches, and message indicators for elevator operation. Textured Stainless Steel finish.

NOTE:

For Prisoner Elevators #1 & #2: Access & Control of the Elevator shall be remote from Control Room 241 and controls at elevator shall be normally locked out.

For Staff Elevator #3: Access to the elevator shall be via a security system card reader supplied by the Owner. Control of the Elevator shall also be remote from Control Room 241.

For Public Elevator #4: Access to the elevator shall be normal. Control of the Elevator shall also be remote from Control Room 241

Provide Remote Control Panel & Wire Runs to Control Room 241 for remote operations.

1. Flush mounted car operating 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. Buttons have [amber] [blue] [white] illumination (halo). All buttons to have raised text and Braille marking on left hand side. The car operating display panel shall be [amber] [blue] [white] DOT-matrix. All texts, when illuminated, shall be [amber] [blue] [white]. The car operating panel shall have a [brushed stainless steel finish] [Scottish Quad Textured Stainless Steel finish].
 2. Additional features of car operating panel shall include:
 - a. Car Position Indicator within operating panel.
 - b. Elevator Data Plate marked with elevator capacity and car number on car top.
 - c. Help buttons with raised markings.
 - d. In car stop switch per local code.
 - e. Firefighter's hat.
 - f. Firefighter's Phase II Key-switch.
 - g. Call Cancel Button.
 - h. Pre-programmed integrated ADA phone (complete description of krms features included as standard)
 - i. Help Button/Communicator. Activation of help button will initiate two-way communication between car and a location inside the building, switching over to alternate location if call is unanswered, where personnel are available to take the appropriate action. Visual indicators are provided for call initiation and call acknowledgement.
 - j. Landing Passing Signal: A chime bell shall sound in the car to signal that the car is either stopping at or passing a floor served by the elevator.
- B. Hall Fixtures: Wall mounted (vandal resistant for prisoner elevator) hall fixtures shall be provided with necessary push buttons and key switches for elevator operation. Wall mounted hall fixtures shall have a brushed stainless steel finish

- C. Hall Lanterns and Chime: A directional lantern visible from the corridor shall be provided at each hall entrance. When the car stops and the doors are opening, the lantern shall indicate the direction in which the car is to travel and a chime will sound. The chime will sound once for up and twice for down. The lanterns shall be vertical orientation at the side of the elevator door

2.03 EQUIPMENT: ELEVATOR OPERATION AND CONTROLLER

A. Elevator Operation

- 1. Simplex Collective Operation: Using a microprocessor-based controller, 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. Additional Operating Features to include:

- 1. Independent Service
- 2. Hoistway Access Bottom Landing
- 3. Hoistway Access Top Landing
- 4. Car Secure Access.
- 5. Provision for Card Reader in Car (Card Reader provided and Installed by others)
- 6. Emergency Hospital Service.
- 7. Provide coaxial cable for CCTV. CCTV camera by others.
- 8. Intercom Provisions

C. Elevator Control System for Inspections and Emergency

- 1. Provide devices within controller to run the elevator in inspection operation.
- 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.

2.07 EQUIPMENT: DOOR OPERATOR AND CONTROL

- A. Door Operator: A closed loop permanent magnet VVVF 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. Electro-mechanical 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

3.06 EXAMINATION

- 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.

3.07 PREPARATION

- A. Coordinate installation of anchors, bearing plates, brackets and other related accessories.

3.08 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.
- E. Perform final adjustments, and necessary service prior to substantial completion.

3.09 CONSTRUCTION

- A. Interface with Other Work:
 - 1. Guide rail brackets attached to steel shall be installed prior to application of fireproofing.
 - 2. Coordinate construction of entrance walls with installation of door frames and sills. Maintain front wall opening until elevator equipment has been installed.
 - a. Ensure adequate support for entrance attachment points at all landings.
 - b. Coordinate wall openings for hall push buttons, signal fixtures and sleeves. Each elevator requires sleeves within the hoistway wall.
 - c. Coordinate emergency power transfer switch and power change pending signals as required for termination at the primary elevator signal control cabinet in each group.
 - d. Coordinate interface of elevators and fire alarm system.
 - e. Coordinate interface of dedicated telephone line.
 - f. Coordinate the installation of the non-fused three phase permanent power disconnect in hoist way at top landing

3.10 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.

3.11 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.

END OF SECTION

SECTION 21 11 00

AUTOMATIC SPRINKLER SYSTEM

PART 1. GENERAL

1.1 Work Included

- a. Design, fabricate, install, and test a new, wet, automatic sprinkler system to cover the new 3-story Courthouse facility. The system shall meet the NFPA 13 code (applicable to the building occupancy and construction type).

1.2 Related Work Specified Elsewhere

- a. Plumbing, Heating & Electrical Trades

1.3 Submittals

- a. Submit Shop Drawings in accordance with the General Conditions. Shop Drawings shall include a ceiling layout of sprinkler system in relation to mechanical, electrical, and structural items and complete details and sections of sprinkler system piping in relation to structure.
- b. Fire Protection Contractor shall be responsible for compiling sprinkler drawings and specs, submitting documents to the State Fire Marshal's Office for review and supplying the Owner with the Fire Marshal's approval.
- c. The following items shall be provided for the Owner on completion of the job: As-built plans, Maintenance manual, Certificate of completion and testing, and one-year guarantee.

1.4 Qualifications

- a. Fire Protection Contractor shall be licensed by the State of Maine to perform the work described in this Specification.

1.5 Design Information

- a. A new 6" (fire service dedicated) water main will be brought in, by others, to the Ground Floor Mechanical Room #014 and the sprinkler system shall originate from this point (See Drawings). Static water pressure for the new service, per the City of Ellsworth, is anticipated to be 80 psi +/-.

PART 2. PRODUCTS

2.1 Materials

- a. Heads, pipes, valves, fittings, pipe hangers, and all other system components to be provided as per NFPA requirements.
- b. Heads shall be Quick Response Type. In areas with finish ceilings, provide fully recessed heads with flush cover plates. Provide institutional type heads for all Prisoner Areas.
- c. Flexible Sprinkler Connections - For heads in suspended acoustical tile ceilings, provide stainless steel flexible connections with ceiling grid retainer by FlexHead Industries or approved equal.
- d. Provide a metal cabinet containing extra heads of each type on the project to be mounted on the wall of Mechanical Room #014 adjacent to the water main entrance.

PART 3. EXECUTION

3.1 Installation

- a. Fire Protection Contractor shall install the new sprinkler system in strict accordance with all pertinent codes.
- b. Fire Protection Contractor shall obtain all applicable permits before commencing work.
- c. Layout and routing is subject to coordination with other trades and the approval of the Architect. Heads shall be located at the center of the 24" sq. acoustical ceiling tiles wherever possible.
- d. There shall be no exposed piping in areas receiving ceilings. In areas where the piping will be exposed, the pipes shall be run in the most un-obstructive way possible.

3.2 System Service, Testing & Certification

- a. The complete system shall be cleaned, serviced, tested, and certified.

--- END OF SECTION ---

SECTION 22 00 00

PLUMBING SYSTEMS

Part I - GENERAL

1.01 DESCRIPTION: Provide and furnish all necessary labor and materials in connection with a complete plumbing system as described in this section and as shown on drawings. Construction Coordination and Collaborate: This Contractor shall coordinate and collaborate all efforts of installation with all other trades during the construction phase of this project. Time will be allowed for a coordination meeting with all other involved trades during the early stage of construction installation.

1.01.1 Commissioning: Time shall be allotted for each Construction Phase of this project for commissioning of systems, equipment, devices, etc.. Plumbing Contractor, as well as all involved Sub-Contractors, shall collaborate with Commissioning Agency.

1.02 WORK SPECIFIED IN THIS SECTION:

- A. Plumbing fixtures and trim.
- B. Sanitary waste, vent, storm drain systems.
- C. Hot and cold water system.
- D. Piping insulation.
- E. Hangers, supports, sleeves, escutcheons, etc.
- F. Pipe identification.
- G. Testing of systems.
- H. Domestic Hot Water sundries, and piping.

1.03 WORK SPECIFIED ELSEWHERE

- A. Section 05 41 00: Light Metal Framing
- B. Section 07 53 10: Roofing & Flashing
- C. Section 07 92 00: Sealants
- D. Section 09 90 00: Painting.
- E. Section 23 00 00: Heating & Ventilation
- F. Section 26 00 00: Electrical

1.04 REFERENCES:

Unless otherwise specified or indicated, materials and workmanship shall conform with the latest edition of the following standards and specifications:

- 1. American National Standards Institute (ANSI).
- 2. Underwriters Laboratories, Inc. (U.L.).
- 3. American Society for Testing and Materials (ASTM).
- 4. National Fire Protection Association (NFPA).
- 5. State of Maine Plumbing Code

1.05 SUBMITTALS:

- A. Submit shop drawings in accordance with the requirements of the General Conditions. Submittals shall include manufacturer's specifications and installation instructions on all specified items.
- B. Provide submittals on the following items:
 - 1. Plumbing fixtures and associated faucets & trim
 - 2. Domestic Hot & Cold Water Piping & Specialties
 - 3. Insulation
 - 4. Valves and Piping
 - 5. Miscellaneous Equipment
- C. Provide warranties and guarantees for standard manufactures products specified in the section.

Part II - PRODUCTS

2.01 PLUMBING FIXTURES:

- A. Plumbing fixtures shall be provided as indicated on Drawings. Unless otherwise noted, all areas, provide commercial grade heavy duty wall carriers for applicable wall hung lavatory fixtures. Detention Area fixtures shall be institutional type, stainless steel for high Abuse, minimum security.
- B. Fixture trims, faucet, traps, waste pipe, and escutcheons that are exposed in finished areas shall be polished chromium plated over nickel finish, brass pipe. Floor drain strainers and sanitary floor clean out covers shall be satin finish brass.
- C. All fixtures shall have the manufacturer's label and guarantee.
- D. All vitreous fixtures shall be white in color, thoroughly vitrified, fused and free from pores.
- E. Stainless steel ware shall be commercial grade manufactured.
- F. Air gaps shall be provided between the level of each supply opening and the flood rim of the fixture receptacle. The minimum air gap distance shall not be less than twice the diameter of the waste pipe.
- G. All hot and cold water supplies to fixtures and equipment shall be fitted with stops in addition to faucet, bibbs, etc. All trim, supplies, traps exposed piping at fixtures and escutcheons shall be chrome- plated on finished brass, bronze, or copper unless otherwise noted. Non siphon traps shall be provided where required by code or law.
- H. The following catalog numbers apply to non detention type fixtures as manufactured by American Standard; unless otherwise noted; but fixtures equal in design and quality may be substituted when submitted for approval. The Architect shall establish mounting height for all plumbing fixtures.

- I. Final locations of fixtures shall be determined from architectural drawings, refer to architectural and plumbing drawings for the quantities of fixtures under this section.

1. WC1 Water Closet: (Staff/Employee Areas) ADA wall-mounted, American Standard, "AFWALL FloWise", #2856.128, vitreous china water saver type flushes on 1.6 gallons, siphon jet action 17" high elongated bowl, 1-1/2" top spud, with wall carrier hardware, 4 bolt caps. Provide open front plastic seat with cover. Provide wall carrier hardware with nuts, bolts, washers, and wax sealing ring. Provide Sloan top spud manual flush valve with high efficiency, low consumption range of 1.1 to 1.6 gpf.

WC-1 Water Closet: (Public Areas) ADA wall-mounted, American Standard, "AFWALL FloWise", #3351.528, vitreous china water saver type flushes on 1.6 gallons, siphon jet action 17" high elongated bowl, 1-1/2" top spud, with wall carrier hardware, 4 bolt caps. Provide open front plastic seat with cover. Provide wall carrier hardware with nuts, bolts, washers, and wax sealing ring. Public Areas: Provide Sloan Optima Plus #8111 automatic flush valve with manual override button, battery operated, top spud, or approved equal, with valve mounted infrared detector.

2. WC2 Water Closet: Floor-mounted toilet, Acorn Penal-Ware#1695-W-3-HCT-N3-FVT. Toilet shall be constructed from 14 gauge 304 stainless steal. Toilet shall be siphon jet type with elongated bowl with 3" waste floor connection, floor outlet. Through the wall back 1-1/2" NPT male connection water supply with concealed supply flush valve with wall mounted push button flush control. Provide optional paper roll holder, wall recess type, #1840-FA and flush valve access panel #2898. Provide wall frame #8292 for valve(s) access servicing.
3. Urinals : UR-1, AS Lynbrook 1.0 series. Wall mount, vitreous china, 1.0 gpf, 1-1/4" inlet spud. Flush valve: Provide Sloan Optima Plus #8180 automatic flush valve with manual override button, battery operated, top spud, or approved equal, with valve mounted infrared detector and battery powered. Wall carrier; Zurn series .
4. LAV 1 Lavatory: Toilets, Integral basin & counter top, provided by General Contractor. Provide AS #2385.130 or equal, center set lavatory faucet with chromed brass grid strainer drain. Washerless ceramic disc valving, 3/8" male threaded inlet, .5 gpm vandal-resistant flow device, drain with 1 1/4" tail piece. Provide integral perforated grid drain and drain tube. Provide wall supply with loose key stops, trap and nipple to suit code. Drain and supply to be provided with protective cover kits, for ADA requirements for all open cabinets.
5. LAV-2 Wall hung lavatory, Acorn Penal-Ware#1652-1-BP-4-LW1-1813. 18" handicap lavatory with oval bowl shall be constructed from 14 gauge 304 stainless steel. Lavatory bowl shall be oval 14-3/4" x 9-1/2" x 5" deep with 1-1/4" NPT female drain connection for wall mounting. Lavatory valve shall be remotely located Air-trol pneumatically push button operated using atmospheric air. Timing 5 to 60 seconds. Provide through the wall drain extension, P trap, cleanout, and handicap front frame mount mirror.

Lavatories and urinals shall receive an approved white silicone sealing grout applied between Fixtures and room structure. Sealant specified in Section 07900.

6. SK-1 - Sink: Basin & countertop provided by General Contractor. Provide strainer, and trap, Elkay #LK-99, bottom mount. Provide Elkay faucet, #LKGT1042, chrome finish, single hole faucet pull out spray & lever handle spout, with aerator, cast brass spout and brass escutcheon plate, comply with ANSI A112.18.1.

7. SK-2 – Janitor’s Mop Basin: 24” x 24” x 10” mop basin, Fiat series model #TSB-3003 without shelf. Provide faucet #830-AA with wall brace, hose & bracket #832-AA and 24” x 3” mop hanger #889- CC-24, stainless steel wall back slash, and faucet #830-AA.
8. SK-3 – Janitor’s Sink Basin: 20” x 17” x 13” deep basin, wall mounted; Fiat series model #L-1 wall hung Serv-A-Sink. Provide wall mounting brackets, faucet #830-AA with wall brace, hose & bracket #832-AA and faucet #830-AA. Weight capacity 600 lbs.
9. SHWR-1: Shower Station: Wall surface mounted, Aker Co., series #BF-S-38SD/ADA, or approved equal. Recess mounted wall unit, one piece gelcoated fiberglass, 3-3/8” diameter center drain, elevated corner shelf, balsa wood anti-fles textured floor, with 3 year limited warranty, wall mounted folding wooden seat, grab bars, and curtain rods. Overall outside dimensions; 38”w x 38-1/2” deep x 72-1/2” high. Provide optional unit cap, 38” x 37” x 9-1/2”.

For the above shower unit: provide Symmons #1-117VT-FS-XB30 or equal, pressure balancing and temperature mixing valve. Provide shower head adjustable telescopic spray unit, chrome finish, with leveltrol diverter #4-458, with volume control for shower and hand spray, vacuum breaker. Unit shall have 2.75 gpm flow resistor and built in supply stops.

2.02 BACKFLOW PREVENTER: BFP

Provide and install one 3" reduced pressure back-flow preventer, Watts #LF909 or approved equal. Double check type for non-toxic service, continuous pressure operation, possible back pressure. Assembled unit shall have bronze body, SS dura check assembly, test ports and valves, main shut off valves and air gap device. Provide flood protection device kit with power adapter, activation module/cable, cellular gateway module #88009420, and BMS kit #88009418.

2.03 DCW BARRIER FREE COOLER:

H2O-1: Provide and install two wall mounted water cooled, barrier free type, Halsey Tayler HTHB8 Series, single filling station, model HTHB8-WF or approved equal. 8.0 gph of 50 F water at 70F amb. temperature, 3.5 RLA, 120v 1 phase. Cooling unit shall have high efficiency positive start compressor using R134A refrigerant, with pressurized counter flow cooling evaporator chiller. Cooler to comply with ADA standards. Provide optional accessories: vandal resistant kit, water filter, lead filter.

H2O-2: Provide and install two wall mounted water cooler, barrier free type, Halsey Tayler HTHB8 Series Bi-Level with filling station, model OVLSE-1 or approved equal. 8.0 gph of 50F water at 70 F amb. temperature, 3.8 RLA, 120v 1 phase. Cooling unit shall have high efficiency positive start compressor using R134A refrigerant, with pressurized counter flow cooling evaporator /chiller. Cooler to comply with ADA standards. Provide optional accessories: vandal resistant kit, water filter, lead filter, and flex bubbler.

2.04 SUMP PUMP: SP-1, 2, 3, & 4

Provide (4) sump pit submergible pump as shown on plans with piping sundries. Little Giant model #MDP-1, 304 stainless steel motor housing with stainless steel base, 1/3 hp, 120 volt, single phase, auto control float switch. Unit shall be completely field piped with necessary trim. 48.0 gallons at 20 ft. pump head with 1-1/2” connections.

2.05 EYE/FACE WASH STATION: EWS-1

Emergency Eyewash Station: wall mount type, Bradely model #S19-222B, twin spray heads with covers and chains, compact, stainless steel eye wash bowl, face spray ring, universal ID sign, integral flow control, chrome plated brass yoke assembly, Hand operated by a large visible safety yellow PVC push handle. Provide DW & CW mixing valve with spring check valves and shut off valves. 1/2" IPS, 1/2" stay open valve. Mixing valve fail to DCW, Navigator #S19-2000 EFX8.

2.06 EYE/FACE WASH SHOWER: EWSHR-1

Emergency Eyewash Shower: floor mount type, Bradely model #S19-312B, twin spray heads with covers and chains, compact, stainless steel eye wash bowl, face spray ring, universal ID sign, integral flow control, chrome plated brass yoke assembly, Hand operated by a large visible safety yellow PVC push handle, shower head with triangular handle pull valve. Provide DW & CW mixing valve with spring check valves and shut off valves. 1/2" IPS, 1/2" stay open valve. Mixing valve fail to DCW, Navigator #S19-2150- EFX20. Main water supply connection: 1-1/4" NPT.

2.07 WASTE DRAIN BOX: WDB

Provide waste drain box with 1-1/2" drain outlet and 1-1/2" vent. Fixture recess type with Locking/keyed cover, 12"x12"x6"d, with trap primer, stainless steel cabinet, Basic Lab Controls #BLC-CDB/TP-02 or approved equal.

2.08 FLOOR DRAINS: FD

FD : Zurn Series Z-415N or approved equal, body with integral trap and 1/2 primer tap, pipe size 2" & 3". Provide 5" satin finish bronze top strainer with vandal proof screws. Provide 1/2" automatic trap primer to be installed on cold water lines serving lavatories. Primer valves shall be concealed under vanities, ceiling cavities, accessible or be provided access door.

2.09 FLOOR DRAIN/INTERCEPTOR: FD I

FD I : Zurn Series Z-1189 or approved equal, size 12, acid resistant body integral oil/sediment interceptor. Bronze cleanout plug and visible double wall trap seal, removable sediment basket, horizontal baffle, internal vent connection, with Dura-coated heavy duty cast iron grate. Provide 1/2" automatic trap primer to be installed on cold water lines serving lavatories. Primer valves shall be concealed under vanities, ceiling cavities, accessible or be provided access door.

2.10 ELECTRIC DHW HEATER: DHWS 1 & 2 & 3

DHWS-1: Provide 1440 watt capacity electric, high efficiency, commercial type domestic hot water heater as shown on plans. AO Smith model #EPU-2.5 or approved equal, one (1) 1440 watt elements, 120 volt, single phase, 12.0 amps. Provide element self contained temperature controller. Unit shall be completely piped with necessary trim to domestic hot water system. Recovery rate; DHW, 7.0 gph, maximum temperature rise of 90°F.

DHWS-2: Provide 1440 watt capacity electric, high efficiency, commercial type domestic hot water heater as shown on plans. AO Smith model #EPU-6 or approved equal, one (1) 1440 watt elements, 120 volt, single phase, 12.0 amps. Provide element self contained temperature controller. Unit shall be completely piped with necessary trim to domestic hot water system. Recovery rate; DHW, 7.0 gph, maximum temperature rise of 90°F.

DHWS-3: Provide 2500 watt capacity electric, high efficiency, commercial type domestic hot water heater as shown on plans. AO Smith model #EJCS-20 or approved equal, one (1) 2500 watt elements, 120 volt, single phase, 21.0 amps. Provide element self contained temperature controller. Unit shall be completely piped with necessary trim to domestic hot water system. Recovery rate; DHW, 11.0 gph, maximum temperature rise of 90°F.

2.11 HOSE BIBB WALL HYDRANTS: HB

Exterior Wall hydrants shall be exposed type, fully recessed, Watts series #HY-725 or approved equal, automatic draining freezeless with vacuum breaker, backflow preventer, 3/4" hose thread nozzle, chrome finish, with protective cover. Provide loose key with unit.

Interior Wall hydrants shall be exposed type, fully recessed, Watts series #HY-330 or approved equal, with vacuum breaker, backflow preventer, 3/4" hose thread nozzle, chrome finish, with protective cover. Provide loose key with unit.

2.12 HOT WATER CIRCULATING PUMPS: CP-DHW

CP-DHW1; Provide and install one Domestic HW Re-circulating pump. 1/8 HP 3450 RPM, 5.0 GPM, 15' Head, bronze body and impeller, 115v - volts, 60 HZ 1 phase, Taco # 009-BC-1, 1" or approved equal. Pump shall be manufactured by B & G, Taco, or Amtrol as acceptable pump manufactures and suitable for portable water.

2.13 DHW MIXING STATIONS:

Mechanical Rooms: Wall mounted HW Mixing Station shall be 1", self regulating, adjustable temperature range 100 to 140 F, bronze body, stainless steel stem and trim, 125 psi, control temperature performance; +/- 3 F. exposed type Symmons Series #7-500A-ASBVW or approved equal, with check valves, removable cartridge & strainer, chrome finish, shut off, dial thermometer. Mount mixing valve 48" AFF. Fail safe to DCW. 3/4" inlets, 1" outlet.

2.14 COMPRESSION TANK:

A. DHW Heating System (ET-1)

Compression tank shall be installed per manufacturer's instructions complete with all necessary shut off cocks and sundries. Tank shall be manufactured by Amtrol, Therm-xtrol series, model #ST-5 or approved equal. Tank shall have a total volume capacity of 2.0 gallons, with acceptance volume of acceptance factor of .45. Dimensions: 8" dia. x 13"h. Extrol, Taco as acceptable tank manufactures and suitable for portable water.

2.15 CLEAN AGENT SUPPRESSION SYSTEMS: (File Storage 015) Alternate #5

Clean agent suppression systems shall be provided for the IT Room and File Storage Rooms as Alternate #5. Statement of Work:

- 1) Provide Clean Agent System per the material listed below.
- 2) Provide clean agent equipment and installation.
- 3) Provide submittals, field support for programming, startup, commissioning, owner training, and close out documentation.
- 4) Provide engineered stamped plans, design review, complete with stamped documents.
- 5) Contractor's Fire & Security Support Services Design Team will complete designs.

- 6) Utilize the owner's AutoCAD DWG files to create scaled floor plans. The owner will provide AutoCAD files.
- 7) Respond to the AHJ following their plan review.
- 8) Provide owner training on all system functions and operations.
- 9) A one-year warranty on equipment is included.

Fire Alarm Design Scope:

- 1) Provide design concentration, design documents, and installation methods per contract documents.
- 2) Designs will be completed by Fire & Security Support Services Special Hazard Design team.
- 3) Design shall include the I.T. Room and File Storage Room
- 4) Designs shall be based on FK-5-1-12 Agent for Class A & C Fires 4.2% Class A surface hazard and 4.52% for Class C energized electrical hazard
- 5) Designs shall include clean agent releasing panel, related devices, nozzles, detectors, manual release station, notification and signage.
- 6) One (1) Main agent cylinder with agent
- 7) One (1) Solenoid; supervised for placement on cylinder
- 8) Dry contact relay for connection to BMS, EPO, Dampers and Building Fire Alarm connection.

Project Submittals to Include:

- 1) All equipment is defined in the bill of materials within this proposal per Our Special Hazard Design Team.
- 2) Floor plans with final device and address locations (owner to provide AutoCAD files), (addresses to be field verified)
- 3) Shop drawings containing riser diagrams and details.
- 4) Data sheets for all proposed equipment for all systems in scope
- 5) Battery and voltage drop calculations.
- 6) Clean agent calculations.
- 7) Submittals shall be submitted to the AHJ for approval.
- 8) As-Built record drawings.

Clean Agent Commissioning Scope:

- 1) Provide programming and final commissioning for the system.
- 2) Commissioning does not include discharge of clean agent tank(s).
- 3) Both rooms shall be door fan tested to verify room integrity.
- 4) Testing and Certification per NFPA 72
- 5) Owner's Training shall be scheduled as Owner's convenience.

Clean Agent Installation Scope:

- 1) Install clean agent piping, hangers and nozzles
- 2) Install clean agent tanks and associated supports
- 3) The installation scope applies to the equipment and materials listed within this proposal.
- 4) The installation of the clean agent system shall meet all NEC, state code and local jurisdictional requirements.
- 5) Utilize existing power panels and breakers. If the existing power panels do not have the capacity for the new equipment we will provide a proposal for the additional cost of the power panel, breakers installation labor and materials upon written request from the owner.
- 6) Supply surge protection as required.

- 7) Supply required 120v permanent power to activate fire alarm control panel(s), auxiliary panel(s) and NAC power supply(s)
- 8) Support cables per NEC means and methods.
- 9) Provide conduit raceways as required by NEC, state code and local jurisdictional code requirements.
- 10) Provide all wire/cable, raceways, conduits, device back boxes, mounting hardware for a complete installation.
- 11) Install and terminate all Clean Agent releasing control equipment enclosures, back boxes, and power supplies.
- 12) Install and terminate all fire alarm initiating, notification, and control field devices.
- 13) All wire and cables shall be free of grounds, short circuits, and open circuits.
- 14) Megger testing as required by contract documents.
- 15) All fire suppression wires shall be clearly labeled in junction boxes, and cabinets.

2.16 MISCELLANEOUS EQUIPMENT AND FITTINGS:

A. Valves.

1. All valves shall be suitable size and type and shall be Crane, Jenkins or approved equal. Where required in copper piping, valves shall be bronze except those which are chromium plated and they shall be brass. All valves shall be for not less than 125 pound working pressure.

Isolation valves shall be provided and installed for all DCW, DHW, and DHWR main branch lines that serve plumbing fixtures and sundries. All fixtures shall have individual service stops as stated in paragraph 2.01.G.

2. Shut-off valves shall be bronze, bodied ball valves with stainless steel ball and stem, Apollo series 70-100 or equal.
3. Drain cocks shall be 1/2 inch bronze globe valves with 3/4 inch hose end, Jenkins figure 113 with figure 658 cap and chain.
4. Stop and Waste Nibco or equal.
5. Check valves shall be bronze swing type, Jenkins figure 1222, Fairbanks figure 0681, Hammond figure IB 943 or Nibco S-413Y.
6. Locate valves for easy access and operation, where concealed, provide access doors. Do not locate valves with stem below horizontal.
7. Shock absorbers shall be Amtrol or Precision Plumbing Products, Inc. or equal. Water hammer arrestors installed at each branch manifold for hot and cold water in pipe chases and where shown on Drawings. Provide with gate valve for service. All branch lines being served with cold and hot water service shall be provided with such device. Amtrol # 536
8. Floor Clean Outs: Floor clean outs shall be Zurn series Z-1404 with satin finish bronze top recessed for tile, where applicable.

9. DCW Pressure Reducing Station: Provide and install (1) 2-1/2" pressure reducing valve with wye strainer and station components as detailed. PRV shall be Watts model #223S or approved equal. PRV shall be bronze body construction with stainless steel components suitable for initial pressure of 300 lbs water pressure and domestic water service. Factory pressure setting of 50 lbs, adjustable range from 25 up to 75 psi.. 160 degree F temperature.

2.17 WATER PIPING AND FITTING:

- A. Copper tubing (type L) and fittings shall be used for all water inside of buildings. Fittings shall be cast-brass or wrought copper suitable for sweat connections for use with hard-drawn tubing.
- B. Branches and run-outs. Piping shall be installed as indicated on the Drawings. Pipe shall be cut accurately to measurements established at the building by the Contractor and shall be worked into place without springing or forcing. Care shall be taken not to weaken the structural portions of the building. Piping shall be run parallel with the lines of the building unless otherwise shown or noted on the Drawings. Branch pipe from service lines may be taken off top or bottom of main, using such cross-over fittings as may be required by structural or installation conditions. Service pipe, valves and fittings shall be kept a sufficient distance from other work and other services to permit not less than 2" between finished covering and other work and not less than 2" between finished covering on the different services. Changes in pipe sizes shall be made with reduced fittings.
- C. Expansion and contraction of piping: Allowance shall be made throughout for expansion and contraction. Horizontal runs over 50 feet in length shall be anchored to the wall or to the supporting construction about midway on the run to force expansion, evenly divided toward the ends.
- D. Sweated tubing joints: Tubing shall be cut square and burrs shall be removed. Both inside of fittings and outside of tubing shall be well cleaned before sweating. Care shall be taken to prevent annealing of fittings and hard drawn tubing when making connections. Installation shall be made by competent workmen in accordance with manufacturer's recommendations. Mitering of joints for elbows and notching of straight runs of pipe for tees will not be permitted. Joints for interior soldered fittings shall be made with a non-corrosive paste flux and solid string or wire solder composed of 95 percent tin and 5 percent antimony. Cored solder or 50 percent tin and 50 percent antimony will not be permitted.
- E. Dissimilar piping materials: Where there is a junction of two different metallic piping materials, and where electrolysis may occur, provide dielectric unions or companion flanges with non conductive gaskets.

2.18 SANITARY WASTE, VENT, & STORM DRAIN PIPING:

- A. Except as otherwise noted, all sanitary waste and vent piping shall be schedule 40 cast iron piping and fittings shall be used. Schedule 40 PVC piping and fittings may be used if an approved fire stop device is used at the floor penetrations. Provide clean outs as shown, and at changes in direction and as required by local and State code.
- B. Except as otherwise noted, all Condensate drain piping shall be installed as shown on plans. Piping which is located exposed in Mechanical, Electrical Rooms, concealed in wall partitions, or is exposed to physical damage shall be piped with schedule M copper and fittings. Condensate piping concealed in accessible grid T-bar ceiling maybe schedule 40 PVC piping.

2.19 ESCUTCHEONS:

- A. Escutcheons shall be installed around all exposed pipe passing through a finished floor, wall, or ceiling. Escutcheons shall be heavy cast brass, chromium plated, adjustable, and shall be of sufficient outside diameter to cover sleeve opening and shall fit snugly around pipe, and lock with set screw.

2.20 TRAPS:

- A. All traps connected to the sanitary system shall be vented as shown on the Drawings and as required by the local and state plumbing codes.
- B. Type of fixture traps shall be cast brass, for concealed, and cast brass chrome plated for accessible, water-seal, self-cleaning "P" trap. Each trap shall have an accessible cleanout of ample size, protected by the water seal.

2.21 EXPANSION PROVISION:

- A. Where branches are taken off hot and cold water risers, the tee in the riser shall be located with adequate clearance from the structure or other piping to allow for expansion of the riser without strain on the branch piping.
- B. Branches shall be taken off the risers with at least three fittings to form an adequate swing joint.
- C. For each hot water riser suitable swing shall be provided at top and bottom connections from mains to risers to allow for expansion in both main and riser.
- D. Where soldered or brazed joints are used for the piping systems, proper swing joints as described above for branches from risers shall be provided, or adequate length loops shall be installed to prevent undue strain on the tubing or joints to expansion and contraction.
- E. Main domestic hot water and return pipe lines that run more than fifty shall be provide with means of expansion by either pipe expansion loop or U type flex connector made of bronze braided corrugated high tensile material by KeFlex or approved manufacture.

2.22 HANGERS AND SUPPORTS:

- A. Provide all pipe hangers and fixture supports, and be responsible for proper and permanent location.
- B. All piping shall be rigidly supported from the building structure by means of approved hangers and supports. Horizontal piping shall be hung with adjustable wrought iron or malleable iron pipe hangers, unless otherwise specified, spaced as follows:
 - 1. Cast Iron or PVC pipe: 6 feet at joints.
 - 2. Copper tubing: 6 feet on center.
 - 3. Steel Piping, sch. 40: $\frac{3}{4}$ " and less 8 ft. on center, 1" and larger 12 ft. on center

- C. Vertical stacks of soil, waste, vent and conductor piping shall have friction clamps on each floor. Vertical supply risers shall be supported at each floor by friction clamps or inserting around the supply pipe, a coupling which shall rest on pipe sleeve. Soil, waste and conductor stacks shall be firmly supported at their base, either by a suitable hanger placed on the horizontal line near the riser, or by a base fitting set on a pedestal or foundation carried down to a firm bearing.
- D. Hangers for piping, sizes 4 inches and smaller, shall be Carpenter-Patterson No. 1A Bank Type, Grinnell Co., Calco Steel Products Co., or equal, black steel with hanger rods with machine threads. For un-insulated, copper tubing, the hangers shall be copperized. Hanger for use on insulated service lines shall be sized to allow for insulation thickness, except that branch runouts to individual fixtures and water piping within concealed pipe chases shall be supported with split ring hangers attached directly to tubing.
- E. Chain, strap, perforated bar, or wire hangers will not be approved. Approved gang hangers may be used in lieu of separate hangers on pipes running parallel to each other and close together. Where used for copper tubing, the gang hangers shall have copper saddles or shall be sheet-lead coated.
- F. All fixtures and equipment shall be supported and fastened in a satisfactory manner. Where wall-hung fixtures are secured to partitions, they shall be fastened with 1/4 inch through bolts provided with nuts, washers and plates at back, except where chair carriers are specified. Bolt heads and nuts shall be hexagon and exposed bolts, nuts, washers and screws shall be chromium-plated brass. Where secured to concrete or masonry walls, they shall be fastened with brass bolts or machine screws in lead sleeve type expansion shields and shall extend at least 3 inches into solid concrete or masonry work. Water closets shall be installed with double gasket seals between floor and closet.

2.23 SLEEVES:

- A. All sleeves shall be one-piece Schedule 40 steel pipe. The sleeves shall be fitted securely to prevent slipping or moving.
- B. All piping through masonry walls, beams and partitions shall be sleeved. All sleeves shall finish flush with the finish line.
- C. Space between sleeves and piping shall be sealed watertight and/or gastight as described below:
 - 1. Un-insulated metal piping shall be sealed watertight and/or gastight by packing space between pipe and sleeve with approved packing. Special care shall be taken not to drive lead below top of sleeve. Mechanical seals may be used.
 - 2. Insulated piping and plastic piping shall be sealed watertight and/or gastight by packing space between pipe sleeve and insulation with an approved packing. Fill the remaining space with approved waterproof resilient adhesive sealant.
- D. Sleeves shall be of size to allow for continuous full thickness of pipe insulation through sleeve.
- E. Provide waterproof sleeve or casting on each pipe entering or leaving building through foundation walls and tank pits, or wet wells. Seal space between each pipe and its waterproof sleeve. Each end of sleeve shall be sealed as described above. Each pipe shall be concentric with sleeve. Sleeves shall be waterproof type with welded or cast flange and of size and length to suit pipe and wall thickness. Sleeves shall be all galvanized after welding.

2.24 INSULATION:

- A. Provide thermal insulation on cold, hot, and return water. Insulation shall be continuous through supports.
- B. Insulation shall be omitted on branch runouts designated as chromeplated, except as otherwise specified.
- C. Pipe covering shall be Armaflex #AP-2000 or equal, 1/2" thickness for all hot and cold pipe sizes 3/4" and less. 3/4" thick for 1" to 1-1/4", and 1" thick for 1-1/2" and larger.
- D. Fittings for hot water and hot water recirculating piping shall be covered with Armaflex fitted of same thickness and finish as adjacent pipe covering.
- E. Valves, flanges and fittings for cold water and hot water piping shall be covered with mitered sections of Armaflex. Insulation shall be of same thickness and finish as adjacent pipe covering.
- F. The insulation lap shall be sealed with an externally applied sealer.
- G. Storm Drain & Condensate Drain; provide 1/2" thick Armaflex # AP-2000 closed cell insulation for all storm drain and condensate piping, fittings, and roof drains. Install per manufacture's recommended procedures.

2.25 PIPE IDENTIFICATION:

- A. Provide color coded pipe identification markers on all piping in the building installed under this Section. Pipe markers shall be semi-rigid plastic identification markers equal to "Set Mark" Type "SNA" by Seton Nameplate Corporation or equal.
- B. Provide an arrow marker with each pipe content marker to indicate the direction of flow. If flow can be in either direction, use a double headed arrow marker.
- C. Piping shall be labeled at 20 foot intervals, adjacent to each valve, on each riser. This work shall be done after architectural finish painting where such is required on the pipes.
- D. The following color coding shall be used with names in black letters on backgrounds indicated:

<u>Service</u>	<u>Legend</u>	<u>Background Color</u>
Domestic CW	Domestic C.W.	Green
Domestic HW	Domestic H.W.	Green
Domestic HWR	Domestic H.W.R.	Green
Storm Drain	Storm Drain	Green
Condensate Waste	Condensate Drain	Green

- E. In general, 3/4 inch high legend shall be used for pipe lines.
- F. All markers to be OSHA approved.

2.26 VALVE TAGS AND CHARTS:

- A. All valves on pipes of every description have neat circular 1 1/2 inch brass valve tag attached with brass chain to each valve stem. Stamp on these valve tags in white letters as large as practical the number of the valve and its service, such as "H.W.", "C.W." for hot water and cold water respectively. The number of each service shall be consecutive.
- B. Valve numbers shall correspond to numbers indicated for valves on the record Drawings and on two printed detailed lists. These printed lists shall state the numbers and location, including the painted door room number, the location in the room (with location dimensions if concealed), of each valve and the fixture or group of fixtures which it controls, and other necessary information, such as requiring the opening or closing of another valve or valves, when any one valve is to be opened or closed.
- C. The printed lists shall be prepared in a form to meet the approval of the Architect and Owners. Record lists shall be included as part of O & M manuals.

Part III - EXECUTION

3.01 GENERAL:

- A. The work shall be executed in compliance with the latest edition of the Maine State Plumbing and other applicable Building Codes and all local regulations, etc., applicable to work in this section.

Permits: Obtain and pay for all required permits, licenses, etc.. In case of conflict between the Contract Documents and a governing code or ordinance, the more stringent standard shall apply.

- B. Unless otherwise specified or indicated, materials and workmanship shall conform with the latest edition of the following standards and specifications:
 - 1. American National Standards Institute (ANSI).
 - 2. Underwriters Laboratories, Inc. (U.L.).
 - 3. American Society for Testing and Materials (ASTM).
 - 4. National Fire Protection Association (NFPA).
- C. All work shown on Drawings is diagrammatic. It is not intended to specify or to show every offset, fitting, and component. However, it is the intent of these Specifications and Drawings accompanying same that all required components and materials shall be furnished and installed under this Section, whether or not indicated or specified, in such a manner as to make the entire installation fully complete, operable and maintainable in all respects to satisfaction of Owner.
- D. Refer to appropriate sections for specifications on cutting and sealing openings for piping and other equipment penetrating walls, floors, and roofs. Building Structure Penetrations; General Contractor to provide cutting & finish patching of all building structure penetrations involving removals and new installations of system items, devices, etc. associated with this trade. This contractor shall provide necessary and proper fire stop(s), water seal or weather stop(s), etc. associated with system device penetration. This trade shall coordinate all system component penetrations through building structure(s) with General Contractor and Owner.

- E. Refer to Section 02072 and the General Conditions for provisions governing work in existing buildings, including removal of existing equipment and advance notice of service interruption.

3.02 TESTING – ADJUSTING & COMMISSIONING:

- A. Due to the extent of the work, testing shall be done in sections before any work is covered in and in order that the various parts of the work can go ahead without delay.
- B. Sanitary & Storm drain piping: Before the installation of fixtures, close all openings of the system and fill all lines with water to roof and allow to stand until a thorough inspection has been made. No appreciable drop should be noticed within a 60 minute period, as witnessed by Architect or Owner.
- C. Water piping shall be tested to a hydrostatic pressure test of 125 pounds per square inch and it shall hold tight for a period of 2 hours.
- D. All piping shall then be blown out and made clean and free from scale, water or sludge.
- E. If inspection or test show defects, such defective work or materials shall be replaced and inspection and test repeated.
- F. The Inspector or Plumbers shall be notified sufficiently in advance of all tests in order that he may observe them.
- G. All tests to be witnessed by Architect or his authorized agent, or Owner. Contractor shall provide an allowance for Commissioning before project completion. An allowance of 4 hours minimum of onsite time for commissioning shall be allotted.
- H. All operating equipment installed under this Section shall be placed in operation and shall function continuously in an operating test for a period of two weeks.
- I. Carry out operating test prior to scheduling the project final inspection and after completion of all installation and running adjustments, balancing and any other work required to place the equipment in complete operating condition to meet all requirements under this specification. During this running test period the Contractor shall deliver to the Architect two complete sets of operating, service and replacement data for all equipment which will require operating maintenance or replacement, and one copy of this literature shall be available during the instruction of operating personnel. During all working hours of the operating test

Contractor instruction personnel shall be available for and provide thorough and detailed training to operating and maintenance personnel in operation, maintenance, and adjustment of all equipment installed.

3.03 COMPLETION:

- A. Valve tags and charts: All valves shall have tags noting service and number which shall be noted on record Drawings and Charts.
- B. Provide properly executed certificate of inspection from authorities having jurisdiction.
- C. Instruct such persons as the Owner designates in the proper operation and maintenance of the systems and their parts. Submit to the Architect a letter naming the person or persons so instructed and the dates of such instruction.

- D. Prepare and deliver four sets of complete literature showing operating, service and replacement data for all equipment which will require periodic maintenance or replacement.
- F. Documentation: Proper and adequate documentation must be provided, this will include:
 - a. Accurate as-built drawings and sequences submitted in hardcopy and CD disk digital format updated via a standard 2026 Computer Aided Drafting (CAD) program)
 - b. Owner's manuals including technical spec sheets
 - c. Operator manuals

END OF SECTION

DIVISION 23 00 00

HEATING, VENTILATING, AND AIR CONDITIONING

PART ONE: GENERAL

1.01 Scope

- A. The work covered by this section of the specification shall include all equipment, materials, labor, transportation, permits, inspections and incidentals required to complete all operations in connections with the installation of a heating and ventilation system as shown on the drawings and/or as herein specified. The Contractor shall assume complete responsibility for receiving, storing, handling, and installing all equipment. All work shall be executed to conform to all required local, state, and federal laws, regulations, etc., applicable to work in this section.
- B. The general provisions of the contract, including the General Conditions, Contract Conditions, and Drawings apply to work specified in this section.
- C. Commissioning: Time shall be allotted for this project for commissioning of systems, equipment, devices, etc., Mechanical Contractor, as well as all involved Sub-Contractors, shall collaborate and coordinate with Owner's Commissioning Agency.

1.02 WORK SPECIFIED IN THIS SECTION

- A. Air Handling Unit Equipment
- B. Exhaust Fans
- C. Automatic Temperature Controls
- D. HW Boilers
- E. Ductwork and RG&D's
- F. HW Circulating Pumps
- G. Variable Air Volume Boxes
- H. Insulation
- I. Heat Pump CW & HW Generator
- J. Direct Outside Air Systems

1.03 WORK SPECIFIED ELSEWHERE

- A. Section 06 00 00: Rough Carpentry
- B. Section 07 31 00: Roofing and Flashing
- C. Section 07 90 00: Sealants
- D. Section 09 90 00: Painting.
- E. Section 22 00 00: Plumbing
- F. Section 26 00 00: Electrical Systems

1.04 REFERENCE:

American Society for Testing and Materials (ASTM)
Underwriters' Laboratories, Inc. (UL)
Air Moving and Conditioning Assoc. (AMCA)
American Society of Heating, Refrigerating, and Air
Conditioning Engineers (ASHRAE)
American Society of Mechanical Engineers (ASME)
National Electrical Manufacturers Association Institute of Electrical and Electronics
Engineers (IEEE)
American National Standards Institute (AWWA)
Local and State Fire Code
The Board of Fire Underwriters
Local and State Plumbing Codes
American Welding Society
Building Officials Code Administration (BOCA)
Office of Safety and Health Administration (OSHA)

1.05 SUBMITTALS

- A. All items shall be submitted for approval to the Owner as mentioned in the General Conditions, apply are as follows:
1. All equipment, including fan curves data.
 2. Piping specialties (thermometers, gauges, valves, flexible connections, strainers, etc.)
 3. Hot water specialties
 4. Pipe, fittings and hangers
 5. Grills, diffusers and registers
 6. Duct accessories, (volume damper, turning vanes, access doors, etc.)
 7. Thermal insulation for all systems
 8. Piping, valve and equipment identification
 9. Schematic control diagrams and control schemes
 10. Contractor's duct fabrication and piping standards
 11. Shop drawings for ductwork and piping

PART TWO: PRODUCTS

2.01 AIR HANDLING UNIT: AHU #1 & 3

- A. Provide horizontal central station air handling units as shown on plan. The following unit Manufactures model numbers are based upon Daikin Equipment. Provide a Daikin modular Vision series model #CAH006GDCC. Trane manufacture would be acceptable equivalent equipment based upon physical size limitations and unit arrangement, subject to approval.
- B. Fan Section: (Supply) The supply fan section shall be low pressure, plenum, blow through type with galvanized steel cabinet. Fan cabinet shall be internally insulated with 2" thick neoprene glass fiber. Fan shall be factory balanced. The unit shall be provided with access doors on both sides of the section for inspecting fan components and coils, etc..

Fan arrangement shall be horizontal, rear inlet-front outlet, with motor position internally mounted. Motor shall be high efficient TEFC +3 type, 5.0HP, 480v, 60 hz, 3 phase, motor efficiency not less than 90% , 1750 RPM. Fan to be 12.0" axial plenum type with air flow capacity of

2,500 cfm at a TSP= 6.0" with fan rpm of 4194, and motor brake horsepower of 3.8 bhp. Motor drive sheave shall be variable pitch type for fan speed adjustment.

Unit shall be provided with manufacture's internal vibration isolators. All section components to be internally insulated with 2" minimum high density injected foam insulation with double wall construction. Section dimensions: 52"w x 30"h x 20"l.

- C. Economizer / Mixing Box Filter Section: Unit shall be provided with (1) combination angle filter mixing, economizer box lined with 2" high density board insulation, double wall construction. Filters to be 2" glass type, 35% efficient. Dampers shall be opposed blade, ultra low leak type. Section dimensions: 52"w x 30"h x 20"l. Filter area; 7.6 sq. ft., MERV 13 filters. AHU-1: In lieu of hinged access doors both sides, provide 28"h x 20"w opens for return air ductwork connections. AHU-3: provide removable hinged access doors both sides, along with top 16" x 48" return inlet with OB Damper.

D. Coil Sections:

HW-heating coil; 82.0 MBH, 2 - row, 4.8 sq. ft. with approx. face velocity 600 ft/min., EAT=42 db/ - wb, EWT=140 degree F HWS, 8.7 gpm, 30% glycol. Supply header shall be provided with orifice baffle plate, and coil shall be pitched inside the unit for proper air venting. Section dimensions: 52"w x 30"h x 30"l.

CW-Cooling coil; 100.1 total MBH, 8 - row, 5.7 sq. ft. with approx. face velocity 440 ft/min., EAT=80 db/ 67 wb, EWT=45.0`F, 21.2 gpm, LWT=54.0`F . Aluminum fin material, copper tube and header with galvanized steel case frame. Total section dimensions: 52"w x 30"h x 30"l.

E. Discharge Plenum Section:

AHU-1; Unit shall be provided with two horizontal air discharge side end outlets.
AHU-3; Unit shall be provided with top vertical air discharge end outlet.
Box lined with 2" high density board insulation, double wall construction.
Section dimensions: 52"w x 30"h x 20"l. Discharge outlet: 48"w x 12" deep.

- F. Unit Section Access: Provide for each section with access doors both sides. Section shall be double wall constructed with 2" high density board insulation. Section door minimum dimensions: 18"w x 24"h.

- G. Wiring: Supply fan power wiring shall be brought to motor(s) by others along with necessary disconnect. Control wiring and associated controls shall also be by others.

- H. Unit Schedules: per as described and scheduled.

AHU-1 Overall length: 136", overall height: 30", overall width: 52". Top section hung.
AHU-3 Overall length: 140", overall height: 34", overall width: 58". Base rail: 4" high

2.02 AIR HANDLING UNIT: AHU #2 & 4

A. Provide horizontal central station air handling units as shown on plan. The following unit Manufactures model numbers are based upon Daikin Equipment. Provide a Daikin modular Vision series model #CAH008GDQC. Trane manufacture would be acceptable equivalent equipment based upon physical size limitations and unit arrangement, subject to approval.

B. Fan Section: (Supply) The supply fan section shall be low pressure, plenum, blow through type with galvanized steel cabinet. Fan cabinet shall be internally insulated with 2" thick neoprene glass fiber. Fan shall be factory balanced. The unit shall be provided with access doors on both sides of the section for inspecting fan components and coils, etc..

Fan arrangement shall be horizontal, rear inlet-front outlet, with motor position internally mounted. Motor shall be high efficient TEFC +3 type, 5.0HP, 480v, 60 hz, 3 phase, motor efficiency not less than 90% , 4194 RPM. Fan to be 12.0" axial plenum type with air flow capacity of

4,000 cfm at a TSP= 5.6" with fan rpm of 4027, and motor brake horsepower of 4.8 bhp. Motor drive sheave shall be variable pitch type for fan speed adjustment.

Unit shall be provided with manufacture's internal vibration isolators. All section components to be internally insulated with 2" minimum high density injected foam Insulation with double wall construction. Section dimensions: 58"w x 34"h x 20"l.

C. Economizer / Mixing Box Filter Section: Unit shall be provided with (1) combination angle filter mixing, economizer box lined with 2" high density board insulation, double wall construction. Filters to be 2" glass type, 35% efficient. Dampers shall be opposed blade, ultra low leak type. Section dimensions: 58"w x 34"h x 20"l. Filter area; 7.6 sq. ft., MERV 13 filters. AHU-2: In lieu of hinged access doors both sides, provide 28"h x 20"w opens for return air ductwork connections. AHU-4: provide removable hinged access doors both sides, along with top 16" x 48" return inlet with OB Damper.

D. Coil Sections:

HW-heating coil; 98.7 MBH, 2 - row, 7.5 sq. ft. with approx. face velocity 400 ft/min., EAT=42 db/ - wb, EWT=140 degree F HWS, 10.5 gpm, 30% glycol. Supply header shall be provided with orifice baffle plate, and coil shall be pitched inside the unit for proper air venting. Section dimensions: 58"w x 34"h x 24"l.

CW-Cooling coil; 123.4 total MBH, 8 - row, 5.7 sq. ft. with approx. face velocity 440 ft/min., EAT=80 db/ 67 wb, EWT=45.0`F, 21.2 gpm, LWT=54.0`F . Aluminum fin material, copper tube and header with galvanized steel case frame. Total section dimensions: 58"w x 36"h x 36"l.

E. Discharge Plenum Section:

AHU-2; Unit shall be provided with two horizontal air discharge side end outlets.
AHU-4; Unit shall be provided with top vertical air discharge end outlet.
Box lined with 2" high density board insulation, double wall construction.
Section dimensions: 58"w x 34"h x 22"l. Discharge outlet: 48"w x 12" deep.

- F. Unit Section Access: Provide for each section with access doors both sides. Section shall be double wall constructed with 2" high density board insulation. Section door minimum dimensions: 18"w x 24"h.
- G. Wiring: Supply fan power wiring shall be brought to motor(s) by others along with necessary disconnect. Control wiring and associated controls shall also be by others.
- H. Unit Schedules: per as described and scheduled.

AHU-2 Overall length: 136", overall height: 30", overall width: 52". Top section hung.
AHU-4 Overall length: 140", overall height: 34", overall width: 58". Base rail: 4" high

2.03 DEDICATED OUTSIDE AIR HANDLING UNIT: DOAS-G

- A. Provide built up central station air handling unit as shown on plan. The following unit manufactures model numbers are based upon Daikin Equipment. Provide a Daikin modular Vision series model #CAH05GDGM. Trane manufacture would be acceptable equivalent equipment based upon physical size limitations and unit arrangement, subject to approval.

- B. Supply Fan Bottom Section: The supply fan section shall be low pressure, plenum, blow through type with galvanized steel cabinet. Fan cabinet shall be internally insulated with 2" thick neoprene glass fiber. Fan shall be factory balanced. The unit shall be provided with access doors on both sides of the section for inspecting fan components and coils, etc..

Fan arrangement shall be horizontal, rear inlet-front outlet, with motor position internally mounted. Motor shall be high efficient TEFC +3 type, 5.0HP, 480v, 60 hz, 3 phase, motor efficiency not less than 90% , 4000 RPM. Fan to be 12.4" centrifugal plenum type with air flow capacity of 2,000 cfm at a TSP= 5.7" with fan rpm of 3,827 and motor brake horsepower of 3.05 bhp. Motor drive sheave shall be variable pitch type for fan speed adjustment.

Unit shall be provided with manufacture's internal vibration isolators. All section components to be internally insulated with 2" minimum high density injected foam Insulation with double wall construction. Section dimensions: 38"w x 34"h x 28"l.

- B. Exhaust Fan Bottom Section: The exhaust fan section shall be low pressure, plenum, blow through type with galvanized steel cabinet. Fan cabinet shall be internally insulated with 2" thick injected foam insulation. Fan shall be factory balanced. The unit shall be provided with access doors on both sides of the section for inspecting fan components and coils, etc.. Fan arrangement shall be horizontal, rear inlet-front outlet, centrifugal plenum type with motor position internally mounted.

Motor shall be high efficient TEFC +3 type, 3 HP, 480v, 60 hz, 3 phase, motor efficiency not less than 90% , 3500 RPM. Fan to be 12.4" centrifugal plenum type, with air flow capacity of 2,000 cfm at a TSP= 4.9" with fan rpm of 3658 and motor brake horsepower of 2.64 bhp. Motor drive shall be direct drive for 0 to 10vdc control speed adjustment.

Provided internal vibration isolators for each fan unit.

All section components to be internally insulated with 2" minimum high density board Insulation with double wall construction. Section dimensions: 38"w x 34"h x 28"l.

- C. RA Inlet Top Plenum Section: Unit shall be provided with top RA inlet air plenum, less damper, lined with 2" high density board insulation, double wall construction. Section dimensions: 38"w x 34"h x 24"l. Hinged access doors both sides.
- D. OA Inlet Top Plenum Section: Unit shall be provided with top OA inlet air plenum, less damper, lined with 2" high density board insulation, double wall construction. Section dimensions: 38"w x 34"h x 24"l. Hinged access doors both sides.
- E. Pleated Filter Sections: Unit shall be provided with pleated filter sections, lined with 2" high density board insulation, double wall construction. Filters to be 2" glass type, MERV 13, 35% efficient. Section dimensions: 38"w x 34"h x 12"l. Filter area; vary sq. ft., Hinged Access doors both sides.
- F. Coil Sections:
- HW-heating coil; 197,142 MBH, 3 - row, 4.7 sq. ft. with approx. face velocity 480 ft/min., EAT=2 db/ - wb, EWT=92.7 degree F HWS, 20.2 gpm, 35% glycol. Supply header shall be provided with orifice baffle plate, and coil shall be pitched in side the unit for proper air venting. Section dimensions: 38"w x 34"h x 20"l.
- CW-Cooling coil; 96.8.1 total MBH, 12 - row, 4.2 sq. ft. with approx. face velocity 480 ft/min., EAT=82 db/ 68 wb, EWT=45.0`F, LWT=55.0`F . Aluminum fin material, copper tube and header with galvanized steel case frame. Total section dimensions: 38"w x 34"h x 36"l.
- G. Coil Access Section: Provide intermediate section with access doors both sides. Section shall be double wall constructed with 2" high density board insulation. Section dimensions: 38"w x 34"h x 24"L.
- H. Supply Discharge Plenum Section:
- Unit shall be provided with air diffuser for horizontal inlet flow and top outlet with internal 4" deep type, Varicel SH cartridge. Filter area; 5.3 sq. ft. Provide intermediate section with access doors both sides. Box lined with 2" high density board insulation, double wall construction. Section dimensions: 38"w x 34"h x 24l. Discharge SA outlet: 24"w x 12" deep.
- J. Fixed Plate Heat Exchanger Section: Plate model #EMC-750-654-260-ND-S. Air volume 2,000cfm with internal bypass. Refer to plan schedule M-7.3 for design permeters. Provide intermediate section with access doors both sides. Section shall be double wall constructed with 2" high density board insulation. Section dimensions: 38"w x 68"h x 56"L.
- K. Wiring: Supply and return fan power wiring shall be brought to motor(s) by others along with necessary disconnect. Control wiring and associated controls shall also be by others.
- L. Unit Schedules: Per Plan M-7.3

Overall length: 168", overall height: 68", overall width: 38". Base rail: 6" high.

2.04 DEDICATED OUTSIDE AIR HANDLING UNIT: DOAS-1

- A. Provide built up central station air handling unit as shown on plan. The following unit manufactures model numbers are based upon Daikin Equipment. Provide a Daikin modular Vision series model #CAH015GDQM. Trane manufacture would be acceptable equivalent equipment based upon physical size limitations and unit arrangement, subject to approval.
- B. Supply Fan Bottom Section: The supply fan section shall be low pressure, plenum, blow through type with galvanized steel cabinet. Fan cabinet shall be internally insulated with 2" thick neoprene glass fiber. Fan shall be factory balanced. The unit shall be provided with access doors on both sides of the section for inspecting fan components and coils, etc..

Fan arrangement shall be horizontal, rear inlet-front outlet, with motor position internally mounted. Motor shall be high efficient TEFC +3 type, 7.0HP, 480v, 60 hz, 3 phase, motor efficiency not less than 90% , 2,570 RPM. Fan to be 17.7" centrifugal plenum type with air flow capacity of 6,000 cfm at a TSP= 5.7" with fan rpm of 2,337 and motor brake horsepower of 4.78 bhp. Motor drive sheave shall be variable pitch type for fan speed adjustment.

Unit shall be provided with manufacture's internal vibration isolators. All section components to be internally insulated with 2" minimum high density injected foam Insulation with double wall construction. Section dimensions: 76"w x 42"h x 24"l.

- B. Exhaust Fan Bottom Section: The exhaust fan section shall be low pressure, plenum, blow through type with galvanized steel cabinet. Fan cabinet shall be internally insulated with 2" thick injected foam insulation. Fan shall be factory balanced. The unit shall be provided with access doors on both sides of the section for inspecting fan components and coils, etc.. Fan arrangement shall be horizontal, rear inlet-front outlet, centrifugal plenum type with motor position internally mounted.

Motor shall be high efficient TEFC +3 type, 7 HP, 480v, 60 hz, 3 phase, motor efficiency not less than 90% , 2,570 RPM. Fan to be 17.7" centrifugal plenum type, with air flow capacity of 6,000 cfm at a TSP= 5.7" with fan rpm of 2,337 and motor brake horsepower of 4.78 bhp. Motor drive shall be direct drive for 0 to 10vdc control speed adjustment.

Provided internal vibration isolators for each fan unit.

All section components to be internally insulated with 2" minimum high density board Insulation with double wall construction. Section dimensions: 76"w x 42"h x 24"l.

- C. RA Inlet Top Plenum Section: Unit shall be provided with top RA inlet air plenum, less damper, lined with 2" high density board insulation, double wall construction. Section dimensions: 76"w x 42"h x 12"l. Hinged access doors both sides.
- D. OA Inlet Top Plenum Section: Unit shall be provided with top OA inlet air plenum, less damper, lined with 2" high density board insulation, double wall construction. Section dimensions: 76"w x 42"h x 16"l. Hinged access doors both sides.
- E. Pleated Filter Sections: Unit shall be provided with pleated filter sections, lined with 2" high density board insulation, double wall construction. Filters to be 2" glass type, MERV 13, 35% efficient. Section dimensions: 76"w x 42"h x 24"l. Filter area; vary sq. ft., Hinged Access doors both sides.

F. Coil Sections:

HW-heating coil; 561,3 MBH, 3 - row, 14.4 sq. ft. with approx. face velocity 416 ft/min., EAT=2 db/ - wb, EWT=92.7 degree F HWS, 61.0 gpm, 35% glycol. Supply header shall be provided with orifice baffle plate, and coil shall be pitched in side the unit for proper air venting. Section dimensions: 76"w x 42"h x 36"l.

CW-Cooling coil; 291.7 total MBH, 10 - row, 4.2 sq. ft. with approx. face velocity 416 ft/min., EAT=82 db/ 68 wb, EWT=45.0`F, LWT=55.0`F . Aluminum fin material, copper tube and header with galvanized steel case frame. Total section dimensions: 76"w x 42"h x 48"l.

- G. Coil Access Section: Provide intermediate section with access doors both sides. Section shall be double wall constructed with 2" high density board insulation. Section dimensions: 76"w x 42"h x 24"L.

H. Supply Discharge Plenum Section:

Unit shall be provided with air diffuser for horizontal inlet flow and top outlet with internal 4" deep type, Varicel SH cartridge. Filter area; 17.8 sq. ft. Provide intermediate section with access doors both sides. Box lined with 2" high density board insulation, double wall construction. Section dimensions: 76"w x 42"h x 16l. Discharge SA outlet: 72"w x 18" deep.

- J. Fixed Plate Heat Exchanger Section: Plate model #EMC-1200-1602-240-ND-S. Air volume 2,000cfm with internal bypass. Refer to plan schedule M-7.3 for design perimeters. Provide intermediate section with access doors both sides. Section shall be double wall constructed with 2" high density board insulation. Section dimensions: 76"w x 84"h x 84"L.

- K. Wiring: Supply and return fan power wiring shall be brought to motor(s) by others along with necessary disconnect. Control wiring and associated controls shall also be by others.

- L. Unit Schedules: Per Plan M-7.3

Overall length: 204", overall height: 84", overall width: 76". Base rail: 6" high.

2.05 FAN COIL AIR HANDLING UNITS: FCU #1 thru 7

- A. Provide horizontal fan coil air handling units as shown on plan. The following unit manufactures model numbers are based upon Daikin equipment, Blower Coil Unit BCHB series sized for air flows of 800 and 1200 cfm, manufactured unit or approved equal as follows;
- B. Fan Section: The supply fan section shall be low pressure, forward curved, draw through type with galvanized steel cabinet. Fan cabinet shall be internally insulated with 1" thick matt faced insulation. Fan shall be factory balanced. The unit shall be provided with access doors on both sides of the section for inspecting fan components and coils, etc.. Fan arrangement shall be horizontal with standard motor position, belt driven. Motor shall be open drip proof type. Fans shall be double inlet, forward curved centrifugal type and shall be modular design. Motors shall be ECM speed type controlled by others via 0 to 10vdc control signal. Fan coil arrangement shall be draw-through design for uniform coil face velocity and discharge air temperature. Motor drive sheave shall be variable pitch type for fan speed adjustment.

Unit shall be provided with manufacture's vibration isolators for ceiling unit mounting.

- C. Unit Control Box: Provide control box with factory wiring to two speed motors, motor Contactors with 24vac coils, disconnect switch, 24vac/40VA transformer with fused secondary.
- D. Filter Box Section: Provide optional angle filter box with 2" pleated 35% efficient filters. Furnish two sets of throwaway filters.
- E. Coil Sections: HW & CW coils; CW coil shall be pitched inside the unit for proper air venting and drain into removable pvc drain pan. Coil connections to be left side facing the supply air outlet. All hydronic coils are constructed with copper tubes and mechanically bonded aluminum corrugated plate fins. Water coils shall be furnished with a threaded drain plug at the lowest point. A manual air vent shall be provided at the high point of the coil.
- L. Unit Schedules:

Unit #	Model #	scfm	HP	Voltage	CW MBH/GPM	HW MBH/GPM	Control
FCU-x	BCD-0161	1200	1.0	115/1/60	33.4 / 7.1	41.2 / 4.4	0 to 10vdc
FCU-x	BCH-0121	1000	3/4	115/1/60	30.0 / 6.0	38.2 / 4.0	0 to 10vdc
FCU-x	BCH-0101	800	1/2	115/1/60	26.0 / 5.5	35.6 / 3.8	0 to 10vdc

All units to be equipped with ECM speed motors, unit temperature controls, interlocks, and damper actuators shall be provided by A.T.C. Contractor. Refer to plans and schedules for unit capacities and locations.

2.06 EXHAUST FANS:

A. Inline Exhaust Fans: EF 1, 2 & 3

Fan shall be cabinet in-line, direct driven type with housing constructed of galvanized steel. Motor(s) shall be open drip proof, high efficiency type, ECM type. Fan wheels shall be constructed of aluminum. Units shall have the capacity as scheduled. Fan shall have hinged access doors on both sides. L. Cook model as listed or approved equal.

Unit#	Model #	CFM	ESP	Voltage	HP	Notes	Throat Area
EF-1	SQN-D-135	2133	.50	208/3	.75	1,2,6	18"x 18"
EF-2	SQN-D-135	2133	.50	208/3	.75	1,2,6	18"x 18"
EF-3	SQN-D-100	716	.50	120/1	.16	1,2,4,5	12"x 12"

Notes: (1) Provide vibration isolators, 2) Hi Eff. EMC Motors, 3) Provide back draft Damper, 4) Epoxy coating, 5) Variable Speed Controlled by others, 6) Fixed Speed.

2.07 INLINE FILTER BOX: IFB-1

A. Inline Filter Box

Inline filter box construction; 16 ga. Aluminized steel, factory assembled, lift off gasketed access doors, 2" / 4" extruded aluminum track with 1-1/2" mounting flanges. Provide options; static taps insulation and flange adaptors. BLC Series Clean Line Side access 12SA. acceptable manufactures, equivalent equipment equal subject to approval. Overall dimensions: 14.7"H x 23.5"W x 12"D.

B. Unit Schedules (Base upon BLC 12SA Series)

Unit #	Model #	Prefilter	HEPA Filter
IFB-1	12SA02x01-1000-1H	FLP30/21224	FLH95/121123SMD

2.08 ROOF EXHAUST VENTILATOR : RFV-1 & 2

Provide roof exhaust air ventilator, RFV's, axial flow propeller type, with hood, pitched roof curb as shown on plans. Penn Ventilator Model Linea series follows with throat free area of as indicate. Acme, Cook, or Greenheck acceptable equipment manufacture's based upon approval. Hood shall be tiered low contour type and have bird/bug screen and colored aluminum anodized finish. Color shall be approved by architect. Provide manufacture's prefabricated insulated 18" high roof mounted curb to match manufacture's hood.

Unit#	Model #	CFM	ESP	Voltage	HP	Notes	Throat Area
RFV-1& 2	LF40BC	4467	.250	120/1	.50	1,3,4,5	44" x 44"

Note: 1) Unit NEMA 3R Disconnect, Damper, 2) Explosion Proof Motor, 3) Hinged Base Frame, 4) ECM motor speed control, 5) Unibeam Fabricated Curb.

2.09 VARIABLE AIR VOLUME UNITS: VAV-x

A. Provide variable air volume units (VAV's) as shown on plans. The VAV units shall be pressure independent type with HW coils and electronic controls and actuators. Box controller/actuator shall be provided by A.T.C.

Casings shall be 22 gauge galvanized steel provided with hanger holes at four corners. Interior surface of casing shall be acoustically and thermally lined with 1/2" thick 1.9 lb./cu ft. density fiberglass with high density facing. Insulation shall meet NFPA-90A and UL 181.

Units shall be provided with factory mounted one or two row re-heat coils. Coils shall have full fin collars for accurate fin spacing and tube fin contact. Tubes shall be 5/8" O.D. seamless copper with female sweat type water connections. Coils shall be leak tested at 300 psig. Unit shall be provided with factory mounted removable access panel on the bottom of the unit to access the air valve and entering air side of the coil.

Units shall be provided with slip and drive or straight flange rectangular discharge duct connection.

The VAV units shall have extruded aluminum volume air flow control device with 3/8" actuator shaft, and driven pneumatically with factory provided actuator and controller. Controller shall allow maximum and minimum air flow adjustments. Valve inlet shall be tapered to fit standard round flexible ductwork.

Factory installed integral multiple point averaging flow sensing ring shall be provided for flow measurement within 5% of unit rated airflow with 1-1/2 diameters of straight upstream duct. Integral flow taps and chart shall also be provided on each unit.

- B. Provide per drawing M-1.1, 1.2, & 1.3 & M-7.1 schedule Daikin model units or approved equal Trane, Envirotec, or Metal-Aire manufactured units.

VAV #	SIZE cfm	MBH	GPM	DESIGN cfm	NECK SIZE inches	DUCT OUTLET inches W x H
Type	600	13.2	.8	600 max	6	9 x 10
	800	17.6	1.0	800 max	7	12 x 10
	1000	19.8	1.2	1000 max	8	12 x 10
	1500	26.4	1.6	1500 max	10	14 x 10
	2000	33.0	2.0	2000 max	12	16 x 12

2.10 LIEBERT GLYCOL A/C UNIT: IT-AC

- A. Equipment Room air conditioning indoor unit shall be split system type, with refrigeration piped cooling loop between evaporator/compressor section and remote air cooled condenser section. Liebert VERTIV series PDX model #PX011UA1 D-MCSO28E1. No equivalents accepted.
- B. Unit operation control package shall be included with two stages of cooling, along with hot gas bypass option for low cooling load and single point of power source terminals. Total nominal capacity 39,000 btu/hr. based upon 75 degree F db and 61 degree F wb. and 95 degree F outdoor ambient temperature. Unit shall operate from 480v 3 phase power, with FLA load of approximately 16.6 amps, 20.9 kva.
- C. Unit shall be provided with microprocessor with graphics and AG control system. Provide five year compressor warranty for compressor, hot gas bypass, unit disconnect, suction service valves, pressure gauges, spring isolators, and high / low pressure switches, and low ambient temperature control, adjustable floor stand, steam generating humidifier, front return air inlet with grille, high efficiency filter, high efficiency motor, two-way top discharge plenum, smoke detector, fire-stat, floor water detector and auto-change over glycol control.
- D. Provide unit matching dry cooler condenser, model #MCS028. Fan motor 480V, 3PH, 3/4 HP, (.56 kva), Unit size: 52"w x 44" d x 40"h, weight; 1100 lbs.
- E. Room Unit shall operate from 480v 3 phase power, with FLA load of approximately 55.4 amps, 20.2 kva. Pump / Package Drycooler unit: shall operate from 480v 3 phase power, with FLA load of approximately 9.7 amps, 3.5 kva.
- F. Optional Equipment: Provide non-locking disconnect switch, top discharge air bonnet, front return air grille, turning vanes, leak detection kit, factory warranty inspection and field startup.

2.11 AIR CONDITIONING UNIT: SCU1-5 / AC-IU1 Units

- A. Air conditioning system shall consist of drop in ceiling mounted fan/evaporator units and outdoor matching condenser. Equipment listed is based upon Daikin REYA series outdoor condensers and FXZA series evaporator fan cassetts.

SCU-1A, 1B, 2A, 2B, 4A, & 4B : Condenser Unit capacity: 256,799 btu/hr cooling / 182,900 btu/hr heating. Daikin VRV Heat Pump Recovery Unit series: model #REYA288AATJA,. Unit specifications: EER 10.0, 480 v, 3 ph., refrigeration R 32, RLA; 22.8, max fuse size; 30 amps, pre-refrigeration piping flare type, 1/8" & 1/2" liquid, 5/8" & 1" suction.

SCU-3 - 5 : Condenser Unit capacity: 210,397 btu/hr cooling / 119,076 btu/hr heating. Daikin VRV Heat Pump Recovery Unit series: model #REYA240AATJA,. Unit specifications: EER 10.0, 480 v, 3 ph., refrigeration R 32. RLA; 34.8, max fuse size; 50 amps, pre-refrigeration piping flare type, 5/8" liquid, 7/8" & 1-1/8"suction.

- B. AC Cassette Units: Ceiling mounted fan evaporators indoor unit model #FXZA- series, 208V - 1 ϕ , remote wall controllers. Provide refrigerant piping tees model #KHRP26A22T9, navigation remote wall controller #BRC1E73, field-charge refrigerant liquid and suction lines as scheduled. Refer to Equipment schedules Plan M-5.1, 5.2, 5.3.
- C. Equipment Accessories to be provided: 1) condensate pumps, 2) remote wall controllers, 3) iTouch Manager for Daikin system interface, 3) equipment start up, 4) AC cassettes will be provided with motion detection, CO2 & refrigeration sensors.

D. Unit Schedules. Per plan schedules

Unit Type	Model #	cfm	Watts	Voltage	Cool/Heat	Note
IU-(as tagged) FXZA09AAVJU		317HI	35	208/1/60	8872/10228	1, 2,3,4
IU-(as tagged) FXAQ12AAVJU		353HI	36	208/1/60	11260/12957	1, 2,3,4

Note 1) Ceiling T-Bar drop in w/ grille, 2) Wall Wired Control – integrated into respective SCU
3) Trim kit, 4) BacNet integration with Building Management System

2.12 AIR CONDITIONING UNIT: AC TECH ACU1-4 / AC1-4

- A. Air conditioning system shall consist of wall mounted fan/evaporator units and outdoor matching condenser.

ACU-x : Condenser Unit capacity: 12,000 btu/hr cooling / 0 btu/hr heating. Daikin OTERRA cooling only unit series: model #RKF12BVJU9,. Unit specifications: EER 12.5, 208 v, 1 ph., refrigeration R 32. RLA; 15.8, max fuse size; 20 amps, pre-refrigeration piping flare type, 1/4" liquid, 3/8" suction. Provide accessories, remote wall controller, optional low ambient control, and pre-charged liquid, and suction lines.

- B. AC- Wall Evaporator/Fan Units: Ceiling mounted fan evaporators indoor unit model #FTKf12BVJU9- series, 208V - 1 ϕ , remote wall controllers. Provide refrigerant piping tees model #KHRP26A22T9, navigation remote wall controller #BRC1E73, pre-charge refrigerant 1/4" liquid and 1/2" suction lines. Refer to Equipment schedules Plan M-5-2, 5.3, & 3.5.

- C. Equipment Accessories to be provided: 1) condensate pumps, 2) remote wall controllers, 3) iTouch Manager for Daikin system interface, 3) equipment start up, 4) AC wall units will be provided with motion refrigerant detection sensors.

D. Unit Schedules. AC Units

Unit #	Model #	cfm	Watts	Voltage	Cool/Heat	Note
IU-1 & 2	FXZQ09TAVJU	317HI	36	208/1/60	9036/10919	2 & 3
IU-3 & 4	FXAQ05TAVJU	280HI	36	208/1/60	5455/6824	2 & 3

Note 1) Ceiling T-Bar drop in w/ grille 2) Wall Wired Control – integrated into ACU-x
3) Wall mounted

2.13 CABINET / UNIT HEATERS: CUH & UH

- A. HW cabinet unit heaters shall be manufactured by Sterling, or Modine, Trane or approved equal. Units shall be as follows:
- B. HW-heating coil; copper coil with aluminum fins, 140 degree F EWT, EAT=60 db/ 52 wb, LWT=120 degree F HWR, at scheduled gpm. Supply and return water manifolds header shall be provided, and coil shall be pitched for proper air venting.
- C. Wiring: Supply fan power wiring shall be brought to motor by others along with necessary disconnect. Control wiring and associated controls shall also be by others.
- D. Unit Schedules. (Based upon Sterling)

CUH #1, 2, 3, 4, & 5 shall be Sterling Model #04, wall mount, semi recessed, inverted flow type (RWI #1130) with front bottom supply air and top return air. 31 MBH, with 180 degree F EWT 430 CFM, 4.0 GPM, .10 HP motor.

All CUH enclosures shall have primer coat and standard baked enameled finished approved color by Owner. Unit power: 120volt / 60hz / 1 phase. Provide motor speed control switches, heavy duty architectural aluminum anodized front inlet and discharge grilles, unit filters, MERV 8. Unit thermostat and associated controls by A.T.C.

UNIT HEATERS: UH

- A. HW unit heaters shall be manufactured by Sterling, or Modine, Trane or approved equal.
- B. HW-heating coil; copper coil with aluminum fins, 140 degree F EWT, EAT=60 db/ 52 wb, LWT=120 degree F HWR, at scheduled gpm. Supply and return water manifolds header shall be provided, and coil shall be pitched for proper air venting.
- C. Wiring: Supply fan power wiring shall be brought to motor by others along with necessary disconnect. Control wiring and associated controls shall also be by others.

D. Unit Schedules.

Unit #	Model #	scfm	HP	Voltage	Coil MBH	GPM	Note
UH-1	HS-60	900	1/20	120/1/60	40.0	4.4	1, 3
UH-2	HS-60	900	1/20	120/1/60	40.0	4.4	1, 3
UH-3	HS-60	900	1/20	120/1/60	40.0	4.4	1, 3

Note: 1) Ceiling Suspended - provide vibration isolators
2) Wall mounted - provide vibration isolators
3) Unit thermostat and associated controls by A.T.C.

2.14 RADIATION HEATING PANELS (RP-1 & LRP-1)

- A. Ceiling radiant panel shall be Sterling Radiator Manufacturer, 23.75" wide ceiling mount panel for suspended 24" x 24" T-Bar grid application, 6 pass, 3.36 MBH, 840 btu/ LF at 180 degree HWS.

Enclosure shall be extruded aluminum castellated design. Enclosure finish; electrostatic acrylic powder paint tested to ASTM D3359 crosshatch adhesion test. Provide all necessary enclosure accessories. Insulation: 1" thick foil backed faced insulation.

Provide all necessary enclosure accessories, ceiling hangers trim, etc, such all piping is enclosed and hidden.

2.15 COMPRESSION & RETENTION TANKS:

- A. HW Glycol Heating System (ET-2 & 3)

Compression tanks shall be installed per manufacturer's instructions complete with all necessary traps, air charging and draining valves and shut off cocks. Tank shall be manufactured by Taco CBX-800 or approved equal. Storage tank shall be vertically floor mounted, ASME rated with total storage capacity of 160.0 gallons, 61 gallons acceptable, max. working pressure 125 psig, and maximum working temperature 375 F. One bottom mounted, threaded 1"connections: two 1-1/2" top connections. Tank dimensions 30" diameter x 86" high.

- B. CW Glycol Cooling System (ET-1)

Compression tank shall be installed per manufacturer's instructions complete with all necessary traps, air charging and draining valves and shut off cocks. Tank shall be manufactured by Taco CBX-300 or approved equal. Storage tank shall be vertically floor mounted, ASME rated with total storage capacity of 74.0 gallons, 48 gallons acceptable, max. working pressure 125 psig, and maximum working temperature 375 F. One bottom mounted, threaded 1"connections: two 1-1/2" top connections. Tank dimensions 20" diameter x 50" high.

- C. HW & CW Retention Buffer Storage Tank (RBT-1 & 2)

Storage tank shall be vertical, floor mounted, ASME rated with storage capacity of 200 gallons, max. working pressure 125 psig, and maximum working temperature 375 F. Taco model MPT0200F04-125N1 AA or approved equal. Flanged connections: 2 – 4.0" on bottom end and two 4" on top, one – 1.0" sensing port, on one side. Optional 1/2" Armaflex insulation.

2.16 HW & CW CIRCULATING PUMPS:

A. HWP #1 - 4- HW System (35% Glycol)

Provide HW circulating pumps, base mounted, centrifugal type as shown on plans. Pumps shall be manufactured by Taco acceptable pump manufactures. Taco Series KS pumps with high efficient Baldor motors.

Provide HW circulating pumps as shown on plans. Pumps are Taco Series KS 3009D.

Pump #	GPM	HEAD	HP	RPM	VOLTS	PHASE	IMPEL
HWP 1-4	250.0	60'	5.0	1760	480v	3	6.75" Hi Eff +3 TEFC Motor

Provide new 3.0" size MPV's, and 4" suction diffusers. Provide 3" & 4" butterfly, waffer type isolation valves for each pump set.

B. CP-1J & 2J- Boiler HW Jockey

Provide HW re-circulating pumps, in-line centrifugal type, as shown on plans. Taco Series Viridan, Model VR25-3 ECM

Pump #	GPM	HEAD	HP	RPM	VOLTS	PHASE	IMPEL	Flange	TYPE
CP-1J	150.0	30'	2.1	3450	208	1	-	2.5"	Inline
CP-2J	150.0	30'	2.1	3450	208	1	-	2.5"	Inline

C. CWP #1 & 2 CW Chiller Pumps (35% glycol)

Provide CW circulating pumps as shown on plans. Pumps are Taco Series KS-3009D.

Pump #	GPM	HEAD	HP	RPM	VOLTS	PHASE	IMPEL
CWP1 & 2	250.0	60'	5.0	1760	480v	3	6.75 Hi Eff +3 TEFC Motor

Provide new 3" size MPV's, and 4" suction diffusers. Provide 3" & 4" butterfly, waffer type isolation valves for each pump set.

D. CWP #3 & 4 CW Chiller Pumps (35% glycol)

Provide CW circulating pumps as shown on plans. Pumps are Taco Series KS-3007D.

Pump #	GPM	HEAD	HP	RPM	VOLTS	PHASE	IMPEL
CWP1 & 2	150.0	48'	5.0	1760	480v	3	5.5 Hi Eff +3 TEFC Motor

Provide new 3" size MPV's, and 4" suction diffusers. Provide 3" & 4" butterfly, waffer type isolation valves for each pump set.

Provide multi – purpose valves, isolation valves, wye strainer, and stainless steel flex connector for each pump as detailed. Motors Hi Eff +3 TEFC type. Provide factory start-up during commissioning for all pumps.

E. CP #1 & 2 Radiant Floor Heat System

Provide HW circulating pump in-line centrifugal type as shown on plans. Pumps shall be manufactured by Taco or B & G as acceptable pump manufactures. Taco Series 0013.

Pump #	GPM	HEAD	HP	RPM	VOLTS	PHASE	IMPEL	Flange
CP-1	20.0	16'	1/8	3250	115	1	-	1-1/4"
CP-2	20.0	16'	1/8	3250	115	1	-	1-1/4"

Provide line size isolation valves, wye strainer, and stainless steel flex connector for each pump.

2.17 AIR / DIRT SEPARATOR: AS-1 & 2, MAG-1, & Chem Feeder.

- A. AS-1: HW System: 4.0" air purge separator with strainer and 1/2" auto air eliminator, Taco Model #4904A--125A series or approved equal. Air vent, Amtrol #706 or approved equal.
- B. AS- 2: CW System:4.0" air purge separator with strainer and 1/2" auto air eliminator, Taco Model #4904A--125A series or approved equal. Air vent, Amtrol #706 or approved equal.
- C. MAG-1: CW & HW System:6.0" magnetic filter/separator with strainer. Spear & Jackson with" auto air eliminator, Model #BMXT300/4AAV series or approved equal.
- D. CHEM FEEDER: CW & HW System: Provide Neptune vertical style dish bottom out by pass chemical feeder. Neptune Model #DBF-5HP series or approved equal with tank stand legs, 4" fill cap, bottom drain, 3/4" inlet and outlet connections. Dimensions: 30" h x 10" diameter.

2.18 ELECTRIC / STEAM HUMIDIFIER

A. HUM-1 Provide (1) electric to steam humidifier as shown on plans. Humidifier shall be manufactured by Dri-steam Humidifier Co., model #VM16 or approved equal. Unit shall have the capacity to produce 50.0 lbs. of steam per hour. Provide automatic skimmer system controls, and steam distribution tube to be mounted inside DOAS #G, approximately 40 " in width. Power shall be 480v, 3 phase, FLA 19.2 amps. Standard equipment: cabinet enclosure for wall mount, cleanable vaporizing chamber, immersion heater(s), electronic water level control, surface skimmer, and unit control system. Optional equipment: (2)1-1/2" OD x 10' vapor hose kit, time proportioning modulating control with duct mount humidistat for 0% to 100% capacity, air flow switch, high limit duct humidistat, and drain cooling kit.

B. HUM-2: Provide (1) electric to steam humidifier as shown on plans. Humidifier shall be manufactured by Dri-steam Humidifier Co., model #VM34 or approved equal. Unit shall have the capacity to produce 102 lbs. of steam per hour. Provide automatic skimmer system controls, and steam distribution tube to be mounted inside DOAS #1, approximately 70" in width. Power shall be 480v, 3 phase, FLA 40.9 amps. Standard equipment: cabinet enclosure for wall mount, cleanable vaporizing chamber, immersion heater(s), electronic water level control, surface skimmer, and unit control system. Optional equipment: (2)1-1/2" OD x 10' vapor hose kit, time proportioning modulating control with duct mount humidistat for 0% to 100% capacity, air flow switch, high limit duct humidistat, and drain cooling kit.

ATC contractor shall be responsible for necessary control wiring and electrical contractor responsible for power wiring. Provide factory start-up during commissioning.+

2.19 HEAT PUMP CHILLED/HOT WATER GENERATOR: HPLG-1 & 2

- A. Heat pump Chill/Hot water generator shall be air sourced, modular type, with independent chilled water package & HW generation capability. WaterFurance TruClimate 900 Primary Heat Pump Chiller(T9RS) 030-Banked model #T9RS030VV24BACH1N6GSSNSSS or approved equal and shall be a self contain unit. Two 30 ton modules required, banked configuration.

Description: Modular Heat Pump Chillers configured as follows:

- 4-pipe air cooled heat pump chiller
 - Compressor with OptiHeat Technology
 - Dual Variable Speed scrolls with vapor injection
 - Operates with ambient conditions as low as -25 F*
 - 140 deg water production with as low as 0 deg ambient
 - Refrigerant: R-454B with a GWP of 466
 - Supervisory controls
 - Up to 10 modules as a single chiller
-
- Modules capable of heating, cooling, and simultaneously producing hot and chilled water for maximum system efficiencies.

- B. Unit operation control package shall be included with variable compressor speed for 25 to 100% Unloading with single point of power source terminals.

Chiller shall have 60.0 ton total capacity with a total nominal capacity 57.4 tons base upon 95 degree F db outside air temperature and 45 degree F wb leaving chilled ater temperature. Evaporative fluid type shall be 35% propylene glycol, total unit 144.0 gpm, EWT=55 F, LWT= 44.0 F degree. Full load efficiency 9.0 EER and IPLV efficiency 19.2. Electrical: 480v, 3ph, 60 hz, 72.4 FLA, each. Total assembled package, 144.8 FLA.

HW generation shall have 487.8 MBH total capacity base upon 10 degree F db outside air temperature and 140 degree F wb leaving hot water temperature. Condenser fluid type shall be 35% propylene glycol, total unit 50.4 gpm, EWT=120 F, LWT= 140.0 F degree. Full load efficiency Coefficient of performance 1.55. Electrical: 480v, 3ph, 60 hz, 72.4 FLA, each. Total assembled package, 144.8 FLA.

- C. Provide five year compressor warranty for compressors, VF motor step loading, unit disconnect, suction service valves, pressure gauges, spring isolators, flow control differential pressure type, (water flow switch "paddle type" not allowed), and low ambient control, and unloaded compressor start option, hot gas bypass. Install unit per manufacture's recommendations. Unit UL listed.
- D. Package Control Set: Unit controls to be housed in a weather tight enclosure with electric heater and panel T stat for cold conditions. Controller shall be DDC microprocessor type with panel operator interface control/display. Unit controls shall be stand alone and be system ready to be networked with Building Management System. BMS shall be supplied by others. Unit DDC system shall be fully seamless by means of BACnet communications software. Unit manufacture's representative and A.T.C. contractor shall coordinate programming point interface and commissioning.
- E. Unit control package shall be provided to control unit condenser fans, scroll compressors, CW pumps, (provided by others), and all necessary safety functions. Unit shall operate from 480v ,3 phase power, with FLA load of approximately 144.8.4 amps. Provide unit electrical power disconnect with locking enclosure hinged cover.

- F. Manufacture's trained technicians shall provide unit start up. All involved contractors shall coordinate start up with manufacture's trained technicians. Unit scheduled for Commissioning.

2.20 GLYCOL FEED SYSTEMS

Provide two glycol feed system which shall include 50 gallon polyethylene mixing tank with hinged polyethylene cover. Tank shall be supported by carbon steel bottom mount stand, painted with enamel. NEMA 4x control panel with H/O/A switch, 8 ft. 120v power cord, gear pump, bottom mount, pressure switch, pressure relief valve, suction valve with strainer, and 3/4" outlet. J.L. Wingert Co., model GL50-E1 or Skidmore S-55-100-2-PEPS.

2.21 BOILER / BURNER PACKAGE: BLR #1 & 2

- A. Provide HW boiler(s) with burner(s) as shown on plans. Viessmann Vitocrossal 2000, C12 series. No approved equals. Condensing type, LP gas fired; Gross input 2000 MBH, Net output 1940 MBH, CSA thermal/combustion efficiency of 96.5%. Two Boiler(s)/burner(s) packaged assembly shall be started up by approved factory representative.

Standard Equipment:

- * Pre-piped / pre-wired
- * Insulated metal jacket enclosure
- * Boiler / Burner pre-mounted on factory steel frame
- * Taco or B & G HW individual pumps
- * Individual Control Assembly
- * Digital Cascading Boiler Control Panel
- * Manual reset, Hi-Limit control
- * ASME and National Certified

BURNER: Manufactured by Viessmann, integrated in boiler, electric ignition, with maximum firing rate of 90.0 gph, LP fuel. Boiler / Burner control circuit power by 120 volt, 60hz, 1 phase, FLA = 2.3 amps per assembled package. Condensate flow rate 5.5 gph. Provide condensate neutralizing drain kit and combination 8" dia. Common vent/flue to accommodated both boilers. Burner shall be started by approved factory representative. System scheduled for Commissioning.

2.22 INFLOOR RADIATION FLOOR HEAT

Provide and install infloor radiant hydronic system as shown on plans. Installer must be trained, certified, and experience of type of application. System components shall be manufactured by Uponor, Watts, Zurn. Embassy Pipe tubing; 5 /8" Liquipex as indicated with DIN 4726 compliant diffuser barrier rated for 100 psi and 180 deg. Supply and return manifolds shall be sized 1-1/4", pre-assembled, and mounted horizontally inside 36" x 36" by 6" wall cavity or as detailed. Provide all necessary accessories for a complete installation. Where applicable, supply manifold shall be equipped with valve actuators, auto air vent, shut offs, pressure gauge, and necessary piping and tubing connectors. Return manifolds shall be equipped with flow indicator/adjuster, shut offs, pressure gauge, and necessary piping and tubing connectors. Maximum pipe runs not to exceed 500 ft. with not splices or pipe couplings allowed.

Inlet warm water temperature shall not exceed 140 deg. F. maintained by ATC system. Total flow for each manifold 20.0 GPM for each station.

Radiant Manifold Station #1& 2 shall be provided with 24 volt actuators, one for each zone.

Provide protective pipe sleeves, half couple type, 1/2" wall thickness x 12" l, rubber material for subgrade installation at all concrete expansion and isolation joints. Manufacture: Rubatex. Refer to drawing Architecture Plans for joint locations.

2.23 FIN PIPE RADIATION

FR-1 type: Fin pipe radiation, wall type, shall be Sterling Radiator Manufacturer, Classic Series Style JVK-AR11 slime line profile, Classic Architectural series, R11, 1" IPS, 2-3/4" x 3-3/4" fin, 40 fins per foot, 1 tier, or equal, 630 btu/ LF at 200 degree HWS. Enclosure shall be classic series with return pipe hangers and slide type damper. Enclosure shall have primer coat and standard baked enameled finished approved color by Owner. Provide all necessary enclosure accessories.

FR-2: Fin pipe radiation, pedestal type, shall be Sterling Radiator Manufacturer, Classic Architectural Series Style VB-AR-PM PEDESTRAL profile, model #CS144, 1-1/4" IPS, 4-1/4" square 40 fins per foot or equal, 1020 btu/ LF at 180 degree HWS. Enclosure shall be Classic series. Enclosure shall have primer coat and standard baked enameled finished approved color by Owner. Provide all necessary enclosure accessories.

FR-3 type: Fin pipe radiation, wall type, shall be Sterling Radiator Manufacturer, Classic Series Style JVK-AR20 slime line profile, Classic Architectural series, R11, 1" IPS, 2-1" x 3-3/4" fin, 40 fins per foot, 2 tier, or equal, 1330 btu/ LF at 160 degree HWS. Enclosure shall be classic series with return pipe hangers and slide type damper. Enclosure shall have primer coat and standard baked enameled finished approved color by Owner. Provide all necessary enclosure accessories.

2.24 HW & CW WATER PIPING SYSTEMS

- A. PIPING: All Steam, condensate, HWS & HWR, CWS & CWR piping 2 1/2" to 4" shall be steel schedule 40-ASME 120 pipe with either screwed type Malleable iron fittings, or welded pipe and fittings. Victualic fittings will be acceptable for HW and CW systems. HWS & HWR, and CWS & CWR piping 2" and smaller shall be steel schedule 40 ASME 120 pipe with screwed type fittings or type L copper with sweat copper fittings, acceptable.

Underground Chill Water Piping: Carrier pipe; 2.5" diameter, schedule 40, HDPE jacket, 2.5"-3.5 lbs/cu.ft., closed cell polyurethane insulation, welded Victualic end couplings. Manufacture Rickwell, Thermacor model Ferro-Therm or approved equal.

All piping shall be installed so as to provide allowances for expansion and contraction and shall be thoroughly cleaned and reamed before installation.

- B. VALVES: Gate valves shall be all bronze body, non-rising stem, renewable composite disk, union bonnet, 125 Lb. W.S.P.. Valve body shall be designed such that repacking valve under pressure is possible. With the exception of steam, Shut off valves 2" and smaller may be ball type, inline service (3-piece), bronze, full port, with fiberglass reinforced teflon seats. Acceptable valves shall be : Apollo-3, Watts Series B-6800, Fairbanks No. 0851 "Sphero", Hammond Series BV-811. Shut off valves 2-1/2" and larger shall be cast iron body OS & Y type with rising stem. ITT Grinnell, Fairbanks, Jenkins manufactures are acceptable.

Shut off valves shall be installed on all main and sub main branches and as shown on the Drawings, details and where specified: Provide shut off valves on branch lines and as detailed.

- C. **BALANCING VALVES:** Balancing valves shall be provided for all terminal heating and cooling unit, and branch mains as indicated. The flow measuring device shall have a calibrated orifice, disconnects, chain metal tag-ball valve shutoff with memory locking device. Balancing valves shall be Gerand, or Taco.
- D. **CHECK VALVES:** Check valves shall be 300 lbs non shock type, capable of changing disc without removing valve body. Jenkins, Mueller Muesco 101AP or approved equal.
- E. **AIR VENTS:** Float type air vents shall be automatic and installed at all high points in the system and at the top of each coil and drain valve at all low points. Vents shall be Bell and Gossett Company, Amtrol #706 or equal.
- F. **DRAIN VALVES:** Drain valves shall be installed in all low points in the system and on supply and return connections for chemical cleaning. Drain valves shall be ball type with hose connector and cap and chain.
- G. **STRAINERS:** Provide wye strainers for all hot and chill water coil equipment. Wye strainer shall be 125 lb. iron body, with 20 mesh stainless steel screen, threaded ends or sweat ends.
- H. **PRESSURE GAUGES:** Provide pressure gauges (commercial Grade B) in supply and return connections to each pump. Gauges shall have a scale with a mid-point of approximately 50 psig. Pressure gauges shall be of the 4-1/2" size cast aluminum cases, phosphor bronze bourbon tubes, brass movements, white dial faces with black lettering and adjustable black pointer and brass sockets. Pressure gauges shall be Trerice #6001 or approved equal. All gauges shall be provided with Trerice #872 pressure snubber or approved equal. All pressure gauges shall be equipped with Trerice #865T handle gauge cocks or approved equal. All gauges shall be provided with vibration dampener and shall be as manufactured by March, U.S. Gauge, Weiss and Trerice.
- I. **THERMOMETERS:** Thermometers shall be stainless steel, bi-metal, 5" diameter face adjustable angle, with separable brass sockets, 4" stem length; the range shall be -40 degrees F to 60 degrees F for chill water piping. Thermometers shall be manufactured by Marsh, Weiss, Tel-Tru, Trerice (B85600) or approved equal.
- J. **VIBRATION FLEX JOINTS;** Vibration joints for pumps, AHU coils shall be bronze or stainless steel braid hose type, rated for 125 psi minimum, manufactured by Flexonics PCB series or equal.
- K. **DRAIN VALVES:** Drain valves shall be installed in all low points in the system and on supply and return connections for chemical cleaning. Drain valves shall be ball type with hose connector and cap and chain.
- L. **DIELECTRIC UNIONS:** Dissimilar piping materials: Where there is a junction of two different metallic piping materials, and where electrolysis may occur, provide dielectric unions or companion flanges with non conductive gaskets.

2.25 HANGERS AND SUPPORTS:

- A. Provide all pipe hangers and equipment supports, and be responsible for proper and permanent location. All piping and equipment shall be supported and fastened in a satisfactory manner.
- B. All piping shall be rigidly supported from the building structure by means of approved hangers and supports. Horizontal piping shall be hung with adjustable wrought iron or malleable iron pipe hangers, clevis or roller type unless otherwise specified, spaced as follows:

Pipe Size	Rod Diameter	Maximum Spacing	Hanger Type
3 / 4"	3 / 8"	5'-0"	Clevis
1"	3 / 8"	6'-0"	Clevis
1-1 / 4"	3 / 8"	8'-0"	Clevis
1-1 / 2" & 2"	1 / 2"	12'-0"	Clevis
2-1 / 2" & 3"	1 / 2"	12'-0"	Clevis w/ roller
4" & 5"	5 / 8"	15'-0"	Roller w/ spring

- C. Vertical piping shall have friction clamps on each floor. Vertical pipe risers shall be supported at each floor by friction clamps or inserting around the supply pipe, a coupling which shall rest on pipe sleeve. shall be firmly supported at their base, either by a suitable hanger placed on the horizontal line near the riser, or by a base fitting set on a pedestal or foundation carried down to a firm bearing.
- D. Hangers for piping shall be Carpenter-Patterson No. 1A Bank Type, Grinnell Co., Calco Steel Products Co., or equal, black steel with hanger rods with machine threads. For un-insulated, copper tubing, the hangers shall be copperized. Hanger for use on insulated service lines shall be sized to allow for insulation thickness, except that branch runouts to individual fixtures and water piping within concealed pipe chases shall be supported with split ring hangers attached directly to tubing.
- E. Chain, strap, perforated bar, or wire hangers will not be approved. Approved gang hangers may be used in lieu of separate hangers on pipes running parallel to each other and close together. Where used for copper tubing, the gang hangers shall have copper saddles or shall be sheet-lead coated.
- F. All insulated piping hanger supports shall be provide with hanger insulation protection saddles thickness of the associated pipe insulation. Carpenter & Paterson 350 series.
- G. Pipe and pipe support hanger shall be constructed of the same material such that electrolysis may not occur between hanger, protection saddle, etc. and piping.

2.26 PIPE INSULATION

- A. Unless otherwise noted or specified, insulate all piping conveying heating fluids with pre-molded fiberglass pipe insulation with all service jacket. Insulation average thermal conductivity shall not exceed 0.24 Btu per inch of thickness per square foot per degree F per hour at a mean temperature of 75 degrees F. Fire and smoke hazard for composity insulation (, jacket or facing and adhesive) shall not exceed a flame spread of 25 and smoke developed of 50 per ASTM E84, NFPA 255 and UL 723. Insulation shall be Johns- Manville, FLAME SAFE, AP, Owens-Corning Fiberglass 25ASJ, KNAUF or approved equal.

- B. Insulation thickness for pipe sizes 1 1/2" and smaller shall be 1" thick with white removable protective jack. Insulated Pipe fittings shall match pipe insulation. HW piping 2" and larger shall be insulated with 1-1/2" thick pipe insulation with white removable protective jack.
- C. Condensate waste piping: Insulate with 1/2" thick pre-molded glass fiber insulation or Armaflex and fittings, flanges, valves, etc.
- D. Chilled water piping: provide 3/4" thick Armaflex # AP-2000 closed cell insulation or 1-1/2" high density fiberglass with white removable protective jack. All CWS & R piping, pumps, tanks, fittings, and system cold competent devices shall be insulated. Install per manufacture's recommended procedures.
- E. Steam and condensate: piping 1-1/2" and larger shall be insulated with 1-1/2" thick pipe insulation with white removable protective jack for all piping fittings, flanges, valves,
- F. Exterior Piping: Exterior Piping: Insulation shall be 2" high density, mineral wool pipe insulation with all aluminum, Stocco & Boss 020 removable service jacket. All joints shall have stainless steel wing seals and bands. Insulation average thermal conductivity shall not exceed 0.24 Btu per inch of thickness per square foot per degree F per hour at a mean temperature of 75 degrees F.

2.27 ESCUTCHEONS

- A. Escutcheons shall be installed around all exposed pipe passing through a finished floor, wall, or ceiling. Escutcheons shall be heavy cast brass, chromium plated, adjustable, and shall be of sufficient outside diameter to cover sleeve opening and shall fit snugly around pipe, and lock with set screw.

2.28 SLEEVES:

- A. All sleeves shall be one-piece Schedule 40 steel pipe. The sleeves shall be fitted securely to prevent slipping or moving.
- B. All piping through masonry walls, floors, beams and partitions shall be sleeved. All sleeves shall finish flush with the finish line. All sleeves shall be chalked with an approved water repellent and fire retardant sealant.
- C. Space between sleeves and piping shall be sealed watertight and/or gastight as described below:
 - 1. Un-insulated metal piping shall be sealed watertight and/or gastight by packing space between pipe and sleeve with approved packing. Special care shall be taken not to drive lead below top of sleeve. Mechanical seals may be used.
 - 2. Insulated piping and plastic piping shall be sealed watertight and/or gastight by packing space between pipe sleeve and insulation with an approved packing. Fill the remaining space with approved waterproof resilient adhesive sealant.
- D. Sleeves shall be of size to allow for continuous full thickness of pipe insulation through sleeve.

- E. Provide waterproof sleeve or casting on each pipe entering or leaving building through foundation walls and tank pits, or wet wells. Seal space between each pipe and its waterproof sleeve. Each end of sleeve shall be sealed as described above. Each pipe shall be concentric with sleeve. Sleeves shall be waterproof type with welded or cast flange and of size and length to suit pipe and wall thickness. Sleeves shall be all galvanized after welding.

2.29 PIPE IDENTIFICATION:

- A. Provide color coded pipe identification markers on all piping in the building installed under this Section. Pipe markers shall be semi-rigid plastic identification markers equal to "Set Mark" Type "SNA" by Seton Nameplate Corporation or equal.
- B. Provide an arrow marker with each pipe content marker to indicate the direction of flow. If flow can be in either direction, use a double headed arrow marker.
- C. Piping shall be labeled at 20 foot intervals, adjacent to each valve, on each riser. This work shall be done after architectural finish painting where such is required on the pipes.
- D. The following color coding shall be used with names in black letters on backgrounds indicated:

<u>Service</u>	<u>Legend</u>	<u>Background Color</u>
Heating HWS	Heating HWS	Yellow
Heating HWR	Heating HWR	Yellow
Chilled Water Supply	CWS	Yellow
Chilled Water Return	CWR	Yellow

- E. In general, 3/4 inch high legend shall be used for pipe lines.
- F. All markers to be OSHA approved.

2.30 VALVE TAGS AND CHARTS:

- A. All valves on pipes of every description have neat circular 1 1/2 inch brass valve tag attached with brass chain to each valve stem. Stamp on these valve tags in white letters as large as practical the number of the valve and its service, such as "H.W.", "C.W." for hot water and cold water respectively. The number of each service shall be consecutive.
- B. Valve numbers shall correspond to numbers indicated for valves on the record Drawings and on two printed detailed lists. These printed lists shall state the numbers and location, including the painted door room number, the location in the room (with location dimensions if concealed), of each valve and the fixture or group of fixtures which it controls, and other necessary information, such as requiring the opening or closing of another valve or valves, when any one valve is to be opened or closed.
- C. The printed lists shall be prepared in a form to meet the approval of the Architect and Owners. Record lists shall be includes as part of O & M manuals.

- 2.31 LP GAS PIPING; Provide and install (4) 1000 gallon U.G. LP gas tanks and piping systems as indicated on plans. Contractor is to coordinate with local gas utility company(s) for the LP gas tanks and piping systems. Provide underground LP gas piping to Mechanical Room 237 and Generator as shown on plans, details and per Dead River installation recommendations. All above ground LP Gas piping shall be schedule 40, A120, sch. 40 steel pipe with M.I. pipe fittings. All underground piping shall be sleeved or encased properly as recommended.

All piping shall be piped and installed in accordance with NFPA 54. All interior and exterior above ground gas piping shall be painted with one primer and one coat yellow acrylic. Piping system shall be tested at 1-1/2 times the working pressure, but not less than 50 Psi before LP gas piping is placed in service. All leaks shall be repaired in a manner.

2.32 DUCTWORK

Low pressure ductwork shall be defined as ductwork subjected to velocities of 2000 fpm or less, and operating pressure of 2" w.g. or less, positive or negative. Medium pressure duct is defined as ductwork subjected to velocities 2000 FPM and up and operating pressure of 6" positive static pressure.

Duct Pressure-Velocity Classification is as follows:

<u>System</u>	<u>SP Rating</u>	<u>Pressure</u>	<u>Seal Class</u>	<u>Velocity</u>
VAV Supply Ducts	6"	+ Pos.	A	2000 FPM UP
VAV Return Ducts	2"	Pos. or Neg.	B	2000 FPM DN
All other ducts	2"	Pos. or Neg.	B	2000 FPM DN

All supply air ductwork from DOAS-G & DOAS-1, to VAV boxes shall be considered medium pressure, class A ductwork construction. Ductwork serving all other air handling equipment shall be considered low pressure, class A ductwork construction.

2.32a DIMENSIONS

1. The size of ducts marked on the drawings are clear area and will be adhered to as closely as possible. The right is reserved to vary duct sizes to accommodate structural conditions during progress of work with-out additional cost to Owners. Duct layout is schematic to indicate size and general arrangement only. All ducts shall be arranged to adjust to "field conditions" Sheet Metal Contractor shall coordinate work with Electrical Contractor and other trades.

The duct sizes shown indicate the clear inside dimensions.

2.32b DUCT LEAKAGE

1. All ductwork shall be sealed as outlined in the HVAC Duct Construction Standards Metal and Flexible by the Sheet Metal and Air Conditioning Contractors National Association, Inc. (Hereafter referred to as SMACNA HVACDS). All ductwork shall be sealed to a minimum of class A as outlined in the manual.

2. All medium duct systems shall be sealed as required to provide no more than 5 percent of the total system capacity and tested by an independent agency. All ductwork joints, seams, fittings, etc. shall be sealed with two coats of an asbestos-free mastic sealant. Foster - Monolar Mastic or equal. Test each medium pressure duct system as outlined in paragraph 2.26 Testing, Balancing, & Adjusting of this Section.

2.32c DUCTWORK:

1. Ducts shall be constructed of galvanized steel in accordance with high and low pressure duct construction standards specified by SMACNA "HVAC Duct Construction Standards-Metal & Flexible, 3rd Edition, 2005. All ductwork shall be constructed of quality materials. All gauges, reinforcing, longitudinal and cross joints, elbows, transitions, hangers, access panels, volume dampers, etc., shall be as shown and specified in the Sheet Metal and Air Conditioning Contractors' National Association, Inc.'s "Duct Construction Standards" under the classification of 2" w.g. (+,-). Provide access panels into ducts at all coils, automatic dampers, controls, instruments, filters, valves and equipment not easily accessible. Provide manually operated volume control dampers in all duct run-outs to ceiling diffusers. Locate all ductwork to miss all field obstructions, including all piping, conduits, beams, bar joists, etc. Elbows shall be square type with turning vanes. Support ductwork with approved strap hangers fastened to side and bottom by sheet metal screws and to building with leak expansion plugs or other approved means. All framing angles shall be provided by this contractor. All duct runs shall be coordinated with existing conditions and approved by the Engineer.
2. Fittings: Square elbows, round elbows, fittings, branch take-offs, transitions, duct volume dampers, fire dampers, flexible connections, and access doors shall conform with the SMACNA HVACDCS, Section 2.
 - a. Rectangular branches shall be 45 degree take-offs and conical or bellmouth take-offs shall be used for round branches. (Each branch line shall have a Volume damper installed.)
 - b. Round Elbows: Provide 45 degree and 90 degree elbows of 2 piece die stamped construction for ducts 8 inches or less in diameter. For ducts over 8 inches in diameter, provide 5 mitered piece for 90 degrees and 3 mitered piece of 45 degrees.
 - c. Round and Oval Ducts: SMACNA HVACDCS, Section 3. Rectangular Ducts: Make joints between sections of duct and between ducts and fittings with either gasketed flanged connection, welded flange joints, or other joints recommended in SMACNA HVACDCS Section 1, and reinforce at the joints and between the joints as recommended.
 - d. Flexible round duct: flexible insulated duct shall be permitted for supply air devices and shall have glass fiber reinforced foil face vapor barrier facing. Flex runs shall not exceed 5 feet.

3. Dampers

Balance / Volume Dampers: unless otherwise noted, all manual Balancing dampers shall be pre-manufactured, constructed of formed steel a minimum of #16 gauge and stiffened as required for pressure class, OBD type. Acceptable manufacture Ruskin series MD 25 and MD 35. Do not use splitter dampers. Shop manufactured dampers will not be excepted.

Control / Mixing Dampers: unless otherwise noted, all control and air mixing dampers shall be pre-manufactured, constructed of formed steel a minimum of #16 gauge and stiffened as required for pressure class, opposed blade type, and neoprene edge seal. Acceptable manufacture Ruskin series CD60 for rectangular and CDR25 for round damper configurations.

Exterior OA / EA Dampers: unless otherwise noted, all outside and exhaust dampers that is associated with ductwork penetrating to the exterior shall be pre-manufactured, insulated, damper, constructed of formed aluminum a minimum of #12 gauge and stiffened as required for pressure class, opposed blade type, and EDPM edge seal. Compete blade shall have an insulating factor of R-2.29 with temperature index of 55. Acceptable manufacture TAMCO, series 9000 for rectangular and CDR25 for round damper configurations.

4. Flexible Connectors

- a. Furnish and install flexible connections on all air handling unit and exhaust fans equipment. Connections shall be made from Ventglas neoprene coated glass fabric, as furnished by Ventfabrics, Inc., or equal.
- b. Materials: Interlocking spiral or helically corrugated type constructed of zinc-coated steel, corrosion-resistant steel, aluminum, or noncollapsible fire-retardant, woven mineral fabric.
- c. Joints: Make airtight slip-joints, seal with pressure- sensitive vapor-seal adhesive tape or duct-sealer, and secure with sheet metal screws. To prevent insulation compression place 2-inch wide by one-inch thick closed cell foam plastic spacers over the joints under vapor barriers. To provide a vapor tight joint, use a corrosion-resistant steel or aluminum clamp over such spacers.

2.32d DUCT INSULATION

- A. Unless noted otherwise or indicated on plan, all low and medium pressure supply ductwork shall be insulated with 2" of fiber glass wrap insulation with aluminum vapor barrier. All low pressure return and exhaust ductwork shall be insulated with 1-1/2" of fiber glass wrap insulation with aluminum vapor barrier.
- B. All low and medium pressure supply and return ductwork, located in unheated areas, (unless noted otherwise or indicated on plan), shall be insulated with one layer of 1.5" high density fiberglass duct board with aluminum vapor barrier and thermal conductivity R-value of not less than R = 7.0/inch. All seams taped properly.
- C. All exhaust and fresh OA air ductwork from its associated air handling device to its respective exterior louver shall have one layer of 1" high density fiberglass duct board with thermal conductivity R-value of not less than R = 7.0/inch. All seams taped properly.
- D. All insulated duct fiberglass wrap insulation with foil faced vapor barrier, Owen-Corning type 150 insulation. Flexible insulation shall have glass fiber reinforced foil face vapor barrier facing, Owens- Corning Fiberglass EK FRK-25, or approved equal. Insulation maximum thermal conductivity shall be 0.24 Btu/in/hr/SF degrees F at 75 Degrees F mean temperature. Fire hazard classification shall not exceed a flame spread of 25 and smoke developed of 50 per ASTM E-84, NFPA 255 and UL 723. Insulation shall be Johns-Manville, Flame Safe, AP, Owens- Corning, Knauf, or approved equal.

- E. All ductwork which is indicated on plan or scheduled for acoustical liner shall be environmental approved and have the following characteristics: Liner to exceed ASTM C 1071 for surface burning, temperature resistance, moisture absorption, erosion resistance, corrosiveness, and bacteria and fungi resistance. Liner shall be flexible polyimide foam coated with an acrylic polymer. Thermal Conductivity (k); .30(btu-in)/(hr-sq. ft-F), R-value / inch; 3.3 (hr-sq ft-F)/(btu), Surface burning; flame spread<25, Temperature resistance; ASTM C 411 Pass, Water vapor sorption; < 2% by weight, Fungi / bacteria resistance; no growth, Density; .80 lb/sq. ft. Solcoustic Duct Liner or approved equal. 1" thick. Ph. 972-516-0702
- F. Exterior Duct Insulation: All exterior ductwork shall be insulated with two layers of 2.0" high density fiberglass duct board with EPDM rubber membrane weather barrier, white in color, and thermal conductivity R-value of not less than R = 7.0/inch. All seams taped properly.

2.32e DUCT ACCESS DOORS

Hinged insulated access doors with seals shall be provided in ducts where indicated on drawings, or as required. Provide access panels for all equipment installed in ductwork such as motorized dampers, reheat coils, turning vanes (up stream) Units shall be provided at each fire damper unless accessible through grilles and as shown on drawings. Doors equal Ruskin ADH series. Size: duct size or 12"w x 12"h min.

2.32f MOTOR OPERATED DAMPERS & LOUVERS

Motor operated control dampers mounted in duct shall be provided by Temperature Control Contractor, but installed by Sheetmetal Contractor.

2.32g DUCT SLEEVES

Provide galvanized duct sleeves through outside wall at all locations as shown on drawings. 20 gage minimum. Where sleeves are installed in bearing walls, provide structural steel sleeves.

2.33 DIFFUSERS, GRILLES, REGISTERS

Diffusers/Grilles/Registers type: Shall be Price series or approved equal. RG & D's shall have square inlet and be T-bar and surface mounted where applicable.

- A. Supply Diffusers and Grilles: Diffusers shall have a full face pattern controller, two, three and four way pattern as indicated: Provide adjustable air pattern cones.

S-1 Type: 8" inlet, 24"x24", Series SCDA, T-bar, Price # SCDA, 4 cone
S-2 Type: 10" inlet, 24"x24", Series SCDA, T-bar, Price # SCDA, 4 cone
S-3 Type: 12" inlet, 24"x24", Series SCDA, T-bar, Price # SCDA, 4 cone

- B. Supply air grilles(Holding Area): Price series MSD with steel horizontal front security bars and center deflection core with standard white finish. Grilles shall be surface mount where and 2 way and 4 way air pattern where applicable.

S-4 Type: 15" w x 15"h grille, surface with OBD and B12 finish.

- C. Supply Grilles: Grilles shall be architectural linear bar type, aluminum constructed and anodized white finish. Provide the following options; linear straighten grid, hinged access doors, OB damper Price #LBMH 26B, 1/2" bar spacing, and 3/4" border frames.

SG-1 Type 12" w x 8" h inlet grille, horizontal bars, 15 degrees, OBD

- D. Supply Slot Diffusers, SD-1 Type; coated steel 24 gauge, black extruded aluminum deflector, full 180 deg. adjustable air pattern. Diffusers shall be equal to JS series by Price or equal from Anemostat, Krueger or Titus.

SD-1 Type: JS-4" w x 24" l with insulated box, 1 slot & 6" dia. connector

- E. Supply Slot Diffusers, SD-2 Type; coated steel 24 gauge, black extruded aluminum deflector, full 180 deg. adjustable air pattern. Diffusers shall be equal to JS series by Price or equal from Anemostat, Krueger or Titus.

SD-2 Type: JS-4" w x 48" l with insulated box, 1 slot & 6" dia. connector

- F. Return air grilles and registers: Price 600 series with aluminum fixed louvers, 45 degrees 1/2" blade spacing with opposed blade damper or approved equal, standard white finish. Grilles and registers shall be surface mount where applicable.

R1 Type: 12" w x 12" h grille, surface

R2 Type: 24" x 12" grille, drop in

R3 Type: 24" w x 24" h grille, drop in

R4 Type: 24" w x 48" h grille, drop in

R5 Type: 12" w x 12" h grille, Detention Type, Price MSBL, surface mount, OBD

RG1 Type: 12" w x 8" h grille, wall surface mount

- G. Return Grilles: Grilles shall be architectural linear bar type, aluminum constructed and anodized aluminum finish. Provide the following options; linear straighten grid, OB damper Price #LBPH 26B, 1/2" bar spacing, and 3/4" border frames.

RG-4 Type 48" w x 28" h inlet grille, horizontal bars, 15 degrees, OBD

- H. Exhaust air grilles and registers: Price 80 series with aluminum 1/2 x 1/2 x 1/2 squares with opposed blade damper or approved equal, standard white finish. Grilles and registers shall be surface mount where applicable.

E-1 Type: 10" w x 10" h grille, surface 80 series

E-2 Type: 10" w x 10" h grille, surface, Detention Type, Price MSBL, OBD

E-3 Type: 12" w x 12" h grille, surface 80 series

- I. Transfer air grilles : Krueger EGC-5 series with aluminum 1/2 x 1/2 x 1/2 squares without opposed blade damper or approved equal, standard white finish. Grilles and registers shall be surface mount where applicable.

TG-1 Type: 12 "x 12" grille, T-bar

2.34 FIRE DAMPERS:

Install as indicated on drawings fire dampers with fusible link. The damper shall be curtain type which will allow clear free area to be the same as duct size and have a minimum fire rating of 2 hour, UL listed. Rectangular Greenheck model #FD 203 type A or approved equal. Each fire damper shall adequate access for servicing, 12" x 12" minimum.

2.35 OUTSIDE AIR LOUVRES

Provide outside intake and exhaust louvres as shown on drawings. General Contractor shall install louvres. Frame shall be constructed of aluminum, 6" deep with fixed aluminum blades, blades set at 37 deg. angle. Blade style shall be drainable type. Louvre shall have 1/2" mesh bird screen and be licensed by AMCA. Ruskin or approved equal. Finish shall be anodized color approved by architect. Provide finish wall collar trim to match louver.

LV-1 & 2: 48"w x 36"h, fixed blade
LV-3, 5 & 6: 36"w x 24"h, fixed blade,
LV-4, 7 & 8: 24"w x 36"h, fixed blade,

Contractor shall coordinate installation with General Contractor.

2.36 ROOF FRESH AIR & EXHAUST HOODS : RV-1, 2, & 3

Provide fresh air and exhaust roof hoods, with 18" high pitched roof curbs as shown on plans. RV-1, 2, & 3; L.Cook Model #TRE series with 36" x 60" throat, 18" high, six tier, with sizes and free area of 15 sq. ft.as scheduled on plan M-2.1.

Hoods shall have bird screen and colored aluminum anodized finish. Color shall be approved by architect. Provide manufacture's prefabricated insulated roof mounted curb to match manufacture's hood. Penn or Acme acceptable manufactures, equivalent equipment subject to approval.

2.37 METAL CHIMNEY BREECHNG

- A. BREECHING: Provide necessary breeching flue and combustion air piping & fittings as shown on plans. Breeching flue maybe constructed of 11 ga. Minimum 316L stainless steel. Provide end cap clean outs and make tie in connections shall be at a 45 degree angle. Provide one layer of 1" thick calcium silicate, asbestos free, insulation block with one 1/2" minimum thick calcium silicate cement. Material shall have an operating range up to 1200 degrees F. Approved manufacture, Owens Corning, Kaylo 10, or approved equal. Apply finish coat of approved white paint on final insulation covering.

Alternative flue venting method maybe use consisting of manufactured metal products by Jeremias or PVC/CPVC products manufactured by Centrotherm.

Boiler Combustion air: approved manufactures Centrotherm and Jeremias. Field installed rectangular combustion air main ductwork with 1" ridge insulation board may be used.

2.38 TESTING, BALANCING, & ADJUSTING

2.38.1 SUMMARY:

Testing, adjusting, and balancing shall include all constant and variable volume air systems and water hydronic systems, including domestic hot water returns.

2.38.2 SUBMITTALS:

Within 30 days of Contractor's Notice to Proceed, submit qualifications of TAB company. If not submitted within time frame specified, the Engineer reserves the right to choose a alternative TAB agency at the Contractor's expense.

Within 60 days of Contractor's Notice to Proceed, submit 1) Strategies and Procedure Plan, 2) System Readiness Check lists, 3) Examination Report, 4) Preliminary Project Example Report, specific to project, 5) Equipment to be used with calibration dates, and 6) Supervisor and field names.

2.38.3 QUALIFICATIONS:

- A. Qualifications: Test and balance agency shall be an independent agency specializing in the testing and balancing of HVAC systems. The agency must have a minimum of five years business, experience and be staffed with qualified personal. TAB agency shall be a State of Maine operated and owned Maine business.
- B. System testing shall be performed by NEBB or AABC certified technicians with a minimum of five years experience, or directly supervised by a qualified Heating and Ventilating Licensed Engineer fully employed by the TAB agency. All work shall be per National Environment Balance Bureau (NEBB). Agency shall be subject to approval before any testing is performed.

2.38.4 CONTRACTOR RESPONSIBILITIES:

- A. Mechanical Contractor shall provide one complete set of construction documents, addendums, approved submittals in hard copy as well as digital format.
- B. A.T.C. contractor shall provide required BMS hardware, software, personnel and field assistance for performing TAB procedures.
- C. Provide access to volume dampers, test ports, equipment, devices, etc.
- D. All HVAC systems shall be complete operational status before testing is started.

2.38.5 EXAMINATION:

- A. TAB agency shall be familiar with all project mechanical and associated electrical system equipment and components, along with the intent system design concepts. Examinations and standard pre-balance preparations shall be completed of all scheduled equipment and systems before testing.

2.38.6 GENERAL PROCEDURES FOR TAB:

- A. Perform TAB on each system according to the procedures in the latest edition of NEBB or AABC for air and hydronics.
- B. All devices that are considered field adjustable shall be field indicated or marked such that permanent identification of final setting.

C. Air Equipment: Provide the complete balancing and adjusting of all air moving equipment and systems including, but not limited to:

1. Adjusting fan speeds including res-heaving if required for all AHU's and fans.
2. Test and record all motor currents and nameplate data.
3. Test and adjust each diffuser, grille and register to within 5% of design requirements. Method of testing shall be to NEBB or AABC standards.
4. List design and measured air velocities and quantities, fan speeds, static pressures, and motor amperage.
5. All air moving equipment shall be tested at maximum operating status via motor starter or VFD.
6. Provide measured temperature and quantities of return air and supply air for all AHU VAV box coil units.

D. Hydronic Equipment: Provide the complete balancing and adjusting of all hydronic equipment and systems including, but limited:

1. Set water flow for CUH's, FR base board, VAV & RH coils, etc., as scheduled.
2. Test and adjust flow at each balancing flow device unit.
3. List design and measured flows and temperatures.
4. Operate all hydronic pumps at maximum flow capacity in respect to motor horse power.

E. Duct leakage tests: (DOAD-G & DOAS-1 Supply Ductwork & Mail Room Exhaust Ductwork)

Provide duct leakage test for all medium pressure duct in accordance with SMACNA HVAC air duct leakage Test procedure. Sheetmetal contractor shall provide duct caps for all tests. Coordinate and schedule tests with all trades.

F. Sound Testing:

Provide complete sound testing of all water and air handling equipment systems including but not limited to:

1. Test each area where DOAS's, AHU's, & FCU's are present overhead where there are roof mounted above, operating at maximum design capacity. Tests shall be conducted in accordance with NEBB Procedural Standards for Measuring sound and Vibration with approved sound measurement equipment and octave filter set. Sound pressure recordings shall be taken within octave bands 63 hz and 8000 hz.

2.38.7 TOLERANCES

A. Air System air flow tolerances: Supply, return, exhaust	plus / minus 5%.
B. Outside minimum	zero to plus 5%
C. Pressure relationships	plus / minus 3%
D. Hydronics HW, CW, DHWR	plus / minus 10%

2.38.8 COMMISSIONING:

- A. Commissioning: The TAB Agency shall be responsible to pre-commission the sequence of ATC operations and devices and all HVAC equipment. TAB agency shall schedule and arrange meetings and procedures with the ATC and Mechanical contractor. HVAC and ATC operations and sequence short falls shall be reported to Mechanical Contractor and Engineering. Deficiency reports formatted similar to commissioning protocol standards BBCC or ACG shall be received. Final commissioning shall be completed by Owner's Commissioning Agency. TAB Agency shall allow time for final Commissioning of involved systems.

2.38.9 FINAL TAB REPORT

- A. Test and balance agency shall submit a final TAB Report, five copies, of a complete record of the HVAC system and equipment performance. All remaining and outstanding deficiencies shall be included. All final operating field settings shall be documented for Owner's Maintenance personnel. The Owner's Representative has the right to reject the final TAB report if independent field measurements do not agree with more than 10% of recorded final reported data. In such an event, TAB services shall be re-performed either by the same TAB agency to the Engineer's satisfaction, or the Engineer reserves the right to choose an independent third party to accomplish such re-balancing at no additional costs to the Owner.

2.39 AUTOMATIC TEMPERATURE CONTROLS

A. General: Building Management System (BMS)

Furnish and install a complete DDC automatic temperature control system, BMS, by Siemens; Maine Controls, or Trane, which shall be connected to, monitor, and control all HVAC equipment, by means of a Building Management System (BMS), to provide the sequences as described in these specifications. The system general components shall be consistent with Network I/A series direct digital control devices, electric, electronic solid state, or a combination of the above, and shall include required components including, low voltage (24 V) and line voltage wiring. It is the intent that the BMS shall be provided with color graphic screen/monitors for all systems herein specified. Pneumatic will not be accepted.

B. DDC System

The Direct Digital Control System, (DDC), referred to as BMS or BAS, shall be an integrated distributed processing network of stand-alone controllers that incorporate seamless Direct Digital Control technology. The DDC will network digital control panels for the following equipment; boilers, pumps, air handling units, fan systems, heat recovery units, and related mechanical equipment.

Each microprocessor based digital controller must maintain its programmed memory in a non-volatile state, this non-volatile memory shall 'keep' its programmed information without the use of a battery when power is unavailable.

The intent of this specification is that all BMS/BAS components and related temperature control components, specified elsewhere, shall be manufactured by the same vendor. Related temperature components are items such as: sensors, transducers, control valves, relays, panels, thermostats, actuators, etc.

C. System Guarantee:

The entire control system shall be guaranteed for parts and labor a period of one (1) year from the date of acceptance by the Owner.

D. Diagrams and Supervision:

Provide any necessary wiring or piping diagrams and supervise the installation. These diagrams shall be incorporated into the Owner and Operating Manuals.

E. Control Panels & Locations:

In general, relays, transmitters, controllers, transformers, or other control devices (not including room thermostats) shall be grouped and mounted in a factory- built cabinet enclosure located in the Mechanical/Electrical Room(s) or as indicated on plans.

Locations system access monitors shall be located in Mechanical Rooms 014 & 237, Maintenance Room 003 and Marshal Room 241, (limited lighting control only).

F. Wiring:

It is the intent that all control wiring for installation of temperature controls shall be provided and installed by the Automatic Temperature Control Contractor, unless noted otherwise. Power wiring for HVAC equipment and wiring for smoke detectors shall be by Electrical Contractor. All wiring shall comply with requirements of Electrical Section 16000 of the specification.

G. Automatic Control Valves:

Automatic control valves shall be full line size and 2- way or 3 - way valves, as indicated on plans or details, and shall be two position or modulating, normally closed or open type, determined by sequence, capable of being manually opened or closed through controller. Ratings: 250 degree F, 125 psi, Material: bronze or brass body, threaded or flanged ends.

H. Transmitters

It is the intend that transmitter/sensors be used throughout for all HVAV equipment CUH's and UH's, and VAV boxes, etc..

Each transmitter shall be located as shown or where it will respond to the average space temperature if not indicated on prints. Transmitters shall be mounted approximately 48" above finished floor on interior walls or surfaces, not on outside walls. It is the intent that each zoned terminal heating or cooling device, in all areas, be independently controlled by its respective wall transmitter. Areas of high abuse, transmitters shall be protected with metal die cast guards.

2.39.I Scope of Work

1. Provide and install new system BMS hardware & software and graphics system with new BACnet-IP controls systems and provide BMS controls for the new 64,000sqft. facility.

2.39.I.1 BMS Open System Design and Qualifications

1. Open System Design: It is the owners expressed goal to implement an open Building Automation System that will allow products from different manufacturers and/or suppliers to be integrated into a single unified system in order to provide flexibility for expansion, maintenance, and service of the system. The BAS manufacturer / contractor must provide proof of open system design as outlined below.
2. Prior to award of the contract the BAS contractor is to provide proof of "Open System Design" with the following requirements:
 1. Provide proof of having a local office within 50 miles [80 km] of project for at least 5 years, staffed by trained personnel capable of providing installation, engineering, programming, servicing, commissioning, instruction, routine maintenance, and emergency service on systems.
 2. The controls system shall utilize the Niagara4 software framework.
 1. The Contractor shall have a minimum of 2 years' experience in the sales, installation, engineering, programming servicing and commissioning of Niagara4.
 2. Submit the Niagara Compatibility Statement (NiCS) via a letter from the manufacturer. The NiCS shall have no connectivity restrictions and all aspects of the Niagara Framework will be provided to maintain an Open System Design. The System as provided shall confirm with the following NiCS properties (Station Compatibility In, Station Compatibility Out, Tool Compatibility In, AND Tool Compatibility Out shall each have a value of "All").
 3. The controls system shall conform to the following guidelines for communication protocols.
 1. BACnet shall be used for all BAS provided controllers.
 1. The manufacturer of the hardware and software components as well as its subsidiaries must be a member in good standing of the BACnet International and all controllers used shall be BACnet Listed with documentation on the BACnet website (<https://www.bacnetinternational.net/btl/search.php>)
 2. The use of BACnet Communications protocol alone shall NOT warrant an "Open System Design." Manufacturers must adhere to all aspects of "BAS Open System Design and Qualifications" and "Acceptable System Manufacturers" sections to comply.
 2. Modbus shall only be acceptable for third party devices.
 3. Proprietary communications protocols shall NOT be acceptable.

4. A software programming tool shall be provided for this project and adhere to the following guidelines:
 1. All software tools needed for full functional use, including programming of controllers, Niagara4 Framework network management and expansion, and graphical user interface use and development, of the BAS described within these specifications shall be provided to the owner or his designated agent.
 2. The software programming tool shall be free of charge and openly available for download from the internet.
 3. For any manufacturer that does not have a free programming tool the manufacturer must provide the tool with this project for a minimum of 5 years with proof of availability via letter from the manufacturer.
 4. Any licensing required by the manufacturer now and to the completion of the warranty period, including changes to the licensee of the software tools and the addition of hardware corresponding to the licenses, to allow for a complete and operational system for both normal day to day operation and servicing shall be provided.

PART 2 - PRODUCTS

2.39.J.1 Acceptable System Manufacturers and Contractors

1. Provide a building automation system supplied by a company regularly engaged in the manufacturing and distribution of building automation systems for a minimum of 5 years.
2. The manufacturer of the hardware and software components shall have a technical support group accessible via a toll free number that is staffed with qualified personnel, capable of providing instruction and technical support service for networked control systems.
3. BACnet/IP communication protocol must be used for all BAS manufacturer provided controllers (including terminal devices such as VAVs, FCUs, etc.) – use of MSTP field controllers will be prohibited.
4. Any approved manufacturer that can supply both equipment and controls must provide controls pricing separately from equipment pricing.
5. Acceptable Manufacturers
 1. Siemens Controls
 2. Maine Controls
 3. Trane
6. All other manufacturers/contractors besides the “Basis of Design” manufacturer (including those listed above) must submit a compliance matrix outlining “C – Comply”, “D – Does Not Comply”, and “E – Exclude” for the entirety of the 230900 and 230993 sections prior to bid award.
 1. Being listed as an approved manufacturer/contractor does not preclude the bidder from meeting all aspects and requirements of this specification.

2. Those bidders not prequalified prior to review of bids will not be considered responsive. To be prequalified a bidder must be accepted to bid the project by the engineer either by a bid addendum or documented RFI response from the engineer. No other pre-qualifications shall be acceptable.

2.39.J.2 Quality Assurance

7. All new building automation system products on this project shall be provided by a firm that is a registered ISO 9001:2015 manufacturer, for a minimum duration of 5 years, at time of bid.
8. The BAS system labor and materials shall be warranted free from defects for a period of 1 year(s) after final commissioning and owner acceptance.

2.39.J.3 BMS Controllers

9. All controllers on the job shall have the following minimum requirements:
 1. IP Communication (BACnet/IP)
 1. BACnet/IP communication protocol shall be used for all BAS manufacturer provided controllers (including terminal devices such as VAVs, FCUs, etc.)
 2. 2 - RJ45 ports each capable of supporting 10/100 Base-T.
 1. Supporting controller daisy chaining on the Ethernet network via integral switch functionality.
 2. Integrated fail-safe should allow for communication when the controller is powered down.
 2. Each individual controller shall have an embedded web-based HTML5 visual interface with the following functionality without reliance on any other controller for access:
 1. Typical and custom control processes
 2. Scheduling
 3. Energy management applications
 4. Alarm management applications
 5. Historical/trend data for points specified
 6. Maintenance support applications
 7. Graphical interface
 3. Any software required for programming shall be unlicensed and openly available
 4. Auto commissioning features shall be available for VAVs and FCUs to schedule automatic testing and record values (air flows, pressures, temperatures, etc.) for different operating modes. The auto commissioning feature shall be able to email reports and run commissioning on a specified schedule.

2.39.K. SEQUENCE OF CONTROLS:

2.39.K.01 PUMP CONTROL: BMS

HWP-1 & 2 (Building), HWP-3 & 4 (Boiler 1 & 2 and HPLG-1 & 2): H.W. circulating pumps shall be controlled on/off based upon outside temperature & terminal heating unit function. A "hand- off-auto" switch shall be provided for each pump. In the "hand" position, the pump shall operate continuously. In the "auto" position, the pump shall be under control of the BMS controller and shall run continuously to maintain discharge pressure when the outside air temperature is below 65 degrees F (adj.) and on system heating demand. Pumps shall alternate from active to standby once every week. If lead pump does not prove flow, lag pump shall be started. Each pump drive motor VFD RPM speed shall be controlled, 0 to 10vdc, based upon HW heating demand load. Minimum and maximum pump RPM shall be field determined by TAB Agency.

CWP-1 & 2 (Building), CWP-3 & 4 (HPLG-1 & 2): Chilled water circular pump(s) shall run continuously during occupied periods and when OA enthalpy is above 20.0 Btu/lb. allowable economy cooling during system mechanical cooling demands. Pumps shall be de-energized during unoccupied periods.

When 1st stage of water flow is proven by differential pressure switch, HPLG-1 (1st stage) shall be energized to maintain 42 degree F water temperature. When 1st stage of cooling is in adequate to maintain HVAC equipment AHU, DOAS, FCU discharge air temperature, 2nd stage pump stage shall be activated, along to follow 2nd stage HPLG-2 cooling.

Manufacture's unit controls shall control compressors, fans, safety controls devices, etc.. BMS shall monitor all point functions of Chiller unit using manufacture's interface hardware and software including network communications BACnet software.

All circulating pumps CWP-1, 2, 3, & 4 shall be provided with VFD's.

Boiler jockey pumps CP-J1 & J2 Circulator: Pumps shall be controlled on/off based upon boiler activity schedule and heating demand.

CP- DHWR 1 Circulator: Pumps shall be controlled on/off based upon occupied schedule. BMS to control & monitor DHWS temperature with Hi alarm.

CP-1 & 2 Radiant floor HW pump: Pumps on/off based upon occupied schedule & space temperature, 65°F, adjustable. BMS to control & monitor temperature with low alarm.

2.39.K.02 H.W. BOILER/BURNER: BMS

A complete Master control set of factory installed operating and safety controls shall be properly installed, checked, and calibrated to protect the unit from abnormal operating conditions. All safety controls shall be manual reset type. BMS shall monitor each boiler for common trouble alarm provide lead/lag/standby rotation for equal operating periods.

2.39.K.03 HWS RESET BMS

The BMS control system, provided by ATC, shall sense the common supply hot water temperature and shall control to maintain required boiler reset hot water set point by means of energizing/de-energizing lead burner controls. Reset water temperature schedule shall be determined by O.A. temperature. Minimum HWS temperature set point shall not be less than 140 F, adjustable.

2.39.K.04 CABINET & UNIT HEATERS (CUH 1 - 5) / UH-1, 2, 3 & 4 BMS

CUH's and UH's fans shall be energized when wall stat calls for heat and associated HWS 2 way valve, pipe mounted aqua-stat confirms water temperature above 120 F. When space temperature is satisfied, fan shall be turned off. Provide CUH on BMS schedule. UH will not be on time schedule.

2.39.K.05 POINT OF USE DHW HEATERS: BMS

Provide BMS schedule occ/unocc. control. Interlock control with associated HWP-DHWR pump.

2.39.K.06 RADIANT PANEL & FIN RADIATION: BMS

Provide one spring return, two position actuator, N.C. HW valve for each FR, LCP-1 and RP-1 terminal heating unit. Local wall T-sensor shall control via BMS system valve open and closed position. When room temperature call for heat, valve shall be energized open. Closed for satisfies heat.

2.39.K.07 CHILLED WATER CONTROL PANEL (HPLG-1 & 2) BMS

Chilled water control / panel shall be provided by the A.T.C. contractor. Plan M-5.1 for Site location. ATC shall be responsible to wire to unit panel for CW enable function and monitor CWS & R temperature, water flow and pressure. Alarms shall be provided for all monitoring functions. The BMS shall provide external set point control, external current limiting for KW load shedding, external compressor(s) lockout monitoring, unit emergency stop/trip functions. CW energy BTU monitoring shall also be included with the BMS system. BMS shall monitor all point functions of Chiller unit using BMS interface hardware and software including network communications BACnet software.

2.39.K.08 VAV TERMINALS BMS

A wall mounted transmitter with adjustable set point shall modulate the box damper from maximum open for cooling / heating, minimum position for ventilation.

Jury Rooms and Courtrooms 1, 2, 3 & 4, shall operate in like manner, however dampers shall go closed during unoccupied periods determined by motion sensor or schedule when space temperature is satisfied.

All boxes supplied with RH coils, shall be provided with a 2-way modulating type HW valve. In the heating mode, valve shall modulate to maintain box D.A. temperature. Boxes that are associated with radiant panels shall also open and close associated valves accordingly.

The VAV box shall be provided and installed by this contractor a stand-alone micro-processor controller/damper drive, Device shall monitor air flow, DA temperature, feedback damper position, graphically displayed.

2.39.K.09 ELECTRIC/STEAM HUMIDIFIER (HUM-1 & 2) BMS

Humidifier Control (2 total): ATC contractor shall be responsible for control wiring and controlling electric steam humidifier, including one set of high limits, air proven switches 2" modulating steam valves, etc., for the use of DOAS-G, & DOAS-1. When RA humidity fall below 20% RH, humidifier shall be energized. When RA humidity raises above 30%, BMS system shall de-energize associated NC, spring return steam valve.

2.39.K.10 AIR HANDLING UNITS: (AHU 1, 2, 3 & 4) BMS

Occupied Control

The AHU's supply and return fans shall run continuously.

R.A. dampers shall be position fully open when fan motor is started by variable speed drives. OA via associated VAV box shall closed for morning warm up cycle. RA dampers 100 % open until MA temperature reaches DA set point. Once DA temperature is reached, then respective VAV OA supply air damper and supply fan shall be energized to provide 20% fresh outside air minimum or as scheduled. AHU shall received fresh outside air minimum from its respective VAV terminal.

Discharge Air Control & Reset

Discharge air temperature shall be maintained during the AHU operation and maintain a predetermined reset temperature based upon RA temperature. Whenever the RA temperature is 75 F (adj.), DA temperature shall be 55 F. Whenever the RA temperature is 65 F (adj.), DA temperature shall be 65 F. Discharge air controller shall modulate 2-way H.W. and 3 way CW valve. Control shall be proven by air flow station.

When O.A. enthalpy, < 20.0 btu/lb., permits, discharge air temperature shall be maintained as per above schedule during the economy cooling mode of operation. Discharge air controller shall modulate associated VAV terminal damper to maintain set point. When fresh air increases more than 30%, associated RFV-x relief damper shall modulate open and respective RFV-x fan motor shall be energized via VF drive to maintain equivalent relief air via associated BMS air flow sensor.

Discharge air pressure control:

AHU's: Associated courtroom discharge static air pressure shall be maintained by static space pressure sensor input to BMS controller and BMS shall vary AHU's SA fan speeds via variable speed drive. Space temperature, low room occupancy and CO2 levels shall determine minimum and maximum fan speeds.

OA, SA, RA and RFA minimum shall be maintained through the use of duct air flow stations (AFS) provided by the ATC contractor and installed by the sheet metal contractor. Associated OA CO2 and NOx monitoring and acceptable levels shall determine OA cfm volume via associated VAV terminal.

Courtrooms & other designated areas: CO2 Levels; ATC via BMS shall monitor CO2 levels and occupancy of each area. When respective designated area is occupied, determined by motion detector(s) room HVAC shall be maintained per AHU schedule(s). During room vacant periods, associated VAV box air flow shall go to an unoccupied air flow minimum.

CO2 levels shall be maintained between 700 and 800 ppm by increasing OA rates from associated VAV terminal unit.

Unit Off Periods (AHU-1, 2, 3 & 4)

In unoccupied mode, AHU and associate equipment shall be de-energized, OA dampers shall go fully closed, and MA dampers: RA 100% open and OA 0% open. There shall be fan operation for unoccupied heating periods only whenever space temperature reaches 60 F, sensed by any wall transmitters.

AHU-1, 2, 3 & 4: Associated 2 –way HW valves shall modulate to 20% of maximum water flow to reduce thermal shock conditions whenever OA temperatures are below 40`F adj.

Provide interlock with controls for a smoke detector and CO2 sensor devices to be supplied and installed by ATC Contractor. Detectors shall be interlocked each AHU. Locate detector such that when smoke is detected in supply and return air ductwork, unit will shut off. When cause of smoke has been taken care of, unit shall be manually reset by proper authorities via remote reset keyed device. CO2 sensors shall be located on OA entering the mixing box. If CO2 is detected to high, an alarm shall annunciate Maintenance staff. If CO2 increases, associated AHU shall be force to de-engerize state.

Provide all necessary relays, safety devices, such as freeze stats, etc., to protect the unit from component damage due to control device failure or mal-function. Low Temperature Safety Thermostat (Freeze-stat): Electric low temperature warning thermostat shall have low point sensitive elements installed to cover entire duct area. Thermostat shall be two position type with manual reset.

2.39.K.11 AIR FLOW MONITORING STATION: (AFS) BMS

Provide and install air flow monitoring stations as indicated on drawings. Flow device shall be Annular model #AIR 79 airbar, or approved equal, + or - 2% accuracy with capability of measuring .05" differential pressure. Stations to be provided by the A.T.C. Contractor and installed by the Sheetmetal Contractor.

2.39.K.12 DEDICATED OUTSIDE AIR UNITS: (DOAS-G & DOAS-1) BMS

During occupied periods (determined by BMS clock schedule), unit's associated SF & EF shall run continuously. EF shall run continuously by schedule, while SF-1 shall run base upon HVAV system's OA minimum and economizer cooling sequence.

Upon unit start up: Both SA and RA fans shall ramp up to pre-set RPM determined by controller and by means of variable speed drives, ramp time of 1 minutes. Unit OA and EA shut off dampers shall open and RA and SA ductwork, spring return, dampers shall open and OA bypass damper closed. Unit's energy recovery core matrix shall provide thermal energy transfer when OA bypass damper is fully closed via 2 position, NC, spring return actuator.

VFD Fan Control: Both RA and SA fan speeds shall be verified by VFD inverters. The controlling signal to the VFD's shall be determined by the operation of the associated BMS controls interlocking with associated VAV terminal units and AHU's. The unit's RF fan(s) shall run at a fixed field determined rpm to maintain minimum exhaust air requirements. Unit's-SF fan RPM shall be controlled in accordance with HVAV system OA requirements. When AHU-x begins to economize cool, requiring more than (field determined) cfm minimum OA, DOAS-x's

bypass damper shall begin to modulate open. Air flow stations for AHU-x's supply air and return air, shall monitor air flow to maintain system air flow balance.

Unoccupied Periods (DOAS 1 & 1)

In unoccupied mode, unit associate equipment devices shall be de-energized, OA dampers shall go fully closed. Ductwork SA and EF: 100% closed. There shall be no fan operation for unoccupied cooling or heating periods.

Provide interlock with controls for a smoke detector device to be supplied by and installed by Electrical Contractor. Detectors shall be interlocked with unit. Locate detector such that when smoke is detected in supply and exhaust air ductwork, unit will shut off. When cause of smoke has been taken care of, unit shall be manually reset by proper authorities.

Provide all necessary relays, safety devices, such as freeze stats, etc., to protect the unit from component damage due to control device failure or mal-function. Low Temperature Safety Thermostat (Freeze-stat): Electric low temperature warning thermostat shall have low point sensitive elements installed to cover entire duct area. Thermostat shall be two position type with auto reset.

2.39.K.13 EXHAUST VENTILATION: EF-1, 2, 3 & RFV 1 & 2 (BMS)

EF-1: 001 Electrical room ventilation base on temperature, provide space sensor, and (2) 24" w x 32"h OBD with SR damper actuators. Space temperature > 80 F, (adj.) EA air damper shall go fully to the open position, EF-1 energize, and associated LV-5 OBD fully open, and Electrical Room exhaust grille (1) 18"w x 12"h OBD, fully open.

Salley Port: room ventilation base upon temperature & Nox levels. Same as Electrical room functions with the exception of Sally Port dedicated room exhaust grille (1) 18"w x 12"h OBD, fully open and LV-3 (1) 36"w x 24"h OBD fully open on a call of CO2, NOx or temperature.

EF-2: 129 Secured Parking ventilation shall be controlled and interlocked with respective wall mounted carbon monoxide and NO2 sensors as indicated on plan. Associated two position spring return exhaust and make up air motorized dampers shall open when fan(s) are initialized. Fan shall have 1 minute time delay off when in the automatic selected. Mount respective CO sensors 60" above finish floor with protective guard and NO2 sensors 24" below roof without guard. Provide remote H/O/A control switches, as shown on plans, one per each exhaust fan motor panel. Refer to Plan sheets for panel arrangements.

When in Auto position, either sensor shall energize EA fan(s) when CO raises above 100 ppm or when NO2 raises above 10 ppm. All set points adjustable. When H/O/A control switch is in the Hand setting, fan and associates dampers shall energize open. OBD, SR closed, Damper dimensions: 36" x 24" EA and 36" x 24" OA. Each system shall be interfaced with BMS for Normal/Alarm Status.

EF-3: 167 Mail Room ventilation base on emergency panic. Provide wall panic button. Exhaust system shall operate 24/7 and be room pressured monitored. Provide room pressure sensor/control device to maintain .005" w.c. continuously via inline exhaust air fan EF-3. Provide (1) 24: x 12"h OBD with SR, NO, damper actuators. Provide AFS to monitor air flow to maintain 200 cfm, adjustable, normal status condition.

When panic button is activated, EF-3 shall go to high speed, Alarm status shall be reported, HVAC air handling equipment AHU's, FCU's, DOAS's and RFV', de-activated.

RFV-1 & 2: Courtroom relief air ventilation shall be controlled and interlocked with respective associated two position, spring return, NC, relief air motorized dampers. Actuators shall open when room OA air increased to more than 30% of supplied air to space. Associated RFV fan shall initialize on via VFD to maintain modulating OA flow to space. Provide air flow duct sensor for each courtroom duct system.

OBD, SR closed, Damper dimensions: 48" x 24" EA Each system shall be interfaced with BMS for Normal/Alarm Status.

2.39.K.14 AC-CASSETTS: (IU-x units) (BMS)

AC VRF fan units shall be activated during unoccupied periods when local unoccupied BMS wall T-sensor button is pressed. The function shall allow the respective AC unit, as well as the associated outdoor condenser, SCU to function as secondary cooling/heating without activation. Ceiling mounted evaporators shall be controlled by BMS individual wired wall mounted digital T-sensors. T-sensor provided by A.T.C. Contractor and installed by A.T.C Contractor.

2.39.K.15 WATER / OIL MONITOR (BMS)

Monitor each Elevator Sump pit and Mechanical & Electrical Room service pits, Sprinkler Area for water/oil/high activity. Total of (11) areas. Alarms from respective control panel. Each system shall be interfaced with BMS for Normal/Alarm Status. Electrical Contractor shall provide Sump pump controller/monitor, total of 4.

2.39.K.16 ELECTRICAL POWER MONITOR / LOAD SHEDDING (BMS)

Provide Entrance Power monitoring for the Electrical Service Main. During Standby Generator operation, BMS shall monitor Normal power KW usage. When usage gets to 80% of generator capacity, BMS shall begin to load shed HVAC equipment loads, starting with the following;

1) HUM-1, 2 off, 2) Chilled Water HPLG-1 & 2 to 50% capacity, 3) AHU-1, 2, 3, 4 to 50% motor bhp, 4) CWG-1 to 0% capacity.

2.39.K.17 ELECTRICAL POWER GENERATOR MONITORING

Provide generator systems monitoring for up to 8 critical operation points, displayed graphically.

2.39.K.18 BUILDING PRESSURE MONITORING

Building Pressure Monitoring, provide as indicated on plans, space sensors to monitor and control building pressure during economy cooling. BMS shall limit respective space pressure(s) from AHU-1, 2, 3, & 4 & DOAS-1 & 2 such that building pressure does not exceed .003" w.c., adjustable. Add: A.T.C. Contractor shall provide all HW & CW flow meters. Badger 200 series, bronze body, +/- 1% full scale or approved equal.

2.39.K.19 BUILDING LIGHTING CONTROL

Marshal's Office Room 243: Monitoring and control of limited building lighting shall be controlled remotely by Marshal Security staff. Provide dedicated remote access and monitor to control lighting as indicated on Electrical plans. Areas of lighting control shall include, however, not limited to, the following: Ground Floor areas; Prisoner Area #1 019, Area #1 018, Hallways 017, Sally Port 028, Secure Garage Parking 012, All Stair Wells ST-1, 4,5, & 6, and all Elevators. First Floor Areas: Exit 101, Entrance 102, Queuing 103, Lobby West 104, Lobby East 104. Second Floor Areas: Lobby West 201, Lobby East 201.

2.39.K.20 BUILDING OVERHEAD DOOR CONTROL

Marshal's Office Room 243: Monitoring and control of building overhead door shall be controlled remotely by Marshal Security staff. Provide dedicated remote access control for five overhead doors as indicated on Electrical plans. Areas of individual door control shall include, Ground Floor Sally Port 028 & Secure Garage Parking 012.

Sally Port & Secure Garage Parking OHD's shall be provided with individual operational indication lights. When door is activated to open or close, respective door light shall blink Red color during activated open or close cycle. Door closure shall also be proven.

2.39.K.21 AIR HANDLER UV STERILIZATION

There shall be provided UV sterilization protection for all air handling equipment which includes the following: AHU 1,2,3 & 4, DOAS-G & DOAS-1, and FCU 1 thru 7. Unit side mounted or in duct, 9" probe PHI Cell type lamps. Manufacture: RGF Guardian Air QR series, model #QRP-9, 5.5" dia., 120v, 14 watts. Total of 28 units.

2.39.K.22 MANUAL OVERRIDES & SCHEDULES

There shall be the capability to manually override, in a "user friendly manner", unoccupied heating and cooling schedules from the ATC Panel / System. This shall be accomplished by individual mark timed switches, override switches, keypad display, or CRT wired to necessary controls if DDC are used.

2.39.K.23 SYSTEM MONITORING & ANNUNCIATION

ATC Contractor shall provide system monitoring and alarm annunciation via DDC control color graphic system as scheduled. Each physical DDC point shall be historically trended for manual or automatic printing and all alarms automatically printed.

2.39.K.24 SYSTEM TRAINING

ATC Contractor shall provide system training of all system components and DDC control color graphic software programmed systems.

Provide 16 hours of training for the building operators, made up of four different sessions. The 1st of four sessions shall occur off site at the nearest local Office. The purpose will be to simulate and familiarize the operations and equipment / programming, etc. for maintenance personnel. The 2nd session of training shall be 'hands-on' type at the Owner's place of convenience at approximately 90% project completion. The intent of this training is

that 4 hours will occur before the owner has occupied the facility and the rest is to follow after the owner has accepted beneficial use. A mutual agreement on the scheduling of this training class will be made between the owner and the ATC contractor. The training class will use the actual operator manual that will be submitted for this project. Third session training at the completion of Phase II. Final session at the end of Phase III.

In addition to the above training and after the project has been finally commissioned, the ATC Contractor shall allow for 24 hours of Owner customized software programming, additional custom sequence and graphic time at the Owner request.

2.39.KJ.25 COMMISSIONING:

Commissioning: Time shall be allotted for each Construction Phase of this project for commissioning of systems, equipment, devices, etc., A.T.C. Contractor, as well as all involved Sub-Contractors, shall collaborate and coordinate efforts with the TAB Contractor to perform pre-commissioning of control sequences. Time shall also be allotted to perform a final commissioning with the Owner's Commissioning Agent.

2.39.K.26 DOCUMENTATION:

Proper and adequate documentation must be provided, this will include:

- a. Accurate as-built drawings and sequences submitted in hardcopy and electronic form. Provide 100 GB Seagate file storage drive for the storage of program files, graphic information, and updated standard Computer Aided Drafting (CAD) as built record drawings and specifications.
- b. Owner's manuals including technical spec sheets
- c. Operator manuals

2.39.K.27 DDC SYSTEM DESCRIPTION

- A. Microprocessor-based monitoring and control including analog/digital conversion and program logic. A control loop or subsystem in which digital and analog information is received and processed by a microprocessor, and digital control signals are generated based on control algorithms and transmitted to field devices to achieve a set of predefined conditions.

1. DDC system shall consist of a high-speed, peer-to-peer network of distributed DDC controllers, other network devices, operator interfaces, and software.

- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in

NFPA70, by a qualified testing agency, and marked for intended location and application.

The system shall be based on the Niagara 4 Framework, with all field level controllers communicating via the BACnet/IP protocol.

2.39.L BUILDING MANAGEMENT DESCRIPTION

2.39L.1 WEB ACCESS

A. DDC system shall be Web based.

1. Web-Based Access to DDC System:

DDC system software shall be based on server thin-client architecture, designed around open standards of Web technology. DDC system server shall be accessed using a Web browser over DDC system network, using Owner's LAN, and remotely over Internet through Owner's LAN. Intent of thin-client architecture is to provide operators complete access to DDC system via a Web browser. No special software other than a Web browser shall be required to access graphics, point displays, and trends; to configure trends, points, and controllers; and to edit programming.

Web access shall be password protected.

2.4 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Products installed in ducts, equipment, and return-air paths shall comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less. B. DDC

Data Access:

1. When logged into the system, operator shall be able to also interact with any DDC controller connected to DDC system as required for functional operation of DDC system.
2. System(s) shall be used for application configuration; for archiving, reporting and trending of data; for operator transaction archiving and reporting; for network information management; for alarm annunciation; and for operator interface tasks and controls application management. C. Future

Expandability:

1. DDC system size shall be expandable to an ultimate capacity of at least two times total I/O points indicated.
2. Additional DDC controllers, I/O and associated wiring shall be all that is needed to achieve ultimate capacity. Initial network infrastructure shall be designed and installed to support ultimate capacity.
3. Operator interfaces installed initially shall not require hardware and software additions and revisions for ultimate capacity.

D. Input Point Displayed Accuracy: Input point displayed values shall meet following end-to-end overall system accuracy, including errors associated with meter, sensor, transmitter, lead wire or cable, and analog to digital conversion.

1. Flow:
 - a. Air: Within 5 percent of design flow rate.
 - b. Air (Terminal Units): Within 5 percent of design flow rate.
 - c. Water: Within 2 percent of design flow rate.
 2. Gas:
 - a. Carbon Dioxide: Within 50 ppm.
 3. Moisture (Relative Humidity):
 - a. Air: Within 3 percent RH.
 - b. Space: Within 3 percent RH.
 - c. Outdoor: Within 3 percent RH.
 4. Pressure:
 - a. Air, Ducts and Equipment: 0.5 percent of instrument range.
 - b. Space: Within 0.25 percent of instrument range.
 - c. Water: Within 0.25 percent of instrument range.
 5. Speed: Within percent of reading.
 6. Temperature, Dry Bulb:
 - a. Air: Within 1 deg F.
 - b. Space: Within 1 deg F.
 - c. Outdoor: Within 1 deg F.
 - d. Heating Hot Water: Within 1 deg F.
 - e. Other Temperatures Not Indicated: Within 1 deg F.
- E. Precision of I/O Reported Values: Values reported in database and displayed shall have following precision:
1. Current:
 - a. Milliamperes: Nearest 1/100th of a milliampere.
 - b. Amperes: Nearest 1/10th of an ampere up to 100 A; nearest ampere for 100A and more.

2. Flow:

- a. Air: Nearest 1/10th of a cfm through 100 cfm; nearest cfm between 100 and 1000 cfm; nearest 10 cfm between 1000 and 10,000 cfm; nearest 100 cfm above 10,000 cfm.
- b. Water: Nearest 1/10th gpm through 100 gpm; nearest gpm between 100 and 1000 gpm; nearest 10 gpm between 1000 and 10,000 gpm; nearest 100 gpm above 10,000 gpm.

3. Gas:

- a. Carbon Dioxide (ppm): Nearest ppm.

4. Moisture (Relative Humidity):

- a. Relative Humidity (Percentage): Nearest 1 percent.

5. Pressure:

- a. Air, Ducts and Equipment: Nearest 1/10th in. w.c..
- b. Space: Nearest 1/100th in. w.c..
- c. Water: Nearest 1/10 psig through 100 psig; nearest psig above 100 psig.

6. Temperature:

- a. Air, Ducts and Equipment: Nearest 1/10th of a degree.
- b. Outdoor: Nearest degree.
- c. Space: Nearest 1/10th of a degree.
- d. Heating Hot Water: Nearest degree.

7. Voltage: Nearest 1/10 volt up to 100 V; nearest volt above 100 V.

F. Control Stability: Control variables indicated within the following limits:

1. Flow:

- a. Air, Ducts and Equipment, except Terminal Units: Within 5 percent of design flow rate.
- b. Air, Terminal Units: Within 5 percent of design flow rate.
- c. Water: Within 2 percent of design flow rate.

2. Gas:

- a. Carbon Dioxide: Within 50 ppm.

3. Moisture (Relative Humidity):

- a. Air: Within 5 percent RH.
- b. Space: Within 5 percent RH.
- c. Outdoor: Within 5 percent RH.

4. Pressure:

- a. Air, Ducts and Equipment: 0.5 percent of instrument range.
- b. Space: Within 0.25 percent of instrument range.
- c. Water: Within 0.25 percent of instrument range.

5. Temperature, Dry Bulb:

- a. Air: Within 0.5 deg F.
- b. Space: Within 0.5 deg F.
- c. Heating Hot Water: Within 1 deg F.

G. Environmental Conditions for Controllers, Gateways, and Routers:

1. Products shall operate without performance degradation under ambient environmental temperature, pressure and humidity conditions encountered for installed location.

a. If product alone cannot comply with requirement, install product in a protective enclosure that is isolated and protected from conditions impacting performance. Enclosure shall be internally insulated, electrically heated, cooled and ventilated as required by product and application.

2. Products shall be protected with enclosures satisfying the following minimum requirements unless more stringent requirements are indicated. Products not available with integral enclosures complying with requirements indicated shall be housed in protective secondary enclosures. Installed location shall dictate the following NEMA 250 enclosure requirements:

- a. Outdoors, Protected: Type 3.
- b. Outdoors, Unprotected: Type 4.
- c. Indoors, Heated with Filtered Ventilation: Type 1 or Type 2.
- d. Indoors, Heated with Non-Filtered Ventilation: Type 2.
- e. Indoors, Heated and Air Conditioned: Type 1.
- f. Mechanical Equipment Rooms:

1) Boiler Rooms: Type 12.

2) Air-Moving Equipment Rooms: Type 1.

Within Duct Systems and Air-Moving Equipment Not Exposed to Possible Condensation: Type 2.
Within Duct Systems and Air-Moving Equipment Exposed to Possible Condensation:
Type 4.

H. Environmental Conditions for Instruments and Actuators:

1. Instruments and actuators shall operate without performance degradation under the ambient environmental temperature, pressure, humidity, and vibration conditions specified and encountered for installed location.

a. If instruments and actuators alone cannot comply with requirement, install instruments and actuators in protective enclosures that are isolated and protected from conditions impacting performance. Enclosure shall be internally insulated, electrically heated and ventilated as required by instrument and application. I. DDC System Reliability:

1. Design, install and configure DDC controllers, devices and to yield a MTBF of at least 40,000 hours, based on a confidence level of at least 90 percent. MTBF value shall include any failure for any reason to any part of products indicated.
2. If required to comply with MTBF indicated, include DDC system and product redundancy to maintain DCC system, and associated systems and equipment that are being controlled, operational and under automatic control.
3. Critical systems and equipment that require a higher degree of DDC system redundancy than MTBF indicated shall be indicated on Drawings. J. Electric Power Quality:

1. Power-Line Surges:

- a. Protect DDC system products connected to ac power circuits from power-line surges.
- b. Do not use fuses for surge protection.

2. Power Conditioning:

a. Protect susceptible DDC system products connected to ac power circuits from irregularities and noise rejection. Characteristics of power-line conditioner shall be as follows:

- 1) At 85 percent load, output voltage shall not deviate by more than plus or minus 1 percent of nominal when input voltage fluctuates between minus 20 percent to plus 10 percent of nominal.
- 2) During load changes from zero to full load, output voltage shall not deviate by more than plus or minus 3 percent of nominal.

- 3) Accomplish full correction of load switching disturbances within five cycles, and 95 percent correction within two cycles of onset of disturbance. 4) Total harmonic distortion shall not exceed 3-1/2 percent at full load.
3. Ground Fault: Protect products from ground fault by providing suitable grounding. Products shall not fail due to ground fault condition.

K. Backup Power Source:

1. HVAC systems and equipment served by a backup power source shall have associated DDC system products that control such systems and equipment also served from a backup power source.

L. Continuity of Operation after Electric Power Interruption:

1. Equipment and associated factory-installed controls, field-installed controls, electrical equipment, and power supply connected to building normal and backup power systems shall automatically return equipment and associated controls to operating state occurring immediately before loss of normal power, without need for manual intervention by operator when power is restored either through backup power source or through normal power if restored before backup power is brought online.

2.5 SYSTEM ARCHITECTURE

A. System architecture shall consist of no more than two levels of LANs.

1. Level one LAN shall connect network controllers and operator workstations.
2. Level one or Level two LAN shall connect programmable application controllers to other programmable application controllers, and to network controllers.
3. Level two LAN shall connect application-specific controllers to programmable application controllers and network controllers.
4. Level two LAN shall connect application-specific controllers to application-specific controllers.

B. DDC system shall consist of dedicated LANs that are not shared with other building systems and tenant data and communication networks.

C. System architecture shall be modular and have inherent ability to expand to not less than two times system size indicated with no impact to performance indicated.

D. System architecture shall perform modifications without having to remove and replace existing network equipment.

E. Number of LANs and associated communication shall be transparent to operator. All I/O points residing on any LAN shall be capable of global sharing between all system LANs.

F. System design shall eliminate dependence on any single device for system alarm reporting and control execution. Each controller shall operate independently by performing its' own control, alarm management and historical data collection. G. Special Network Architecture Requirements:

1. Air-Handling Systems: For control applications of an air-handling system that consists of air-handling unit(s) and VAV terminal units, include a dedicated LAN of application specific controllers serving VAV terminal units connected directly to controller that is controlling air-handling system air-handling unit(s). Create a DDC system LAN that aligns with air-handling system being controlled.

2.6 DDC SYSTEM OPERATOR INTERFACES

A. Operator Means of System Access: Operator shall be able to access entire DDC system through any of multiple means, including, but not limited to, the following:

1. Portable operator terminal with hardwired connection through LAN port.
2. Portable operator workstation with wireless connection through LAN router.
3. Mobile device and application with secured wireless connection through LAN router or cellular data service.
4. Remote connection through web access.

B. Access to system, regardless of operator means used, shall be transparent to operator.

C. Network Ports: For hardwired connection of desktop or portable workstation. Network port shall be easily accessible, properly protected, clearly labeled, and installed at the following locations:

1. Each mechanical equipment room. D. Mobile

Device:

1. Connect to system through a wireless router connected to LAN and cellular data service.
2. Able to communicate with any DDC controller connected to DDC system using a dedicated application and secure web access. E. Critical Alarm Reporting:

1. Operator-selected critical alarms shall be sent by DDC system to notify operator of critical alarms that require immediate attention.
2. DDC system shall send alarm notification to multiple recipients that are assigned for each alarm.
3. DDC system shall notify recipients by any or all means, including e-mail, text message and prerecorded phone message to mobile and landline phone numbers.

F. Simultaneous Operator Use: Capable of accommodating up to five simultaneous operators that are accessing DDC system through any one of operator interfaces indicated.

2.7 NETWORK COMMUNICATION PROTOCOL

A. Network communication protocol(s) used throughout entire DDC system shall be open to Owner and available to other companies for use in making future modifications to DDC system. B. ASHRAE 135 Protocol:

1. ASHRAE 135 communication protocol shall be sole and native protocol used throughout entire DDC system.
2. DDC system shall not require use of gateways except to integrate HVAC equipment and other building systems and equipment, not required to use ASHRAE 135 communication protocol.
3. If used, gateways shall connect to DDC system using ASHRAE 135 communication protocol and Project object properties and read/write services indicated by interoperability schedule.
4. Operator workstations, controllers and other network devices shall be tested and listed by BACnet Testing Laboratories. C. Industry Standard Protocols:

1. DDC system shall use any one or a combination of the following industry standard protocols for network communication while complying with other DDC system requirements indicated:

- a. ASHRAE 135.
2. Operator workstations and network controllers shall communicate through ASHRAE 135 protocol.
3. Portions of DDC system networks using ASHRAE 135 communication protocol shall be an open implementation of network devices complying with ASHRAE 135. Network devices shall be tested and listed by BACnet Testing Laboratories.

2.8 SYSTEM SOFTWARE

A. System Software Minimum Requirements:

1. Real-time multitasking and multiuser 64-bit operating system that allows concurrent multiple operator workstations operating and concurrent execution of multiple real-time programs and custom program development.
2. Operating system shall be capable of operating DOS and Microsoft Windows applications.
3. Network communications software shall manage and control multiple network communications to provide exchange of global information and execution of global programs.

4. Operator interface software shall include day-to-day operator transaction processing, alarm and report handling, operator privilege level and data segregation control, custom programming, and online data modification capability.

5. Scheduling software shall schedule centrally based time and event, temporary, and exception day programs. B. Operator Interface Software:

1. Minimize operator training through use of English language prorating and English language point identification.

2. Minimize use of a typewriter-style keyboard through use of a pointing device similar to a mouse.

3. Operator sign-off shall be a manual operation or, if no keyboard or mouse activity takes place, an automatic sign-off.

4. Automatic sign-off period shall be programmable from one to 60 minutes in one-minute increments on a per operator basis.

5. Security Access:

a. Operator access to DDC system shall be under password control.

b. An alphanumeric password shall be field assignable to each operator.

c. Operators shall be able to access DDC system by entry of proper password.

d. Operator password shall be same regardless of which computer or other interface means is used.

e. Additions or changes made to passwords shall be updated automatically.

f. Each operator shall be assigned an access level to restrict access to data and functions the operator is cable of performing.

g. Software shall have at least five access levels.

h. Each menu item shall be assigned an access level so that a one-for-one correspondence between operator assigned access level(s) and menu item access level(s) is required to gain access to menu item.

i. Display menu items to operator with those capable of access highlighted. Menu and operator access level assignments shall be online programmable and under password control.

6. Operators shall be able to perform commands including, but not limited to, the following:

a. Start or stop selected equipment.

b. Adjust set points.

c. Add, modify, and delete time programming.

d. Enable and disable process execution.

e. Lock and unlock alarm reporting for each point.

- f. Enable and disable totalization for each point.
- g. Enable and disable trending for each point.
- h. Override control loop set points.
- i. Enter temporary override schedules.
- j. Define holiday and event schedules.
- k. Change time and date.
- l. Enter and modify analog alarm limits.
- m. Enter and modify analog warning limits.
- n. View limits.
- o. Enable and disable demand limiting.
- p. Enable and disable duty cycle.
- q. Display logic programming for each control sequence.

7. Reporting:

- a. Generated automatically and manually.
- b. Sent to displays, printers and disk files.
- c. Types of Reporting:
 - 1) General listing of points.
 - 2) List points currently in alarm.
 - 3) List of off-line points.
 - 4) List points currently in override status.
 - 5) List of disabled points.
 - 6) List points currently locked out.
 - 7) List of items defined in a "Follow-Up" file.
 - 8) List weekly schedules.
 - 9) List holiday programming.
 - 10) List of limits and deadbands.

8. Summaries: For specific points, for a logical point group, for an operator selected group(s), or for entire system without restriction due to hardware configuration. C. Graphic Interface Software:

- 1. Include a full interactive graphical selection means of accessing and displaying system data to operator. Include at least five levels with the penetration path operator assignable (for example, site, building, floor, air-handling unit, and supply temperature loop). Native language descriptors assigned to menu items are to be operator defined and modifiable under password control.
- 2. Include a hierarchical-linked dynamic graphic operator interface for accessing and displaying system data and commanding and modifying equipment operation. Interface shall use a pointing device with pull-down or penetrating menus, color and animation to facilitate operator understanding of system.

3. Include at least 10 levels of graphic penetration with the hierarchy operator assignable.
4. Descriptors for graphics, points, alarms and such shall be modified through operator's workstation under password control.
5. Graphic displays shall be online user definable and modifiable using the hardware and software provided.
6. Data to be displayed within a graphic shall be assignable regardless of physical hardware address, communication or point type.
7. Graphics are to be online programmable and under password control.
8. Points may be assignable to multiple graphics where necessary to facilitate operator understanding of system operation.
9. Graphics shall also contain software points.
10. Penetration within a graphic hierarchy shall display each graphic name as graphics are selected to facilitate operator understanding.
11. Back-trace feature shall permit operator to move upward in the hierarchy using a pointing device. Back trace shall show all previous penetration levels. Include operator with option of showing each graphic full screen size with back trace as horizontal header or by showing a "stack" of graphics, each with a back trace.
12. Display operator accessed data on the monitor.
13. Operator shall select further penetration using pointing device to click on a site, building, floor, area, equipment, and so on. Defined and linked graphic below that selection shall then be displayed.
14. Include operator with means to directly access graphics without going through penetration path.
15. Dynamic data shall be assignable to graphics.
16. Display points (physical and software) with dynamic data provided by DDC system with appropriate text descriptors, status or value, and engineering unit.
17. Use color, rotation, or other highly visible means, to denote status and alarm states. Color shall be variable for each class of points, as chosen by operator.
18. Points shall be dynamic update rates on a per point basis.
19. For operators with appropriate privilege, points shall be commanded directly from display using pointing device.
 - a. For an analog command point such as set point, current conditions and limits shall be displayed and operator can position new set point using pointing device.
 - b. For a digital command point such as valve position, valve shall show its current state such as open or closed and operator could select alternative position using pointing device.
 - c. Keyboard equivalent shall be available for those operators with that preference.
20. Operator shall be able to split or resize viewing screen into quadrants to show one graphic on one quadrant of screen and other graphics or spreadsheet, bar chart, word processing, curve plot and other information on other quadrants on

screen. This feature shall allow real-time monitoring of one part of system while displaying other parts of system or data to better facilitate overall system operation.

21. Graphic generation software shall allow operator to add, modify, or delete system graphic displays.

a. Include libraries of symbols depicting HVAC symbols such as fans, coils, filters, dampers, valves pumps, and electrical symbols.

b. Graphic development package shall use a pointing device in conjunction with a drawing program to allow operator to perform the following:

1) Define background screens.

2) Define connecting lines and curves.

3) Locate, orient and size descriptive text.

4) Define and display colors for all elements.

5) Establish correlation between symbols or text and associated system points or other displays.

D. Project-Specific Graphics: Graphics documentation including, but not limited to, the following:

1. Site plan showing each building, and additional site elements, which are being controlled or monitored by DDC system.

2. Plan for each building floor and the roof, showing the following:

a. Room layouts with room identification and name.

b. Locations and identification of all monitored and controlled HVAC equipment and other equipment being monitored and controlled by DDC system.

c. Location and identification of each hardware point being controlled or monitored by DDC system.

3. Control schematic for each of following, including a graphic system schematic representation, similar to that indicated on Drawings, with point identification, set point and dynamic value indication, sequence of operation and controller wiring diagram.

4. Graphic display for each piece of equipment connected to DDC system through a data communications link. Include dynamic indication of all points associated with equipment.

5. DDC system network riser diagram that shows schematic layout for entire system including all networks and all controllers, operator workstations and other network devices.

E. Customizing Software:

1. Software to modify and tailor DDC system to specific and unique requirements of equipment installed, to programs implemented and to staffing and operational practices planned.
2. Online modification of DDC system configuration, program parameters, and database using menu selection and keyboard entry of data into preformatted display templates.
3. As a minimum, include the following modification capability:
 - a. Operator assignment shall include designation of operator passwords, access levels, point segregation and auto sign-off.
 - b. System text addition and change capability shall include English or native language descriptors for points and access levels and action messages for alarms, run time and trouble condition.
 - c. Time and schedule change capability shall include time and date set, time and occupancy schedules, exception and holiday schedules and daylight savings time schedules.
 - d. Point related change capability shall include the following:
 - 1) System and point enable and disable.
 - 2) Run-time enable and disable.
 - 3) Assignment of points to calibration tables, lockout, and run time and to a fixed I/O value.
 - 4) Assignment of alarm and warning limits.
 - e. Application program change capability shall include the following:
 - 1) Enable and disable of software programs.
 - 2) Programming changes.
 - 3) Assignment of comfort limits, global points, time and event initiators, time and event schedules and enable and disable time and event programs.
4. Software shall allow operator to add points, or groups of points, to DDC system and to link them to energy optimization and management programs. Additions and modifications shall be online programmable using operator workstation, downloaded to other network devices and entered into their databases. After verification of point additions and associated program operation, database shall be uploaded and recorded on hard drive and disk for archived record.
5. Include high-level language programming software capability for implementation of custom DDC programs. Software shall include a compiler, linker, and up- and down-load capability.
6. Include a library of DDC algorithms, intrinsic control operators, arithmetic, logic and relational operators for implementation of control sequences. Also include, as a minimum, the following:

- a. Proportional control (P).
- b. Proportional plus integral (PI).
- c. Proportional plus integral plus derivative (PID).
- d. Adaptive and intelligent self-learning control (optimal start).

1) Algorithm shall monitor loop response to output corrections and adjust loop response characteristics according to time constant changes imposed.

2) Algorithm shall operate in a continuous self-learning manner and shall retain in memory a stored record of system dynamics so that on system shut down and restart, learning process starts from where it left off.

7. Fully implemented intrinsic control operators including sequence, reversing, ratio, time delay, time of day, highest select AO, lowest select AO, analog controlled digital output, analog control AO, and digitally controlled AO.

8. Logic operators such as "And," "Or," "Not," and others that are part of a standard set available with a high-level language.

9. Arithmetic operators such as "Add," "Subtract," "Multiply," "Divide," and others that are part of a standard set available with a high-level language.

10. Relational operators such as "Equal To," "Not Equal To," "Less Than," "Greater Than," and others that are part of a standard set available with a high-level language. F. Alarm Handling Software:

1. Include alarm handling software to report all alarm conditions monitored and transmitted through DDC controllers and other network devices.

2. Include first in, first out handling of alarms according to alarm priority ranking, with most critical alarms first, and with buffer storage in case of simultaneous and multiple alarms.

3. Alarm handling shall be active at all times to ensure that alarms are processed even if an operator is not currently signed on to DDC system.

4. Alarms display shall include the following:

- a. Indication of alarm condition such as "Abnormal Off," "Hi Alarm," and "Low Alarm."

- b. "Analog Value" or "Status" group and point identification with native language point descriptor such as "Space Temperature, Building 110, 2nd Floor, Room 212."

- c. Discrete per point alarm action message, such as "Call Maintenance Dept. Ext-."

- d. Include extended message capability to allow assignment and printing of extended action messages. Capability shall be operator programmable and assignable on a per point basis.

5. Alarms shall be directed to appropriate operator workstations, printers, and individual operators by privilege level and assignments.

6. Alarms shall be categorized and processed by class.

a. Class 1:

1) Associated with fire, security and other extremely critical equipment monitoring functions; have alarm, trouble, return to normal, and acknowledge conditions printed and displayed.

2) Unacknowledged alarms to be placed in unacknowledged alarm buffer.

3) All conditions shall cause an audible sound and shall require individual acknowledgment to silence audible sound.

b. Class 2:

1) Critical, but not life-safety related, and processed same as Class 1 alarms, except do not require individual acknowledgment.

2) Acknowledgement may be through a multiple alarm acknowledgment.

c. Class 3:

1) General alarms; printed, displayed and placed in unacknowledged alarm buffer queues.

2) Acknowledgement of queued alarms shall be either on an individual basis or through a multiple alarm acknowledgment.

3) Alarms returning to normal condition shall be printed and not cause an audible sound or require acknowledgment.

d. Class 4:

1) Routine maintenance or other types of warning alarms.

2) Alarms to be printed only, with no display, no audible sound and no acknowledgment required.

7. Include an unacknowledged alarm indicator on display to alert operator that there are unacknowledged alarms in system. Operator shall be able to acknowledge alarms on an individual basis or through a multiple alarm acknowledge key, depending on alarm class.

8. To ensure that no alarm records are lost, it shall be possible to assign a backup printer to accept alarms in case of failure of primary printer.

G. Reports and Logs:

1. Include reporting software package that allows operator to select, modify, or create reports using DDC system I/O point data available.
2. Each report shall be definable as to data content, format, interval and date.
3. Report data shall be sampled and stored on DDC controller, within storage limits of DDC controller, and then uploaded to archive on workstation for historical reporting.
4. Operator shall be able to obtain real-time logs of all I/O points by type or status, such as alarm, point lockout, or normal.
5. Reports and logs shall be stored on workstation hard drives in a format that is readily accessible by other standard software applications, including spreadsheets and word processing.
6. Reports and logs shall be readily printed and set to be printed either on operator command or at a specific time each day.

H. Standard Reports: Standard DDC system reports shall be provided and operator shall be able to customize reports later.

1. All I/O: With current status and values.
2. Alarm: All current alarms, except those in alarm lockout.
3. Disabled I/O: All I/O points that are disabled.
4. Alarm Lockout I/O: All I/O points in alarm lockout, whether manual or automatic.
5. Alarm Lockout I/O in Alarm: All I/O in alarm lockout that are currently in alarm.
6. Logs:
 - a. Alarm history.
 - b. System messages.
 - c. System events.
 - d. Trends.

I. Custom Reports: Operator shall be able to easily define any system data into a daily, weekly, monthly, or annual report. Reports shall be time and date stamped and shall contain a report title.

J. Utility Reports: Prepare Project-specific reports.

1. Electric Report:
 - a. Include weekly report showing daily electrical consumption and peak electrical demand with time and date stamp for each meter.
 - b. Include monthly report showing the daily electrical consumption and peak electrical demand with time and date stamp for each meter.

- c. Include annual report showing the monthly electrical consumption and peak electrical demand with time and date stamp for each meter.
 - d. For each weekly, monthly and annual report, include sum total of submeters combined by load type, such as lighting, receptacles and HVAC equipment showing daily electrical consumption and peak electrical demand.
 - e. For each weekly, monthly and annual report, include sum total of all submeters in building showing electrical consumption and peak electrical demand.
- K. Energy Reports: Prepare Project-specific daily, weekly, monthly, annual and since-installed energy reports.

- 1. Prepare report for each purchased energy utility, indicating the following:
 - a. Time period being reported with beginning and end date, and time indicated.
 - b. Consumption in units of measure commonly used to report specific utility consumption over time.
 - c. Gross area served by utility.
 - d. Consumption per unit area served using utility-specific unit of measure.
 - e. Cost per utility unit.
 - f. Utility cost per unit area.
 - g. Convert all utilities to a common energy consumption unit of measure and report for each utility.
 - h. Consumption per unit area using common unit of measure.

Standard Trends:

- 1. Trend all I/O point present values, set points, and other parameters indicated for trending.
- 2. Trends shall be associated into groups, and a trend report shall be set up for each group.
- 3. Trends shall be stored within DDC controller and uploaded to hard drives automatically on reaching 75 percent of DDC controller buffer limit, or by operator request, or by archiving time schedule.
- 4. Preset trend intervals for each I/O point after review with Owner.
- 5. Trend intervals shall be operator selectable from 10 seconds up to 60 minutes. Minimum number of consecutive trend values stored at one time shall be 100 per variable.
- 6. When drive storage memory is full, most recent data shall overwrite oldest data.
- 7. Archived and real-time trend data shall be available for viewing numerically and graphically by operators.

M. Custom Trends: Operator shall be able to define a custom trend log for any I/O point in DDC system.

1. Each trend shall include interval, start time, and stop time.
2. Data shall be sampled and stored on DDC controller, within storage limits of DDC controller, and then uploaded to archive on workstation hard drives.
3. Data shall be retrievable for use in spreadsheets and standard database

programs. N. Programming Software:

1. Include programming software to execute sequences of operation indicated.
2. Include programming routines in simple and easy to follow logic with detailed text comments describing what the logic does and how it corresponds to sequence of operation.
3. Include means for detecting programming errors and testing software control strategies with a simulation tool before implementing in actual control. Simulation tool may be inherent with programming software or as a separate product.

2.9 ASHRAE 135 GATEWAYS

A. Include BACnet communication ports, whenever available as an equipment OEM standard option, for integration via a single communication cable. BACnet-controlled plant equipment includes, but is not limited to, boilers, and variable-speed drives.

2.10 SERVER

A. Description: EC-Net 4 Supervisor, TRD-SUP-10 used for client-server computing. The ECNet 4 Supervisor shall allow multiple Niagara based JACE 8000 controllers along with other I.P., and Wi-Fi product lines to be networked together.

2.11 DDC CONTROLLERS

- A. DDC system shall consist of a combination of network controllers, programmable application controllers and application-specific controllers to satisfy performance requirements indicated.
- B. DDC controllers shall perform monitoring, control, energy optimization and other requirements indicated.
- C. DDC controllers shall use a multitasking, multiuser, real-time digital control microprocessor with a distributed network database and intelligence.

D. Each DDC controller shall be capable of full and complete operation as a completely independent unit and as a part of a DDC system wide distributed network. E. Environment Requirements:

1. Controller hardware shall be suitable for the anticipated ambient conditions. F.

Power and Noise Immunity:

1. Controller shall operate at 90 to 110 percent of nominal voltage rating and shall perform an orderly shutdown below 80 percent of nominal voltage.
2. Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios with up to 5 W of power located within 36 inches of enclosure. G.

DDC Controller Spare Processing Capacity:

1. Include spare processing memory for each controller. RAM, PROM, or EEPROM will implement requirements indicated with the following spare memory:

- a. Network Controllers: 50 percent.
- b. Programmable Application Controllers: Not less than 60 percent.
- c. Application-Specific Controllers: Not less than 70 percent.

2. Memory shall support DDC controller's operating system and database and shall include the following:

- a. Monitoring and control.
- b. Energy management, operation and optimization applications.
- c. Alarm management.
- d. Historical trend data of all connected I/O points.
- e. Operator interfaces.
- f. Monitoring of manual overrides.

H. DDC Controller Spare I/O Point Capacity: Include spare I/O point capacity for each controller as follows:

1. Network Controllers:

- a. 10 percent of each AI, AO, BI, and BO point connected to controller.
- b. Minimum Spare I/O Points per Controller:
 - 1) AIs: Two.
 - 2) AOs: Two.
 - 3) BIs: Three.
 - 4) BOs: Three.

2. Programmable Application Controllers:

- a. 10 percent of each AI, AO, BI, and BO point connected to controller.
- b. Minimum Spare I/O Points per Controller:
 - 1) AIs: Three.
 - 2) AOs: Three. 3) BIs: Three.
 - 4) BOs: Three.

3. Application-Specific Controllers:

- a. 10 percent of each AI, AO, BI, and BO point connected to controller.
- b. Minimum Spare I/O Points per Controller:
 - 1) AIs: One.
 - 2) AOs: One. 3) BIs: One.
 - 4) BOs: One.

I. Maintenance and Support: Include the following features to facilitate maintenance and support:

- 1. Mount microprocessor components on circuit cards for ease of removal and replacement.
- 2. Means to quickly and easily disconnect controller from network.
- 3. Means to quickly and easily access connect to field test equipment.
- 4. Visual indication that controller electric power is on, of communication fault or trouble, and that controller is receiving and sending signals to network.

J. Input and Output Point Interface:

- 1. Hardwired input and output points shall connect to network, programmable application and application-specific controllers.
- 2. Input and output points shall be protected so shorting of point to itself, to another point, or to ground will not damage controller.
- 3. Input and output points shall be protected from voltage up to 24 V of any duration so that contact will not damage controller.
- 4. AIs:
 - a. AIs shall include monitoring of low-voltage (zero- to 10-V dc), current (4 to 20 mA) and resistance signals from thermistor and RTD sensors.
 - b. AIs shall be compatible with, and field configurable to, sensor and transmitters installed.

- c. Controller AIs shall perform analog-to-digital (A-to-D) conversion with a minimum resolution of 12 bits or better to comply with accuracy requirements indicated.
- d. Signal conditioning including transient rejection shall be provided for each AI.
- e. Capable of being individually calibrated for zero and span.
- f. Incorporate common-mode noise rejection of at least 50 dB from zero to 100 Hz for differential inputs, and normal-mode noise rejection of at least 20 dB at 60 Hz from a source impedance of 10000 ohms.

5. AOs:

- a. Controller AOs shall perform analog-to-digital (A-to-D) conversion with a minimum resolution of 12 bits or better to comply with accuracy requirements indicated.
- b. Output signals shall have a range of 4 to 20 mA dc or zero- to 10-V dc as required to include proper control of output device.
- c. Capable of being individually calibrated for zero and span.
- d. AOs shall not exhibit a drift of greater than 0.4 percent of range per year.
- e. Network and programmable application controller AOs shall be equipped with individual H-O-A switches and output adjustment potentiometers for use in the hand position.

6. BIs:

- a. Controller BIs shall accept contact closures and shall ignore transients of less than 5-ms duration.
- b. Isolation and protection against an applied steady-state voltage of up to 180-V ac peak.
- c. BIs shall include a wetting current of at least 12 mA to be compatible with commonly available control devices and shall be protected against effects of contact bounce and noise.
- d. BIs shall sense "dry contact" closure without external power (other than that provided by the controller) being applied.
- e. Pulse accumulation input points shall comply with all requirements of BIs and accept up to 10 pulses per second for pulse accumulation. Buffer shall be provided to totalize pulses. Pulse accumulator shall accept rates of at least 20 pulses per second. The totalized value shall be reset to zero on operator's command.

7. BOs:

- a. Controller BOs shall include relay contact closures or triac outputs for momentary and maintained operation of output devices.

Relay contact closures shall have a minimum duration of 0.1 second. Relays shall include at least 180 V of isolation. Electromagnetic interference suppression shall be provided on all output lines to limit transients to nondamaging levels. Minimum contact rating shall be 1 A at 24-V ac.

Triac outputs shall include at least 180 V of isolation. Minimum contact rating shall be 1 A at 24-V ac.

BOs shall include for two-state operation or a pulsed low-voltage signal for pulse width modulation control.

BOs shall be selectable for either normally open or normally closed operation.

Include tristate outputs (two coordinated BOs) for control of three-point floatingtype electronic actuators without feedback.

Limit use of three-point floating devices to VAV terminal unit control applications. Control algorithms shall operate actuator to one end of its stroke once every 24 hours for verification of operator tracking.

2.12 NETWORK CONTROLLERS

A. General Network Controller Requirements:

1. Provide Tridium JACE 8000 controller operating on the Niagara 4 Framework.
2. Include adequate number of controllers to achieve performance indicated.
3. System shall consist of one or more independent, standalone, microprocessor-based network controllers to manage global strategies indicated.
4. Controller shall have enough memory to support its operating system, database, and programming requirements.
5. Data shall be shared between networked controllers and other network devices.
6. Operating system of controller shall manage input and output communication signals to allow distributed controllers to share real and virtual object information and allow for central monitoring and alarms.
7. Controllers shall have a real-time clock.
8. Controller shall continually check status of its processor and memory circuits. If an abnormal operation is detected, controller shall assume a predetermined failure mode and generate an alarm notification.
9. Controllers shall be fully programmable.
10. The JACE shall be provided with an open license.

B. Communication:

1. Network controllers shall communicate with other devices on DDC system Level one network.
2. Network controller also shall perform routing if connected to a network of programmable application and application-specific controllers.

C. Operator Interface:

1. Controller shall be equipped with a service communications port for connection to a portable operator's workstation or mobile device. D. Serviceability:

1. Controller shall be equipped with diagnostic LEDs or other form of local visual indication of power, communication, and processor.
2. Wiring and cable connections shall be made to field-removable, modular terminal strips or to a termination card connected by a ribbon cable.
3. Controller shall maintain BIOS and programming information in event of a power loss for at least 96 hours.

2.13 PROGRAMMABLE APPLICATION CONTROLLERS

A. General Programmable Application Controller Requirements:

1. Include adequate number of controllers to achieve performance indicated.
2. Controller shall have enough memory to support its operating system, database, and programming requirements.
3. Data shall be shared between networked controllers and other network devices.
4. Operating system of controller shall manage input and output communication signals to allow distributed controllers to share real and virtual object information and allow for central monitoring and alarms.
5. Controllers shall have a real-time clock.
6. Controller shall continually check status of its processor and memory circuits. If an abnormal operation is detected, controller shall assume a predetermined failure mode and generate an alarm notification.
7. Controllers shall be fully programmable. B. Communication:

1. Programmable application controllers shall communicate with other devices on network. C.

Operator Interface:

1. Controller shall be equipped with a service communications port for connection to a portable operator's workstation or mobile device. D. Serviceability:

1. Controller shall be equipped with diagnostic LEDs or other form of local visual indication of power, communication, and processor.
2. Wiring and cable connections shall be made to field-removable, modular terminal strips or to a termination card connected by a ribbon cable.
3. Controller shall maintain BIOS and programming information in event of a power loss for at least 72 hours.

2.14 APPLICATION-SPECIFIC CONTROLLERS

A. Description: Microprocessor-based controllers, which through hardware or firmware design are dedicated to control a specific piece of equipment. Controllers are not fully user-programmable but are configurable and customizable for operation of equipment they are designed to control.

1. Capable of standalone operation and shall continue to include control functions without being connected to network.
2. Data shall be shared between networked controllers and other network devices.

B. Communication: Application-specific controllers shall communicate with other application specific controller and devices on network, and to programmable application and network controllers.

C. Operator Interface: Controller shall be equipped with a service communications port for connection to a portable operator's workstation. Connection shall extend to port on space temperature sensor that is connected to controller. D. Serviceability:

1. Controller shall be equipped with diagnostic LEDs or other form of local visual indication of power, communication, and processor.
2. Wiring and cable connections shall be made to field-removable, modular terminal strips or to a termination card connected by a ribbon cable.
3. Controller shall use nonvolatile memory and maintain all BIOS and programming information in event of power loss.

2.15 CONTROLLER SOFTWARE

A. General Controller Software Requirements:

1. Software applications shall reside and operate in controllers. Editing of applications shall occur at operator workstations.
2. I/O points shall be identified by up to 30-character point name and up to 16-character point descriptor. Same names shall be used at operator workstations.
3. Control functions shall be executed within controllers using DDC algorithms.
4. Controllers shall be configured to use stored default values to ensure fail-safe operation. Default values shall be used when there is a failure of a connected input instrument or loss of communication of a global point value.

B. Security:

1. Operator access shall be secured using individual security passwords and user names.
2. Passwords shall restrict operator to points, applications, and system functions as assigned by system manager.
3. Operator log-on and log-off attempts shall be recorded.
4. System shall protect itself from unauthorized use by automatically logging off after last keystroke. The delay time shall be operator definable.

C. Scheduling: Include capability to schedule each point or group of points in system. Each schedule shall consist of the following:

1. Weekly Schedule:

- a. Include separate schedules for each day of week.
- b. Each schedule should include the capability for start, stop, optimal start, optimal stop, and night economizer.
- c. Each schedule may consist of up to 10 events.
- d. When a group of objects are scheduled together, include capability to adjust start and stop times for each member.

2. Exception Schedules:

- a. Include ability for operator to designate any day of the year as an exception schedule.
- b. Exception schedules may be defined up to a year in advance. Once an exception schedule is executed, it will be discarded and replaced by regular schedule for that day of week.

3. Holiday Schedules:

- a. Include capability for operator to define up to 99 special or holiday schedules.
- b. Schedules may be placed on scheduling calendar and will be repeated each year.
- c. Operator shall be able to define length of each holiday period.

D. System Coordination:

1. Include standard application for proper coordination of equipment.
2. Application shall include operator with a method of grouping together equipment based on function and location.
3. Group may then be used for scheduling and other applications.

E. Binary Alarms:

1. Each binary point shall be set to alarm based on operator-specified state.
2. Include capability to automatically and manually disable alarming.

F. Analog Alarms:

1. Each analog object shall have both high and low alarm limits.
2. Alarming shall be able to be automatically and manually disabled.

G. Alarm Reporting:

1. Operator shall be able to determine action to be taken in event of an alarm.
2. Alarms shall be routed to appropriate operator workstations based on time and other conditions.
3. Alarm shall be able to start programs, print, be logged in event log, generate custom messages, and display graphics.

H. Remote Communication:

1. System shall have ability to dial out in the event of an alarm.

I. Electric Power Demand Limiting:

1. Demand-limiting program shall monitor building or other operator-defined electric power consumption from signals connected to electric power meter or from a watt transducer or current transformer.
2. Include the following information and reports, to be available on an hourly, daily, weekly, monthly and annual basis:
 - a. Total electric consumption.
 - b. Peak demand.
 - c. Date and time of peak demand.
 - d. Daily peak demand.

J. Maintenance Management: System shall monitor equipment status and generate maintenance messages based on operator-designated run-time, starts, and calendar date limits.

K. Sequencing: Include application software based on sequences of operation indicated to properly sequence chillers, boilers, and other applicable HVAC equipment.

L. L. Control Loops:

1. Support any of the following control loops, as applicable to control required:

- a. Two-position (on/off, open/close, slow/fast) control.
- b. Proportional control.
- c. Proportional plus integral (PI) control.
- d. Proportional plus integral plus derivative (PID) control.
 - 1) Include PID algorithms with direct or reverse action and anti-windup.
 - 2) Algorithm shall calculate a time-varying analog value used to position an output or stage a series of outputs.
 - 3) Controlled variable, set point, and PID gains shall be operator-selectable.
- e. Adaptive (automatic tuning).

M. Staggered Start: Application shall prevent all controlled equipment from simultaneously restarting after a power outage. Order which equipment (or groups of equipment) is started, along with the time delay between starts, shall be operator-selectable. N. Energy Calculations:

- 1. Include software to allow instantaneous power or flow rates to be accumulated and converted to energy usage data.
- 2. Include an algorithm that calculates a sliding-window average (rolling average). Algorithm shall be flexible to allow window intervals to be operator specified (such as 15, 30, or 60 minutes).
- 3. Include an algorithm that calculates a fixed-window average. A digital input signal shall define start of window period (such as signal from utility meter) to synchronize fixed window average with that used by utility.

2 O. Anti-Short Cycling:

- 1. BO points shall be protected from short cycling.
- 2. Feature shall allow minimum on-time and off-time to be selected.

P. On and Off Control with Differential:

- 1. Include an algorithm that allows a BO to be cycled based on a controlled variable and set point.
- 2. Algorithm shall be direct- or reverse-acting and incorporate an adjustable

differential. Q. Run-Time Totalization:

- 1. Include software to totalize run-times for all BI and BO points.
- 2. A high run-time alarm shall be assigned, if required, by operator.

2.16 ENCLOSURES

A. General Enclosure Requirements:

1. House each controller and associated control accessories in an enclosure. Enclosure shall serve as central tie-in point for control devices such as switches, transmitters, transducers, power supplies and transformers.
2. Do not house more than one controller in a single enclosure.
3. Include enclosure door with key locking mechanism. Key locks alike for all enclosures and include one pair of keys per enclosure.
4. Include wall-mounted enclosures with brackets suitable for mounting enclosures to wall or freestanding support stand as required.
5. Supply each enclosure with a complete set of as-built schematics and wiring diagrams and product literature located in a pocket on inside of door.

B. Internal Arrangement:

1. Internal layout of enclosure shall group and protect electric, and electronic components associated with a controller, but not an integral part of controller.
2. Arrange layout to group similar products together.
3. Include a barrier between line-voltage and low-voltage electrical and electronic products.
4. Factory or shop install products, tubing, cabling and wiring complying with requirements and standards indicated.
5. Terminate field cable and wire using heavy-duty terminal blocks.
6. Include spare terminals, equal to not less than 10 percent of used terminals.
7. Include spade lugs for stranded cable and wire.
8. Install a maximum of two wires on each side of a terminal.
9. Include enclosure field power supply with a toggle-type switch located at entrance inside enclosure to disconnect power.
10. Include enclosure with a line-voltage nominal 20-A GFCI duplex receptacle for service and testing tools. Wire receptacle on hot side of enclosure disconnect switch and include with a 5-A circuit breaker.
11. Mount products within enclosure on removable internal panel(s).
12. Include products mounted in enclosures with engraved, laminated phenolic nameplates (black letters on a white background). The nameplates shall have at least 1/4-inch- high lettering.
13. Route cable and wire located inside enclosure within a raceway with a continuous removable cover.
14. Label each end of cable and wire in enclosure following an approved identification system that extends from field I/O connection and all intermediate connections throughout length to controller connection.

15. Size enclosure internal panel to include at least 25 percent spare area on face of panel.

C. Environmental Requirements:

1. Evaluate temperature and humidity requirements of each product to be installed within each enclosure.
2. Where required by application, include temperature-controlled electrical heat to maintain inside of enclosure above minimum operating temperature of product with most stringent requirement.

2.17 RELAYS

A. General-Purpose Relays:

1. Relays shall be heavy duty and rated for at least 10 A at 250-V ac and 60 Hz.
2. Relays shall be either double pole double throw (DPDT) or three-pole double throw, depending on the control application.
3. Relays shall have LED indication.
4. Performance:
 - a. Mechanical Life: At least 10 million cycles.
 - b. Electrical Life: At least 100,000 cycles at rated load.
 - c. Pickup Time: 15 ms or less.
 - d. Dropout Time: 10 ms or less.
 - e. Pull-in Voltage: 85 percent of rated voltage.
 - f. Dropout Voltage: 50 percent of nominal rated voltage.
 - g. Power Consumption: 2 VA.
 - h. Ambient Operating Temperatures: Minus 40 to 115 deg F.
5. Equip relays with coil transient suppression to limit transients to non-damaging levels.

B. Current Sensing Relay:

1. Monitors ac current.
2. Independent adjustable controls for pickup and dropout current.
3. Energized when supply voltage is present and current is above pickup setting.
4. De-energizes when monitored current is below dropout current.
5. Dropout current is adjustable from 50 to 95 percent of pickup current.
6. Include a current transformer, if required for application.

7. House current sensing relay and current transformer in its own enclosure. Use NEMA 250, Type 12 enclosure for indoors and NEMA 250, Type 4 for outdoors.

2.18 ELECTRICAL POWER DEVICES

A. Transformers:

1. Transformer shall be sized for the total connected load, plus an additional 25 percent of connected load.
2. Transformer shall be at least 40 VA.
3. Transformer shall have both primary and secondary fuses. B. Power-Line

Conditioner:

1. General Power-Line Conditioner Requirements:

- a. Design to ensure maximum reliability, serviceability and performance.
- b. Overall function of the power-line conditioner is to receive raw, polluted electrical power and purify it for use by electronic equipment. The power-line conditioner shall provide isolated, regulated, transient and noise-free sinusoidal power to loads served.

2. Standards: NRTL listed per UL 1012.

2.19 CONTROL WIRE AND CABLE

A. Wire: Single conductor control wiring above 24 V.

1. Wire size shall be at least No. 18 AWG.
2. Conductor shall be 7/24 soft annealed copper strand with 2- to 2.5-inch lay.
3. Conductor insulation shall be 600 V, Type THWN or Type THHN, and 90 deg C according to UL 83.
4. Conductor colors shall be black (hot), white (neutral), and green (ground).
5. Furnish wire on spools.

B. Single Twisted Shielded Instrumentation Cable above 24 V:

1. Wire size shall be a minimum No. 10 AWG.
2. Conductors shall be a twisted, 7/24 soft annealed copper strand with a 2- to 2.5-inch lay.
3. Conductor insulation shall have a Type THHN/THWN or Type TFN rating.

4. Shielding shall be 100 percent type, 0.35/0.5-mil aluminum/Mylar tape, helically applied with 25 percent overlap, and aluminum side in with tinned copper drain wire.
5. Outer jacket insulation shall have a 600-V, 90-deg C rating and shall be Type TC cable.
6. For twisted pair, conductor colors shall be black and white. For twisted triad, conductor colors shall be black, red and white.
7. Furnish wire on spools.

C. Single Twisted Shielded Instrumentation Cable 24 V and Less:

1. Wire size shall be a minimum No. 20 AWG.
2. Conductors shall be a twisted, 7/24 soft annealed copper stranding with a 2- to 2.5-inch lay.
3. Conductor insulation shall have a nominal 15-mil thickness, constructed from flame retardant PVC.
4. Shielding shall be 100 percent type, 1.35-mil aluminum/polymer tape, helically applied with 25 percent overlap, and aluminum side in with tinned copper drain wire.
5. Outer jacket insulation shall have a 300-V, 105-deg C rating and shall be Type PLTC cable.
6. For twisted pair, conductor colors shall be black and white. For twisted triad, conductor colors shall be black, red and white.
7. Furnish wire on spools.

D. LAN and Communication Cable: Comply with DDC system manufacturer requirements for network being installed.

1. Cable shall be balanced twisted pair.
2. Comply with the following requirements and for balanced twisted pair cable described in Section 260523 "Control-Voltage Electrical Power Cables" and Section 271513 "Communications Copper Horizontal Cabling."
 - a. Cable shall be plenum rated.
 - b. Cable shall have a unique color that is different from other cables used on Project.

2.20 RACEWAYS

- A. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems" for electrical power raceways and boxes.
- B. Comply with requirements in Section 270528 "Pathways for Communications Systems" for raceways for balanced twisted pair cables and optical fiber cables.

2.21 ACCESSORIES

A. Damper Blade Limit Switches:

1. Sense positive open and/or closed position of the damper blades.
2. NEMA 250, Type 13, oil-tight construction.
3. Arrange for the mounting application.
4. Additional waterproof enclosure when required by its environment.
5. Arrange to prevent "over-center" operation.

B. Manual Valves:

1. Needle Type:

- a. PTFE packing.
- b. Construct of brass for use with copper and polyethylene tubing and of stainless steel for use with stainless-steel tubing.
- c. Aluminum T-bar handle.
- d. Include tubing connections.

2. Ball Type:

- a. Body: Bronze ASTM B 62 or ASTM B 61.
- b. Ball: Type 316 stainless steel.
- c. Stem: Type 316 stainless steel.
- d. Seats: Reinforced PTFE.
- e. Packing Ring: Reinforced PTFE.
- f. Lever: Stainless steel with a vinyl grip.
- g. 600 WOG.
- h. Threaded end connections.

2.22 IDENTIFICATION

A. Control Equipment, Instruments, and Control Devices:

1. Self-adhesive label bearing unique identification.

a. Include instruments with unique identification identified by equipment being controlled or monitored, followed by point identification.

2. Letter size shall be as follows:

- a. DDC Controllers: Minimum of 0.5 inch high.
- b. Repeaters: Minimum of 0.5 inch high.
- c. Enclosures: Minimum of 0.5 inch high.

- d. Electrical Power Devices: Minimum of 0.25 inch high.
- e. Accessories: Minimum of 0.25 inch high.
- f. Instruments: Minimum of 0.25 inch high.
- g. Control Damper and Valve Actuators: Minimum of 0.25 inch high.

- 3. Legend shall consist of white lettering on black background.
- 4. Instruments, control devices and actuators with Project-specific identification tags having unique identification numbers following requirements indicated and provided by original manufacturer do not require additional identification.

B. Valve Tags:

- 1. Brass tags and brass chains attached to valve.
- 2. Tags shall be at least 1.5 inches in diameter.
- 3. Include tag with unique valve identification indicating control influence such as flow, level, pressure, or temperature; followed by location of valve, and followed by three-digit sequential number. For example: TV-1.001.
- 4. Valves with Project-specific identification tags having unique identification numbers following requirements indicated and provided by original manufacturer do not require an additional tag.

C. Raceway and Boxes:

- 1. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- 2. Paint cover plates on junction boxes and conduit same color as the tape banding for conduits. After painting, label cover plate "HVAC Controls," using an engraved phenolic tag.

D. Equipment Warning Labels:

- 1. Self-adhesive label with pressure-sensitive adhesive back and peel-off protective jacket.
- 2. Lettering size shall be at least 14-point type with white lettering on red background.
- 3. Warning label shall read "CAUTION-Equipment operated under remote automatic control and may start or stop at any time without warning. Switch electric power disconnecting mains to OFF position before servicing."
- 4. Lettering shall be enclosed in a white line border. Edge of label shall extend at least 0.25 inch beyond white border.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Verify compatibility with and suitability of substrates.

B. Examine roughing-in for products to verify actual locations of connections before installation.

1. Examine roughing-in for instruments installed in piping to verify actual locations of connections before installation.
2. Examine roughing-in for instruments installed in duct systems to verify actual locations of connections before installation.

C. Examine walls, floors, roofs, and ceilings for suitable conditions where product will be installed.

D. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 DDC SYSTEM INTERFACE WITH OTHER SYSTEMS AND EQUIPMENT

A. Communication Interface to Equipment with Integral Controls:

1. DDC system shall have communication interface with equipment having integral controls and having a communication interface for remote monitoring or control.

3.3 CONTROL DEVICES FOR INSTALLATION BY INSTALLERS

A. Deliver selected control devices, specified in indicated HVAC instrumentation and control device Sections, to identified equipment and systems manufacturers for factory installation and to identified installers for field installation.

B. Deliver the following to duct fabricator and Installer for installation in ductwork. Include installation instructions to Installer and supervise installation for compliance with requirements.

1. DDC control dampers, which are specified in Section 230923.12 "DDC Control Dampers."
2. Airflow sensors and switches, which are specified in Section 230923.14 "Flow Instruments."

3. Pressure sensors, which are specified in Section 230923.23 "Pressure Instruments."

C. Deliver the following to plumbing and HVAC piping installers for installation in piping. Include installation instructions to Installer and supervise installation for compliance with requirements.

1. DDC control valves, which are specified in Section 230923.11 "Control Valves."
2. Pipe-mounted sensors, switches and transmitters. Flow meters are specified in Section 230923.14 "Flow Instruments." Liquid temperature sensors, switches, and transmitters are specified in Section 230923.27 "Temperature Instruments."
3. Pipe- and tank-mounted thermowells. Liquid thermowells are specified in Section 230923.27 "Temperature Instruments."

3.4 GENERAL INSTALLATION REQUIREMENTS

- A. Install products to satisfy more stringent of all requirements indicated.
- B. Install products level, plumb, parallel, and perpendicular with building construction.
- C. Support products, piping wiring, and raceways. Brace products to prevent lateral movement and sway or a break in attachment when subjected to a force.
- D. If codes and referenced standards are more stringent than requirements indicated, comply with requirements in codes and referenced standards.
- E. Fabricate openings and install sleeves in ceilings, floors, roof, and walls required by installation of products. Before proceeding with drilling, punching, and cutting, check for concealed work to avoid damage. Patch, flash, grout, seal, and refinish openings to match adjacent condition.
- F. Firestop Penetrations Made in Fire-Rated Assemblies: Comply with requirements in Section 078413 "Penetration Firestopping."
- G. Seal penetrations made in acoustically rated assemblies. Comply with requirements in Section 079219 "Acoustical Joint Sealants."
- H. Fastening Hardware:
 1. Stillson wrenches, pliers, and other tools that damage surfaces of rods, nuts, and other parts are prohibited for work of assembling and tightening fasteners.
 2. Tighten bolts and nuts firmly and uniformly. Do not overstress threads by excessive force or by oversized wrenches.
 3. Lubricate threads of bolts, nuts and screws with graphite and oil before assembly.

I. If product locations are not indicated, install products in locations that are accessible and that will permit service and maintenance from floor, equipment platforms, or catwalks without removal of permanently installed furniture and equipment.

3.5 ROUTER INSTALLATION

A. Install routers if required for DDC system communication interface requirements indicated.

1. Install router(s) required to suit indicated requirements.

B. Test router to verify that communication interface functions properly.

3.6 CONTROLLER INSTALLATION

A. Install controllers in enclosures to comply with indicated requirements.

B. Connect controllers to field power supply.

C. Install controller with latest version of applicable software and configure to execute requirements indicated.

D. Test and adjust controllers to verify operation of connected I/O to achieve performance indicated requirements while executing sequences of operation. E.

Installation of Network Controllers:

1. Quantity and location of network controllers shall be determined by DDC system manufacturer to satisfy requirements indicated.

2. Install controllers in a protected location that is easily accessible by operators.

3. Top of controller shall be within 84 inches of finished floor.

F. Installation of Programmable Application Controllers:

1. Quantity and location of programmable application controllers shall be determined by DDC system manufacturer to satisfy requirements indicated.

2. Install controllers in a protected location that is easily accessible by operators.

3. Top of controller shall be within 84 inches of finished floor.

G. Application-Specific Controllers:

1. Quantity and location of application-specific controllers shall be determined by DDC system manufacturer to satisfy requirements indicated.

2. For controllers not mounted directly on equipment being controlled, install controllers in a protected location that is easily accessible by operators.

3.7 INSTALLATION OF WIRELESS ROUTERS FOR OPERATOR INTERFACE

- A. Install wireless routers to achieve optimum performance and best possible coverage.
- B. Mount wireless routers in a protected location that is within 60 inches of floor and easily accessible by operators.

3.8 ELECTRIC POWER CONNECTIONS

- A. Connect electrical power to DDC system products requiring electrical power connections.
- B. Design of electrical power to products not indicated with electric power is delegated to DDC system provider and installing trade. Work shall comply with NFPA 70 and other requirements indicated.
- C. Comply with requirements in Section 262816 "Enclosed Switches and Circuit Breakers" for electrical power circuit breakers.
- D. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for electrical power conductors and cables.
- E. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems" for electrical power raceways and boxes.

3.9 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements in Section 260553 "Identification for Electrical Systems" for identification products and installation.
- B. Install self-adhesive labels with unique identification on face for each of the following:
 1. Router.
 2. DDC controller.
 3. Enclosure.
 4. Electrical power device.
 5. Accessory.

C. Install unique instrument identification on face of each instrument connected to a DDC controller.

D. Install unique identification on face of each control damper and valve actuator connected to a DDC controller.

E. Warning Labels and Signs:

1. Shall be permanently attached to equipment that can be automatically started by DDC control system.
2. Shall be located in highly visible location near power service entry points.

3.10 NETWORK INSTALLATION

A. Install cable in continuous raceway.

1. Where indicated on Drawings, cable trays may be used for copper cable in lieu of conduit.

3.11 NETWORK NAMING AND NUMBERING

A. Coordinate with Owner and provide unique naming and addressing for networks and devices.

B. ASHRAE 135 Networks:

1. MAC Address:

- a. Every network device shall have an assigned and documented MAC address unique to its network.
- b. Ethernet Networks: Document MAC address assigned at its creation.
- c. ARCNET or MS/TP networks: Assign from 00 to 64.

2. Network Numbering:

- a. Assign unique numbers to each new network.
- b. Provide ability for changing network number through device switches or operator interface.
- c. DDC system, with all possible connected LANs, can contain up to 65,534 unique networks.

3. Device Object Identifier Property Number:

- a. Assign unique device object identifier property numbers or device instances for each device network.

- b. Provide for future modification of device instance number by device switches or operator interface.
 - c. LAN shall support up to 4,194,302 unique devices.
- 4. Device Object Name Property Text:
 - a. Device object name property field shall support 32 minimum printable characters.
 - b. Assign unique device "Object Name" property names with plain-English descriptive names for each device.
 - 1) Example 1: Device object name for device controlling boiler plant at Building 1000 would be "HW System B1000."
 - 2) Example 2: Device object name for a VAV terminal unit controller could be "VAV unit 102".
- 5. Object Name Property Text for Other Than Device Objects:
 - a. Object name property field shall support 32 minimum printable characters.
 - b. Assign object name properties with plain-English names descriptive of application.
 - 1) Example 1: "Zone 1 Temperature."
 - 2) Example 2 "Fan Start and Stop."
- 6. Object Identifier Property Number for Other Than Device Objects:
 - a. Assign object identifier property numbers according to Drawings indicated.
 - b. If not indicated, object identifier property numbers may be assigned at Installer's discretion but must be approved by Owner in advance, be documented and be unique for like object types within device.

3.12 CONTROL WIRE, CABLE AND RACEWAYS INSTALLATION A.

Comply with NECA 1.

B. Wire and Cable Installation:

- 1. Comply with installation requirements in Section 260523 "Control-Voltage Electrical Power Cables."
- 2. Comply with installation requirements in Section 271313 "Communications Copper Backbone Cabling."
- 3. Comply with installation requirements in Section 271513 "Communications Copper Horizontal Cabling."

4. Install cables with protective sheathing that is waterproof and capable of withstanding continuous temperatures of 90 deg C with no measurable effect on physical and electrical properties of cable.
- a. Provide shielding to prevent interference and distortion from adjacent cables and equipment.
5. Terminate wiring in a junction box.
 - a. Clamp cable over jacket in junction box.
 - b. Individual conductors in the stripped section of the cable shall be slack between the clamping point and terminal block.
6. Terminate field wiring and cable not directly connected to instruments and control devices having integral wiring terminals using terminal blocks.
7. Install signal transmission components according to IEEE C2, REA Form 511a, NFPA 70, and as indicated.
8. Use shielded cable to transmitters.
9. Use shielded cable to temperature sensors.
10. Perform continuity and meager testing on wire and cable after installation.

C. Conduit Installation:

1. Comply with Section "260533 "Raceways and Boxes for Electrical Systems" for control voltage conductors.
2. Comply with Section 270528 "Pathways for Communications Systems" for balanced twisted pair cabling and optical fiber installation.

3.13 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and installations, including connections.
- B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Testing:

1. Perform preinstallation, in-progress, and final tests, supplemented by additional tests, as necessary.
2. Preinstallation Cable Verification: Verify integrity and serviceability for new cable lengths before installation. This assurance may be provided by using vendor verification documents, testing, or other methods. As a minimum, furnish evidence of verification for cable attenuation and bandwidth parameters.
3. In-Progress Testing: Perform standard tests for correct pair identification and termination during installation to ensure proper installation and cable placement. Perform tests in addition to those specified if there is any reason to question condition of material furnished and installed. Testing accomplished is to be documented by agency conducting tests. Submit test results for Project record.
4. Final Testing: Perform final test of installed system to demonstrate acceptability as installed. Testing shall be performed according to a test plan supplied by DDC system manufacturer. Defective Work or material shall be corrected and retested. As a minimum, final testing for cable system, including spare cable, shall verify conformance of attenuation, length, and bandwidth parameters with performance indicated.
5. Test Results: Record test results and submit copy of test results for Project record.

3.14 DDC SYSTEM I/O CHECKOUT PROCEDURES

- A. Check installed products before continuity tests, leak tests and calibration.
- B. Check instruments for proper location and accessibility.
- C. Check instruments for proper installation on direction of flow, elevation, orientation, insertion depth, or other applicable considerations that will impact performance.
- D. Control Damper Checkout:

1. Verify that control dampers are installed correctly for flow direction.
2. Verify that proper blade alignment, either parallel or opposed, has been provided.
3. Verify that damper frame attachment is properly secured and sealed.
4. Verify that damper actuator and linkage attachment is secure.
5. Verify that actuator wiring is complete, enclosed and connected to correct power source.
6. Verify that damper blade travel is unobstructed.

- E. Control Valve Checkout:
 1. Verify that control valves are installed correctly for flow direction.
 2. Verify that valve body attachment is properly secured and sealed.
 3. Verify that valve actuator and linkage attachment is secure.
 4. Verify that actuator wiring is complete, enclosed and connected to correct power source.

5. Verify that valve ball travel is unobstructed.
6. After piping systems have been tested and put into service, but before insulating and balancing, inspect each valve for leaks. Adjust or replace packing to stop leaks. Replace the valve if leaks persist.

F. Instrument Checkout:

1. Verify that instrument is correctly installed for location, orientation, direction and operating clearances.
2. Verify that attachment is properly secured and sealed.
3. Verify that conduit connections are properly secured and sealed.
4. Verify that wiring is properly labeled with unique identification, correct type and size and is securely attached to proper terminals.
5. Inspect instrument tag against approved submittal.
6. For instruments with tubing connections, verify that tubing attachment is secure and isolation valves have been provided.
7. For temperature instruments:
 - a. Verify sensing element type and proper material.
 - b. Verify length and insertion.

3.15 DDC SYSTEM I/O ADJUSTMENT, CALIBRATION AND TESTING:

- A. Calibrate each instrument installed that is not factory calibrated and provided with calibration documentation.
- B. Provide a written description of proposed field procedures and equipment for calibrating each type of instrument. Submit procedures before calibration and adjustment.
- C. For each analog instrument, make a three-point test of calibration for both linearity and accuracy.
- D. Equipment and procedures used for calibration shall comply with instrument manufacturer's written instructions.
- E. Calibrate each instrument according to instrument instruction manual supplied by manufacturer.
- F. If after calibration indicated performance cannot be achieved, replace out-of-tolerance instruments.
- G. Analog Signals:
 1. Check analog voltage signals using a precision voltage meter at zero, 50, and 100 percent.

2. Check analog current signals using a precision current meter at zero, 50, and 100 percent.

3. Check resistance signals for temperature sensors at zero, 50, and 100 percent of operating span using a precision-resistant source. H. Digital Signals:

1. Check digital signals using a jumper wire.

2. Check digital signals using an ohmmeter to test for contact making or breaking.

I. Control Dampers:

1. Stroke and adjust control dampers following manufacturer's recommended procedure, from 100 percent open to 100 percent closed and back to 100 percent open.

2. Check and document open and close cycle times for applications with a cycle time less than 30 seconds.

3. For control dampers equipped with positive position indication, check feedback signal at multiple positions to confirm proper position indication.

J. Control Valves:

1. Stroke and adjust control valves following manufacturer's recommended procedure, from 100 percent open to 100 percent closed and back to 100 percent open.

2. Check and document open and close cycle times for applications with a cycle time less than 30 seconds.

3. For control valves equipped with positive position indication, check feedback signal at multiple positions to confirm proper position indication.

K. Meters: Check sensors at zero, 50, and 100 percent of Project design values.

L. Sensors: Check sensors at zero, 50, and 100 percent of Project design values.

M. Switches: Calibrate switches to make or break contact at set points indicated.

N. Transmitters:

1. Check and calibrate transmitters at zero, 50, and 100 percent of Project design values.

2. Calibrate resistance temperature transmitters at zero, 50, and 100 percent of span using a precision-resistant source.

3.16 DDC SYSTEM CONTROLLER CHECKOUT

A. Verify power supply.

1. Verify voltage, phase and hertz.
2. Verify that protection from power surges is installed and functioning.
3. Verify that ground fault protection is installed.
4. If applicable, verify if connected to a backup power source.
5. If applicable, verify that power conditioning units, transient voltage suppression and high-frequency noise filter units are installed.

B. Verify that wire and cabling is properly secured to terminals and labeled with unique identification.

C. Verify that spare I/O capacity is provided.

3.17 DDC CONTROLLER I/O CONTROL LOOP TESTS A.

Testing:

1. Test every I/O point connected to DDC controller to verify that safety and operating control set points are as indicated and as required to operate controlled system safely and at optimum performance.
2. Test every I/O point throughout its full operating range.
3. Test every control loop to verify operation is stable and accurate.
4. Adjust control loop proportional, integral and derivative settings to achieve optimum performance while complying with performance requirements indicated. Document testing of each control loop's precision and stability via trend logs.
5. Test and adjust every control loop for proper operation according to sequence of operation.
6. Test software and hardware interlocks for proper operation. Correct deficiencies.
7. Operate each analog point at the following:
 - a. Upper quarter of range.
 - b. Lower quarter of range.
 - c. At midpoint of range.
8. Exercise each binary point.
9. For every I/O point in DDC system, read and record each value at operator workstation, at DDC controller and at field instrument simultaneously. Value displayed at operator workstation, at DDC controller and at field instrument shall match.
10. Prepare and submit a report documenting results for each I/O point in DDC system and include in each I/O point a description of corrective measures and

3.18 adjustments made to achieve desire results. DDC SYSTEM VALIDATION TESTS

- A. Perform validation tests before requesting final review of system. Before beginning testing, first submit Pretest Checklist and Test Plan.
- B. After approval of Test Plan, execute all tests and procedures indicated in plan.
- C. After testing is complete, submit completed test checklist.
- D. Pretest Checklist: Submit the following list with items checked off once verified:
 - 1. Detailed explanation for any items that are not completed or verified.
 - 2. Required mechanical installation work is successfully completed and HVAC equipment is working correctly.
 - 3. HVAC equipment motors operate below full-load amperage ratings.
 - 4. Required DDC system components, wiring, and accessories are installed.
 - 5. Installed DDC system architecture matches approved Drawings.
 - 6. Control electric power circuits operate at proper voltage and are free from faults.
 - 7. Required surge protection is installed.
 - 8. DDC system network communications function properly, including uploading and downloading programming changes.
 - 9. Each controller's programming is backed up.
 - 10. Equipment, products, tubing, wiring cable and conduits are properly labeled.
 - 11. All I/O points are programmed into controllers.
 - 12. Testing, adjusting and balancing work affecting controls is complete.
 - 13. Dampers and actuators zero and span adjustments are set properly.
 - 14. Each control damper and actuator goes to failed position on loss of power.
 - 15. Valves and actuators zero and span adjustments are set properly.
 - 16. Each control valve and actuator goes to failed position on loss of power.
 - 17. Meter, sensor and transmitter readings are accurate and calibrated.
 - 18. Control loops are tuned for smooth and stable operation.
 - 19. View trend data where applicable.
 - 20. Each controller works properly in standalone mode.
 - 21. Safety controls and devices function properly.
 - 22. Interfaces with fire-alarm system function properly.
 - 23. Electrical interlocks function properly.
 - 24. Operator workstations and other interfaces are delivered, all system and database software is installed, and graphic are created.
 - 25. Record Drawings are completed.

E. Test Plan:

1. Prepare and submit a validation test plan including test procedures for performance validation tests.
2. Test plan shall address all specified functions of DDC system and sequences of operation.
3. Explain detailed actions and expected results to demonstrate compliance with requirements indicated.
4. Explain method for simulating necessary conditions of operation used to demonstrate performance.
5. Include a test checklist to be used to check and initial that each test has been successfully completed.
6. Submit test plan documentation 20 business days before start of tests.

F. Validation Test:

1. Verify operating performance of each I/O point in DDC system.
 - a. Verify analog I/O points at operating value.
 - b. Make adjustments to out-of-tolerance I/O points.
 - 1) Identify I/O points for future reference.
 - 2) Simulate abnormal conditions to demonstrate proper function of safety devices.
 - 3) Replace instruments and controllers that cannot maintain performance indicated after adjustments.
2. Simulate conditions to demonstrate proper sequence of control.
3. Readjust settings to design values and observe ability of DDC system to establish desired conditions.
4. After 24 Hours following Initial Validation Test:
 - a. Re-check I/O points that required corrections during initial test.
 - b. Identify I/O points that still require additional correction and make corrections necessary to achieve desired results.
5. After 24 Hours of Second Validation Test:
 - a. Re-check I/O points that required corrections during second test.
 - b. Continue validation testing until I/O point is normal on two consecutive tests.
6. Completely check out, calibrate, and test all connected hardware and software to ensure that DDC system performs according to requirements indicated.

7. After validation testing is complete, prepare and submit a report indicating all I/O points that required correction and how many validation re-tests it took to pass. Identify adjustments made for each test and indicate instruments that were replaced.

G. DDC System Response Time Test:

1. Simulate HLC.

a. Heavy load shall be an occurrence of 50 percent of total connected binary COV, one-half of which represent an "alarm" condition, and 50 percent of total connected analog COV, one-half of which represent an "alarm" condition, that are initiated simultaneously on a one-time basis.

2. Initiate 10 successive occurrences of HLC and measure response time to typical alarms and status changes.

3. Measure with a timer having at least 0.1-second resolution and 0.01 percent accuracy.

4. Purpose of test is to demonstrate DDC system, as follows:

a. Reaction to COV and alarm conditions during HLC.

b. Ability to update DDC system database during HLC.

5. Passing test is contingent on the following:

a. Alarm reporting at printer beginning no more than two seconds after the initiation (time zero) of HLC.

b. All alarms, both binary and analog, are reported and printed; none are lost.

c. Compliance with response times specified.

6. Prepare and submit a report documenting HLC tested and results of test including time stamp and print out of all alarms.

H. DDC System Network Bandwidth Test:

1. Test network bandwidth usage on all DDC system networks to demonstrate bandwidth usage under DDC system normal operating conditions and under simulated HLC.

2. To pass, none of DDC system networks shall use more than 70 percent of available bandwidth under normal and HLC operation.

3.19 FINAL REVIEW

A. Submit written request to Architect and Owner when DDC system is ready for final review. Written request shall state the following:

1. DDC system has been thoroughly inspected for compliance with contract documents and found to be in full compliance.
2. DDC system has been calibrated, adjusted and tested and found to comply with requirements of operational stability, accuracy, speed and other performance requirements indicated.
3. DDC system monitoring and control of HVAC systems results in operation according to sequences of operation indicated.
4. DDC system is complete and ready for final review.

B. Review by Architect and Owner shall be made after receipt of written request. A field report shall be issued to document observations and deficiencies.

C. Take prompt action to remedy deficiencies indicated in field report and submit a second written request when all deficiencies have been corrected. Repeat process until no deficiencies are reported.

D. Should more than two reviews be required, DDC system manufacturer and Installer shall compensate entity performing review for total costs, labor and expenses, associated with third and subsequent reviews. Estimated cost of each review shall be submitted and approved by DDC system manufacturer and Installer before making the review.

E. Prepare and submit closeout submittals and begin procedures indicated in "Extended Operation Test" Article when no deficiencies are reported.

F. A part of DDC system final review shall include a demonstration to parties participating in final review.

1. Provide staff familiar with DDC system installed to demonstrate operation of DDC system during final review.
2. Provide testing equipment to demonstrate accuracy and other performance requirements of DDC system that is requested by reviewers during final review.
3. Demonstration shall include, but not be limited to, the following:
 - a. Accuracy and calibration of 10 I/O points randomly selected by reviewers. If review finds that some I/O points are not properly calibrated and not satisfying performance requirements indicated, additional I/O points may be selected by reviewers until total I/O points being reviewed that satisfy requirements equals quantity indicated.
 - b. HVAC equipment and system hardwired and software safeties and life-safety functions are operating according to sequence of operation. Up to

10 I/O points shall be randomly selected by reviewers. Additional I/O points may be selected by reviewers to discover problems with operation.

c. Correct sequence of operation after electrical power interruption and resumption after electrical power is restored for randomly selected HVAC systems.

d. Operation of randomly selected dampers and valves in normal-on, normal-off and failed positions.

e. Reporting of alarm conditions for randomly selected alarms, including different classes of alarms, to ensure that alarms are properly received by operators and operator workstations.

f. Trends, summaries, logs and reports set-up for Project.

g. For up to three HVAC systems randomly selected by reviewers, use graph trends to show that sequence of operation is executed in correct manner and that HVAC systems operate properly through complete sequence of operation including different modes of operations indicated. Show that control loops are stable and operating at set points and respond to changes in set point of 20 percent or more.

h. Software's ability to communicate with controllers, operator workstations, uploading and downloading of control programs.

i. Software's ability to edit control programs off-line.

j. Data entry to show Project-specific customizing capability including parameter changes.

k. Step through penetration tree, display all graphics, demonstrate dynamic update, and direct access to graphics.

l. Execution of digital and analog commands in graphic mode.

m. Spreadsheet and curve plot software and its integration with database.

n. Multitasking by showing different operations occurring simultaneously on four quadrants of split screen.

o. System speed of response compared to requirements indicated.

p. For Each Network and Programmable Application Controller:

1) Memory: Programmed data, parameters, trend and alarm history collected during normal operation is not lost during power failure.

2) Operator Interface: Ability to connect directly to each type of digital controller with a portable workstation and mobile device. Show that maintenance personnel interface tools perform as indicated in manufacturer's technical literature.

3) Standalone Ability: Demonstrate that controllers provide stable and reliable standalone operation using default values or other method for values normally read over network.

4) Electric Power: Ability to disconnect any controller safely from its power source.

5) Wiring Labels: Match control drawings.

6) Network Communication: Ability to locate a controller's location on network and communication architecture matches Shop Drawings.

- 7) Nameplates and Tags: Accurate and permanently attached to control panel doors, instrument, actuators and devices.

q. Communications and Interoperability: Demonstrate proper interoperability of data sharing, alarm and event management, trending, scheduling, and device and network management. Use ASHRAE 135 protocol analyzer to help identify devices, view network traffic, and verify interoperability. Requirements must be met even if only one manufacturer's equipment is installed.

- 1) Data Presentation: On each operator workstation, demonstrate graphic display capabilities.
- 2) Reading of Any Property: Demonstrate ability to read and display any used readable object property of any device on network.
- 3) Set Point and Parameter Modifications: Show ability to modify set points and tuning parameters indicated. Modifications are made with messages and write services initiated by an operator using workstation graphics, or by completing a field in a menu with instructional text.
- 4) Peer-to-Peer Data Exchange: Network devices are installed and configured to perform without need for operator intervention to implement Project sequence of operation and to share global data.
- 5) Alarm and Event Management: Alarms and events are installed and prioritized according to Owner. Demonstrate that time delays and other logic are set up to avoid nuisance tripping. Show that operators with sufficient privileges are permitted.
- 6) Schedule Lists: Schedules are configured for start and stop, mode change, occupant overrides, and night setback as defined in sequence of operations.
- 7) Schedule Display and Modification: Ability to display any schedule with start and stop times for calendar year. Show that all calendar entries and schedules are modifiable from any connected operator workstation by an operator with sufficient privilege.
- 8) Archival Storage of Data: Data archiving is handled by operator workstation and server and local trend archiving and display is accomplished.
- 9) Modification of Trend Log Object Parameters: Operator with sufficient privilege can change logged data points, sampling rate, and trend duration.
- 10) Device and Network Management:

Display of network device status.

Display of BACnet Object Information.

Silencing devices transmitting erroneous data.

Time synchronization.

Remote device re-initialization.

Backup and restore network device programming and master database(s).

Configuration management of routers.

3.20 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.21 MAINTENANCE SERVICE

A. Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by DDC system manufacturer's authorized service representative. Include monthly preventive maintenance, repair or replacement of worn or defective components, cleaning, calibration and adjusting as required for proper operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

3.22 SOFTWARE SERVICE AGREEMENT

A. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for two years.

B. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.

1. Upgrade Notice: At least 30 days to allow Owner to schedule and access system and to upgrade computer equipment if necessary.

3.23 DEMONSTRATION

A. Engage a factory-authorized service representative with complete knowledge of Project-specific system installed to train Owner's maintenance personnel to adjust, operate, and maintain DDC system.

B. Extent of Training:

1. Base extent of training on scope and complexity of DDC system indicated and training requirements indicated. Provide extent of training required to satisfy requirements indicated even if more than minimum training requirements are indicated.

2. Inform Owner of anticipated training requirements if more than minimum training requirements are indicated.

3. Minimum Training Requirements:

a. Provide not less than five days of training total.

- b. Stagger training over multiple training classes to accommodate Owner's requirements. All training shall occur before end of warranty period.

C. Training Schedule:

1. Schedule training with Owner 20 business days before expected Substantial Completion.
2. Schedule training to provide Owner with at least 15 business days of notice in advance of training.
3. Training shall occur within normal business hours at a mutually agreed on time. Unless otherwise agreed to, training shall occur Monday through Friday, except on U.S. Federal holidays, with two morning sessions and two afternoon sessions. Each morning session and afternoon session shall be split in half with 15-minute break between sessions. Morning and afternoon sessions shall be separated by 30-minute lunch period. Training, including breaks and excluding lunch period, shall not exceed eight hours per day.
4. Provide staggered training schedule as requested by Owner.

D. Instructor Requirements:

1. One or multiple qualified instructors, as required, to provide training.
2. Instructors shall have not less than five years of providing instructional training on not less than five past projects with similar DDC system scope and complexity to DDC system installed.

E. On-Site Training:

1. Owner will provide conditioned classroom or workspace with ample desks or tables, chairs, power and data connectivity for instructor and each attendee.
2. Instructor shall provide training materials, projector and other audiovisual equipment used in training.
3. Provide as much of training located on-site as deemed feasible and practical by Owner.
4. On-site training shall include regular walk-through tours, as required, to observe each unique product type installed with hands-on review of operation, calibration and service requirements.
5. Operator workstation provided with DDC system shall be used in training. If operator workstation is not indicated, provide a temporary workstation to convey training content.

F. Training Content for Daily Operators:

1. Basic operation of system.
2. Understanding DDC system architecture and configuration.
3. Understanding each unique product type installed including performance and service requirements for each.
4. Understanding operation of each system and equipment controlled by DDC system including sequences of operation, each unique control algorithm and each unique optimization routine.
5. Operating operator workstations, printers and other peripherals.
6. Logging on and off system.
7. Accessing graphics, reports and alarms.
8. Adjusting and changing set points and time schedules.
9. Recognizing DDC system malfunctions.
10. Understanding content of operation and maintenance manuals including control drawings.
11. Understanding physical location and placement of DDC controllers and I/O hardware.
12. Accessing data from DDC controllers.
13. Operating portable operator workstations.
14. Review of DDC testing results to establish basic understanding of DDC system operating performance and HVAC system limitations as of Substantial Completion.
15. Running each specified report and log.
16. Displaying and demonstrating each data entry to show Project-specific customizing capability. Demonstrating parameter changes.
17. Stepping through graphics penetration tree, displaying all graphics, demonstrating dynamic updating, and direct access to graphics.
18. Executing digital and analog commands in graphic mode.
19. Demonstrating control loop precision and stability via trend logs of I/O for not less than 10 percent of I/O installed.
20. Demonstrating DDC system performance through trend logs and command tracing.
21. Demonstrating scan, update, and alarm responsiveness.
22. Demonstrating spreadsheet and curve plot software, and its integration with database.
23. Demonstrating on-line user guide, and help function and mail facility.
24. Demonstrating multitasking by showing dynamic curve plot, and graphic construction operating simultaneously via split screen.
25. Demonstrating the following for HVAC systems and equipment controlled by DDC system:

- a. Operation of HVAC equipment in normal-off, -on and failed conditions while observing individual equipment, dampers and valves for correct position under each condition.
- b. For HVAC equipment with factory-installed software, show that integration into DDC system is able to communicate with DDC controllers or gateways, as applicable.
- c. Using graphed trends, show that sequence of operation is executed in correct manner, and HVAC systems operate properly through complete sequence of operation including seasonal change, occupied and unoccupied modes, warm-up and cool-down cycles and other modes of operation indicated.
- d. Hardware interlocks and safeties function properly and DDC system performs correct sequence of operation after electrical power interruption and resumption after power is restored.
- e. Reporting of alarm conditions for each alarm, and confirm that alarms are received at assigned locations, including operator workstations.
- f. Each control loop responds to set point adjustment and stabilizes within time period indicated.

Sharing of previously graphed trends of all control loops to demonstrate that each control loop is stable and set points are being maintained

2.40 MOTORS AND DRIVES:

- A. Unless otherwise noted, all motors/ drives shall be furnished factory-mounted on the driven equipment and shall be provided by equipment manufacturer. Mechanical Contractor shall supply all motors to associated HVAC equipment. Electrical Contractor shall be responsible for providing motor starters, variable frequency drives, and disconnects and power wiring to all mechanical equipment including motor starters and terminating in such equipment. This Contractor and Electrical Contractor shall coordinate such installation of electrical equipment and both shall be present when motors of 1/2 hp and larger are to be first energized.
- B. Motors shall meet the latest applicable standards of the following:
 - National Electric Manufacturers' Association (NEMA)
 - American National Standards Institute (ANSI)
 - Institute of Electrical and Electronic Engineers (IEEE)
 - National Electrical Code (NEC)
 - Underwriters' Laboratories (UL)
- C. Motors shall be horizontal, induction type, for general purpose applications under usual indoor and outdoor service conditions as defined in NEMA Standard MG1-14.02 (Class B insulation, continuous 40 degrees C ambient).
- D. Unless otherwise noted, all motors 1/2 horsepower and larger shall be rated 480 or 208 volts, 3-phase, 60 hertz. All motors smaller than 1/2 horsepower shall be rated 120 volts, single- phase, 60 hertz.

- E. Motors shall develop rated horsepower at terminal voltage rating from 90 to 110 percent of rated frequency, and a combined frequency/voltage deviation of 10 percent at any frequency between 95 and 105 percent of rated.

PART THREE: EXECUTION

3.01 GENERAL

- A. The work shall be executed in strict conformance with the latest edition of the State Building Code and all local regulations that may apply. In case of conflict between the Contract Documents and a governing code or ordinance, the more stringent standard shall apply.
- B. All piping and ductwork shall be properly supported as approved by the Engineer.
- C. Follow equipment manufacturers' detailed instructions and recommendations in the installation and connection of all equipment. No equipment installation or connections shall be made in a manner that voids the manufacturer's warranty.
- D. Duct systems shall be thoroughly cleaned during erection.
- E. Refer to Section 06100 for specifications on cutting and sealing openings for piping, ductwork and other equipment penetrating walls, floors and roofs.
- F. Refer to Section 06100 and General Conditions for provisions governing work, including removal of existing equipment and advance notice of service interruption.
- G. All work shown on Drawings is diagrammatic. It is not intended to specify or to show every offset, fitting, and component. However, it is the intent of these Specifications and Drawings accompanying same that all required components and materials shall be furnished and installed under this Section, whether or not indicated or specified, in such a manner as to make the entire installation fully complete, operable and maintainable in all respects to satisfaction of Owner.
- H. Refer to appropriate sections for specifications on cutting and sealing openings for piping and other equipment penetrating walls, floors, and roofs.

Building Structure Penetrations; General Contractor to provide cutting & finish patching of all building structure penetrations involving removals and new installations of system items, devices, etc. associated with this trade. This contractor shall provide necessary and proper fire stop(s), water seal or weather stop(s), etc. associated with system device penetration. This trade shall coordinate all system component penetrations through building structure(s) with General Contractor and Owner.

3.02 GENERAL - PIPING

- A. All piping shall be installed so as to provide allowances for expansion and contraction and shall be thoroughly cleaned and reamed before installation.
- B. Shut off valves shall be installed on all main and sub main branches and as shown on the Drawings, details and where specified. Provide shut off valves on branch lines and as detailed.
- C. Piping system shall be tested at 1-1/2 times the working pressure, but not less than 50 psi.

All leaks shall be repaired in a manner approved by the Engineer before applying insulation

D. SLEEVES:

All piping through masonry walls, floors, beams and partitions shall be sleeved. All sleeves shall finish flush with the finish line. All sleeves shall be chalked with an approved water repellant and fire retardant sealant. Space between sleeves and piping shall be sealed watertight and/or gastight as described below:

1. Uninsulated metal piping shall be sealed watertight and/or gastight by packing space between pipe and sleeve with approved packing. Special care shall be taken not to drive lead below top of sleeve. Mechanical seals may be used.
2. Insulated piping and plastic piping shall be sealed watertight and/or gastight by packing space between pipe sleeve and insulation with an approved packing. Fill the remaining space with approved waterproof resilient adhesive sealant.

Sleeves shall be of size to allow for continuous full thickness of pipe insulation through sleeve.

Provide waterproof sleeve or casting on each pipe entering or leaving building through foundation walls and tank pits, or wet wells. Seal space between each pipe and its waterproof sleeve. Each end of sleeve shall be sealed as described above. Each pipe shall be concentric with sleeve. Sleeves shall be waterproof type with welded or cast flange and of size and length to suit pipe and wall thickness. Sleeves shall be all galvanized after welding.

3.03 GENERAL - DUCTWORK

- A. Assemble and install ductwork in accordance with recognized industry practices to achieve air tight (5% leakage) and noiseless (no objectionable noise) systems, and capable of performing each indicated service. Install each run with minimum of joints. Align ductwork accurately at connections, with internal surfaces smooth. Support ducts rigidly with suitable ties, braces, hangers and anchors of type which will hold ducts true-to-shape and to prevent buckling.

3.04 SEALING DUCT

After installation to seal class recommended in SMACNA "HVAC Duct Standards - 1st Edition 1985". Use sealant described in Paragraph 2.1 (G) of this section. All joints in sheet-metal ducts shall be made airtight, and all branches and turns shall be made with elbows and fittings. Elbows shall be provided with fixed double wall turning vanes designed to reduce resistance of the elbow to equivalent of a long radius elbow with throat radius not less than duct width.

3.05 LOCATION OF DUCT

- A. Locate ductwork runs, except as indicated otherwise, vertically and horizontally and avoid diagonal runs wherever possible. Locate runs as indicated by diagrams, details and notations or if not otherwise indicated, run ductwork in shortest route which does not obstruct usable space or block access for servicing building and its equipment. Hold ducts close to

walls overhead construction, columns, and other structural and permanent enclosure elements of building. Limit clearance to 1/2" where furring is shown for enclosure or concealment of ducts, but allow for insulation thickness, if any. Where possible, locate insulated ductwork for 1" clearance outside of insulation. Wherever possible in finished and occupied spaces, conceal ductwork from view by locating mechanical shafts, hollow wall construction or above suspended ceilings. Do not encase horizontal runs in solid partitions except as specifically shown. Coordinate layout with suspended ceiling, lighting layouts and similar finished work.

- B. Electrical Equipment Spaces: Do not run ductwork through electrical equipment spaces and enclosures.
- C. Where ducts pass through interior partitions and floors, conceal space between construction opening and duct or duct- plus-insulation with sheet metal flanges of same gauge as ducts. Overlap opening on 4 sides by at least 1-1/2" and seal to prevent sound transmission.
- D. Coordinate duct installations with installation of accessories, dampers, coil frames, equipment, controls and other associated work of ductwork system.
- E. Support ductwork in manner complying with SMACNA "HVAC Duct Standards - 1st Edition 2004 hangers and supports section.
- G. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pitot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.
- H. Clean duct system and force air at high velocity through duct to remove accumulated dust. Cheese-cloth shall be secured over each air outlet to entrain dirt and dust during this operation. Duct systems shall be thoroughly cleaned during erection.
- I. Provide adequate access into ductwork for cleaning purposes.

3.06 COORDINATION WITH ELECTRICAL WORK

- A. Available electric power shall be, in general, 480/277 volt, & 208/120 volt, 3 phase, 60 hertz for motors of 1/2 hp and higher, and 120 volts, 1 phase, 60 hertz for motors smaller than 1/2 hp.
- B. Unless otherwise specifically noted, all 208v 3 phase motors furnished in this Section shall be furnished with magnetic across the line starters with H-O-A switch and reset push button in cover, and control transformer as necessary for reduced voltage, all contained in suitable general purpose enclosure. Electrical Contractor shall be responsible for providing motor starters and disconnects and power wiring to all mechanical equipment including motor starters and terminating in such equipment. This Contractor and Electrical Contractor shall coordinate such installation of electrical equipment and both shall be present when motor of 1/2 hp and larger are to be first energized. All coil control wiring shall be done under this section except as otherwise noted. Each unit shall be equipped with necessary auxiliary contacts for its application. Coil voltage shall not exceed 120 volts. Connections to the selector switch shall be such that only the normal automatic regulatory control devices will be bypassed when the switch is in the manual position; all safety control devices, such as motor overload protective devices, shall be connected in the motor control circuit in both the manual

and the automatic positions of the selector switch. The starters solid state type with adjustable overcurrent relays, shall be as manufactured by Telemecanique, Westinghouse, General Electric or Cutler Hammer. Starters for outdoor equipment shall be weatherproof-type if exposed to the elements.

- C. Unless otherwise noted, and where a magnetic starter is not required, 120v single phase motors furnished in this section shall be furnished with a manual toggle type starter with overload heaters and red pilot lights in a suitable general purpose enclosure supplied and installed by the electrical contractor. The units shall be as manufactured by Westinghouse, General Electric or Cutler Hammer.
- D. Unless otherwise noted all control and interlock wiring with appurtenances necessary to make the work of this section complete shall be furnished and installed under this section. See "Automatic Temperature Controls" section.
- C. Starters for all 208v 3 phase equipment shall be provided with thermal overload solid state type, relays.

3.07 COMPLETION

- A. The contractor shall provide four report copies of the complete balancing and adjusting of all air, and water systems as specified as well as duct pressure test results.
- B. Submit four copies of maintenance data and operating instructions including schematic diagrams of control systems, valve tagging charts, spare parts lists, extended warranty certificates, etc.
- C. Verify that project record documents are complete such as Submittals and Record Documents. Clean and repair damage to finished surfaces resulting from work under this Section. Remove materials and equipment from areas of work and storage areas. All dirt and debris resulting from the work shall be thoroughly taken up and removed from the premises on a regular schedule acceptable by Architect/Engineer/Owner. All equipment shall be cleaned for inspection and use.
- D. All special tools required for maintenance shall be provided to owner at the completion of the project.
- E. Provide two extra sets of clean air filters for the all air handling and ventilation equipment. Install one set and leave with the owner one other set.
- D. Commissioning: Time shall be allotted for each Construction Phase of this project for commissioning of systems, equipment, devices, etc.,. Mechanical Contractor, as well as all involved Sub-Contractors, shall collaborate and coordinate efforts with Commissioning Agency for the duration of all three construction phases.
- F. Documentation : Proper and adequate documentation must be provided, this will include:
 - a. Accurate as-built drawings and sequences submitted in hardcopy and electronic form, flash drive, or CD, formatted in 2026 AutoCad standard Computer Aided Drafting (CAD) program.
 - b. Owner's manuals including technical spec sheets
 - c. Operator manuals

END OF SECTION

APPENDIX SECTION - A

DAIKIN EQUIPMENT REFRIGERATION PIPING & WIRING DATA

1. Indoor Unit Details

SCU -1A - REYA96AATJA

Name	Model	Tot. Cool	Sens. Cool	Tot. Heat	Air Flow Rate	Sound	Voltage	MCA	MOP	WxHxD	Weight
		BTU/h	BTU/h	BTU/h	cfm	dBA		A		inch	lbs
IU-1-22	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-1-20	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-1-21	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-1-19	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-1-15	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-1-16	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-1-18	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3

Entering Air Temperature:

Cooling: 78.0 FDB / 65.0

Heating: 72.0 FDB

Required room measures

Validated using ASHRAE Standard 15-2022

These calculations are for non-institutional occupancy

Room	Indoor unit	Mrel lbs	Minimum Required Room Volume ft ³	Room Area ft ²	Ceiling Height ft	Calculated Volume ft ³
	IU-1-22 (BC-1-1 Port # A)	1.5	157.0			
	IU-1-20 (BC-1-1 Port # B)	1.4	149.2			
	IU-1-21 (BC-1-1 Port # C)	2.8	288.4			
	IU-1-19	2.8	288.4			

Room	Indoor unit	Mrel lbs	Minimum Required Room Volume ft ³	Room Area ft ²	Ceiling Height ft	Calculated Volume ft ³
	(BC-1-1 Port # C)					
	IU-1-15 (BC-1-1 Port # D)	3.1	323.8			
	IU-1-16 (BC-1-1 Port # D)	3.1	323.8			
	IU-1-18 (BC-1-1 Port # F)	1.9	196.2			

Only units connected to outdoor unit SCU -1A are considered for the measures displayed here. If other outdoor units serve the same room(s), check the measures there as well.

(BS)SvBox	Model	Mrel lbs	Use Enclosure Kit
BC-1-1	BSF6A54AAVJ	35.2	No

SCU-1B - REYA168AAYDA

Name	Model	Tot. Cool	Sens. Cool	Tot. Heat	Air Flow Rate	Sound	Voltage	MCA	MOP	WxHxD	Weight
		BTU/h	BTU/h	BTU/h	cfm	dBA		A		inch	lbs
IU-1-17	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-1-3	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-1-2	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-1-1	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-1-4	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-1-5	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-1-7	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-1-8	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-1-10	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-1-11	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-1-14	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-1-13	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-1-6	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-1-12	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3

Entering Air Temperature:

Cooling: 78.0 FDB / 65.0

Heating: 72.0 FDB

Required room measures

Validated using ASHRAE Standard 15-2022

These calculations are for non-institutional occupancy

Room	Indoor unit	Mrel lbs	Minimum Required Room Volume ft ³	Room Area ft ²	Ceiling Height ft	Calculated Volume ft ³
	IU-1-17 (BC-1-2 Port # A)	7.0	734.2			
	IU-1-3 (BC-1-2 Port # A)	7.0	734.2			

Room	Indoor unit	Mrel lbs	Minimum Required Room Volume ft ³	Room Area ft ²	Ceiling Height ft	Calculated Volume ft ³
	IU-1-2 (BC-1-2 Port # A)	7.0	734.2			
	IU-1-1 (BC-1-2 Port # A)	7.0	734.2			
	IU-1-4 (BC-1-2 Port # B)	2.9	305.4			
	IU-1-5 (BC-1-2 Port # B)	2.9	305.4			
	IU-1-7 (BC-1-2 Port # C)	4.8	503.8			
	IU-1-8 (BC-1-2 Port # C)	4.8	503.8			
	IU-1-10 (BC-1-2 Port # E)	4.9	506.5			
	IU-1-11 (BC-1-2 Port # E)	4.9	506.5			
	IU-1-14 (BC-1-2 Port # G)	2.5	265.7			
	IU-1-13 (BC-1-2 Port # G)	2.5	265.7			
	IU-1-6 (BC-1-2 Port # H)	2.7	277.9			
	IU-1-12 (BC-1-2 Port # H)	2.7	277.9			

Only units connected to outdoor unit SCU-1B are considered for the measures displayed here. If other outdoor units serve the same room(s), check the measures there as well.

(BS)SvBox	Model	Mrel lbs	Use Enclosure Kit
BC-1-2	BSF8A54AAVJ	56.5	No

SCU-2 - REYA264AAYDA

Name	Model	Tot. Cool	Sens. Cool	Tot. Heat	Air Flow Rate	Sound	Voltage	MCA	MOP	WxHxD	Weight
		BTU/h	BTU/h	BTU/h	cfm	dBA		A		inch	lbs
IU-2-31	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4
IU-2-28	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4
IU-2-26	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-2-23	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4
IU-2-25	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-2-27	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-2-29	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-2-30	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-2-22	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-2-21	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-2-24	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4
IU-2-17	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-2-19	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-2-20	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4
IU-2-14	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-2-13	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-2-12	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-2-16	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-2-18	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4
IU-2-15	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3

Entering Air Temperature:
Cooling: 78.0 FDB / 65.0
Heating: 72.0 FDB

Required room measures

Validated using ASHRAE Standard 15-2022

These calculations are for non-institutional occupancy

Room	Indoor unit	Mrel lbs	Minimum Required Room Volume ft ³	Room Area ft ²	Ceiling Height ft	Calculated Volume ft ³
	IU-2-31 (BC-2-1 Port # A)	2.6	276.0			
	IU-2-28 (BC-2-1 Port # B)	2.2	225.8			
	IU-2-26 (BC-2-1 Port # C)	1.7	174.2			
	IU-2-23 (BC-2-1 Port # D)	1.8	189.8			
	IU-2-25 (BC-2-1 Port # E)	8.9	927.1			
	IU-2-27 (BC-2-1 Port # E)	8.9	927.1			
	IU-2-29 (BC-2-1 Port # E)	8.9	927.1			
	IU-2-30 (BC-2-1 Port # E)	8.9	927.1			
	IU-2-22 (BC-2-1 Port # F)	3.2	335.8			
	IU-2-21 (BC-2-1 Port # F)	3.2	335.8			
	IU-2-24 (BC-2-1 Port # H)	1.6	163.2			
	IU-2-17 (BC-2-2 Port # A)	7.1	746.0			
	IU-2-19 (BC-2-2 Port # A)	7.1	746.0			

Room	Indoor unit	Mrel lbs	Minimum Required Room Volume ft ³	Room Area ft ²	Ceiling Height ft	Calculated Volume ft ³
	IU-2-20 (BC-2-2 Port # A)	7.1	746.0			
	IU-2-14 (BC-2-2 Port # B)	2.0	204.0			
	IU-2-13 (BC-2-2 Port # C)	2.1	219.7			
	IU-2-12 (BC-2-2 Port # D)	2.3	236.9			
	IU-2-16 (BC-2-2 Port # E)	2.1	216.5			
	IU-2-18 (BC-2-2 Port # H)	6.8	709.3			
	IU-2-15 (BC-2-2 Port # H)	6.8	709.3			

Only units connected to outdoor unit SCU-2 are considered for the measures displayed here. If other outdoor units serve the same room(s), check the measures there as well.

(BS)SvBox	Model	Mrel lbs	Use Enclosure Kit
BC-2-1	BSF8A54AAVJ	112.1	No
BC-2-2	BSF8A54AAVJ	112.1	No

SCU-3 - REYA168AAYDA

Name	Model	Tot. Cool	Sens. Cool	Tot. Heat	Air Flow Rate	Sound	Voltage	MCA	MOP	WxHxD	Weight
		BTU/h	BTU/h	BTU/h	cfm	dBA		A		inch	lbs
IU-2-8	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-2-11	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-2-10	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-2-7	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-2-6	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4
IU-2-5	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4
IU-2-2	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4
IU-2-9	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-2-3	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4
IU-2-1	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-2-4	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4
IU-Entry	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4

Entering Air Temperature:

Cooling: 78.0 FDB / 65.0

Heating: 72.0 FDB

Required room measures

Validated using ASHRAE Standard 15-2022

These calculations are for non-institutional occupancy

Room	Indoor unit	Mrel lbs	Minimum Required Room Volume ft ³	Room Area ft ²	Ceiling Height ft	Calculated Volume ft ³
	IU-2-8 (BC-3-1 Port # A)	1.7	174.2			
	IU-2-11 (BC-3-1 Port # B)	1.9	197.7			
	IU-2-10 (BC-3-1 Port # C)	1.8	186.8			

Room	Indoor unit	Mrel lbs	Minimum Required Room Volume ft ³	Room Area ft ²	Ceiling Height ft	Calculated Volume ft ³
	IU-2-7 (BC-3-1 Port # D)	1.5	158.6			
	IU-2-6 (BC-3-1 Port # F)	5.4	561.4			
	IU-2-5 (BC-3-1 Port # F)	5.4	561.4			
	IU-2-2 (BC-3-1 Port # F)	5.4	561.4			
	IU-2-9 (BC-3-2 Port # A)	1.8	185.2			
	IU-2-3 (BC-3-2 Port # B)	1.5	153.8			
	IU-2-1 (BC-3-2 Port # C)	2.0	211.8			
	IU-2-4 (BC-3-2 Port # D)	5.1	532.6			
	IU-Entry (BC-3-2 Port # D)	5.1	532.6			

Only units connected to outdoor unit SCU-3 are considered for the measures displayed here. If other outdoor units serve the same room(s), check the measures there as well.

(BS)SvBox	Model	Mrel lbs	Use Enclosure Kit
BC-3-1	BSF6A54AAVJ	57.2	No
BC-3-2	BSF4A54AAVJ	57.2	No

SCU-4 - REYA264AAYDA

Name	Model	Tot. Cool	Sens. Cool	Tot. Heat	Air Flow Rate	Sound	Voltage	MCA	MOP	WxHxD	Weight
		BTU/h	BTU/h	BTU/h	cfm	dBA		A		inch	lbs
IU-3-29	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-31	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-33	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-34	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-30	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4
IU-3-32	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4
IU-3-35	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4
IU-3-24	FXZA05AAVJU	5,346	4,503	6,479	300	26 - 32	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-28	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-27	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-26	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-4	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4
IU-3-3	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-2	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-1	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4
IU-3-7	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-5	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4
IU-3-6	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4
IU-3-8	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-25	FXZA05AAVJU	5,346	4,503	6,479	300	26 - 32	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-311	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4

Entering Air Temperature:

Cooling: 78.0 FDB / 65.0

Heating: 72.0 FDB

Required room measures

Validated using ASHRAE Standard 15-2022

These calculations are for non-institutional occupancy

Room	Indoor unit	Mrel lbs	Minimum Required Room Volume ft ³	Room Area ft ²	Ceiling Height ft	Calculated Volume ft ³
	IU-3-29 (BC-4-1 Port # A)	5.3	556.4			
	IU-3-31 (BC-4-1 Port # A)	5.3	556.4			
	IU-3-33 (BC-4-1 Port # A)	5.3	556.4			
	IU-3-34 (BC-4-1 Port # A)	5.3	556.4			
	IU-3-30 (BC-4-1 Port # B)	2.1	214.9			
	IU-3-32 (BC-4-1 Port # C)	1.7	178.9			
	IU-3-35 (BC-4-1 Port # D)	2.6	274.4			
	IU-3-24 (BC-4-1 Port # E)	2.0	211.8			
	IU-3-28 (BC-4-1 Port # F)	3.5	369.7			
	IU-3-27 (BC-4-1 Port # F)	3.5	369.7			
	IU-3-26 (BC-4-1 Port # F)	3.5	369.7			
	IU-3-4 (BC- 4-2 Port # A)	5.0	517.1			
	IU-3-3 (BC- 4-2 Port # A)	5.0	517.1			

Room	Indoor unit	Mrel lbs	Minimum Required Room Volume ft ³	Room Area ft ²	Ceiling Height ft	Calculated Volume ft ³
	IU-3-2 (BC-4-2 Port # A)	5.0	517.1			
	IU-3-1 (BC-4-2 Port # B)	2.3	238.4			
	IU-3-7 (BC-4-2 Port # C)	1.5	160.1			
	IU-3-5 (BC-4-2 Port # D)	4.6	475.7			
	IU-3-6 (BC-4-2 Port # D)	4.6	475.7			
	IU-3-8 (BC-4-2 Port # D)	4.6	475.7			
	IU-3-25 (BC-4-2 Port # E)	1.4	146.0			
	IU-311 (BC-4-2 Port # F)	2.0	207.1			

Only units connected to outdoor unit SCU-4 are considered for the measures displayed here. If other outdoor units serve the same room(s), check the measures there as well.

(BS)SvBox	Model	Mrel lbs	Use Enclosure Kit
BC-4-1	BSF6A54AAVJ	94.9	No
BC-4-2	BSF6A54AAVJ	94.9	No

SCU-5 - REYA240AAYDA

Name	Model	Tot. Cool	Sens. Cool	Tot. Heat	Air Flow Rate	Sound	Voltage	MCA	MOP	WxHxD	Weight
		BTU/h	BTU/h	BTU/h	cfm	dBA		A		inch	lbs
IU-3-38	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-36	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-22	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-23	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-37	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4
IU-3-12	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-9	FXZA05AAVJU	5,346	4,503	6,479	300	26 - 32	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-10	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-15	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-13	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-16	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-17	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4
IU-3-18	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-19	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-20	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4
IU-3-21	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4
IU-3-14	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3

Entering Air Temperature:
Cooling: 78.0 FDB / 65.0
Heating: 72.0 FDB

Required room measures

Validated using ASHRAE Standard 15-2022

These calculations are for non-institutional occupancy

Room	Indoor unit	Mrel lbs	Minimum Required Room Volume ft ³	Room Area ft ²	Ceiling Height ft	Calculated Volume ft ³

Room	Indoor unit	Mrel lbs	Minimum Required Room Volume ft ³	Room Area ft ²	Ceiling Height ft	Calculated Volume ft ³
	IU-3-38 (BC-5-1 Port # A)	3.2	334.3			
	IU-3-36 (BC-5-1 Port # A)	3.2	334.3			
	IU-3-22 (BC-5-1 Port # B)	3.8	392.5			
	IU-3-23 (BC-5-1 Port # B)	3.8	392.5			
	IU-3-37 (BC-5-1 Port # D)	2.0	210.2			
	IU-3-12 (BC-5-2 Port # A)	2.2	227.5			
	IU-3-9 (BC- 5-2 Port # B)	1.9	202.4			
	IU-3-10 (BC-5-2 Port # C)	1.7	182.1			
	IU-3-15 (BC-5-2 Port # D)	1.4	146.0			
	IU-3-13 (BC-5-2 Port # E)	1.9	202.4			
	IU-3-16 (BC-5-2 Port # F)	1.6	171.1			
	IU-3-17 (BC-5-2 Port # G)	2.0	203.9			
	IU-3-18 (BC-5-2 Port # H)	7.8	815.8			

Room	Indoor unit	Mrel lbs	Minimum Required Room Volume ft ³	Room Area ft ²	Ceiling Height ft	Calculated Volume ft ³
	IU-3-19 (BC-5-2 Port # H)	7.8	815.8			
	IU-3-20 (BC-5-2 Port # H)	7.8	815.8			
	IU-3-21 (BC-5-3 Port # A)	2.9	303.3			
	IU-3-14 (BC-5-3 Port # A)	2.9	303.3			

Only units connected to outdoor unit SCU-5 are considered for the measures displayed here. If other outdoor units serve the same room(s), check the measures there as well.

(BS)SvBox	Model	Mrel lbs	Use Enclosure Kit
BC-5-1	BSF4A54AAVJ	94.7	No
BC-5-2	BSF8A54AAVJ	94.7	No
BC-5-3	BSA36AAVJ	94.7	No

2. Condensing Unit Details

Performance

Name	Model	Combination Ratio	Cooling		Heating	
			Ambient Temp.	Corrected Capacity	Ambient Temp.	Corrected Capacity
		%	°F	BTU/h	°F	BTU/h
SCU -1A	REYA96AATJA	69.3	95.0	86,211	0.0/ -4.0 -13.0	74,876
SCU-1B	REYA168AAYDA	79.2	95.0	149,048	0.0/ -4.0 -13.0	97,222
SCU-2	REYA264AAYDA	77.7	95.0	230,073	0.0/ -4.0 -13.0	176,466
SCU-3	REYA168AAYDA	76.8	95.0	149,026	0.0/ -4.0 -13.0	97,140
SCU-4	REYA264AAYDA	80.3	95.0	234,899	0.0/ -4.0 -13.0	179,257
SCU-5	REYA240AAYDA	69.9	95.0	205,878	0.0/ -4.0 -13.0	128,584

Electrical Information

Name	Model	Voltage	MCA	MOP	WxHxD	Weight
			A	A	inch	lbs
SCU -1A	REYA96AATJA	460V 3ph	34.9	40.0	48.8 x 65.4 x 30.1	725.3
SCU-1B	REYA168AAYDA	460V 3ph	27.1	30.0	48.8 x 65.4 x 30.1	800.3
SCU-2	REYA264AAYDA	460V 3ph				

Name	Model	Voltage	MCA	MOP	WxHxD	Weight
			A	A	inch	lbs
A	*REYA144AAYDA		23.3	30.0	48.8 x 65.4 x 30.1	800.3
B	*REYA120AAYDA		18.2	25.0	48.8 x 65.4 x 30.1	725.3
SCU-3	REYA168AAYDA	460V 3ph	27.1	30.0	48.8 x 65.4 x 30.1	800.3
SCU-4	REYA264AAYDA	460V 3ph				
A	*REYA144AAYDA		23.3	30.0	48.8 x 65.4 x 30.1	800.3
B	*REYA120AAYDA		18.2	25.0	48.8 x 65.4 x 30.1	725.3
SCU-5	REYA240AAYDA	460V 3ph	35.1	40.0	68.9 x 65.4 x 30.1	972.2

Refrigerant Information

Name	Model	Refrigerant	Factory Charge	Estimated Field Charge	Estimated Total Charge	Minimum Room Volume to Meet ASHRAE 15
		Type	lbs	lbs	lbs	ft ³
SCU -1A	REYA96AATJA	R32	25.79	9.38	35.17	n/a
SCU-1B	REYA168AAYDA	R32	25.79	30.68	56.47	n/a
SCU-2	REYA264AAYDA	R32	51.59	60.52	112.11	n/a
SCU-3	REYA168AAYDA	R32	25.79	31.37	57.16	n/a
SCU-4	REYA264AAYDA	R32	51.59	43.34	94.93	n/a
SCU-5	REYA240AAYDA	R32	25.79	68.92	94.71	n/a

Branch Selector Box Information

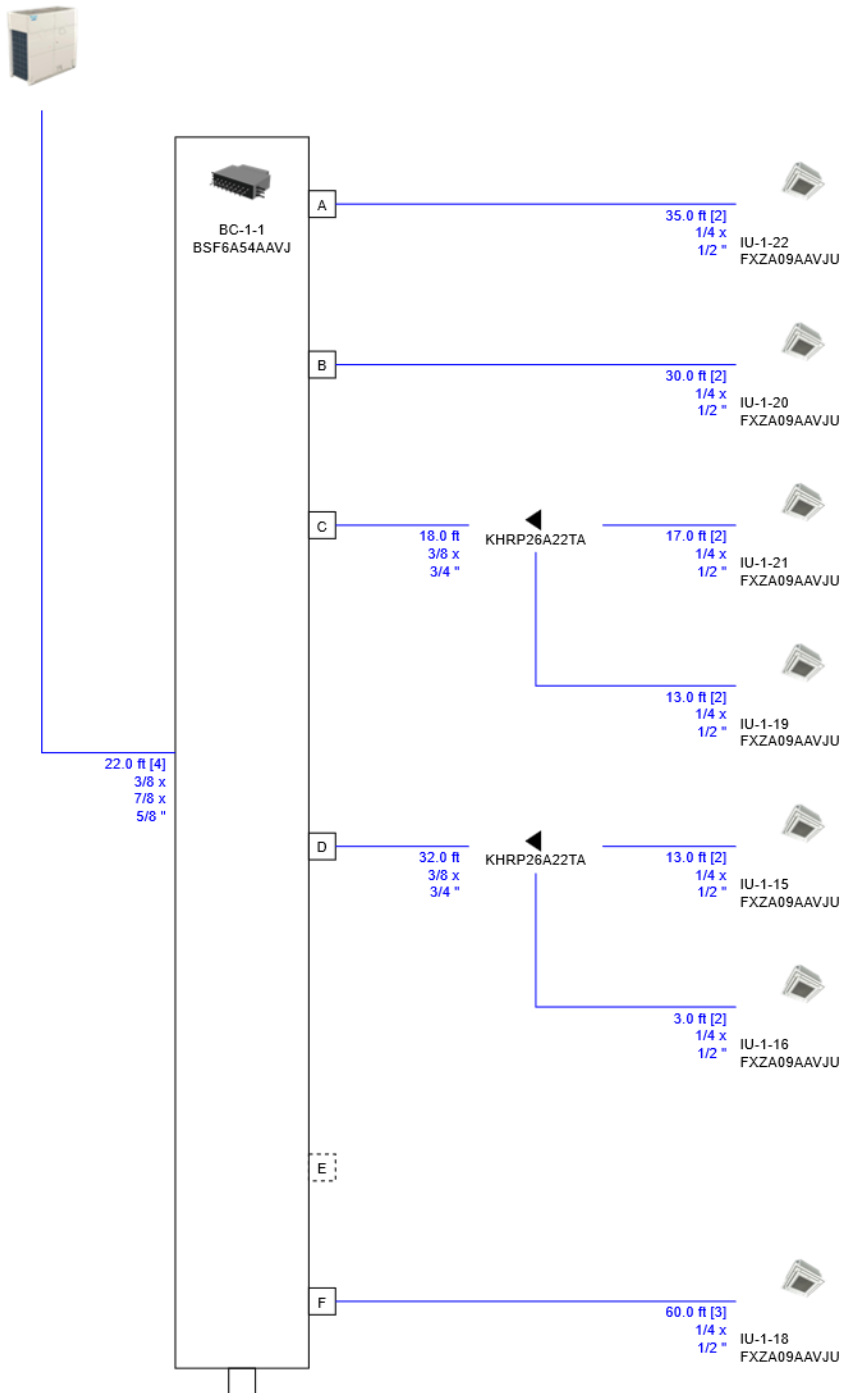
Model	Voltage	MCA	Operating Sound	Max Sound	WxHxD	Weight
		A	dB(A)	dB(A)	inch	lbs
BSF8A54AAVJ	230V 1ph	1.9	n/a	n/a	33.4x9.5x27.7	110
BSF6A54AAVJ	230V 1ph	1.9	n/a	n/a	33.4x9.5x27.7	99
BSF4A54AAVJ	230V 1ph	1.2	n/a	n/a	19.3x9.5x27.7	73

BSA36AAVJ	230V 1ph	0.9	n/a	n/a	15.2x8.1x16.7	29

The maximum sound is the max value of transient sound (oil return, defrost, changing from cooling to heating, etc.)
Manufacturers shall provide sound data for all branch selector boxes. If sound data is unavailable or exceeds the values above, necessary precautions shall be taken, including but not limited to, the supply and install of sound blankets at no extra cost to the owner, or the relocation of branch boxes away from the occupied spaces at no extra cost to the owner, or extra insulation to the ceilings and walls around the branch selector boxes at no extra cost to the owner.

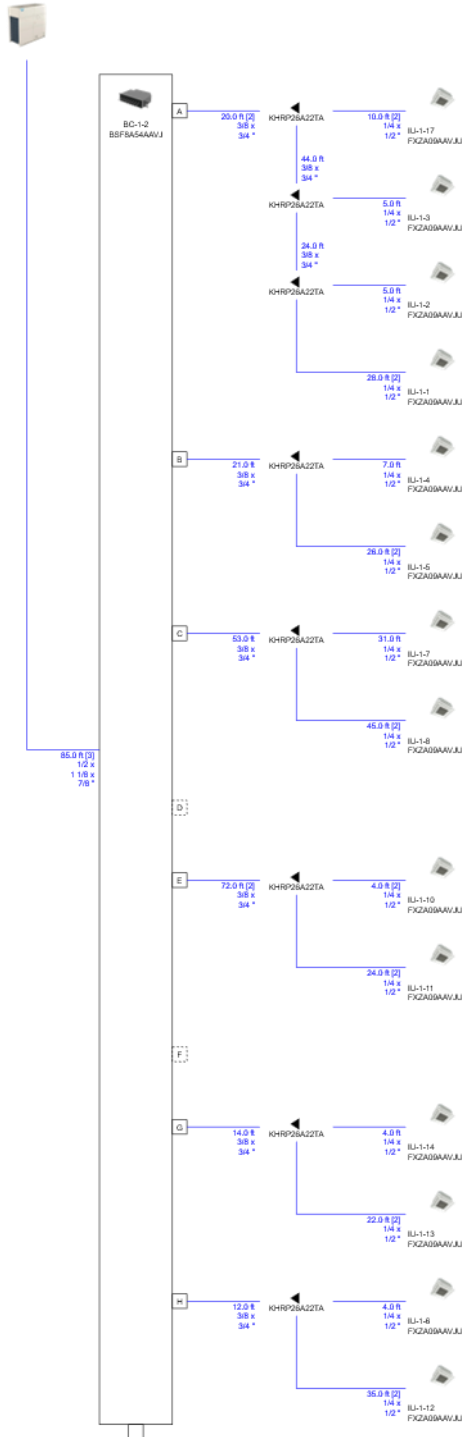
Piping SCU -1A

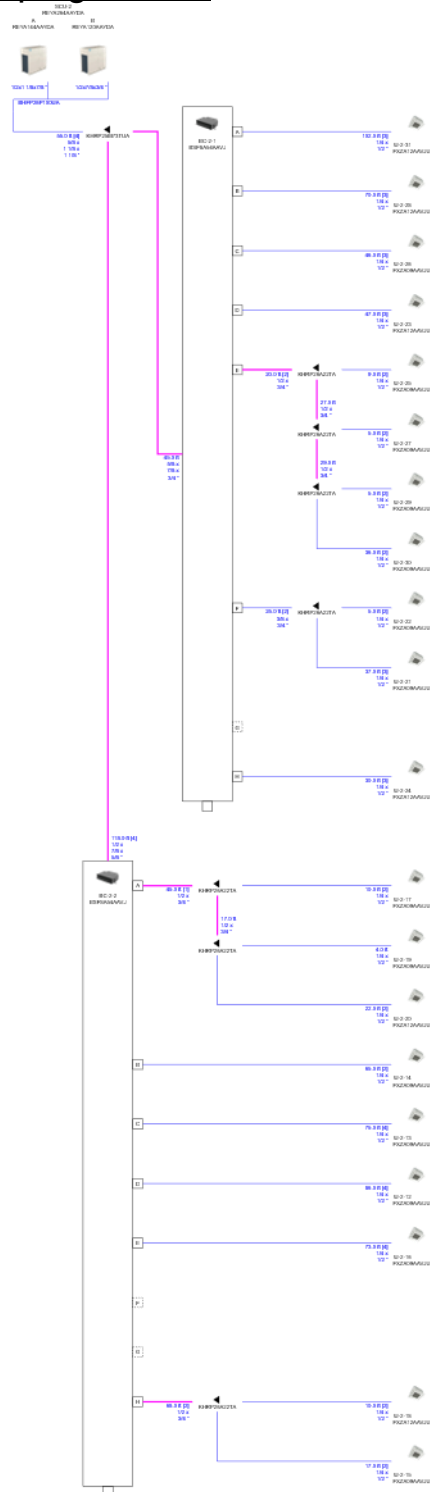
SCU -1A
REYA96AATJA



Piping SCU-1B

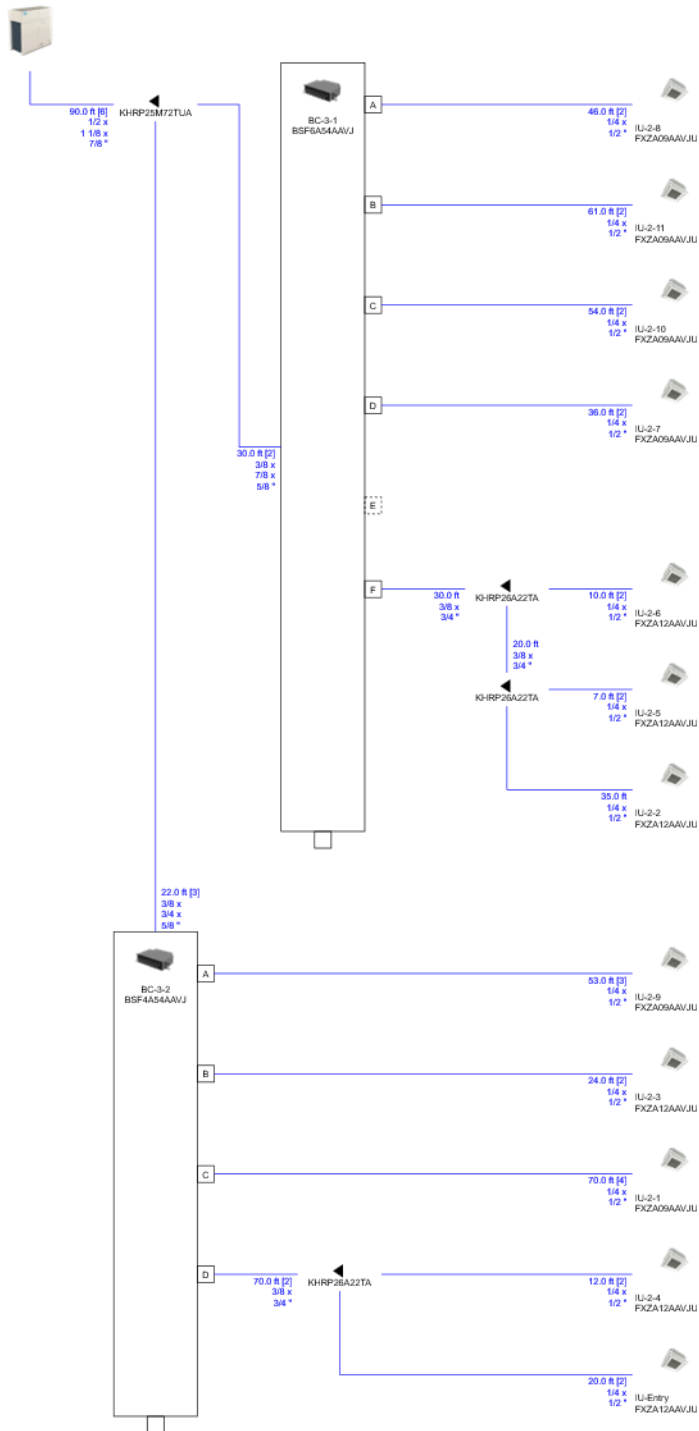
SCU-1B
REV: 1/18/2014



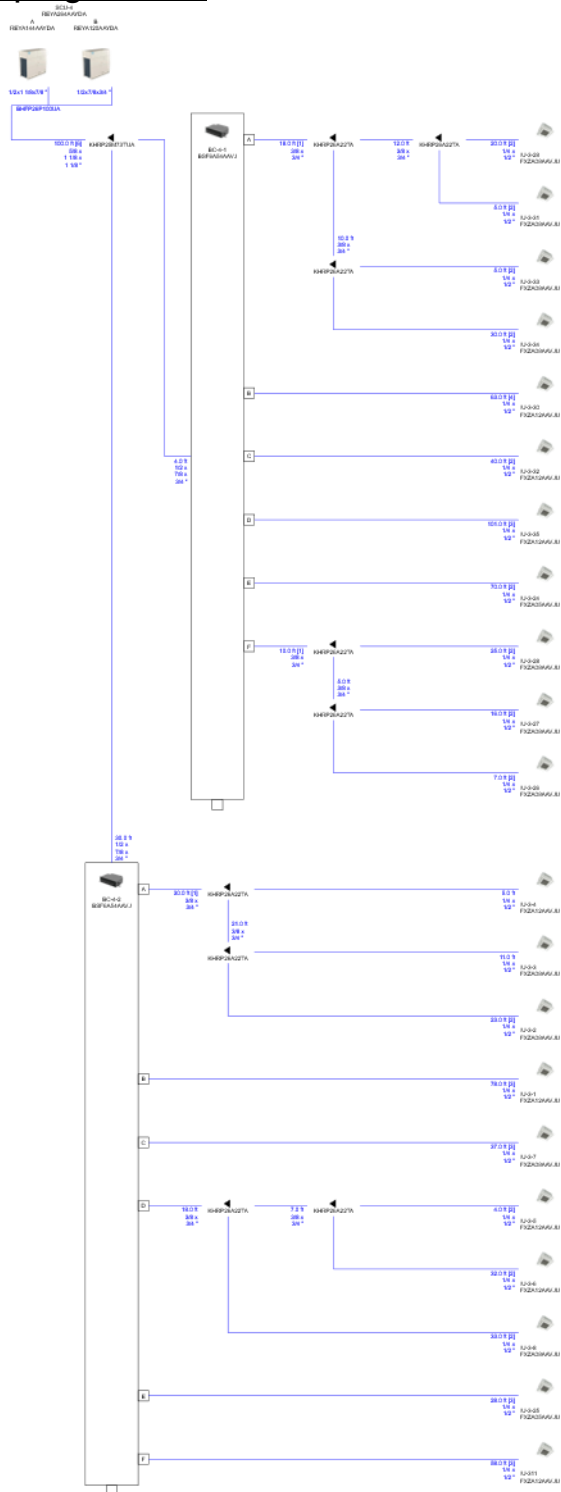


Piping SCU-3

SCU-3
REYA168AAVDA

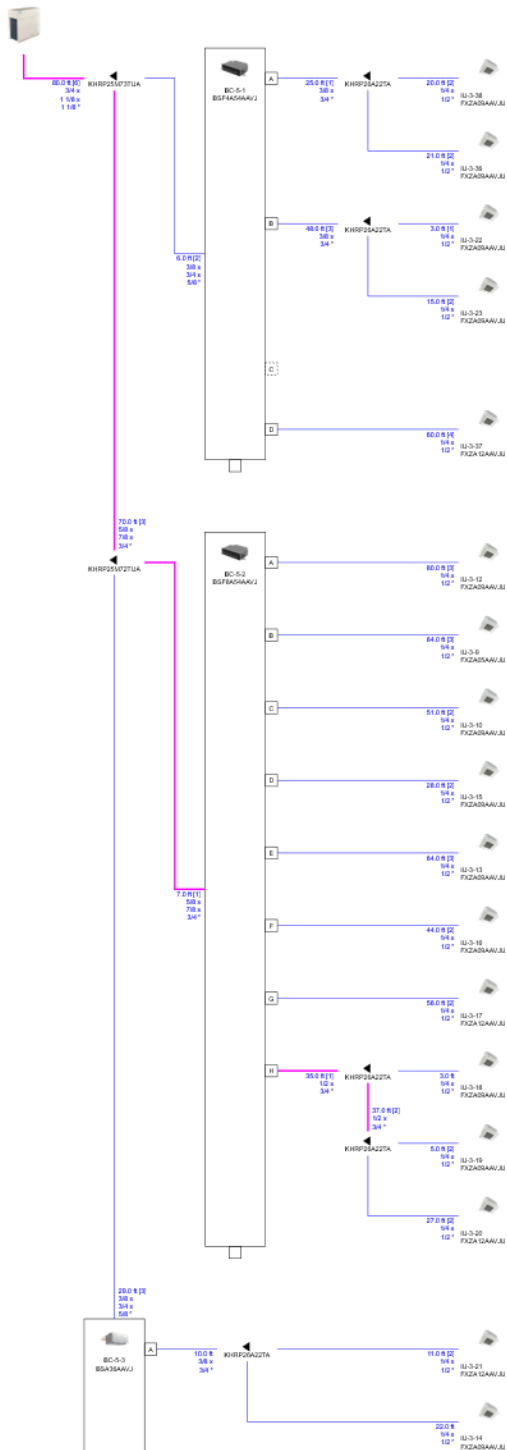


Piping SCU-4



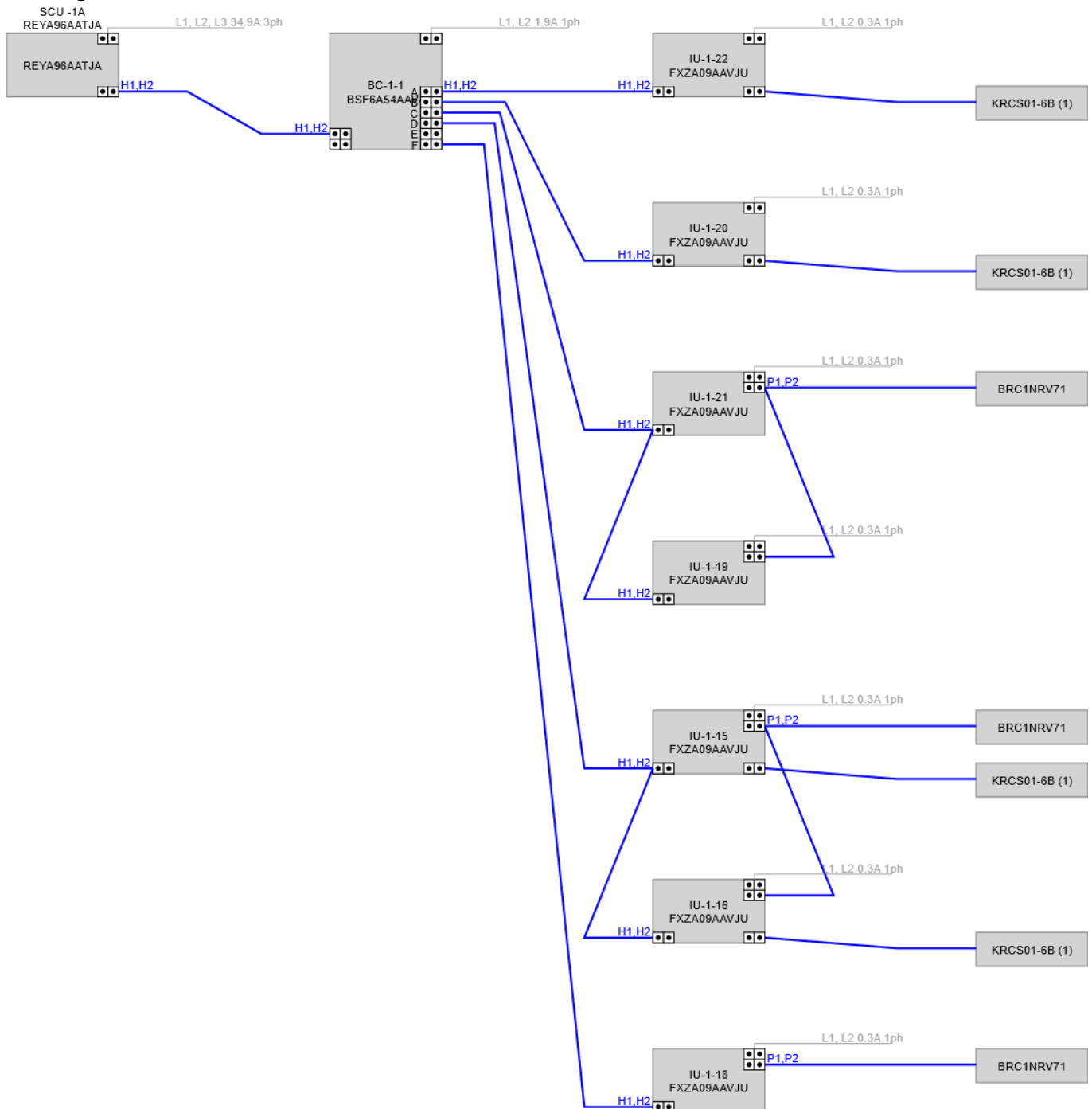
Piping SCU-5

SCU-5
REV 24/04/2014

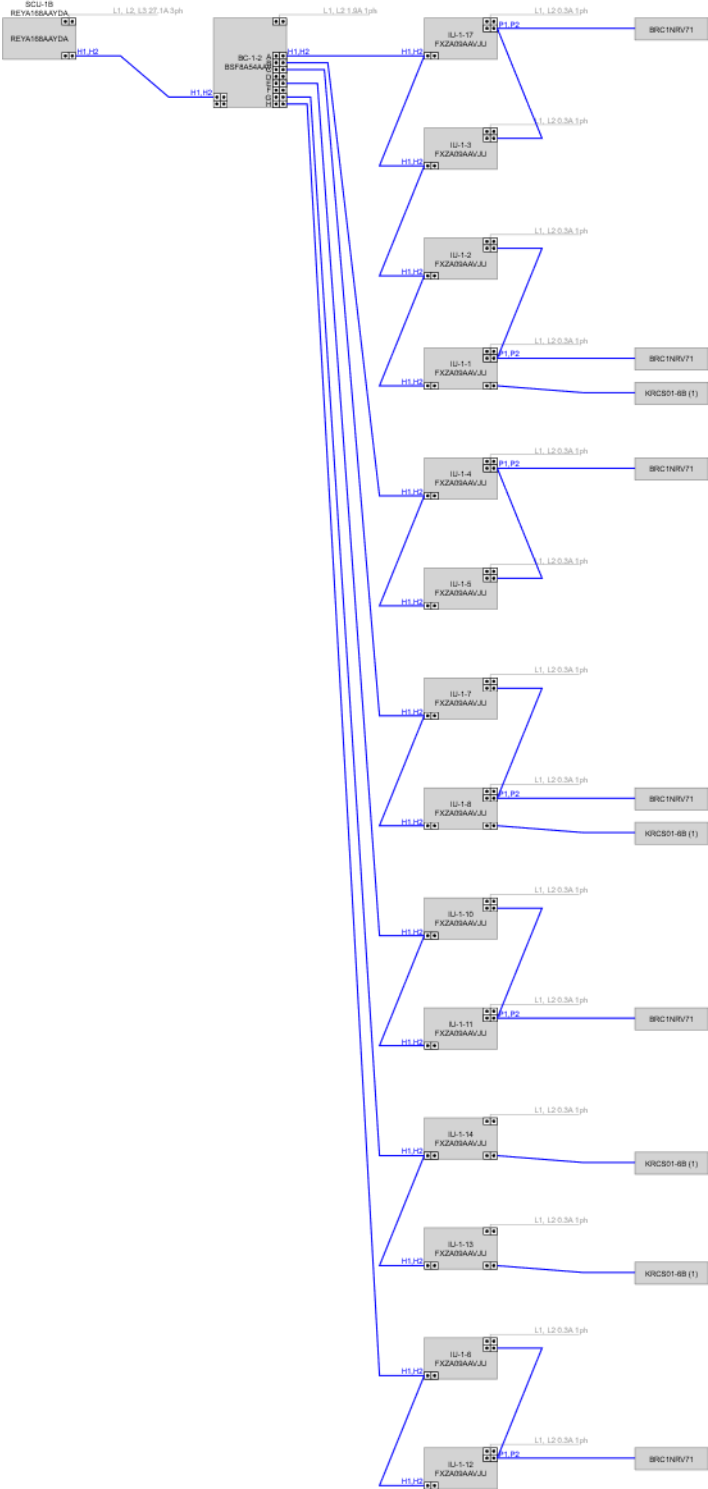


4. Wiring Diagrams

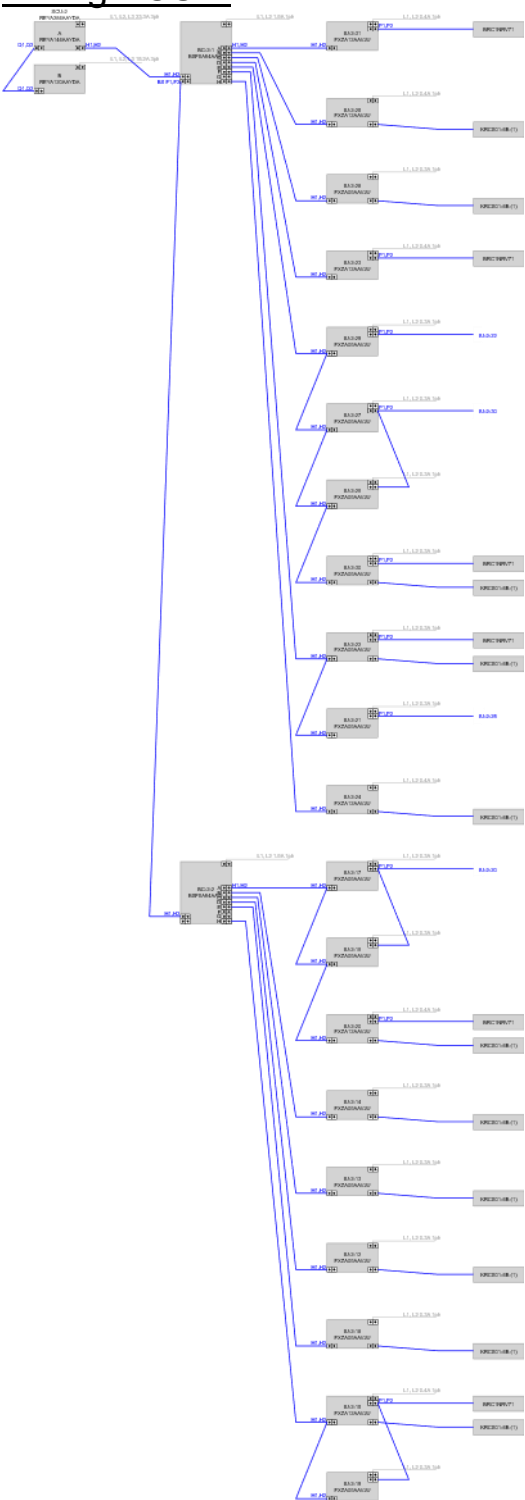
Wiring SCU -1A



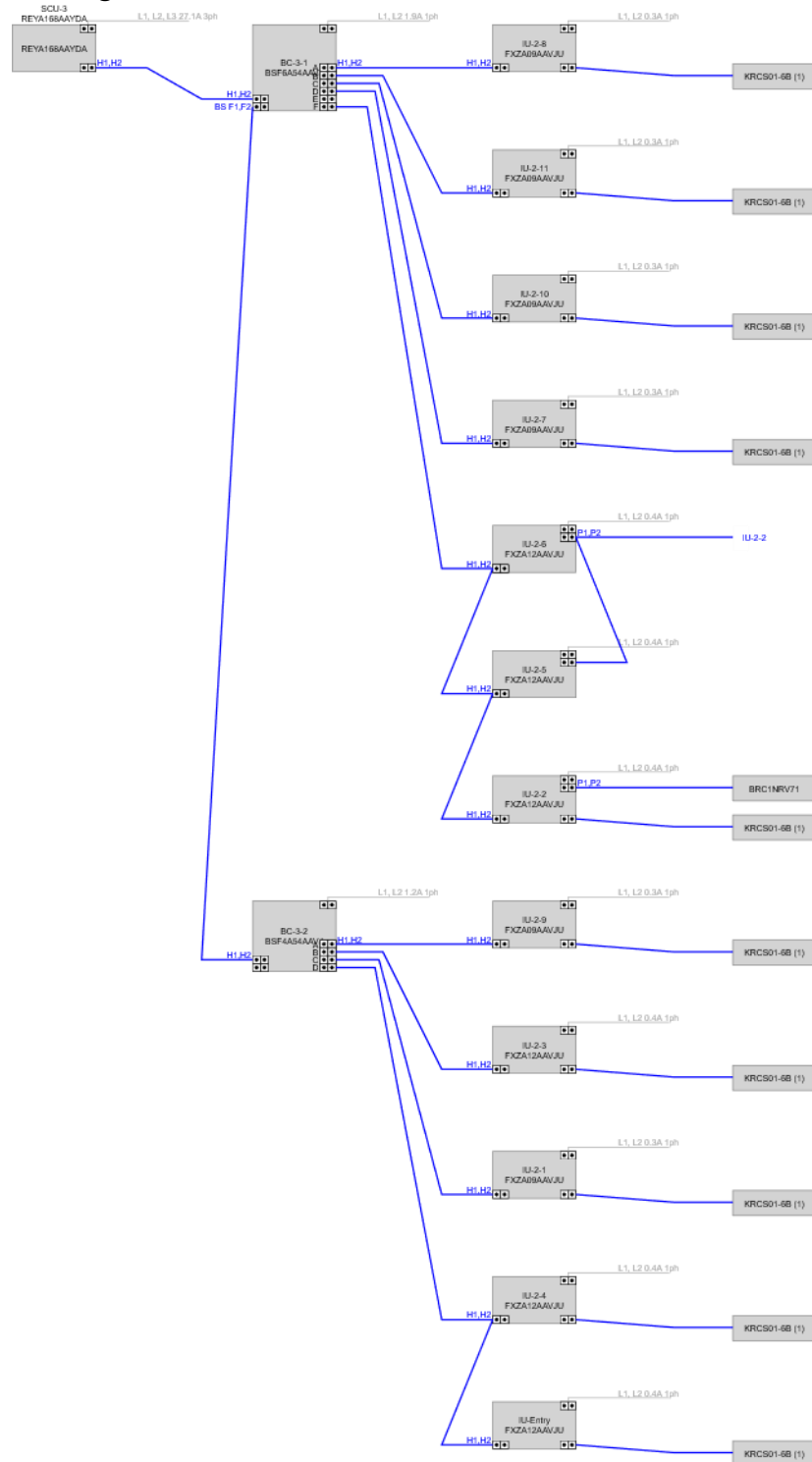
Wiring SCU-1B



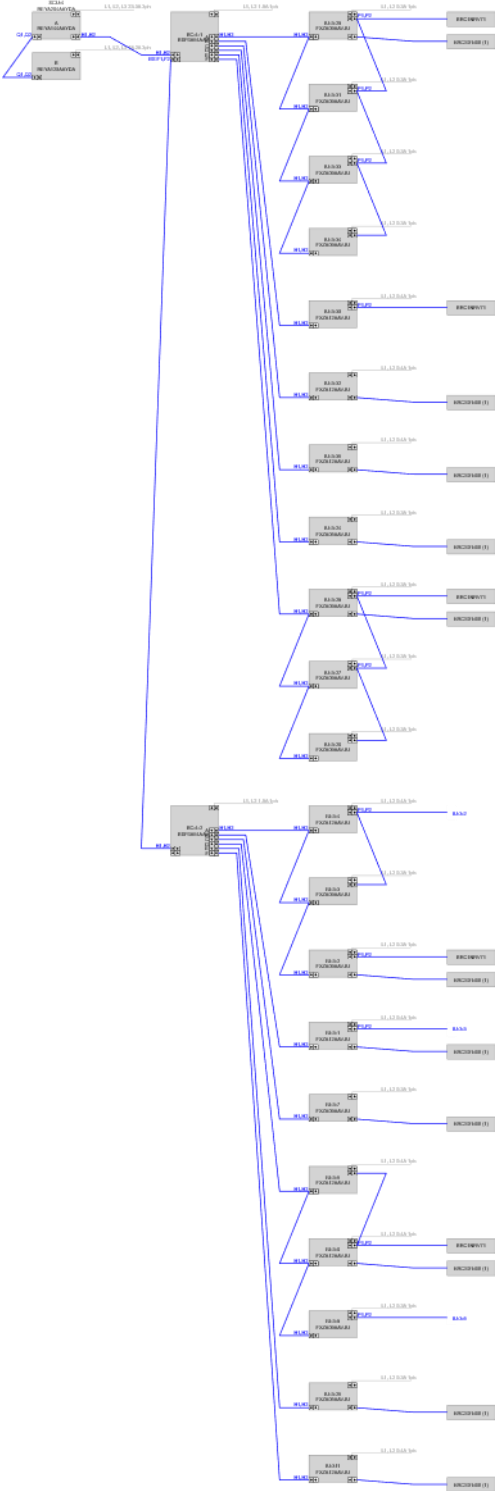
Wiring SCU-2



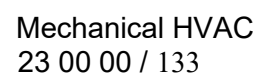
Wiring SCU-3



Wiring SCU-4



Hancock Judicial Center



SECTION 26 00 00

ELECTRICAL POWER & LIGHTING

1. PART ONE: GENERAL

- 1.1. The work covered by this section of the specification shall include all equipment, materials labor, transportation, permits, inspections and incidentals required to complete all operations in connection with the installation of electrical systems as shown on the drawings and/or as herein specified.
- 1.2. The Contractor shall assume complete responsibility for receiving, storing, handling, and installing all equipment.
- 1.3. The general provisions of the contract, including the General Conditions, Contract Conditions, and Drawings apply to work specified in this section.
- 1.4. This Contractor shall provide Efficiency Maine Incentive Rebate applications for applicable project equipment incentive rebates. Applications shall be submitted within 30 days of Contract signing for all applicable equipment that qualifies for incentives.
- 1.5. Commissioning: Time shall be allotted for Construction coordination between all Contractors involved for the duration of this project for commissioning of systems, equipment, devices, etc., Electrical Contractor, as well as all involved Sub-Contractors shall collaborate and coordinate with the Commissioning Agency.

2. WORK SPECIFIED IN THIS SECTION

- 2.1. Electrical Service Entrance
- 2.2. Electrical Switch Gear
- 2.3. Electrical Distribution Panels
- 2.4. Electrical Wiring for Fixtures, Devices, and Mechanical Equipment
- 2.5. Emergency Generator & Auto Transfer Switch Gear
- 2.6. Interior Light fixtures
- 2.7. Exterior Light fixtures
- 2.8. Electrical Specialties
- 2.9. Variable Frequency Drives for Motors
- 2.10 Security & Video Surveillance
- 2.11 Fire Alarm Addressable System

3. WORK SPECIFIED ELSEWHERE

- 3.1. Section 22 00 00: Plumbing
- 3.2. Section 23 00 00: Heating & Ventilation

4. SCOPE OF WORK

- 4.1. The contractor shall provide all materials, labor, and supervision necessary to furnish and install a complete operating electrical system as indicated and as necessary. The work shall include but not be limited to the following:
- 4.2. Provide power distribution system as indicated on the power rise diagram, on the plans, and herein specified. Provide new underground power service entrance.
- 4.3. Furnish and install electrical circuits, devices, exterior and interior lighting fixtures where indicated, and electrical equipment where indicated.
- 4.4. Furnish and install exit signs lighting.
- 4.5. Furnish and install power to all mechanical equipment.
- 4.6. Furnish and install all power wiring to motor starters, VFD's, and disconnects. Provide motor starters and VF drives that are not supplied with mechanical equipment. Magnetically held type motor starters and disconnects associated with HVAC and plumbing equipment shall be furnished by the Electrical Contractor. Automatic Temperature Control Contractor shall furnish and install control wiring associated with control devices, unless otherwise noted. Electrical Contractor shall fully review Mechanical and Plumbing Plans and Specification Division 22 00 00 and 23 00 00 for power requirements and equipment locations.
- 4.7. Furnish and install duct smoke detectors for all HVAC air handling equipment.
- 4.8. Provide empty 3/4" conduit with pull string for telephone, data, Audio/Visual, and Video systems as indicated.
- 4.9. Furnish and install Door Security empty conduit and device boxes with pull string.
- 4.10. Provide new Fire Alarm System.
- 4.11. Provide materials and labor necessary for temporary power. Provide temporary electrical wiring to all contractors for the duration of the project.
- 4.12. Obtain and pay for all necessary permits and inspections.
- 4.13. Temporary Power: Provide necessary electrical power services for the duration of the project. Areas of construction shall be adequately illuminated, and equipment shall electrically sourced for testing or operation. Coordinate efforts with General Contractor and all trades. Initial electrical power will be provided by the City of Ellsworth via a jobsite 110kw generator. Fuel for the generator shall be provided by the City of Ellsworth.

Once permanent power is connected and usable in the new building, the temporary power generator will be removed, and the electrical costs from then on shall be paid by the General Contractor until Substantial Completion is established.

5. CODE COMPLIANCE

- 5.1. All wiring shall comply with the 2023 Edition of the National Electrical Code NFPA 70, the 2021 Edition of the Life Safety Code NFPA 101, and all applicable OSHA, federal, state, and local codes. Obtain and pay for all required permits.

6. SUBMITTALS

- 6.1. Within 30 days of the contract award, submittals are required for the following equipment.
- 6.2. Lighting fixtures
- 6.3. Disconnect switches
- 6.4. Motor starters and Variable Frequency Drives
- 6.5. All Wiring devices, system(s) layouts and associated devices
- 6.6. Power Switch Equipment & Electrical Distribution Panels
- 6.7. Standby Generator System

PART 2 PRODUCTS

1. ELECTRICAL SERVICE AND DISTRIBUTION EQUIPMENT

1.1. New Service Entrance & Metering

- 1.2. A new 480v/277v, 3ph, wye entrance power service shall be provided by Electrical Contractor as indicated on Site Plan E-1.4 and riser diagram E-2.1 & 2.2 and as specified. This Contractor shall provide and install all underground and above ground equipment and wiring conductor feeders for a new service 480 volt, 60 hz, 3 phase, 4 wire, wye service, 1200 ampere entrance as planned. This contractor shall coordinate with Versant of Maine Utility Power Company and Owner. Jessie xxxx service project manager, Jessie, contact information, 207-445-6362.

1.3. Main Entrance Service 1200 ampere, 600v rated Disconnect

- 1.4. New facility main entrance service shall be provided with a four pole service disconnect OCPD device rated for 1200 ampere service, housed inside a NEMA 1 enclosure.

Main Distribution Panelboards (MDP-480)

- 1.5. Main Distribution Panelboard (MDP-480) shall be General Electric, Spectra Series, or approved equal be rated for 1200 amps and have 1200 main ampere and 65,000 AIC minimum breaker, #SKHA12. Main Feeder panelboard MDP shall be 3 pole, four wire with three pole breaker spaces rated as indicated on drawing (E-2.1), floor/surface mounted. Circuit breakers shall be bolt on Spectra Series or approved equal. Panel hinged, with front locking cover, neutral kit, main disconnect, main lug modules, circuit breaker mounting modules, and panel interior with copper buses. Provide 3 pole, 65,000 AIC rated, OCPD breakers as scheduled and with adjustable ampere trip range of 25% minimum.

Main Distribution Panelboards (MDP-480 Sub)

- 1.6. Main Distribution Panelboard (MDP-480 Sub) shall be General Electric, Spectra Series, or approved equal be rated for 600 amps and have 600 main ampere and 42,000 AIC minimum breaker, #SKHA06. Main Feeder panelboard MDP shall be 3 pole, four wire with three pole breaker spaces rated as indicated on drawing (E-2.1), floor/surface mounted. Circuit breakers shall be bolt on Spectra Series or approved equal. Panel hinged, with front locking cover, neutral kit, main disconnect, main lug modules, circuit breaker mounting modules, and panel interior with copper buses. Provide 3 pole, 65,000 AIC rated, OCPD breakers as scheduled and with adjustable ampere trip range of 25% minimum.

1.7. Main Distribution Panelboards (EV-208)

- 1.7.1. Addition Distribution Panelboard (ev-208) shall be General Electric, Spectra Series, or approved equal be rated for 400 amps and have 400 main ampere and 42,000 AIC minimum breaker, SKHA04. Main Feeder panelboard MPG-480 shall be 3 pole, four wire with three pole breaker spaces rated as indicated on drawing (E-2.1), floor/surface mounted. Circuit breakers shall be bolt on Spectra Series or approved equal. Panel hinged, with front locking cover, neutral kit, main disconnect, main lug modules, circuit breaker mounting modules, and panel interior with copper buses. Provide 3 pole, 42,000 AIC rated, OCPD breakers as scheduled and with adjustable ampere trip range of 25% minimum.

1.8. Main Distribution Panelboards (MDP-208)

- 1.8.1. Addition Distribution Panelboard (MDP-208) shall be General Electric, Spectra Series, or approved equal be rated for 1000 amps and have 1000 main ampere and 42,000 AIC minimum breaker, SKHA010. Main Feeder panelboard MDP shall be 3 pole, four wire with three pole breaker spaces rated as indicated on drawing (E-2.1), floor/surface mounted. Circuit breakers shall be bolt on Spectra Series or approved equal. Panel hinged, with front locking cover, neutral kit, main disconnect, main lug modules, circuit breaker mounting modules, and panel interior with copper buses. Provide 3 pole, 42,000 AIC rated, OCPD breakers as scheduled and with adjustable ampere trip range of 25% minimum.

1.9. Main Distribution Panelboards (MDP1-208)

- 1.9.1. Addition Distribution Panelboard (MDP-208) shall be General Electric, Spectra Series, or approved equal be rated for 800 amps and have 800 main ampere and 42,000 AIC minimum breaker, SKHA08. Main Feeder panelboard MDP shall be 3 pole, four wire with three pole breaker spaces rated as indicated on drawing (E-2.1), floor/surface mounted. Circuit breakers shall be bolt on Spectra Series or approved equal. Panel hinged, with front locking cover, neutral kit, main disconnect, main lug modules, circuit breaker mounting modules, and panel interior with copper buses. Provide 3 pole, 42,000 AIC rated, OCPD breakers as scheduled and with adjustable ampere trip range of 25% minimum.

1.10. Distribution Panelboards:

1.10.1. Panelboard (MPG-480 & MP1-480) shall have factory installed 200 amp OCPD main. Ratings shall be 200 main ampere and 22,000 AIC minimum, 3 pole, 4 wire. Sub feeder panelboard shall be General Electric A-Series, #ALF3421CB or approved equal, 3 phase, 480/277 volt with 42 single pole spaces, surface mounted. Circuit breakers shall be plug-in style, 22,000 AIC rated or approved equal. Provide locking cover.

1.10.2. Panelboard (PP1- PP8 & MP1-208) shall have factory installed main lugs only. Ratings shall be 225 main ampere and 22,000 AIC minimum, 3 pole, 4 wire. Sub feeder panelboard shall be General Electric A-Series, #ALF3422SB or approved equal, 3 phase, 208/120 volt with 42 single pole spaces, recess mounted. Circuit breakers shall be plug-in style, 22,000 AIC rated or approved equal. Provide locking cover.

1.10.3. Panelboard (MPG-208) shall have factory installed main 200 amp OCPD. Ratings shall be 200 main ampere and 22,000 AIC minimum, 3 pole, 4 wire. Sub feeder panelboard shall be General Electric A-Series, #ALF3422SB or approved equal, 3 phase, 208/120 volt with 42 single pole spaces, surface mounted. Circuit breakers shall be plug-in style, 22,000 AIC rated or approved equal. Provide locking cover.

1.10.4. Panelboard (I.T. Rm & PP4Tech, PP5Tech, PP8Tech, & PP9Tech) shall have factory installed 100 ampere OCPD main. Ratings shall be 125 main ampere and 22,000 AIC minimum, 3 pole, 4 wire. Sub feeder panelboard shall be General Electric A-Series, #ALF3422SB or approved equal, 3 phase, 208/120 volt with 36 single pole spaces, surface mounted. Circuit breakers shall be plug-in style, 22,000 AIC rated or approved equal. Provide locking cover.

1.10.5. All panelboards shall be sized as indicated on the riser diagram. Provide breaker schedules for all panel boards. All components UL Listed.

2. TRANSFORMERS (T-1 2 & 3)

2.1. Provide three low noise 3 phase, T-1, T-2 & T-3 design transformers. Transformers shall be dry type, 460 volts wye primary/208 wye / 120volts secondary, 60 HZ, copper winding, NEMA 2 drip proof enclosure for indoor use low temperature rise, 150C with multi-voltage tap terminals.

2.2. T-1: 350.0 KVA, GE QL series #9T83C9879, L38AA frame, 3280lbs, 48"w x 36"d x 52"h.

2.3. T-2: 45.0 KVA, GE QL series #9T83C9873, Y373C frame, 490lbs, 24"w x 18"d x 32"h.

2.4. T-3: 300.0 KVA, GE QL series #9T83C9878, L38AA frame, 2480lbs, 32"w x 24"d x 36"h.

2.5. T-4: 112.5 KVA, GE QL series #9T83C9875, L375C frame, 1190 lbs, 32"w x 24"d x 36"h.

3. EMERGENCY STANDBY GENERATOR

- 3.1. Provide one diesel fired emergency generator as show on plans. Generator shall be 350 KW / 350KVA, 480/277v, 3 phase, 60Hz, rated for 527 full load amps. Unit set shall have standard features: 6 cylinder, diesel-fuel, water cooled engine with pusher type fan and fan guard, and standard NEMA 3R, level 3 exterior enclosure.
- 3.2. Engine Model: Perkins 2206D-E13TAG2, 350kW Standby Power Rating at 1800 RPM Governor - Electronic Isochronous. Voltage: 480/277V, 3 Phase, 60 Hz, 0.8 PF. Gen Model: Stamford S4L1D-E41, 12 Lead Wye, 480V, 3 Phase, 125°C Rise Over 40°C Ambient. Voltage Regulator: Stamford AS440 Automatic Voltage Regulator. Control Panel: Blue Star DCP7310 Microprocessor Based Gen-Set Controller Mounted Facing Left from Generator End (Unless Specified Otherwise) Standard Features: Low Oil Pressure, High Coolant Temp, Overspeed, Over crank Shutdowns Emergency Stop Pushbutton, Audible Alarm Buzzer with Silencing Switch. Control Panel Options: Low Water Level Sensor with Shutdown, Break Glass E-Stop Station. Remote Annunciator: Deep Sea DSE2548 Remote Annunciator with Enclosure (Surface Mounted). Unit Color: Gray Enclosure: Level 3 (Weather Proof Enclosure) Powder Coated 14 Gauge Steel Rugged and Durable 200 MPH Wind Rated Enclosure Pitched Roof for Increased Structural Integrity and Improved Watershed Punched Intake with Baffle and Punched Exhaust Openings Keyed Alike Lockable Doors with Draw Down Latches and Stainless Steel Component Hinges Additional 1.5" Thick Poly damp Type D Acoustical Foam (PAF) Formed Steel Base with Mounting and Lifting Holes Includes Vibration Mounts to Isolate Unit from Base Rail. Sound Attenuation Foam: Sound Attenuation Installed in Enclosure and Exhaust Hood. Cooling: Unit Mounted Radiator (50 Deg C Ambient). Coolant Drain Extension: Plumbed to Bulkhead Fitting in Base. Oil Drain Extension: Plumbed to Bulkhead Fitting in Base. Mainline Breaker: 400-AMP, 3 Pole, 240V Breaker, Mounted and Wired in a NEMA 1 Enclosure.
- 3.3. Jacket Water Heater: Engine Block Heater 1500W 120VAC Rated for -20°F. Heater Installed with Isolation Valves and Wired to Terminal. Air Cleaner: Dry Single Stage. Air Restriction Indicator: Installed in Air Filtration System. Silencer: Critical Grade Compact (CPJ Series) Silencer Mounted to Engine. Battery: 12 Volt System with Rack and Cables. Battery Charger: DSE 12 Volt 10 Amp Mounted and Wired to Terminal. Fuel Tank: 24 Hour / 250 Gallon UL 142 Listed Sub-Base Fuel Tank with Stub-up Area. Double Wall Construction with Secondary Containment Standard. Includes: Supply and Return Connections, Fuel Level Gauge, Fuel Leak Switch and Fill & Vent Plumbing. Factory Test: Standard Commercial Testing Includes: Verification of Alarm Shutdowns, Voltage Settings, Block Loading to Rated kW and PF. Owner's Manual: Print Copy (Qty 1), Electronic Copy. Warranty: 2 Year / 2000 Hour Limited.
- 3.4. Provide cycle timer for weekly automatic start-up tests. Unit shall be factory field started and field certified for system installation.
- 3.5. Unit shall be manufactured by Blue Star Power Systems, model # PD350-0 350kWe. No approved equals. The unit overall length cannot exceed 225" long and 72" wide and 136" high. Unit weight 10,050 lbs. with 1,420-gallon fuel tank, 24.0 gal/hr. at 100 % capacity. UL listed, UL 2200 Tested, EPA Certified.

4. EMERGENCY AUTOMATIC TRANSFER SWITCH

- 4.1. Provide one emergency automatic transfer switch as show on plans. Switch shall be 1200 amp rated, 480/277v, three poles, NEMA #3 enclosure, UL-listed for Service Entrance Rated and with standard accessories. Microprocessor controls, program transition, positive Locking. Manufactured by ASCO Power Corp., style 300 series-1200. Model# J03AUSB31200NGXM. No approved equals.
- 4.2. Provide control options: 4 NO/NC relay modules, load power / current monitoring, and local and remote digital displays.

5. WIRING MATERIALS

- 5.1. Conductors shall be #12 AWG minimum with THWN/THHN insulation rated 90 degrees C. All conductors shall be copper. Type MC cable may be used for branch circuits only as long as it is well protected from damage, sharp edges, etc. Type NM cable may not be used for powering equipment devices of voltage 120 volts or higher. Type NM cable may be used for low voltage system wiring such as fire alarm and A.T.C. system devices. All cables shall be run perpendicular to the building structure. Where multi-wire branch circuits are used, wires shall be color coded to indicate the phase. The color code shall be posted on the panelboard.
- 5.2. All HVAC, Service Closets, Mechanical and Electrical Equipment Rooms: All power and low voltage wiring serving these areas shall be feed using metal conduit, EMT or rigid conduit. The IT Server Rooms: All power 120 volts and higher wiring serving these areas shall be feed using metal conduit, EMT or rigid conduit.
- 5.3. Conduit (rigid and EMT) shall be used in designated power feeds, main equipment loads, electrical & mechanical rooms, and where indicated on the plans and where required for protection from physical damage. The conduit shall not be used as a grounding conductor.
- 5.4. Where flexible connections are required, such as motor connections, liquid tight flexible metal conduit shall be used for exterior, wet locations. MC cable may be used for interior flexible connections. Supplemental grounding conductors shall be used, sized by Article 250-95.
- 5.5. Except as otherwise indicated, boxes shall be metal. Where devices are installed on 4" square boxes, plaster rings shall be used. All boxes shall be of sufficient size for the conductors contained
- 5.6. Where telephone, data, and security cable outlets are indicated on the plans, furnish and install empty 3/4" conduit to above ceiling and 4" square box with plaster ring (where applicable), 18" above finished floor and wire from device jack back to IT Room, or as designated.

6. Devices:

6.1. Switches shall be rated 20 ampere AC only specification grade, Leviton 5521 series or equal, side-wired, commercial grade. Where gang switch covers occur, switches shall be labeled with an approved metal name tag.

6.2. Light switches,

6.2.1. Keyed type, Leviton series 12212KL, 20 amp with S.S. wall cover,

6.2.2. Occupied pilot Leviton series 1221-PL, 20 amp with S.S. wall cover

6.2.3. motion detectors, lighting control, Leviton OSSMT series, adaptive time delay, 10 to 30 min., infrared/ultrasonic with photocell.

6.3. Dimming switches shall be commercial specification grade, architectural slide type,

6.4. Leviton model # 80800-LI, applicable for LED Dimming.

6.5. Except as otherwise indicated, Receptacles (interior) shall be rated 15 ampere 125 volt, grounding type, commercial grade. They shall be side-wired, specification grade, Leviton 8200 series or equal.

6.6. Unless otherwise noted IT Server Rooms receptacles shall be rated 15 ampere 125 volt, isolated grounding type, commercial grade, side-wired, Leviton 5261 series or equal.

6.7. GFCI receptacles shall be Leviton Suregard #6598 or equal, with 5 milliampere trip threshold. Single receptacles shall have the same ampere rating as the circuit.

6.8. All device plates shall be brushed aluminum.

Floor Power/Data /Voice/Audio/Video Receptacles: Wiremold Legrand Evolution series or approved equal, model shall be determined based upon configuration, 2 hr fire rated shall be 6" & 8" hole core with adjustable 6" or 8" flush mount nickel retaining cover. UL 514A/514C listed. Acceptable configurations determined by owner's approval.

Courtrooms, Jury Rooms, & Judges Chambers: 8" diameter with 4- 15a/120v power receptacles, 1 field configurable voice/audio/ video port, 1 microphone port, 4 data, network ports, 1- USB port. Receptacle NEMA 5-15R, 20A 125V with two circuits and IG compatible.

Conference Rooms, Prisoner Station & Marshall Station: 6" diameter with 4- 15a/120v power receptacles, 4 data/network ports, 1 – USB port Receptacle NEMA 5-15R, 20A 125V with two circuits and IG compatible.

6.9. Underground Power/Utility Boxes: Non vehicle loads, Carson Pedestrian rated model 1730, light duty HDPE body/cover, 17"w x 30"L x 24" deep. T Cover, Green, Hex Head fastener, EMS Marker, plastic reader door. Provide necessary sundries/accessories for device mounting, box accessibility, and conduit pass through. Boxes shall be installed per manufactures recommendations.

Vehicle loads, Synertech Duo Mold, heavy duty model 2436 HD polymer concrete 60" deep, 20,000 psi applications.

7. LIGHTING FIXTURES

- 7.1. Furnish and install new fixtures as per fixture schedule. All LED fixtures shall be high performance type, 50,000 hour lamp life, equipped with low harmonic, energy efficient electronic ballasts. LED troffers shall be fastened to the grid ceiling by clips or other effective means.
- 7.2. LED lamps shall match the ballast design. Spectrum daylight chroma type. Color temperature shall be 3000 to 3500 degrees K, minimum.
- 7.3. All lighting fixtures shall be field located to clear obstructions. Troffers in T-grid ceilings shall accommodate the actual ceiling layout.
- 7.4. Exit Sign lighting: all exit light fixtures shall source power with an independent power lighting circuit, designated on nearest power panel and mark so for maintenance tests. Project close-Out Record drawings shall indicate circuits. Exit signs shall be provide inline fused means of disconnects.
- 7.5. All lighting fixtures listed below are pre-approved. Equals will not be considered.
- 7.6. All lighting fixtures shall be approved for Efficiency Maine incentive rebate program. This contractor shall be responsible for Efficiency Maine incentive rebate program application.

TYPE	WATTS	DESCRIPTION	REFERENCE
A1 19LED	2 X 2 LED 80 CRI RECESSED	VERSIFY EDGE-LIT LED OUTPUT, 120V, DIMMING WIRE CONTROL SWITCH, 0-10DCV	COOPER LIGHTING 22D3X-LP-WD-35-L835-UNV STD-CD
A2 19LED	2 X 2 LED 80 CRI RECESSED	VERSIFY EDGE-LIT LED OUTPUT, 120V, DIMMING WIRE CONTROL SWITCH, 0-10DCV, EMER. BACKUP	COOPER LIGHTING 22D3X-LP-WD-35-L835-UNV STD-CD-EL14W
B1 33LED	LINEAR CEILING HUNG LED 80 CRI	MICROBAY 4 FT., LED OUTPUT, 120V, DIMMING WIRE CONTROL SWITCH, 0-10DCV	COOPER LIGHTING 4MB-5SL-FLTU-UNV-L835 CD
B2 33LED	LINEAR CEILING HUNG LED 80 CRI	MICROBAY 4 FT., LED OUTPUT, 120V, DIMMING WIRE CONTROL SWITCH, 0-10DCV, EMER. BACKUP	COOPER LIGHTING 4MB-5SL-FLTU-UNV-L835 CD-EL14W
C1 33LED	LINEAR CEILING HUNG LED 80 CRI	MICROBAY 4 FT., LED OUTPUT, 120V, DIMMING WIRE CONTROL SWITCH, 0-10DCV	COOPER LIGHTING 4MB-5SL-FLTU-UNV-L835 CD
C2 33LED	LINEAR CEILING HUNG LED 80 CRI	MICROBAY 4 FT., LED OUTPUT, 120V, DIMMING WIRE CONTROL SWITCH, 0-10DCV, EMER. BACKUP	COOPER LIGHTING 4MB-5SL-FLTU-UNV-L835 CD-EL14W

D1 30 LED	CEILING 1x4 FT. RECESS MOUNTED LED 120V SECURITY, MEDIUM OUTPUT, 0 TO 10V	COOPER LIGHTING FMR-X12-4-LD4-2-STD-35- UNV-82-86-EDD-1
D2 30 LED	CEILING 1x4 FT. RECESS MOUNTED LED 120V SECURITY, MEDIUM OUTPUT, 0 TO 10V EMERGENCY BACK UP	COOPER LIGHTING FMR-X12-4-LD4-2-STD-35- UNV-82-86-EDD-1-EL14W
E 1-30 LED	CEILING 4 FT. SURFACE MOUNT LED 120V WRAP AROUND, MEDIUM OUTPUT, 0 TO 10V	COLUMBIA LIGHTING CNW4-LSCS-30-MLE-U-120
F1 25 LED	19" ROUND SURFACE MOUNTED LED 120V MEDIUM OUTPUT, 0 TO 10V	ALLURE LIGHTING GL-R1.5-35-SM-CC-
F2 25 LED	19" ROUND SURFACE MOUNTED LED 120V MEDIUM OUTPUT, 0 TO 10V EMERGENCY BACK UP	ALLURE LIGHTING GL-R1.5-35-SM-CC- UNV-EMB-H18170
G1 80 LED	24" ROUND CEILING HUNG LED 120V MEDIUM OUTPUT, 0 TO 10V	ALLURE LIGHTING GL-IR2-35-CM-CC-WH
G2 80 LED	24" ROUND CEILING HUNG LED 120V MEDIUM OUTPUT, 0 TO 10V EMERGENCY BACK UP	ALLURE LIGHTING GL-IR2-35-CM-CC-WH UNV-EMB-H18170
H1 120 LED	36" ROUND CEILING HUNG LED 120V MEDIUM OUTPUT, 0 TO 10V	ALLURE LIGHTING GL-IR3-35-CM-CC-WH
H2 120 LED	36" ROUND CEILING HUNG LED 120V MEDIUM OUTPUT, 0 TO 10V EMERGENCY BACK UP	ALLURE LIGHTING GL-IR3-35-CM-CC-WH UNV-EMB-H18170
J1 73 LED	CEILING .5x8 FT. SUSPENDED LED 120V DIRECT/INDIRECT, MEDIUM OUTPUT, 0 TO 10V	COOPER LIGHTING VLT-F-100U-100D-835-2-UNV W-AC48-T1-8
J2 73 LED	CEILING .5x8 FT. SUSPENDED LED 120V DIRECT/INDIRECT, MEDIUM OUTPUT, 0 TO 10V EMERGENCY BACK UP	COOPER LIGHTING VLT-F-100U-100D-835-2-UNV W-AC48-T1-8-BSL6
R1 14 LED	6" X 6" LED RECESSED DOWNLIGHT 120V DIFFUSE LENS, WHITE FINISH, 0-10V	COOPER LIGHTING HCSQ6-30-DO10-HM6-3040 835-MW-
R2 14 LED	6" X 6" LED RECESSED WALL WASH 120V DIFFUSE LENS, WHITE FINISH, 0-10V TRIM WHITE	COOPER LIGHTING HCSQ6-30-DO10-HM6-3040- 835-61SQ-MW-61SQLWW
S 20 LED	11' WALL SCONCE LED 120V MILLED CENTER BAR TRIM, 0 TO 10V	VISTA LIGHTING CB5142-L35H-MV-OBA-MBT
V 20 LED	19' WALL SCONCE LED 120V MILLED CENTER BAR TRIM, 0 TO 10V	VISTA LIGHTING CB5524-L35K-MV-BCA

EWB 20 LED	WALKWAY BOLLARDS LIGHTS LED 277V DARK BRONZE, MEDIUM OUTPUT, SURGE PROTECTOR,	ABOVE ALL LIGHTING CSBD-40H-20-30-1-BK-
XS 1 LED	EXIT SIGN, GREEN LED, 120V SINGLE SIDED, WHITE HOUSING FINISH	COOPER LIGHTING APXH7-R-G2BK
XP 1 LED	EXIT SIGN, PRISONER AREA, GREEN LED, 120V SINGLE SIDED, WHITE HOUSING FINISH	ADVANTAGE LIGHTING BABSWM-B14-G-M
X1 30 LED	EXTERIOR 12" CEILING MOUNT, DOWN LED, 277V BRUSHED ALUMINUM BRONZE, FUSED	WAC LIGHTING FM-W2612-2-30-AL-277
X2 80 LED	EXTERIOR WALL MOUNT, DOWN LED, 277V IRON GRAY / TEXTURED, FUSED	PERFORMANCE LIGHTING SH2-T3-80-80-35K-IG-UNV-FRST
PL-1 1-143W	POLE 20' EXTERIOR LED 277V Galleon GRAPHITE METALIC, SQ. ALUM POLE SINGLE LAMP/ARMS AS SHOWN MOUNTING OPTIONS AS REQUIRED	COOPER LIGHTING GALN-SA-1-C-835-U-5WQ-GM F 277- FUSED
PL-2 1-286W	POLE 20' EXTERIOR LED 277V Galleon GRAPHITE METALIC SQ. ALUM POLE DOULBE LAMP/ARMS AS SHOWN MOUNTING OPTIONS AS REQUIRED	COOPER LIGHTING GALN-SA-1-C-835-U-5WQ-GM F 277- FUSED

7.7. Exit sign lighting shall be as indicated on fixture schedule and located as shown on plans. Devices shall be wired to main power through separate lighting power circuit.

2.08 DATA / TELEPHONE SYSTEM

All plan indicated devices will be provide and installed by Owner's Contract Venders. This Contractor shall be responsible for providing rough-in device boxes, and 3/4" empty conduit with labeled pull string, piped from device box location to above accessible ceiling, unless otherwise noted. Coordinate all device locations with Owner.

Interior data and telephone systems shall be wired by Owner and this contractor. Contractor shall provide empty conduits for all data / telephone devices. Owner shall provide cable runs for all data / telephone along with terminations. Data / telephone system shall be digital, IP addressable, integrated on the same cabling network.

Where telephone and data outlets are indicated on the plans, furnish and install empty 2" x 4" square box with plaster ring (where applicable), 18" above finished floor, or as noted. In the case for office cubicles, Contractor shall coordinate with the cubical manufacture for correct wire termination.

Areas of hard ceilings where data or telephone deices are located, contractor shall homerun empty conduit with pull string from devices location to accessible ceiling location.

2.09 SECURITY / SURVEILLANCE SYSTEM:

Interior and exterior security and surveillance systems shall be provided and wired by the Owner. V/A/V systems shall be fully integrated with the current systems. Where camera stations and door device locations are indicated on the plans, Contractor to furnish and install empty 3/4" conduit with clearly labeled pull string to device junction box and accessible ceiling, or otherwise noted. Owner shall provide cable runs and proper wire conductors. Owner shall provide wire from device back to recording equipment and control equipment located in the respective IT Room and IT Tech Rooms. Coordinate with Owner all device locations. Areas of hard ceilings where security devices are located, contractor shall homerun empty conduit with pull string from devices location to accessible ceiling location.

2.10 DOOR CARD ACCESS SYSTEM: FOBS

All plan indicated devices FOB card readers will be provided, installed by Owner's qualified Security Contractor. This Contractor shall be responsible coordinating and providing rough-in device boxes, if applicable, and 3/4" empty conduit with labeled pull string, piped from device box location to above accessible ceiling, unless otherwise noted. Coordinate all device locations with Owner and other involved trade contractors. Areas of hard ceilings where card readers are located, contractor shall homerun empty conduit with pull string from devices location to accessible ceiling location.

2.11 DISTRESS BUTTON SYSTEM:

All plan indicated distress button devices will be provided, installed by Owner's qualified Security Contractor. This Contractor shall be responsible coordinating and providing rough-in device boxes, if applicable, and 3/4" empty conduit with labeled pull string, piped from device box location to above accessible ceiling, unless otherwise noted. Coordinate all device locations with Owner and other involved trade contractors. Areas of hard ceilings where card readers are located, contractor shall homerun empty conduit with pull string from devices location to accessible ceiling location.

2.12 FIRE ALARM SYSTEM

Provide fire alarm detection system along with peripherals as shown on plans. The fire alarm panel and system shall be new and all peripherals devices shall be addressable. The fire alarm system shall consist of a digital programmable type panel with future expansion capabilities and addressable point of origin peripheral capabilities, Norris Fire Warden, model 100-2(E) Rev 3, Minuteman, or Honeywell approved equal. The following peripherals model numbers are based upon Norris Fire equipment, .

Smoke detectors:	Norris NP-110(A) series.
Heat detectors:	Norris NP-100(A) series.
Audio / visual alarms:	Norris SpectrAlert series.
Visual alarms:	Norris SpectrAlert series
Manual pull stations:	Norris BG12LX series double action type
Duct smoke detectors:	DNR (A)/DNRW, ionization type
Refrigeration Gas Leak detectors:	Detector type shall be compatible for application.

Provide and install duct type smoke detectors for supply & return air of AHU-1, 2, 3 & 4, DOAS-G & DOAS-1 supply and return air. Duct smoke detectors shall be DNR (A)/DNRW, ionization type or approved equal.

System shall be programmed and wired such that when any device should go into alarm state, a signal to the panel shall initiate appropriate system devices.

This contractor shall provide necessary wiring for peripherals such as smoke, heat, refrigeration gas detectors, manual pull stations, audio/visual devices, etc. to meet local and state code. All low voltage cable shall be fire rated.

System shall be programmed and wired such that when any sprinkler alarm device should go into alarm state, a signal to the fire alarm panel shall initiate the local fire department. The remaining zone output alarms, such as audio/visual alarms and door security, shall be supervised manually by staff personnel.

Areas of hard ceilings where fire devices are located, contractor shall homerun empty conduit with pull string from devices location to accessible ceiling location.

Elevator(s) fire safety interlocks. Contractor shall coordinate necessary fire alarm hardware devices & software programming along with wiring to facilitate elevator(s) safety functions. Contractor shall coordinate efforts with Elevator Contractor.

Sprinkler System:

This contractor shall provide necessary wiring for peripherals such as flow switches, tamper switches, electric arm switches, auto air devices, etc. Arrange and coordinate with sprinkler contractor for peripheral device locations and necessary wiring requirements. These devices shall be tie in and programmed into the Fire Alarm System Panel.

2.12.2 TRAINING:

Provide 4 hours of onsite training and 2 hours of custom programming for the building Owner operators. This training shall be 'hands-on' type at the Owner's place of convenience. A mutual agreement on the scheduling of this training class will be made between the owner and the contractor. The intent of this training is that 2 hours will occur before the owner has occupied the facility and the rest is to follow after the owner has accepted beneficial use. The training class will use the actual Operator manual that will be submitted for this project.

2.12.3 DOCUMENTATION:

Proper and adequate documentation must be provided, this will include:

- a. Accurate as-built drawings and sequences submitted in hardcopy and electronic format and digitally documented by AutoCad 2026 a standard Computer Aided Drafting (CAD) program)
- b. Owner's manuals including technical spec sheets
- c. Operator manuals

2.12.4 Manufacture's representative shall be responsible for all programming and testing of the system. Programming of processor shall consist of NFPA specified standards, minimum, along with an additional four hours for customized messages and four hours of owner operation instructions.

2.12.5 Commissioning: Upon completion of system, Owner's Commissioning Agency shall verify function of sprinkler system. Allow a minimum of 8 hours field time for coordination and collaboration of commissioning process.

2.13 VARIABLE FREQUENCY DRIVES AND MOTORS

2.13.1 DRIVES: Variable Speed Drives (VFD)

All VFD shall be microprocessor-based, adjustable frequency type as follows;

2.13.2 STANDARD PROTECTIVE FEATURES:

Current Limit, Undervoltage Trip, Overvoltage Trip, Overcurrent Trip, Overtemperature Trip, External Signal Trip, Overcurrent Stall Protection, and Overvoltage Stall Protection

2.13.3 SELF DIAGNOSTICS

Overcurrent, Overtemperature, Auxiliary, Overvoltage, Undervoltage, Overload, and Operating Error

2.12.4 PROGRAM FEATURES & CAPABILITIES

Acceleration Rate: 0.1 to 1600 seconds, 0 to 60 Hz
Deceleration Rate: 0.1 to 1600 seconds, 60 to 0 Hz
Start Torque (boost): AUTO or one of 8 manual settings
Maximum Frequency: 50, 60, 100, 120, 200 or 240 Hz
Volts per Hertz Pattern: To reach rated voltage at 50, 60, 100, 120 Hz
DC Brake: Time-0 to 3 seconds, Level-one of 10 levels
Restart Mode: Restart or No Restart after return of input power
Frequency Source: Local, Remote Pot, Remote 0-10V, Remote 4-20mA
Start and Direction: Local or Remote
Local Reverse: Lockout or Operable
Stop Mode: Ramp or Coast
Accel Stall: On/Off
Decel Stall: On/Off
Low Limit Frequency: 0.5 to maximum frequency
High Limit Frequency: 0.5 to maximum frequency
Jog Frequency: 0.5 to 20 Hz
Reset Frequencies: Three settings between low limit and high limit
Skip Frequencies: Three selectable between 0.5 and maximum with a selectable width of 0 to 5 Hz.
Second Accel Time: As a function of the first Accel time
Second Decel Time: As a function of the first Decel time
Current Limit: Adjustable Decel rate

2.13.5 ELECTRICAL SPECIFICATIONS

- a. Input Voltage: 480V AC, +/- 10%, 3-phase
Input Frequency: 48 to 62 Hz
Output Voltage : 0 to 230V AC, 3-phase (230V input)
Output Frequency: 0.5 to 240 Hz
Frequency Regulation: +/- 0.5% of maximum
Current Rating: Continuous - 100%
Intermittent - 150% for one minute
Speed Potentiometer, Start/Stop Selector, Fwd/Rev Selector, Frequency Display, mode Display, and Mode Programming Switches
 - b. External Signals

0-10V DC, 4-20mA DC, Panel Potentiometer, Preset Speeds, and Drive Running, At Speed and Fault Contacts
 - c. AHU-1, 2, 3 & 4 Supply Fan, : Provide Toshiba H7 Series Model # Q9-2035-IE-RE3 rated for 5.0 HP Motor, 8.0 FLA. Total of 4 VFD's.
 - d. DOAS-G Supply Fan, and Spare: Provide Toshiba H7 Series Model # Q9-2035-IE-RE3 rated for 5.0 HP Motor, 8.0 FLA. Total of 2 VFD's.
 - e. DOAS-G Return Fan, and Spare: Provide Toshiba H7 Series Model # Q9-2030-IE-RE3 rated for 3.0 HP Motor, 6.0 FLA. Total of 2 VFD's.
 - f. DOAS-1 Return Fan and spare, : Provide Toshiba H7 Series Model Q9-2035-IE-RE3 rated for 5.0 HP Motor, 8.7 FLA. Total of 2 VFD's.
 - g. DOAS-1 Supply Fan, and Spare : Provide Toshiba H7 Series Model Q9-2045-IE-RES rated for 7.5 HP Motor, 10.0 FLA. Total of 2 VFD's.
- AHU-1, 2, 3 & 4 / DOAS-g & DOAS-1 Variable Frequency Drives: A) Provide RFI filtering for each phase of each VFD. Each RFI filtering group shall be housed in NEMA 1 enclosure and wire in series before associated VFD with proper grounding. B) Each VFD shall be provided with bypass setup which shall include, but not limited to, breaker, motor starter, NEMA 1 enclosure, and reactors for harmonic balancing. Enclosure dimensions for all above: 28"h x 16"w x 10"d.
- E. Pumps: HWP-1, 2, 3, & 4 / CWP-1, 2, 3, & 4: VFD's will be supplied by Electrical Contractor. Provide Toshiba H7 Series Model Q9-2035-IE-RE3 rated for 5.0 HP Motor, 10.7 FLA. Total of 8 VFD's.

2.13.6 Commissioning: Upon completion of systems, Owner's Commissioning Agency shall Verify function of system's VFD's. Allow a minimum of 8 hours field time for coordination and collaboration of commissioning process.

2.14 SPECIALTIES

Domestic HW Pan - Monitoring: Provide plug and play water monitor. Dry contacts for water detection and alarm shall be tied into the BMS. Manufactured produce by Water Bug model # Smart Alarm.

Magnetic Door Holder: Contractor shall coordinate necessary power wiring and devices Interlocked with building fire safety functions.

Electric Door Strikes, Card Readers: Contractor shall coordinate necessary power wiring and devices to integrate with respective building system function. Contractor shall coordinate and collaborate efforts with Owner's Vendors. Provide empty conduit with pull string. Areas of hard ceilings where strikes or card readers are located, contractor shall homerun empty conduit with pull string from devices location to accessible ceiling location.

Distress Emergency Buttons: Contractor shall coordinate necessary empty conduit and wall box with pull string for Owner's Vendor final wiring and installation.

Exterior Lighting Systems: Proposed exterior lights shall be provided and wired by this contractor. All exterior lighting devices are scheduled with lighting control panels with one common photometric sensor. Lighting source power from scheduled circuit panel boards. Refer to Site Electrical Plans E-7.4 & 7.5 and Electrical Detail Plan E-3.5. Exterior lighting shall be wired and integrated with the Building Management System, (BMS), and controlled via BMS.

Interior lighting in Public Areas, all stair wells, Prisoner Areas, Sally Port, Secured Garage Parking, shall be remotely controlled from Marshal's Security 243 via Building Management System. This Contractor shall provide lighting power relay contactors and coordinate with the BMS A.T.C. Contractor.

Electrical Vehicle Charging Stations: EVCS-0 thru 5; Contractor shall provide necessary underground conduit for feeder wiring. Both power & communication wiring shall be sourced from the Mechanical Room 014. Refer to one-line electrical riser diagram, plan E-2.1 & 2.1. Refer to electrical plan E 5.1 & 5.2 for trench underground conduit tie-in locations.

EVCS-0 thru 5: Manufactured by ChargePoint, model "Omni" series, no approved equals. EVCS-0-5: Manufactured by ChargePoint, model "CP6621B-50A-L5-5, no approved equals. Stations shall be equipped with pedestal mounts, dual independent 18' power cable ports, card readers, RFID reader, cellular / WiFi, Cloud Plan subscription, 1 year warranty, and active configuration support. Equipment Vender: Future Energy, 3250 West Big Beaver Road, Troy, Michigan, 48084. Contact: Tino Sida, 586-782-4000 Office, 817-521-2667 mobile. E-mail: tino.sida@futureenergy.com

Provide necessary means of power disconnect. Contractor shall coordinate and collaborate efforts with other trades. Collaborate efforts during commissioning. Provide manufacture's system start-up for each station.

Commissioning: Upon completion of systems, Owner's Commissioning Agency shall verify function of systems. All pre-commissioning checks shall be completed before final Commissioning. Allow a minimum of 8 hours field time for coordination and collaboration of final commissioning process.

Overhead Door – Operation: Provide power to each Over Head Door operator and coordination with A.T.C. Contractor. Each door shall be controlled fully open & closed remotely via Building Management System. Respective operation warning light shall be interlocked. Operation Red Warning lights provided by this Contractor.

2.15 MOTORS

All motors shall be furnished factory-mounted on the driven equipment and shall be provided by equipment manufacturer. Mechanical Contractor shall supply all motors to associated HVAC equipment, unless otherwise noted. Electrical Contractor shall be responsible for providing motor starters, VFD's and disconnects and power wiring to all mechanical equipment including motor starters and terminating in such equipment. This Contractor and Mechanical Contractor shall coordinate such installation of electrical equipment and both shall be present when motors of 1/2 hp and larger are to be first energized.

Furnish and install branch circuit wiring for power to all motors. Control wiring shall be furnished by A.T.C. under this specification.

Furnish and install motor disconnect switches for servicing of equipment located at all motors. Disconnect switches shall be furnished with dual element time delay fuses to match NEC requirements and equipment specifications. In no case shall the maximum fuse size specified by the equipment manufacturer be exceeded.

Manual motor starters for fractional horsepower motors shall be General Electric CR 101 Y in NEMA 1 enclosures or flush mounted. Furnish and install overload heaters in accordance with manufacturer's nameplate.

Magnetic motor starters shall be General Electric style CR306. Starters shall be furnished with HOA selector switch. Furnish and install overload heaters in accordance with manufacturer's nameplate.

Where running conduit, equipment shall be connected to power wiring by means of flexible metal conduit or liquid tight flexible conduit in damp or wet locations. Only listed fittings shall be used. A separate grounding conductor shall be installed in all flexible raceways.

PART 3 EXECUTION OF WORK

1. All work shall be performed in a neat workmanlike manner. All efforts shall be made to coordinate the work with their trades.
2. Provide necessary and proper fire stop(s), water seal or weather stop(s), etc. associated with system device penetration. Coordinate all system component penetrations through building structure(s) with General Contractor and Owner.
3. Examination
 - 3.1. Verify field measurements and circuiting arrangements are as shown on Drawings.
 - 3.2. Beginning of demolition means installer accepts existing conditions.
4. Preparation
 - 4.1. Disconnect electrical systems in walls, floors, and ceilings scheduled for removal.
 - 4.2. Coordinate utility service outages with Utility Company.
5. Temporary Service
 - 5.1. Electrical Contractor shall allow for all costs for temporary electrical usage during project construction. Electrical Contractor shall provide separate means of power electrical metering for construction utility electrical costs. Refer to Section 01 05 00 Temporary Facilities.
 - 5.2. Wiring for temporary use of all trades throughout the building as follows: a 20 amp 120 volt source shall be available to all areas of construction with 50 ft. extension cord. The contractor shall furnish and install a 200 watt lamp outlet (or equivalent) for each 1000 sq. ft. of building area for temporary power and light.
6. General:
 - 6.1. All materials entering into the installation must be new and of the quality specified, otherwise to be the best commercial quality obtainable for the purpose. All parts of the work and the erections thereof must be performed in the best and most substantial manner in accordance with the standards of the trade and all applicable codes.
 - 6.2. All trenching and backfill for underground conduit shall be in accordance with all pertinent provision of Section 02200 Earthwork of these specifications.
 - 6.3. Any item inadvertently omitted from the plans and specifications, but which is necessary for the proper completion and operation of the work, in accordance with the intent of the plans and specifications, shall be supplied by the contractor at no additional charge.
 - 6.4. All questions as to the interpretation or extent of the drawings, and specifications shall be referred to the Engineer.
 - 6.5. Throughout the progress of the work, the electrical subcontractor shall examine at the site, architectural drawings, together with drawings of equipment companies and other trades and shall take note carefully all architectural changes and corresponding changes in other lines so that no work will be installed which would have to be removed or altered.

- 6.6. This subcontractor shall be responsible that advance information be given to the General Contractor of location and size of all frames, boxes and openings needed.
- 6.7. The General Contractor will provide all boxed openings, recesses, lintels and bucks required for the admission of the work. Furnish him with all necessary information in ample time.
- 6.8. In no case may any structural member be pierced or violated in any way without written permission from the Engineer.
- 6.9. The electrical contractor shall take effective measures to protect all materials and fittings from loss or damage; and all pipe and duct openings from obstruction throughout the construction.
- 6.10. All dirt and debris resulting from the work shall be thoroughly taken up and removed from the premises. All equipment shall be cleaned for inspection and use.
- 6.11. All electrical conduit shall be concealed in ceiling space or partitions except EMT conduit located in Mechanical Room. Provide means of venting conduit, enclosures, etc. of condensation where moisture may occur.
- 7. Completion:
 - 7.1. Panel Board Name Plates and Schedules: All panel boards shall have name tags noting service and number which shall be noted on record Drawings and Charts. Each panel shall be provided with breaker schedules.
 - 7.2. Provide properly executed certificate of inspection from authorities having jurisdiction.
 - 7.3. Instruct such persons as the Owner designates in the proper operation and maintenance of the systems and their parts. Submit to the Architect a letter naming the person or persons so instructed and the dates of such instruction.
 - 7.4. Commissioning: Time shall be allotted before the completion of this project for final commissioning of systems, equipment, devices, etc., Electrical Contractor, as well as all involved Sub-Contractors shall collaborate and coordinate with Owner's Commissioning Agency.
 - 7.5. Prepare and deliver four sets of complete literature showing operating, service and replacement data for all equipment which will require periodic maintenance or replacement.
 - 7.6. Documentation: Proper and adequate documentation must be provided, this will include: Accurate as-built drawings and sequences submitted in hardcopy and CD disk form updated via a standard 2026 Computer Aided Drafting (CAD) program Four hard copies.
Owner's manuals including technical spec sheets along with Operator manuals.

END OF SECTION

APPENDIX SECTION - A

DAIKIN EQUIPMENT
REFRIGERATION PIPING
& WIRING DATA

1. Indoor Unit Details

SCU -1A - REYA96AATJA

Name	Model	Tot. Cool	Sens. Cool	Tot. Heat	Air Flow Rate	Sound	Voltage	MCA	MOP	WxHxD	Weight
		BTU/h	BTU/h	BTU/h	cfm	dBA		A		inch	lbs
IU-1-22	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-1-20	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-1-21	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-1-19	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-1-15	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-1-16	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-1-18	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3

Entering Air Temperature:

Cooling: 78.0 FDB / 65.0

Heating: 72.0 FDB

Required room measures

Validated using ASHRAE Standard 15-2022

These calculations are for non-institutional occupancy

Room	Indoor unit	Mrel lbs	Minimum Required Room Volume ft ³	Room Area ft ²	Ceiling Height ft	Calculated Volume ft ³
	IU-1-22 (BC-1-1 Port # A)	1.5	157.0			
	IU-1-20 (BC-1-1 Port # B)	1.4	149.2			
	IU-1-21 (BC-1-1 Port # C)	2.8	288.4			

Room	Indoor unit	Mrel lbs	Minimum Required Room Volume ft ³	Room Area ft ²	Ceiling Height ft	Calculated Volume ft ³
	IU-1-19 (BC-1-1 Port # C)	2.8	288.4			
	IU-1-15 (BC-1-1 Port # D)	3.1	323.8			
	IU-1-16 (BC-1-1 Port # D)	3.1	323.8			
	IU-1-18 (BC-1-1 Port # F)	1.9	196.2			

Only units connected to outdoor unit SCU -1A are considered for the measures displayed here. If other outdoor units serve the same room(s), check the measures there as well.

(BS)SvBox	Model	Mrel lbs	Use Enclosure Kit
BC-1-1	BSF6A54AAVJ	35.2	No

SCU-1B - REYA168AAYDA

Name	Model	Tot. Cool	Sens. Cool	Tot. Heat	Air Flow Rate	Sound	Voltage	MCA	MOP	WxHxD	Weight
		BTU/h	BTU/h	BTU/h	cfm	dBA		A		inch	lbs

IU-1-17	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-1-3	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-1-2	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-1-1	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-1-4	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-1-5	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-1-7	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-1-8	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-1-10	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-1-11	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-1-14	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-1-13	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-1-6	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-1-12	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3

Entering Air Temperature:

Cooling: 78.0 FDB / 65.0

Heating: 72.0 FDB

Required room measures

Validated using ASHRAE Standard 15-2022

These calculations are for non-institutional occupancy

Room	Indoor unit	Mrel lbs	Minimum Required Room Volume ft ³	Room Area ft ²	Ceiling Height ft	Calculated Volume ft ³
	IU-1-17 (BC-1-2 Port # A)	7.0	734.2			
	IU-1-3 (BC-1-2 Port # A)	7.0	734.2			

Room	Indoor unit	Mrel lbs	Minimum Required Room Volume ft ³	Room Area ft ²	Ceiling Height ft	Calculated Volume ft ³
	IU-1-2 (BC-1-2 Port # A)	7.0	734.2			
	IU-1-1 (BC-1-2 Port # A)	7.0	734.2			
	IU-1-4 (BC-1-2 Port # B)	2.9	305.4			
	IU-1-5 (BC-1-2 Port # B)	2.9	305.4			
	IU-1-7 (BC-1-2 Port # C)	4.8	503.8			
	IU-1-8 (BC-1-2 Port # C)	4.8	503.8			
	IU-1-10 (BC-1-2 Port # E)	4.9	506.5			
	IU-1-11 (BC-1-2 Port # E)	4.9	506.5			
	IU-1-14 (BC-1-2 Port # G)	2.5	265.7			
	IU-1-13 (BC-1-2 Port # G)	2.5	265.7			
	IU-1-6 (BC-1-2 Port # H)	2.7	277.9			
	IU-1-12 (BC-1-2 Port # H)	2.7	277.9			

Only units connected to outdoor unit SCU-1B are considered for the measures displayed here. If other outdoor units serve the same room(s), check the measures there as well.

(BS)SvBox	Model	Mrel lbs	Use Enclosure Kit
BC-1-2	BSF8A54AAVJ	56.5	No

SCU-2 - REYA264AAAYDA

Name	Model	Tot. Cool	Sens. Cool	Tot. Heat	Air Flow Rate	Sound	Voltage	MCA	MOP	WxHxD	Weight
		BTU/h	BTU/h	BTU/h	cfm	dBA		A		inch	lbs
IU-2-31	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4
IU-2-28	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4
IU-2-26	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-2-23	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4
IU-2-25	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-2-27	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-2-29	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-2-30	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-2-22	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-2-21	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-2-24	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4
IU-2-17	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-2-19	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-2-20	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4
IU-2-14	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-2-13	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-2-12	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-2-16	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-2-18	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4
IU-2-15	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3

Entering Air Temperature:
Cooling: 78.0 FDB / 65.0
Heating: 72.0 FDB

Required room measures

Validated using ASHRAE Standard 15-2022

These calculations are for non-institutional occupancy

Room	Indoor unit	Mrel lbs	Minimum Required Room Volume ft ³	Room Area ft ²	Ceiling Height ft	Calculated Volume ft ³
	IU-2-31 (BC-2-1 Port # A)	2.6	276.0			
	IU-2-28 (BC-2-1 Port # B)	2.2	225.8			
	IU-2-26 (BC-2-1 Port # C)	1.7	174.2			
	IU-2-23 (BC-2-1 Port # D)	1.8	189.8			
	IU-2-25 (BC-2-1 Port # E)	8.9	927.1			
	IU-2-27 (BC-2-1 Port # E)	8.9	927.1			
	IU-2-29 (BC-2-1 Port # E)	8.9	927.1			
	IU-2-30 (BC-2-1 Port # E)	8.9	927.1			
	IU-2-22 (BC-2-1 Port # F)	3.2	335.8			
	IU-2-21 (BC-2-1 Port # F)	3.2	335.8			
	IU-2-24 (BC-2-1 Port # H)	1.6	163.2			
	IU-2-17 (BC-2-2 Port # A)	7.1	746.0			
	IU-2-19 (BC-2-2 Port # A)	7.1	746.0			

Room	Indoor unit	Mrel lbs	Minimum Required Room Volume ft ³	Room Area ft ²	Ceiling Height ft	Calculated Volume ft ³
	IU-2-20 (BC-2-2 Port # A)	7.1	746.0			
	IU-2-14 (BC-2-2 Port # B)	2.0	204.0			
	IU-2-13 (BC-2-2 Port # C)	2.1	219.7			
	IU-2-12 (BC-2-2 Port # D)	2.3	236.9			
	IU-2-16 (BC-2-2 Port # E)	2.1	216.5			
	IU-2-18 (BC-2-2 Port # H)	6.8	709.3			
	IU-2-15 (BC-2-2 Port # H)	6.8	709.3			

Only units connected to outdoor unit SCU-2 are considered for the measures displayed here. If other outdoor units serve the same room(s), check the measures there as well.

(BS)SvBox	Model	Mrel lbs	Use Enclosure Kit
BC-2-1	BSF8A54AAVJ	112.1	No
BC-2-2	BSF8A54AAVJ	112.1	No

SCU-3 - REYA168AAYDA

Name	Model	Tot. Cool	Sens. Cool	Tot. Heat	Air Flow Rate	Sound	Voltage	MCA	MOP	WxHxD	Weight
		BTU/h	BTU/h	BTU/h	cfm	dBA		A		inch	lbs

IU-2-8	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-2-11	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-2-10	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-2-7	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-2-6	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4
IU-2-5	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4
IU-2-2	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4
IU-2-9	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-2-3	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4
IU-2-1	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-2-4	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4
IU-Entry	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4

Entering Air Temperature:

Cooling: 78.0 FDB / 65.0

Heating: 72.0 FDB

Required room measures

Validated using ASHRAE Standard 15-2022

These calculations are for non-institutional occupancy

Room	Indoor unit	Mrel lbs	Minimum Required Room Volume ft ³	Room Area ft ²	Ceiling Height ft	Calculated Volume ft ³
	IU-2-8 (BC-3-1 Port # A)	1.7	174.2			
	IU-2-11 (BC-3-1 Port # B)	1.9	197.7			
	IU-2-10 (BC-3-1 Port # C)	1.8	186.8			
	IU-2-7 (BC-3-1 Port # D)	1.5	158.6			

Room	Indoor unit	Mrel lbs	Minimum Required Room Volume ft ³	Room Area ft ²	Ceiling Height ft	Calculated Volume ft ³
	IU-2-6 (BC-3-1 Port # F)	5.4	561.4			
	IU-2-5 (BC-3-1 Port # F)	5.4	561.4			
	IU-2-2 (BC-3-1 Port # F)	5.4	561.4			
	IU-2-9 (BC-3-2 Port # A)	1.8	185.2			
	IU-2-3 (BC-3-2 Port # B)	1.5	153.8			
	IU-2-1 (BC-3-2 Port # C)	2.0	211.8			
	IU-2-4 (BC-3-2 Port # D)	5.1	532.6			
	IU-Entry (BC-3-2 Port # D)	5.1	532.6			

Only units connected to outdoor unit SCU-3 are considered for the measures displayed here. If other outdoor units serve the same room(s), check the measures there as well.

(BS)SvBox	Model	Mrel lbs	Use Enclosure Kit
BC-3-1	BSF6A54AAVJ	57.2	No
BC-3-2	BSF4A54AAVJ	57.2	No

SCU-4 - REYA264AAYDA

Name	Model	Tot. Cool	Sens. Cool	Tot. Heat	Air Flow Rate	Sound	Voltage	MCA	MOP	WxHxD	Weight
		BTU/h	BTU/h	BTU/h	cfm	dBA		A		inch	lbs

IU-3-29	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-31	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-33	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-34	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-30	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4
IU-3-32	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4
IU-3-35	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4
IU-3-24	FXZA05AAVJU	5,346	4,503	6,479	300	26 - 32	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-28	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-27	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-26	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-4	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4
IU-3-3	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-2	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-1	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4
IU-3-7	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-5	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4
IU-3-6	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4
IU-3-8	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-25	FXZA05AAVJU	5,346	4,503	6,479	300	26 - 32	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-311	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4

Entering Air Temperature:

Cooling: 78.0 FDB / 65.0

Heating: 72.0 FDB

Required room measures

Validated using ASHRAE Standard 15-2022

These calculations are for non-institutional occupancy

Room	Indoor unit	Mrel lbs	Minimum Required Room Volume ft ³	Room Area ft ²	Ceiling Height ft	Calculated Volume ft ³
	IU-3-29 (BC-4-1 Port # A)	5.3	556.4			
	IU-3-31 (BC-4-1 Port # A)	5.3	556.4			
	IU-3-33 (BC-4-1 Port # A)	5.3	556.4			
	IU-3-34 (BC-4-1 Port # A)	5.3	556.4			
	IU-3-30 (BC-4-1 Port # B)	2.1	214.9			
	IU-3-32 (BC-4-1 Port # C)	1.7	178.9			
	IU-3-35 (BC-4-1 Port # D)	2.6	274.4			
	IU-3-24 (BC-4-1 Port # E)	2.0	211.8			
	IU-3-28 (BC-4-1 Port # F)	3.5	369.7			
	IU-3-27 (BC-4-1 Port # F)	3.5	369.7			
	IU-3-26 (BC-4-1 Port # F)	3.5	369.7			
	IU-3-4 (BC-4-2 Port # A)	5.0	517.1			
	IU-3-3 (BC-4-2 Port # A)	5.0	517.1			

Room	Indoor unit	Mrel lbs	Minimum Required Room Volume ft ³	Room Area ft ²	Ceiling Height ft	Calculated Volume ft ³
	IU-3-2 (BC-4-2 Port # A)	5.0	517.1			
	IU-3-1 (BC-4-2 Port # B)	2.3	238.4			
	IU-3-7 (BC-4-2 Port # C)	1.5	160.1			
	IU-3-5 (BC-4-2 Port # D)	4.6	475.7			
	IU-3-6 (BC-4-2 Port # D)	4.6	475.7			
	IU-3-8 (BC-4-2 Port # D)	4.6	475.7			
	IU-3-25 (BC-4-2 Port # E)	1.4	146.0			
	IU-311 (BC-4-2 Port # F)	2.0	207.1			

Only units connected to outdoor unit SCU-4 are considered for the measures displayed here. If other outdoor units serve the same room(s), check the measures there as well.

(BS)SvBox	Model	Mrel lbs	Use Enclosure Kit
BC-4-1	BSF6A54AAVJ	94.9	No
BC-4-2	BSF6A54AAVJ	94.9	No

SCU-5 - REYA240AAYDA

Name	Model	Tot. Cool	Sens. Cool	Tot. Heat	Air Flow Rate	Sound	Voltage	MCA	MOP	WxHxD	Weight
		BTU/h	BTU/h	BTU/h	cfm	dBA		A		inch	lbs

IU-3-38	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-36	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-22	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-23	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-37	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4
IU-3-12	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-9	FXZA05AAVJU	5,346	4,503	6,479	300	26 - 32	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-10	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-15	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-13	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-16	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-17	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4
IU-3-18	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-19	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3
IU-3-20	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4
IU-3-21	FXZA12AAVJU	11,260	7,521	12,957	353	26 - 34	208-230V 1ph	0.4	15A	22.6 x 10.2 x 22.6	36.4
IU-3-14	FXZA09AAVJU	8,872	6,187	10,228	317	26 - 33	208-230V 1ph	0.3	15A	22.6 x 10.2 x 22.6	35.3

Entering Air Temperature:
Cooling: 78.0 FDB / 65.0
Heating: 72.0 FDB

Required room measures

Validated using ASHRAE Standard 15-2022

These calculations are for non-institutional occupancy

Room	Indoor unit	Mrel lbs	Minimum Required Room Volume ft ³	Room Area ft ²	Ceiling Height ft	Calculated Volume ft ³
	IU-3-38 (BC- 5-1 Port # A)	3.2	334.3			

Room	Indoor unit	Mrel lbs	Minimum Required Room Volume ft ³	Room Area ft ²	Ceiling Height ft	Calculated Volume ft ³
	IU-3-36 (BC-5-1 Port # A)	3.2	334.3			
	IU-3-22 (BC-5-1 Port # B)	3.8	392.5			
	IU-3-23 (BC-5-1 Port # B)	3.8	392.5			
	IU-3-37 (BC-5-1 Port # D)	2.0	210.2			
	IU-3-12 (BC-5-2 Port # A)	2.2	227.5			
	IU-3-9 (BC-5-2 Port # B)	1.9	202.4			
	IU-3-10 (BC-5-2 Port # C)	1.7	182.1			
	IU-3-15 (BC-5-2 Port # D)	1.4	146.0			
	IU-3-13 (BC-5-2 Port # E)	1.9	202.4			
	IU-3-16 (BC-5-2 Port # F)	1.6	171.1			
	IU-3-17 (BC-5-2 Port # G)	2.0	203.9			
	IU-3-18 (BC-5-2 Port # H)	7.8	815.8			
	IU-3-19 (BC-5-2 Port # H)	7.8	815.8			

Room	Indoor unit	Mrel lbs	Minimum Required Room Volume ft ³	Room Area ft ²	Ceiling Height ft	Calculated Volume ft ³
	IU-3-20 (BC-5-2 Port # H)	7.8	815.8			
	IU-3-21 (BC-5-3 Port # A)	2.9	303.3			
	IU-3-14 (BC-5-3 Port # A)	2.9	303.3			

Only units connected to outdoor unit SCU-5 are considered for the measures displayed here. If other outdoor units serve the same room(s), check the measures there as well.

(BS)SvBox	Model	Mrel lbs	Use Enclosure Kit
BC-5-1	BSF4A54AAVJ	94.7	No
BC-5-2	BSF8A54AAVJ	94.7	No
BC-5-3	BSA36AAVJ	94.7	No

2. Condensing Unit Details

Performance

Name	Model	Combination Ratio	Cooling		Heating	
			Ambient Temp.	Corrected Capacity	Ambient Temp.	Corrected Capacity
		%	°F	BTU/h	°F	BTU/h
SCU -1A	REYA96AATJA	69.3	95.0	86,211	0.0/ -4.0 -13.0	74,876
SCU-1B	REYA168AAYDA	79.2	95.0	149,048	0.0/ -4.0 -13.0	97,222
SCU-2	REYA264AAYDA	77.7	95.0	230,073	0.0/ -4.0 -13.0	176,466
SCU-3	REYA168AAYDA	76.8	95.0	149,026	0.0/ -4.0 -13.0	97,140
SCU-4	REYA264AAYDA	80.3	95.0	234,899	0.0/ -4.0 -13.0	179,257
SCU-5	REYA240AAYDA	69.9	95.0	205,878	0.0/ -4.0 -13.0	128,584

Electrical Information

Name	Model	Voltage	MCA	MOP	WxHxD	Weight
			A	A	inch	lbs
SCU -1A	REYA96AATJA	460V 3ph	34.9	40.0	48.8 x 65.4 x 30.1	725.3
SCU-1B	REYA168AAYDA	460V 3ph	27.1	30.0	48.8 x 65.4 x 30.1	800.3
SCU-2	REYA264AAYDA	460V 3ph				
A	*REYA144AAYDA		23.3	30.0	48.8 x 65.4 x 30.1	800.3
B	*REYA120AAYDA		18.2	25.0	48.8 x 65.4 x 30.1	725.3
SCU-3	REYA168AAYDA	460V 3ph	27.1	30.0	48.8 x 65.4 x 30.1	800.3
SCU-4	REYA264AAYDA	460V 3ph				
A	*REYA144AAYDA		23.3	30.0	48.8 x 65.4 x 30.1	800.3
B	*REYA120AAYDA		18.2	25.0	48.8 x 65.4 x 30.1	725.3
SCU-5	REYA240AAYDA	460V 3ph	35.1	40.0	68.9 x 65.4 x 30.1	972.2

Refrigerant Information

Name	Model	Refrigerant	Factory Charge	Estimated Field Charge	Estimated Total Charge	Minimum Room Volume to Meet ASHRAE 15
		Type	lbs	lbs	lbs	ft³
SCU -1A	REYA96AATJA	R32	25.79	9.38	35.17	n/a
SCU-1B	REYA168AAYDA	R32	25.79	30.68	56.47	n/a
SCU-2	REYA264AAYDA	R32	51.59	60.52	112.11	n/a
SCU-3	REYA168AAYDA	R32	25.79	31.37	57.16	n/a
SCU-4	REYA264AAYDA	R32	51.59	43.34	94.93	n/a
SCU-5	REYA240AAYDA	R32	25.79	68.92	94.71	n/a

Branch Selector Box Information

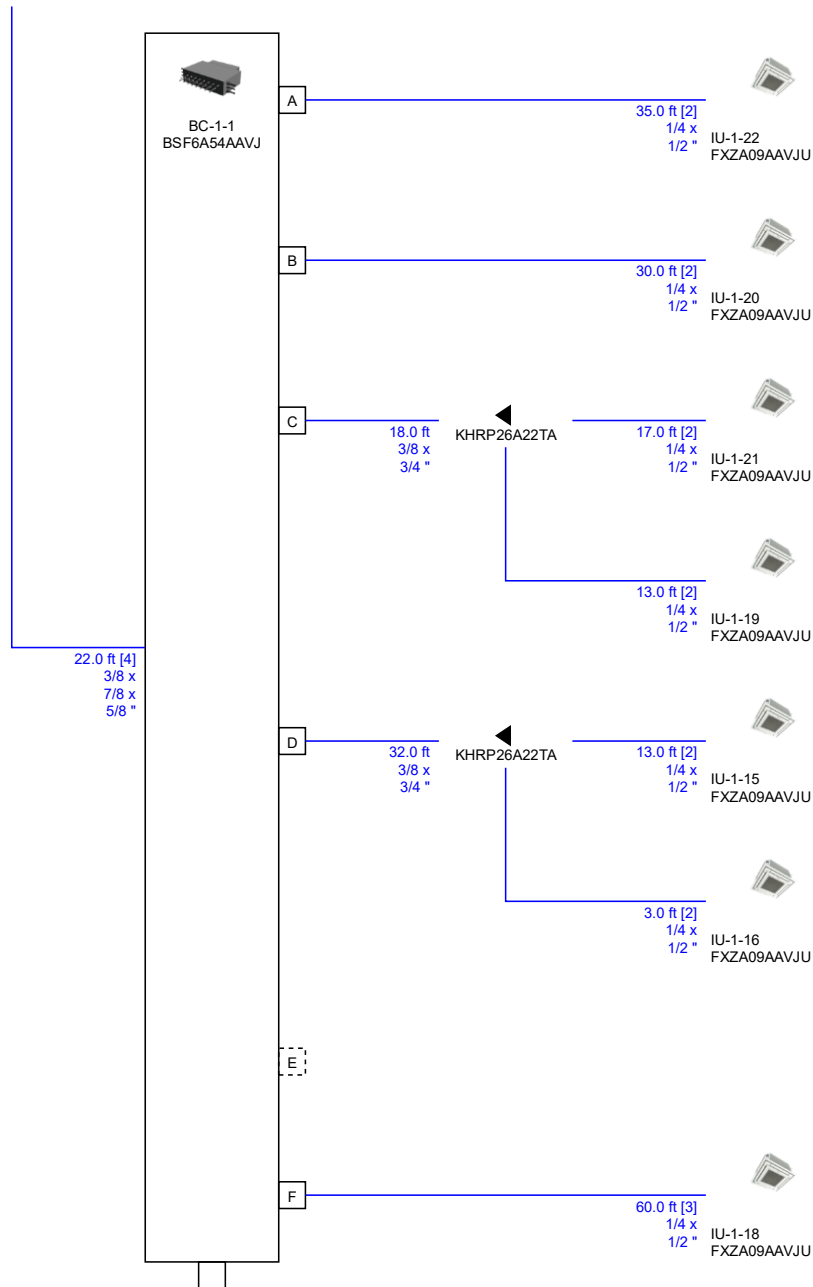
Model	Voltage	MCA	Operating Sound	Max Sound	WxHxD	Weight
		A	dB(A)	dB(A)	inch	lbs
BSF8A54AAVJ	230V 1ph	1.9	n/a	n/a	33.4x9.5x27.7	110
BSF6A54AAVJ	230V 1ph	1.9	n/a	n/a	33.4x9.5x27.7	99
BSF4A54AAVJ	230V 1ph	1.2	n/a	n/a	19.3x9.5x27.7	73
BSA36AAVJ	230V 1ph	0.9	n/a	n/a	15.2x8.1x16.7	29

The maximum sound is the max value of transient sound (oil return, defrost, changing from cooling to heating, etc.) Manufacturers shall provide sound data for all branch selector boxes. If sound data is unavailable or exceeds the values above, necessary precautions shall be taken, including but not limited to, the supply and install of sound blankets at no extra cost to the owner, or the relocation of branch boxes away from the occupied spaces at no extra cost to the owner, or extra insulation to the ceilings and walls around the branch selector boxes at no extra cost to the owner.

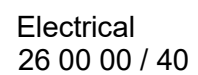
3. Piping Diagrams

Piping SCU -1A

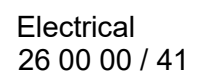
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REYA96AATJA



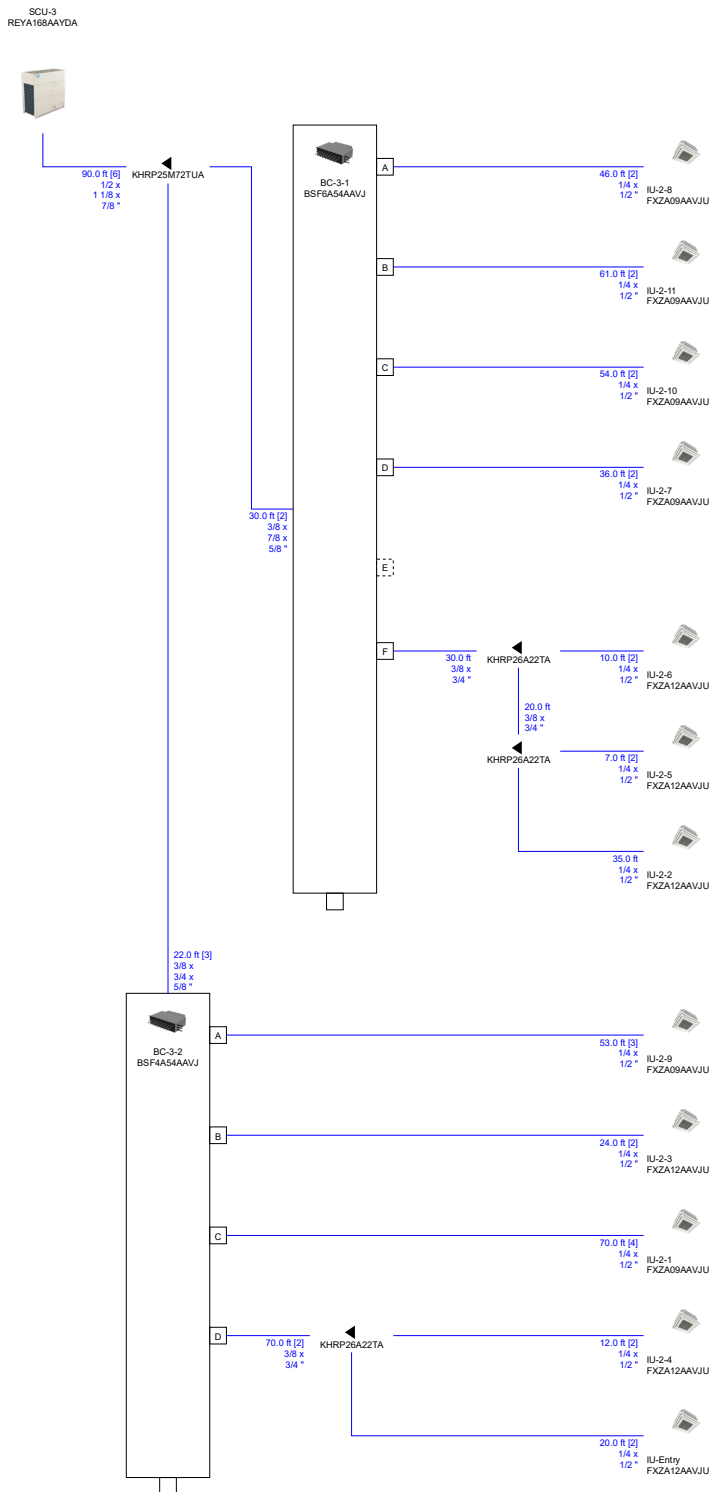
Hancock Judicial Center



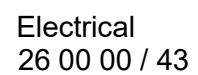
Hancock Judicial Center



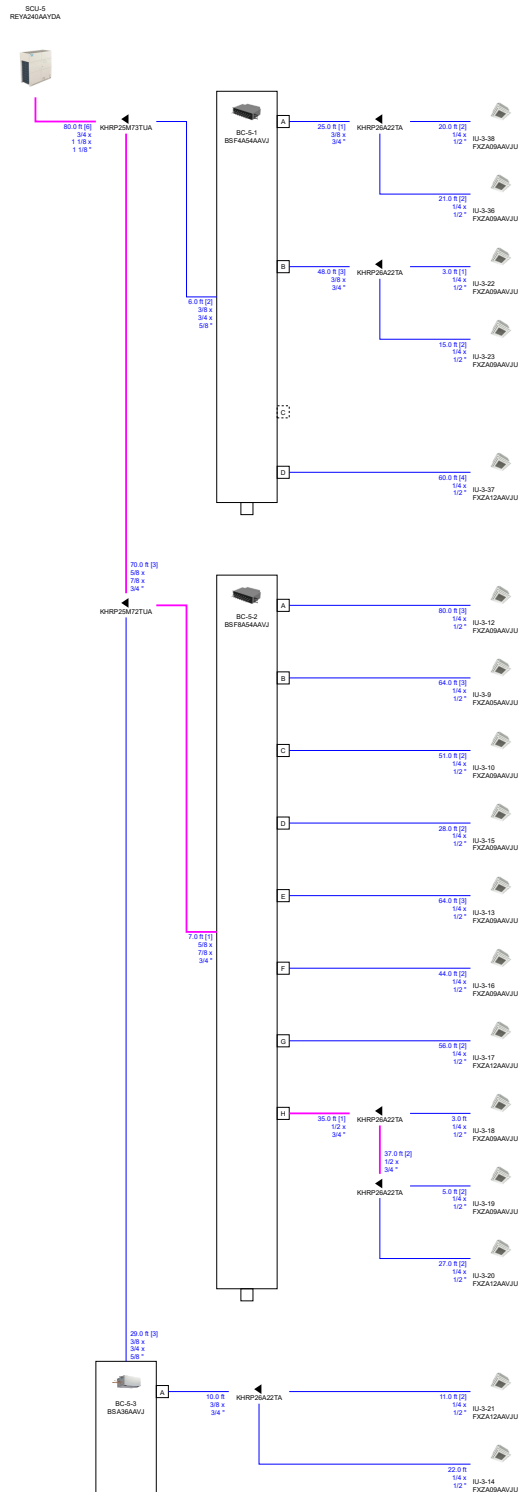
Piping SCU-3



Hancock Judicial Center

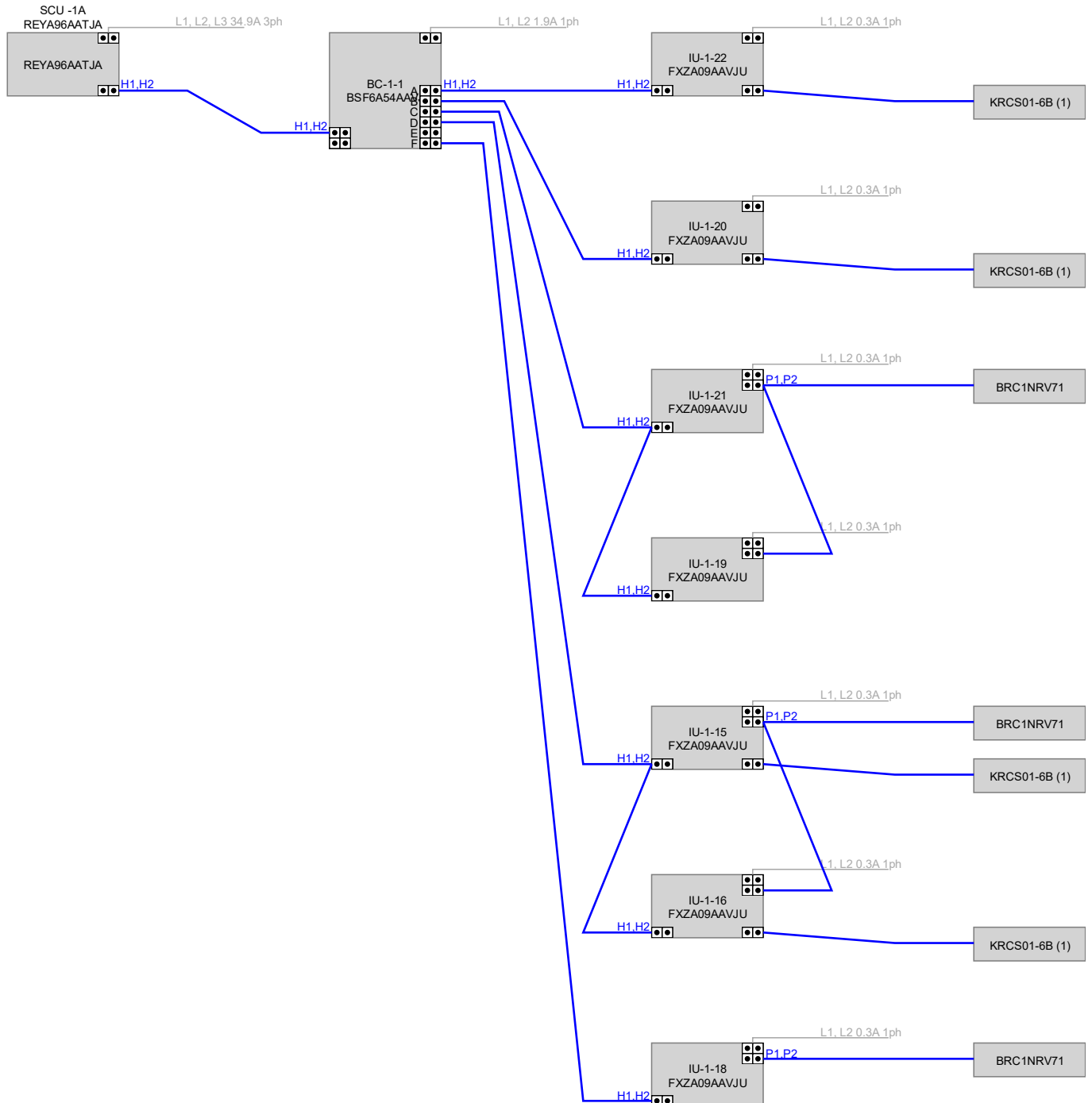


Piping SCU-5

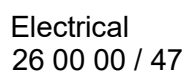


4. Wiring Diagrams

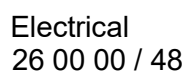
Wiring SCU -1A



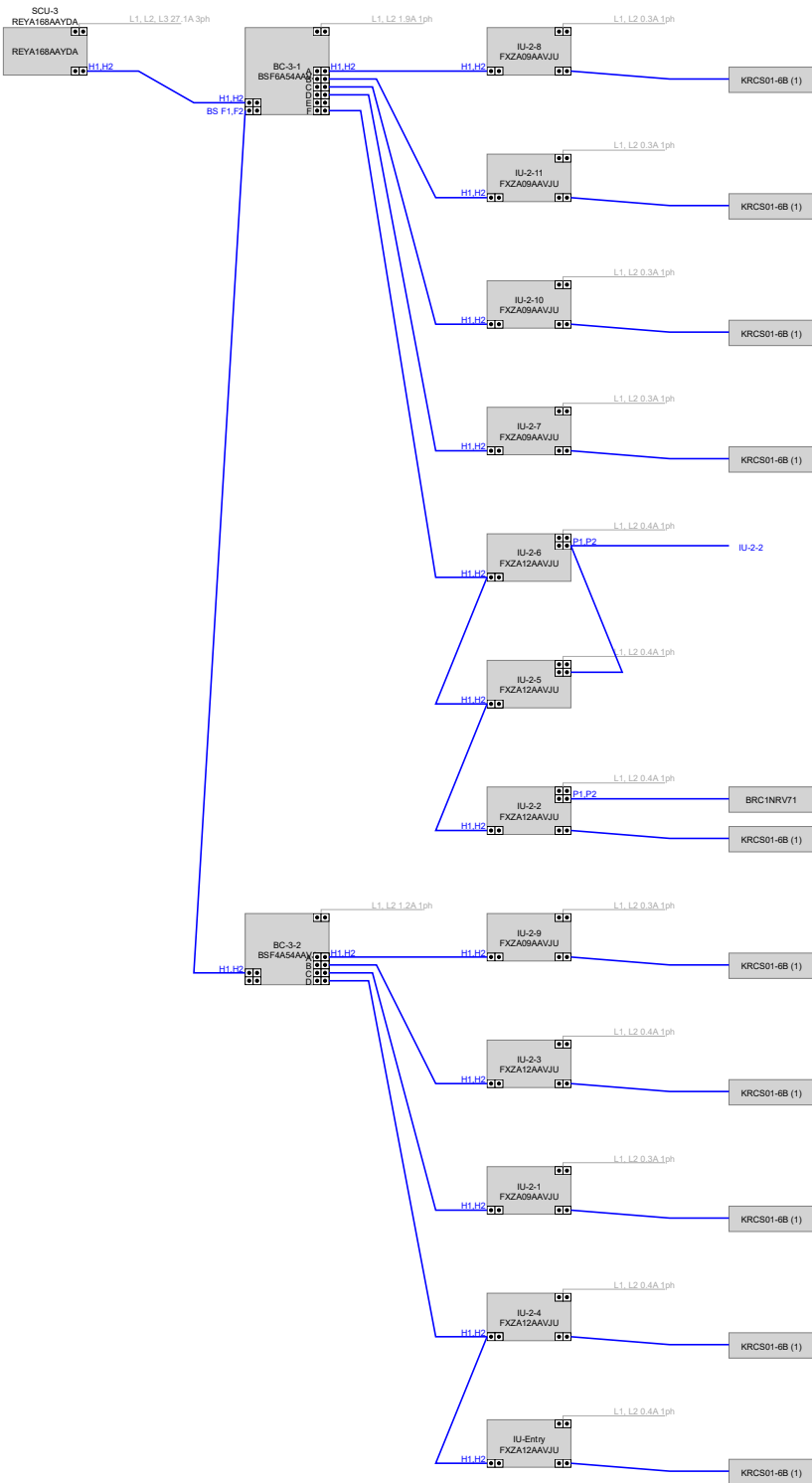
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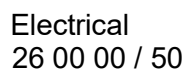
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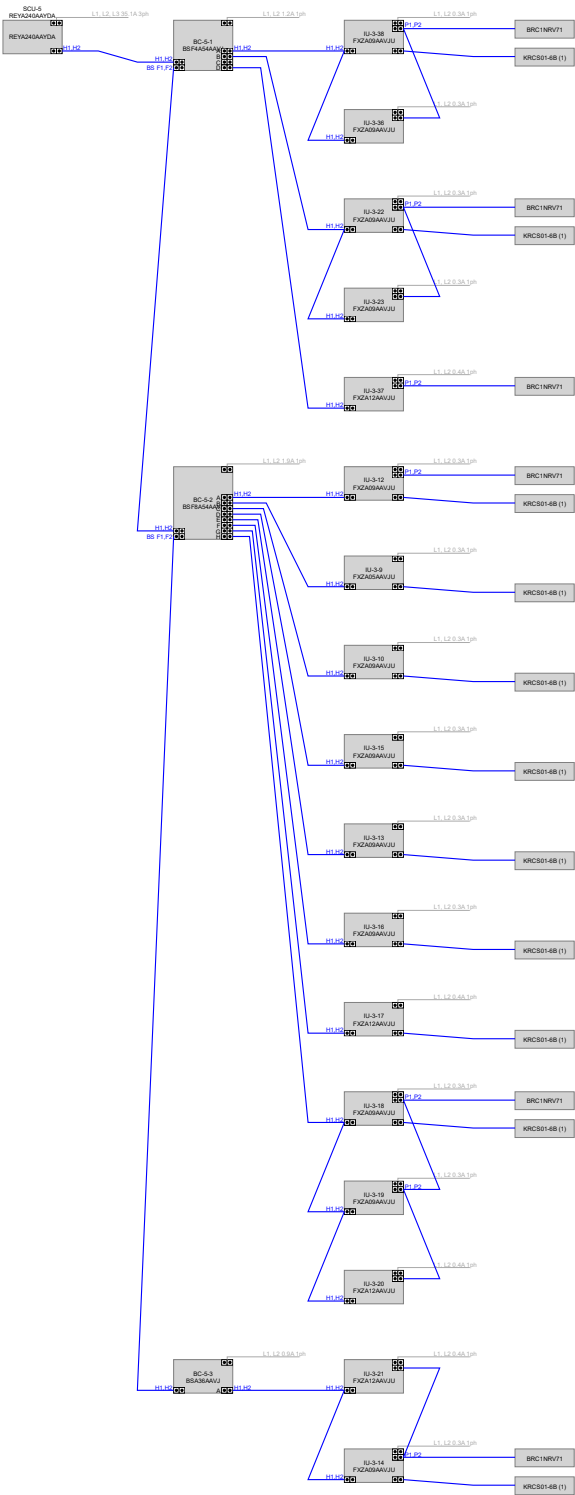
Wiring SCU-3



Hancock Judicial Center



Wiring SCU-5



SECTION 31 10 00 SITE CLEARING

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Coordinate Work with that of other trades affecting or affected by Work of this Section. Cooperate with such trades to assure the steady progress of the Work.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Protecting existing trees shrubs groundcovers plants and grass to remain.
 - 2. Protecting existing site utilities to remain.
 - 3. Removing trash and debris from the property.
 - 4. Removing existing trees, shrubs, groundcovers, plants, and grass.
 - 5. Clearing and grubbing.
 - 6. Stripping and stockpiling topsoil.
- B. Related Sections include the following:
 - 1. Section 31 22 00 - Grading.
 - 2. Section 31 23 00 - Excavation, Backfill, and Compaction.
 - 3. Section 31 25 00 - Erosion and Sedimentation Controls.
 - 4. Section 32 92 10 - Topsoil.

1.3 DEFINITIONS

- A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials. Topsoil shall conform either naturally or by addition of amendments provided by the Contractor to the requirements of Section 32 92 10 Topsoil.

1.4 MATERIAL OWNERSHIP

- A. Except for stripped topsoil or other materials indicated to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 PROJECT CONDITIONS

- A. Prior to excavation, verify the underground utilities, pipes, structures, and facilities. Maine Dig-Safe law requires at least the following minimum measures:
 - 1. Pre-mark the boundaries of your planned excavation with white paint, flags or stakes, so utility crews know where to mark their lines.
 - 2. Call Dig Safe, at 1-888-DIGSAFE, at least three business days - but no more than 30 calendar days - before starting work. Don't assume someone else will make the call.
 - 3. Wait three business days for lines to be located and marked with color-coded paint, flags or stakes. Note the color of the marks and the type of utilities they indicate. Transfer these marks to the As-Built drawings.

4. Contact the landowner and other non-member utilities (water, sewer, gas, etc.), for them to mark the locations of their underground facilities. Transfer these marks to the As-Built drawings.
 5. Re-notify Dig Safe and the non-member utilities if the digging, drilling or blasting does not occur within 30 calendar days, or if the marks are lost due to weather conditions, site work activity, or any other reason.
 6. Hand dig within 18 inches in any direction of any underground line until the line is exposed. Mechanical methods may be used for initial site penetration, such as removal of pavement or rock.
 7. Dig Safe requirements are in addition to town, city and/or state DOT street opening permit requirements.
 8. For complete Dig Safe requirements, call the PUC or visit their website.
 9. If you damage, dislocate or disturb any underground utility line, immediately notify the affected utility. If damage creates safety concerns, call the fire department and take immediate steps to safeguard health and property.
 10. Any time an underground line is damaged or disturbed, or if lines are improperly marked, you must file an Incident Report with the PUC. For an Incident Report form, visit www.state.me.us/mpuc or call the PUC at 800-452-4699.
- B. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
- C. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.
- D. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Section 31 23 00 – Excavation, Backfill, and Compaction.
1. Obtain approved borrow soil materials off-site when satisfactory soil materials are not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
 - B. Locate and clearly flag trees and vegetation to remain or to be relocated.
 - C. Protect existing site improvements to remain from damage during construction.
1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to Drawings and Section 31 25 00 - Erosion and Sedimentation Controls.
- B. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- C. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 UTILITIES

- A. Locate and identify utilities indicated to be removed.
 - 1. Arrange with utility companies to shut off indicated utilities.
- B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Owner's Representative not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without the Owner's Representative's written permission.

3.4 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction.
 - 1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
 - 2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
 - 3. Grind stumps and remove roots, obstructions, and debris extending to a depth of 18 inches below exposed subgrade.
 - 4. Use only hand methods for grubbing within tree protection zone.
 - 5. Chip removed tree branches and stockpile in areas approved by Engineer.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
 - 1. Place fill material in horizontal layers not exceeding a loose depth of 12 inches, and compact each layer to a density equal to adjacent original ground.

3.5 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.
 - 1. Remove subsoil and nonsoil materials from topsoil, including trash, debris, weeds, roots, and other waste materials.
- C. Where trees are indicated to be left standing, stop topsoil stripping a sufficient distance to prevent damage to main root system.

- D. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 1. Stockpile topsoil in storage piles in areas shown, or where directed.
 - 2. Limit height of topsoil stockpiles to 72 inches.
 - 3. Do not stockpile topsoil within tree protection zones.
 - 4. Dispose of excess topsoil as specified for waste material disposal.

3.6 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.
- B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
 - 1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.
 - 2. Paint cut ends of steel reinforcement in concrete to remain to prevent corrosion.

3.7 SITE DEBRIS

- A. Remove existing trash and debris from the site including junk automobiles and debris from campsites.

3.8 DISPOSAL

- A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.
 - 1. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities.

END OF SECTION

SECTION 31 22 00

GRADING

PART 1 - GENERAL

1.01 GENERAL PROVISIONS:

- A. Coordinate Work with that of other trades affecting or affected by Work of this Section. Cooperate with such trades to assure the steady progress of the Work.
- B. The Standard Specifications referred to herein is the book entitled "*Standard Specifications*" published by the State of Maine Department of Transportation dated March 2020 or latest edition and Supplemental Specifications in Force, excluding the following portions thereof:

Division 100, Sections 102 Through 109; Numerical Index of Payment Items Included In Each Section.

Those Sections of the aforementioned *Standard Specifications* which are cited herein, are applicable to the Work of this Contract as they may be modified, amplified, or added to by this Section.

- C. Reference is made to the latest Erosion and Sedimentation Control Plan and erosion controls and details included in the Drawing set for this project. Strict adherence to this Plan and Drawings must be followed in order to prevent adverse downstream impacts from erosion and sedimentation, originating from on-site construction activity.

1.02 DESCRIPTION OF WORK:

- A. Provide all labor, material, equipment and services required to complete the following:
 - 1. All rough grading and finish grading as required and as indicated on the Drawings, for the building floor slab, entrance road and parking areas, sidewalks, site drainage, storm water treatment areas, landscaping, etc.

1.03 QUALITY ASSURANCE; SUBMITTALS:

- A. General: Comply with requirements of the General Conditions for Submittals and Quality Control.
- B. Inspection:
 - 1. The Geotechnical Engineer may inspect critical phases of site grading as directed by the Architect/Engineer, prior to placement of fill materials, pavement bases, or footings.
 - 2. Allow for and coordinate all local code inspections as required.
 - 3. Tolerances:
 - a) Construct rough-graded surfaces to plus or minus 1.0 inch of elevations indicated, creating smooth, even surfaces.
 - b) Construct fine-graded surfaces to plus or minus 3/8 inch of elevations indicated, creating smooth, even surfaces.

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

3.01 ROUGH GRADING:

- A. Rough grading of all areas within the project, including excavated and filled sections and adjacent transition areas, shall be reasonably smooth, compacted and free from irregular surface changes; the degree of finish shall be that ordinarily obtainable from skilled blade bulldozer or scraper operations except as otherwise specified. The finished subgrade surface generally shall be not more than 0.1 feet above or below the established grade or approved cross-section, with due allowance for topsoil, sod, gravel bases and pavement depths; the subgrade tolerance for all areas to be paved shall not exceed 1.0 inch above or below the established subgrade. All ditches, swales and gutters shall be finished to drain readily. Provide roundings at top and bottom of banks and at other breaks in grade.
- B. Protection: Protect newly graded areas from the action of the elements. Any settlement or erosion that occurs prior to Acceptance of the Work shall be repaired, and grades re-established to the required elevations and slopes. Fill to required subgrade levels and recompact any areas where settlement occurs.

3.02 SUBGRADE PREPARATION FOR PAVEMENTS AND WALKS:

- A. Form, shape and roll subgrade to conform to cross-section of finished pavement. Roller: ten-ton minimum weight in all open areas; suitable equipment in confined spaces.
- B. Remove stones greater than 5" from subgrade to 12" depth. Fill depressions with suitable material. When surface areas become impervious due to concentrations of fines, lightly scarify and recompact. In severe cases, remove such material and replace with suitable soil as directed.

3.03 FINE GRADING:

- A. Fine grading of gravel bases in areas to receive pavement or concrete slab-on-grade shall be accomplished by the use of a suitable motor-grader, or by hand-raking in areas too small to allow machine grading. Finish grading shall be carried out after the base material has been thoroughly compacted as specified. Use screeds, grade stakes, string-lines, etc. as necessary to maintain specified finish sub-grades and tolerances.
- B. Finish-tolerance for all areas to receive pavements or slab-on-grade shall not exceed 3/8 inch above or below the required finished subgrade of the gravel base material.
- C. Loamed areas shall be fine-graded using hand raking and/or tractor-mounted rakes, in conjunction with removal of stones and debris, etc. Finish-tolerance for lawn and play field areas shall not exceed 5/8 inch above or below specified finished grades. Tolerance on slopes, embankments, open areas, etc. shall be within $\pm 1\frac{1}{4}$ inches of specified finished grades.
- D. Protection and Restoration: Protect finish-graded areas from the action of the elements. Any settlement or erosion that occurs prior to Acceptance of the Work shall be repaired, and grades re-established to the required elevations and slopes. Fill to required finish-grade levels and recompact any areas where settlement occurs.

END OF SECTION

SECTION 31 23 00

EXCAVATION, BACKFILL, AND COMPACTION

PART 1 - GENERAL

1.01 GENERAL PROVISIONS:

A. Coordinate Work with that of other trades affecting or affected by Work of this Section. Cooperate with such trades to assure the steady progress of the Work.

B. The Standard Specifications referred to herein is the book entitled "*Standard Specifications*" published by the State of Maine Department of Transportation, latest edition and Supplemental Specifications in Force, excluding the following portions thereof:

Division 100, Sections 102 Through 109; Numerical Index Of Payment Items Included In Each Section.

Those Sections of the aforementioned *Standard Specifications* which are cited herein are applicable to the Work of this Contract as they may be modified, amplified, or added to by this Section.

C. Reference is made to the Erosion and Sedimentation Control Plan and erosion controls and details included in the Drawing set for this project. Strict adherence to this plan and Drawings must be followed in order to prevent adverse downstream impacts from erosion and sedimentation, originating from on-site construction activity.

D. Reference is made to OSHA Safety and Health Standards for the Construction Industry.

1.02 DESCRIPTION OF WORK:

A. Provide all labor, material, equipment and services required to complete the following:

1. Excavation, trenching, filling, backfilling and compaction as required, for the structures, buildings, utility lines, roads, driveways, and parking areas, site drainage, landscaping, etc., including removal and replacement of unsuitable subsurface materials.
2. Provide and install compacted structural fill as necessary to raise sub-grades under footings and slabs within the building areas, compacted granular fill as necessary for site, roadway, and parking lot subgrades, and crushed stone or sand bedding materials for utility piping, and the building floor slabs and footing drains, etc.; all as required to complete the construction as indicated on the Contract Drawings and as specified herein.
3. Provide all necessary sheeting, shoring and bracing to protect the Work and assure safety of Workmen, adjacent property and the public.
4. Maintenance of all excavations free from water.
5. Removal and proper disposal of all loose or disturbed marine deposits, glacial till, or other unsuitable material within the building areas, pavement areas, or other subgrade areas, and replacement with suitable compacted fill.

6. Pre-compact undisturbed original soil or existing fill as appropriate and as specified, prior to construction and placement of new fill and backfill.
7. Perform field density tests as required herein.

1.03 QUALITY ASSURANCE; SUBMITTALS:

- A. General: Comply with requirements of the General Conditions for submittals and quality control.
- B. Field Measurements:
 1. Verify that survey horizontal and vertical control reference points are present and correct as indicated. Protect from disturbance during the course of the Work, or correctly re-establish as necessary.
 2. During construction, provide all necessary line and grade staking to properly control the Work.
- C. Testing and Inspection:
 1. The Owner may engage a testing and inspection service for excavation classification and quality control testing during earthwork operations.
 2. Allow for and coordinate all local inspections as required.
 3. The Geotechnical Engineer may inspect critical phases of earth excavation, rock excavation, fill placement, and footing excavation as directed by the Architect/Engineer, prior to placement of fill materials, pavement bases, or footings. Coordinate with Owner and Architect/Engineer and local inspectors for inspection of Work.
 4. Tests for Proposed Soil Materials:
 - a) Test soil materials proposed for use in the Work and promptly submit test reports to Architect/Engineer.
 - b) For granular fill materials, perform a mechanical analysis (ASTM D421) and moisture-density curve (ASTM D-1557 modified). Submit samples and test results to Architect/Engineer prior to placement of fill.
 5. Tolerances:
 - a) Maintain the moisture content of fill material as it is being placed within plus or minus two percent of the optimum moisture content of the material as determined by the laboratory tests herein specified.
 - b) Grading - See Section 31 22 00 - Grading.
- D. Submittals:
 1. Soils material test results for compacted granular fill, compacted structural fill, stone bedding material, and sand bedding material.
 2. Field density test results.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Fill Material from On-Site Excavations:

1. Suitable excavated material may be used for general filling and rough grading of the site or as embankment fill, provided the soil can be compacted to required density. On-site material shall not be used as fill beneath or adjacent to structures, parking areas, or roadways.
2. Unsuitable soils include materials that cannot be compacted to required density or contain organic material, peat, muck, coal, ash or debris.
3. Excavated bedrock may not be used as fill material, except as general site fill outside pavement or structure limits. Rock-over 5 inches in diameter shall not be permitted within 12 inches of finish grade at surface.

B. Compacted Structural Fill: Structural granular fill shall be used below and adjacent to the building floor slab, retaining walls, exterior foundation walls and where indicated in Contract Documents. Compacted structural fill shall consist of sand and gravel of hard durable particles, free of organic material, loam, lumps or balls of clay, trash, snow, ice, frozen soil, stones over 5-inch diameter, or other objectionable material. The gradation of that portion of the material passing a 3-inch sieve shall meet the following limits:

Sieve Designation	Percentage by Weight Passing Square Mesh Sieve
4-Inch	100
3-Inch	90-100
¾ inch	25-90
No.40	0-30
No.200	0-6

- #### C. Granular Borrow: Granular borrow shall be used as fill to raise site grades to sub-grade below pavement areas as well as general site fill. Granular borrow shall be suitable sand or gravel, free of organic materials, loam, lumps or balls of clay, trash, snow, ice, frozen soil, stumps, stones over 5-inch diameter, or other objectionable material. Granular borrow material shall conform to MDOT *Standard Specification* 703.19 "Granular Borrow".
- #### D. Underdrain Filter Sand/Underdrain Backfill: Granular material for underdrain shall be free from organic matter and shall conform to the MDOT "Standard Specifications" Section 703.22 for Underdrain Type B
- #### E. 3/4 Inch Crushed Stone: Crushed stone shall be a quarry product 3/4 inch or washed gravel stone obtained from offsite sources for use as detailed on the drawings. Crushed stone shall consist of durable crushed rock or gravel stone essentially free of silt, clay, loam or other deleterious materials and shall conform to the following gradation requirements of MaineDOT 703.13

PART 3 - EXECUTION

3.01 PREPARATION:

- A. Be sure that all required erosion and sedimentation controls are in place and properly maintained, prior to and during any earthwork.
- B. All stripping and grubbing operations shall be completed in a given Work area, and loam properly stockpiled, prior to beginning earthwork in that area. However, to minimize erosion, avoid stripping and grubbing large areas unless earthwork is scheduled to begin immediately, throughout the area. Particularly, do not leave large areas of steeply sloping ground unprotected for prolonged periods. Limit bare, disturbed or un-revegetated areas to less than 3 acres where practicable.
- C. Locate and mark any and all existing underground and aboveground utilities before beginning any earthwork. Notify "Dig-Safe" at least 3 days prior to beginning any excavation Work.
- D. Remove and properly dispose of any pavement, structures, fences, etc. scheduled for removal. Save and properly store any materials scheduled for re-use.
- E. Contractor shall secure any necessary sources of borrow materials promptly, so that earthwork may proceed expeditiously once started. Complete all earthwork activities in a given area as soon as possible once the area is stripped and grubbed. Completed areas should be loamed, seeded or stabilized as soon as possible after final grade is established.
- F. Bring each area to final grade, and install loaming and seeding (either temporary or permanent) as soon as possible, and no longer than 15 days, after completing final grading. Maintain all necessary erosion controls as required until grass and plant growth is firmly established. Temporary erosion controls shall remain in place until Acceptance of related Work and shall be removed by the Contractor within 30 days of Acceptance unless otherwise approved by Architect/Engineer.

3.02 EARTH EXCAVATION:

- A. Excavation consists of the removal, reuse as site fill, and/or satisfactory stockpiling or disposal of all materials encountered, to establish subgrades shown on the Drawings. Maintain surface drainage to prevent ponding or erosion. Do not excavate extremely wet or frozen material. In wet areas, provide pumping equipment or grade the area so that water drains from the soil to allow proper excavation or drilling operations. Provide any special equipment necessary to perform earthwork operations. When excavating near trees to be saved, provide adequate tree protection and prune roots when exposed to minimize injury to same.
 - 1. Mass excavation - removal of soil materials in open areas where equipment with blade or bucket, such as bulldozer, front-end loader, or earth scraper is used.
 - 2. Trench excavation - removal of soil materials in confined areas, such as trenches or pits, where equipment such as backhoe, shovel, clamshell or trencher is used.
- B. Contractor shall remove all existing material, including but not necessarily limited to soil, rubble, debris, trash, existing stone or masonry walls, minor structures, unsuitable material and soils of all types. If the Contractor uncovers material of a suspicious or hazardous nature, regulated material, unhealthful or contaminated soils or other unanticipated conditions, immediately inform the Architect/Engineer, and do not proceed in affected areas until instructed to do so in writing by the Architect/Engineer. Unanticipated conditions will be handled in a manner similar to that for uncovering of rock (See Rock Excavation - Section 31 23 15).

C. Contractor shall remove existing site materials as follows:

1. Footings and Foundations - As defined on Drawings and in these documents.
2. Building Floor Slabs- As defined on Drawings and in these documents.
3. Utility Trenches - Excavate to required depths below pipe invert or utility structure base, allowing for pipe bedding material or gravel base material, as defined on Drawings and in these documents.
4. New paving and planting areas - Excavate to required depths below finish grades, allowing for new material and base material, as defined on Drawings and in these documents.

D. Prepare subgrade for grass areas 6" below finish grade. See Drawings and Details for depth to subgrade for other areas.

E. Excavations carried below the depths indicated or as required for construction, without written authorization from the Architect/Engineer, shall be filled with concrete or compacted structural fill, where requested by the Architect/Engineer, at the Contractor's expense.

3.03 BUILDING AND STRUCTURAL EXCAVATION:

A. Conform to elevations and dimensions shown within a tolerance of 0.10 ft., and extending a sufficient distance from footings and foundations to permit proper foundation and subdrain construction as required.

B. Excavate all unsuitable materials to the material limits, extending beyond all footings in fill a distance equal to the depth of fill required below the footing plus two feet on all sides. Final excavation to subgrade in marine deposits shall be made with equipment suitable for the purpose (such as with a smooth bladed backhoe or by hand) so as to minimize disturbance to bearing surfaces.

C. In all cases, excavate and remove all topsoil.

D. For adequate frost protection, excavation for all exterior foundations, utility structures, guard rails, etc., must extend to a minimum depth of 5.0 feet below the lowest surrounding exterior grade. Excavation for interior footings must extend to a depth of at least 2 feet unless otherwise specified or indicated on Drawings (refer to Architectural/Structural Drawings and Geotechnical reports when available). Protect bottoms of excavations from freezing when atmospheric temperature is below 35 degrees Fahrenheit.

E. All backfilling and compaction Work shall be inspected and tested as specified by the Architect/Engineer prior to the pouring of footings. Contractor shall allow for and coordinate any required local inspections. The Contractor shall notify the Architect/Engineer when areas are ready for testing, and shall have the Architect/Engineer's approval in writing prior to beginning the construction of footings. See requirements for SS 3.12 - Compaction, below.

3.04 TRENCH EXCAVATION AND BACKFILL (Utilities):

A. Trench excavation includes excavation for underground cables, pipes and structures as shown on the Drawings. Make trench walls as near vertical as practical, consistent with OSHA requirements (See OSHA Regulations - 29 CFR 1926.650-Subpart P-Excavations) and safe Working practices.

Shore and brace as necessary. Keep excavations free from water in order to carry on Work properly.

- B. Do not excavate to full depth in freezing temperature unless structure or line can be installed immediately. Protect excavation bottom from freezing.
- C. Excavation shall be made to such a point as to allow a minimum of six inches (6") of bedding to be placed beneath the bottom of all barrels, bells or couplings of all pipes installed. The maximum clear width of trench at the top of the pipe shall be not more than the outside diameter of the pipe plus two feet. The bottom of the trench shall be accurately graded to provide a uniform layer of bedding material for each Section of pipe. Safety shall be the controlling factor in determining minimum trench widths.
- D. Before installation of any sewer pipe, drain pipe, water line or other piped utilities the Contractor shall first place and consolidate a minimum six inch (6") layer of 3/4" crushed stone or approved bedding on the trench bottom. After the pipe has been laid, additional crushed stone or bedding shall be placed (maximum 6" layers) and consolidated to the mid-point of the pipe using approved methods. The trench shall then be carefully backfilled with stone, sand or approved backfill deposited in six inch (6") layers, thoroughly consolidated by hand or mechanical tampers, until the pipe has at least twelve inches (12") of cover over the top of the pipe. (Refer to pipe installation Details on Drawings.)
- E. The remainder of the trench shall be backfilled as follows:
 - 1. In Roads, Walks, Drives, Etc.:
 - a) The area between a line 12 inches over the top of the pipe and a line at sub-grade elevation below finished pavement (see pavement Details on Drawings), shall be carefully backfilled in not over twelve (12) inch layers using suitable material taken from the excavation or approved granular borrow hauled in for the purpose, as approved by the Architect/Engineer. No mud, frozen earth, or stone larger than four (4) inches in diameter is to be used for trench backfilling.
 - b) The trench shall be consolidated by tamping, rolling, or other mechanical means, as proposed by the Contractor subject to the approval of the Architect/Engineer. The approval by the Architect/Engineer of the proposed method of compaction of the backfill shall in no way be construed as relieving the Contractor of responsibility for settlement of trenches, and any settlement shall be repaired by him at Contractor's own cost and expense. If the pipe is displaced from alignment, it shall be re-laid at the Contractor's expense.
 - c) The remaining distance to the top of the trench shall be filled with road subbase and base gravel as specified, hauled in for the purpose and furnished by the Contractor. This gravel shall be placed, graded and compacted in maximum 8-inch or 6-inch layers, as Specified, to the finished surface. (See Section 32 11 10 - Gravel Base Courses).
 - 2. In landscaped areas, etc.:
 - a) Trenches in landscaped and other non-traffic areas shall be filled with suitable material excavated from the trench, unless directed otherwise by the Architect/Engineer. In all other respects, backfilling operation shall be carried out as specified in 1a. & 1b. above. (See landscaping Details on Drawings for proper sub-grade elevations).

- F. After the completion of all backfilling operations, the Contractor shall grade the site to the lines, grades and elevations shown on the Contract Drawings, taking into account any subsequent topsoil and paving requirements. Finished grading shall not be done until the installation of all underground utilities has been completed in the affected area.
- G. When installation of piped utilities is in fill, place compacted fill to proposed height of top of pipe and then trench to required elevation to set pipe allowing for required bedding materials. Extend compacted fill at least 10 ft. on both sides of pipe centerline. Backfill around pipe, as specified above, to provide required cover, and compact to required density.

3.05 DEWATERING:

- A. Control surface runoff and sub-surface infiltration so as not to allow water to enter or accumulate in excavations or areas to be filled. Remove water from excavations continuously to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to the stability of subgrades, foundations and undisturbed bearing surfaces. Control water level to at least 12 inches below subgrade elevation to reduce disturbance of the subgrade soils and provide a more stable working surface during construction. Provide and maintain sumps, pumps, well points, suction and discharge lines and other dewatering systems and components necessary to convey water away from the work area. Discharge water in a safe, legal manner into temporary sedimentation ponds or prepared outlet areas before discharging to existing waterways or drainage systems, as required. Do not allow water carrying excessive soil particles to be discharged directly to existing waterways or drainage systems. Under no conditions shall surface water or groundwater be discharged into sanitary sewer systems.
- B. Install temporary erosion and sedimentation controls as required, to prevent erosion and sediment damage downstream. Correct any erosion or sedimentation problems immediately at no additional cost to the Owner. Conform to all applicable regulations of the City of Ellsworth or Hancock County Soil & Water Conservation District, Maine Department of Environmental Protection, US Army Corps of Engineers, and Environmental Protection Agency NPDES Permit Requirements.

3.06 ROCK EXCAVATION:

- A. If rock excavation is required see Section 31 23 15 - Rock Excavation of these Specifications. Rock excavation shall be defined as: All rock, ledge, or boulders in undisturbed soil that cannot be removed by a Caterpillar 345 excavator, and/or D-8 bulldozer with ripper, without the use of a hydraulic hammer (hoe ram) or explosives. Boulders, concrete and cut stone encountered in excavations shall be considered to be unclassified material regardless of location.

3.07 FROST:

- A. No fill materials shall be placed when the subgrade, the fill material, or the previous lift on which fill is to be placed is frozen. In the event that the subgrade or any fill which has already been placed becomes frozen, it shall be thawed, scarified and then recompact, or else removed, to the approval of the Architect/Engineer before the next lift is placed. Any soft spots resulting from frost shall be removed or re-compacted to the satisfaction of the Architect/Engineer before new fill material is placed.

3.08 FILL AND BACKFILL:

- A. Filling is the placement of satisfactory soil materials, whether originating from on-site or off-site, in areas where existing grade is to be raised in elevation. Where the existing ground or subgrade has a density less than that specified herein (see SS 3.12 - "Compaction"), compact the soil to

the required density. Where unsatisfactory soils occur in areas to be filled, remove same before filling and dispose of these soils in areas designated by the Specifications.

- B. Backfilling is the placement, or replacement, of satisfactory excavated soil materials, or borrow, whether originating from on-site or off-site, in areas where existing grade is to be generally restored to original elevation, in trenches, pits, against structures or other areas previously excavated, or as shown on the Drawings.
- C. Place fill and backfill in not over 12" layers (loose measure), except where thinner layers are specified herein, and compact each layer to required density (see SS 3.12 - "Compaction"). Areas to be filled and backfilled must be free of standing water. Do not place fill or backfill on surfaces that are muddy, frozen, or contain frost or ice.
- D. On existing slopes of 4:1 or steeper, excavate horizontal benches 6' wide every 2' vertically to eliminate shear planes before placing any fill.
- E. Filling and backfilling of walls, foundations, trenches or retaining walls shall not commence until construction below finish grade has been inspected, forms removed and the excavation cleared of trash and debris. Allow for and coordinate required local inspections. Stones larger than 2" maximum dimension will not be permitted in the upper layer of fill.
- F. Filling and backfilling of trenches shall not commence until all piping, conduit, etc., has been installed, tested, inspected and approved and the locations of all pipe, fittings, and underground structures have been measured and recorded. Fill and/or backfill shall be carefully placed in layers, as specified herein, by hand methods around the pipe or conduit to a depth of one foot above the top of the pipe and shall be carefully tamped and compacted with hand rammers or mechanical tampers so as not to damage the completed pipe.
- G. The Contractor shall assume responsibility for surface and subsurface drainage onto, or from, the site and shall maintain such drainage during the life of the Contract, and shall at all times protect adjacent property, structures and utilities.

3.09 PLACEMENT OF COMPACTED GRANULAR BORROW:

- A. In roadway and parking areas, compacted granular fill shall be used for all filling and backfilling to subgrade.
- B. Compacted Granular Borrow should be placed in maximum 8" thick lifts and compacted to a minimum of 92 percent of maximum dry density as determined by ASTM D1557. Before placing the first lift of compacted granular fill, all disturbed soil, loose rock, organic matter, asphalt, concrete, trash, rubble or other deleterious or compressible material shall be removed from the subgrade. The granular fill shall be spread evenly by mechanical equipment or by manual means above the approved (compacted) subgrade, and shall be built up in horizontal layers as nearly even as practicable to prevent the thickness of lift from exceeding that specified.
- C. If in the opinion of the Architect/Engineer, the Granular Borrow material becomes too wet for the required compaction, the fill shall be dried by a method approved by the Architect/Engineer prior to commencing or continuing compaction operations. Likewise, if in the opinion of the Architect/Engineer, the fill material becomes too dry for the required compaction, the fill shall be moistened by a method approved by the Architect/Engineer prior to commencing or continuing compaction operations.
- D. Puddling methods of compaction will not be permitted.

3.10 PLACEMENT OF COMPACTED STRUCTURAL FILL:

- A. Compacted Structural Fill shall be used for all filling and backfilling to subgrade in all footing and wall areas and areas within the building which are to have a concrete slab-on-grade, under concrete pads and as indicated on the Drawings.
- B. Compacted Structural Fill shall be placed in maximum 8" thick lifts and compacted to a minimum of 95 percent of maximum dry density as determined by ASTM D1557. Before placing the first lift of compacted structural fill, all disturbed soil, loose rock, organic matter, asphalt, concrete, trash, rubble or other deleterious or compressible material shall be removed from the subgrade. The structural fill shall be spread evenly by mechanical equipment or by manual means above the approved (compacted) subgrade, and shall be built up in horizontal layers as nearly even as practicable, to prevent the thickness of lift from exceeding that specified.
- C. If in the opinion of the Architect/Engineer, the Structural Fill material becomes too wet for the required compaction, the fill shall be dried by a method approved by the Architect/Engineer prior to commencing or continuing compaction operations. Likewise, if in the opinion of the Architect/Engineer, the fill material becomes too dry for the required compaction, the fill shall be moistened by a method approved by the Architect/Engineer prior to commencing or continuing compaction operations.
- D. Puddling methods of compaction will not be permitted.

3.11 PLACEMENT OF COMPACTED STONE FILL:

- A. Compacted Stone Fill should be placed in maximum 8-inch thick lifts (6" under floor slab) and compacted with hand compaction equipment. The Compacted Stone Fill shall be spread evenly by mechanical equipment or by manual means, and shall be built up in horizontal layers as nearly even as practicable to prevent the thickness of lift from exceeding that specified. Care shall be taken during compaction not to damage perforated drainpipe, pipes, conduits or other utilities.

3.12 COMPACTION:

- A. All fill and backfill shall be placed in maximum 8-inch lifts and compacted in accordance with the following unless otherwise specified:

1) Under Building Areas, Footings & Slabs	95%
2) Exterior Foundation Areas	95%
3) Under Gravel Subbase for Roads, Driveways and Parking Areas	92%
4) Utility and Pipe Trenches	92%
5) Unclassified General Fill, Embankment and Landscaped Areas	90%
6) Under Building Entrances, Exterior Area Slabs, Pads & Walks	95%
7) Gravel Subbase and Aggregate Base Courses (refer to Section 32 11 10)	95%
- B. The in-place density and the degree of compaction shall be determined in accordance with ASTM D 2922 (nuclear in-place density) as Work progresses. Each layer of fill shall be placed and tested and where directed by Architect/Engineer succeeding layers shall not be placed until approval of the previous layer has been given. Any corrective Work required as a result of the testing and the expense of re-testing shall be borne by the Contractor, at no additional cost to the Owner.
- C. Final Approval: Immediately before placing of footings, foundations, or floor slab on compacted structural or stone fill or virgin soil, the Architect/Engineer will observe the foundation and floor

slab subgrade. The Contractor shall remove any soft fill if directed, and replace it with properly compacted material. The pouring of foundations or floor slab shall commence within 24 hours of final approval. Rain, frost and other factors (which, in the opinion of the Architect/Engineer, are potentially damaging to the fill) occurring after the final approval, but before or during pouring, may require additional testing of the compacted fill for approval by the Architect/Engineer.

- D. Backfill and Compaction of Excavations and Walls: Any excavation (e.g. utilities, walls, footings, etc.) made in areas where compacted granular or structural fill is required, shall be backfilled with compacted granular or structural fill as designated. Where compacted fill is placed adjacent to walls, the difference in elevation of the top of the fill on either side of the wall can be no more than one foot at any time, or else the wall must be adequately braced.

3.13 FIELD QUALITY CONTROL:

- A. All of the material testing shall be performed by a testing laboratory experienced in performing the required tests, and shall be approved by the Architect/Engineer. The Owner shall employ the testing laboratory and pay for all of the tests, except for re-testing as specified below.
- B. Materials test reports and in-place field density test reports shall be submitted by the testing laboratory directly to the Architect/Engineer, or designated representative, with a copy to the Contractor.
- C. The standards for all tests shall be as follows:
 - 1) Mechanical Analysis: ASTM D421.
 - 2) Modified Proctor Method: ASTM D1557M.
 - 3) In-place Field Density: ASTM D2922.
- D. The actual locations of all tests shall be determined in the field by the Architect/Engineer, or his representative.
- E. The in-place field density tests shall be taken generally as follows:
 - 1. Paved Areas and Building Slab Subgrade: Make at least one field density test of undisturbed subgrade for every 2000 sq. ft. of paved area and 1000 sq. ft. of building slab, but in no case less than 3 tests. In each compacted fill layer, make one field density test for every 2000 sq. ft. of paved area and 1000 sq. ft. of overlaying building slab, but in no case less than 3 tests.
 - 2. Foundation Wall Backfill Outside of Structure: Make at least ten field density tests at locations and elevations as directed.
 - 3. Fill and backfill at inside walls and foundations: One (1) test will be required for each 20 linear feet on the inside face of the walls and foundations, for each 2' vertical depth of fill and backfill and at the finished subgrade.
 - 4. Fill and backfill other than at the walls and foundations: One (1) test will be required for each 500 cubic yards of fill and backfill.
 - 5. Backfill in utility trenches: One (1) test will be required for each 75 lineal feet of trench line, for each 2' vertical depth of backfill and at the finished subgrade.
- F. If any of the in-place field density tests as specified above indicate that the compaction is less than specified herein, the extent of the unacceptable compaction shall be clearly established by additional testing. All of the material which has failed to meet the compaction requirements shall

be removed, refilled or re-backfilled, compacted and tested until the specified compaction requirements are met. All of the corrective Work shall be in accordance with the Contract Documents, and all costs related to the corrective Work and testing shall be paid by the Contractor.

3.14 DISPOSAL OF EXCESS AND WASTE MATERIALS:

- A. Transport waste material, including unsuitable subsurface materials, trash, stumps and debris, to off-site disposal area in accordance with these Specifications, DEP Site Location Order and local regulations, at Contractor's expense.

3.15 MAINTENANCE AND RESTORATION:

- A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion, and keep free of trash and debris.
- B. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances, until final project Acceptance.
- C. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and recompact to required density before proceeding with other affected Work at no additional cost to the Owner.
- D. Restore new or existing lawns, pavement, walks and curbs, or other exterior surfaces displaced or marked by the Work of this Contract, to their original or finished conditions, to the satisfaction of the Architect/Engineer or his representative at no additional cost to the Owner.
- E. Restore areas affected by settlement, due to the Work of the Contractor, to original lines, grades or levels. Correct conditions contributing in any way to such settlement in a manner approved by the Architect/Engineer. Remove and replace any improperly placed or compacted fill material at no additional cost to the Owner.
- F. Restore damaged lawn areas by topsoiling and seeding. Water as directed by Architect/Engineer until final project Acceptance.

END OF SECTION

SECTION 31 23 15

ROCK EXCAVATION

PART 1 - GENERAL

1.01 GENERAL PROVISIONS:

- A. Coordinate Work with that of other trades affecting or affected by Work of this Section. Cooperate with such trades to assure the steady progress of the Work.
- B. The Standard Specifications referred to herein is the book entitled "*Standard Specifications*" published by the State of Maine Department of Transportation latest edition, and Supplemental Specifications in Force, excluding the following portions thereof:

Division 100, Sections 102 Through 109; Numerical Index of Payment Items Included in Each Section.

Those Sections of the aforementioned *Standard Specifications* which are cited herein are applicable to the Work of this Contract as they may be modified, amplified, or added to by this Section.

- C. Reference is made to the latest Erosion and Sedimentation Control Plan and erosion controls and Details included in the Drawing set for this project. Strict adherence to this Plan and Drawings must be followed in order to prevent adverse downstream impacts from erosion and sedimentation, originating from on-site construction activity.
- D. Reference is also made to the U.S. Department of Interior "Blasting Guidance Manual"; N.F.P.A. 495-"Code for Explosive Materials"; Maine State "Rules for Manufacture, Transportation, Storage and Use of Explosives" (MRSA Title 25, Section 2441); and Maine DOT "Safety Specifications", Section 107.12, "Use of Explosives."

1.02 DESCRIPTION OF WORK:

- A. Provide all labor, material, equipment and services required to complete all rock excavation as indicated on the Drawings, and/or as required to complete the Work, including both trench rock and open rock.
- B. Provide all necessary shielding and covering, and undertake all measures necessary to protect the Work and assure the safety of workers, adjacent property utilities, and the public.
- C. All rock excavation shall be completed by mechanical means using a hydraulic hammer (hoe ram) mounted to an excavator, or by other mechanical equipment acceptable to the Architect/Engineer. The use of explosives will not be permitted unless the Architect/Engineer determines that it is not possible to complete the required rock excavation by mechanical means.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Explosives: If the Architect/Engineer determines that it is not possible to complete the required rock excavation by mechanical means, the use of explosives shall be provided as recommended by the blasting contractor based on seismic survey, and as permitted by NFPA 495 and the Maine State Fire Marshall.

- B. Delay Device: As recommended by the blasting contractor and as permitted by NFPA 495, and the Maine State Fire Marshall.
- C. Blast Mat Materials: As recommended by the blasting contractor.

PART 3 - EXECUTION

3.01 PREPARATION:

- A. Verify site conditions and note any subsurface irregularities affecting Work of this Section.
- B. Identify required lines, levels, contours, and datum.
- C. Notify "Dig-Safe" at least 3 days prior to beginning any excavation or blasting Work.
- D. Accurately locate any existing utilities before beginning drilling or blasting; contact local utility companies.
- E. Check for conflict with underground utilities or structures. The blasting contractor shall notify the General Contractor of any and all apparent conflicts or potentially hazardous conditions before proceeding with the Work.

3.02 ROCK EXCAVATION (By Mechanical Means):

Rock excavation may be required at this site. Rock excavation shall be defined as: All rock, ledge, or boulders in undisturbed soil that cannot be removed by a Caterpillar 345 excavator, and/or D-8 Bulldozer with ripper, without use of a hydraulic hammer (hoe ram) or explosives. Boulders, concrete and cut stone encountered in excavations shall be considered to be unclassified material regardless of location.

A. Uncovering of Rock:

When, during the process of excavation, rock is encountered, the Contractor shall notify the Architect/Engineer before proceeding further. The Contractor shall not proceed with the excavation of material claimed as rock until such material has been classified by the Architect/Engineer. Failure on the part of the Contractor to notify the Architect/Engineer for the purpose of taking Cross-Sections, etc., will forfeit the Contractor's right-of-claim to any Credits or Allowance for Rock Excavation.

B. Cross-Sections:

The Contractor shall employ and pay for a Professional Civil Engineer or Professional Land Surveyor, acceptable to the Architect/Engineer, to take cross-sections of rock and to provide computations of quantities within the limit of excavation lines. No material claimed as rock shall be drilled, blasted or removed until the following procedures have been performed:

1. The Contractor shall, by independent party as described above, quantify all rock excavation based on the design grades shown on the Drawings, and the pay limits for rock excavation specified herein (SS 3.02 F), and shall provide the Architect/Engineer with quantities, sections and/or profiles for review, prior to excavation.
2. The Architect/Engineer shall review cross sections and/or profiles, and shall either approve quantities or propose revisions to design of footings, trenches, layout and general grading, to minimize rock excavation if possible or necessary.

3. The Contractor shall confirm any proposed revisions and resultant rock quantity changes.
4. The Architect/Engineer shall provide to the Contractor a letter of authorization to proceed with excavation of material claimed as rock, which shall indicate the agreed upon Quantity and Price for the entire process of blasting, excavation, hauling and disposal.

C. Blasting:

1. If the Architect/Engineer determines that it is not possible to complete the required rock excavation by mechanical means, rock excavation by blasting will be required. The blasting contractor shall conduct a Pre-Blast Survey, including photographs, of all structures within the blasting area, and shall provide the Architect/Engineer with a written report of the survey. A Pre-Blast Survey shall be performed for all structures within 500 feet of any blast site. The Pre-Blast Survey shall encompass and reflect the U.S. Department of Interior, "Rules for Pre-Blast Surveys", cited in the Site Location of Development Law of the State of Maine.
2. All drilling equipment will be equipped with suitable dust control apparatus, which must be kept in operation and used during all drilling operations.
3. All blasting operations, including the transport, handling, and storage of explosives, shall be conducted in full compliance with all Federal and State laws and regulations and all local ordinances, and with all possible care so as to avoid injury to persons and property. Contractor shall limit ground vibrations to less than 1.9 in. per sec. peak particle velocity, and peak air over pressures to less than 0.018 psi, measured at the location of the nearest structure. Contractor shall provide protection against flying rock; the rock shall be well covered, and sufficient warning shall be given to all persons in the vicinity of the Work before blasting. Care shall be taken to avoid injury to all utilities, above and below ground, to other buildings (including foundations) and structures, and to private property. The Contractor, in addition to observing all state and municipal ordinances relating to the storage and handling of explosives, shall also conform to any further regulations which the Owner or Architect/Engineer shall deem necessary. Responsibility for all damages to persons or property shall rest with the Contractor. Only personnel qualified in the use of explosives shall be employed for blasting.
4. Blasting shall be performed only after approval has been given by the Architect/Engineer for such operation. Contractor shall notify the Architect/Engineer prior to any blasting activities, and shall provide daily schedules for blasting activities including locations and times to the Architect/Engineer. The Architect/Engineer shall approve all blasting activities and schedules. Contractor shall contact Architect/Engineer immediately prior to any blasting activity for permission to commence blasting, as requested. Contractor shall not commence with any blasting activity without such permission and confirmation from the Architect/Engineer.
5. All transportation, storage and handling of explosives, and all drilling and blasting operations shall be performed in accordance with M.R.S.A. Title 25, Section 2442, and all pertinent provisions of: the "Manual of Accident Prevention in Construction", issued by the Associated General Contractors of America, Inc.; the "Construction Safety Rules and Regulations", as adopted by the State Board of Construction Safety, Augusta, Maine; the Maine Department of Transportation "Safety Specifications", Section 107.12, "Use of Explosives"; and the U.S. Dept. of Interior "Blasting Guidance Manual."
6. Any site where electric blasting caps are located, or where explosive charges are being placed or have been placed, shall be designated as a "Blasting Area."
7. Bring explosives to the Work site only as needed and in small quantities.

8. A "Blasting Area" within three hundred (300) feet of any traveled way shall be marked in both directions by approved signs, with information similar to the following:

"BLASTING AREA. TURN OFF TRANSMITTERS"

and on the reverse side:

"END OF BLASTING AREA"

9. Notify each public utility company having structures in proximity to the site of the Work of the impending use of explosives, and give such notice sufficiently in advance to enable each company to take such steps as it may deem necessary to protect their property from injury. Such notice shall not relieve the Contractor of responsibility for any damage resulting from his blasting operations.
10. The Contractor shall be liable for all damages to persons or property caused by blasting or explosions, or arising from neglect to properly guard and protect the excavations and all portions of the Work, and the Contractor shall wholly indemnify the Owner against claims on such account.
11. No compensation will be allowed the Contractor in any event, or under any circumstances, for loss incurred by the Contractor or arising from the Contractor's neglect to fully comply with these or other applicable requirements.
12. Provide the Architect/Engineer with a Blasting Log for the Work, containing the following information:
 - a) Location
 - b) Time and Date
 - c) Number of holes
 - d) Amount and type of explosives used per hole
 - e) Measurement of peak particle velocity and frequency, at nearest structure.
 - f) Air-blast monitoring results.
 - g) The names of persons, companies, corporations, or public utilities contracting, owning, leasing or occupying property or structures in proximity to the site of the blasting Work.
13. Copies of blasting records, together with an explanatory narrative of the blasting, shall be submitted to the Architect/Engineer, with a copy for submission to the Department of Environmental Protection.

D. Excavation:

1. All disturbed, broken or shattered rock fragments shall be excavated and removed from the final subgrade prior to placement of structural fill or foundations. Under footings, foundation bases, or retaining walls, fill over-excavated areas by extending indicated bottom elevation of footing or base to clean excavation bottom. When acceptable to the Architect/Engineer, concrete fill or compacted crushed stone may be used to bring elevations to proper position.

2. Use of Excavated Materials: Excavated rock suitable for use as embankment fill, rip-rap, or other use, as shown on the Drawings or as directed by the Architect/Engineer, shall be immediately utilized for such use where possible. Where excess quantities or scheduling conflicts make such immediate use impossible, the materials shall be removed from the area and properly disposed of off-site, or stored for later use at a location as directed by the Architect/Engineer. (See also Section 31 23 00 - Excavation, Backfill and Compaction, SS 2.01 A.3).
3. Unsuitable Excavated Materials: All non-salvageable rock, unsuitable subsurface material, refuse, and debris which accumulates as a result of Work under this Section shall become the property of the Contractor and shall be removed from the site. No refuse or debris of any nature shall be allowed to accumulate to the detriment of the Work or to the good appearance of the site. All such materials shall be gathered and disposed of at frequent, regular intervals in a legal manner.

E. Basis of Payment:

Based on subsurface investigations performed by S.W. Cole, rock excavation is not anticipated to be required. If rock excavation is required to complete the Work, payment for rock excavation shall be made in accordance with the provisions in Section 00 72 13 - General Conditions, SS 27. Changes in the Work.

END OF SECTION

SECTION 31 25 00

EROSION AND SEDIMENTATION CONTROLS

PART 1 - GENERAL

1.01 GENERAL PROVISIONS:

- A. Coordinate Work with that of other trades affecting or affected by Work of this Section. Cooperate with such trades to assure the steady progress of the Work.
- B. The "*Standard Specifications*" referred to herein is the book entitled "*Standard Specifications*" published by the State of Maine Department of Transportation, latest edition and Supplemental Specifications in Force, excluding the following portions thereof:

Division 100, Sections 102 Through 109; Numerical Index of Payment Items Included in Each Section.

Those Sections of the aforementioned *Standard Specifications* which are cited herein are applicable to the Work of this Contract as they may be modified, amplified or added to by this Section.

- C. All Work shall be in conformance with the requirements of the City of Ellsworth, Hancock County Soil and Water Conservation District, the Maine Department of Environmental Protection (DEP), the U.S. Army Corps of Engineers, and U.S. Environmental Protection Agency NPDES Permit Requirements.
- D. Reference is made to the Erosion and Sedimentation Control Plan, and erosion controls notes and details included in the Drawing set for this project. Strict adherence to this Plan and Drawings is required in order to prevent adverse downstream impacts from Erosion and Sedimentation, originating from on-site construction activity. The Erosion and Sedimentation Control Plan is included in this Specification and shall apply to the Work of this Section as though fully repeated herein.
- E. Reference is made to the "*Maine Erosion and Sedimentation Control Handbook for Construction, Best Management Practices*" handbook (referred to herein as the *Erosion Control Handbook*) as published by the Department of Environmental Protection, latest edition. All erosion control measures and procedures shall comply with the *Erosion Control Handbook* unless otherwise specified.

1.02 DESCRIPTION:

- A. It is not the intent herein to describe all the items and Work that may be required under this Section. All site Erosion and Sedimentation Control measures, not otherwise specified herein or indicated on the Drawings, but required by regulatory authorities, inspector or the Architect/Engineer for the proper protection of exposed slopes, drainage ways, etc., shall be included under this Section.
- B. Schedule of Work: Work includes but is not limited to the following:
 - 1. Provide and install erosion and sedimentation controls required in conformance to the Erosion and Sedimentation Control Plan, as indicated on Drawings, Details and as specified herein, and/or as required, or directed by Architect/Engineer to minimize erosion throughout the site.

2. Provide and install riprap, geotextile fabric, and/or other measures to stabilize slopes and control erosion, as indicated on Drawings and/or as required or directed by Architect/Engineer.
3. Provide temporary seeding and mulching as required or directed by Architect/Engineer to stabilize earth and loam stockpiles, excavated areas, and ditches and slopes, until final landscaping can be completed and all affected areas stabilized.

1.03 QUALITY CONTROL; SUBMITTALS:

- A. General: Comply with requirements of the General Conditions for submittals and quality control.
- B. Requirements of Regulatory Agencies:
 1. Local ordinances for the City of Ellsworth.
 2. Hancock County Soil and Water Conservation District; Maine Department of Environmental Protection (DEP).
 3. Federal codes and regulations, specifically including Army Corps of Engineers and EPA NPDES Permit requirements.
- C. Submit product specification sheets and/or product samples for the following:
 1. Silt fence.
 2. Geotextile fabric (for riprap).
 3. Erosion control blankets and revegetation matting.

PART 2 - PRODUCTS

2.01 EROSION AND SEDIMENTATION CONTROLS:

- A. Baled hay or straw: 14" x 18" x 30" (standard size), tightly bound (MDOT *Standard Specification 656.02*).
- B. Stakes: Shall be 1 1/4" x 1 1/4" x 4 - 4.5' long hardwood stakes, or steel posts 5' long with projections for fastening (MDOT *Standard Specification 656.03*).
- C. Silt Fence: 12 month ultraviolet, degradation-resistant geotextile extra strength fabric, affixed/stapled to square posts; "Envirofence" by Mirafi or equal (extra strength); (MDOT *Standard Specification 656.03 and 656.08*).
- D. Temporary Seeding: Conservation Mix, as specified by Hancock County Soil and Water Conservation District or as indicated in the Erosion and Sedimentation Control Report (Appendix "A"). Refer to SS 3.01 G, herein.
- E. Hay Mulch: Clean, dry hay not older than previous season's cutting, relatively free from noxious weeds and undesirable material.
- F. Mulch Binder: May be emulsified asphalt, or approved equal by Architect/Engineer.
- G. Rip Rap: Shall be of sound, durable rock, angular in shape, of D₅₀ size (diameter) as noted on the Drawings. Riprap shall consist of a well-graded mixture of stone sizes, down to the one-inch

particle size, with 50 percent of the stone mixture (by weight) being greater than D_{50} size (specified by equivalent diameter size). Refer to *Erosion Control Handbook, Section E* and *MDOT Standard Specification, Section 703.26* for additional information and riprap requirements.

- H. Geotextile: Woven polypropylene erosion control fabric for use with riprap; Mirafi, 600X or equal.
- I. Filter Fabric: Mirafi, 140N or equal.
- J. Erosion Control Blanket: Wheat, straw and coconut fiber woven blanket, with photodegradable netting on both sides; North American Green SC 150 or equivalent unless otherwise specified or indicated on Drawings.
- K. Additional Erosion Control Products: Refer to the Erosion and Sedimentation Control Report for additional products not mentioned herein.

PART 3 - EXECUTION

3.01 EROSION AND SEDIMENTATION CONTROLS:

- A. All erosion and sedimentation controls shall be installed in conformance with the approved Erosion and Sedimentation Control Plan, found in the project Drawings, and these Specifications.
- B. Install all sedimentation and erosion controls immediately after clearing and prior to start of grubbing and stripping operations.
- C. Install staked hay bales or stone check dams, as required, in both existing and new drainage ways and around existing and newly installed catch basins. Location and installation shall be as indicated on Drawings and Details.
- D. Install silt fence, as required, along base of all new or disturbed slopes, alongside drainageways, and in other areas as indicated on Drawings.
 - 1. Fence posts shall be a maximum of 8 feet on center and driven a minimum of 18 inches into the ground.
 - 2. The Geotextile fabric used for silt fencing shall be secured to the posts in a suitable manner to prevent tearing and sagging of the fabric. The bottom of the Geotextile fabric shall be entrenched into the ground a minimum of 6 inches.
- E. Provide stone or hay bale check dams, as required, at all culvert inlets and outlets, as indicated on the Drawings.
- F. Inspect check dams and silt fencing on a weekly basis and after every major storm event to remove any build-up of silt and debris. Sediment build-up shall be removed when it reaches a depth of 6", and distributed to an area undergoing final grading.
- G. Temporary Seeding shall be installed in conformance with the approved Erosion and Sedimentation Control Plan, found in the project Drawings, and these specifications.
 - 1. Topsoil stripped and stockpiled on site shall be immediately seeded with erosion control seed mix and mulched with hay.
 - 2. Exposed earthwork areas, which will not be worked on for one week, shall be hay mulched. Unfinished areas which are not to be worked on for one month, or will be wintered, shall be

seeded with erosion control mix at a rate of 4 pounds of seed per 1000 sq. ft. and mulched with hay. Apply hay mulch at the rate of 3 tons per acre such that no soil is exposed. Anchor mulch to prevent wind blown movement.

3. In sensitive areas (within 25 ft. of stream or wetland edge) temporary mulch must be applied within 7 days of initial disturbance and prior to any storm event.
 4. Winter Mulch: If the catch of grass is less than 75% by November 15, apply additional hay mulch to achieve a protective layer of 5 tons per acre. Anchor mulch with mesh to prevent wind blown movement.
- H. Construct riprap aprons, swales, and/or slopes where indicated on Drawings, upon a properly graded and compacted 6" gravel base or geotextile (See Details and Drawings). If geotextile is used, anchor edges in shallow trench and backfill, in accordance with manufacturer's instructions. Stones shall be placed full depth in one operation, with special handwork if necessary to insure interlocking of all face stones. Do not drop stones on geotextile in such a manner as to damage geotextile. Openings and voids between stones shall be filled with smaller particles included in riprap D₅₀ mixture and larger rocks securely rammed into place. Loose stones or exceedingly large stones tending to rise above the average general surface shall be imbedded, reoriented or discarded.
- I. Ditches, swales and ponds shall be lined with riprap, matting, sod, or loamed and seeded, as indicated on the Drawings. See erosion and sedimentation control Details on Drawings for proper installation procedures. Ditches, swales, lawns and berms shall be constructed and maintained as described in the Erosion and Sedimentation Control Plan.
- J. Install erosion control blanket on slopes and areas where indicated on Drawings. See erosion and sedimentation Details and Drawings for proper installation procedures.

END OF SECTION

SECTION 32 11 10

GRAVEL BASE COURSES

PART 1 - GENERAL

1.01 GENERAL PROVISIONS:

- A. Coordinate Work with that of other trades affecting or affected by Work of this Section. Cooperate with such trades to assure the steady progress of the Work.
- B. The "Standard Specifications" referred to herein is the book entitled "*Standard Specifications*" published by the State of Maine Department of Transportation, latest edition, and Supplemental Specifications in Force, excluding the following portions thereof:

Division 100, Sections 102 Through 109; Numerical Index of Payment Items Included in Each Section.

Those Sections of the aforementioned *Standard Specifications* which are cited herein are applicable to the Work of this Contract as they may be modified, amplified or added to by this Section.

1.02 DESCRIPTION OF WORK:

- A. Provide labor, materials, equipment and services necessary for proper and complete installation of the gravel subbase and base courses for pavement, sidewalk, and concrete slab areas, as indicated on the Drawings and herein specified:
 - 1. Preparation of subgrade (incl. Geotextile installation, as required).
 - 2. Gravel subbase course.
 - 3. Gravel base course.
 - 4. Materials and compaction testing as required.

1.03 QUALITY ASSURANCE:

- A. General: Comply with requirements of the General Conditions for submittals and quality control.
- B. Codes and Standards: The Work under this Section shall conform to the following, except as may be modified herein:
 - 1. American Society for Testing and Materials (ASTM), Standard Specifications and Methods of Testing.
 - 2. State of Maine, Department of Transportation, Standard Specifications, Latest Edition.

1.04 SUBMITTALS:

- A. Furnish samples, test reports, and materials certifications as required for gravel base and subbase.
- B. Test Results:

1. Mechanical analysis (ASTM D421) and moisture-density curve (ASTM D1557M) test results for gravel subbase and base courses.
2. Field Density test results (ASTM D2922).

1.05 PRODUCT HANDLING:

- A. Store materials properly to prevent damage, deterioration and inclusion of foreign matter. Aggregates shall be stockpiled in a well-drained location.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Geotextile for Subgrade: Heavy-duty woven polypropylene stabilization fabric, Mirafi 600X or equal.
- B. Gravel Subbase: Clean gravel of hard durable particles free from vegetable matter, lumps or balls of clay and other deleterious substances. The gradation of the part that passes a 3-inch sieve shall meet the grading requirements of MDOT Specifications Section 703.06(b), Type C.
- C. Crushed Aggregate Base: Aggregate for base shall be crushed ledge or crushed gravel of hard durable particles free from vegetable matter, lumps or balls of clay and other deleterious substances. The gradation of the part that passes a 3-inch sieve shall meet the grading requirement of Maine DOT Specification, Section 703.06(a), Type A. Type A aggregate for base shall not contain particles of rock which will not pass the 2-inch square mesh sieve. Reclaimed asphalt pavement shall not be used for or blended with aggregate base or subbase.

PART 3 - EXECUTION

3.01 SUBGRADE PREPARATION FOR GRAVEL BASE COURSES:

- A. Form, shape and roll subgrade to conform to subgrade elevations and cross-section of finished pavement. Roller: ten-ton minimum weight in all open areas; suitable equipment in confined spaces.
- B. Remove stones greater than 4" from subgrade to 12" depth. Fill depressions with suitable fill material. When surface areas become impervious due to concentrations of fines, lightly scarify and recompact. In severe cases, remove such overcompacted material and replace with suitable soil as directed.
- C. Compact subgrade to 92% of maximum laboratory density (ASTM-D 2922). Shape to smooth surface free of irregularities. Protect from damage by proper construction of drainage swales as indicated on Drawings and directed by Engineer, prior to placement of gravel subbase.
- D. Geotextile Reinforcement for Subgrade: Install geotextile stabilization fabric on prepared and compacted subgrade in all areas indicated on Drawings, or as designated by the Architect/Engineer. Install in accordance with manufacturer's instructions.

3.02 INSPECTION AND TESTING:

- A. Prior to placement of any subbase gravel, the Architect/Engineer shall inspect and approve the subgrade.
- B. Allow for and coordinate for required local inspections.

- C. See SS 1.04 of this Section for required tests and test reports.
- D. Refer to Section 31 23 00 - Excavation, Backfill and Compaction, SS 3.12 for general standards and locations for testing. The Architect/Engineer or his representative may designate specific locations for testing.

3.03 GRAVEL SUBBASE:

- A. On prepared and approved subgrade, construct gravel subbase to conform to Details and Drawings and these Specifications. Gravel shall consist of sound gravel particles free of thin shale, clay or organic material, with no stone over 6" in size, as specified in SS 2.01 B.
- B. Construct subbase in one course when depth required is 8" or less and two or more courses when depth required is over 8". Compact each course to 95% of maximum laboratory density. Course thicknesses required are after compaction.
- C. Conform construction methods to MDOT *Standard Specifications, Sections 304.03, 304.04 and 304.05*, and these Specifications.

3.04 CRUSHED AGGREGATE BASE:

- A. On approved compacted subbase, construct crushed aggregate base to lines and grades to conform to Details and Drawings and these Specifications. Material shall consist of sound gravel particles free of thin shale, clay or organic material, with no stone over 2" in size, as specified in SS 2.01 C. Coordinate base course construction with prefabricated granite or concrete curb installation when required.
- B. Construct base in one course when depth required is 6" or less and two or more courses when depth required is over 6". Compact each course to 95% of maximum laboratory density. Thickness required is after final compaction.
- C. Construction methods shall conform to MDOT *Standard Specifications, Sections 304.03, 304.04 and 304.05*, and these Specifications.

END OF SECTION

SECTION 32 12 20

BITUMINOUS PAVING

PART 1 - GENERAL

1.01 GENERAL PROVISIONS:

- A. Coordinate Work with that of other trades affecting or affected by Work of this Section. Cooperate with such trades to assure the steady progress of the Work.
- B. The "Standard Specifications" referred to herein is the book entitled "*Standard Specifications*" published by the State of Maine Department of Transportation, latest edition, and Supplemental Specifications in Force, excluding the following portions thereof:

Division 100, Sections 102 Through 109; Numerical Index of Payment Items Included in Each Section.

Those Sections of the aforementioned *Standard Specifications* which are cited herein are applicable to the Work of this Contract as they may be modified, amplified or added to by this Section.

1.02 DESCRIPTION OF WORK:

- A. Provide labor, materials, equipment and services necessary for proper and complete installation of all non-porous bituminous paving and related items, as indicated on the Drawings and as herein specified:
 - 1. Bituminous Concrete Pavement for roads, entrances, parking areas, walks, cart paths, etc.
 - 2. Pavement Markings.
 - 3. Testing as required.
 - 4. Pavement Repair.

1.03 QUALITY ASSURANCE:

- A. General: Comply with requirements of the General Conditions for submittals and quality control.
- B. Codes and Standards: The Work under this Section shall conform to the following, except as may be modified herein:
 - 1. American Society for Testing and Materials (ASTM), Standard Specifications and Methods of Testing.
 - 2. State of Maine, Department of Transportation, *Standard Specifications*, Latest Edition.

1.04 SUBMITTALS:

- A. Furnish samples of manufacturer's product data, test reports, and materials certifications as required for bituminous concrete mixes.
- B. Test Results:

1. Mechanical analysis (ASTM D421), asphalt content (ASTM D2172), and in-place density (ASTM D2041 & D2726) test results for bituminous concrete pavement.

1.05 PRODUCT HANDLING:

- A. All asphalt materials and mixes shall be applied at temperatures within their optimum range as defined by MDOT *Standard Specifications*.

1.06 JOB CONDITIONS:

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for normal activities and other construction activities.
- B. Utilize flagmen, barricades, warning signs and warning lights as may be required.
- C. Weather Limitations for Bituminous Placement: Apply asphalt tack coats when ambient temperature is above 50 degrees F (10 degrees C), and when temperature has not been below 40 degrees F (1 degree C) for 12 hours immediately prior to application. Do not apply when base is wet or contains an excess of moisture.
- D. Construct asphalt concrete surface course or leveling course when atmospheric temperature is above 50 degrees F (4 degrees C) and when base is dry. Base course may be placed when air temperature is above 40 degrees F (4 degrees C) and rising. Do not place pavement on frozen gravel base.
- E. Grade Control: Contractor shall be responsible for establishment and maintenance of required lines, grades, and surface tolerances.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Base Course Bituminous Concrete Paving: Bituminous material shall conform to Maine DOT *Standard Specifications*, Section 401 Hot Mix Asphalt Pavement and 702.01 performance graded asphalt binder, PG 64-28. Aggregates shall conform to MDOT Specifications, Section 703.07 and 703.09, Type 19 mm HMA Mix. Aggregate Consensus Properties Criteria shall conform to MDOT 703.07 as specified in Table 1, below. .
- B. Top Course Bituminous Concrete Paving: Bituminous material shall conform to Maine DOT Specifications, Section 702.01 performance graded asphalt binder PG-64-28. Aggregates shall conform to MDOT Specifications, Section 703.09, Type 9.5 mm. HMA Mix. Aggregate Consensus Properties Criteria shall conform to MDOT 703.07 as specified in Table 1, below.

TABLE 1: AGGREGATE CONSENSUS PROPERTIES CRITERIA
(.3 to <3.0 Million ESAL'S)

AASHTO T 335 Coarse Aggregate Angularity (Minimum)	AASHTO T-304 Method A Uncompacted Void Content of Fine Aggregate (Minimum)	ASTM D 4791 (8.4) Flat and Elongated Particles (Maximum)	AASHTO T176 Clay Content/Sand Equivalent (Minimum)
75/60	40	10	45

AASHTO T 335 - "75/60" denotes that 75% of the coarse aggregate has one fractured face and 60% has two fractured faces.

AASHTO T304 - Criteria are presented as percent air voids in loosely compacted fine aggregate, (U).

ASTM 4791 - Criteria are presented as maximum percent by weight of flat and elongated particles. (5:1 ratio).

- C. Pavement Markings: Traffic paint conforming to MDOT Specifications, Section 708.03 (Type F). Color: White or yellow as indicated on the plans (w/o glass beads); Blue (w/non-skid aggregate), where indicated on Drawings for handicapped areas.

- E. Tack Coating (Asphalt Emulsion Binder): As per MDOT Specifications 409.

PART 3 - EXECUTION

3.01 TESTING:

- A. See SS 1.04 B for specified tests and test reports.
- B. The Architect/Engineer or his representative will designate test frequencies and locations.

3.02 BITUMINOUS CONCRETE PAVEMENT:

A. Scope:

1. Construct base course of bituminous concrete pavement on prepared gravel base, to lines, grades and sections shown on the Drawings for each specific area. Extend base course 6" beyond back of curb where applicable.
2. Construct surface course of bituminous concrete pavement on prepared bituminous base, to lines, grades and sections shown on the Drawings for each specific area.

B. Construction Methods:

1. Conform to MDOT *Standard Specifications*, Section 401.16, 401.17, 401.18 and 401.20.
2. Submit certificate of compliance to the Specifications from the pavement vendor to the Architect/Engineer.
3. Edge of pavement shall be clean and true. Raveled edges not accepted. Hand-tamp edges and bevel if forms or screed strips are not used.
4. Place asphalt concrete mixture on prepared surface, spread and strike-off, by means of self-propelled paver. Spread mixture at minimum temperature of 225 degrees F (107 degrees C). Place inaccessible and small areas by hand. Place each course to required grade, cross-section, compacted thickness, and surface tolerance (see Item 3.04).
5. Make joints between old and new pavements, or between successive days Work, to ensure continuous bond between adjoining Work. Construct joints to have same texture, density and smoothness as other sections of asphalt concrete course. Clean contact surfaces and apply tack coat.

6. Rolling:

- a) After the mix has been spread, struck off, and surface irregularities adjusted on each course, it shall be thoroughly compacted by rolling with a powered steel wheel tandem roller weighing not less than 2 or more than 10 tons. Begin rolling as soon as mixture will bear roller weight without excessive displacement.
 - b) Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.
 - c) Breakdown Rolling: Accomplish breakdown or initial rolling immediately following rolling of joints and outside edge. Check surface after breakdown rolling, and repair displaced areas by loosening and filling, if required, with hot material.
 - d) Second Rolling: Follow breakdown rolling as soon as possible, while mixture is hot. Continue second rolling until mixture has been thoroughly compacted.
 - e) Any displacement or irregularities occurring as the result of the reversing of the direction of a roller, or from other causes, shall be corrected at once by the use of rakes or lutes and addition of fresh mixture when required. Care shall be exercised in rolling not to displace the line and grade of the edges of the bituminous mixture.
 - f) Finish Rolling: Perform finish rolling while mixture is still warm enough for removal of roller marks. Continue rolling until roller marks are eliminated and course has attained maximum density.
7. Compaction Tests: After construction, the Architect/Engineer will designate locations for removal of pavement cores to determine compaction and thickness. Remove and properly replace pavement in any areas showing deficiencies in required compaction or thickness, with new material properly laid.
8. Patching: Remove and replace paving areas that become loose, broken or mixed with foreign materials, and any defective or substandard areas. Cut out such areas and fill with fresh, hot asphalt concrete. Compact by rolling to maximum surface density and smoothness.
9. Protections: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.03 PAVEMENT MARKING

- A. Cleaning: Sweep and clean surface to eliminate loose material and dust.
- B. Apply paint in accordance with MDOT *Standard Specifications*, Section 627.04, 627.05, and 627.06. (Delete references to glass beads.)
- C. Stripe parking lot spaces and any other pavement graphics as indicated on Drawings and Details with 4" wide striping. Fire lanes, crosswalks, etc. to be marked as indicated on Drawings. The Universal Handicap Symbol, as detailed on Drawings, shall be painted at the designated handicapped stalls. The drop-off strips between the handicapped stalls and other handicap areas shall be painted solid blue with non-skid surfaces, where indicated on Drawings.
- D. Apply paint with mechanical equipment to produce uniform straight edges. Apply in 2 coats at manufacturer's recommended rates.

3.04 FIELD QUALITY CONTROL:

- A. General: Test in-place asphalt concrete courses for compliance with requirements for compaction, thickness and surface smoothness. Repair or remove and replace unacceptable paving as directed by Architect/Engineer.
- B. Thickness: After construction, the Architect/Engineer will designate locations for removal of pavement cores to determine compaction and thickness. In-place compaction will not be acceptable if less than 93% of theoretical maximum density as determined by ASTM D-2041 and D-2726. In-place compacted thickness will not be acceptable if less than the required thickness, as shown on Drawings for that particular Section, within a tolerance of minus 1/4 inch, as determined by ASTM D-3549.
- C. Surface Smoothness: Test finished surface of each asphalt concrete course for smoothness, using a 10-foot straightedge applied parallel with and at right angles to centerline of paved area, or alternately by flooding. Surfaces will not be acceptable if exceeding the following tolerances for smoothness:

Any irregularities which vary 1/4 of an inch from a true surface in the finished surface course shall be corrected. Any irregularities which vary 3/8 of an inch from a true surface in base or binder course shall be corrected. Irregularities which may develop before the completion of rolling and while the material is still workable, may be remedied by loosening the surface mixture and removing or adding material as necessary. Any unsatisfactory irregularities or defects remaining after final compaction shall be corrected by removing and replacing with new materials, as specified, to form a true and even surface. All minor surface projections, joints and minor honeycombed surfaces shall be ironed out smoothly to grade, as directed. Adequate and approved straight edges shall be furnished and used by the Contractor. Architect/Engineer or his representative shall inspect and approve compacted surfaces.

If, at any time before the final Acceptance of the Work, any damaged, soft, or imperfect places, or spots shall develop in the surface, all such places shall be removed and replaced with new materials and then compacted until the edges at which the new Work connects with the old become invisible.

3.05 PAVEMENT REPAIR:

- A. Repair any existing bituminous pavement damaged during construction activities, including pavement on abutting public streets and highways.
- B. Meet the original subgrade, gravel base and finished grade specifications and elevations.
- C. Match the existing pavement in materials, course thickness, and finishes.

END OF SECTION

SECTION 32 13 50

CONCRETE WALKS AND PADS

PART 1 - GENERAL

1.01 GENERAL PROVISIONS:

- A. Coordinate Work with that of other trades affecting or affected by Work of this Section. Cooperate with such trades to assure the steady progress of the Work.
- B. The "Standard Specifications" referred to herein is the book entitled "*Standard Specifications*" published by the State of Maine Department of Transportation, latest edition, and Supplemental Specifications in Force, excluding the following portions thereof:

Division 100, Sections 102 Through 109; Numerical Index of Payment Items Included in Each Section.

Those Sections of the aforementioned *Standard Specifications* which are cited herein are applicable to the Work of this Contract as they may be modified, amplified or added to by this Section.

1.02 DESCRIPTION OF WORK:

- A. Provide labor, materials, equipment and services necessary for proper and complete installation of all concrete paving, slabs, pads, thrust blocks and related items, as indicated on the Drawings and Details and as herein specified:

- 1. Concrete Walk Pavement.
- 2. Concrete Pads.

1.03 QUALITY ASSURANCE:

- A. General: Comply with requirements of the General Conditions for Submittals and Quality Control.
- B. Codes and Standards: The Work under this Section shall conform to the following, except as may be modified herein:
 - 1. American Society for Testing and Materials (ASTM), Standard Specifications and Methods of Testing.
 - 2. State of Maine, Department of Transportation, *Standard Specifications*, Latest Edition.

1.04 SUBMITTALS:

- A. Furnish samples of manufacturer's product data, test reports, and materials certifications as required for structural concrete mix.
- B. Furnish product data for concrete curing and sealing products.
- C. Test Results:
 - 1. Concrete mix design (ASTM C-94), and in-place test results - slump tests (C-143), air content (C-173), and compressive strength tests (C-31 & C-39).

1.05 PRODUCT HANDLING:

- A. Store and protect materials properly to prevent damage, deterioration and inclusion of foreign matter. Protect cement from sources of moisture prior to use. Aggregates shall be stockpiled in a well-drained location.

1.06 JOB CONDITIONS:

- A. Do not place concrete when air temperature is below 40 degrees F. Do not place concrete on frozen ground. Protect concrete from freezing during initial 24-hour cure.
- B. Grade Control: Contractor shall be responsible for establishment and maintenance of required lines, grades, and surface tolerances.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Concrete:
 - 1. Mix: Maximum 4 gallons of water per 94 lb. sack of cement.
 - 2. Strength: 4000 psi at 28 days.
 - 3. Air Entrainment: Total air content shall be 6% by volume.
 - 4. Slump: 3" to 4".
 - 5. Shall conform to MDOT, Section 502 (NOTE: for MDOT projects, the *Standard Specifications, Section 502-Structural Concrete* has been replaced in its entirety with *Supplemental Specifications in Force, Special Provision, Section 502-Structural Concrete*. This revised *Standard Specification* for concrete structures and incidental concrete construction shall be used for all MDOT projects).
 - 6. Expansion Joints: In conformance with MDOT *Standard Specifications*, Section 705.01.
 - 7. Cement: Portland Cement, Type IIA conforming to MDOT *Standard Specifications*, Section 701.
- B. 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.
- C. Form Coating: A non-staining form release agent that will not discolor or deface surface of concrete.
- D. Welded Wire Mesh: Welded plain cold-drawn steel wire fabric, ASTM A 185. Furnish in flat sheets, not rolls, unless otherwise acceptable to Architect/Engineer.
- E. Reinforcing Bars: Deformed steel bars, ASTM A 615, Grade 40.
- F. Fabricated Bar Mats: Welded or clip-assembled steel bar or rod mats, ASTM A 184. Use ASTM A 615, Grade 40 steel bars, unless otherwise indicated.
- G. Dowel Bars at Control Joints: Plain steel bars, ASTM A 615, Grade 40. Cut bars true to length with ends square and free of burrs. One end of bar to be wrapped with felt, to allow horizontal movement of joint.

- H. Metal Expansion Caps: Furnish for one end of each dowel bar in expansion joints. Design caps with one end closed and a minimum length of 3 inches to allow bars movement of not less than 1 inch, unless otherwise indicated.
- I. Hook Bolts: ASTM A 307, Grade A bolts, internally and externally threaded. Design hook bolt joint assembly to hold coupling against pavement form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.
- J. Concrete Mix Design and Testing: Comply with requirements of applicable Division 3 Sections for concrete mix design, sampling and testing, and quality control.
- K. Water: Potable, clean, free from oil, acid, vegetable matter, alkalis, salts and other deleterious substances.
- L. Curing Compound: Brush, roller, or spray-applied curing agent meeting the requirements of ASTM C-309; Cur-to-Spec MS by ProSoCo, Inc., or equal.
- M. Surface Treatment for Concrete Walks and Pads: Antispalling compound specifically formulated to protect the concrete from moisture and de-icing salts; Consolideck Saltguard by ProSoCo, Inc., or equal.

PART 3 - EXECUTION

3.01 TESTING:

- A. See SS 1.04 C for specified tests and test reports.
- B. The Architect/Engineer or his representative will designate required test frequencies and locations.

3.02 CONCRETE WALKS AND PADS:

A. Form Construction:

- 1. Set forms to required grades and lines, rigidly braced and secured. Install sufficient quantity of forms to allow continuous progress of Work and so that forms can remain in place at least 24 hours after concrete placement.
- 2. Check completed formwork for grade and alignment to following tolerances:
 - Top of forms: not more than 1/8 inch in 10 inches.
 - Vertical face on longitudinal axis: not more than 1/4-inch in 10 feet.
- 3. Clean forms after each use, and coat with form release agent as often as required to ensure separations from concrete without damage.
- 4. Reinforcement: Locate, place and support reinforcement and/or welded wire fabric as Detailed on Drawings and as specified unless otherwise indicated.

B. Concrete Placement:

- 1. General: Comply with requirements of Division 3 Sections for mixing and placing concrete, and as herein specified.
- 2. On prepared aggregate base, construct concrete walk with reinforcing wire mesh, joints and curb face as indicated on the Drawings and Details.

3. Forms for sidewalks and pads shall be smooth, free from warp, of adequate strength to resist springing out of shape, and of proper depth to conform to the thickness of the proposed concrete slab. Forms shall be clean and free from dirt, and concrete or materials from previous use. Oil all forms prior to placing concrete.
 4. Place clean wire mesh as indicated in the Details; avoid damaging or moving wires while placing concrete.
 5. Slabs for concrete walks shall have expansion and control joints as indicated on the Drawings. Score expansion joints across surface of concrete as Detailed, at maximum horizontal intervals of 8 feet. Control joints shall be full slab depth, and shall include a preformed compressible filler and steel dowel bars, as Detailed. Install control joints at intervals of not more than 30 ft., at junctions with all structures, and/or where indicated on the Drawings.
 6. Do not place concrete until subgrade and forms have been checked for line and grade. Moisten subgrade if required to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
 7. Place concrete using methods which prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation.
 8. Consolidate with care to prevent dislocation of reinforcing, dowels, and joint devices.
 9. Surface finishing shall be performed after all bleed water and/or water sheen has left the surface and the concrete has started to stiffen. Float the surface with appropriate wooden or aluminum float and steel trowel surface. Surface finish shall be as indicated on the Drawings, or as directed by the Architect/Engineer. No plastering of the surface with mortar will be permitted.
 10. Concrete shall be cured for at least 72 hours. Protect concrete during initial curing process with moist burlap or polyethylene sheeting, and take precautions to exclude vehicular, pedestrian and animal traffic from the walk surfaces. Apply curing compound, as specified in SS 2.01 L, following initial cure; comply with manufacturer's instructions.
 11. Provide sample of concrete pavements for approval by Architect/Engineer prior to installation. Sample shall include examples of scoring, troweling and finishing as indicated on the Drawings, or as directed by the Architect/Engineer.
- C. Surface treatment, as specified in SS 2.01 M, shall be applied in two coats at a minimum of 28 days after the concrete is placed.
1. Application procedure, surface preparation, precautions and the rate of application shall be in strict compliance with the manufacturer's detailed instructions.

3.03 FIELD QUALITY CONTROL:

- A. Concrete testing shall be carried out at the time the concrete is placed, as specified in SS 1.04 C.1 and 2.01 J. Surface tolerances for concrete sidewalks and slabs shall be 1/8 inch in 10 feet.

END OF SECTION

SECTION 32 16 19

CONCRETE SLIPFORM CURBING

PART 1 - GENERAL

1.01 GENERAL PROVISIONS:

- A. Coordinate Work with that of other trades affecting or affected by Work of this Section. Cooperate with such trades to assure the steady progress of the Work.
- B. The "Standard Specifications" referred to herein is the book entitled "*Standard Specifications*" published by the State of Maine Department of Transportation, latest edition, and Supplemental Specifications in Force, excluding the following portions thereof:

Division 100, Sections 102 Through 109; Numerical Index of Payment Items Included in Each Section.

Those Sections of the aforementioned *Standard Specifications* which are cited herein are applicable to the Work of this Contract as they may be modified, amplified or added to by this Section.

1.02 DESCRIPTION OF WORK:

- A. Provide labor, materials, equipment and services necessary for proper and complete installation of all slipform concrete curbing and related items, as indicated on the Drawings and herein specified:

- 1. Concrete Slipform curbing.

1.03 QUALITY ASSURANCE:

- A. General: Comply with requirements of the General Conditions for submittals and quality control.
- B. Codes and Standards: The Work under this Section shall conform to the following, except as may be modified herein:
 - 1. American Society for Testing and Materials (ASTM), Standard Specifications and Methods of Testing.
 - 2. State of Maine, Department of Transportation, *Standard Specifications*, Highways and Bridges, Latest Edition.

1.04 SUBMITTALS:

- A. Furnish product data as required for slipform curbing.

1.05 PRODUCT HANDLING:

- A. Handle and store materials properly to prevent damage and deterioration.

1.06 JOB CONDITIONS:

- A. Traffic Control: Utilize warning signs, barricades, and flagmen as may be required to protect workmen and vehicular traffic.
- B. Layout Control: Contractor shall be responsible for establishment and maintenance of required lines, grades, and surface tolerances.

- C. Weather Conditions: Comply with requirements in MaineDOT Standard Specifications.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Concrete for slipform shall be Class A meeting the requirements of 502.05 of the MaineDOT Specifications with the exception that chloride permeability will be waived. This includes a minimum compressive strength of 4,000 psi. Entrained air will meet current requirements of 6.0-9.0%. Depending on aggregate source proposed use, the ASR requirement will be enforced and may require a pozzolan addition to the mix.
- B. Apply salt guard penetrating sealant to all concrete curb.
- C. Apply epoxy binding agent to surface of pavement to receive concrete curb.
- D. Concrete shall include polyester fibers which shall be uniformly incorporated into the dry mix at a rate of 0.25 percent of the total batch weight. Certification shall be provided by the supplier with each shipment meeting the following requirements:
 - 1. Average Length 0.25 inches $\pm$ 0.005.
 - 2. Average Diameter 0.0008 inches $\pm$ 0.0001.
 - 3. Specific Gravity 1.32-1.40
 - 4. Melting Temperature 480° Minimum

PART 3 – EXECUTION

3.01 PLACEMENT OF CURBING:

- A. Installation of Slipform Curb:
 - 1. Set curb on a compacted HMA base paving.
 - 2. Apply epoxy bonding agent.
 - 3. Deposit, consolidate, and slip form the concrete to the required section.
 - 4. Protect as specified for concrete walks and pads in Section 32 13 50.
 - 5. Concrete shall be placed with an approved slipform machine that will produce a finished product according to the design specified in the plans and will meet the same standards set for cast-in-place curbing. For cold weather slipforming, the outside temperature must be at least 36°F and rising. The curb shall be placed on a firm, uniform bearing surface, shall conform to the section profile specified in the plans and shall match the appropriate grade. Proper curing shall be insured through the use of a curing compound spray that meets AASHTO M 148, Type 2 Liquid Membrane-Forming Compounds for Curing Concrete. Expansion joints will be provided at ends of curve radii or wherever the curb meets rigid structures such as building foundations or fire hydrants. Contraction joints will be placed at 10 foot intervals using sawing methods, which cut 1-3" into the concrete. Joints shall be constructed perpendicular to the subgrade and match other joints in roadways, sidewalks or other structures when applicable. Construction joints will be used at the end of a day's construction or when the placement of concrete is interrupted by more than 30 minutes. The use of an insert bar to create a plane of weakness will not be permitted, control joints will be used.

6. Slipform curbing must be adequately protected after placement. The concrete shall be allowed to cure for at least 72 hours. During cold weather conditions, when temperatures drop below the required temperature of 36°F after placement, curbing shall be protected by concrete blankets or a combination of plastic sheeting and straw. After any placement of slipform curbing, regardless of weather conditions, the placed curbing shall be adequately protected by traffic control devices and flagging as necessary.
7. Backfilling:
 - a. Fill all remaining spaces under the curb with approved material and thoroughly hand tamped so the stones will have a firm uniform bearing on the foundation for the entire length and width.
 - b. Fill any remaining excavated areas surrounding the curb to the required grade with approved materials. Place this material in layers not exceeding 8 inches in depth, loose measure and thoroughly tamped.
8. Finishing:
 - a. Finished surface of the curb roughened by brooming lightly or other method acceptable to the Owner.
 - b. Membrane curing compounds shall be a Type 2, white pigmented product selected from Maine Department of Transportation's Qualified Products List of concrete curing compounds. Curing compound will be applied in two applications immediately after the final finishing. The second application will be perpendicular in direction to the first application to ensure complete coverage.
 - c. Any voids or surface irregularities shall be repaired using the concrete grout from the same concrete load and a float shall be used on the repaired areas prior to texturing.
 - d. All edges of concrete shall be rounded with an approved edging tool while the concrete is still plastic and shall leave a true smooth surface.

3.02 PROTECTION:

- A. Protect the curb and keep in good condition. Clean all exposed surfaces smeared or discolored and restore to a satisfactory condition of the curb shall be removed and replaced.

END OF SECTION

SECTION 32 16 40

STONE CURBS

PART 1 - GENERAL

1.01 GENERAL PROVISIONS:

- A. Coordinate Work with that of other trades affecting or affected by Work of this Section. Cooperate with such trades to assure the steady progress of the Work.
- B. The "Standard Specifications" referred to herein is the book entitled "*Standard Specifications*" published by the State of Maine Department of Transportation, latest edition, and Supplemental Specifications in Force, excluding the following portions thereof:

Division 100, Sections 102 Through 109; Numerical Index of Payment Items Included in Each Section.

Those Sections of the aforementioned *Standard Specifications* which are cited herein are applicable to the Work of this Contract as they may be modified, amplified or added to by this Section.

1.02 DESCRIPTION OF WORK:

- A. Provide labor, materials, equipment and services necessary for proper and complete installation of all pre-fabricated curbing and related items, as indicated on the Drawings and herein specified:
 - 1. Cut Granite curbing.

1.03 QUALITY ASSURANCE:

- A. General: Comply with requirements of the General Conditions for submittals and quality control.
- B. Codes and Standards: The Work under this Section shall conform to the following, except as may be modified herein:
 - 1. American Society for Testing and Materials (ASTM), Standard Specifications and Methods of Testing.
 - 2. State of Maine, Department of Transportation, *Standard Specifications*, Highways and Bridges, Latest Edition.

1.04 SUBMITTALS:

- A. Furnish product data as required for granite curbing.

1.05 PRODUCT HANDLING:

- A. Handle and store materials properly to prevent damage and deterioration.

1.06 JOB CONDITIONS:

- A. Traffic Control: Utilize warning signs, barricades, and flagmen as may be required to protect workmen and vehicular traffic.
- B. Layout Control: Contractor shall be responsible for establishment and maintenance of required lines, grades, and surface tolerances.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Granite Curbing: Quarried granite stone vertical curbing, sloped curbing, and/or transition sections as indicated on Drawings, conforming to MDOT *Standard Specifications, Section 712.04*. Dimensions to be as indicated on Drawings and Details.

PART 3 - EXECUTION

3.01 GRANITE CURBING:

- A. Install vertical or slope-faced granite curbing where indicated on Drawings, to lines and grades indicated. At catch basins, install curb-inlet sections where indicated and detailed; coordinate curb installation with frame and grate installation.
- B. Install curbing after placement and compaction of gravel subbase, and before placement of pavement base. Finished installation shall conform to granite curb Details on Drawings.
- C. Curb installation procedures shall conform to MDOT *Standard Specifications, Section 609.03 and 609.06*.

END OF SECTION

SECTION 32 30 00

SITE IMPROVEMENTS

PART 1 - GENERAL

1.01 GENERAL PROVISIONS:

- A. Coordinate Work with that of other trades affecting or affected by Work of this Section. Cooperate with such trades to assure the steady progress of the Work.
- B. The "Standard Specifications" referred to herein is the book entitled "*Standard Specifications*" published by the State of Maine Department of Transportation, latest edition, and Supplemental Specifications in Force, excluding the following portions thereof:

Division 100 Sections 102 Through 109 Numerical Index of Payment Items Included in Each Section.

Those Sections of the aforementioned *Standard Specifications* which are cited herein are applicable to the Work of this Contract as they may be modified, amplified or added to by this Section.

- C. All Work shall comply with applicable requirements and conditions of the City of Ellsworth, the, Maine Department of Environmental Protection (DEP) regulations, Hancock County Soil and Water Conservation District standards and, if applicable, Army Corps of Engineers (ACOE) and U. S. Environmental Protection Agency (EPA) NPDES Permit requirements, to prevent adverse environmental impacts.

1.02 DESCRIPTION:

- A. Provide all labor, materials, equipment and services necessary for proper and complete installation of the following as indicated on the Drawings and herein Specified:
 - 1. Bicycle Racks
 - 2. Handicap Curb Cut/Ramp
 - 3. Site Signage
 - 4. Concrete Filled Metal Bollard
 - 5. Aluminum Flagpole
 - 6. Light Pole Bases
 - 7. Granite Pavers
 - 8. Lighted Bollards
 - 9. Benches & Trash Receptacles
 - 10. Stone Retaining Walls

1.03 QUALITY ASSURANCE:

- A. General: Comply with requirements of the General Conditions for Submittals and Quality Control.
- B. Shop Drawings: Submit product specification literature and/or shop drawings for:

1. Bicycle Racks
2. Site Signage
3. Concrete Filled Metal Bollard
4. Aluminum Flagpole
5. Light Pole Bases
6. Granite Pavers
7. Lighted Bollards
8. Benches & Trash Receptacles

PART 2 - PRODUCTS

2.01 BICYCLE RACKS:

- A. Shall be as indicated on Drawings and Details.
- B. Concrete shall have a minimum compressive strength of 4000 psi at 28 days.
- C. Bicycle Racks, Type Orion Model ORN-LB-2-SF-P; with surface mount round flange, or approved equal. Color to be selected by the Architect.

2.02 HANDICAP CURB CUT:

- A. Shall conform to Section 32 12 20 - Bituminous Paving and Section 32 13 50 - Concrete Walks & Pads.
- B. Shall be as indicated on Drawings and Details.
- C. Shall conform to ANSI A117.1-1986 Code for Handicap Standards.

2.03 SITE SIGNAGE:

- A. Handicap Parking Sign: As indicated on Drawings.
- B. Regulatory Signs: As indicated on Drawings. Reflective sheet aluminum conforming to MDOT *Standard Specifications* 719. Posts shall be as detailed on drawings.
- C. Site Signs: As indicated on Drawings. Size, type, material, color, layout, typestyle and graphics shall be approved by Architect/Engineer. Contractor shall submit proofs or camera-ready artwork for approval.

2.04 CONCRETE FILLED METAL BOLLARD:

- A. 6-inch diameter Schedule 40 steel tube with one shop coat rust preventative primer and 2 shop coats epoxy gloss finish in color safety yellow or as directed by Architect/Engineer.
- B. Concrete Fill and Bases: 4000 psi-28 day strength, domed at top of bollard, as Detailed on Drawings.

2.05 ALUMINUM FLAGPOLE:

- A. Concrete Flagpole Bases: 4000 psi-28 day strength with 16 gauge foundation sleeve, base plate, supporting plate, ground rod, conduit and sweep, as Detailed on Drawings.
- B. Aluminum Flagpole: 35' and 40' aluminum flagpoles; Traditional Style; Color: satin; with revolving non-fouling internal halyard truck, Model ECH35IH and ECH40IH Hurricane Series with internal M-winch as manufactured by the Elder Flag Manufacturing Co. Inc., or approved equal.
- C. Flagpole assembly shall be designed to withstand 120 MPH winds (flagged).

2.06 LIGHT POLE BASES:

- A. Concrete Light Pole Bases, 4000 psi-28 day strength with 1" chamfer, anchor bolts, conduit and sweep, as Detailed on Drawings.

2.07 GRANITE PAVERS:

- A. Pavers: 24" x 48" x 1 1/2" thick granite pavers with thermal top, sawn balance, color to be selected by Architect, as Detailed on the Drawings. Basis of Design: XL Pavers, Woodbury Gray, as produced by Swenson Stone Works, or approved equal.
- B. Asphalt Pavement Base and Asphalt Setting Bed: Conforming to Maine Department of Transportation Standard Specifications, as Detailed on Drawings.
- C. Bedding and Joint Sand: Clean, non-plastic, naturally occurring sand. Particle shape shall be a mix of sub-angular and sub-rounded. The particles shall conform to the grading requirements of ASTM C33 except that less than 1 percent shall pass the No. 200 sieve.

2.08 LIGHTED BOLLARDS:

- A. Lighted Bollard Foundations, 4000 psi-28 day strength with tooled smooth surface, anchor bolts, conduit and sweep, as Detailed on Drawings. Refer to electrical specifications, Section 26 00 00 for model.

2.09 BENCHES AND TRASH RECEPTACLES:

- A. Benches: Augusta Collection Park Benches with back, side armrests, all-steel construction and ultra-resilient powder-coated finish, black in color.
- B. Trash Receptacle: SDC-36 Steelsites Collection Trash Receptacles, 36-gallon size, and ultra-resilient powder-coated finish, black in color.
- C. Trash Receptacle with Ash Receptacle: SDC-36 Steelsites Collection Trash Receptacles, 36-gallon size, with Ash Tray and ultra-resilient powder-coated finish, black in color.
- D. Recycling Receptacle: SDC-36 Steelsites Collection Trash Receptacles, 36-gallon size, with Recycle Lid and ultra-resilient powder-coated finish, black in color.

2.10 STONE RETAINING WALLS:

- A. Granite Retaining Wall: Rough cut granite blocks as Detailed on Drawings.
- B. Natural Stone Retaining Wall: 500 lb. to 1,000 lb. stones as Detailed on Drawings.

PART 3 - EXECUTION

3.01 BICYCLE RACKS:

- A. Shall be located as indicated on Drawings.
- B. Construct reinforced concrete pad as indicated on Drawings.
- C. Surface mount bicycle racks on concrete pad per manufacture's specifications, 30" apart as indicated on Drawings.

3.02 HANDICAP CURB CUT:

- A. Install Handicap Curb Cuts as indicated on Drawings.
- B. Installation shall conform to ANSI A117.1-1986 Code.

3.03 SITE SIGNAGE:

- A. Install site handicap and directional signage in locations and as indicated on Drawings.
- B. All hardware shall be hot dipped galvanized.
- C. Cold galvanize all cuts.
- D. Set posts plumb and true to grade to allow proper sign mounting height.
- E. Conform to all applicable regulatory agencies having jurisdiction.

3.04 CONCRETE FILLED METAL BOLLARD:

- A. Install bollards plumb and true in location indicated on Drawings and as Detailed. Fill with concrete and crown top to shed water.
- B. Touch-up paint, or field apply 3rd coat (safety yellow). Do not allow over spray to splatter on wood fence, pavement etc.

3.05 ALUMINUM FLAG POLE:

- A. In locations indicated on Drawings, construct concrete foundations as Detailed.
- B. Assemble flagpole, winch and cable assembly, ball top, lighting cable and accessories per manufacturer's specifications.
- C. Erect flagpole into foundation tube and center it. Pack dry sand between the pole and foundation tube. Leave two inches void at the top and fill with waterproof sealant.
- D. Provide power source to light per manufacturer's specifications.

3.06 LIGHT POLE BASES:

- A. Install Light Pole Bases in locations, as Detailed on Drawings.

3.07 GRANITE PAVERS:

- A. Prepare subgrade, gravel base and asphalt pavement base in accordance with Section 32 11 10 – Gravel Base Courses, and Section 32 12 20 – Bituminous Paving.
- B. Spread sand and asphalt setting bed evenly over the asphalt pavement base to a $\frac{3}{4}$ " nominal depth thickness as required to meet finish grade.
- C. Ensure that pavers are free from foreign materials before installation. Lay the pavers in the pattern as shown on the drawings. Maintain straight pattern lines and adjust as necessary.
- D. Joints between the pavers shall be between 1/16" and 1/8" wide.
- E. Vibrate the pavers into the setting bed sweeping dry sand into the joints until they are full. Sweep off excess sand and return to the site one month after installation to inspect the sand in joints and add additional sand to fill joints where necessary.
- F. The final surface elevations shall not deviate more than 1/4" under a 10-foot long straightedge.

3.08 LIGHTED BOLLARDS:

- A. Install Lighted Bollards in locations, as Detailed on Drawings.

3.09 BENCHES AND TRASH RECEPTACLES:

- A. Benches and Trash Receptacles shall be surface mounted per Manufacturer's Specifications in locations, as Detailed on Drawings.

3.10 STONE RETAINING WALLS:

- A. Install on crushed stone bed with drainage stone, perforated underdrain and geotextile fabric as Detailed on Drawings.

END OF SECTION

SECTION 32 31 13

CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.1 DOCUMENTS

- A. This section of the specifications forms part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

1.2 SUMMARY

A. Section Includes:

- 1. Furnish and install chain link fences.
- 2. Furnish and install swing and personnel gates.
- 3. Furnish and install motorized gate system.

B. Related sections:

- 1. Section 31 23 00 – Excavation, Backfill and Compaction
- 2. Section 03 30 00 – Cast-in-Place Concrete

1.3 REFERENCES

A. ASTM International:

- 1. ASTM A123/A 123M - Standard Specification for Hot-Dip Galvanized Coatings on Iron and Steel Products.
- 2. ASTM A153/A 153M - Standard Specification for Hot-Dip on Iron and Steel Hardware.
- 3. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
- 4. ASTM F567 - Standard Practice for Installation of Chain-Link Fence.
- 5. ASTM F1184 - Standard Practice for Industrial and Commercial Horizontal Slide Gates.

B. Chain Link Fence Manufacturers Institute:

- 1. CLFMI - Product Manual.

1.4 SYSTEM DESCRIPTION

- A. Fence Height: 6 feet nominal.
- B. Line Post Spacing: At intervals not exceeding 10 feet.
- C. Fence Post and Rail Strength: Conforming to ASTM F1043 Heavy Industrial Fence quality.

1.5 SUBMITTALS

- A. Provide Submittals in accordance with the General Conditions.
- B. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, and schedule of components.
- C. Product Data: Submit data on posts, accessories, fittings and hardware.
- D. Manufacturer's Installation Instructions: Submit installation requirements.

1.6 QUALITY ASSURANCE

- A. Supply material in accordance with CLFMI - Product Manual.
- B. Perform installation in accordance with ASTM F567.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with a minimum of five years documented experience.
- B. Fence Layout: Mark in field prior to commencement of work in consultation with the Architect/Engineer.
- C. Installer: Company specializing in performing work of this section with a minimum of five years documented experience.

1.8 PROJECT CONDITIONS

- A. Field Measurements: Verify layout information for fences and gates shown on the drawings in relation to the property survey and existing structures. Verify dimensions by field measurements.

1.9 DELIVERY, STORAGE AND HANDLING

- A. Follow manufacturer's requirements for transporting, handling, storing, and protecting products.
- B. Deliver fence posts and accessories in packed cartons or firmly tied rolls.
- C. Identify each package with manufacturer's name.
- D. Store fence materials and accessories in secure and dry place.

PART 2 PRODUCTS

2.1 FENCE MATERIALS

- A. Fabric: The fabric shall be woven with a 9-gauge aluminum-coated steel wire in a 2-inch (50 mm) mesh and shall meet the requirements of ASTM A 491.
- B. Privacy slats shall be heavy duty HDPE slats factory inserted vertically into wire mesh and shall meet the requirements of ASTM F3000/F3000M.
- C. Posts, Rails and Braces: Posts, rails, and braces furnished for use in conjunction with aluminum-coated steel fabric shall be of galvanized steel pipe. Note that the fence shall include a bottom rail.
- D. Line posts, rails, and braces shall be galvanized steel pipe conforming to the requirements of Fed. Spec. RR-F-191/3 for Class I steel pipe, Grade B.
- E. Dimensions of the posts, rails, and braces shall be as shown on the plans.
- F. Wire Ties and Tension Wires: Wire fabric ties, wire ties, and tension wire for use in conjunction with a given type of fabric shall be of the same material identified with the fabric type. The tension wire shall be 7-gauge coiled spring wire coated similarly to the

respective wire fabric being used. Wire fabric ties shall be hog rings, aluminum wire, or galvanized steel wire not less than 9 gauge.

- G. Miscellaneous Fittings and Hardware: Miscellaneous steel fittings and hardware for use with aluminum-coated steel fabric shall be of commercial grade steel or better quality, wrought or cast as appropriate to the article, and sufficient in strength to provide a balanced design when used in conjunction with fabric posts, and wires of the quality specified herein. Miscellaneous aluminum fittings for use with aluminum alloy fabric shall be wrought or cast aluminum alloy.
- H. Marking: Each roll of fabric shall carry a tag showing the kind of base metal (steel, aluminum, or aluminum alloy number), kind of coating, the gage of the wire, the length of fencing in the roll, and the name of the manufacturer. Posts, wire, and other fittings shall be identified as to manufacturer, kind of base metal (steel, aluminum, or aluminum alloy number), and kind of coating.

2.2 GATE MATERIALS

- A. Gate frames for swing gates and personnel gate shall consist of galvanized steel pipe and shall conform to the specifications for the same material under paragraph 2.1.C. The fabric shall be of the same type material as used in the chain-link fence.
- B. Personnel gate shall include outdoor rated heavy duty electric strike. Electric strike shall be Trine EN400 with EN-400 Gatebox or approved equal. Provide power to electric strike as required for card reader operation. Card reader to be provided by Owner.
- C. Cantilever slide gate shall be constructed of welded aluminum as detailed on the drawings and shall conform to UL 325 and ASTM F 2200. Basis of Design: Fortress Structural Cantilever Slide Gate as manufactured by: Tymetal Corp., 678 Wilbur Avenue, Greenwich, New York, (888-978-4283) or approved equal. The gate fabric shall be of the same type material as used in the chain-link fence. Vehicle gate clear space opening shall be as indicated on the drawings.
- D. The slide gate operator shall utilize 230 volt AC single phase power and shall be rated to operate a gate weighing up to 2,000 Lbs. Cold weather package shall be provided including heater, special oil and V-belt. Basis of Design: Tymetal TYM 2000 or approved equal.
- E. Gate motorization system shall provide functionality for one gate and shall consist of the following components or approved equal:
 - 1. Fully integrated wireless radio frequency identification (RFID) reader system with vehicle identification tags as selected by the Owner. Basis of Design: TransCore Encompass 4 or approved equal.
 - 2. Timer, adjustable for variable open/close cycle duration.
 - 3. Vehicle loops and loop safety detectors to ensure gate remains open while vehicle is within gate opening.
 - 4. Vehicle free-exit loop (fail secure).
 - 5. Electric safety gate edge.
 - 6. Gate edge transmitter.
 - 7. Radio Receiver.
 - 8. Transmitter.
 - 9. 24 Volt Battery for Operator Backup.

2.3 CONCRETE

- A. Type specified in Section 03 30 00.

2.4 REINFORCEMENT FOR FILLED POSTS

- A. Reinforcing Steel:
 - 1. Steel Reinforcing Bars: ASTM A 615. Grade 60.

PART 3 EXCUTION

3.1 INSTALLATION, GENERAL

- A. Install fence in accordance with the details on the plans and as specified here using new materials. During installation, fence and gate components shall be carefully handled and stored to avoid contact with abrasive surfaces. Install components in sequence as recommended by fence manufacturer. Installation shall comply with ASTM F567.
 - 1. Install fencing as indicated on the drawings provided.
 - 2. Variations from the installation indicated must be approved.
 - 3. Variations from the fence installation indicated and all cost for removal and replacement will be the responsibility of the contractor.

3.2 INSTALLATION, FENCE AND SWING GATES

- A. Clear fence line as required for fence installation
- B. Excavation: Drill or hand-excavated (using post hole digger) holes for post to diameters and spacing indicated, in firm, undisturbed or compacted soil.
 - 1. If not indicated on the drawings, excavated holes for each post to a minimum diameter of 30 inches.
 - 2. Unless otherwise indicated, excavate hole depths not less than 72 inches or to frost line.
- C. Set all posts plumb, in concrete footings with top of footing flush with finish grade. Slope top of concrete for water runoff.
- D. Brace each gate and corner post to adjacent line post with horizontal center brace rail and diagonal truss rods. Install brace rail one bay from end and gate posts.
- E. Install top rail through line post tops and splice with 6-inch long rail sleeves.
- F. Install bottom rail between terminal posts.
- G. Install center and bottom brace rail on corner gate leaves.
- H. Place fabric on outside of posts and rails.
- I. Do not stretch fabric until concrete foundation has cured 7 days.
- J. Stretch fabric between terminal posts or at intervals of 100 feet maximum, whichever is less.
- K. Position bottom of fabric 2 inches above finish grade.
- L. Fasten fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 15 inches on centers.

- M. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.
- N. Support gates from gate posts.
- O. Install gate with fabric to match fence. Install three hinges on each gate leaf.
- P. Connect to existing fence at existing terminal post.
- Q. Install electric strike on personnel gate including power source from panel board in courthouse building, breaker and wire size according to manufacturer's requirements.

3.3 INSTALLATION, MOTORIZED GATE SYSTEM

- A. Install according to manufacturer's requirements.
- B. Provide source power from panel board in courthouse building, breaker and wire size according to manufacturer's requirements.
- C. Vehicle loops to be installed by sawcutting pavement and resealed with epoxy according to manufacturer's requirements.
- D. Install gate operator on secure side of fence and protect with bollards (not shown on Drawings).
- E. Install pole mounted RFID reader including all power and communications conduits and wires in accordance with manufacturer's requirements.
- F. Test complete system in presence of Architect/Engineer.

3.4 DEMONSTRATION

- A. Instruct the owner's personnel on proper operation and maintenance of fence and gate components.

END OF SECTION

SECTION 32 92 10

TOPSOIL

PART 1 - GENERAL

1.01 GENERAL PROVISIONS:

- A. Coordinate Work with that of other trades affecting or affected by Work of this Section. Cooperate with such trades to assure the steady progress of the Work.
- B. The "Standard Specifications" referred to herein is the book entitled "*Standard Specifications*" published by the State of Maine Department of Transportation, latest edition, and Supplemental Specifications in Force, excluding the following portions thereof:

Division 100 Sections 102 Through 109 Numerical Index of Payment Items Included in Each Section.

Those Sections of the aforementioned *Standard Specifications* which are cited herein are applicable to the Work of this Contract as they may be modified, amplified or added to by this Section.

- D. All Work shall comply with applicable requirements and conditions of the City of Ellsworth, Maine Department of Environmental Protection (DEP) regulations, Hancock County Soil and Water Conservation District standards and, if applicable, Army Corps of Engineers (ACOE) and U. S. Environmental Protection Agency (EPA) NPDES Permit requirements, to prevent adverse environmental impacts.
- E. Reference is made to the latest erosion and sedimentation controls and details included in the Drawing set for this project. Strict adherence to the erosion controls and notes and details on the Drawings is required in order to prevent adverse downstream impacts from erosion and sedimentation, originating from on-site construction activity. Reference is also made to Section 31 25 00 - Erosion and Sedimentation Controls.
- F. All existing topsoil on this site shall become property of the Contractor and shall be removed from the site prior to excavation. No topsoil shall be stockpiled on the site without the express written permission of the Owner.

1.02 DESCRIPTION OF WORK:

- A. Provide all labor, material, and equipment as required to complete the following:

- 1. Preparation of final subgrades in all revegetated and landscaped areas.
- 2. Installation of loam over all lawn and planting areas.
- 3. Harrowing, raking and fine grading of all loamed areas.
- 4. Soil treatment, as required.
- 5. Watering as necessary, from on-site sources.

1.03 QUALITY ASSURANCE; SUBMITTALS:

- A. General: Comply with requirements of the General Conditions for Submittals and Quality Control.
- B. Materials Testing: All loam shall be tested by an approved soils testing laboratory which normally provides testing of agricultural soils.
 - 1. The soils testing laboratory shall analyze the Contractor's sample(s) and shall identify the materials and the rates of distribution required to meet the Specifications for loam. The

laboratory shall also recommend the addition of fertilizer and limestone to meet Specifications for pH and nutrient levels.

2. The amended loam, unless otherwise Specified or approved, shall have an acidity range of approximately 5.5 pH to 7.6 pH.
3. The organic content of loam shall be not less than 4% or more than 20% as determined by the wet combustion method (chromic acid reduction).
4. There shall be not less than 20% loam nor more than 80% loam passing the 200 mesh sieve, as determined by the wash test made in accordance with the standard test ASTM D1140.
5. All laboratory testing of loam shall be at the Owner's expense. All sampling and related costs shall be at the Contractor's expense. Test reports shall be forwarded to the Owner, Engineer, and Contractor.

C. Submittals required:

1. Loam samples for testing, as Specified herein.

1.04 PLANTING SEASON:

- A. Install topsoil and related materials during season or seasons normal for such Work. More specifically, construct lawns and landscaped areas between April 30 and June 30 and between August 15 and October 15.
- B. Contractor may perform landscaping Work during unseasonable conditions only if approved by the Architect/Engineer. No additional compensation will be allowed, and Work is subject to approval as to time and methods of operation and DEP or local conditions of approval.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Topsoil:

1. The Contractor shall notify the Architect/Engineer in advance of the time he intends placing topsoil. No topsoil may be placed without proper authorization from the Architect/Engineer.
2. The Contractor may reuse existing on-site topsoil from off-site stockpile, after samples are taken and tested by an approved laboratory as Specified herein, and the results sent to the Architect/Engineer for review and approval.
3. Amend topsoil as required by the Architect/Engineer, based on laboratory testing, prior to spreading. No topsoil shall be amended or spread if it is in a frozen or muddy condition.
4. Off-site topsoil shall be provided as follows:
 - a) Provide new topsoil which is fertile, friable, natural loam, surface soil, reasonably free of subsoil, clay lumps, brush, weeds and other litter, and free of roots, stumps, stones larger than 1/2" in any dimension, and other extraneous or toxic matter harmful to Plant growth. It shall contain at least 4% of decayed organic matter (humus). Topsoil shall not be excessively acid or alkaline nor contain toxic substances which may be harmful to Plant growth.

- b) Obtain topsoil from local sources or from areas having similar soil characteristics to that found at project site. Obtain topsoil only from naturally, well-drained sites where topsoil occurs in a depth of not less than 4 in. Do not obtain from bogs or marshes.
- c) Before any topsoil is delivered, the Contractor shall deliver to the site a sample of proposed supply for inspection, testing, and approval by the Architect/Engineer. Delivery of topsoil may begin upon approval of the sample.
- d) If the topsoil is not approved, additional sources shall be located and sampling and testing shall be accomplished as Specified herein until an approved topsoil material is found, all at the Contractor's expense. Delivery and spreading of topsoil may begin only upon approval of the sample.
- e) No topsoil shall be delivered in a frozen or muddy condition.

B. Fertilizer:

- 1. Provide commercial brand fertilizer of neutral character, the elements of which are derived from organic sources. Fertilizer shall be a standard product complying with state and federal fertilizer laws.
- 2. Actual percentages of nitrogen, phosphorous, and potash shall be based on laboratory test recommendations, as approved by the Architect/Engineer.

For purposes of Bidding: Provide fertilizer with percentage of nitrogen required to provide not less than 1 lb. of actual nitrogen per 100 sq. ft. of lawn area and not less than 4% phosphoric acid and 2% potassium. Provide nitrogen in a form that will be available to lawns during initial period of growth; at least 50% of nitrogen shall contain no less than 3% water-insoluble nitrogen.

- 3. Fertilizer shall be delivered to the site, mixed as Specified, in the original, unopened standard size bags showing weight, analysis and name of manufacturer. Containers shall bear the manufacturer's guarantee statement of analysis, or a manufacturer's certificate of compliance covering analysis, which shall be furnished to the Architect/Engineer. Fertilizer shall be stored in a weatherproof location and in a manner such that it will be kept dry and its effectiveness will not be impaired.

C. Lime:

- 1. Provide natural dolomitic limestone containing not less than 85% of total carbonates with a minimum of 30% magnesium carbonates, ground so that not less than 90% passes a 20-mesh sieve and not less than 50% passes a 100-mesh sieve. Coarser material will be accepted, provided the Specified rates of application are increased proportionately on the basis of quantities passing the 100 mesh sieve.

D. Water:

- 1. Potable water, unless otherwise approved by the Architect/Engineer.

E. Crabgrass Preventative:

- 1. "Tupersan" or approved equal.

F. Broad Leaf Weed Control:

- 1. 2-4-D material.

PART 3 - EXECUTION

3.01 TOPSOIL:

- A. Subgrade Preparation: Subsoil shall be graded and uniformly compacted to a true smooth slope six (6) inches below, and parallel to, the proposed finish grade for areas to be seeded. Subgrade shall be loosened to a depth of two (2) inches. Subsoil shall be kept in a loosened condition until the loam is spread. Subgrade shall be inspected and approved by the Architect/Engineer before placing of loam.
- B. Topsoil Placement: Topsoil shall be placed and spread, compacted and otherwise manipulated, over approved areas to a sufficient depth so that after natural settlement and light rolling, the completed Work shall conform to the lines, grades, and elevations indicated on the Drawings or as directed by the Architect/Engineer.
- C. Topsoil Preparation: After topsoil has been spread, it shall be carefully prepared by scarifying or harrowing and hand raking. The whole surface shall then be rolled with a hand roller weighing not more than one hundred (100) pounds per foot of width. All depressions caused by settlement as a result of rolling shall be filled with additional loam, and the surface regraded and re-rolled until it presents a smooth, even finish to the required grades.
- D. Lime Application: Prior to completion of topsoil preparation, and if recommended as a result of soil analysis, lime shall be evenly distributed and thoroughly worked into the top three (3) inches of topsoil, at the rate recommended by the soil analysis laboratory. Limestone shall be applied at least seven (7) days before applying fertilizer. The pH content of the loam shall be 6.0 to 7.0 before sod or seed is placed. Fine grade the topsoil to a smooth, friable, fine texture surface, free of hollows, bumps or depressions. Remove all stones over 1" in diameter, stocks, roots or other extraneous matter. Avoid over compaction of topsoil.
- E. Fertilizer Application: Commercial fertilizers shall be uniformly applied in all new grass areas. The application shall be within one week prior to placement of sod or seed, at the rate recommended by the soil analysis laboratory, and worked lightly into the top two (2) inches of loam. Grass areas shall be watered thoroughly after the application of fertilizers.

END OF SECTION

SECTION 32 92 20

SEEDING

PART 1 - GENERAL

1.01 GENERAL PROVISIONS:

- A. Coordinate Work with that of other trades affecting or affected by Work of this Section. Cooperate with such trades to assure the steady progress of the Work.
- B. The "Standard Specifications" referred to herein is the book entitled "*Standard Specifications*" published by the State of Maine Department of Transportation, latest edition, and Supplemental Specifications in Force, excluding the following portions thereof:

Division 100 Sections 102 Through 109 Numerical Index of Payment Items Included in Each Section.

Those Sections of the aforementioned *Standard Specifications* which are cited herein are applicable to the Work of this Contract as they may be modified, amplified or added to by this Section.

- C. All Work shall comply with applicable requirements and conditions of the City of Ellsworth, Maine Department of Environmental Protection (DEP) regulations, Hancock County Soil and Water Conservation District standards and, if applicable, Army Corps of Engineers (ACOE) and Maine Department of Environmental Protection (MDEP) MEPDES Permit requirements, to prevent adverse environmental impacts.
- D. Reference is made to the Erosion and Sedimentation Control Plan included in the Drawing set for this project. Strict adherence to this Plan and erosion controls and notes on Drawings is required in order to prevent adverse downstream impacts from erosion and sedimentation, originating from on-site construction activity. Reference is also made to Section 31 25 00 - Erosion and Sedimentation Controls.
- E. All existing topsoil on this site shall become property of the Contractor and shall be removed from the site prior to excavation. No topsoil shall be stockpiled on the site without the express written permission of the Owner.

1.02 DESCRIPTION OF WORK:

- A. Provide all labor, material, equipment and services as required to complete the following:
 - 1. Seeding of lawns, slopes, swales, berms, etc. as specified.
 - 2. Sodding of lawns, slopes, swales, berms, etc. as specified.
 - 3. Interim watering, fertilization and maintenance, as required.

1.03 QUALITY ASSURANCE; SUBMITTALS:

- A. General: Comply with requirements of the General Conditions for Submittals and Quality Control.
- B. Submittals required:
 - 1. Certificate from vendor that the seed being supplied complies with these Specifications.
 - 2. Certificate from vendor stating mulch for the hydroseeding conforms to that Specified.
 - 3. Certificate from vendor stating turfgrass sod for sodding conforms to that Specified.

1.04 PLANTING SEASON:

- A. Plant lawns and grassed areas during season or seasons normal for such Work. More specifically, construct landscaped areas between May 1 and September 15.
- B. Contractor may construct lawns, etc. during unseasonable conditions only if approved by the Architect/Engineer. No additional compensation will be allowed, and Work is subject to approval as to time and methods of operation.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws, as applicable.
- B. Sod: Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" in TPI's "Guideline Specifications to Turfgrass Sodding." Deliver sod in time for planting within 24 hours of harvesting. Protect sod from breakage and drying.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Grass Seed Mixtures: the following seed mixtures shall be used as Specified herein, unless otherwise indicated on Drawings: Seed shall be delivered pre-mixed to the site in standard size sealed containers, bearing the vendor's guaranteed statement attesting to the composition of the mixture and to the percentages of purity and germination of each variety. Seed shall be stored in such a manner that its effectiveness is not impaired. Samples of seed shall be taken as directed by the Architect/Engineer and shall be submitted to the State Agricultural Station for analysis upon request.
- 1. Park Mixture: Parks, playgrounds, campus areas, and other high traffic areas requiring high levels of maintenance and frequent mowing shall be seeded at the rate of 3 lbs/1,000 sq. ft. with fresh, clean, new crop seed, conforming to MDOT *Standard Specifications* 618.01 (a) and 717.03 (a), Method Number 1, and shall be composed of the following varieties:

PARK MIXTURE:

<u>Seed Name</u>	<u>%Mix (by weight)</u>	<u>Germination</u>	<u>Purity</u>
Creeping Red Fescue	45 %	80 %	85 %
Kentucky Bluegrass	25 %	80 %	85 %
Chewings Fescue	15%	80%	85%
Perennial Rye	10 %	80 %	85 %
Annual Ryegrass	5%	80%	85%

- B. Sod: Certified Number 1 Quality/Premium, including limitations on thatch, weeds, diseases, nematodes, and insects, complying with "Specifications for Turfgrass Sod Materials" in TPI's "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture, strongly rooted, and capable of vigorous growth and development when planted.

- a. Turfgrass Species: Sod of grass species as follows, with not less than 95 percent germination, not less than 85 percent pure seed, and not more than 0.5 percent weed seed:
 - i. Full Sun: Kentucky bluegrass (*Poa pratensis*), a minimum of three cultivars.

C. Mulch:

1. Clean hay free of weed seed.

PART 3 - EXECUTION

3.01 SEEDING:

- A. Hydroseeding: Upon completion of topsoil preparation and fine grading as Specified in Section 02920-Topsoil, hydroseed all prepared areas with a seed, lime and mulch slurry. Rates of mix as follows:

Seed: 175 lbs. per acre
Lime: 1440 lbs. per acre
Mulch: 1,750 lbs. per acre
Fertilizer: 390 lbs. per acre

1. Hydroseeding equipment shall maintain the slurry in an agitated condition and distribution shall be uniform in all areas. Furnish a certified statement prior to this Work, as to the number of pounds of lime, seed and mulch per 100-gallon unit of water. This statement should specify the number of square yards of seeding that can be covered per unit of the solution and confirm that specified application rates shall be met.
 2. Hydroseeding shall be done with suitable standard equipment capable of spreading at the above rates. Exercise care in hydroseeding. Do not perform hydroseeding operations on a windy day; keep mixture off all equipment, structures, vehicles, pedestrians and pavement. Protect newly seeded areas from erosion, traffic, etc.
- B. Mechanical Seeding: Mechanical seeding shall be done on dry or moderately dry soil, and at a time when wind does not exceed a velocity of five (5) miles per hour. Seeding shall be done in two directions, at right angles, in such a manner that a uniform stand shall result without bare spots. Seed shall be sown evenly by hand, or with an approved mechanical spreader, to a depth not exceeding one-fourth (1/4) inch, at the rate of five (5) pounds per one thousand (1000) square feet of area.
1. After seeding, the surface shall be evenly and lightly raked with a fine wood-toothed rake or other approved method, and rolled in both directions with a hand roller weighing not more than one hundred (100) pounds per foot of width, and then watered thoroughly with a fine spray.
 2. Maintain a moist seedbed until a thick stand of grass is produced. Furnish sufficient watering equipment to apply water to a minimum 2 in. depth in a 24-hour period, to assure continued growth of germinated grass. Watering shall be done to provide uniform coverage, prevent erosion, and prevent damage from watering equipment to the finished surface.
- C. Mulching of Seeded Areas: Mulch to be 1 in. deep over all grassed areas with sufficient density so that bare soil is not visible through mulch (75-90 lbs/1000 SF).

3.02 SODDING:

- A. Lay sod within 24 hours of harvesting. Do not lay sod if dormant or if ground is frozen or muddy.

- B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to subgrade or sod during installation. Tamp and roll lightly to ensure contact with subgrade, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.
 - a. Lay sod across angle of slopes exceeding 1:3.
 - b. Anchor sod on slopes exceeding 1:6 with wood pegs[or steel staples] spaced as recommended by sod manufacturer but not less than 2 anchors per sod strip to prevent slippage.
- C. Saturate sod with fine water spray within two hours of planting. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches (38 mm) below sod.

3.03 MAINTENANCE:

- A. Upon completion of Seeding and prior to Acceptance, remove from the site excess soil and debris, and repair all damage resulting from landscaping operations.
- B. Seed maintenance shall begin immediately after each area is planted. Areas shall be watered, mowed, weeded, replanted, fertilized, cultivated, and otherwise maintained and protected as necessary to establish a uniform stand of the Specified grasses, until Acceptance.
- C. At the time of first cutting, keep mower blades not less than 2-1/2 inches high. After the grass has started, all areas and parts of areas which fail to show a uniform stand of grass, for any reason whatsoever, shall be reseeded and such areas and parts of areas shall be reseeded repeatedly until all areas are covered with a satisfactory growth of grass.
- D. The Contractor shall maintain seeded areas until final Acceptance at the completion of the Contract.
- E. Protect seeded areas against trespassing as necessary, by utilizing 4-ft. high barrier fencing, using steel drive posts and 2 inch by 4 inch welded wire mesh, or by other approved means. Damage resulting from erosion, gulleys, washouts, vehicle traffic, or other causes shall be repaired by filling with approved topsoil, tamping, refertilizing and reseeding by the Contractor at his expense, if such damage occurs prior to Acceptance of the seeded area.
- F. Seeded and sodded areas shall be watered in a satisfactory manner during and immediately after planting, and not less than twice per week, until Acceptance. Contractor shall furnish his own hose and hose connections from the outlets where water is furnished, and shall provide all necessary watering equipment. If water is not available from the Owner, suitable water shall be provided by the Contractor.
- G. All seeded and sodded areas shall be guaranteed for three (3) mowings by the Landscape Contractor, with notification to the Architect/Engineer between each mowing.
- H. Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and mulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
- I. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 1/3 of grass height. Remove no more than 1/3 of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet.

3.04 INSPECTION AND ACCEPTANCE:

- A. The Architect/Engineer will inspect all Work upon the written request of the Contractor, received at least 10 days before the anticipated date of lawn inspection.
- B. To be acceptable, a stand of grass shall consist of a uniform stand of at least 70 percent established permanent grass species.
- C. Architect/Engineer's inspection shall determine whether maintenance shall continue in any part.
- D. Furnish full and complete written instructions for maintenance of the lawns to the Owner, at the time of Acceptance.
- E. After all necessary corrective Work and clean-up has been completed, and maintenance instructions have been received by the Owner, the Architect/Engineer will certify in writing the Acceptance of the lawns or other grassed areas. The Contractor's responsibility for maintenance of grassed areas, lawns, or parts of lawns, shall cease on receipt of Acceptance.

END OF SECTION

SECTION 32 93 00 PLANTS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS:

- A. Coordinate Work with that of other trades affecting or affected by Work of this Section. Cooperate with such trades to assure the steady progress of the Work.
- B. The "Standard Specifications" referred to herein is the book entitled "Standard Specifications" published by the State of Maine Department of Transportation, latest edition, and Supplemental Specifications in Force, excluding the following portions thereof:

Division 100 Sections 102 Through 109 Numerical Index of Payment Items Included in Each Section.

Those Sections of the aforementioned *Standard Specifications* which are cited herein are applicable to the Work of this Contract as they may be modified, amplified or added to by this Section.

- C. All Work shall comply with applicable requirements and conditions of the City of Ellsworth, Maine Department of Environmental Protection (DEP) regulations, Hancock County Soil and Water Conservation District standards and, if applicable, Army Corps of Engineers (ACOE) and Maine Department of Environmental Protection (MDEP) MEPDES Permit requirements, to prevent adverse environmental impacts.
- D. Reference is made to the Erosion and Sedimentation Control Plan included in the Drawing set for this project. Strict adherence to this Plan and erosion controls and notes on Drawings is required in order to prevent adverse downstream impacts from erosion and sedimentation, originating from on-site construction activity. Reference is also made to Section 31 25 00 - Erosion and Sedimentation Controls.
- E. All existing topsoil on this site shall become property of the Contractor and shall be removed from the site prior to excavation. No topsoil shall be stockpiled on the site without the express written permission of the Owner.

1.2 DESCRIPTION OF WORK:

- A. Provide all labor, material, equipment and services as required to complete the following:
 - 1. Planting of trees, shrubs, and perennials as specified.
 - 2. Interim watering, fertilization and maintenance, as required.
 - 3. Planting soil as specified.
 - 4. Tree stabilization as specified.

1.3 QUALITY ASSURANCE; SUBMITTALS:

- A. General: Comply with requirements of the General Conditions for Submittals and Quality Control.
- B. Submittals required:
 - 1. Product Data: For each type of product indicated, including soils.
 - a. Plant Materials: Include quantities, sizes, quality, and sources for plant materials.
 - b. Pesticides and Herbicides: Include product label and manufacturer's application instructions specific to the Project.
 - 2. Qualification Data: For qualified landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.
 - 3. Certification:
 - a. For information only, submit 2 copies of certificates of inspection as required by governmental authorities, and manufacturer's or vendor's analysis for soil amendments and fertilizer materials. Submit other data substantiating that materials comply with specified requirements.
 - b. Submit seed vendor's certified statement for each grass seed mixture required, stating botanical and common name, percentage by weight, and percentages of purity, germination, and weed seed for each grass seed species.
 - 4. Material Test Reports: For imported or manufactured topsoil.
 - 5. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of plants during a calendar year. Submit before start of required maintenance periods.
- C. DELIVERY, STORAGE, AND HANDLING
 - 1. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws if applicable. Protect materials from deterioration during delivery, and while stored at the site.
 - 2. Plant Materials:
 - a. In preparing plants for moving, all precautions customary in good trade practice shall be taken. All plants shall be dug immediately before moving unless otherwise specified. Broken, loose, or manufactured balls will be rejected.
 - b. All plants shall be packed, transported, and handled with utmost care to insure adequate protection against injury and drying. Do not bend or bind-tie trees or shrubs in such manner as to damage bark, break branches or destroy natural shape. Provide protective covering during delivery.
 - c. Deliver plant materials after preparations for planting have been completed and plant immediately. If planting is delayed more than 6 hours after delivery, set all plants in shade, protect from weather and mechanical damage, and keep roots moist.
 - d. Label all plant materials of each variety with a securely attached waterproof tag bearing legible designation of botanical and common name.
 - 3. Bulk Materials:
 - a. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 - b. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 - 4. Deliver bare-root stock plants freshly dug. Immediately after digging up bare-root stock, pack root system in wet straw, hay, or other suitable material to keep root system moist until planting.

5. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.
6. Handle planting stock by root ball.
7. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.
 - a. Heel-in bare-root stock. Soak roots that are in dry condition in water for two hours. Reject dried-out plants.
 - b. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
 - c. Do not remove container-grown stock from containers before time of planting.
 - d. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly-wet condition.

D. PROJECT CONDITIONS

1. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.
2. Planting Seasons:
 - a. Plant trees, shrubs, and perennials during seasons or seasons normal for such work, specifically:
 - Potted and Container: April 1 – July 15 or Aug. 15 – Oct. 15.
 - Balled and Burlapped: April 1 – June 15 or Aug. 15 – Oct. 15.
3. Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.
4. Contractor may plant, etc. during unseasonable conditions only if approved by the Landscape Architect/Engineer. No additional compensation will be allowed, and Work is subject to approval as to time and methods of operation.

1.4 DEFINITIONS

- A. Backfill: The earth used to replace or the act of replacing earth in an excavation.
- B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required; wrapped with burlap, tied, rigidly supported, and drum laced with twine with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.
- C. Balled and Potted Stock: Plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required.
- D. Bare-Root Stock: Plants with a well-branched, fibrous-root system developed by transplanting or root pruning, with soil or growing medium removed, and with not less than minimum root spread according to ANSI Z60.1 for type and size of plant required.
- E. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed

- from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.
- F. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.
 - G. Fabric Bag-Grown Stock: Healthy, vigorous, well-rooted plants established and grown in-ground in a porous fabric bag with well-established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60.1 for type and size of plant.
 - H. Finish Grade: Elevation of finished surface of planting soil.
 - I. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
 - J. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
 - K. Pests: Living organisms that occur where they are not desired, or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
 - L. Planting Area: Areas to be planted.
 - M. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
 - N. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.
 - O. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.
 - P. Stem Girdling Roots: Roots that encircle the stems (trunks) of trees below the soil surface.
 - Q. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.
 - R. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
 - S. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.5 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner, or incidents that are beyond Contractor's control.
 - b. Structural failures including plantings falling or blowing over.
 - c. Faulty performance of tree stabilization.
 - d. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 2. Warranty Periods from Date of Planting Completion:
 - a. Trees, Shrubs, Vines, and Ornamental Grasses: 24 months.
 - b. Ground Covers, Biennials, Perennials, and Other Plants: 12 months.
 - c. Annuals: Three months.
 3. Include the following remedial actions as a minimum:
 - a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
 - b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
 - c. A limit of one replacement of each plant will be required except for losses or replacements due to failure to comply with requirements.
 - d. Provide extended warranty for period equal to original warranty period, for replaced plant material.

1.6 MAINTENANCE SERVICE

- A. Initial Maintenance Service for Trees and Shrubs: Provide maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than maintenance period below.
1. Maintenance Period: 12 months from date of planting completion.
- B. Initial Maintenance Service for Ground Cover and Other Plants: Provide maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than maintenance period below.
1. Maintenance Period: Six months from date of planting completion.
- C. Continuing Maintenance Proposal: From Installer to Owner, in the form of a standard yearly (or other period) maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

PART 2 - PRODUCTS

2.1 PLANT MATERIAL

- A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant Schedule or Plant Legend shown on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
 - 1. All plants shall be nursery grown unless otherwise stated, and shall have been growing under the same climatic conditions as the location of this project for at least two (2) years prior to award date of this contract.
 - 2. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 3/4 inch (19 mm) in diameter; or with stem girdling roots will be rejected.
 - 3. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.
- B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Landscape Architect, with a proportionate increase in size of roots or balls.
- C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which shall begin at root flare according to ANSI Z60.1. Root flare shall be visible before planting.
- D. Labeling: Label each plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for the plant as shown on Drawings.
- E. If formal arrangements or consecutive order of plants is shown on Drawings, select stock for uniform height and spread, and number the labels to assure symmetry in planting.
- F. Shrubs and Perennials: Provide healthy, disease-free plants of species and variety shown or listed, with well-established root systems reaching to sides of the container to maintain a firm ball, but not with excessive root growth encircling the container. Provide only plants that are acclimated to outdoor conditions before delivery.
- G. Deciduous Shrubs: Provide balled and burlapped (B&B) deciduous shrubs otherwise noted in plant list. Container grown deciduous shrubs will be acceptable in lieu of balled and burlapped deciduous shrubs as approved by the Owner's Representative.
- H. Coniferous and Broadleafed Evergreens: Provide balled and burlapped (B&B) evergreens. Container grown evergreens will be acceptable as approved by the Owner's Representative.
- I. Deciduous Trees: Provide balled and burlapped (B&B) deciduous trees unless otherwise noted in plant list. Container grown deciduous trees will be accepted in lieu of balled and burlapped deciduous trees as approved by the Owner's Representative.

2.2 INORGANIC SOIL AMENDMENTS

- A. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:
 - 1. Class: T, with a minimum of 99 percent passing through No. 8 (2.36-mm) sieve and a minimum of 75 percent passing through No. 60 (0.25-mm) sieve.

2.3 ORGANIC SOIL AMENDMENTS

- A. Peat Humus: Peat humus shall be a natural peat approved by the Owner's Representative consisting of sedge, sphagnum or reed peat of such physical condition as will pass through a 1 in. screen and will be readily incorporated with the topsoil. The peat humus shall be free from sticks, stones, roots and other objectionable matter.
- B. Manure: Manure shall be dehydrated processed, well-rotted manure subject to approval by the Owner's Representative. Manure shall be free of weeds, grass, or harmful chemicals.

2.4 FERTILIZERS

- A. Fertilizer: Fertilizer shall contain available elements in conformity with the standards of the Association of Official Agricultural Chemists. The fertilizer shall indicate the weight, contents and guarantee analysis shown thereon or on a securely attached tag, as applicable.
 - 1. Granular fertilizer shall be a commercial grade fertilizer containing the following percentages of available nutrients by weight:
 - a. Nitrogen 10 percent
 - b. Phosphoric Acid 10 percent
 - c. Potash 10 percent
 - 2. Water soluble fertilizer shall be completely soluble in water and contain the following percentages of available nutrients by weight. It shall contain a coloring agent.
 - a. Nitrogen 16 percent
 - b. Phosphoric Acid 32 percent
 - c. Potash 16 percent
 - 3. Slow release fertilizer packets shall be slow release fertilizer contained in a polyethylene perforated bag with micropore holes. Each bag shall contain 4 ounces of minimum water soluble fertilizer to be effective for 8 years. Packages shall contain the following percentage of available elements by weight.
 - a. Nitrogen 20 percent
 - b. Phosphoric Acid 10 percent
 - c. Potash 5 percent
- B. The Owner's Representative may approve the use of other fertilizers providing they contain an equivalent amount of nutrients in an acceptable form.
- C. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

2.5 TOPSOIL

- A. Loam or approved topsoil removed within the confines of the project area shall be reused in accordance with Section 312000, Earthwork. If quantity of stockpiled topsoil is insufficient, provide new topsoil which is fertile, friable, natural loam, surface soil, reasonably free of subsoil, clay lumps, brush, weeds and other litter, and free of roots, stumps, stones larger than 2 in. in any dimension, and other extraneous or toxic matter harmful to plant growth. Sand, silt, and clay contents comprising existing or new topsoil shall fall within the following ranges:
 1. Sand 50% - 70%
 2. Silt 2% - 40%
 3. Clay 10% - 28%
- B. Submit representative soil samples of new topsoil from off-site sources as well as existing topsoil removed from within confines of site to qualified soil testing laboratory to ascertain what amendments may be necessary to obtain proper tilth, nutrient characteristics, and pH balance in accordance with the following. Provide amendments as necessary at rates indicated on the soil test.
 1. Organic Matter: greater than 5% organic matter (by weight).
 2. pH Range: 5.8 to 6.2.
 3. Phosphorus/Potassium: medium to medium high range.
 4. Soluble Salt: not greater than 500 ppm.

2.6 MULCHES

- A. Planting Bed Mulch: Provide shredded bark mulch for planting beds. Do not use material that is decayed or mixed with soil, weeds or other foreign matter. Use material that is large enough in size to prevent it from drifting and blowing in normal wind storms. Submit samples to Owner's Representative for approval prior to delivery of bark mulch to site.
- B. Anti-Erosion Mulch: Use "Erosionet" or similar mulch where slopes are too severe to be maintained by planting bed mulch alone.
- C. Mulch Binder: Material for mulch binder may be emulsified asphalt of a type acceptable to the Owner's Representative and may be diluted with water to assure even distribution. Other types of approved mulch binders may be used when authorized by the Owner's Representative.

2.7 TREE STABILIZATION MATERIALS

- A. Stakes and Guys: Provide stakes of sound new hardwood, free of known holes and other defects. Provide wire ties and guys of 2-strand, twisted, pliable galvanized iron wire not lighter than 12 ga. with zinc-coated turnbuckles or an approved equal. Provide new 2-ply garden hose not less than 1/2 in. hose size, cut to required lengths to protect tree trunks from damage by wires or an approved equal.

- B. Wrapping: Wrapping material for tree trunks shall be furnished in strips approximately 4 to 6 inches wide consisting of first quality, 8 oz. per sq. yd. burlap, approved waterproof paper tape or polyethylene film, ASTM D 2103.
- C. Root-Ball Stabilization Materials:
 - 1. Upright Stakes and Horizontal Hold-Down: Rough-sawn, sound, new hardwood or softwood, free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal (38-by-38-mm actual) by length indicated; stakes pointed at one end.
 - 2. Wood Screws: ASME B18.6.1.

2.8 MISCELLANEOUS PRODUCTS

- A. Water: Water used for landscape work shall be free from oil, acids, alkalis, salts, or other substances harmful to plants.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive plants for compliance with requirements and conditions affecting installation and performance.
 - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 - 2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
 - 3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 - 4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Landscape Architect and replace with new planting soil.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Landscape Architect's acceptance of layout before excavating or planting. Make minor adjustments as required.

- D. Apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks (before wrapping), branches, stems, twigs, and foliage to protect during digging, handling, and transportation.
 - 1. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.
- E. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.
- F. Preparation of Planting Soil: Before mixing, clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful or toxic to plant growth. Mix specified soil amendments with topsoil at the rates specified. Unless otherwise specified or indicated on the Drawings, the following planting soil mixture (thoroughly mixed by volume) shall be used for backfill around trees and shrubs: dehydrated processed manure 1 part; topsoil 8 parts; peat moss 3 parts.

3.3 PLANTING AREA ESTABLISHMENT

- A. Preparation of Planting Beds: Loosen subgrade of planting bed areas to a minimum depth of 6 in. using a cultimulcher or similar equipment. Remove stones over 1 1/2 in. in any dimension, and sticks, stones, rubbish and other extraneous matter. Spread planting soil mixture to the 6" minimum depth and as required to meet lines, grades and elevations shown, after light rolling and natural settlement.
- B. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.4 EXCAVATION FOR TREES AND SHRUBS

- A. Excavate pits in accordance with Typical Planting Details with vertical sides and with bottom of excavation slightly raised at center to provide proper drainage. Loosen hard subsoil in bottom of excavation. For balled and burlapped (B&B) trees and shrubs, make excavations at least twice as wide as the ball diameter and a minimum of 1 ft. 6 in. wider than root spread.
- B. Obstructions: Notify Landscape Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.
- C. Drainage: Notify Landscape Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.

3.5 TREE, SHRUB, AND PERENNIAL PLANTING

- A. Before planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.
- B. Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.

- C. Set balled and burlapped stock plumb and in center of planting pit or trench with root flare 2 inches (50 mm) above adjacent finish grades.
1. Use planting soil for backfill.
 2. After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
 3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
 4. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside the root ball about 1 inch (25 mm) from root tips; do not place tablets in bottom of the hole.
 5. Continue backfilling process. Water again after placing and tamping final layer of soil.
- D. Set container-grown stock plumb and in center of planting pit or trench with root flare 2 inches (50 mm) above adjacent finish grades.
1. Use planting soil for backfill.
 2. Carefully remove root ball from container without damaging root ball or plant.
 3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
 4. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside the root ball about 1 inch (25 mm) from root tips; do not place tablets in bottom of the hole.
 5. Continue backfilling process. Water again after placing and tamping final layer of soil.
- E. Set fabric bag-grown stock plumb and in center of planting pit or trench with root flare 1 inch (25 mm) above adjacent finish grades.
1. Use planting soil for backfill.
 2. Carefully remove root ball from fabric bag without damaging root ball or plant. Do not use planting stock if root ball is cracked or broken before or during planting operation.
 3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
 4. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside the root ball about 1 inch (25 mm) from root tips; do not place tablets in bottom of the hole.
 5. Continue backfilling process. Water again after placing and tamping final layer of soil.
- F. Set and support bare-root stock in center of planting pit or trench with root flare 1 inch (25 mm) above adjacent finish grade.
1. Use planting soil for backfill.
 2. Spread roots without tangling or turning toward surface, and carefully work backfill around roots by hand. Puddle with water until backfill layers are completely saturated. Plumb before backfilling, and maintain plumb while working backfill around roots and placing layers above roots.
 3. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside

soil-covered roots about 1 inch (25 mm) from root tips; do not place tablets in bottom of the hole or touching the roots.

4. Continue backfilling process. Water again after placing and tamping final layer of soil.
- G. When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.
- H. Dish completed planting pits to form shallow (4") saucer to collect water. Mulch pits, trenches and planted areas with at least 4 in. thickness of shredded bark or equivalent substitute approved by Owner's Representative.
- I. Apply anti-desiccant using power spray to provide an adequate film over trunks, branches, stems, twigs, and foliage. If deciduous trees or shrubs are moved in full-leaf, spray with anti-desiccant at nursery before moving and again 2 weeks after planting.
- J. Prune, thin out and shape trees and shrubs in accordance with standard horticultural practice. Remove dead, broken, or diseased branches. Prune trees to retain required height and spread. Unless otherwise directed by the Owner's Representative, do not cut tree leaders, and remove only injured or dead branches from flowering trees, if any. Prune shrubs to retain natural character and accomplish their use in the landscape design. Pruning cuts shall be made to outside the branch color or branch bark ridge; tree paint is not permitted. Required shrub sizes are the size after pruning. Remove and replace excessively pruned or misformed stock resulting from improper pruning.
- K. Wrap tree trunks of 2 in. caliper and larger. Start at ground and cover trunk to height of first branches and securely attach. Inspect tree trunks for injury, improper pruning and insect infestation and take corrective measures required before wrapping. Wrapping shall only be present from November 1st to April 1st.
- L. Immediately after planting, guy and stake trees of 1-1/2 in. caliper or larger or over 6 ft. in height on planting schedule. Allow plants to have normal sway to promote strong growth.
- M. Plant labels shall be removed immediately after acceptance by Landscape Architect.

3.6 FERTILIZING TREES AND SHRUBS

A. Water Soluble Fertilizer:

1. The first liquid feeding will be permitted as the first watering only during backfilling of the plant, unless otherwise directed by the Owner's Representative. All seedlings will be liquid fed during planting. The second liquid feeding will be made the following spring season, no later than June 30th.
2. Liquid fertilizer shall be completely dissolved and mixed in water at the rate of 6 lbs. of the fertilizer concentrate to 100 gallons of water.
3. The resulting solution shall be poured in the plant pit as directed by the Owner's Representative. A second application at the same rate shall be applied as directed by the Owner's Representative. The solution shall be applied at the following rates for each application:
 - a. Plants up to 2 ft. in height shall receive 4 quarts.
 - b. Plants above 2 ft. and up to 6 ft. shall receive 6 quarts.
 - c. Plants above 6 ft. and up to 12 ft. shall receive 12 quarts.
 - d. Plants above 12 ft. shall receive 16 quarts.

B. Slow Release Fertilizer Packets:

1. All woody plants except evergreen seedlings shall be fertilized with slow release fertilizer packets at the time of planting, unless otherwise directed by the Owner's Representative. Fertilizer packets shall be placed equidistantly within the planting pit adjacent to the ball or root mass, but not in direct contact with roots. Placement depth shall be 6 to 8 inches. Packets shall not be cut, ripped or damaged.
2. If it becomes necessary to remove and replace dead or unhealthy plants, damaged or broken packets shall be replaced with new packets. The application rates shall be as follows:

Type of Plants	No. of Packets
Evergreen Trees	
Under 18 inches height	1
18 inches to 3 ft. height	2
3 ft. to 6 ft. height	3
Over 6 ft. height	4
Deciduous Trees	
Under 6 ft. height	2
6 ft. to 12 ft. height or under 4 in. caliper	3
Over 4 inches caliper	4
Shrubs	
Under 2 ft. height or spread	1
2 ft. to 3 ft. height or spread	2
Over 3 ft. height or spread	3
Vines and Ground Covers	1

3.7 PLANT MAINTENANCE

- A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings. Spray or treat as required to keep trees and shrubs free of insects and disease.
- B. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.
- C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

3.8 PLANT ACCEPTANCE

- A. The acceptability of the plant material furnished and planted under this Contract shall be at the end of a period of establishment, during which the Contractor, as necessary, shall employ all possible means to preserve the plants in a healthy and vigorously growing condition and to insure their successful establishment. The establishment period shall extend for a period of one (1) calendar year from the date of final acceptance of the project. During this period, the Contractor shall water, cultivate and prune the plants, repair guy wires and stakes, mouse bait

as may be required and do any other work necessary to maintain the plants in a healthy growing condition. This shall include seasonal spraying with approved insecticides or fungicides as may be required. The Contractor shall also be responsible for protecting the plants from mice and other rodents. All dead or rejected plants shall be promptly removed from the project and replaced by live healthy plants meeting the same specifications, if such plants are declared unacceptable during this planting season. Otherwise, they shall be replaced during the next subsequent planting season. No payment shall be made for unsatisfactory work during the establishment period.

- B. The period of establishment shall commence at the date of final acceptance. Necessary replacements shall be made so that at the time of final acceptance all plants shall be in a healthy, vigorous growing condition and free from sizable die-back.
- C. It shall be the sole responsibility of the Contractor to replace any unsatisfactory plants on the project regardless of whether they are specifically designated by the Owner's Representative. In the case of individual doubtful plants, the Contractor may call upon the Owner's Representative to make a determination as to their acceptability, but it shall not be incumbent on the Owner's Representative to furnish the Contractor with exact lists of replacements.
- D. All replacements of plants shall be completed by the end of the planting season prior to the final acceptance date. Any small quantity of plants which fail between the end of the planting season and the final acceptance date shall be canceled from the list of accepted plants and the Contractor will receive no payment for them. If a sizable number fails, the Owner's Representative may extend the date of final acceptance to the subsequent planting season, in which case, the Contractor will be subject to liquidated damages, to be established by the Owner's Representative. All replacement planting shall conform in every way to the requirements of the original planting. The Owner's Representative may require that any replacement plants that are not dormant, or that are planted late in the season, be sprayed, as directed, with an approved anti-desiccant.

3.9 CLEANUP AND PROTECTION

- A. During planting, keep adjacent paving and construction clean and work area in an orderly condition.
- B. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.
- C. After installation and before Substantial Completion, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

3.10 RESTORATION

- A. All pavements, seeded and planted areas, structures and substructures not specifically provided for in the contract disturbed by the Contractor during the execution of the work shall be restored by the Contractor, in a manner satisfactory to the Owner's Representative, to their original conditions at no additional cost to the Owner.

3.11 DISPOSAL

- A. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.

END OF SECTION

SECTION 33 10 50

WATER DISTRIBUTION SYSTEMS

PART I - GENERAL

1.01 GENERAL PROVISIONS:

- A. Coordinate Work with that of other trades affecting or affected by Work of this Section. Cooperate with such trades to assure the steady progress of the Work.
- B. The Standard Specifications referred to herein is the book entitled "*Standard Specifications, Highways and Bridges*" published by the State of Maine Department of Transportation, latest edition and Supplemental Specifications in Force, excluding the following portions thereof:

Division 100 Sections 102 Through 109 Numerical Index of Payment Items Included in Each Section.

Those Sections of the aforementioned *Standard Specifications*, which are cited herein, are applicable to the Work of this Contract as they may be modified, amplified or added to by this Section.

- C. The Contractor shall Work in close cooperation with the Ellsworth Water Department (referred to herein as the *Water Department*), other affected utility companies and the City of Ellsworth, to the end that all Work is constructed with their standard practices and regulations.

1.02 DESCRIPTION OF WORK:

- A. Provide labor, materials, equipment and services necessary for the following:
 - 1. Excavation, trenching, bedding and backfilling as required for all underground water and fire protection system piping and appurtenances.
 - 2. Installation of underground water and fire protection distribution piping, thrust blocks, valves, fire hydrants, and other appurtenances, as indicated on the Drawings and as required for the complete system.

1.03 QUALITY CONTROL; SUBMITTALS:

- A. General: Comply with requirements of the General Conditions for Submittals and Quality Control.
- B. Shop Drawings: Submit product specification literature and/or shop drawings for:
 - 1. All ductile iron water pipe, valves, fittings, etc.
 - 2. All copper tubing, HDPE pipe and HDPE CST tubing including fittings, joints and couplings, valves, corporation stops, etc.

1.04 AS-BUILT DRAWINGS:

- A. As-built scale drawings, accurately showing actual locations and elevations of all underground and surface water lines and appurtenances, shall be produced, updated and maintained by the Contractor during the progress of Work and shall be turned over to the Architect/Engineer at the completion of the project.

PART 2 - PRODUCTS

2.01 UTILITY TRENCHES:

- A. Sand Bedding Material for Water Lines: Well-graded Sand Bedding Material, as specified under Section 31 23 00 – Excavation, Backfill and Compaction.
- B. Granular Backfill: Well-graded sand or gravel Granular Borrow, as specified under Section 31 23 00 – Excavation, Backfill and Compaction.

2.02 WATER SERVICE AND FIRE PROTECTION:

Note: All water service materials shall be in conformance with the *Water Department* Standards and Specifications and as specified herein. Contractor shall obtain specifications and standards for materials and water line installation from the *Water Department* and shall notify the Architect/Engineer of any conflicts or discrepancies with these Specifications.

- A. Pipe: All water pipe shall be in conformance with *Water Department* Standards and Specifications.
 - 1. Ductile Iron: Pipe shall be ductile iron centrifugally cast with push-on joints conforming to AWWA/ASNI C151/A21.51. Pipe shall be Class 52, double cement lined and bituminous coated conforming to AWWA/ANSI C151/A21.51. Ten percent of the pipe shall be suitable for field cutting and marked as such. Polyethylene encasement meeting the requirements of AWWA C105 shall be utilized on all ductile iron pipe installed in corrosive soils.
 - 2. High Density Polyethylene (HDPE) pipe shall be manufactured in accordance with AWWA C906. This material shall have a long-term Hydrostatic Strength of 1600 psi when tested in accordance with ASTM D2837. HDPE shall be manufactured from PE 4710 polyethylene compounds that meet or exceed ASTM D3350 cell classification 4445574. The manufacturer shall comply with NSF Standard 61 and/or Standard 14 and must be certified by the NSF International for potable water.

HDPE pipe and fittings shall have a Standard Dimension Ratio (SDR) of 11 and be rated for a working pressure of 200 psi at a temperature of 75 degrees Fahrenheit with a service life of 50 years. All pipe and fittings shall be ductile iron pipe size.
 - 3. Copper Tubing: Copper tubing shall be type “K” soft copper (ASTM B88).
 - 4. Copper Tube Size (CTS) HDPE: HDPE pipe shall be CST and conform to AWWA C901-02 (PE 3608 Pressure Class 200) standards and be clearly marked. Stainless steel inserts and compression fittings must be used at all joints. Tubing shall be approved for potable water service by the National Sanitation Foundation and bear the NSF seal. The product shall be rated for a minimum 200 working psi and standard ratio (SDR) shall not exceed 9 for tubing size. Fittings shall be equipped with compression-type connections with insert stiffeners. CST HDPE pipe shall comply with AWWA C-901, ASTM D 1248 and D 2737, PE 3608.
- B. Brass Fittings: All fittings will be made of No Lead Brass (0.25% lead or less brass) such as Enviro Brass or approved equal.
- C. Blank Flanges: 250 lbs. Class 125 bolt hole (C115/A21.15)
- D. Brass Fittings for Type “K” Copper and HDPE (CTS):
 - 1. 3/4-inch through 2-inch brass fittings shall have a lead content meeting standards noted above for the fitting in question. The vendor shall supply *Water Department* with the lead content of the fittings. Fittings shall conform to ASNI/AWWA C800 standards for Type “K” soft copper and shall be compression type on the copper end. CST HDPE pipe shall have stainless steel stiffeners.
 - 2. Brass Goods (Miscellaneous) shall be 125 lbs., brass shall have a lead content meeting standards noted above for the fitting in question. The vendor shall supply *Water Department* with the lead content of the fittings, with iron pipe size (IPS) threads shall be used for connecting water services. Items included are bushings, couplings, elbows, nipples, plugs, and tees. Manufactured by Lee, Wheeler, Nibco, Hayes, Ford, McDonald EB2, Mueller, Cambridge Brass, or approved equal.

3. Corporation Stops: 3/4-inch and 1-inch corporations shall have a lead content meeting the standards noted above. The vendor shall supply the *Water Department* with the lead content of fittings. Corporations shall have a ball valve type construction with inlet CC thread and compression pack joint on the outlet, heavy patterns, and shall conform to AWWA/ANSI C800.

1 1/4-inch to 2-inch shall have a lead content meeting standards noted above for the fitting in question. The vendor shall supply *Water Department* with the lead content of the fittings, with inlet iron pipe thread and compression pack joint on the outlet, heavy patterns, and conforming to AWWA/ANSI C800. Manufactured by Ford, Hayes, McDonald EB2, Mueller, Cambridge Brass, or approved equal.
4. Curb Stops: Curb stops shall have a lead content meeting standards noted above. The vendor shall supply *Water Department* with the lead content of the fittings. Curb stops shall have a ball valve type construction or approved equal with compression pack joints on each end. Curb stops shall open left with no drain, have heavy patterns, and shall conform to AWWA/ANSI C800. Curb stops shall be manufactured by Ford, Hayes, McDonald EB2, Mueller, Cambridge Brass, or approved equal.
- E. Copper Meter Setters: Meter setters 5/8 x 3/4-inch and 3/4-inch meters shall have compression pack joint connections on the inlet and outlet ends suitable for 3/4-inch copper tubing. Meter setters for one-inch meters shall have female iron pipe thread connections on the inlet and outlet ends. Two meter gaskets shall be supplied with each horn. Manufactured by McDonald EB2, Cambridge Brass, or approved equal.
- F. Duc Lugs and Tie Bolts: Duc lug bolts shall be Star Supply Corp. or approved equal. Tie bolts with hexagonal nuts shall be Star Supply Corp. or approved equal.
- G. Flange Adapters: Flange adapter couplings shall have either ductile iron ASTM A536 or gray iron ASTM A126 body. Bolt circle, bolt size, and spacing shall conform to ANSI 150 lbs. flange drilling. Grade 30 gasket with either a malleable iron ASTM A47 or ductile iron ASTM A536 follower. Anchor studs shall be installed for a minimum working pressure of 125 psi. Bolts and nuts shall be ductile iron ASTM A536, Rockwell 912, or approved equal.
- H. Fire Hydrants:
 1. Approved Hydrants: Waterous Pacer Model WB-67-250.
 2. The hydrant shall open right.
 3. The operating nut shall:
 - a. be D.I. or bronze
 - b. be pentagon in shape with dimensions: Top 1-13/16" tapering to 1-7/8" on bottom.
 4. Nozzles shall be:
 - a. 2 each – 2-1/2" National Standard Thread
 - b. 1 each – 4-1/2" National Standard Threadbottom.
 5. Port covers shall be supplied without chains and shall have the same size pentagon operator as specified herein
 6. Traffic model hydrant with breakaway feature
 7. Barrel length(s) shall be:
 - a. 6 ft. cover, 6-1/2 ft. bury; or
 - b. 5-1/2 ft. cover, 6 ft. bury, or
 - c. 5 ft. cover, 5'-6" bury
 8. Hydrant shoe or base shall have the following:
 - a. 6" MJ inlet;
 - b. 5-1/4" valve opening with non-draining bronze seat that is permanently plugged;
 - c. Valve seat and sub-seat arrangement shall be bronze to bronze;
 - d. Horizontal and vertical blocking planes manufactured into hydrant base
 9. Bolts:
 - a. All buried mechanical joint bolts and nuts (T-head, etc.) shall be Cor-Ten or equal;
 - b. All buried flange joint bolts shall be stainless steel (Type 304) or silicone bronze.
 10. Protective Coatings shall consist of the following:
 - a. All paintings and coatings shall be a minimum of 3 mils total dry film thickness, unless noted
 - b. The internal area of the hydrant base, which is normally exposed to water and which includes the internal body of hydrant shoes, including lower valve plate, shall be epoxy coated

- c. All internal and external cast iron or ductile iron components shall be coated with an approved bituminous coating, 3 mils minimum
 - d. Coatings for upper barrel - exterior:
 - i. Surface preparation blast clean SSPC-SP-6
 - ii. Primer Sherwin Williams Red Oxide E61RC21, 1.5 mils, dry
 - iii. Finish coat Sherwin Williams – Regal Yellow, F78Y30, 1.5 mils, dry or sufficient paint to hide the second coat
 - iv. Total dry film thickness - 3 mils minimum.
 - e. Coatings for bonnet, operating nut, port cap:
 - i. Surface preparation: Blast clean, SSPC-SP-6
 - ii. Exterior primer
 - iii. Exterior aluminum
 - iv. Total dry film thickness: 3 mils minimum.
11. Flow Indicator Collars: *Water Department* personnel shall install flow indicator collars on all new hydrants
12. Field Test of Installed Hydrant
- a. Hydrant flow shall completely stop with no more than 200 ft. lb. of torque applied to the operating nut.
 - b. Failure to shut completely at no more than 200 ft. lb. of torque will be cause for rejection of that hydrant.
- I. Pipe Couplings: Sleeves shall be epoxy coated ductile iron ASTM A536, and shall have smooth inside taper for uniform gasket seating. Gasket shall be grade 30. Follower flanges shall be ductile cast iron ASTM A536. Bolts shall be 304 stainless steel with heavy 304 stainless steel hexagon nuts conforming to ANSI/AWWA C111/A 21.11 standards. OD range shall be approved by the *Water Department*. Ford coupling or approved equal.
- J. Pipe Fittings: Pipe fittings shall have mechanical joint ends conforming to ANSI/AWWA C111/A21.11, double cement lining and bituminous coating conforming to ANSI/AWWA C104/A21.4. Fittings shall be supplied with mechanical joint accessories unless specified otherwise, with high strength low alloy steel bolts and heavy hexagon nuts conforming to ANSI/AWWA C111/A21.11. Long body fittings shall be Class 350 ductile iron conforming to ANSI/AWWA C110/A21.10. Compact body fittings shall be Class 350 ductile iron conforming to ANSI/AWWA C153/A21.53.
- K. Repair Sleeves: Repair sleeves shall have single band of 304 stainless steel with malleable iron ASTM A47 grade 32510 lugs, grade 30 gasket and high strength low alloy steel bolts with heavy semi-finished hexagon nuts conforming to AWWA/ANSI C111/A21.11 or 3904 stainless steel bolts and nuts as manufactured by Rockwell or approved equal.
- L. Retainer Glands: Mechanical joint retainer glands shall be heavy duty ductile iron body, UL or FM approved, and shall have a minimum pressure rating of 350 psi for 4-inch and 6-inch, and 250 psi for 8-inch and larger. Set screws shall be either “Cor-Ten” steel, ductile iron, or approved equal. The number of set screws shall be equal or greater than the number of the nominal diameter of the gland. Locking rings and megalugs are acceptable replacements for retainer glands, but are not a replacement for thrust blocks.
- M. Service Boxes, Covers, and Rods: Service boxes shall be Erie style with arch pattern, one-inch diameter, constructed from SC #40 Black Steel, adjustable in length from five feet to six feet, and have 1/2-inch diameter stainless steel rod 36-inches in length with brass cotter pins. One-inch caps shall be heavy with brass pentagon plug and coarse “rope” thread to fit a one-inch Erie style box. Two-inch caps shall be a #3 cover, cast iron with brass bushing and brass pentagon plug to fit a two-inch Erie style box. All caps shall have the word “WATER” clearly cast in the top and be constructed of magnetic material.
- N. Service Box Foot Adapter: Service box foot pieces shall be cast iron and fit all standard one-inch Erie style service boxes and fit over curb stops larger than one inch.
- O. Service Saddles: Service saddles shall be constructed of ductile iron with epoxy coating and with two stainless steel bands, nuts, and washers. Body castings shall be wrap-around design of high tensile ductile iron conforming to ASTM A536. Gasket shall be of 3 1/2-inch diameter and constructed of Buna-

N, and grooved to conform to the pipe surface, bonded in place for easy installation. Finish shall be epoxy coated. Ford FC202 or approved equal.

- P. Tapping Sleeves: Mechanical joint tapping sleeve shall be ductile iron and have ductile iron mechanical joint end seals conforming to AWWA C111, with outlet flange conforming to AWWA C207, Class D with ANSI 150 lb. drilling recessed for tapping valve. Tapping sleeve shall fit AWWA standard of 1908, Class AB-CD cast iron pipe. Manufactured by Clow, Mueller, or approved equal. Acceptable for cast iron and ductile iron pipe.

Stainless steel tapping sleeve shall be entirely 304 stainless steel or 304 stainless steel body with ductile iron outlet flange conforming to AWWA C207 Class D, ANSI 150 lb. drilling recessed for tapping valve. Bolts shall be high strength 18-8 stainless steel with heavy hexagon nuts conforming to ANSI/AWWA C111/A21.11.

Gasket Material shall be grade 30 or approved equal, and shall have a smooth inside taper for uniform seating, acceptable for ductile iron pipe.

All size on size taps require full body Ductile Iron MJ tapping sleeves.

- Q. Tapping Valves: Tapping valves shall be epoxy coated with 200 psi working pressure, non-rising stem, "O" ring, open left, flanged end conforming to AWWA C207, Class D, ANSI 150 lb. drilling, mechanical joint end conforming to ANSI/AWWA C509, manufactured by Waterous Series 500, American Darling CRS80, Mueller A2360, AVK Series 25, or approved equal.

Tapping valves shall be supplied with standard mechanical joint accessories, high strength low alloy steel bolts, and heavy hexagon nuts conforming to ANSI/AWWA C111/A21.11.

Tapping valve seat plates and bonnets shall have either all silicone bronze or 304 stainless steel bolts and nuts.

- R. Tracer Wire and Marking Tape:

1. Water Main Marking Tape: Lineguard III by Tri-Sales, Inc., 2" wide, blue; detectable with magnetic locators, or approved equal.
2. Tracer Wire: Copperhead Industries part number 1230-SF, or approved equal.
3. Tracer Wire Slice Kits: 3M Brand DBR Direct Bury Splice Kit, or approved equal.
4. Grounding Rod: Copperhead 1-lb., Drive-In Magnesium anode (part number ANO-1005 with part number SCB-01SR Connector), or approved equal.

- S. Valves: Valves shall be epoxy coated inside and out and supplied with standard mechanical joint accessories, high strength low alloy steel bolts and heavy hexagon nuts conforming to ANSI/AWWA C111/A21.11. Valve seat plate and bonnet shall have either all-silicone bronze or 304 stainless steel bolts and nuts.

Gate valves shall be 200 psi working pressure, non-rising stem, "O" ring, stem seal, open left, mechanical joint, two-inch ductile iron operating nut with stainless steel bolt, resilient seated gate valve conforming to ANSI/AWWA C509, manufactured by Waterous Series 500, American-Darling CRS 80, Mueller A 2360, AVK series 25, or approved equal.

Valve boxes shall be cast iron, or ductile iron free from defects, two piece, sliding type with a non-flange top section, no inside stops, and an outside shaft diameter of six inches. Bottom section shall be belled base. Length of top section shall be a minimum of 24 inches. Middle and bottom section length as needed. Boxes shall have the work "WATER" clearly cast into the cover.

Valve box top extension and cover shall be cast iron. Boxes will have "WATER" cast in the cover. Pioneer-style box shall be 4.5-inch or 5.25-inch straight body.

PART 3 - EXECUTION

3.01 PREPARATION:

- A. Notify "Dig-Safe" (1-800 225-4977) at least 3 days prior to beginning any excavation Work.
- B. Accurately locate any existing utilities before beginning excavation; contact local utility companies.
- C. Check for conflict with underground utilities or structures. Notify the Architect/Engineer immediately of all discrepancies before proceeding with the Work.
- D. Fully coordinate Work with utility companies and *Water District* to insure timely work by Others so as not to hold up construction.

3.02 WATER SERVICE:

Note: Coordinate all water main connections and service installations with the *Water Department* inspector.

- A. Trenching: Excavate trenches for water lines in locations indicated in Drawings. Trench cross-section and pipe installation shall be in accordance with *Water District* standards and as indicated on the Drawings and Details.
- B. Handling Pipe and Fittings: Manufacturer's recommendations and instructions for storage and handling shall be strictly adhered to. All pipe and fittings shall be kept clean and free of defects. Defective pipe shall be removed or repaired to the satisfaction of the Architect/Engineer.
- C. Laying Pipe and Fittings: Laying and installation of pipe and fittings shall be in accordance with manufacturer's recommendations and instructions and with the requirements of AWWA Standard Specifications for Installation of Cast Iron Water Mains, C600, and the *Water Department*, except as otherwise provided herein.
 - 1. Pipe shall be laid to a depth of between 6.0 and 6.5 feet to the top of pipe, generally according to the lines and grades indicated on the Drawings. Maintain minimum 10 ft. separation from all sanitary sewer lines and other underground utilities whenever possible. Where water mains must cross within 12" over or under sewer lines, encase both pipes in concrete for 10 ft. in both directions or as Detailed on the Drawings. All pipes shall be laid to straight lines for horizontal alignment using mechanical joint bends, unless otherwise specified or indicated on the Drawings. Vertical alignment for all water pipes, and, where permitted, horizontal alignment for pipe laid on curves, shall not deviate from a straight line more than 12 inches per 18-foot length of pipe for sizes up to 12 inches in diameter, or more than 6 inches per 18-foot length of pipe for sizes larger than 12 inches in diameter. Every possible precaution shall be taken to ensure that each joint is properly made up and fully seated.
 - 2. A firm even bearing throughout the length of pipe shall be maintained. Pipe bedding shall be Sand Bedding Material as specified in Section 31 23 00 – Excavation, Backfill and Compaction and as indicated on the Drawings, with thorough compaction as specified.
 - 3. Pipe cutting shall be done by wheel cutter, acetylene torch or saw. Rough edges shall be removed and the pipe ends shall be tapered and ground smooth to conform to receiving pipe.
 - 4. Concrete thrust blocks in accordance with AWWA requirements and manufacturer's recommendations and instructions shall be installed at all bends, tees, capped ends, etc., as indicated on the Drawings and Details, and as directed by the Architect/Engineer or the *Water Department*. Minimum bearing area shall be as required or as Detailed on the Drawings. Joints and bolts must be protected by felt roofing paper prior to placing concrete. Concrete shall be 3,000 psi. Concrete shall be placed against undisturbed material, and shall not cover joints, bolts or nuts, or interfere with the removal of any joint. Wooden side forms shall be provided for thrust blocks.

5. At all times when pipe installation is not in progress or the trench is unattended, the open ends of pipes shall be closed by watertight plugs or other approved means.
- D. Jointing Push-on Pipe: Pipe shall be laid with bell ends facing the open trench to receive the spigot (bevel) end of next pipe. A thin film of lubricant, as supplied by the pipe manufacturer, applied on spigot end of pipe being installed shall be used to facilitate joint assembly.
- E. Jointing Mechanical Joint Pipe: Mechanical joints at valves, fittings, and where designated shall be installed in accordance with the "Notes on Method of Installation" under ANSI Specification A 21.11 and the instructions of the manufacturer.
- F. Tracer Wire and Marking Tape Installation:
- a. Install warning tape continuously along PVC/HDPE water main. At end of rolls and repairs, splice tape with 3-foot overlap connected with duct tape. Tape should be installed at a depth of two (2) feet above water main.
 - b. Install tracer wire continuously between each end of the PVC/HDPE water mains. It shall be installed in the same trench as the pipe and secured to the pipe as required to ensure the wire remains adjacent to the pipe.
 - c. Tracer wire shall be grounded at all ends of the wire by connecting the wire to an approved waterproof connection to a grounding anode, buried at the same depth as the tracer wire.
 - d. Tracer wire shall be installed up through a valve box at each end of the PVC/HDPE water main. The wire shall be accessible by hand from the surface, and shall be installed with enough slack to allow for adjustments to the elevation of the valve box for paving.
 - i. At the point of connection between existing conductive pipes where there is not a valve box installed, the tracer wire shall not be connected to the iron pipe.
- G. Hydrant Installation:
- a. Set hydrants, buried valves and valve boxes plumb, and center with each valve box directly over the valve.
 - b. Carefully tamp earth fill around the valve box to a distance of 4 ft. on all sides of the box, or to the undisturbed trench face, if less than 4 ft.
 - c. Set as shown on the Drawings or as directed by the Engineer.
 - d. Clean interiors of all foreign matter before installation and inspect in opened and closed positions.
- H. Field Test Hydrant Installation:
- a. Hydrant flow shall completely stop with no more than 200 ft. lb. of torque applied to the operating nut.
 - b. Failure to shut completely at no more than 200 ft. lb. of torque will be cause for rejection of that hydrant.
- I. Testing and Disinfection: Pipeline shall be flushed with clean, potable water, pressure tested and chlorinated by the Contractor under the supervision of the *Water Department*. Flush underground piping prior to connection to sprinkler piping as required by NFPA. Chlorination shall be in accordance with AWWA C651. Hydrostatically test inderground piping to 150 psi for a 1-hour period; pressure testing and leakage rates shall be in accordance with AWWA standard C600 and the *Water Department's* standards and specifications. All costs associated with testing and disinfection shall be paid by the Contractor.

END OF SECTION

SECTION 33 32 13

PUMPING STATION – SANITARY SEWERAGE

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Coordinate Work with that of other trades affecting or affected by Work of this Section. Cooperate with such trades to assure the steady progress of work.

1.2 SUMMARY

- A. The work of this section includes furnishing all labor, materials, tools and equipment necessary to furnish and install 1 packaged submersible pumping station as specified herein and as shown on the drawings.
- B. Related Sections include the following:
 - 1. Section 33 36 50 – Sanitary Sewer Systems for piping requirements.

1.3 DESIGN REQUIREMENTS

- A. The station shall be of circular precast reinforced concrete construction, complete with two submersible sewage pumps, motors, motor controls, interior electrical wiring and conduits, piping and valves, liquid level sensors, lift out assembly, entrance hatch, and other necessary appurtenances.

1.4 PERFORMANCE REQUIREMENTS

- A. The materials and equipment covered by this specification are intended to be standard materials and equipment of proven ability as manufactured by reputable concerns. Design equipment and construct in accordance with the best practice of the industry and shall be installed in accordance with the manufacturer's recommendations and the Contract Documents. The specifications call attention to certain features but do not purport to cover all details entering into the construction of the equipment.
- B. The performance criteria for each pump shall be as indicated on the drawings. Pumps shall be as indicated within contract plans. Do not overload the motor at any point on the pump curve above the static head.

1.5 SUBMITTALS

- A. Product Data: For equipment and components.
 - 1. Provide performance curves.
 - 2. Include complete master wiring diagrams and elementary or control schematics, including required coordination with other electrical control devices operating in conjunction with the pumping station. Due to the complexity of the control functions, it is imperative the above drawings be clear and carefully prepared to facilitate interconnections with other equipment. Standard preprinted sheets or drawings simply marked to indicate applicability to this contract will not be acceptable.

- B. Shop Drawings: For equipment and components.
- C. Operation and Maintenance Manual of the pumping station including equipment and components.
- D. Field quality-control test reports.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. All materials and equipment shall be shipped, stored, handled and installed in such a manner as not to degrade quality, serviceability or appearance. Store equipment in a clean, dry location free from construction dust, precipitation and excess moisture. If stored for more than two weeks, the equipment shall receive all maintenance considerations required by the manufacturer for proper storage of the equipment.

1.7 SYSTEM STARUP

- A. Provide a minimum of two days for installation and startup.

PART 2 - PRODUCTS

2.1 PUMPING STATION.

- A. Pump Chamber. Show the precast reinforced concrete pump chamber as indicated on the drawings. Conform to the applicable requirements of ASTM C478. Wire fabric for reinforcement shall conform to the requirements of ASTM A185 and steel reinforcement shall conform to the requirements of ASTM A615 Grade 60. The precast structure shall be designed for hydrostatic head equal to depth of the structure and shall be capable of withstanding an H- 20 truck load. The chamber shall be installed watertight.
- B. Entrance Hatch. The access opening to the pump chamber shall have an entrance hatch mounted above the pumps and shall be of the style, type and size shown on the drawings. The manufacturer shall guarantee proper operation and against defects in material or workmanship for a period of five years. Provide an aluminum hatch as manufactured by Bilco Company, Babcock-Davis Associates, Inc., Products Division, Washington Aluminum Company, Inc., or equal. The hatch cover shall be single leaf, watertight self-draining type. Door leaf shall be of 1/4 inch thick aluminum diamond pattern plate capable of withstanding an H- 20 truck load. Channel frame shall be of 1/4 inch thick aluminum with anchor flange around the perimeter. The door leaf shall be equipped with a minimum of two stainless steel hinges with stainless steel pins, spring operators to afford easy operation, and an automatic hold-open arm with release handle. Provide hatch with a recessed padlock hasp and padlock as manufactured by Corbin (No. 2863, 1/4W) or equal by Schlage (No. 912). A 1-1/2 inch drainage coupling shall be located in the front right corner of the channel frame. Drain shall discharge into pump chamber. Provide stainless steel hardware, mill finish aluminum.

2.2 PUMPS AND RAIL ASSEMBLY.

- A. General. Furnish and install two (2) submersible wastewater pumps. Provide explosion proof submersible grinder raw sewage pumps designed with a cutter type impeller and submersible type motor.
- B. Construction. The pump and motor housing shall be of close grained cast iron construction with all interior and exterior surfaces coated with baked epoxy enamel. The pump shaft shall be of

AISI Type 430 stainless steel with upper and intermediate ball bearings for radial and thrust loading and a lower sleeve bearing to minimize the overhang to the impeller and cutter load.

1. Construct the pump housing with an intermediate oil- filled, seal chamber and the chamber shall be separate from the motor. Tandem, spring loaded, silicon carbide x silicon carbide with nitrile rubber, shaft seals shall be used to seal the pump casing from the seal chamber, and in turn from the motor housing.
 2. Check Valves. Provide each pump with a vertical self contained, straight-through design, ball check valve constructed of schedule 80 PVC. Valve shall be designed for wastewater application and located as shown on the drawings.
- C. Rail Assembly. Arrange the pump and its check valve to allow easy removal, installation and adjustment without the necessity of personnel entering the chamber. SS, Cast Brass or Bronze, non-sparking guide brackets with guide yokes of sufficient bearing length to prevent binding shall bolt to the pump. The yokes shall mate over guard rails of ½ inch stainless steel pipe running between an upper rail supporting casting, and a lower discharge casing. As the pump is lowered into position, a discharge nozzle shall be guided into a chamfered cavity in the discharge casing. A shoulder on the nozzle shall bottom on the discharge casing when the pump is properly located and shims shall not be required to insure alignment for a lead-tight seal. An O-ring shall affect the hydraulic seal around the nozzle when it is in its operation position. A brace, easily removable from the top of the chamber shall be provided to lock the parts together, preventing line surges from breaking the seal and allowing leakage. A lifting eye shall be attached to each plate and shall be furnished with 3/16 inch stainless steel chain and clevis for lifting of the pump and assembly. The top chain and clevis for lifting of the pump and assembly. The top chain link shall be placed into a Type 304 stainless steel hook (one for each pump) which is attached to the wet-well wall or roof slab located as to allow easy access from the wet-well opening.
- D. Corrosion Protection. After casting, parts are subjected to post-machining, finishing processes (SSPC-SP3) in preparation for painting and final assembly. Prior to the application of Amerlock 2, castings undergo a Heblolan solvent cleaning (SSPC-SP1). Pre-treat all iron castings with phosphate and chromic rinse and painted with a high temperature baked epoxy after machining and all machined surfaces exposed to the sewage water to be re-painted with a high temperature baked epoxy. All fasteners shall be Type 304 stainless steel.
- E. Pipe Connections:
1. Use pre-molded elastomeric sealed joints at the joints between the pipe (such as but not limited to influent sewer) and sewer manhole sections. Pre-molded elastomeric sealed joints shall be A-Lok, Res-Seal, Press-Wedge II, Lock Joints Flexible Manhole Sleeve, Kor-N-Seal Joint Sleeve, or equal.
 2. For pipes (such as but not limited to discharge pipe, vent) installed submerged or below grade, the annular space shall be sealed watertight with mechanically expanded interlocking synthetic rubber links of the Link-Seal type, or equal. Nuts and bolts shall be type 304 stainless steel.
 3. For pipes installed non-submerged or above grade, pack the annular space with jute and caulked flush at both ends with a polysulfide sealant.

2.3 MOTORS.

- A. Motors shall be submersible design and shall be connected to pumps, speed reducers or other driven equipment, through a coupling system suitable for imposed load, torque and end thrust conditions, as required by the equipment manufacturer.
- B. Motors shall have two bearings, two ball bearings to support the rotor and take radial and thrust loads and a sleeve bearing in the seal chamber to prevent shaft deflection at lower seal from radial thrust of grinder impeller. Bearings shall be designed for L-10 life of 100,000 hours.

- C. Furnish each motor with required cables for power and control monitoring of seals and thermals.). Factory cable type as specified by the pump manufacturer with lengths to suit the installation without splices from pumps to control panel and provided with sufficient length to allow the pumps to be removed from the wet-well and placed adjacent to the wet-well opening for maintenance. In addition, the required cable for each pump within the wet-well shall be coiled and placed into a type 304 stainless steel hook (one for each pump) which is attached to the wet-well wall or roof slab located as to allow easy access from the wet-well opening. Cords shall withstand a pull of 150 pounds and be sealed watertight into the motor and connection points and shall be rated for waterproof submergence up to 65 feet.

2.4 CONTROL PANEL.

- A. General. The pump supplier shall provide a completely self-contained Duplex Motor Control Panel. The control panel shall provide short circuit and overload protection for each pump. An automatic alternator with manual override switch shall be provided to manually select the lead pump duty between the two pumps on successive cycles. The panel shall include seal monitoring protection per pump manufacture's recommendation, to include the appropriate seal/thermal relay to energize a pilot light indicating a seal fail condition. The panel shall also include thermal overload protection per pump manufacture's recommendation, to include the appropriate seal/thermal relay to de-energize the motor and energize a pilot light indicating an over temp condition. The control panel shall conform to National Electrical Manufacturer's Association (NEMA), Joint Industry Council (JIC), and National Electrical Code (NEC) specifications, and shall be Underwriters' Laboratories (UL) listed. The panel shall be factory wired and tested. The panel shall be built to meet application's requirement for UL698a. The panel manufacturer shall be licensed by UL to be both UL508a and UL698a for the production of control panels.
- B. Enclosure. The duplex motor controls and circuit breakers shall be housed in a NEMA 4X enclosure. Construct the enclosure of 304 stainless steel with continuous seam welds. The enclosure shall be provided with tamper-proof double door system consisting of a bland outer door and a second inner door on which all operating controls are located. The controls shall incorporate a "dead front" type of installation. Provide a padlock hasp.
- C. Circuit Breakers. Provide three pole motor circuit breaker sized to NEC requirements. Circuit breakers shall be thermal magnetic molded case type. The pump motors shall have an interrupting rating of 22,000 amperes symmetrical. Devices for operation on 460_volts shall have a interrupting ampere rating per manufacturers' recommendations and NEC requirements.
- D. Starters. Provide each pump motor with a QOU/U-Line Motor Starter with IEC Overload across the line motor starter with circuit breaker. The starters shall employ gravity drop-out armatures without bell cranks or other mechanical linkages which are subject to failure. Starter coils and contacts shall be easily replaceable with standard hand tools and without removing the starter from the panel. Equip starters with one ambient compensated quick-trip button to facilitate testing of the overload mechanism. Magnetic motor starters shall be full voltage, non-reversing type. Starters shall be furnished with a thermal overload protector, reset pushbutton and auxiliary contacts as required. Furnish a phase failure relay for each sewage pump motor and shall shut-off the pump motor on a phase failure condition.
- E. Controller. Provide DPC-4F Duplex 4-float multi-function pump controller with pump alternator selector switch and adjustable lag pump delay/pump run timer functionality. to alternate the lead pump duty between the two pumps on successive cycles. The pump controller shall be a single device; controllers comprised of two or more relays shall not be considered equal. The selector switch shall be as specified below.
- F. Selector Switch. Provide a hand-off-automatic selector switch for each pump. Selector switches shall be of oil-tight construction. Toggle switch types shall not be considered equal. Selector switch contacts shall be heavy duty, double-break, silver.

- G. Relays. General purpose relays shall be NEMA 300-volt open frame industrial control type. Furnish intrinsically safe relays for interconnection of each non-mercury float switch with the control panel.
- H. Terminal Blocks. Provide terminal blocks for all external connections to the control panel and for all connections between the component mounting plate and enclosure mounted components to allow for easy removal of the component mounting plate if required for service. Terminal blocks shall consist of individual snap together contact sections mounted on a common mounting channel. Terminal block sections shall have tubular screw contacts mounted in a nylon housing to resist breakage; phenolic or other rigid, brittle materials shall not be considered equal. Plain screw contacts requiring lugs to be installed on wires shall not be considered equal.
- I. Control Circuit. The control circuit of the Duplex Motor Control Panel shall operate at 120 VAC and be fuse protected. Tripping the circuit breaker of either pump shall not disable the control circuit.
- J. Elapsed Time Meters. Provide a non-reset meter for each pump to indicate elapsed time of operation of the pump from 0 to 99,999.9 hours.
- K. Indicating Lights. In addition to the aforementioned indicating lights, provide a green "pump running" light for each pump. All indicating lights shall be transformer type, oil-tight, press-to-test with colored lens and legend plate.
- L. Alarm Circuit. Furnish an alarm circuit relay and reset push button as a part of the control panel. The alarm relay shall be activated by the high-water level self-weighted mechanical non-mercury float switch, and the temperature sensing relays. Provide one Type C dry contact for common remote indication of alarm condition. Provide a flasher circuit for connection to an alarm light.
- M. Nameplates. Furnish and install nameplates for all switches, control stations, motor starters, terminal cabinets, indicating lights, etc. to designate the equipment controlled and function. Nameplates shall be black and white laminated phenolic material having engraved letters approximately 1/2 inch high, extending through the black face into the white layer. Nameplates shall be attached to panels by self-tapping screws or rivets and shall be stainless steel. Attach a special nameplate to the pump housing which shall contain identification of housing and bearing numbers.

2.5 PUMP CONTROLS.

- A. Pump Operation. The DPC-4F pump controller shall be located in the control panel and shall operate the pumps to maintain the liquid level between operating limits. Starting and stopping of each sewage pump shall be accomplished by self-weighted mechanical float type non-mercury switches for start and stop levels. The automatic alternator shall alternate the pump sequence after each pump cycle. A means for manually bypassing the alternator and setting either of the pumps on automatic as the lead pump shall be provided. The pumps shall operate in parallel if the liquid level in the basin rises above the "Pump No. 2" on level.
- B. Level Sensors. Provide four float type non-mercury switches, encapsulated within a solid polyurethane float ball. Provide level sensors to operate the pumps and to detect high water level in the basin addition. Provide a mounting bracket near the access opening to allow adjustment of the control and alarm levels as shown on the drawings. Furnish KwikSwitch 4-float kit with offset cable sufficient to suit the installation to not require splicing.

2.6 STATION WIRING.

- A. All pump station wiring shall be factory supplied cabling. Note pumps shall be wired directly to control panel. Should additional on-site wiring be required, the situation shall be reviewed by the engineer and if acceptable, it will be an explosion proof handhold with watertight junction box with rigid conduit (no cord grips). The wiring shall be in accordance with the National Electrical Code and as hereinafter specified.
- B. All wiring shall be of annealed 98 percent conductivity, soft drawn copper. Wire insulation shall be either type THWN or type XHHW. Except for control and signal leads, no wire smaller than number 12 AWG shall be used.
- C. When required, all wiring between the control panel and any handhold/junction box shall be in watertight galvanized rigid steel conduit.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Excavating, trenching, and backfilling are specified in Section 31 23 00 – Excavation, Backfill, and Compaction.

3.2 INSTALLATION

- A. Install all materials and equipment in a neat, workmanlike manner.
- B. All wiring of the equipment shall be as specified under Division 16 of these specifications.
- C. Package Pumping Unit. Install the pumping station in accordance with written instructions provided by the manufacturer and as approved.

3.3 PAINTING

- A. Shop painting and the surface preparation is a part of the work specified in this section and shall be as specified in finish painting.

3.4 CLEAN UP

- A. Prior to start-up and field testing, remove all foreign matter from the pump chamber piping and pumps. Clean spillage of lubricants used in servicing the system from all equipment and concrete surfaces.

3.5 FIELD QUALITY CONTROL

- A. Field test each entire package pumping system as a system using clean fresh water prior to the acceptance of sewage to the station. Operate pumps continuously at the design conditions for at least 15 minutes. Operate all systems, controls, and sequences and demonstrated as operating as approved. The contractor shall perform all tests and shall be responsible for all necessary temporary connections, testing equipment and utilities and shall provide and dispose of all water used. A factory trained representative shall be present for the testing.

3.6 MANUFACTURER'S TRAINING

- A. Provide a minimum of one day for manufacturer's training.

END OF SECTION

SECTION 33 36 50

SANITARY SEWER SYSTEMS

PART I - GENERAL

1.01 GENERAL PROVISIONS:

- A. Coordinate Work with that of other trades affecting or affected by Work of this Section. Cooperate with such trades to assure the steady progress of the Work.
- B. The "Standard Specifications" referred to herein is the book entitled "*Standard Specifications*" published by the State of Maine Department of Transportation, latest edition, and Supplemental Specifications in Force, excluding the following portions thereof:

Division 100 Sections 102 Through 109 Numerical Index of Payment Items Included in Each Section.

Those Sections of the aforementioned *Standard Specifications*, which are cited herein, are applicable to the Work of this Contract as they may be modified, amplified or added to by this Section.

- C. The Contractor shall be responsible for all fees, permits and coordination with the local utility company related to the connection to the existing municipal sewer system.
- D. All sanitary sewer Work shall be in accordance with the standards of local plumbing codes and these Specifications.

1.02 DESCRIPTION OF WORK:

- A. Provide labor, materials, equipment and services necessary for proper and complete installation of the sanitary sewer system, as indicated on the Drawings and as herein Specified:
 - 1. The entire sanitary sewer system from outside building wall to and including the connection to the existing municipal sewer system, including the gravity sewer lines, force main, manholes, and clean-outs.

1.03 QUALITY CONTROL; SUBMITTALS:

- A. General: Comply with requirements of the General Conditions for Submittals and Quality Control.
- B. Shop Drawings: Submit product specification literature and/or shop drawings for:
 - 1. Precast concrete structures (manholes).
 - 2. Cast iron frames and covers for structures.
 - 3. PVC pipe.
 - 4. PVC force main.
- C. Test Results:
 - 1. Mechanical Analysis for fill material and stone (ASTM D421).

1.04 AS-BUILT DRAWINGS:

- A. As-built scale drawings, accurately showing actual locations and elevations of all underground and surface sewer lines and structures shall be produced by the Contractor and turned over to the Architect/Engineer at the completion of the project. Locate distribution pipe, clean-outs, and other buried access points by swing-ties to permanent objects, and indicate on as-built plans.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. The Contractor shall supply all the necessary materials as indicated on the Drawings and as Specified herein. All pipe and fittings shall be free of defects. Material found to be defective shall be removed from the site. The Contractor is responsible for inspecting all material to be used prior to its installation. Defective material, whether by manufacturer, shipping, or damaged during installation, which has been installed, shall be removed with non-defective material.
- B. Sanitary Sewer Pipe: Extra-strength polyvinyl chloride (PVC) pipe and fittings, SDR-35, ASTM D 3034. Joints shall meet the requirements of ASTM D 3212.
- C. Pipe Joints: Pipe joints shall be compatible with the type of pipe used, as recommended by the manufacturer, to create watertight joints.
- D. Sanitary Sewer Force Main: PVC Water-Service Pipe and Fittings: ASTM D 1785, Schedule 80 pipe, with plain ends for solvent-cemented joints with ASTM D 2467, Schedule 80, socket-type fittings.
- E. Tracer Wire: Metallic tracer wire shall be 10 AWG solid copper or stranded copper with an HMW-PE jacket.
- F. Cover Material: At least 4 inches of loam or amended soil shall be placed over the backfill and fill material, including fill extensions. The Contractor shall supply all the necessary fill materials for the restoration of the road crossing.
- G. Stone Bedding Material: 3/4" Crushed Stone Bedding Material, as Specified in Section 31 23 00 – Excavation, Backfill and Compaction.
- H. Insulation: 2" thick, 4'x8', extruded polystyrene plastic rigid insulation board for insulation of system components conforming to AASHTO M230 and MDOT *Standard Specification* 653. Insulation shall be used, where required, as indicated on the Drawings and Details.
- I. Precast Concrete Sections for Sanitary Manholes and Structures: Reinforced precast concrete structures conforming to ASTM C 478, MDOT *Standard Specification* 712.06. Structures and top pieces shall provide H-20 load bearing capacity. Butyl rubber gaskets shall be installed at all joints between manhole sections.
- J. Manhole Steps: Steps for manholes, or specialty structures conforming to ASTM C 478 and MDOT *Standard Specification* 712.09 shall be poly propylene plastic with steel reinforcement (ASTM D 4101), or aluminum (ASTM B 221), Alloy 6061-T6, a minimum of 14" wide cast into the sections.
- K. Manhole Grade Rings: Precast concrete annular grade rings, 4000 psi, 24" diameter center hole, 8-inch thick walls (40-inch outside diameter), typical heights in 1-inch increments 3" through 6". Grade rings shall be used to bring manhole and structure frames to grade in locations where more than 3 courses of brick may be required. Manhole Grade Rings shall not be used in multiple increments or stacked. Where additional height is needed to adjust to final grades, Manhole Grade Rings may be used together with not more than 3 courses of brick. Where changes of more than one foot is required, the Contractor shall bring to grade using intermediate

sections or risers, provided that such risers do not exceed 24" in height. Changes greater than 24" shall require additional barrel sections to be added to the manhole or structure.

- L. Neoprene Boot: All pipes through structure walls shall have neoprene boots meeting ASTM C 443 to ensure a watertight seal between the pipe and structure wall.
- M. Brick: Brick or masonry single units used to build the frames up to grade and to construct manhole inverts shall conform to ASTM C-32, hard brick, solid, hard burned throughout, Grade MS, except Grade SS for manhole inverts; MDOT *Standard Specification 704.01*. Not more than 3 courses of bricks shall be used to bring frames to grade unless otherwise approved by the Architect/Engineer. Where more than three courses of brick are required, the Contractor shall bring to grade using Manhole Grade Rings.
- N. Mortar: Mortar for use in setting bricks for frame and manhole inverts shall consist of one part Portland Cement, Type II; one part Mortar Cement; and four parts Mortar sand. Mortar sand shall conform to the requirements of MDOT *Standard Specification 705.02*.
- O. Cast Iron Frames and Covers: Foundry cast gray iron castings conforming to ASTM A 48, Class 35B (AASHTO M105, Class 30), MDOT *Standard Specification 712.07*. Covers shall be designed for H-20 loading. Covers shall have the word "Sewer" cast thereon. Dimensions, sizes and styles shall be as indicated on the Drawings and Details.

PART 3 - EXECUTION

3.01 PREPARATION:

- A. Notify "Dig-Safe" (1-800 225-4977) at least 3 days prior to beginning any excavation Work.
- B. Accurately locate any existing utilities before beginning excavation; contact local utility companies.
- C. Check for conflict with underground utilities or structures. Notify the Engineer immediately of all discrepancies before proceeding with the Work.
- D. Fully coordinate Work with mechanical and electrical subcontractors to insure timely work by Others so as not to hold up construction.

3.02 STRUCTURES:

- A. All structures to be located in or near pavement or driveway areas shall be built or manufactured to provide regular load bearing capacity. Install all structures to lines, grades and dimensions indicated on Drawings.
- B. Structure walls: 5" thick for precast up to 10' depth; 8" thick for precast below that depth.
- C. The Contractor shall employ such methods in excavating, sheeting and dewatering as will assure the safety of the excavations and any adjacent structures or utilities, and will provide adequate, safe and dry working conditions for the new construction. All Work shall be performed in such a manner as to provide safe working room, to permit placing the concrete structures on firm, dry ground, and to prevent flotation of the structure at all times.
- D. Unusual care shall be exercised in backfilling. Excavation shall be mechanically tamped or water flushed to secure complete filling of voids resulting from withdrawal of any sheeting or shoring, and assure minimum settling. Any shortage in material shall be furnished by the Contractor at his own expense. Any surplus material shall be removed from the site unless otherwise directed by the Architect/Engineer.

- E. Set metal fittings, including covers and frames, in full mortar beds.

3.03 SEWER LINES:

- A. Excavate in locations and to depths indicated on Drawings to install sanitary sewer lines.
- B. Gravity sewer pipe shall be laid to the lines and grades indicated on the Drawings or as directed by the Architect/Engineer; Contractor shall use a laser instrument in setting grade lines of all gravity sewer pipes. All Work shall conform to provisions of the Maine State Plumbing Code, Department of Health Engineering, local plumbing codes and Standards.
- C. Force main shall be installed to the grades indicated on the Drawings or as directed by the Architect/Engineer. Tracer Wire shall be attached to the force main pipe at 10' maximum intervals with zip ties. Terminal points shall be grounded with 5/8"x6' copper clad ground rod.
- D. Contractor shall pressure test gravity sewer lines in conformance with this specification and assure line is free from points of infiltration and ex-filtration. All Work must be tested and approved by the authority having jurisdiction prior to final acceptance of the system.
- E. All sewer force mains shall be hydrostatically tested, as Specified herein.

3.04 LEAKAGE TESTS:

A. General:

All sewers throughout the entire length of lines shall be tested for water tightness. Testing shall be internal pressure tests.

The Contractor shall furnish, at his own expense, the necessary facilities for making the tests, including the furnishing and placing of bulkheads, furnishing and placing of water and other necessary materials, labor and equipment.

Under these Specifications a section shall mean a length of sewer between any two structures, or the building and any structure or Subsurface Disposal System.

B. Low Pressure Air Test for Gravity Sewers:

The Contractor shall test the gravity sewers with a low-pressure air test. It shall be conducted in compliance with the following:

After completing backfill of a section of sewer line, the Contractor shall, at his own expense, conduct a Line Acceptance Test using low pressure air. The test shall be performed using the below stated equipment:

1. Equipment:

Cherne Air-Loc Equipment, as manufactured by Cherne Industrial, Inc., of Edina, Minnesota, or approved equal. Equipment used shall meet the following minimum requirements:

Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe to be inspected and shall resist internal test pressures without requiring external bracing or blocking.

All air used shall pass through a single control panel.

Three individual hoses shall be used for the following connections:

- a) From control panel to pneumatic plugs for inflation.
- b) From control panel to sealed line for introducing the low-pressure air.
- c) From sealed line to control panel for continually monitoring the air pressure rise in the sealed line.

2. Procedures:

All pneumatic plugs shall be seal tested before being used in the actual test installation. One length of pipe shall be laid on the ground and sealed at both ends with the pneumatic plugs to be checked. Air shall be introduced into the plugs to 25 psig. The plugs shall hold against this pressure without bracing and without movement of the plugs out of the pipe.

After a section of pipe has been backfilled and cleaned, and the pneumatic plugs are checked by the above procedure, the plugs shall be placed in the line at each manhole and inflated to 25 psig. Low-pressure air shall be introduced into this sealed line until the internal air pressure reaches 4 psig greater than the average backpressure of any ground water that may be over the pipe. At least two minutes shall be allowed for the air pressure to stabilize.

After the stabilization period (4.0 psig minimum pressure maintained in the pipe), the air hose from the control panel to the air supply shall be disconnected. The portion of line being tested shall be termed "Acceptable" if the time required in minutes for the pressure to decrease from 4.0 to 3.0 psig (greater than the average back pressure of any ground water that may be over the pipe) is not less than the time shown for the given diameters in the following table:

<u>Pipe Diameter in Inches</u>	<u>Minutes</u>
4	2.0
6	3.0
8	4.0
10	5.0
12	5.5
15	7.5

In areas where ground water is known to exist, the Contractor shall install a one-half inch diameter capped pipe nipple, approximately 10" long, through the manhole wall on top of one of the sewer lines entering the manhole; this shall be done at the time the sewer line is installed. Immediately prior to the performance of the Line Acceptance Test, the ground water level shall be determined by removing the pipe cap, blowing air through the pipe nipple into the ground so as to clear it, and then connecting a clear plastic tube to the nipple. The hose shall be held vertically and a measurement of the height in feet of water over the invert of the pipe shall be taken after the water has stopped rising in this plastic tube. The height in feet shall be divided by 2.3 to establish the pounds of pressure that will be added to all readings. (For example, if the height of water is 11-1/2 feet, then the added pressure will be 5 psig. This increases the 4.0 psig to 9.0 psig and the 3.0 psig to 8.0 psig. The allowable drop of one pound and the timing remain the same).

The Contractor shall furnish all labor, materials and equipment for making infiltration and leakage tests.

C. Pressure Test for Force Mains:

All Force Mains shall be tested for water tightness throughout the entire length of lines. Testing shall be by internal hydrostatic pressure tests.

The Contractor shall furnish all necessary facilities, labor, materials and equipment for making the tests.

1. Procedure

All sewer Force Main pipe lines shall be tested hydrostatically for 15 minutes at a pressure 50 percent in excess of the pressures to which the pipe will normally be subjected, but in no case less than 50 pounds per square inch (50 psig). Any obvious leaks or ruptured piping disclosed by the test shall be repaired or replaced, and the test repeated to the Architect/Engineer's satisfaction.

All sewer force mains shall then be tested hydrostatically for leakage for one hour at a pressure equal to the maximum rated pressure of the section of line under test. The rate of leakage shall not exceed 100 gallons per mile of pipe per 24 hours, per inch of nominal pipe diameter. Any leaks or defective pipe disclosed by the leakage test shall be repaired or replaced, and aforementioned leakage test repeated as often as necessary until the leakage requirement is met to the Architect/Engineer's satisfaction.

THE ATTENTION OF THE CONTRACTOR IS DIRECTED TO THE STRICT REQUIREMENTS RELATIVE TO MAXIMUM RATES OF INFILTRATION AND TO THE IMPORTANCE OF THESE SPECIFICATIONS RELATIVE TO TIGHT JOINTS REQUIRED. SEWERS NOT MEETING THE ABOVE REQUIREMENTS SHALL BE REPAIRED AS NECESSARY AT THE CONTRACTOR'S EXPENSE.

3.05 ROADWAYS:

The Contractor shall make road repairs according to MDOT standard specifications. The Contractor shall repair any and all damage to City streets to a standard that is at least equal to the pre-construction quality of the street. The Superintendent of Public Works shall be responsible for determining if the repairs constructed are sufficient, and the Contractor shall coordinate all repair work with the Superintendent.

END OF SECTION

SECTION 33 41 00

STORM DRAINAGE SYSTEMS

PART I - GENERAL

1.01 GENERAL PROVISIONS:

- A. Coordinate Work with that of other trades affecting or affected by Work of this Section. Cooperate with such trades to assure the steady progress of the Work.
- B. The "Standard Specifications" referred to herein is the book entitled "*Standard Specifications*" published by the State of Maine Department of Transportation, latest edition, and Supplemental Specifications in Force, excluding the following portions thereof:

Division 100 Sections 102 Through 109 Numerical Index of Payment Items Included in Each Section.

Those Sections of the aforementioned *Standard Specifications* which are cited herein are applicable to the Work of this Contract as they may be modified, amplified or added to by this Section.

- C. All Work shall comply with the applicable requirements of the City of Ellsworth, Hancock County Soil and Water Conservation District, the Maine Department of Environmental Protection (DEP) and U. S. Environmental Protection Agency (EPA) NPDES Permit requirements, to minimize adverse environmental impacts. Reference is made to the Erosion and Sedimentation Control Plan (report) and erosion controls and Details included in the Drawings for this project. Strict adherence to this plan and Drawings is required in order to prevent adverse downstream impacts.
- D. All Storm Drain lines and structures shall be installed in conformance with applicable MDOT standards, and these Specifications.

1.02 DESCRIPTION OF WORK:

- A. Provide labor, materials, equipment and services necessary for proper and complete installation of the storm drainage system as indicated on the Drawings and as herein specified.
 - 1. The entire new storm drainage system including culverts, drain piping, inlets, outlets, catch basins, manholes, area drains, and related appurtenances.

1.03 QUALITY CONTROL; SUBMITTALS:

- A. General: Comply with requirements of the General Conditions for Submittals and Quality Control.
- B. Shop Drawings: Submit Product Specification Literature and/or Shop Drawings for:
 - 1. Precast concrete structures (manholes, catch basins, field inlets).
 - 2. Cast iron frames, grates and covers for structures.
 - 3. All storm drain pipe.
 - 4. All culvert pipe.

1.04 AS-BUILT DRAWINGS:

- A. As-built scale Drawings, accurately showing actual installed locations and inverts of all underground and surface drainage lines and structures, shall be produced by the Contractor and turned over to the Engineer at the completion of the project.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Storm Drain Pipe and Culverts: Storm drain pipe and culverts shall be as indicated on the Drawings, and in accordance with the following as applicable; substitutions or changes from Specified types or sizes is not acceptable, except as approved by Architect/Engineer:
 - 1. Polyvinyl Chloride Pipe (PVC): Extra strength PVC pipe and fittings, SDR-35, conforming to AASHTO M278 (ASTM D-3034) and MDOT *Standard Specification* 706.08. Joints shall meet the requirements of ASTM D-3212.
 - 2. Corrugated Metal Culvert Pipe (CMP): Aluminum coated CMP pipe, Type II (aluminized steel) conforming to AASHTO M36/M36M and M274 and MDOT *Standard Specification* 706.10. Nuts, bolts and fittings for joint collars shall conform to AASHTO M232.
 - 3. Corrugated High Density Polyethylene Pipe (HDPE): Corrugated HDPE pipe or smooth interior/corrugated exterior (smooth) HDPE pipe and fittings conforming to AASHTO M294 and MDOT *Standard Specification* 706.06. Smooth interior HDPE pipe shall be used unless otherwise Specified or indicated on Drawings. Watertight joints shall be used for HDPE where Specified or as indicated on Drawings and Details.
- B. Stone Bedding Material: $\frac{3}{4}$ inch crushed Stone Bedding Material, as specified in Section 31 23 00 – Excavation, Backfill and Compaction.
- C. Granular Backfill: Well-graded sand or gravel, Granular Borrow, as specified in Section 31 23 00 – Excavation, Backfill and Compaction.
- D. Precast Concrete Sections for Drainage Structures: Precast reinforced concrete structures conforming to ASTM C-478, MDOT *Standard Specification* 712.06. Structures and top pieces shall provide HS-20 load bearing capacity. Butyl rubber gaskets shall be installed at all joints between manhole sections.
- E. Precast Concrete Field Inlet: Precast reinforced concrete structures; 2'- 0" inside as indicated on Drawings and Details.
- F. Brick: Brick or masonry single units used to build the frames up to grade and construct manhole inverts shall conform to ASTM C-32, hard brick, solid, hard burned throughout, Grade MS, except Grade SS for manhole inverts; MDOT *Standard Specification* 704.01. Not more than 3 courses of bricks shall be used to bring frames to grade unless otherwise approved by Architect/Engineer. Where more than three courses of brick are required, Contractor shall bring to grade using Manhole Grade Rings as Specified herein.
- G. Mortar: Mortar for use in setting bricks for frame and manhole inverts shall consist of one part portland cement, Type II; one part Mortar Cement; and four parts Mortar Sand. Mortar sand shall conform to the requirements of MDOT *Standard Specification* Section 705.02.
- H. Cast Iron Frames, Grates and Covers: Foundry cast gray iron castings conforming to ASTM A-48, Class 35B (AASHTO M105, Class 30), MDOT *Standard Specification* 712.07. Grates in paved areas shall be "bicycle safe". Covers shall have the word "Drain" cast thereon. Dimensions, sizes and styles shall be as indicated on Drawings and Details.

- I. Manhole Steps: Steps for manholes, catch basins or specialty drainage structures conforming to ASTM C-478 and MDOT *Standard Specification* 712.09 shall be Polypropylene Plastic with steel reinforcement (ASTM D-4101), or aluminum (ASTM B-221), Alloy 6061-T6, a minimum of 14 in. wide and cast into the Sections.
- J. Manhole Grade Rings: Precast concrete annular grade rings, 4000 psi, 24" diameter center hole, 8-inch thick walls (40-inch outside diameter), typical heights in 1-inch increments 3" through 6". Grade rings shall be used to bring manhole, catch basin and drainage structure frames to grade in locations where more than 3 courses of brick may be required. Manhole Grade Rings shall not be used in multiple increments or stacked. Where additional height is needed to adjust to final grades, Manhole Grade Rings may be used together with not more than 3 courses of brick in accordance with SS 2.01 F herein. Where grade change of more than one foot is required, Contractor shall bring to grade using intermediate sections or Risers, provided that such risers do not exceed 24" in height. Changes greater than 24" shall require additional barrel sections to be added to the manhole or structure.
- T. Riprap: Shall conform to Section 312500 - Erosion Control and Slope Protection, SS2.01 G and MDOT *Standard Specifications* 703.26, in sizes indicated on the Drawings.
- U. Geotextile: Erosion control geotextile fabric shall be Marafi 600X or approved equal, unless otherwise Specified or indicated on Drawings and Details.
- V. Insulation: 2" thick, 4' x 8', extruded polystyrene plastic rigid insulation board for insulation of system components conforming to AASHTO M230 and MDOT *Standard Specification* 653. Insulation shall be used, where required, as indicated on Drawings and Details. Insulation of storm drain system shall meet the requirements of the Public Works Department.

PART 3 - EXECUTION

3.01 PREPARATION:

- A. Notify "Dig-Safe" at least 3 days prior to beginning any excavation Work.
- B. Accurately locate any existing utilities before beginning excavation; contact local utility companies.
- C. Check for conflict with underground utilities or structures. Notify the Architect/Engineer immediately of all discrepancies before proceeding with the Work.
- D. Fully coordinate with utility companies to insure timely Work by others so as not to hold up construction.

3.02 STRUCTURES:

- A. All structures to be located in pavement or driveway areas shall be built or manufactured to provide HS-20 load bearing capacity. Construct all catch basins, manholes and other structures to lines, grades and dimensions indicated on Drawings.
- B. Structure walls: 5 in. thick for precast up to 10 ft. depth; 8 in. thick for precast below that depth.
- C. Brick inverts for drainage manholes shall be built to the crown of the pipe for sizes up to eighteen (18) inches, and to the spring line for larger pipes.
- D. Cut inlet or outlet pipes flush with inside wall unless otherwise indicated.

- E. Set metal or polypropylene fittings, including manhole steps and frames, in full mortar beds.

3.03 STORM DRAIN LINES:

- A. Excavate in locations and to depths indicated on the Drawings to install storm drain lines. Trench excavation for storm drains shall be in accordance with Section 31 23 00 – Excavation, Backfill and Compaction.
- B. Shape stone at bottom of trench to receive barrel of pipe. Lay pipe at uniform slope between structures and points where changes in grade occur.
- C. Drain lines shall be laid to the lines and grades indicated on the Drawings. Contractor shall use laser instrument in setting the grade lines of all drain lines. Accurately verify pipe grades with Engineers level within 50 ft. beyond each structure, and at no more than 100 ft. intervals thereafter. Fine-tune laser azimuth adjustment as necessary to maintain true design slope of pipe.
- D. Joints shall be made as recommended by the manufacturer of the pipe.
- E. Bedding and pipe cover: After the pipe has been laid, additional crushed stone, or approved backfill, shall be placed and consolidated evenly around both sides of the pipe, to the top of the pipe. The pipe shall then be covered with stone, clean sand or approved backfill material to a depth of 12 inches above the top of the pipe, and compacted with a vibrating plate compactor, in accordance with Drawings and Details. Use care when compacting so as not to disturb the true invert of the pipe.
- F. The remainder of the trench shall be backfilled in accordance with Section 31 23 00 – Excavation, Backfill and Compaction.
- G. After all site Work is completed, including spreading of topsoil and seeding, clean silt, stones and debris from all structures and lines.

3.04 ROAD SWALES:

- A. Road drainage swales shall be excavated, filled, graded, compacted and shaped to the lines and grades indicated on the Drawings.
- B. Swales shall be lined with riprap, matting, or loamed and seeded, as indicated on the Drawings and/or as specified in Section 32 92 20 - Seeding. Culvert inlets and outlets shall be riprapped as indicated and Detailed on the Drawings, and as specified below.
- C. Swales shall be constructed and maintained as described in the Erosion and Sedimentation Control Plan and Drawings.

3.05 RIP-RAP HEADWALLS AND APRONS:

- A. Construct riprap headwalls and aprons at culverts, storm drain inlets and outlets upon a properly graded and compacted 6" gravel base or geotextile (See Details on Drawings). Stones shall be placed full depth in one operation with special handwork if necessary to insure interlocking of all face stones. Larger stones shall be laid at the base of the slope and at culvert inlets and outfalls. Openings between stones shall be filled with sand or gravel and rocks securely rammed into place. Loose stones or exceedingly large stones tending to rise above the average general surface shall be imbedded, reoriented or discarded.

3.06 ROADWAYS:

The Contractor shall make road repairs according to MDOT standard specifications. The Contractor shall repair any and all damage to City streets to a standard that is at least equal to the pre-construction quality of the street. The Superintendent of Public Works shall be responsible for determining if the repairs constructed are sufficient, and the Contractor shall coordinate all repair work with the Superintendent.

END OF SECTION

SECTION 33 46 00

SUBDRAINAGE SYSTEMS

PART 1 - GENERAL

1.01 GENERAL PROVISIONS

- A. Coordinate Work with that of other trades affecting or affected by Work of this Section. Cooperate with such trades to assure the steady progress of the Work.
- B. The "Standard Specifications" referred to herein is the book entitled "*Standard Specifications*" published by the State of Maine Department of Transportation, latest edition, and Supplemental Specifications in Force, excluding the following portions thereof:

Division 100 Sections 102 Through 109 Numerical Index of Payment Items Included in Each Section.

Those Sections of the aforementioned *Standard Specifications* which are cited herein are applicable to the Work of this Contract as they may be modified, amplified or added to by this Section.

- C. Reference is made to the latest Erosion and Sedimentation Control Plan and erosion controls and Details included in the Drawing set for this project. Strict adherence to this plan and Drawings is required in order to prevent adverse downstream impacts from erosion and sedimentation, originating from on-site construction activity.

1.02 DESCRIPTION OF WORK

- A. Provide all labor, material, equipment and services required to complete the following:
 - 1. Install building perimeter drains, building slab underdrains, foundation drainage board, cleanouts, site underdrains for porous asphalt pavement and their connections to the storm drainage system; all as indicated on the Drawings.

1.03 QUALITY ASSURANCE; SUBMITTALS

- A. General: Comply with requirements of the General Conditions for submittals and quality control.
- B. Submittals:
 - 1. Product specification literature for foundation drainage board, all subdrainage pipe and fittings, and filter fabric.

1.04 AS-BUILT DRAWINGS

- A. Submit as-built drawings for all subdrainage piping and structures; accurately show locations and inverts of piping and cleanouts, fittings, etc.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Subdrainage Pipe and Fittings: Subdrainage pipe and fittings shall be as follows:
 - 1. Foundation perimeter drains - Perforated polyvinyl chloride (PVC) pipe, Schedule 40 (ASTM D-1785); sizes as indicated on Drawings.

2. Floor slab radon vent piping – 4" perforated pipe and fittings.
 3. Roadway and Pavement Underdrains - Perforated high density polyethylene (HDPE) pipe, drainage pipe (ASTM F-405, AASHTO M-252); sizes as per drawings.
- B. Stone Bedding Material: 3/4" Crushed stone, as Specified in Section 31 23 00 – Excavation, Backfill and Compaction.
- C. Compacted Structural Fill: Structural granular fill shall be used as trench backfill below and adjacent to building floor slabs, exterior foundation walls, footings and retaining walls as Specified in Section 02220-Excavation, Backfill and Compaction, SS 2.01 B.
- D. Granular Borrow: Granular Borrow shall be used as trench backfill above drainage stone and/or underdrains, to subgrade, as Specified in Section 31 23 00 – Excavation, Backfill and Compaction.
- E. Drainage Filter Fabric: Non-woven, continuous filament fibers:
1. Filter fabric for use in trenches for encasement or wrapping of Stone Bedding Material, Compacted Structural Fill, sand or other approved granular drainage material shall be full width, continuous rolls of non-woven polypropylene; Mirafi 140N, or approved equal.

PART 3 - EXECUTION

3.01 TRENCH EXCAVATION (subdrains)

- A. Excavate trenches for underground lines and structures where indicated on the Drawings. Make trench walls as near vertical as practical, consistent with OSHA requirements and safe working practices. Shore and brace as necessary. Keep excavations free from water in order to carry on Work properly; begin trenching at outlet end of subdrainage system.
- B. Excavation shall be made to such a point as to allow a minimum of six inches (6") of 3/4" crushed stone bedding to be placed beneath the bottom of all barrels, bells or couplings of all pipes installed. The maximum clear width of trench at the top of the pipe shall be not more than the outside diameter of the pipe plus two feet. The bottom of the trench shall be accurately graded to provide a uniform layer of bedding material for each section of pipe. Safety shall be the controlling factor in determining minimum trench widths.
- C. Install Drainage Filter Fabric on subgrade or in trench, where required, as indicated on Drawings and Details.
- D. Before installation of any underdrain pipe, the Contractor shall first place and consolidate a minimum six inch (6") layer of Stone Bedding Material, or approved granular drainage material, on the trench bottom. After the underdrain pipe has been laid, additional crushed stone, or approved granular drainage material, shall be placed and consolidated to a depth of 6" above the top of the pipe. When installing flexible pipe, particular care shall be taken when grading stone and laying pipe, to assure a uniform and consistent invert slope. Provide protective filter fabric wrap envelope, where required, as indicated on Drawings and Details.
- E. Complete Drainage Filter Fabric wrap, where required, providing complete enclosure or encasement of Stone Bedding Material, or approved granular drainage material, allowing for overlap of at least one foot or one half of trench width (whichever is greater). Cover fabric with thin layer of stone or backfill, placed by hand, to anchor fabric before commencing trench backfill.
- F. After the completion of all underdrain and trench backfilling operations, the Contractor shall grade the site to the lines, grades and elevations indicated on the Contract Drawings, taking into account any subsequent topsoil, filtration media, slab and paving requirements. Finished grading

shall not be done until the installation of all related subdrains, etc., has been completed for any area.

3.02 SUBDRAINAGE LINES

- A. Install underdrains, subdrainage lines and connector pipes to locations and grades indicated on Drawings and as Detailed.
- B. Install pipe in straight lines and with evenly sloping invert. Allow no sags or rises in pipe to interfere with water flow. This is particularly important when laying flexible pipe on flat slopes.
- C. Where two lines connect, provide proper prefabricated fittings (tee, wye and specials) and match crowns of pipes unless otherwise directed. Field made connections and fittings are unacceptable.
- D. Installation of the subdrains for foundations shall be fully coordinated with the pouring of concrete, location of sleeves for subdrain pipe, placement and compaction of structural fill and floor slab drain material, and as follows:
 - 1. Verify that trench cuts and excavated subgrades are ready to receive Work, and excavations, dimensions, and elevations are as indicated on Drawings and Details.
 - 2. Begin pipe installation only after Acceptance of existing conditions and compacted subgrade.
 - 3. Hand trim excavations to achieve required trench subgrade elevations. Correct over excavations with compacted Granular Borrow or Compacted Structural Fill, as required.
 - 4. Remove large stones or other hard matter which could damage drainage pipe or impede consistent backfilling or compaction.
 - 5. The bottom of the excavation shall be smooth, free from loose earth and accurately graded.
 - 6. Install Drainage filter Fabric or Wrap as required.
 - 7. Install pipe and pipe fittings in accordance with manufacturer's recommendations and instructions.
 - 8. After placing the initial layer of crushed stone, place the subdrain pipe with the holes down, true to the alignment and gradient indicated. All joints shall be properly made-up. Place sufficient amount of crushed stone over reach length of pipe by hand to hold in place and prevent lateral movement or displacement of pipe invert during installation.
 - 9. Install perimeter underdrains along the exterior perimeter of the foundation near the footing grade, with positive drainage.
 - 10. Make connections to Foundation Drainage board or connector pipes as required.
- E. For subdrainage from beneath ground floor slabs and concrete pads, underdrains shall be provided beneath the slab where indicated on the Drawings. The interior underslab subgrade and subgrade below entrance walks and slabs should be sloped to promote water movement toward the underdrains. Provide crushed Stone Bedding Material, Granular Borrow, Compacted Structural Fill, Drainage Filter Fabric and wrap as indicated on Drawings and Details.
- F. Backfilling against the foundation walls shall be coordinated with foundation waterproofing and placement of foundation drainage board and insulation board as indicated on the Drawings, and in conjunction with all other filling and backfilling against foundation walls.

- G. Protect pipe from damage or displacement until backfilling operation begins. Backfill immediately after the subdrain pipe is placed, including cover stone or granular material and Drainage Filter Fabric.
- H. Backfill and compact carefully to hold the subdrain securely in place. Avoid disturbing the alignment and gradient of the subdrain pipe.
- I. Seal exterior foundation backfill with a 6" to 12" surficial layer of impervious soil in areas that are not to be paved or occupied by entrance slabs, to reduce direct surface water infiltration into the backfill and subdrains, or as indicated on Drawings and Details.

END OF SECTION

SECTION 33 51 20

GAS STORAGE AND DISTRIBUTION SYSTEMS

PART I - GENERAL

1.01 GENERAL PROVISIONS:

- A. Coordinate Work with that of other trades affecting or affected by Work of this Section. Cooperate with such trades to assure the steady progress of the Work.
- A. The "Standard Specifications" referred to herein is the book entitled "*Standard Specifications*" published by the State of Maine Department of Transportation, latest edition, and Supplemental Specifications in Force, excluding the following portions thereof:

Division 100, Sections 102 Through 109; Numerical Index of Payment Items Included in Each Section.

Those Sections of the aforementioned *Standard Specifications* which are cited herein are applicable to the Work of this Contract as they may be modified, amplified or added to by this Section.

- B. Contractor shall Work in close cooperation with all affected utility companies and the City of Ellsworth to the end that all Work is constructed in accordance with all applicable standard practices and regulations.
- C. For L.P. Gas tank installations, comply with all requirements of the Maine State Fire Marshall's Office, and NFPA-58 and all other applicable NFPA Standards.
- D. Tank and fittings to be supplied by the Owner's selected propane supplier. Contractor to provide all coordination for complete system installation of system.

1.02 DESCRIPTION OF WORK:

- A. Provide all labor, materials, equipment and services necessary for proper and complete installation of the following:
 - 1. Excavation, trenching, bedding and backfilling for underground lines from aboveground or underground storage tank(s) to the building(s), as indicated on Drawings.
 - 2. Excavation, gravel base, backfill, and stone drainage medium at concrete pads for oil and gas tanks. Reference is made to Division 3 for structural concrete installation.

1.03 QUALITY CONTROL; SUBMITTALS:

- A. General: Comply with requirements of the General Conditions for submittals and quality control.
- B. Shop Drawings: To be provided as per the General Conditions.

1.04 AS-BUILT DRAWINGS:

- A. The Contractor shall survey actual layout and provide to the Architect/Engineer red-line drawings of the complete installation, including exact depth of all buried components.

PART 2 - PRODUCTS

2.01 UTILITY TRENCHES AND BACKFILL::

- A. Bedding Material for Gas Lines and Conduit: Well-graded Sand Bedding Material, as specified in Section 31 23 00 – Excavation, Backfill and Compaction.
- B. Granular Backfill: Well-graded sand or gravel Granular Borrow, as specified in Section 31 23 00 – Excavation, Backfill and Compaction.

PART 3 - EXECUTION

3.01 PREPARATION:

- A. Notify "Dig-Safe" at least 3 days prior to beginning any excavation Work.
- B. Accurately locate any existing or previously installed or existing utilities before beginning excavation.
- C. Check for conflict with underground utilities or structures. Notify the Architect/Engineer immediately of all discrepancies before proceeding with the Work.

3.02 UTILITY TRENCHING FOR L.P. GAS LINES:

- A. Excavate, bed and backfill underground L.P. gas lines and conduit as Specified herein and in accordance with all applicable NFPA standards, and to the locations, lines, and Details indicated on the Drawings.
- B. All underground L.P. gas lines under pavement areas shall be installed in Schedule 40 PVC conduit, as indicated on Drawings.

END OF SECTION

• END OF PROJECT MANUAL •