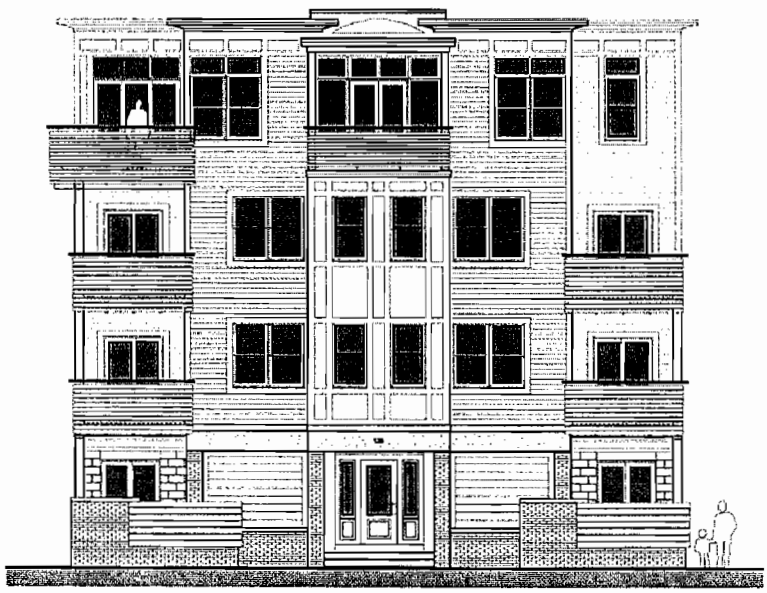
PROJECT MANUAL

SHERIDAN HEIGHTS

PROPOSED CONDOMINIUMS AT
135 SHERIDAN STREET, PORTLAND, MAINE,
FOR SHERIDAN STREET LLC.



CONSTRUCTION DOCUMENTS
BID SET - 02.05.07

PREPARED BY:

TFH ARCHITECTS
100 COMMERCIAL ST, SUITE 212
PORTLAND, ME 04101
FAX: (207) 773 - 0194
TEL: (207) 775 - 6141

OWNER'S REPRESENTATIVE:

shinberg
CONSULTING, LLC
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FAX: (207) 773 - 8597
TEL: (207) 523 - 3410

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DIVISION 06 WOOD AND PLASTICS

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SHERIDAN STREET, LLC
477 Congress Street, 5th Floor
Portland, Maine 04101-3427
207 523 3410 Office
207 773 8597 Fax

ADDENDUM NO. 1

To the Contract Documents for the Sheridan Heights project.

Owner: Sheridan Street, LLC

February 14, 2007

This Addendum modifies, amends and supplements designated parts of the Contract Documents, Project Manual and Drawings for the Sheridan Heights Drawings dated February 5, 2007 and is hereby made a part thereof by reference. This Addendum is binding as though inserted in its entirety in the locations specified herein. It shall be the responsibility of the General Contractor to notify all Subcontractors and Suppliers that will be bidding the project for the various parts of the work of any changes or modifications in the Addendum.

Greg Shinberg, Project Manager
Shinberg Consulting, LLC

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The following drawings will be issued and will replace the drawings originally issued with the bid set on February 5, 2007:

1. A8.0 R 1
2. A8.1 R.1
3. A8.3 R 1
4. A8.4 R 1
5. L1 – S K 1
6. L2 – S K 1

ADDENDUM TO ARCHITECTURAL DRAWINGS - 02.13.07

Sheridan Heights, 135 Sheridan Street, Portland Maine
Original Drawings Dated: February 5, 2007; "Bid Set, Not For Construction"

Drawing G1.0 Drawing Index:

A8.0	Change title to "1st Floor Lighting, Electric Panel & Voice/Data Outlet Plan"
A8.1	Change title to "2nd Floor Lighting, Electric Panel & Voice/Data Outlet Plan"
A8.2	Change title to "3rd Floor Lighting, Electric Panel & Voice/Data Outlet Plan"
A8.3	Change title to "4th Floor Lighting, Electric Panel & Voice/Data Outlet Plan"

Add:

S5.3	Framing Section & Details
S5.4	Framing Section & Details
S5.5	Framing Section & Details
S5.6	Framing Section & Details
L1 – SK 1	Landscape details
L2 – SK 2	Lighting details
LG1	Glass Landscape Plan

Drawing A1.2

Add alternate # 3
Allow for gas fire place vents through the wall to units 3A, 3B, 3D, 3F & 3G
Allow for gas fire place vents through the roof to units 3C

Drawing A1.3

Skylight shaft to units 4B & 4D are to be splayed on 4 sides (not 2 sides).
Frame out all interior doors to units 4A, 4B, 4D, 4E, 4F, 4G (except doors to laundry w/d closet, boiler closet, & non walk-in closets) to allow for future 3'-0" wide doors.

Drawing A1.10

Frame out doors 1B5, 1B6 to allow for future 3'-0" wide doors.

Drawing A1.11

Frame out all interior doors to units 2A, 2B, 2C (except doors to laundry w/d closet, boiler closet, & non walk-in closets) to allow for future 3'-0" wide doors.

Drawing A1.12

Frame out all interior doors to units 2E, 2F, 2G (except doors to laundry w/d closet, boiler closet, & non walk-in closets) to allow for future 3'-0" wide doors.

Drawing A1.13

Frame out all interior doors to units 3A, 3B, 3C (except doors to laundry w/d closet, HVAC closet, & non walk-in closets) to allow for future 3'-0" wide doors.

Drawing A1.14

Frame out all interior doors to units 3D, 3E, 3F, 3G (except doors to laundry w/d closet, HVAC closet, & non walk-in closets) to allow for future 3'-0" wide doors.

Drawing A1.15

Frame out all interior doors to units 4A, 4B (except doors to laundry w/d closet, HVAC closet, & non walk-in closets) to allow for future 3'-0" wide doors.

Drawing A1.16

Frame out all interior doors to units 3D, 3E, 3F, 3G (except doors to laundry w/d closet, HVAC closet, & non walk-in closets) to allow for future 3'-0" wide doors.

Drawing A1.23

Skylight shaft to units 4B & 4D are to be splayed on 4 sides (not 2 sides).
Skylight to unit 4D to be type S1 (not S2).

Drawing A5.0

Detail 1: Finished grade to be above base of lowest brick but below weep holes.
Detail 2: Provide 1"x10" PT cap with 15° top slope & saw kerf drip cut

Drawing A5.1

Detail 1: Provide EPDM membrane between sheathing & CMU. Fix sheathing to vertical PT nailer set in to CMU at 16" OC Refer to Structural drawings.
Detail 2: Provide blocking & framing around structural steel lintel as required to fix all interior & exterior linings. Fix galvanized angle to solid blocking with c/s screws.
Detail 9: Finished grade to be above base of lowest CMU.
Detail 9: Continuous bead of urethane caulk to be 1" wide x 1" deep.
Detail 11: Provide solid blocking behind 1x6 pine board at roof edge.

Drawing A5.3

Detail 1: Decking to be fixed to EPDM wrapped tapered sleepers with No. 8 countersunk square-drive stainless steel screws.

Drawing A5.4

Detail 2: Finished grade to be above base of lowest brick, but below weep holes. Weep holes to be above grade.

Drawing A5.6

Detail 7: Stainless steel gate hinges to be 4" mortised.
Detail 10: Finished grade to be above base of lowest brick, but below weep holes. Weep holes to be above grade.

Drawing A5.7

Detail 6: Provide PT shims beneath fiber cement facings 2 sides of PT strut, to allow for thickness of metal bolt & plate connections at top & bottom of strut. Refer to Structural drawings.

Drawing A7.1

Refer to Specification Section 08700 Finish Hardware for threshold types

Drawings A8.0, A8.1, A8.2 & A8.3

Revision 1 (02.13.07) are issued as part of this addendum.

ADDENDUM TO STRUCTURAL DRAWINGS - 2.13.07
Sheridan Heights, 135 Sheridan Street, Portland Maine
Original Drawings Dated: February 5, 2007; "For Construction"

Drawing S1.1

1. ADD the following note under the Masonry Construction section,
   "G22. All concrete masonry units, or any portion thereof, that are placed below final grade shall have all cells grouted solid. Furthermore, the first course in contact with the supporting concrete foundation wall shall have a continuous waterstop (Greenstreak "Swellstop" or approved equal) placed below the masonry (on top of foundation wall) and aligned with the centerline of the masonry wall."

Drawing S2.0:

1. ADD additional note stating, "10. Bottom of perimeter wall footings shall be a minimum of 4'-6" below exterior final grade at all perimeter walls. See Detail H6/S3.0 for step footing requirements at transition locations. Maximum top of footing (TOF) at foundation walls shall be as follows:
   - Concrete Basement wall footings (Sections C3/S3.1 and H3/S3.1): TOF 121.67.
   - Footings supporting 12" CMU (Section H5/S3.2): TOF 119.50
   - Footings supporting frost walls (Section H1/S3.1): TOF 118.50
2. REVISE Elevator Footing such that it extends 3'-0" beyond face of foundation wall at North and West sides.
3. DELETE "TOF XX" from interior footings in the garage.
4. REPLACE reference to C3/S3.1 with H3/S3.1 at grids 1/K.5 and 3.5/N.

Drawing S3.0:

1. Detail D2/S3.0 – REVISE thickened slab from 1'-0" to 1'-6" at door entrance.
2. Detail D6/S3.0 – DELETE 4'-4" vertical dimension at top of footing. ADD note stating, "Coordinate top of elevator pit footing with elevator submittal after submittal approval has been provided by the architect."

Drawing S3.3:

1. Detail H4/S3.3 – ADD note stating, " Two layers of reinforcement (#4 @12 oc EW) with footing dowels to match are required if wall thickness equals or exceeds 0'-10" (locate reinforcement 2" clear from face of walls).

Drawing S4.0:

1. REVISE Note 2 to reference Drawings S5.0 though S5.6
2. REVISE Note 16 to reference Detail H4/S5.4.
3. REVISE Note 25 to reference H1/S5.6.
4. ADD section label C3/S5.0 at grids 1/D.5 and G/5.3.
5. ADD section label F3/S5.2 at steel beams on elevator walls.
6. ADD section label C3/S5.0 at grids 1/D.5 and G/5.3.
7. ADD detail label C3/S5.6 at grid 1.5/M.2.
8. ADD "L5x5" at grid 1/L and 1/K.

Drawing S4.1:

1. REVISE section label at grids N/4.8 and G/6.5 to be F5/S5.6.
2. REVISE shearwall label at grid K/3 from "S/W1" to "S/W3".
3. REVISE Column at grid E/3.8 to be C3.

Drawing S4.2:

1. REVISE section label at grids N/4.8 and G/6.5 to be F5/S5.6.
2. ADD section label C4/S5.3 at grid M/4.

Drawing S4.3:

1. REVISE section label at grids N/4.8 and G/6.5 to be F5/S5.6 - similar.
2. ADD section C7/S5.6 at elevator.
3. ADD note as follows, " See Architectural Drawings for requirements pertaining to Roof Skylight Alternate. Provide separate price to include truss and other necessary framing alterations to accomodate skylight."

Drawing S5.2:

1. Detail H10/S5.2 – CHANGE fastener spacing from 2" oc to 12" oc.

Drawing S5.3:

1. Detail H4/S5.3 – DELETE note # 4 and column type C7.
2. Detail H9/S5.3 – REVISE 15/32" to 7/16".

Drawing S5.5:

1. Make the following changes to part plan H7/S5.5:
    - ADD column C3 at grid 3/E.7.
    - ADD detail reference C9/S5.6 at grid 4.1/E.6.
    - REVISE 8" dimension to 6" at grid 4.1/E.6.

Drawing S5.6:

1. REVISE reference to Detail located at lower right corner of drawing to be H9/S5.6.

ADD Note 2 to detail C9/S5.6 stating, "Face nail 2x12 PT onto front face of 'Wood Beam' to provide support of wall above."

Section 00400 – Allowance Instructions

Allowance No. 1 : Interior signs - $3500

Allowance No. 2 : Fence at the Glass property as noted on LG1 - $4500

Allowance No. 3 : Mailbox Assembly at Mail Room 103 - $1,200

Section 00410 – Bid Form

Revised Bid Form to Follow

Add Alternate No. 2 should read "Andersen 400 Series and Doors"

Number 5.

Provide cost per ton to remove from site and dispose of the demolition debris present estimated to be approximately 650 Cubic Yards. This material is composed of old fire debris that is primarily brick and charred wood.

Number 6.

Provide cost per cubic yard of gravel to replace the materials hauled from site as noted in Add Alternate Number 5 above. Gravel material to conform to specifications as noted in the attached Section 02200.

SECTION 00410 – BID FORM

BID FROM _____ (Name)

_____ (Address)

_____

The proposal must be submitted to:

Sheridan Street, LLC
477 Congress Street, 5th Floor
Portland, Maine 04101

Attention: Greg Shinberg, Project Manager Shinberg Consulting, LLC

Name of firm submitting this proposal _____

1. General Requirements: $ _____
2. Sitework: $ _____
3. Concrete: $ _____
4. Masonry: $ _____
5. Metals: $ _____
6. Wood & Plastic: $ _____
7. Thermal & Moisture: $ _____
8. Doors & Windows: $ _____
9. Finishes: $ _____
10. Specialties: $ _____
11. Equipment: $ _____
12. Furnishings: $ _____
13. Special Construction: $ _____
14. Conveying Systems: $ _____
15. Mechanical: $ _____
16. Electrical: $ _____
17. Performance & Pmt Bond: $ _____

TOTAL BID LUMP SUM: $ _____

IN WORDS $ _____

Add Alternates:

1. White Roof $ _____
2. Andersen 400 Series Windows / Doors $ _____
3. Fire Place at 3rd Floor $ _____
4. Add Skylights at 4th Floor $ _____
5. Remove demolition debris $ _____
6. Place gravel material on site $ _____

ADDENDA: The undersigned further acknowledges receipt of addenda as listed below and represents that any additions or modifications to, or deletions from, the work called for in these addenda, are included in the Base Bid Sum.

Addendum No. Date _____

Addendum No. Date _____

Addendum No. Date _____

(Note: If no addenda have been received, write in "NONE.")

DECLARATION:

The undersigned declares, by executing this proposal, that:

A. This proposal shall remain valid, for acceptance by The Owner for a period of not less than ninety (90) days from the bid due date.

B. All requirements concerning licensing and all other local, state and national laws have been or will be complied with and that no legal requirements will be violated in the execution of the work if the proposal is accepted.

C. No person, persons or company other than the firm listed below or otherwise indicated hereinafter have any interest whatsoever in the proposal or the contract that may be entered into as a result thereof. This proposal is submitted in good faith, without collusion or fraud.

D. The person or persons signing this proposal is/are fully authorized to sign on behalf of the conditions and provisions thereof.

SIGNED: _____ TITLE: _____

SUBMITTED THIS: _____ DAY OF: _____

NAME OF FIRM: _____

STREET ADDRESS:

_____

CITY: _____ STATE: _____ ZIP: _____

(Complete and strike out words that do not apply)

OPERATING AS: _____

A CORPORATION UNDER THE LAWS OF THE STATE OF

_____

A PARTNERSHIP (GIVE FULL NAMES OF ALL PARTNERS)

_____

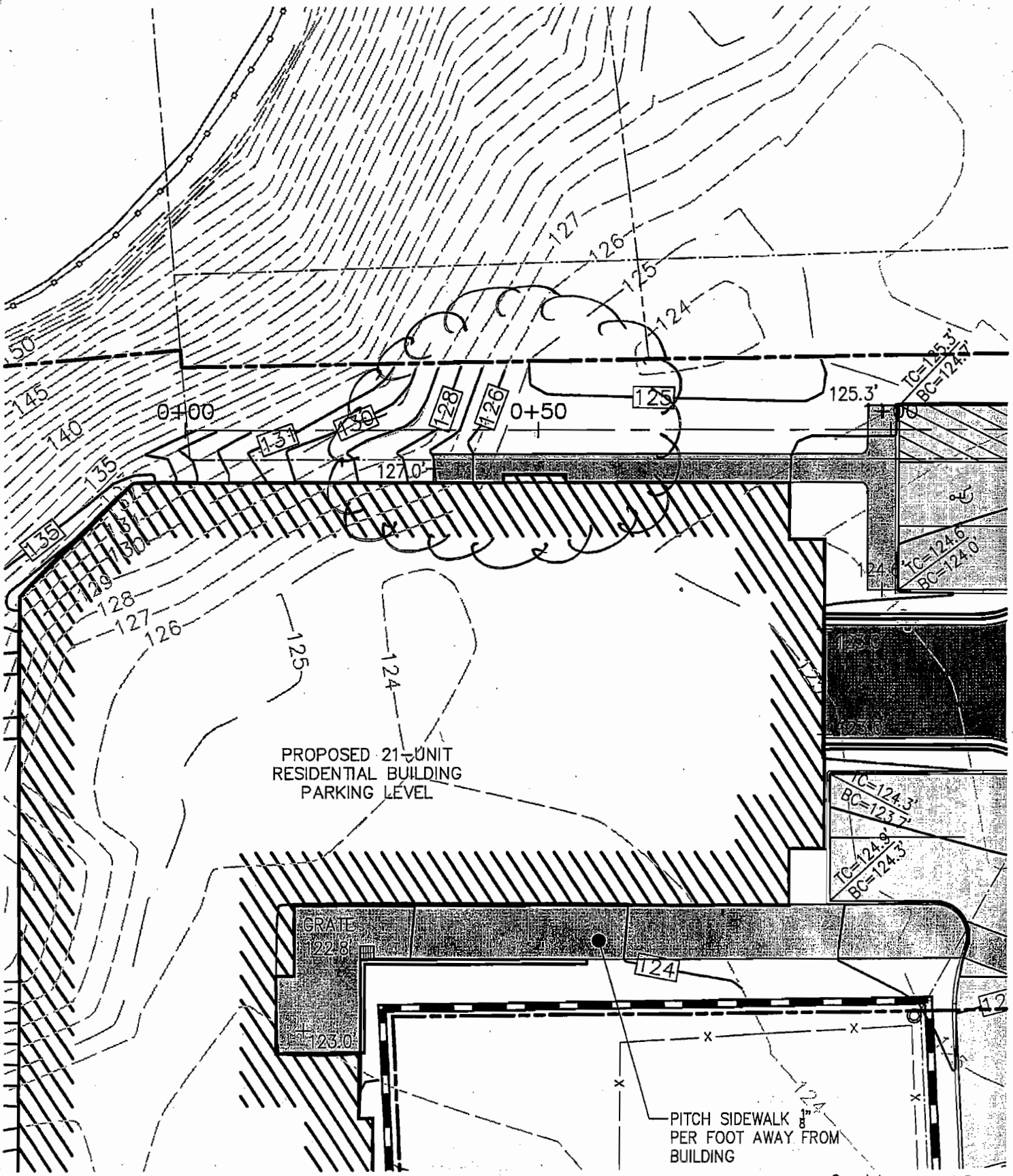
_____

Section 010501 – Permits / Fees

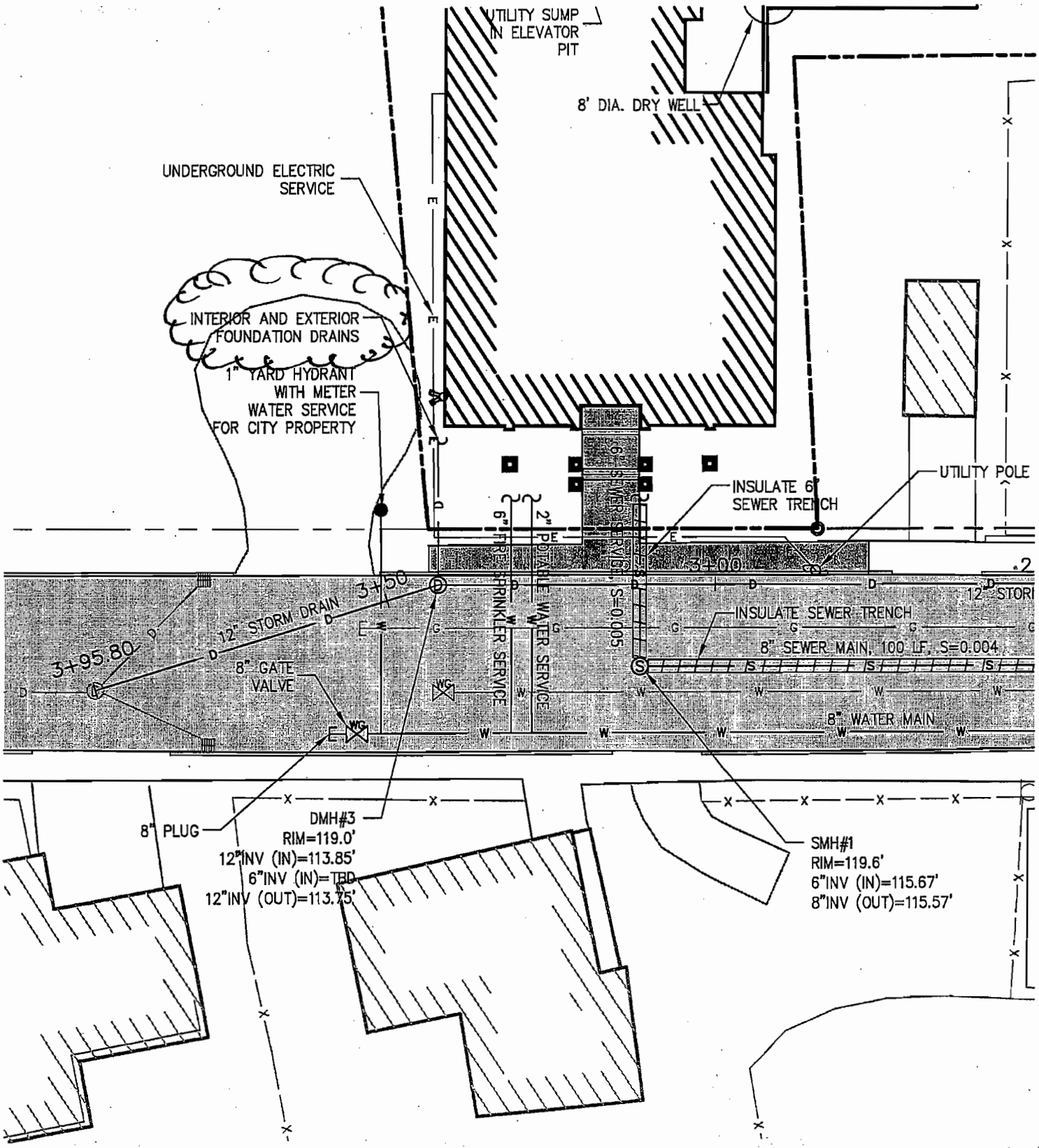
The Building Permit will be paid for by Owner. The Sewer and Water Connection fees will be paid for by Owner. All other permits will be the responsibility of the General Contractor.

Section 02200

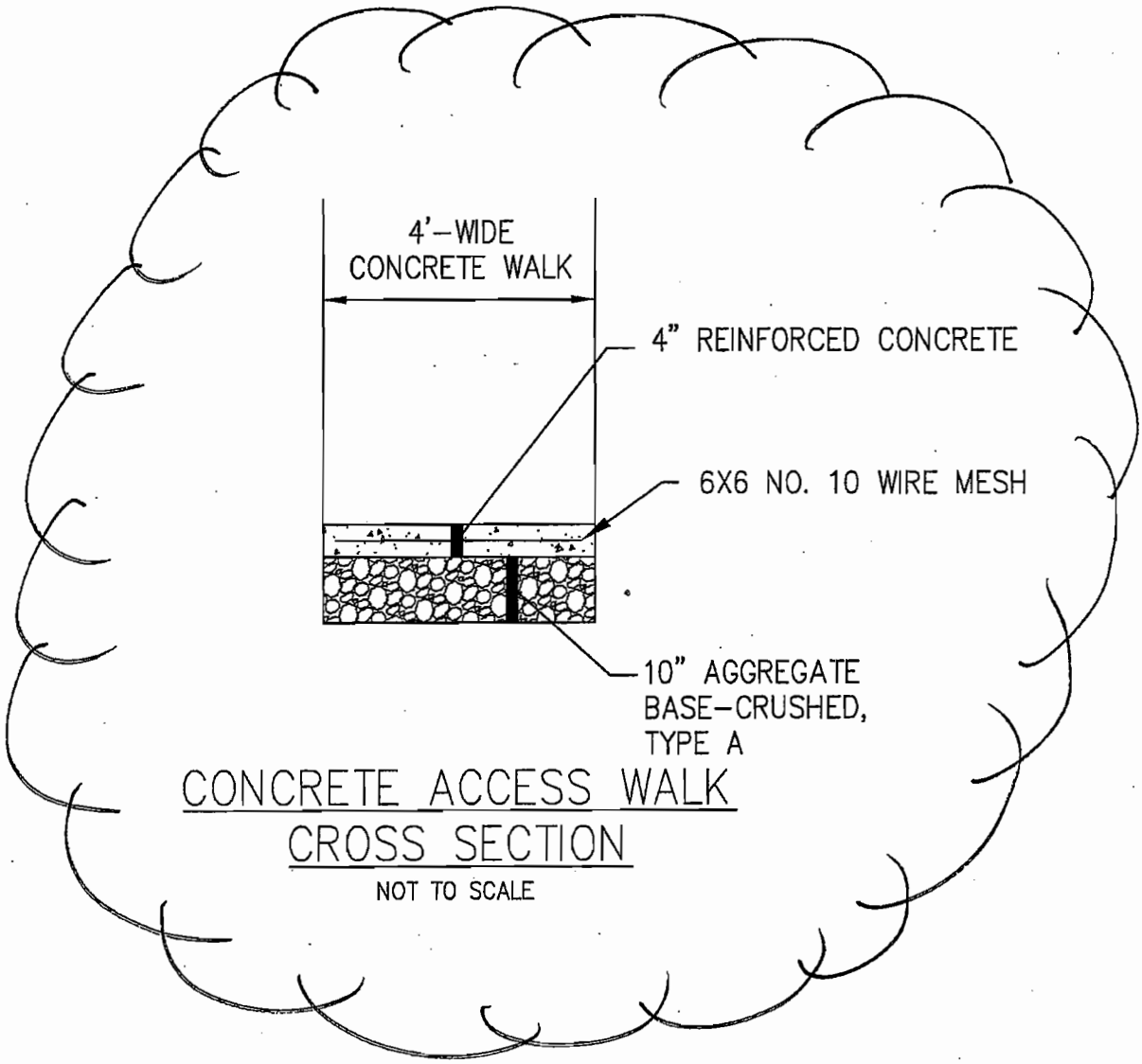
To follow is 5 sheets that amend the Drawings C3, C4, C5, C6 and C7



REVISED REAR GRADING NEAR WALKWAY - SHEET C3



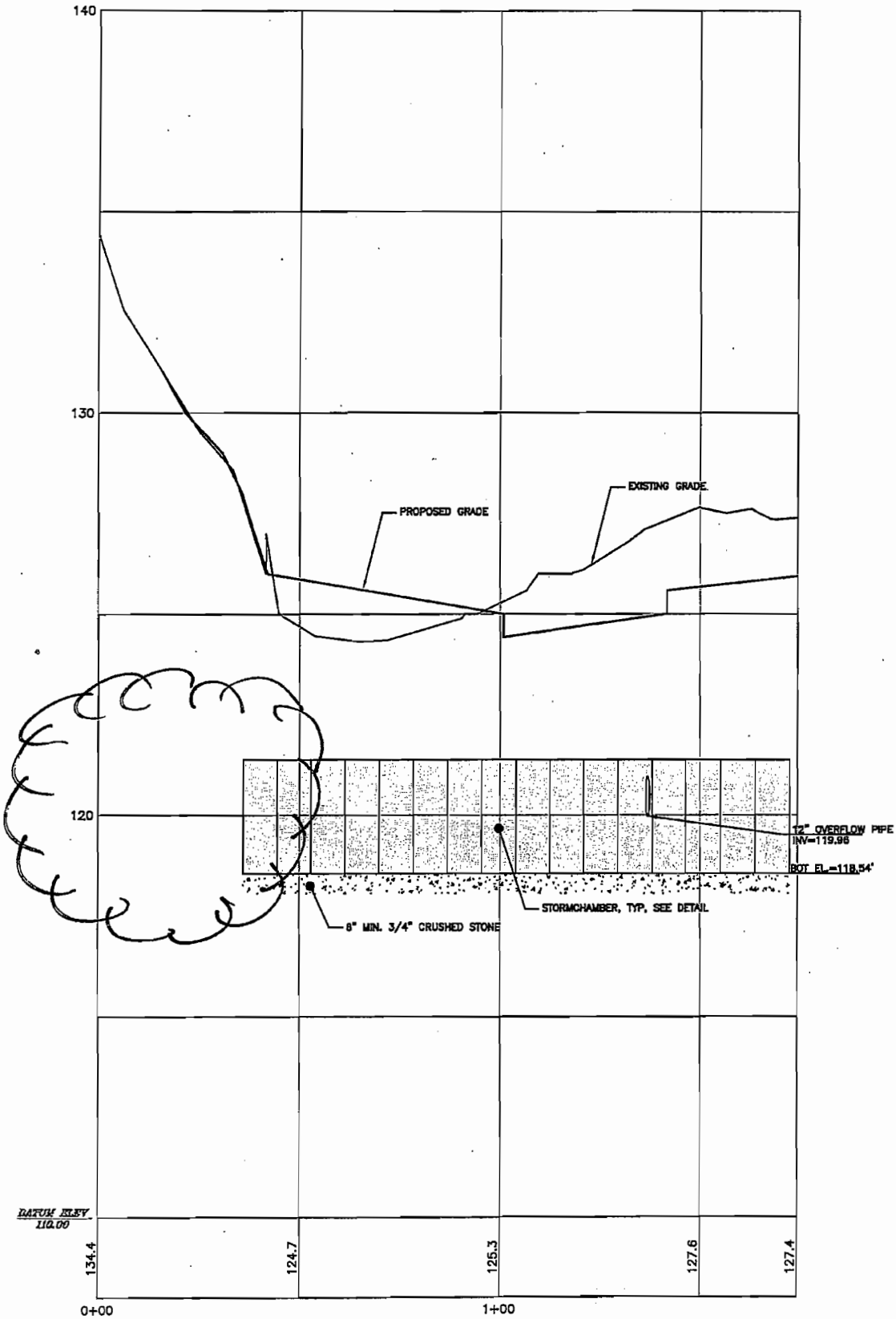
REVISED FOUNDATION DRAIN NOTE - SHEET C4



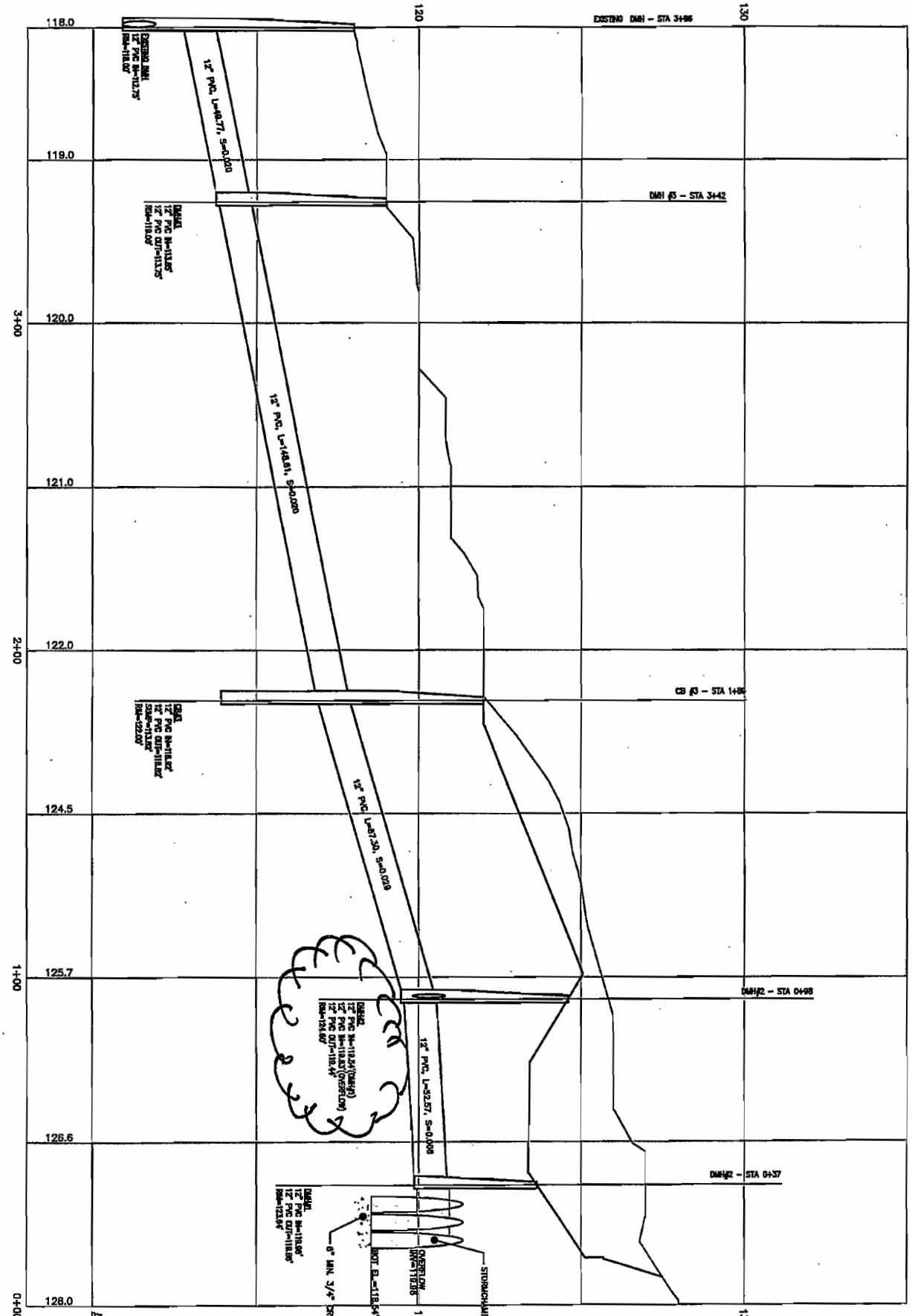
CONCRETE ACCESS WALK
CROSS SECTION

NOT TO SCALE

DETAIL ADDED TO
SHEET C5.



REVISED PROFILE
SHEET C6



REVISED DMH #2. INVERTS

SHEET C7

DIVISION 2

SITE WORK

Scope of Work

Provide, install and test all site work and appurtenant work in complete accordance with the Drawings & Specifications.

Contractors Duties

Except as specifically noted, provide and pay for all labor, materials, equipment, tools, machinery, water, heat, other facilities and services necessary for proper execution and completion of work.

Contents of Division

END OF SECTION

SECTION 02110

CLEARING AND GRUBBING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Clearing includes, but is not limited to, removal of trees, brush, stumps, wooded growth, grass, shrubs, poles, posts, signs, surface boulders, rock, fences, culverts and other vegetation and minor structures; the protection of designated wooded growth; the storage and protection of minor structures and materials which are to be replaced; and the disposal of nonsalvageable structures and materials, and necessary preliminary grading.

B. Limits of Work:

1. Perform clearing and grubbing work within the areas required for construction, or as shown on the Drawings, to a minimum depth of 6 inches below the existing grade. Clearing and grubbing to deeper depths where required to completely remove tree and vegetation roots.
2. Perform additional clearing and grubbing work within areas and to depths which, in the opinion of the Engineer, interfere with excavation and/or construction, or are not otherwise objectionable.

C. Work Not Included:

1. Clearing and grubbing work performed for the convenience of the Contractor will not be considered for payment.

1.2 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:

1. Dispose of combustible material by burning only when permitted by and in accordance with all applicable local and state laws, ordinances and code requirements.

B. Remove and dispose of nonsalvageable structures and material in accordance with all applicable local and state laws, ordinances and code requirements.

PART 2- PRODUCTS

2.1 MATERIALS

A. Provide all materials required to complete the work.

B. All timber and wood shall become the property of the Contractor unless other agreements are made between the Owner and the Contractor.

C. Repair any damage to structures to the complete satisfaction of the Owner and Engineer.

PART 3 - EXECUTION

3.1 PREPARATION

A. Carefully preserve and protect from injury all trees and/or shrubs not to be removed.

B. Right-of-way:

1. Where excavation is required on public or private rights-of-way containing trees, shrubs, other growth, or any structure or construction, obtain the Engineer's direction concerning the extent to which such obstacles can be cleared or stripped prior to performing the Work.
2. In all rights-of-way, remove only those particular growths or structures which are, in the opinion of the Engineer, essential for construction operations.
3. All other removals or damage shall be replaced or restored at the Contractors expense.

3.2 PERFORMANCE

A. Clearing:

1. Remove and dispose of all trees, brush, slash, stubs, bushes, shrubs, plants, debris and obstructions within the area to be cleared, except any areas that may be designated as 'Selective Clearing', and except as otherwise shown on the Drawings or as directed by the Engineer.
2. Remove all stumps unless otherwise directed by the Engineer.
3. Dispose of material to be removed daily as it accumulates.

B. Protection of Wooded Growth:

1. Fell trees toward the center of the area being cleared to protect trees and shrubs to be left standing.
2. Cut up, remove and dispose of trees unavoidably falling outside the area to be cleared.
3. Employ skilled workmen or tree surgeons to trim and repair all trees that are damaged but are to be left standing and paint all cut surfaces with an approved bituminous paint.

C. Selective Clearing:

1. When shown on the Drawings and when directed by the Engineer, perform selective clearing work to preserve natural tree cover,
2. Perform selective clearing work only under the direction and supervision of the Engineer.
3. Remove all dead and uprooted trees, brush, roots and other material which, in the opinion of the Engineer, are objectionable.
4. Cut flush with the ground and remove only those trees indicated by the Engineer.
5. Employ skilled workmen or tree surgeons to carefully trim all branches requiring cutting on trees to be left standing and to paint all cut surfaces with an approved bituminous paint.
6. Paint tree roots which are cut and are to be left exposed to the weather with an approved bituminous paint.

D. Grubbing:

1. Perform grubbing work beneath new roads, driveways, walks, seeded areas and other areas and as directed by the Engineer.

2. Grub out all sod, vegetation and other objectionable material to a minimum depth of 6 inches below the existing grade.
3. Completely remove all stumps, including major root systems.

E. Disposal:
1. Remove from the site and dispose of material not being burned.
2. Provide an approved disposal area unless otherwise specified.

3.3 REPLACEMENT OF MATERIALS

A. Paving, Curbing and Miscellaneous Material:
1. Remove all paving, subpaving, curbing, gutters, brick, paving block, granite curbing, flagging and minor structures that are over the area to be filled or excavated.
2. Remove and replace bituminous asphaltic and portland cement concrete in accordance with the appropriate sections of these Specifications.
3. Properly store and preserve all material to be replaced in a location approved by the Engineer.

B. Shrubs and/Bushes:
1. Remove, store, and replace ornamental shrubs and bushes to be preserved in accordance with accepted horticultural practices.

C. Topsoil:
1. When applicable, carefully remove, store, and protect topsoil in accordance with the appropriate section of this Division.

D. Responsibility:
1. Replace, at no additional cost to the Owner, materials lost or damaged because of careless removal or neglectful or wasteful storage, disposal or use of these materials.

END OF SECTION

SECTION 02115

STRIPPING AND STOCKPILING TOPSOIL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:
   1. Segregate topsoil approved by the Engineer prior to excavation, trenching and grading operations and stockpile it for use in the work.
   2. Unsuitable topsoil shall be disposed of off-site, or if approved by the Engineer used as common borrow.

B. Related Work Specified Elsewhere (When Applicable):
   1. Demolition, clearing and grubbing, grading, embankment, excavation and landscaping are specified in the appropriate sections in this division.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Topsoil shall consist of friable loam of at least two percent decayed organic matter (humus), free of subsoil, and reasonably free of clay lumps, brush, roots, weeds, and other objectionable vegetation, stones and similar objects larger than one (1) inch in any dimension, litter and other materials unsuitable or harmful to plant growth. It shall contain no toxic materials.

B. The quality of the topsoil material to be used shall be subject to approval by the Engineer.
   1. Silt content shall be suitable for use as loam topsoil for landscaping and surface restoration.

PART 3 - EXECUTION

3.1 PERFORMANCE

A. Remove topsoil from the areas that are likely to be disturbed as a result of construction operations to a depth based on the soil profile, as approved by the Engineer.

B. Remove topsoil from all designated areas prior to the performance of normal excavation.

3.2 STORAGE

A. Transport topsoil and deposit in storage piles convenient to the areas which are subsequently to receive the application of topsoil.

B. Stockpile topsoil separate from other excavated materials in areas approved by the Engineer.

C. Take all necessary precautions to prevent other excavated material and objectionable material from becoming intermixed with the topsoil before, during and after stripping and stockpiling operations.

D. Neatly trim and grade stockpiles to provide drainage from surfaces and to prevent depressions where water may become impounded.
E. Construct temporary erosion control devices for all stockpiled material, subject to the Engineer's approval.
F. All loam stripped and stockpiled shall be immediately seeded with 70% Domestic/30% Perennial Rye Grass.
G. Provide temporary erosion control facilities and materials as specified in Section 02270 around all soil storage areas.

END OF SECTION

SECTION 02156

SHEETING

PART 1- GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish, install and maintain sheeting and bracing (or other methods of excavation support and underpinning which the Contractor elects to use) as required to comply with all applicable State and Federal regulations including the Occupational Safety and Health Act.

B. Related Work Specified Elsewhere (When Applicable): structure excavation, trench excavation, backfilling, and dewatering are specified in the appropriate Sections in this Division.

1.2 DESIGN REQUIREMENTS

A. The General Contractor shall be responsible for the design and construction of the excavation support structures. The excavation support structures (sheeting systems or other special excavation techniques) shall be properly designed by a Professional Engineer registered in the State of Maine, who practices in a discipline applicable to excavation work and shall have experience in the design of excavation support systems.

B. The excavation support system shall be designed and installed to sustain all existing and expected loads and utilities, to prevent all movement to earth which could in any way cause injury to workmen, delay the work or endanger adjacent structures. If detrimental effects results from construction activities, the Contractor shall modify the design, revise construction procedures and/or take measures to mitigate and abate further movement at no cost to the Owner.

C. The internal lateral bracing shall be located so that the braces shall not pass through walls and/or slabs.

D. Prior to the installation of any portion of the temporary lateral support system, the Contractor shall furnish to the Owner precondition surveys documenting the existing conditions of the adjacent structures.

1.3 SUBMITTALS

A. Submit attached certificate of design, design calculations including estimates of the lateral and vertical displacements of the excavation lateral support systems under applied loads at critical stages and complete layout drawings of the proposed excavation system, stamped and sealed by a Professional Engineer registered in the State of Maine. The excavation support structures will be reviewed by the Project Engineer as Owner's representative for compatibility with subsurface conditions as presented in the Geotechnical Report. Such review shall not relieve the Contractor of sole responsibility for design and construction of the excavation support system as necessary to prevent damage to adjacent structures, utilities, streets adjacent to excavations and for safety of persons working within the excavated areas.

PART 2 - PRODUCTS

2.1 MATERIAL

A. All materials shall conform to all applicable State and Federal regulations including the Occupational Safety and Health Act.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. Perform preparatory work to discover, protect, maintain and restore utilities, foundations or other facilities located in close proximity of the proposed excavation lateral support system.

B. Conduct pre-excavation to remove obstructions along the alignment of the excavation lateral support system which will interfere with installation of the excavation lateral support system.

C. Install the excavation support system, including the installed wall and bracing system, outside the limits of the permanent structure. Construction tolerances (e.g., wall verticality) and lateral wall deflections as a result of excavation and other activities shall be considered in determining the plan location.

D. Excavation shall not proceed more than 2 ft. below the bracing level, anywhere within the excavation support limits, until the entire level of bracing is completely installed.

E. The first level of bracing shall be installed within 5 ft. of the ground surface prior to any excavation below this level.

3.2 INSTALLATION

A. Install sheeting in accordance with all applicable State and Federal regulations including the Occupational Safety and Health Act.

3.3 REMOVAL OF SHEETING

A. Remove all sheeting and bracing unless the removal may cause injury to adjacent structures and/or property.

B. Proceed with backfilling as specified in these Specifications. When the level of compacted backfill reaches the location of bracing and wales, remove these items from the trench or other excavation. When the level of the backfill reaches a point three feet below the existing ground grade, remove the sheeting by approved methods and equipment.

C. After removing the sheeting, complete backfilling in the usual manner.

3.4 INTERNAL LATERAL WALL BRACING (RAKERS, WALES, AND STRUTS)

A. Rakers are only allowed for the temporary lateral brace that is installed within 5 ft. of the ground surface.

B. Use wales, struts, corner braces to provide support of the excavation lateral support walls as required. Include web stiffeners, plates, brackets, or angles as required to prevent rotation, crippling or buckling of connections and points of bearing between structural steel members. Allow for eccentricities due to fabrication and assembly. Consider effects of temperature changes.

C. Install and maintain all support members in continuous tight contact with each other and with the wall being supported.

D. Preload all bracing members (including rakers, corner braces, and struts) in accordance with methods, procedures and sequence as described on the reviewed shop drawings.

Coordinate excavation work with installation of bracing and preloading. Use steel shims and steel wedges, welded or bolted in place, to maintain the preloading force in the bracing after release of the jacking equipment pressure. Wood shims or wedges shall not be used. Braces shall be preloaded to 50 percent of the maximum design load. Provide means to control the fluctuation of loading due to temperature variations.

E. Accomplish preloading by jacking struts, rakers, etc. in place against the excavation lateral support system walls, or by other methods acceptable to the Owner or Owner's Representative.

CERTIFICATE OF DESIGN

RE: Contract between
OWNER: _____
(Name)
and
CONTRACTOR: _____
(Name)
on
CONTRACT: _____
(Number) (Date)

The undersigned hereby certify that the engineer listed below:

1. Is licensed or registered to perform professional engineering work in the state of _____;
(Location of Project)
2. Is qualified by education and training to design the _____
_____
specified in Section_____of subject contract;

3. Has previously designed comparable excavation support systems;

4. Has prepared the design in full compliance with the requirements of subject contract, including all applicable laws, regulations, rules, and codes; and

5. Will inspect and supervise installation of the excavation support system and will monitor the in-place system to confirm that the system is installed and functions in accordance with the design.

CONTRACTOR	ENGINEER
By:_____	By:_____
(Signature)	(Signature)
_____	_____
(Name)	(Name)
_____	_____
(Title)	(Engineering Discipline)
_____	_____
(Date)	(Date)

END OF SECTION

SECTION 02200

EARTHWORK

PART 1- GENERAL

1.1 DESCRIPTION

A. The Work described by this Section consists of all earthwork encountered and necessary for construction of the project as indicated in the Contract Documents, and includes but is not limited to the following:
   1. Excavation
   2. Backfilling and Filling
   3. Compaction
   4. Grading
   5. Providing suitable soil material for infiltration basin construction
   6. Disposal of excess suitable material and unsuitable materials off-site.

B. Use of recycled or reprocessed aggregate or crushed stone materials is unacceptable.

1.2 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:
   1. All work shall be performed and completed in accordance with all local, state and federal regulations.
   2. The General Contractor shall secure all other necessary permits unless otherwise indicated from, and furnish proof of acceptance by, the municipal and state departments having jurisdiction and shall pay for all such permits, except as specifically stated elsewhere in the Contract Documents.

B. Line and Grade:
   1. The Contractor shall establish the lines and grades in conformity with the Drawings and maintain same to properly perform the work.

C. Testing Methods:
   1. Gradation Analysis: Where a gradation is specified the testing shall be in accordance with ASTM C-l 17-90 and ASTM C-I 36-93 (or latest revision).
   2. Compaction Control:
      a) Unless otherwise indicated, wherever a percentage of compaction for backfill is indicated or specified, it shall be the in-place density divided by the maximum density and multiplied by 100. The maximum density shall be the density at optimum moisture as determined by ASTM Standard Methods of Test for Moisture-Density Relations of Soil Using 10-lb. Hammer and IS-in. Drop, Designation D-l557-91 (Modified Proctor), or latest revision, unless otherwise indicated.
      b) The in-place density shall be determined in accordance with ASTM Standard Method of Test for Density of Soil in Place by the Sand Cone method, Designation D 1556-90, (or latest revision) or Nuclear method Designation D2922.
      c) Wherever specifically indicated, maximum density at optimum moisture may be determined by ASTM Standard Methods of Test for Moisture Density Relations of Soils, ASTM D-698-91 (Standard Proctor).

d) An Independent Testing Laboratory will be retained by the Owner to conduct all laboratory and field soil sampling and testing, and to observe earth work and foundation construction activities. Laboratory testing will consist of sieve analyses, natural water content determinations, and compaction tests. Field testing will consist of in-place field density tests and determination of water contents

1.3 SUBMITTALS

A. Collection of samples and testing of all materials for submittals shall be performed by the Independent Testing Laboratory and paid for by the Contractor until the materials are approved by the Owner or Engineer.

B. Submit test results in accordance with the procedure specified in the General and Supplementary Conditions.

C. Submit test results (including gradation analysis) and source location for all borrow material to be used at least 10 working days prior to its use on the site. Contractor shall identify and provide access to borrow sites.

D. Submit moisture density curve for each type of soil (on site or borrow material) to be used for fill beneath structures or pavement.

1.4 TESTS

The Independent Testing Laboratory shall conform to the following procedures and standards:

A. Submit test results in accordance with the procedure specified in the General and Supplementary Conditions.

B. All testing shall be performed by a qualified Independent Testing Laboratory acceptable to the Engineer and Contractor at the Owner's expense unless otherwise indicated (see Section 01400 - Quality Control).

C. Paved Areas and Building Slab Subgrade: Make at least one field density test of subgrade for every 2,000 sq. ft. of paved area or building slab, but in no case less than 3 tests. In each compacted fill layer, make one field density test for every 2,000 sq. ft. of overlaying building slab or paved area, but in no case less than 3 tests.

D. Trenches: Field density test in trenches shall be taken at 75 linear foot intervals on every' third lift.

E. Foundation Wall Backfill: Take at least one (1) field density tests per lift per wall at locations and elevations as designated by the Engineer.

F. In addition to the above tests the Independent Testing Laboratory will perform additional density tests at locations and times requested by the Engineer.

G. Additional density testing will be required by the Engineer if the Engineer is not satisfied with the apparent results of the Contractor's compaction operation.

1. If the test results fail to meet the requirements of these specifications, the Contractor shall undertake whatever action is necessary, at no additional cost to the Owner, to obtain the required compaction. The cost of retesting will be paid by Owner. The cost of retesting will be determined by Engineer and Owner will invoice Contractor for this cost. If unpaid after 60 days, the invoice amount for retesting will be deducted from the Contract Price. No allowance will be considered for delays in the performance of the work.
2. If the test results pass and meet the requirements of these Specifications, the cost of the testing service will be borne by the Owner, but no allowance will be considered for delays in the performance of the work.

1.5 JOB CONDITIONS

A. Site Information:

1. Data on indicated subsurface conditions are not intended as representations or warranties of accuracy or continuity between soil borings. It is expressly understood that Owner and Engineer will not be responsible for interpretations or conclusions drawn there from by the Contractor. Data are made available for the convenience of Contractor.
2. Additional test borings and other exploratory operations may be made by Contractor at no additional cost to Owner.

B. Existing Utilities and Structures:

1. The locations of utilities and structures shown on the Drawings are approximate as determined from physical evidence on or above the surface of the ground and from information supplied by the utilities. The Engineer in no way warranties that these locations are correct. It shall be the responsibility of the Contractor to determine the actual locations of any utilities or structures within the project area.

PART 2- PRODUCTS

2.1 SOIL MATERIAL

A. Aggregate Base Gravel, Type E: Shall be screened or crushed gravel of hard durable particles free from vegetable matter, lumps or balls of clay, reprocessed materials, and other deleterious substances. Type E Aggregate for base shall not contain particles of rock that will not pass the 6 inch square mesh sieve. The gradation of the part that passes a 3-inch sieve shall meet the following grading requirements:

Sieve Designation	Percent by Weight Passing Square Mesh Sieves
¼ inch	25-100
No. 40	0-50
No. 200	0-7.0

B. Aggregate Base Gravel, Type D: Shall be screened or crushed gravel of hard durable particles free from vegetable matter, lumps or balls of clay, reprocessed materials, and other deleterious substances. Type D Aggregate for base shall not contain particles of rock that will not pass the 6 inch square mesh sieve. The gradation of the part that passes a 3-inch sieve shall meet the following grading requirements:

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves
¼ inch	25-70
No. 40	0-30
No. 200	0-7.0

C. Crushed Gravel Surfacing, Type A: Shall be screened or crushed gravel of hard durable

particles free from vegetable matter, lumps or balls of clay, reprocessed materials, and other deleterious substances. Type A Aggregate for base shall not contain particles of rock that will not pass the 6 inch square mesh sieve. The gradation of the part that passes a 3-inch sieve shall meet the following grading requirements:

Sieve Designation	Percent by Weight Passing Square Mesh Sieves
½ inch	45-70
¼ inch	30-55
No. 40	0-25
No. 200	0-5.0

D. Common Borrow (Common Fill): Shall consist of approved material from on-site areas within the limits of construction or off-site areas required for the construction of the work where designated. Common borrow (Common Fill) shall be free from frozen material, perishable rubbish, peat, organic highly plastic clay and silt, weak or compressible materials, and other unsuitable material.

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves
4 inch	100
3 inch	90-100
No.4	25-90
No. 200	0-15

Plasticity Index of less than 6

E. Screened Stone: Shall be a well graded stone consisting of clean, hard, and durable particles or fragments, free from vegetable or other objectionable matter, meeting the following gradation requirements:

Sieve Designation	Percent by Weight Passing Square Mesh Sieve
1 inch	100
3/4 inch	90-100
3/8 inch	20-55
No.4	0-10
No. 8	0-5

F. Select Fill: Shall consist of well graded granular material free of organic material, loam, wood, trash, snow, ice, frozen soil and other objectionable material and having no rocks with a maximum dimension of over 4 inches and meeting the following gradation requirements, except where it is used for pipe bedding in which case the maximum size shall be 2 inches.

Sieve Designation	Percent by Weight Passing Square Mesh Sieve
4 inch	100
3 inch	90-100
½ inch	50-95
No.4	35-90
No. 16	20-70
No. 50	5-45
No. 200	0-8
Plasticity index of less than 6	

2.2 CONCRETE

A. If concrete is required for excess excavation, provide 3,000 psi concrete.

2.3 FILTER FABRIC

A. If filter fabric is required, refer to Section 02260.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions under which excavating, backfilling, filling, compaction and grading are to be performed and notify the Engineer in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.2 EXCAVATION

A. General:
   1. Excavation consists of removal and disposal of all material encountered when establishing line and grade elevations required for execution of the work.
   2. The Contractor shall make excavations in such manner and to such widths as will give suitable room for building the structures or laying and jointing the piping; shall furnish and place all sheeting, bracing, and supports; shall do all cofferdamming, pumping, and draining; and shall render the bottom of the excavations firm, dry and acceptable in all respects.
   3. All excavation shall be classified as either earth or ledge.
      a) Earth Excavation shall consist of the removal, hauling and disposal of all earth materials encountered during excavation including but not limited to native soil or fill, pavement (bituminous or concrete), existing sewers and manholes, ashes, loam, clay, swamp muck, debris, soft or disintegrated rock or hard pan which can be removed with a backhoe, or a combination of such materials, and boulders measuring less than one cubic yard per boulder.
         1. Removal of surface boulders and rock fences of all sizes in the construction limits shall be part of earth excavation without additional cost to the Owner.
      b) Ledge Excavation: Shall consist of the removal, hauling, and disposal of all ledge or rock encountered during excavation. 'Ledge' and "rock' shall be defined as any natural compound, natural mixture that in the opinion of the

Engineer can be removed from its existing position and state only by drilling and blasting, wedging, sledging, boring or breaking up with power operated tools. No boulder, ledge, slab, or other single piece of excavated material less than two cubic yards in total volume shall be considered to be rock unless, in the opinion of the Engineer it must be removed from its existing position by one of the methods mentioned above.

4. The Contractor shall not have any right of property in any materials taken from any excavation. Do not remove any such materials from the construction site without the approval of the Engineer. The Contractor shall dispose of unsuitable and excess material in accordance with the applicable sections of the Contract Documents.

B. Additional Excavation: When excavation has reached required subgrade elevations, notify the Engineer who will observe the conditions.
   1. If material unsuitable for the structure or paved area or pipeline (in the opinion of the Engineer) is found at off-site or below the grade to which excavation would normally be carried in accordance with the Drawings &/or Specifications, the Contractor shall remove such material to the required width and depth and replace it with thoroughly compacted select fill, screened stone, crushed stone, or concrete as directed by the Engineer.
   2. All excavated materials designated by the Engineer as unsuitable shall become the property of the Contractor and disposed of at off site locations in accordance with all State and local laws and the provisions of the Contract Documents.

C. Unauthorized Excavation: Shall consist of removal of materials beyond indicated subgrade elevations or dimensions without specific authorization of Engineer. Unauthorized excavation, as well as remedial work required by the Engineer shall be at the Contractor's expense. Remedial work required is as follows:
   1. Under footings, foundation bases, or retaining walls, fill unauthorized excavation with select fill or screened stone compacted to 95%, Provide 12" minimum select fill or screened stone directly under footings. Concrete fill may be used to bring elevations to proper position, when acceptable to Engineer.
   2. If the bottom of a trench is excavated beyond the limits indicated, backfill the resulting void with thoroughly compacted screened stone, unless otherwise indicated.
   3. Elsewhere, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Engineer.

D. Structural Excavation:
   1. Shall consist of the removal, hauling, disposal, of all material encountered in the excavation to permit proper installation of structures.
   2. Excavations for structures shall be carried to the lines and subgrades shown on the Drawings.
   3. Excavate areas large enough to provide suitable room for building the structures.
   4. The extent of open excavation shall be controlled by prevailing conditions subject to any limits designated by the Engineer.
   5. Provide, install, and maintain sheeting and bracing as necessary to support the sides of the excavation and to prevent any movement of earth which could diminish the width of the excavation or otherwise injure the work, adjacent structures, or persons and property in accordance with all state and OSHA safety standards.

6. Erect suitable fences around structure excavation and other dangerous locations created by the work, at no additional cost to the Owner.
7. Exposed subgrade surfaces shall remain undisturbed, protected, and maintained as uniform, plane areas and shape to receive the foundation components of the structure.
   a. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10', and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, other construction, and for inspection.
   b. In excavating for footings and foundations, take care not to disturb bottom of excavation. Excavate by hand to final grade and trim bottoms to required lines and grades to leave solid base to receive the structure.
   c. If a structure is to be constructed within the embankment, the fill shall first be brought to a minimum of 3 feet above the base of the footing. A suitable excavation shall then be made as though the fill were undisturbed earth.

E. Trench Excavation: Shall consist of removal, hauling and disposal of all material encountered in the excavation to the widths and depths shown on the Drawings to permit proper installation of underground utilities.
1. Excavate trenches to the uniform width shown on the Drawings sufficiently wide to provide sufficient space for installation, backfilling, and compaction. Every effort should be made to keep the sides of the trenches firm and undisturbed until backfilling has been completed and consolidated.
2. Trenches shall be excavated with approximately vertical sides between the elevation of the center of the pipe and an elevation one foot above the top of the pipe.
3. Grade bottoms of trenches as indicated for pipe and bedding to establish the indicated slopes and invert elevations, notching under pipe joints to provide solid bearing for the entire body of the pipe, where applicable.
   a. All utility and process pipeline trenches shall have the subgrade compacted before trench bedding placement, refer to Part 3.2.E herein for the specific requirements.
4. If pipe is to be laid in embankments or other recently filled material, the material shall first be placed to the top of the fill or to a height of at least two feet above the top of the pipe; whichever is the lesser. Particular care shall be taken to ensure maximum consolidation of material under the pipe location. The pipe trench shall be excavated as though in undisturbed material.
5. Unless otherwise specifically directed or permitted by the Engineer, begin excavation at the low end of sewer and storm lines and proceed upgrade.
6. Perform excavation for force mains and water mains in a logical sequence.
7. The extent of open excavation shall be controlled by prevailing conditions subject to any limits prescribed by the Engineer.
8. As the excavation progresses, install such shoring arid bracing necessary to prevent caving and sliding and to meet the requirements of the state and OSHA safety standards, as outlined in the appropriate section of this Specification.

F. Protection of Persons, Property and Utilities:
1. Barricade open excavations occurring as part of this work and post with warning lights in compliance with local and State regulations.
2. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other

hazards created by earthwork operations. Exercise extreme caution and utilize sheeting, bracing, and whatever other precautionary measures that may be required.

3. Rules and regulations governing the respective utilities shall be observed in execution of all work. Active utilities and structures shall be adequately protected from damage, and removed or relocated only as indicated or specified. Inactive and abandoned utilities encountered in excavation and grading operations shall be removed, plugged or capped only with written authorization of the utility owner. Report in writing to the Engineer, the locations of such abandoned utilities. Extreme care shall be taken when performing work in the vicinity of existing utility lines, utilizing hand excavation in such areas, as far as practicable.
4. Repair, or have repaired, all damage to existing utilities, structures, lawns, other public and private property which results from construction operations, at no additional expense to the Owner, to the complete satisfaction of the Engineer, the utility, the property owner, and the Owner.

G. Use of Explosives:
   1. Do not bring explosives onto site or use in work without prior written permission from authorities having jurisdiction. Contractor is solely responsible for handling, storage, and use of explosive materials when their use is permitted.
   2. All blasting shall be performed in accordance with all pertinent provisions of the "Manual of Accident Prevention in Construction" of the Associated General Contractors of America, Inc.

H. Stability of Excavations:
   1. Slope sides of excavations to comply with all codes and ordinances having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated.
   2. Maintain sides and slopes of excavations in a safe condition until completion of backfilling.

I. Shoring and Bracing:
   1. Provide materials for shoring and bracing, such as sheet piling, uprights, stringers and cross-braces, in good serviceable condition.
   2. Provide trench shoring and bracing to comply with local codes and authorities having jurisdiction. Refer to Specification Section 02156.
   3. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Install shoring and bracing as excavation progresses.

J. Material Storage and Off-Site Disposal:
   1. Stockpile excavated materials which are satisfactory for use on the work until required for backfill or fill. Place, grade and shape stockpiles for proper drainage and protect with temporary seeding or other acceptable methods to control erosion.
   2. Locate and retain soil materials away from edge of excavations.
   3. Dispose of excess soil materials and unsuitable soil materials by loading and hauling these materials to off site locations obtained by the Contractor.

K. Dewatering:
   1. To ensure proper conditions at all times during construction, the Contractor shall provide and maintain ample means and devices (including spare units kept ready for. immediate use in case of breakdowns) with which to intercept and/or remove promptly and dispose properly of all water entering trenches and other excavations (including surface and subsurface waters).

2. Excavations shall be kept dry until the structures, pipes, and appurtenances to be built therein have been completed to such extent that they will not be floated or otherwise damaged. Refer to Specification Section 02401.

L. Cold Weather Protection:
1. Protect excavation bottoms against freezing when atmospheric temperature is less than 35^0F.
2. No frozen material shall be used as backfill or fill and no backfill shall be placed on frozen material.

M. Separation of Surface Material:
1. The Contractor shall remove only as much of any existing pavement as is necessary for the execution of the work.
2. Prior to excavation, existing pavement shall be cut where in the opinion of the Engineer it is necessary to prevent damage to the remaining road surface.
3. Where pavement is removed in large pieces, it shall be disposed of before proceeding with the excavation.
4. From areas within which excavations are to be made, loam and topsoil shall be carefully removed and separately stored to be used again as directed; or, if the Contractor prefers not to separate surface materials, he shall furnish, as directed, loam and topsoil at least equal in quantity and quality to that excavated.

N. Dust Control:
1. During the progress of the work, the Contractor shall conduct his operations and maintain the area of his activities, including sweeping and sprinkling of streets as necessary, so as to minimize the creation and dispersion of dust.
2. If the Engineer decides that it is necessary to use calcium chloride for more effective dust control, the contractor shall furnish and spread the material, as directed.

3.3 BACKFILL and FILL

A. General:
1. Backfilling shall consist of replacing material removed to permit installation of structures or utilities, as indicated in the Contract Documents.
2. Filling shall consist of placing material in areas to bring them up to grades indicated on the Drawings.
3. The Contractor shall provide and place all necessary backfill and fill material, in layers to the required grade elevations.
4. Backfill excavations as promptly as work permits, but not until completion of the following:
   a. Acceptance by Engineer of construction below finish grade including, where applicable, damp-proofing, and perimeter insulation.
   b. Inspection, approval, and recording locations of underground utilities.
   c. Removal of concrete formwork.
   d. Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Temporary sheet piling driven below bottom of structures shall be removed in manner to prevent settlement of the structure or utilities, or cut off and left in place if required.
   e. Removal of trash and debris.
   f. Permanent or temporary horizontal bracing is in place on horizontally supported walls.
   g. Density testing having results meeting requirements specified herein.
5. In general, and unless otherwise indicated, material used for backfill of trenches

and excavations around but not adjacent to structures shall be suitable excavated material which was removed in the course of making the construction excavation or common borrow. Unless otherwise specified or allowed by the Engineer the backfill and fill shall be placed in layers not to exceed 8 inches in thickness.

6. All fill and backfill under structures and pavement, and adjacent to structures, shall be compacted crushed stone or select fill as specified or as indicated on the Drawings. The fill and backfill materials shall be placed in layers not exceeding 8 inches in thickness.
7. All structures (including manholes) shall be placed on a 12-inch mat of screened stone unless otherwise indicated on the Drawings. Refer to the Drawings on fill requirements tank and building structures,
   a. Refer to Part 3.2 for Subgrade Compaction Requirements before pipelines, manholes, tanks, and structures are placed.
8. Suitable excavated material shall meet the following requirements:
   a. Free from large clods, silt lumps or balls of clay.
   b. Free from stones and rock fragments with larger than 4 inch max. dimension.
   c. Free from organics, peat, etc.
   d. Free from frozen material.
9. Do not backfill with, or on, frozen materials.
10. Before placing any material for support of structures, the subgrade shall be adequately dewatered, compacted and tested.
11. Remove, or otherwise treat as necessary, previously placed material that has frozen prior to placing backfill.
12. Do not mechanically or hand compact material that is, in the opinion of the Engineer, too wet.
13. Do not continue backfilling until the previously placed and new materials have dried sufficiently to permit proper compaction.
14. The nature of the backfill materials will govern the methods best suited for their placement and compaction. Compaction methods and required percent compaction is covered in Compaction section.
15. Before compaction, moisten or aerate each layer as necessary to provide a water content necessary to meet the required percentage of maximum dry density for each area classification specified.
16. Do not allow large masses of backfill material to be dropped into the excavation in such a manner that may damage pipes and structures.
17. Place material in a manner that will prevent stones and lumps from becoming nested.
18. Completely fill all voids between stones with fine material.
19. Do not place backfill on or against new concrete until it has attained sufficient strength to support loads without distortion, cracking, and other damage.
20. Deposit backfill and fill material evenly on all sides of structures to avoid unequal soil pressures.
21. Keep stones or rock fragments with a dimension greater than two inches at least one foot away from the pipe or structure during backfilling.
22. Leave sheeting in place when damage is likely to result from its withdrawal.
23. Completely fill voids left by the removal of sheeting with screened stone which is compacted thoroughly.

B. Pipe Bedding, Initial Backfill and Trench Backfill

1. Place bedding and backfill in layers of uniform thickness specified herein, and as

shown on the Drawings.

2. Thoroughly compact each layer by means of a suitable vibrator or mechanical tamper.
3. Install pipe bedding and initial backfill in layers of uniform thickness not greater than eight (8) inches.
4. Deposit the remainder of the backfill in uniform layers not greater than eight inches.
5. Provide underground sewer marking tape for the full length of sewer trenches as shown on the Drawings. Marking tape shall be SETON #210 SEW or equivalent.
6. Where soft silt and clay soils are encountered the trench shall be excavated six inches below the normal bedding and backfilled with 6-inches of compacted common borrow.
7. Backfill trenches with concrete where trench excavations pass within 18 inches of column or wall footings and which are carried below the bottom of such footings, or which pass under wall footings. Place concrete to the level of the bottom of adjacent footings.
8. The following schedule gives the bedding requirements for various types of pipe for all locations, unless specified otherwise. Distances refer to vertical thickness below the pipe.

PIPE BEDDING REQUIREMENTS IN TRENCHES

DI, concrete and Culvert pipe	6 inches min. crushed stone or select fill
PVC, ABS, FRP and PE Pipe	6 inches min. crushed stone.
Sanitary Line	6 inches min. crushed stone.

9. The following schedule gives the initial backfill requirements for various types of pipes. Distances refer to vertical thickness above the top of the pipe.

INITIAL BACKFILL

DI, Concrete, and Culvert Pipe	crushed stone or select fill 12 inches min. over top of pipe.
PVC, ABS, FRP & PE Pipe	12 inches min. crushed stone over top of pipe.
Sanitary Line	12 inches min. crushed stone fill over the top of the pipe.

10. Special bedding and backfill requirements shown on the Drawings supersede requirements of this section.

C. Improper Backfill:

1. When excavation and trenches have been improperly backfilled, and when settlement occurs, reopen the excavation to the depth required, as directed by the

Engineer.

2. Refill and compact the excavation or trench with suitable material and restore the surface to the required grade and condition.
3. Excavation, backfilling, and compacting work performed to correct improper backfilling shall be performed at no additional cost to the Owner.

D. Ground Surface Preparation:
1. Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow, strip, scarify or break-up sloped surface steeper than 1 vertical to 4 horizontal.
2. When existing ground surface has a density less than that specified under "compaction for the particular area classification, break up the ground surface, pulverize, moisture-condition to the optimum moisture content, and compact to required depth and percentage of maximum density.

3.4 COMPACTION

A. General:
1. Control soil compaction during construction to provide not less than the minimum percentage of density specified for each area classification.

B. Percentage of Maximum Density Requirements:
1. Compact soil to not less than the following percentages of maximum dry density determined in accordance with ASTM Dl557 as indicated.
   a. Structures: Compact each layer of backfill or fill material below or adjacent to structures to at least 95% of maximum dry density (ASTM D1557).
   b. Off Traveled Way Areas: Compact each layer of backfill or fill material to at least 90% of maximum dry density (ASTM D1557).
   c. Walkways: Compact each layer of backfill or fill material to at least 95% of maximum dry density (ASTM D1557).
   d. Roadways, Drives and Paved Areas: Compact each layer of fill, subbase material, and base material to at least 95% of maximum dry density (ASTM Dl557).
   e. Pipes: Compact bedding material and each layer of backfill to at least 90% maximum dry density (ASTM Dl557). Where backfilling with excavated material, compact to native field density.

C. Moisture Control:
1. Where subgrade or a layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade, or layer of soil material, in quantities controlled to prevent free water appearing on surface during or subsequent to compaction operations.
2. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.
3. Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing or pulverizing until moisture content is reduced to a satisfactory level.

D. Compaction Methods: The Contractor may select any method of compaction that is suitable to compact the material to the required density.
1. General: Whatever method of compacting backfill is used, care shall be taken that stones and lumps shall not become nested and that all voids between stones shall be completely filled with fine material. All voids left by the removal of sheeting

shall be completely backfilled with suitable materials and thoroughly compacted.

2. Tamping or Rolling: If the material is to be compacted by tamping or rolling, the material shall be deposited and spread in uniform, parallel layers not exceeding the uncompacted thicknesses specified. Before the next layer is placed, each layer shall be tamped as required so as to obtain a thoroughly compacted mass. Care shall be taken that the material close to the excavation side slopes, as well as in all other portions of the fill area, is thoroughly compacted. When the excavation width and the depth to which backfill has been placed are sufficient to make it feasible, and it can be done effectively and without damage to the pipe or structure, backfill may, on approval, be compacted by the use of suitable rollers, tractors, or similar powered equipment instead of by tamping. For compaction by tamping or rolling, the rate at which backfilling material is deposited shall not exceed that permitted by the facilities for its spreading, leveling, and compacting as furnished by the Contractor.

E. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, re-shape, and compact to required density prior to further construction.

3.5 GRADING

A. General:
   1. Grading shall consist of that work necessary to bring all areas to the final grades.
   2. Uniformly grade areas within limits of work requiring grading, including adjacent transition areas.
   3. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.

B. Grading Outside Building Lines:
   1. Grade areas adjacent to building to drain away from structures and to prevent ponding.
   2. Grade surfaces to be free from irregular surface changes, and as follows:
      a. Lawn or Unpaved Areas: Finish grade areas to receive topsoil to within not more than 1" above or below the required subgrade elevations.
      b. Walks: Shape surface of areas under walks to line, grade and cross-section, with finish surface not more than 1/2" above or below the required subgrade elevation.
      c. Pavements: Shape surface of areas under pavement to line, grade and cross-section, with finish surface not more than 3/8" above or below the required subgrade elevation,

C. Grading Surface of Fill Under Building Slabs:
   1. Grade surface to be smooth and even, free of voids, and compacted as specified, to the required elevation.
   2. Provide final grades within a tolerance of 1/2" when tested with a 10' straight edge.

D. Compaction:
   1. After grading, compact subgrade surfaces to the depth and percentage of maximum density for each area classification.

E. Protection of Graded Areas:
   1. Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

2. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

3.6 BASE COURSE AND LEVELING COURSE

A. General:
   1. Base course consists of placing the specified materials in layers to support a leveling course or paved surface, as indicated in the Drawings.

B. Grade Control:
   1. During construction, maintain lines and grades including crown and cross-slope of base course and leveling course.

C. Placing:
   1. Place base course on prepared subbase conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting base materials.
   2. Place leveling course on prepared base course, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compaction.

D. Shaping and Compacting:
   1. All layers of aggregate base course and leveling course shall be compacted to the required density immediately after placing. As soon as the compaction of any layer has been completed, the next layer shall be placed.
   2. The Contractor shall bear full responsibility for and make all necessary repairs to the base leveling courses and the subgrade until the full depth of the base leveling courses is placed and compacted. Repairs shall be made at no additional cost to the Owner.
   3. If the top of any layer of the aggregate base or leveling course becomes contaminated by degradation of the aggregate or addition of foreign materials, the contaminated material shall be removed and replaced with the specified material at the Contractor's expense.

END OF SECTION

SECTION 02260

FILTER FABRIC

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Furnish all materials and install filter fabric of the types, dimensions and in the location(s) shown on the Drawings and specified herein.

B. Related Work Specified Elsewhere:

1. Temporary Erosion Control and Riprap and Stone Ditch Protection are specified in the appropriate sections of this Division.

1.2 QUALITY ASSURANCE

A. A competent laboratory must be maintained by the manufacturer of the fabric at the point of manufacture to insure quality control.

B. During all periods of shipment and storage, the fabric shall be wrapped in a heavy duty protective covering to protect the fabric from direct sunlight, ultraviolet rays, temperatures greater than 140^0F, mud, dirt, dust and debris.

1.3 SUBMITTALS

A. Manufacturer shall finish certified test reports with each shipment of material attesting that the fabric meets the requirements of this Specification.

PART 2- PRODUCTS

2.1 MATERIALS

A. Filter fabric for use in stabilization, drainage, underdrains, erosion control, landscaping and beneath structures shall be formed in widths of not less than six (6) feet and shall meet the requirements of Table 1. Both woven and non-woven geotextiles are acceptable; however no 'slit-tape' woven fabrics will be permitted for drainage, underdrain, and erosion control applications.

Table I

Mechanical Property	Geotextile Test Method	Minimum Permissible Value
Grab Tensile Strength (both directions)	ASTM D4595-86	120 pounds
Grab Elongation	ASTM D4632-86	50 percent
Mullen Burst Strength	ASTM D3786-87	210 psi
Puncture Strength	ASTM D3787	60 pounds

Trapezoid Tear Strength	ASTM D4533-85	50 pounds
Water Flow Rate	ASTM D4491-85	120 gal/min/sf
Equivalent Opening Size	ASTM D4751	80
Coefficient of Permeability	ASTM D4491-85	0.2 cm/sec

The geotextile shall have property values expressed in "typical" values that meet or exceed the values stated above as determined by the most recent test methods specified above.

B. Filter fabric for use in reinforcement and under riprap shall meet the requirements of Table 2. Woven and non-woven geotextiles are acceptable.

Table 2

Geotextile Mechanical Property	Test Method	Minimum Permissible Value
Grab Tensile Strength (both directions)	ASTM 4595-86	195 pounds
Grab Elongation	ASTM D4632-86	20 percent
Mullen Burst Strength	ASTM D3786-87	340 psi
Puncture Strength	ASTM D3787	85 pounds
Trapezoid Tear Strength	ASTM D453385	85 pounds
Equivalent Opening Size (EOS)	ASTM D4751	U.S. Std. Sieve number(s) between #20 & # 100

The geotextile shall meet or exceed the 'typical' values stated above as determined by the most recent test methods specified above.

C. Filter Fabric for use in siltation fencing shall be the following:
   1. Environfence 100X (Mirafi)
   2. Supac 4NP (Phillip 66)
   3. Exxon 180 Siltfence
   4. Amoco 1380 Silt Stop
   5. Harris Siltfence
   6. Or equivalent

PART 3 - EXECUTION

3.1 Install filter fabric as shown on the drawings or as directed in appropriate specifications in this division or in accordance with manufacturer's instructions or as directed by the Engineer.

END OF SECTION

SECTION 02270

TEMPORARY EROSION CONTROL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. The work under this section shall include provision of all labor, equipment, materials and maintenance of temporary erosion control devices as specified herein, of the types shown on the Drawings and as directed by the Engineer.
2. Erosion control measures shall be provided as necessary to correct conditions that develop prior to the completion of permanent erosion control devices or as required to control erosion that occurs during construction operations.
3. Construction operations shall comply with all federal, state and local regulations pertaining to erosion control and construction site storm water management.
4. After awarded the Contract, prior to commencement of construction activities, meet with the Engineer to discuss erosion control requirements and develop a detailed erosion control plan submittal.

B. Related Work Specified Elsewhere:

1. Site work is specified in appropriate sections of this Division.

C. Design Criteria:

1. Conduct all construction in a manner and sequence that causes the least practical disturbance of the physical environment.
2. Stabilize disturbed earth surfaces in the shortest time and employ such temporary erosion control devices as may be necessary until such time as adequate soil stabilization has been achieved.
3. Comply with "Maine Erosion and Sediment Control Handbook for Construction: Best Management Practices" by the Cumberland County Soil and Water Conservation District and the Maine Department of Environmental Protection dated March 2003 (as revised).

1.2 SUBMITTALS

A. The Contractor shall furnish the Engineer, in writing, his work plan and plan sized drawings (scale 1 inch = 40 lf) giving proposed locations for all erosion control structures and device denoting name and locations, and proposed locations for storage of topsoil and excavated material before beginning construction. A schedule of work shall accompany the work plan. Acceptance of this plan will not relieve the Contractor of the responsibility of completion of the work as specified.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Baled Hay:
   1. At least 14" by 18' by 30" securely tied to form a firm bale, staked as necessary to hold the bale in place.
   2. Maintain on site for emergency use only, a minimum of 50 bales of hay.

B. Sand Bags:
   1. Heavy cloth bags of approximately one cubic foot capacity filled with crushed stone or coarse sand.

C. Mulches:
   1. Loose hay, straw, peat moss, wood chips, bark mulch, crushed stone, wood excelsior, or wood fiber cellulose.

D. Matting for erosion control:
   1. Shall consist of undyed and unbleached smolder resistant jute yarn woven into a uniform, open, plain weave mesh. Jute matting shall be furnished in rolled strips as follows:

Width:	48 inches, plus or minus one inch 78 warp ends per width of cloth 41 weft ends per yard
Weight:	To average between 1.35 pound and 1.80 pounds per linear yard. Tolerance: plus or minus 5%

   2. Stakes for pegging erosion matting shall be hardwood approximately 1 inch x inches and of sufficient length. Stakes shall be free from defect and capable of remaining in the ground at least two (2) years.

E. Permanent Seed:
   1. Permanent seed shall be as specified in Section 02480 Landscaping.

F. Temporary Seeding:
   1. Use species appropriate for soil conditions and season and subject to approval by the Engineer.

H. Water:
   1. The Contractor shall provide water and equipment to control dust, as directed by the Engineer.

I. Filter Fabrics:
   1. Filter fabric shall be of one of the commercially available brands such as Mirafi, Typar or equivalent. Fabric types for particular applications shall be approved by the Engineer prior to installation.

2.2 CONSTRUCTION REQUIREMENTS

A. Temporary Erosion Checks:
   1. Temporary erosion checks shall be constructed in ditches and other locations as necessary.
   2. Baled hay, sand bags or siltation fence may be used in an arrangement to fit local

conditions.

B. Temporary Berms:
   1. Temporary harriers of rip-rap shall be constructed along the toe of embankments to prevent erosion and sedimentation.

C. Temporary Seeding:
Areas to remain exposed for a time exceeding 3 weeks shall receive temporary seeding as indicated below:

Season	Seed	Rate
Summer (5/15 - 8/15)	Sudangrass	40 lbs/acre
Late Summer/Early Fall (8/15 - 9/15)	Oats	80 lbs/acre
	Annual Ryegrass	40 lbs/acre
Fall (9/15 - 10/I)	Winter Rye	112 lbs/acre
Winter (10/1 - 4/1)	Mulch w/ Dormant Seed	80 lbs/acre*
Spring (4/1 - 7/1)	Oats	80 lbs/acre
	Annual Ryegrass	40 lbs/acre

* seed rate only

D. Sedimentation Basin:
   1. Sedimentation basins shall be areas where water is temporarily delayed slowed down, constructed where required by site conditions or as or directed by the Engineer.
   2. Capacity shall be equal to the volume of sediment expected to be trapped at the basin during the planned useful life of the structure, or if the periodic removal of debris is practical, the capacity may be proportionately reduced.
   3. Design shall be in accordance with the Standards for Ponds, Grade Stabilization Structure or USDA Soil Conservation Service Engineering Memorandum No. 27 &/or as shown on the Drawings.

E. Siltation fences shall consist of porous filter fabric with a wire mesh backing and shall be supported by posts as per manufacturer's recommendations. Fabric shall be approved by the Engineer.

F. Mulch All Areas Receiving Seeding:
Use either wood cellulose fiber mulch (750 lbs/acre); or straw mulch with chemical tack (as per manufacturers specifications). Netting for small areas may be permitted. Biodegradable netting is required in areas to be exposed to drainage flow.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Temporary Erosion Checks:
   1. Temporary erosion checks shall be constructed in all ditches and drainage swales at 50 foot horizontal spacing and at other locations designated by the Engineer. The Engineer may modify the Contractor's arrangement of silt fences, bales and bags to fit local conditions.
   2. Baled hay, silt fences, or sandbags, or some combination, may be used in other areas as necessary to inhibit soil erosion.
   3. Provide matting for erosion control on all side slopes of 1 foot rise to 2.5 foot

horizontal and steeper, and at all other locations designated on the Drawings.

4. Siltation fence, if called for in the plans, shall be located and installed as shown.
5. Sedimentation ponds shall be sited and constructed to the grades and dimensions necessary for site conditions and will include drainage pipe and an emergency spillway.

B. Maintenance:

Erosion control features shall be installed prior to excavation wherever appropriate. Temporary erosion control features shall remain in place and shall be maintained until a satisfactory growth of grass is established. The Contractor shall be responsible for maintaining erosion control features throughout the life of the construction contract. Maintenance will include periodic inspections by the Owner or Engineer for effectiveness of location, installation and condition with corrective action taken by the Contractor as appropriate.

C. Removing and Disposing of Materials:

1. When no longer needed, material and devices for temporary erosion control shall be removed and disposed of as approved by the Engineer.
2. When removed, such devices may be reused in other locations provided they are in good condition and suitable to perform the erosion control for which they are intended.
3. When dispersed over adjacent areas, the material shall be scattered to the extent that it causes no unsightly conditions nor creates future maintenance problems.
4. Sedimentation basins, if no longer required, will be filled in, the pipe removed, the surface loamed and grass cover shall be established.

END OF SECTION

SECTION 02401

DEWATERING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Furnish, operate and maintain, as incidental to the project, dewatering equipment for the control, collection and disposal of ground and surface water where necessary to complete the work.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

3.1 PERFORMANCE

A. General:

1. Keep work areas dewatered until the structures, pipes, and appurtenances to be built there have been completed to such an extent that they will not be damaged by water.
2. Thoroughly brace or otherwise protect against flotation all pipelines and structures which are not stable.

B. Disposal of Water:

1. Dispose of water pumped or drained from the construction site in a suitable manner to avoid siltation of adjacent wetlands or water bodies, injury to public health, damage to public and private property, and damage to the work completed or in progress.
2. Provide suitable temporary channels for water that may flow along or across the construction site.

C. Damage:

1. Any damage resulting from the dewatering operations, or the failure of the Contractor to maintain the work in a suitably dry condition shall be repaired by the Contractor at no additional cost to the Owner.

D. Temporary Underdrains:

1. When necessary, temporary underdrains may be placed in excavations.
2. Underdrain pipe shall be perforated corrugated metal, polyethylene or P.V.C. pipe.
3. Entirely surround the underdrain and fill the space between the underdrain and the pipe or structure with free draining material.

E. Excavation Sump Pumping:
   1. When necessary and where appropriate to the geotechnical conditions encountered, excavations may be over excavated up a depth of 2.0 feet or more and filled with screened stone to allow sump pumping of groundwater.
   2. The system shall be installed with suitable screens and filters so that pumping of fines does not occur.

F. Well and Wellpoint System:
   1. If necessary, dewater the excavations and trenches with an efficient well or wellpoint system to drain the soil and prevent saturated soil from flowing into the excavated wells and area.
   2. Wellpoint and well system shall be of the type designed for dewatering work and shall be installed with suitable screens and filters so that pumping of fines does not occur.
   3. Pumping units shall be capable of maintaining sufficient suction to handle large volumes of air and water at the same time.

END OF SECTION

SECTION 02419

GRAVEL SURFACING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. This work shall consist of furnishing and placing one or more courses of granular material on a prepared surface in accordance with the specifications in reasonably close conformity with the lines, grades, thicknesses and typical cross sections, as shown on the plans or established by the Engineer.

PART 2- PRODUCTS

2.1 ROADWAY GRAVEL

Roadway gravel shall be aggregate subbase-gravel and/or aggregate base-gravel as described in these Specifications.

PART 3 - EXECUTION

3.1 PLACING

A. If the required compacted depth of roadway gravel exceeds 9 inches the courses shall be constructed in 2 or more layers of approximately equal thicknesses. The maximum completed thickness of any roadway gravel layer shall not exceed 9 inches.

B. Each layer of aggregate shall be placed over the full width of the section. When conditions restrict operations over the full width, the Engineer may authorize the Contractor to place less than full width layers. When the Contractor places material to complete the full width, the exposed edge of the previously placed aggregate shall be cleaned of all contamination before additional roadway gravel is placed adjacent thereto.

C. Roadway gravel courses may be placed upon frozen surfaces when such surfaces have been properly constructed.

D. The material as spread shall be well mixed with no pockets of either fine or coarse material. Segregation of large or fine particles will not be allowed.

3.2 SHAPING AND COMPACTING

A. Compaction of each layer of aggregate subbase and roadway gravel shall continue until a density of not less than 95 percent of the maximum density has been achieved for the full width of the layer. The maximum density shall be determined in accordance with AASHTO T-ISO, Method D. Field density tests will be made by the sand cone method in accordance with AASHTO T-l91 or at the option of the Owner's Representative, by use of Nuclear devices in accordance with ASTM D2922 or by the water balloon test methods in accordance with AASHTO T-205.

B. The surface of each layer shall be maintained during compaction operations in such manner that a uniform texture is produced and the aggregate firmly keyed. The moisture content of the material shall be maintained at the proper percent to attain the required compaction.

3.3 SURFACE TOLERANCE

A. The completed surface of the designated course shall be shaped and maintained to a tolerance, above or below the required cross sectional shape, of 1/2 inch.

END OF SECTION

SECTION 02431

CATCH BASINS, GRATES AND FRAMES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Construct catch basins, grates, frames and brick masonry in conformance with the dimensions and locations shown on the Drawings.

1.2 QUALITY ASSURANCE

A. Precast Catch Basin Base, Barrel and Top Sections:
   1. Conform to ASTM C478-72 (AASHTO M199-795) except as modified herein, on the Drawings, or as directed by the Engineer.
   2. Average strength of 4,000 psi at 28 days
   3. Testing:
      a. Determine concrete strength by tests on 6 inch by 12 inch vibrated test cylinders cured in the same manner as the bases, barrels and tops, and tops.
      b. Have tests conducted at manufacturer's plant or at an approved testing laboratory.
      c. Have not less than 2 tests made for each 100 vertical feet of precast catch basin sections.

B. Frames and Covers:
   1. Acceptable Manufacturers:
      a. Etheridge Foundry Company
      b. Neenah Foundry Company
      c. F. L. LeBaron Foundry Company
      d. Or equivalent.

C. Masonry:
   1. Brick: Shall comply with the ASTM Standard Specifications for Sewer Brick (made from clay or shale), Designation C32, for Grade SS, hard brick. (AASHTO M91-78).
   2. Cement: ASTM C-150.(AASHTO M85-791)
   3. Hydrated Lime: ASTM C-207.
   4. Sand: ASTM C33. (AASHTO M6-65 C197A)).

1.3 SUBMITTALS TO THE ENGINEER

A. Submit shop Drawings and manufacturer's literature in conformance with the Standard General Conditions of the Construction Contract.

B. Bases, Barrel Sections and Tops: Submit test results and receive approval from the Engineer prior to delivery to the site.

PART 2 - PRODUCTS

2.1 PRECAST CATCH BASIN SECTIONS

A. Dimensions, as shown on the Drawings.

B. Use flat tops or eccentric cones as appropriate. Exterior face of cone sections shall not flare out beyond the vertical.

C. Joints: Bell-and-spigot or tongue-and-groove formed on machine rings to insure accurate joint surfaces.

D. Constructed to support an HS-20 wheel loading.

E. Openings:

1. Provide openings in the risers to receive pipes entering the catch basin of the types and materials approved by the Engineer.
2. Make openings at the manufacturing plant or cut openings in the field.
3. Size: To provide a uniform annular space between the outside wall of pipe and the riser.
4. Location: To permit setting of the entering pipes at the correct elevations.

F. Joints:

1. Joint gaskets to be flexible self seating butyl rubber joint sealant installed according to manufacturer's recommendations. For cold weather applications, use adhesive with joint sealant as recommended by manufacturer. Acceptable Materials:
   a. Kent-Seal No. 2
   b. Ram-Nek
   c. Or equivalent.
2. Joints between precast sections shall conform to related standards and manufacturer's instructions.

2.2 FRAMES AND GRATES

A. All essential details of design shall conform to the Drawings. Standard castings differing in non-essential details may be approved by Engineer.

B. All frames and grates shall be made surfaces to prevent rocking under traffic.

C. Grate castings will be smooth with no sharp edges.

D. Constructed to support an HS-10 loading.

2.3 MASONRY

A. Brick:

1. Sound, hard, uniformly burned, regular and uniform in shape and size, compact texture, and satisfactory to the Engineer.
2. Immediately remove rejected brick from the work.

B. Mortar:

1. Composition (by volume):
   a. 1 part portland cement.
   b. 1/2 part hydrated lime.
   c. 4-1/2 parts sand.
2. The proportion of cement to lime may vary from 1:1/4 for hard bnck to 1:3/4 for softer brick, but in no case shall the volume of sand exceed 3 times the sum of the volume of cement and lime.

C. Cement:
   1. Shall be Type II portland cement.

D. Hydrated Lime:
   1. Shall be Type S.

E. Sand:
   1. Shall consist of inert natural sand.
   2. Grading:

Sieve	Percent Passing
3/8	100
4	95-100
8	80-100
16	50-85
50	10-30
100	2-10
Fineness Modulus	2.3 - 3.1

PART 3 - EXECUTION

3.1 PERFORMANCE

A. Precast Catch Basin Sections:
   1. Perform jointing in accordance with manufacturer's recommendations and as approved by the Engineer.
   2. Install barrels and tops level and plumb
   3. Make all joints water tight.
   4. Solidly fill annular spaces around pipes entering the catch basin with non-shrink grout or other material approved by the Engineer.
   5. Cut openings (as required) carefully to prevent damage to barrel sections and tops. Damaged barrel sections and tops shall be replaced by the Contractor at no additional expense to the Owner.

B. Pipe Connections to Catch Basins: Connect pipes to catch basins with joint design and materials approved by the Engineer.

C. Masonry:
   1. Laying Brick:
      a. Use only clean bricks in brickwork for catch basins.
      b. Moisten the brick by suitable means until they are neither so dry as to absorb water from the mortar or so wet as to be slippery when laid.
      c. Lay each brick in a full bed and joint of mortar without requiring subsequent grouting, flushing, or filling, and thoroughly bond as directed.
      d. Construct all joints in a neat workmanlike manner construct the brick surfaces inside the manholes so they are smooth with no mortar extending beyond the bricks and no voids in the joints. Maximum mortar joints shall be 1/2 inch.
   2. Curing:
      a. Protect brick masonry from tying too rapidly by using burlaps which are kept moist, or by other approved means.
      b. Protect brick masonry from the weather and frost as required.

D. Frames and Grates:
   1. Set all frames in a full bed of mortar, true to grade and concentric with the catch basin opening.
   2. Completely fill all voids beneath the bottom flange to make a watertight fit.
   3. Place a ring of mortar at least one inch thick around the outside of the bottom flange, extending to the outer edge of the catch basin all around its circumference.
   4. Clean the frame seats before setting the covers in place.

E. Bedding and Backfilling:
   1. Bedding material of catch basin shall be 6 inches of crushed stone (see Section 02200).
   2. Backfill 18 inches all around catch basin with common borrow.

END OF SECTION

SECTION 02434

CULVERTS AND STORM DRAINS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included.
   1. Provide and install culvert or storm drain pipe with inlet and outlet ends sections of the type(s), size(s) and in the location(s) shown on the Drawings and as specified herein.

B. Related Work Specified Elsewhere:
   1. Excavation and backfill, dewatering, pavement, borrow and bedding material are specified in the appropriate sections in this division.

1.2 SUBMITTALS

A. Submit, in duplicate, sworn certificates of inspections and tests performed at the location of manufacturers.

B. Submit shop drawings in accordance with the General Conditions of the Construction Contract.

1.3 DELIVERY, STORAGE AND HANDLING

A. Exercise care when handling pipe to prevent damage of any nature to pipe and finish.

B. Immediately remove damaged materials and replace at no additional cost to the Owner.

C. Store materials above ground on platforms, skids or other adequate supports.

1.4 FIELD OUALITY CONTROL

A. Acceptance will be on the basis of tests of materials and inspection of the complete product.

B. Inspection may be made at the place of manufacture or on the construction site after delivery, or both, and the pipe shall be subject to rejection at any time due to failure to meet all of the specification requirements, even though sample pipe units may have been accepted as satisfactory at the place of manufacture.

C. Immediately remove from the project site all rejected pipe.

PART 2- PRODUCTS

2.1 MATERLALS

A. Pipe shall be one of the following culvert pipes:
   1. Bituminous Coated Corrugated Metal Pipe (CMP)
   2. Corrugated Aluminum Pipe (CMP)

B. Pipe wall thickness shall be a minimum of 12 gauge (0.109 inches) for all materials.

C. Materials for pipes shall conform to AASHTO Standards.
   1. Bituminous Coated Corrugated Metal Pipe: These pipes and the coupling bands shall conform to the requirements of AASHTO M 36 for the specified sectional dimensions and gauges. Special sections, such as elbow and flared end section shall conform to the applicable requirements of A.ASHTO M 36. Modification of coupling bands resulting in strength requirements which equal or exceed the requirements of AASHTO M 36 will be allowed upon approval of the Engineer. After fabrication, the pipe shall be coated inside and outside in accordance with AASHTO M 190, Type A.
   2. Corrugated Aluminum Pipe: These pipes shall conform to the requirements of AASHTO M 196. Special sections, such as elbows, and metal end sections shall conform to the applicable requirements of AASHTO M 196.

PART 3- EXECUTION

3.1 INSPECTION
   A. Examine areas to receive piping for the following:
      1. Obstructions that adversely affect the installation and quality of the work.
      2. Deviations beyond allowable tolerances for clearances.
   B. Examine pipe and fittings before installation to assure no defective materials are incorporated.
   C. Start the work only when conditions are satisfactory.
   D. Remove and replace all defective materials at no additional cost to the Owner.

3.2 INSTALLATION
   A. Do not install pipe, nor backfill, between December 15 and April 1 without the written permission of the Engineer.
   B. Begin laying the pipe at the downstream end.
   C. Place metal pipe with the longitudinal laps of seams at the sides and the outside laps of circumferential joints pointing up grade.
   D. Lay paved or partially lined pipe with the lining on the bottom.
   E. Join flexible pipe sections and metal end sections by coupling bands.
   F. Assemble the plates for structural plate arches according to the manufacturer's assembly instructions and as shown on the Drawings.

END OF SECTION

SECTION 02480

LANDSCAPING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Perform the following items of work as required to complete the work of this section as shown on the Drawings and as specified hereunder:
   a. Spread stockpiled topsoil and furnish and spread any additional topsoil, required to meet the requirements of this section.
   b. Furnish and sow grass seed/or sod in all areas within the work area to the extent indicated on the Drawings, and in existing grass areas which have been damaged or disturbed by the work of this Contract.
   c. Provide maintenance services as specified hereunder.
2. Examine all other sections of the Specifications and all Drawings for the relationship of the work under this section and the work of other trades. Cooperate with all trades in performing the work under this section.

1.2 SUBMITTALS AND TESTING

A. Seed:

1. Furnish the Engineer with duplicate signed copies of a statement from the vendor, certifying that each container of seed delivered to the project site is fully labeled in accordance with the Federal Seed Act and is at least equal to the specification requirements.
2. This certification shall appear in, or with, all copies of invoices for the seed.
3. Each lot of seed shall be subject to sampling and testing, at the discretion of the Engineer, in accordance with the latest rules and regulations under the Federal Seed Act.

B. Topsoil:

1. Inform the Engineer, within 30 days after the award of the Contract, of the sources from which the topsoil is to be furnished. It is the intent of this section that all topsoil which can be recovered from the site shall be used. Furnish additional topsoil as required.
2. Obtain representative soil samples, taken from several locations in the area under consideration for topsoil removal, to the full stripping depth.
3. Have soil samples tested by an independent soils testing laboratory, approved by the Engineer, at the Contractor's expense.
4. Have soil samples tested for physical properties and pH (or lime requirement), for organic matter, available phosphoric acid, and available potash, in accordance with standard practices of soil testing for agricultural use.
5 Approval, by the Engineer, to use topsoil for use in the work will be dependent upon the results of the soils tests.

C. Lime and Fertilizer:

1. Furnish the Engineer with duplicate copies of invoices for all lime and fertilizer used on the project showing the total minimum carbonates and minimum percentages of the material furnished that pass the 90 and 20 mesh sieves and the

grade furnished.

2. Each lot of lime and fertilizer shall be subject to sampling and testing at the discretion of the Engineer.
3. Sampling and testing shall be in accordance with the official methods of the Association of Official Agricultural Chemists.
4. Upon completion of the project, a final check may be made comparing the total quantities of fertilizer and lime used to the total area seeded. If the minimum rates of application have not been met, the Engineer may require the Contractor to distribute additional quantities of these materials to meet the minimum rates.

1.3 DELIVERY, STORAGE AND HANDLING

A. Seed:
   1. Furnish all seed in sealed standard containers, unless exception is granted in writing by the Engineer.
   2. Containers shall be labeled in accordance with the United States Department of Agriculture's rules and regulations under the Federal Seed Act in effect at the time of purchase.

B. Fertilizer:
   1. Furnish all fertilizer in unopened original containers.
   2. Containers shall be labeled with the manufacturer's statement of analysis.

1.4 JOB CONDITIONS

A. Topsoil:
   1. Do not place or spread topsoil when the subgrade is frozen, excessively wet or dry, or in any condition otherwise detrimental, in the opinion of the Engineer, to the proposed planting or to proper grading.

B. Seeding and Planting:
   1. Work Seasons - Perform seeding and planting work only between the dates of I May to 20 June and 15 August to 1 October, except as otherwise directed in writing by the Engineer.
   2. Weather Conditions:
      a. Do not perform seeding work when weather conditions are such that beneficial results are not likely to be obtained, such as drought, excessive moisture, or high winds.
      b. Stop the seeding work when, in the opinion of the Engineer, weather conditions are not favorable.
      c. Resume the work only when, in the opinion of the Engineer, conditions become favorable, or when approved alternate or corrective measures and procedures are placed into effect.

PART 2 - PRODUCTS

2.1 MATERIALS FOR GRADING AND SEEDING

A. Topsoil:
   1. Additional topsoil from offsite, if required to meet minimum depths, shall be friable topsoil, typical of cultivated topsoils of the locality, containing at least three percent of decayed organic matter (humus). It shall be taken from a well drained arable site. It shall be reasonably free from subsoil, stones, earth, clods, sticks, roots, or other objectionable extraneous matter or debris, and contain no

toxic materials.

B. Fertilizer:

1. Fertilizer shall be used to counteract soil deficiencies as indicated by the soil analysis and as approved by the Engineer. It should be a complete fertilizer, a standard product complying with the state and federal fertilizer laws, part of the elements of which are derived from organic sources, containing the following percentages by weight:

Nitrogen	10N - Minimum 75 percent organic
Phosphorus	6 P -
Potash	4K-

The fertilizer shall be delivered to the site in the original unopened containers bearing the manufacturer's guaranteed statement of analysis, or a manufacturer's certificate of compliance covering analysis shall be furnished to the Engineer. The fertilizer shall be spread at the rate of 17 to 20 lbs/1000 sq-ft.

C. Lime:

1. Provide lime which is ground limestone containing not less than 85 percent of total carbonate and of such fineness that 90 percent will pass a No. 20 sieve and 50 percent will pass a No. 100 sieve.
2. Coarser materials will be acceptable provided the specified rates of application are increased proportionately on the basis of quantities passing a No. 100 sieve. No additional payment will be made to the Contractor for the increased quantity.

D. Soil Enrichers:

1. They shall be one of the following materials:
   a. Peat Moss - Finely shredded and consisting of not less than 90 percent organic matter.
   b. Sawdust - rotten.
2. They shall be natural and suited to horticultural use. They shall not contain lumps, roots or other foreign matter over two inches in diameter. They shall be free from noxious weeds, seeds and other elements harmful to lawns. They shall be subject to inspection approval by the Engineer at the source and upon delivery and shall contain not more than 35 percent moisture by weight at the time of incorporation into the soil.

E. Mulch for Hydro Seeding:

1. Mulch material shall meet the following requirements:
   a. Hay or straw - Hay or straw mulch shall consist of long fibered hay or straw, reasonably free from noxious weeds or other undesirable material. No material shall be used which is so wet, decayed, or compacted as to inhibit even and uniform spreading. No chopped hay, grass clippings or other short fibered material shall be used unless directed.
   b. Wood cellulose fiber - Wood cellulose fiber mulch shall consist of natural wood cellulose fiber containing no materials which will inhibit seed germination or plant growth. Sufficient non-toxic water soluble green dye shall be added to provide a definite color contrast to the ground surface to aid in even distribution. Wood fiber mulch shall be supplied in uniform packages not exceeding 100 pounds each. Each package shall be marked to show the air dry weight.

F. Mulch Binder for Hydroseeding:

Material for mulch binder shall be emulsified asphalt.

a. Emulsified asphalt mulch binder shall be a type acceptable to the Engineer and maybe

diluted with water to assure even distribution.

G. Grass Seed Mixture

Fresh, clean, new crop seed. Seed may be mixed by an approved method on the site, or may be mixed by the dealer. If the seed is mixed on the site, each variety shall be delivered in the original containers which shall bear the dealer's guaranteed statement of the composition of the mixture and the percentage of putty of each variety. The Dealers Guarantee Statement shall be delivered to the Engineer.

2. Grass seed shall be composed of the following varieties which shall be mixed in the proportions and shall test to 97 percent minimum purity, minimum 85 percent germination, and weed seed content not to exceed 0.10 percent.

Percent Proportion by Weight:

a. Roadside and Detention Basin Sideslopes Mixture (Slopes):
   1) Creeping Red Fescue - 40 percent.
   2) Kentucky Bluegrass - 25 percent.
   3) Kentucky 31 Fescue - 30 percent.
   4) Annual Rye Grass - 5 percent.

b. Lawn Areas:
   1) Kentucky 31 Fescue - 25 percent.
   2) Chewing Fescue - 15 percent.
   3) Creeping Red Fescue - 15 percent.
   4) Pennfine Perennial Rye - 25 percent.
   5) Lynn Perennial Rye - 10 percent.
   6) Common Annual Rye - 10 percent.

3. Sow grass seeds uniformly at a rate of 5 to 7 pounds per 1000 sq. ft surface area.

H. Sod:

1. Preferable two year growth, at least 95 percent weed-free, solid landscaping sod composed of perennial fescues, Kentucky bluegrasses. Submit one 12 by 12 inch piece of sod, with source location, for approval of the Engineer, before ordering sod for the work.

2.2 MATERIALS FOR PLANTING

A. Water:
   1. The Contractor shall arrange and pay for water required for the planting. Water shall be clean and suitable for domestic consumption.

B. Manure:
   1. Manure shall be well rotted, unleached, horse or cow manure or a combination of both. It shall be free from any chemicals used to hasten decomposition artificially, or any other injurious substance.
   2. Manure shall be at least nine months old and not more than two years old, free from sawdust, hay, tanbark or wood shavings, or refuse of any kind. Manure shall consist of not more than 25 percent straw or other acceptable material.

C. Stakes shall be white cedar or approved equal, of size and length as shown on the Drawings.

D. Hose for guying shall be new black or green two-ply fiber garden hose, not less than 1/2 inch inside diameter. Seconds rejected by the factory are acceptable.

E. Burlap for wrapping shall be first quality burlap at least eight ounces in weight and six

inches in width.

F. Wire for tree guys shall be galvanized annealed steel wire, No. 14 gauge, as detailed.

G. Tree paint shall be waterproof, adhesive and elastic, free from kerosene, coal tar creosote or any other material injurious to the life of the trees. Tree paint shall contain an antiseptic.

H. Pine bark mulch shall be clean, shredded, free of weeds, seeds, insects and extraneous materials.

2.3 STORAGE OF MATERIAL

A. Materials such as fertilizers, ground limestone, etc. shall be stored in weatherproof storage areas and in such a manner that their effectiveness will not be impaired.

PART 3 – EXECUTION

3.1 PREPARATION

A. Equipment:

1. Provide all equipment necessary for the proper preparation of the ground surface and for the handling and placing of all required materials.
2. Demonstrate to the Engineer that the equipment will apply materials t the specified rates.

B. Subsoil Preparation:

1. Before spreading topsoil, the subgrade shall be raked by approved means. Remove all stones greater than four inches and all debris or rubbish to a depth of six inches. Such materials shall be removed from the site.

C. Screening:

1. All topsoil shall be screened clear of all stones greater than one inch, sticks, plants, and all ether foreign materials before being spread.
2. During the screening of topsoil, commercial fertilizers and lime as required by the soil analysis shall be mixed with the topsoil so that they are evenly distributed throughout the screened topsoil.
3. At the completion of this operation, topsoil is referred to as improved topsoil for the purpose of this specification and the Drawings.

3.2 SEED AND SOD BED PREPARATION

A. Spread improved topsoil uniformly over subgrade and all areas where the existing grade has been changed and areas disturbed by construction operations except for those areas indicated on the site plans to be paved. No subsoil, topsoil, or improved topsoil shall be handled in any way when in a wet or frozen condition.

B. Fine rake surface to receive seed or sod.

C. After natural settlement and a light rolling, the completed work shall conform to the lines, grades, pitches, and spot elevations shown on the plans.

D. Seeding may be done immediately thereafter, provided the seed bed has remained in a good friable condition and has not become wet.

3.3 SEASON

A. Do all seeding work within the dates herein specified.

B. If special conditions exist which may warrant a variance in the above dates, submit a written request to the Engineer stating the conditions and proposed variance. Permission for the variance will be given if in the opinion of the Engineer, the variance is warranted.

C. If seeding is authorized between May 15 and August 15, annual rye shall be sown separately in addition to the specified seed mix. Sow at the rate of six to eight pounds per 1000 square feet.

3.4 SEEDING AND SODDING

A. Immediately before seeding and sodding, the ground shall be restored as necessary to a loose friable condition by discing or other approved method to a depth of not less than two inches. The surface shall be cleared of all debris and of all stones one inch or more in diameter.

B. Seed all areas to be seeded with the specified grass seed, sowing evenly with an approved mechanical seeder at the rate specified in the seed mix schedule. Sow one half the seed in one direction and the other half at right angles to the first seeding. Cultipacker or approved similar equipment may be used to cover the seed and to firm the seed bed in one operation. In areas inaccessible to Cultipacker, the seeded ground shall be lightly raked and rolled in two directions with a water ballast roller Extreme care shall be taken during seeding and raking to insure that no change shall occur in the finished grades and that the seed is not raked from one spot to another.

C. The hydraulic spray method of sowing seed may be used where approved by the Engineer, This work shall be done with an approved machine operated by a competent crew. Seed and fertilizing materials shall be mixed with water in the tank of the machine and kept thoroughly agitated so the materials are uniformly mixed and suspended in the water at all times during operation. The spraying equipment must be designed and operated to distribute seed and fertilizing materials evenly and uniformly on the designated areas at the required rates. If the Engineer finds the application uneven or otherwise unsatisfactory, he may require the hydraulic spray method to he abandoned and the balance of the work done as specified herein. Seed must be lightly raked into the surface of the soil unless seeding is to be followed within 24 hours by mulching.

1. Applying Mulch - At the option of the Contractor, any of the following types of mulch material may be applied.
   a. Hay or straw mulch shall be spread evenly and uniformly over the designated areas. Unless other directed, mulch shall be applied to a thickness of 1". Too heavy application of mulch shall be avoided and lumps and thick spots shall be thinned. Unless otherwise authorized, the mulch shall be anchored in place by uniformly applying an asphalt mulch binder. Application of a concentrated stream of mulch binder will not be allowed. Asphalt mulch binder may be omitted when authorized by the Engineer and when there is a danger of the asphalt contaminating the surface of nearby structures, houses, vehicles, or other objects. Other methods of anchoring mulch may be used subject to the approval of the Engineer.
   b. Wood fiber mulch shall be applied as a water-borne slurry. The wood fiber and

water shall be thoroughly mixed and sprayed on the area to be covered so as to form a uniform mat of mulch at the rate of not less than 30 pounds per 1,000 square feet unit of area. Wood fiber mulch may be mixed with the proper quantities of seed, fertilizer and lime as required in this section, or may be applied separately after seeding has been carried out. In the latter case, it must be applied within 24 hours after seeding.

2. Maintenance - The Contractor shall maintain the mulch by repairing any damaged mulch and by correcting any shifting of the mulch due to wind, water or other causes, until an acceptable growth of grass has been achieved, regardless of the acceptance status of the seeding. He shall supply additional mulch necessary as a result of damage or seed failure. Repairs to mulched areas and furnishing of additional mulch shall be incidental to this item. If wood fiber is used, any reseeding will require additional wood fiber mulch.

D. Do not perform broadcast seeding work during windy weather.

E. Compacting:
   1. Compact the entire area immediately after the seeding operations have been completed.
   2. Compact by Means of a cultipacker, roller, or other equipment approved by the Engineer weighing 60 to 90 pounds per linear foot of roller.
   3. If the soil is of such type that a smooth or corrugated roller cannot be operated satisfactorily, use a pneumatic roller (not wobbly wheel) that has tires of sufficient size to obtain complete coverage of the soil.
   4. When using a cultipacker or similar equipment, perform the final rolling at right angles to the prevailing slopes to prevent water erosion, or at right angles to the prevailing wind to prevent dust.

F. Thoroughly wet soil surfaces before sodding. Place sod pieces tightly together, tamping gently into position as the work progresses. After each area of sodding is completed, roll the entire surface in two directions with a water ballast roller, and soak the newly sodded areas.

G. After the grass has started, all of the areas greater than five square feet which fail to show a uniform stand of grass for any reason whatsoever shall be reseeded repeatedly until all areas are covered with a satisfactory growth of grass.

H. At the time of the first cutting, set mower blades two inches high. All lawns shall receive at least three mowings before acceptance.

I. Maintenance shall also include all temporary protection fences, barriers and signs and all other work incidental to proper maintenance.

J. Maintain grass areas until a full stand of grass is indicated, which will be a minimum of 45 days after all seeding or sodding work is completed, and shall not necessarily relate to Substantial Completion of the General Contract.

K. Protection and maintenance of grass areas shall consist of watering, weeding, cutting, repair of any erosion and reseeding as necessary to establish a uniform stand of the specified grasses, and shall continue until Provisional Acceptance by the Engineer of the work of this section. It shall also include the furnishing and applying of such pesticides as are necessary to keep grass areas free of insects and disease. All pesticides shall be approved by Engineer prior to use.

3.5 SEEDING AND SODDING INSPECTION FOR PROVISIONAL ACCEPTANCE

A. The Engineer shall inspect all work for Provisional Acceptance upon written request of the Contractor. The request shall be received at least ten calendar days before the anticipated date of inspection.

B. Upon completion and reinspection of all repairs or renewals necessary in the judgment of the Engineer, the Engineer shall certify in writing to the Owner as to the Provisional Acceptance of the work of this section.

C. Upon approval of the Provisional Acceptance by the Owner, the Owner will assume maintenance of the lawn areas.

3.6 GUARANTY

A. The Contractor shall submit a written guarantee to the Engineer, after Provisional Acceptance of grass, covering reseeding of grass areas which do not survive through one fill growing season after the date of Provisional Acceptance, at no cost to the Owner.

3.7 CLEAN-UP

A. Any soil or similar material which has been brought on to paved areas by hauling operations or otherwise shall be removed promptly, keeping these areas clean at all time.

B. Upon completion of work under this section all excess stones, debris, and soil resulting from work under this section, which have not previously been cleaned up, shall be removed from the project site.

3.8 PLANTING METHOD

A. The Contractor shall excavate plant pits, furnish and place all plants, and then maintain them in a satisfactory manner until final acceptance.

B. All pits shall be of size and shape as recommended by the supplier.

C. For tree and shrub planting, soil used for backfilling shall be improved topsoil as recommended by soil analysis, with the following additions:

1. For deciduous plants use a mixture of four parts topsoil and one part of manure.
2. For evergreen plants use a mixture of four parts topsoil and one part of peat moss as specified under Soil Enrichers.

D. Plant pits within or near paved areas shall be prepared prior to the laying of the pavement. 'Where tree pits in paved areas are to be covered with mulch, trees shall be placed at sufficient depth below finished grade to allow for the depth of the mulch.

E. Plants shall be set plumb and straight, and at such a level that after settlement, a normal or natural relationship of the crown of the plant with the ground surface is established. Each plant shall be planted in the center of the pit. 'When balled, burlapped and platformed plants are set, the platform shall first be removed from the pit and the soil shall be carefully tamped under and around the base of each ball to fill all voids. All burlap, ropes, and wires shall be removed from the sides and tops of balls, but no burlap shall be pulled out from under the balls, except for plastic burlap, which shall be completely removed from the pit.

F. All seals shall remain unbroken and visible on plant material until final inspection by Engineer. The Contractor shall remove all seals immediately after final inspection.

3.9 PLANTING SEASON

A. Do all planting work within the dates herein specified.

3.10 PRUNING, PAINTING, SPRAYING

A. Pruning:
   1. Each tree and shrub planted shall be pruned to preserve the natural character of the plant and in a manner appropriate to the particular requirements of the landscape design. In general, approximately one third of the wood shall be removed by thinning or shortening branches, but no leaders shall be cut.
   2. All pruning shall be done with sharp tools. All pruning cuts shall be made (lush and clean, especially where lower branches have been removed from collected trees.

B. Painting:
   1. Pruning cuts over one-half inch in diameter shall be painted with tree paint specified under 'Materials" on all exposed cambium as well as other exposed living tissues.

3.11 STAKING

A. All staking shall be done immediately after wrapping. Stakes shall be driven perpendicular into the ground around the periphery of the ball of the tree. Plants shall stand plumb after staking.

3.12 WATERING

A. Plantings shall be watered in a satisfactory manner during and immediately after planting, not less than twice per week, until provisional acceptance.
B. Suitable water for maintaining plants shall be provided by the Owner. The Contractor shall furnish the hose and hose connections from the outlets where water is furnished. Contractor is responsible for all watering until provisional acceptance.

3.13 MAINTENANCE SERVICES

A. Contractor shall provide a minimum of two (2) mowings of all seeded and sodded restoration area on the project site after final completion of the work and all required mowings before final completion.
B. Maintenance shall begin immediately after each plant is planted. Plants shall be watered, mulched, weeded, fertilized, cultivated and otherwise maintained and protected until provisional acceptance.
C. Guys shall be tightened and repaired. Defective work shall be corrected as soon as possible after defects become apparent, and weather and season permit.

3.14 TREE SURGERY

A. Existing trees shall be trimmed of all dead and diseased limbs at the direction of the Engineer. All cuts shall be made close to the trunk and those over one inch in diameter shall be covered with an acceptable tree paint manufactured for this specific purpose. In the case of important large trees where a small amount of cavity work would prolong their lives, such work should be done. The services of a qualified tree surgeon are recommended.

3.15 INSPECTION AND PROVISIONAL ACCEPTANCE

A. The Engineer will inspect all planting work for provisional acceptance upon request of the Contractor.

B. The Contractor shall furnish fill and complete written instructions for maintenance of the planting to the Owner at the time of provisional acceptance.

C. After all necessary corrective work has been completed and maintenance instructions have been received by the Owner, the Engineer will certify in writing the provisional acceptance of the planting.

3.16 GUARANTEE PERIOD

A. All plants shall be guaranteed by the Contractor for a period of not less than one full year from time of provisional acceptance.

B. At the issuance of provisional acceptance, the Owner shall take over maintenance of the planting. Nevertheless, the guarantee of all plant material will remain with the Contractor. The Contractor shall ascertain that the Owner properly waters and maintains all planting during the one year guarantee period.

C. At the end of the guarantee period, any plant that is missing, dead, not true to name or size as specified, or not in satisfactory growth, as determined by the Engineer, shall be replaced. In case of reasonable doubt or question regarding the condition and satisfactory establishment of a rejected plant, the Engineer may allow such a plant to remain through another complete growing season, at which time the rejected plant, if found to be dead, in an unhealthy or badly impaired condition, shall be replaced at once. The Contractor will not be required to replace an inspected and accepted plant more than once.

D. Replacements shall be plants of the same kind and size as specified in the Plant List. They shall be furnished and planted as specified herein. The cost of replacement shall be borne by the Contractor, except where it can be definitely shown that loss resulted from Owner's failure to maintain planting as instructed.

3.17 FINAL INSPECTION AND FINAL ACCEPTANCE

A. At the end of the guarantee period, inspection will be made by the Engineer, at the request of the Contractor.

B. After all necessary corrective work has been completed, the Engineer will certify in writing the final acceptance of the planting.

3.18 CLEANUP

A. Upon completion of work under this section, all excess stones, debris and soil resulting from planting work shall be removed from project site. The site shall be restored to a better condition than was present prior to construction.

END OF SECTION

SECTION 02510

CEMENT CONCRETE SIDEWALKS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: This work shall consist of the construction of new cement concrete sidewalks and driveways in accordance with these specifications and in reasonably close conformity with the lines and grades shown on the Drawings or established by the Engineer.

B. Related Work Specified Elsewhere: (When Applicable) Earthwork, aggregate base and subbase, bituminous concrete paving and granite curbs are specified in the appropriate sections in this Division.

1.2 RELATED DOCUMENTS

A. State of Maine, Department of Transportation, Standard Specifications, dated December 2002 as revised.

1.3 QUALITY ASSURANCE

A. Materials: Use only materials furnished by a bulk cement concrete producer regularly engaged in the production of Portland cement concrete.

B. Submittals: A certificate of compliance shall be furnished to the Engineer that the materials supplied comply with the specification requirements.

PART 2- PRODUCTS

2.1 MATERIALS

A. The Portland cement concrete shall conform to the requirements of AASHTO M85 Type II with a moderate heat of hydration and with the following exceptions:
   1. The autoclave expansion shall be limited to a maximum of 0.20 percent.
   2. There will be no requirements for tensile strength.
   3. Only one brand of cement shall be used on any one contract unless otherwise permitted, in writing, be the Engineer.

B. The welded wire fabric for reinforcement shall conform to the requirements of AASHTO MS 5-73, unless otherwise specified.

C. The pre-molded expansion joint material shall be non-extruding and resilient bituminous type and shall conform to the requirements of AASHTO M213.

PART 3 - EXECUTION

3.1 EXCAVATION

A. Excavation shall be to the depth and width that will permit the installation and bracing of the forms. The foundation shall be shaped and compacted to a firm even surface conforming to the section shown on the Drawings. All soft and yielding subbase material shall be removed and replaced with acceptable select fill material.

3.2 FORMS

A. Forms shall be of wood or metal and shall extend for the fall depth of the concrete. All forms shall be true, free from warp and of sufficient strength to resist the pressure of the concrete without springing. Bracing and staking of forms shall be such that the forms remain in both horizontal and vertical aliment until their removal.

3.3 PLACING CONCRETE

A. The foundation shall be thoroughly moistened immediately prior to placing the concrete. The proportioning, mixing and placing of the concrete shall be in accordance with good construction practices, as stated in the requirements of the MHD specifications.

3.4 FINISHING

A. The surface shall be finished to produce a broom like pattern.
B. No plastering of the surface with mortar will be permitted.

3.5 JOINTS

A. Joints shall be located as shown on the plans. Slabs shall be placed alternately and the joints coated with an approved bituminous material before placing the adjacent slab.
B. When a concrete sidewalk is constructed adjacent to a curb, building, retaining wall, light pole base or other fixed structure, a 1/4 inch thick pre-molded joint filler shall be used between the slab and the structure.

3.6 CURING

A. Concrete shall be cured for at least 72 hours. Curing shall be by moist burlap or mats, white-pigmented curing compound or by other approved methods. During the curing period, all traffic, both pedestrian and vehicular, shall be excluded. Vehicular traffic shall be excluded for such additional time as may be directed.

END OF SECTION

SECTION 02513

BITUMINOUS CONCRETE PAVING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:
   1. Furnish all plant, labor, equipment arid materials required to install bituminous concrete pavement courses, including sidewalks, driveways, temporary and permanent trench paving and restoration of pavement markings as needed.
   2. Remove bituminous asphaltic and/or Portland cement pavement, and replace bituminous asphaltic pavement, sub-base, binder courses and surface courses, including temporary pavement, within the necessary area(s) and as directed by the Engineer. -
   3. Keep pavement removal to a minimum width suitable for the required construction.
   4. Apply pavement markings to the permanent paving as specified.

B. Work Not Included: Removal and replacement of paving for the convenience of the Contractor will not be considered for payment.

C. Related Work Specified Elsewhere (When Applicable):
   1. Excavation, backfill, aggregate base and subbase.

1.2 QUALITY ASSURANCE

A. Materials: Use only materials furnished by a bulk bituminous concrete producer regularly engaged in the production of hot mixed, hot laid bituminous concrete.

B. Equipment: Provide, maintain and operate pavers, dump trucks, tandem, 3-wheel and pneumatic tired rollers well suited to the mixtures being placed. Provide, maintain and operate hand equipment as required. When applicable, provide, maintain and operate trimming equipment and materials.

C. Mix Requirements, Method of Placement and Compaction: State of Maine, Department of Transportation, Standard Specifications, dated December 2002 as revised. Specifications for mixing, placing and compacting bituminous concrete surfaces are applicable to this work.

1.3 SUBMITTALS

A. A certificate of compliance shall be furnished to the Engineer that the materials supplied comply with the specification requirements.

B. Delivery slips shall be furnished with each load of mix delivered to the project. Information shall include:
   1. Vehicle identification.
   2. Date.
   3. Project.
   4. Identification of material
   5. Gross, tare and net weights.
   6. Signed by the bituminous concrete producer.
   7. Stamped by a licensed public weighmaster.

PART 2- PRODUCTS

2.1 MATERIALS

A. Class 1 Bituminous Concrete.

General - These mixtures shall be composed of mineral aggregate, mineral filler, if required, and bituminous material.

2. Composition of the mixture - The mineral aggregates, filler, if required, and bituminous material shall be proportioned and mixed as hereinafter specified to conform with the composition by weight tabulated in Table A, herein. Sufficient approved mineral filler shall be used to correct any deficiencies in grading of aggregate.

3. Job Mix Formula - The composition limits in Table A are master ranges of tolerances of materials in general. In order to obtain standard texture, density and stability, the Contractor will furnish to the Engineer a specific job mix formula for the particular uniform combination of materials and sources of supply to be used on each project. The job mix formula for each mixture shall establish a single percentage of aggregate passing each required sieve size, a single percentage of bituminous material to be added to the aggregate and the number of seconds for dry mixing time and the number of seconds for wet mixing time. AASHO-T195 (Ross Count) with a coating factor of 98% will be used when necessary to evaluate proper mixing time. The job mix formula shall also specify a single source of uniform blend of particular sources for fine aggregate, a single source of supply for mineral filler and for asphalt. Two or more job mix formula may be approved for a particular plant; however, only material conforming to one job mix formula will be permitted to be used on any given calendar day. The job mix formula shall bind the Contractor to furnish paving mixtures not only within the master ranges, but also conforming to the exact formula thus set up for the project, within allowable tolerances as follows:

Asphalt	±0.4%
No. 4 and larger sieves	±7.0%
No. 8 and smaller sieves*	±4.0%
*Except passing No. 200 sieve	±2.0%

4. Asphalt cement shall be:

AC-5
AC-10
AC-20
AC-40

TABLE A
*PERCENT BY WEIGHT
PASSING
SQUARE OPENING SIEVES

Standard Sieves	Base Course	Binder Course	Surface Course	**Dense Mix	Surface Treatment	***Patching Mix
2"	100					
1 ½"	90-100					
1"	65-90	100				
¾"	55-80	80-100				
½"	40-65	55-80	100	100		100
3/8"			80-100	80-100	100	90-100
No.4	20-45	28-50	50-76	55-80	80-100	50-65
8	15-33	20-38	37-54	48-63	64-85	24-36
16			26-40	36-49	46-68	14-28
30	8-17	8-22	17-31	24-38	26-50	8-25
50	4-12	5-15	10-23	14-27	13-31	5-21
100			6-16	6-18	7-17	3-15
200	0-4	0-5	2-7	4-8	3-8	2-8
Bitumen	4-5	4.5-5.5	5.5-7.0	7-8	7-8	4-6

* Percentages shown in table above for aggregate sizes are stated as proportional percentages of integral total aggregate for the mix.

** Dense mix including approved anti-stripping compound shall be furnished and used for protective (bottom) courses of pavement on bridges, and elsewhere shown on the plans.

***Patching mix shall include 1% of hydrated lime based on weight of total aggregate.

No job mix formula will be approved which specifies:
More than 45% passing No. 8 for Top Course.
More than 55% passing No. 8 for Dense Mix.
Less than 4% passing No. 200 for Top Course.

Should a change of sources of materials be made, a new job mix formula shall be established by the Contractor before the new material is used. When unsatisfactory results or other conditions make it necessary, the Engineer may establish a new job mix formula.

The aggregate will be accepted in stockpile at the plant site. The bituminous material will be accepted on certification.

If the Contractor elects to furnish bituminous concrete from more than one plant, the job mix formula must be adhered to be all plants.

SECTION 02601

MANHOLES, COVERS AND FRAMES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Construct manholes, covers, frames, brick masonry, inverts and apply waterproofing in conformance with the dimensions, elevations, and locations shown on the Drawings and as specified herein.

B. Related Work Specified Elsewhere (when applicable):
   1. Final sewer testing is specified in this Division.
   2. Pipe, excavation, backfill, paving and dewatering are specified in the appropriate Sections in this Division.
   3. Concrete and grout are specified in Division 3.

1.2 QUALITY ASSURANCE

A. Precast Manhole Base, Barrel and Top Sections:
   1. Conform to ASTM C478-84 (AASHTO M199-82) except as modified herein, and on the Drawings.
   2. Average strength of 4,000 psi at 28 days.
   3. Testing:
      a. Determine concrete strength by tests on 6-inch by 12-inch vibrated test cylinders cured in the same manner as the bases, barrels and tops.
      b. Have tests conducted at the manufactures plant or at a testing laboratory approved by the Engineer.
      c. Have not less than 2 tests made for each 100 vertical feet of precast manhole sections.

B. Manhole Steps
   1. Acceptable Manufacturers:
      a. Aluminum Company of America.
      b. Reliance Steel Products, Inc.
      c. M. A. Industries, Inc.
      d. Or equivalent.

C. Frames and Covers:
   1. Acceptable Manufacturers:
      a. Etheridge Foundry Co.
      b. Neenah Foundry Co.
      c. E. L. LeBaron Foundry Company.
      d. Or equivalent.

D. Masonry:
   1. Brick: Shall comply with the ASTM Standard Specifications for Sewer Brick (made from clay or shale), Designation C32, for Grade SS, hard brick. (AASHTO M91-78).

2. Cement: ASTM C-ISO (AASHTO M85-791).
3. Hydrated Lime: ASTM C-2O7
4. Sand: ASTM C33 (AASHTO M6-65 (1974)).

E. Waterproofing:
1. Acceptable Manufacturers:
a. Minwax Fibrous Brush Coat, Minwax Co., N.Y., N.Y.
b. Tremco 121 Foundation Coating, Tremco Mfg. Co., Newark, N.J.
c. Or approved equal.

1.3 SUBMITTALS TO THE ARCHITECT/ENGINEER

A. Submit shop drawings and manufacturer's literature in conformance with Section 01340 and the Standard General Conditions of the Construction Contract.

B. Precast Manhole Sections: Submit test results and receive approval from the Engineer prior to delivery to the site.

PART 2- PRODUCTS

2.1 PRECAST MANHOLE SECTIONS

A. Dimensions, shall be as shown on the Drawings:
1. Base & Riser Sections:
a. Diameter: As shown on the Drawings.
b. Length: As required.
e. Wall Thickness: Not less than 5 inches.
d. Joints: Bell-and-spigot or tongue-and-groove formed on machine rings to insure accurate joint surfaces.
2. Tops:
a. Diameter: Eccentric cone type, 24 inches I.D. at top, 48 inches I.D. at bottom unless otherwise shown on the Drawings.
b. Length: 4 feet.
c. Wall thickness: Not less than 5 inches at the base, tapering to not less than 8 inches at the top.
d. Joints: Bell-and-spigot or tongue-and-groove formed on machine rings to insure accurate joint surfaces.
e. Exterior face of cone sections shall not flare out beyond the vertical.
3. Flat Slab Tops:
a. Location: Where shallow installations do not permit the use of a cone-type top and where indicated on the Drawings.
b. Slab thickness: Not less than 8 inches.
c. Constructed to support an HS-20 wheel loading.

B. Openings:
1. Provide openings in the risers to receive pipes entering the manhole.
2. Make openings at the manufacturing plant.
3. Size: To provide a uniform annular space between the outside wall of pipe and riser.
4. Location: To permit setting of the entering pipes at the correct elevations.
5. Openings shall have a flexible watertight union between pipe and the manhole

base.

a. Cast into the manhole base and sized to the type of pipe being used.
b. Type of flexible joint being used shall be approved by the Engineer. Install materials according to the Manufacturer's instructions.
   1. Lock Joint Flexible Manhole Sleeve made by Interpace Corporation.
   2. Kor N Seal made by National Pollution Control System. Inc.
   3. Press Wedge II made by Press-Seal Gasket Corporation.
   4. A-Lok Manhole Pipe Seal made by A-Loc Corporation.
   5. Or equivalent.

C. Joints:
   1. Joint gaskets to be flexible self seating butyl rubber joint sealant installed according to manufacturer's recommendations. For cold weather applications, use adhesive with joint sealant as recommended by manufacturer. Acceptable Materials:
      a. Kent-Seal No. 2
      b. Ram-Nek
      c. Or equivalent.
   2. Joints between precast sections shall conform to related standards and manufacturer's instructions.
   3. All manholes greater than 6 ft. diameter and all manholes used as wet wells, valve pits and other dry-pit type structures shall be installed with exterior joint collars. The joint collar shall be installed according to the manufacturer's instructions. Acceptable materials:
      a. Mac Wrap exterior joint sealer as manufactured by Mar-Mac Manufacturing Company.
      b. Or equivalent.

D. Waterproofing:
   1. The exterior surface of all manholes shall be given two coats of bituminous waterproofing material at a application rate of 75 to 100 square feet per gallon, per coat.
   2. The coating shall be applied after the manholes have cured adequately and can be applied by brush or spray in accordance with the manufacturer's written instruction.
   3. Sufficient time shall be allowed between coats to permit sufficient drying so that the application of the second coat has no effect on the first coat.

E. Frost Protective Wrapping:
   I. The frost protective wrap shall be constructed of an ultraviolet resistant polyethylene material and shall be a minimum thickness of 6 mils.

2.2 FRAMES AND COVERS

A. Standard Units:
   1. Made of cast iron conforming to ASTM A48-76, Class 30 minimum.
   2. Have machined bearing surfaces to prevent rocking.
   3. Castings shall be smooth with no sharp edges.
   4. Constructed to support an HS-20 wheel loading.
   5. Dimensions and Style shall conform to the Drawings, Standard castings differing in non-essential details are subject to approval by the Engineer:

a. Covers - solid with sewer in 3-inch letters diamond pattern, and concealed pickholes.
b. Frame - 24-inch diameter clear opening, with flange bracing ribs, unless otherwise shown on the drawings.

6. Frames cast-in-place in concrete covers shall provide top flange, 24 inch diameter clear opening, frame height as required by slab thickness.
   a. Acceptable Units: LeBaron Type SF, Neenah R-1960-A or approved equal.
7. Minimum weight of frame and cover shall be 430 lbs.

B. Water Tight Units:
1. Same features as above for Standard Units, with 24-inch diameter minimum clear opening.
2. Sealing features:
   a. Inner lid held by a bronze tightening bolt in a locking bar.
   b. Neoprene gasket
   c. Water tight pick hole.
3. Minimum weight of frame and cover shall be 510 lbs.

2.3 MANHOLE STEPS

A. Aluminum or polyethylene coated steel safety type desired with a minimum concentrated live load of 300 pounds.
B. Thoroughly clean all surfaces to be embedded with a suitable cleaning agent to ensure that the surfaces are free from all foreign matter such as dirt, oil and grease.
C. Aluminum surfaces to be embedded shall be given a protective coating of an approved heavy-bodied bituminous material. The steps shall become thoroughly dry before being placed into the concrete.
D. All steps shall be cast into walls of the precast section so as to form a continuous ladder with a distance of 12-inches between steps.

2.4 MASONRY

A. Brick:
1. Sound, hard, uniformly burned, regular and uniform in shape and size, compact texture, and satisfactory to the Engineer.
2. Immediately remove rejected brick from the work.

B. Mortar:
1. Composition (by volume):
   a. 1 part portland cement.
   b. 1/2 part hydrated lime.
   c. 4-1/2 parts sand.
2. The proportion of cement to lime may vary from 1:1/4 for hard brick to 1:3/4 for softer brick, but in no case shall the volume of sand exceed 3 times the sum of the volume of cement and lime.

C. Cement shall be Type II portland cement.
D. Hydrated lime shall be Type

E. Sand:
1. Shall consist of inert natural sand.
2. Grading:

Sieve	Percent Passing
#3/8	100
4	95-100
8	80-100
16	50-85
50	10-30
100	2-10
Fineness Modulus	2.3 -3.1

PART 3 - EXECUTION

3.1 PERFORMANCE

A. Precast Manhole Sections:
1. Perform jointing in accordance with manufacturer's recommendations and as approved by the Engineer.
2. Install riser sections and tops level and plumb.
3. Make all joints watertight.
4. When necessary, cut openings carefully to prevent damage to barrel sections and tops. Solidly fill annular spaces around pipes entering the manholes with non-shrink ~rout or sealant approved by the Engineer. Replace damaged manhole sections and tops at no additional cost to the Owner.
5. When manhole steps are included in the Work, install barrel sections and tops so that steps are in alignment.

B. Drop Manholes:
1. The difference in elevation between the invert of the inlet pipe to the invert of the outlet pipe shall not exceed 24 inches without use of a drop structure.
2. Where difference in elevation exceeds 24 inches, construct a drop manhole as shown on the Drawings or as directed by the Engineer.

C. Adjust to Grade:
I. Adjust tops of manholes to grade with brick masonry.
2. Concrete rings are not acceptable for adjusting to grade.

D. Pipe Connections to Manholes: Connect pipes to manholes with joint design and materials approved by the Engineer.

E. Invert Channels:
1. Smooth and semicircular in shape conforming to the inside of the adjacent sewer section.
2. Make changes in direction of flow with smooth curves having a radius as large as permitted by the size of the manhole
3. Stop the pipes at the inside face of the manhole where changes of direction occur.
4. Form invert channels with brick.
5. Shape invert to make smooth transition in vertical grade.
6. Slope the floor of the manhole to the flow channel, as shown on the Drawings.

F. Masonry:
1. Laying Brick:

a. Use only clean bricks in brickwork for manholes.
b. Moisten the brick by suitable means until they are neither so dry as to absorb water from the mortar nor so wet as to be slippery when laid.
c. Lay each brick in a full bed and joint of mortar without requiring subsequent grouting, flushing, or filling, and thoroughly bond as directed.
d. Construct all joints in a neat workmanlike manner. Construct the brick surfaces inside the manholes so they are smooth with no mortar extending beyond the bricks and no voids in the joints. Maximum mortar joints shall be 1/2 inch.
e. Outside faces of brick masonry shall be plastered with mortar from ¼-inch to 3/S-inch thick.
f. Completed brickwork shall be watertight.

2. Curing:
   a. Protect brick masonry from drying too rapidly by using burlaps which are kept moist, or by other approved means.
   b. Protect brick masonry from the weather and frost as required.

G. Frames and Covers:
1. Set all frames in a full bed of mortar, true to grade and concentric with the manhole opening.
2. Completely fill all voids beneath the bottom flange to make a watertight fit.
3. Place a ring of mortar at least one inch thick around the outside of the bottom flange, extending to the outer edge of the manhole all around its circumference.
4. Clean the frame seats before setting the covers in place.

H. Plugging and Patching:
1. Fill all exterior cavities with non-shrink grout and with bituminous waterproofing once the concrete and mortar has set.
2. Touch up damaged water proofing.

I. Cleaning:
1. Thoroughly clean manholes, steps, frames and covers of all debris and foreign matter.

J. Beddingand Backfilling:
1. Bedding of manholes shall be 6 inches of 3/4" screened stone.
2. Backfill a minimum of 18 inches all around manhole with gravel borrow.

K. Frost Protective Wrap:
1. The Contractor shall comply with the manufacturer's instructions for the particular conditions of installations in each case.
2. Clean each manhole exterior of all dirt and remove any sharp protrusions.
3. Apply two (2) 6-inch wide vertical strips of bituminous waterproofing material and/or duct tape from the top to bottom of the manhole per layer.
4. Prior to installing pipe through each manhole or valve pit, wrap each manhole to the maximum depth of frost penetration, but not less than 5 feet below grade, with four (4) layers of the polyethylene material by beginning the wrap at the adhesive strip and proceeding around the manhole, valve pit, etc., continuously by overlapping the adhesive strip by 24 inches on the final layer. Cut the polyethylene wrap in areas where piping exits the manhole. The size of the cut is to be equivalent to the pipe's outside diameter.
5. Tuck and pleat the polyethylene wrap at the top of each manhole in a continuous manner, minimizing the size of each fold. Extend the polyethylene wrap past the top of the

manhole frame and temporarily tuck the remainder inside the frame, until final backfill and paving.

6. In paved areas, cut the polyethylene wrap flush with the manhole rim after the pavement is in place.
7. In unpaved areas, pull the polyethylene wrap together, and tie around frame with galvanized wire.
8. Protect the installed frost harrier from harmful weather exposures and from possible physical abuses, where possible by prompt installation of concealing work or, where that is not possible, by temporary covering or enclosure.
9. Backfill around the manhole/frost barrier with material as outlined in Section 02200 - Earthwork.

3.2 MANHOLE TESTING

A. General:
   1. Perform either a vacuum test or an exfiltration test on all manholes.
   2. All testing must be performed in the presence of the Engineer.
   3. Suitably plug all pipes entering each manhole and brace plugs to prevent blow out.

B. Exfiltration Tests After Backfilling:
   1. Fill each manhole with water to the top of the manhole frame.
   2. A period of up to 2 hours may be permitted, if the Contractor so wishes, to allow for absorption.
   3. At the end of the absorption period, refill each manhole with water to the top of the manhole frame and begin the 8-hour test period.
   4. At the end of the S-hour test period, refill each manhole to the top of the manhole frame and measure the volume of water added. The leakage for each manhole shall not exceed 1/16 gallon per foot of diameter per vertical foot (above ground water) per S-hour period.

C. Infiltration Tests:
   1. When the groundwater is above the bottom of the manhole, infiltration testing may be performed on that portion of the manhole below water level.
   2. After a 60-minute period, if no water is visibly moving down the interior surfaces of a manhole, the portion of the manhole below groundwater may be considered to be satisfactorily watertight.
   3. The remaining portion above the groundwater level must be tested for exfiltration as specified above.

D. Vacuum Test:
   1. The manhole shall be tested by a vacuum test after assembly of the manhole, connection piping and backfilling.
   2. Plug all lifting holes completely with non-shrink grout.
   3. Properly tighten all boot clamps and brace all plugs to prevent them from being sucked into the manhole.
   4. Install the testing equipment according to the manufacturer's instructions.
   5. A vacuum of 10 inches of Hg shall be drawn on the manhole and the loss of 1 inch of Hg vacuum timed. The manhole shall be considered to have passed the test if the time for the loss of 1 inch of Hg vacuum is two (2) minutes or longer.
   6. If the manhole fails the initial test, the Contractor shall locate the leak(s) and make repairs. The manhole shall be retested until a satisfactory test result is obtained.
   7. If a satisfactory vacuum test cannot be obtained, the manhole shall be water exfiltration tested and repaired as necessary.

E. Manhole Repairs:
   1. Correct leakage by reconstruction, replacement of gaskets &/or other methods as approved by the Engineer.
   2. The use of lead-wool or expanding mortar will not be permitted.

F. After the manholes have been backfilled and prior to final acceptance, any signs of leaks or weeping visible inside the manholes shall be repaired and the manhole made watertight.

END OF SECTION

SECTION 02630

POLYVINYL CHLORIDE (PVC) DRAINAGE PIPE

PART 1 - GENTRAL

1.1 DESCRIPTION

A. Work Included: Furnish and install PVC drainage pipe and fittings of the type (s) and size (s) and in the location (s) shown on the Drawings and as specified herein.

B. Related Work Specified Elsewhere: 'Pipe & Pipe Fittings - General" is specified in this Division.

1.2 OUALITY ASSURANCE

A. Standards:
   1. Pipe and fittings (interior) shall conform to ASTM D-2665.
   2. Pipe and fittings (exterior) shall conform to ASTM D-3034.
   3. Solvent cement shall meet the requirements of ASTM D-2564.
   4. Shall have NSF seal of approval.

B. Acceptable Manufacturers:
   1. Certain-Teed Products, Corp.
   2. J-M Manufacturing.
   3. Harvel.
   4. Cabot.
   5. Or approved equal.

PART 2- PRODUCTS

2.1 MATERIALS

A. Pipe Outside Buildings:
   1. Pipe & Fittings:
      a. Virgin Type I, Grade I, or Type I, Grade 2 or as shown on the Drawings.
      b. Pipe and Fittings: Gasketed style utilizing twin gasket coupling or single gasket bell and spigot type.
      c. Pipe Lengths: Laying length of 20 feet minimum.

B. Piping Inside Building:
   1. Pipe and Fittings:
      a. Solvent weld type with drainage type fittings.
      b. Type I, Grade I, or Type I, Grade 2 or as shown on the Drawings.
   2. Joints:
      a. Solvent weld using approved pipe manufacturer's solvent.
      b. Couplings: Same schedule as pipe.

C. Adapters: When applicable, provide adapters for connecting PVC to pipe constructed from other materials.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Jointing:
   1. Clear each pipe length, coupling and fitting of all debris and dirt before installing.
   2. Provide and use coupling pullers for joining the pipe.
   3. Shove home each length of pipe against the pipe previously laid and hold securely in position.
   4. Do not pull or cramp joints.

B. Fabrication:
   1. Cutting:
      a. Use a hand saw or pipe cutter with blades (not rollers).
      b. Examine all cut ends for possible cracks caused by cuffing.
   2. Connecting:
      a. Solvent weld connections as recommended by the manufacturer.
      b. Connect pipe and fittings only when temperature is above the minimum recommended by the manufacturer.
      c. Threaded adapters shall be connected only with plastic male into metal female.

END OF SECTION

SECTION 02650

BURIED UTILITY MARKINGS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:
   1. This work shall consist of providing utility line markings installed above all buried lines installed as part of this contract as indicated on the Drawings and replacing existing markings disturbed as part of this contract.

B. Related Work Specified Elsewhere:
   1. Pipe, excavation, backfill, insulation are specified in the appropriate Sections in this Division.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials and color shall be in accordance with latest AASHTO specifications for pipe and utility marking.

B. For ferrous pipe material use 0.004" minimum polyethylene film; 6" wide clearly marking type of buried utility

C. For non-ferrous pipe material (e.g. Concrete, PVC, PE, etc.) use detection tape composite of polyethylene and metallic core 6" wide clearly marking type of buried utility.

D. Seton Identification Products, New Haven, CT, or equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Marking tape shall be installed over utility lines centerline and buried 24" below grade.

B. Markings damaged during opening of trench shall be reinstalled with 2' overlap at broken sections.

END OF SECTION

Portland Water District
Standards

DIVISION 2

SITE WORK

Scope of Work

Provide, install and test all site work and appurtenant work in complete accordance with the Drawings & Specifications.

Contractors Duties

Except as specifically noted, provide and pay for all labor, materials, equipment, tools, machinery, water, heat, other facilities and services necessary for proper execution and completion of work.

Contents of Division

END OF SECTION

SECTION 02110

CLEARING AND GRUBBING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Clearing includes, but is not limited to, removal of trees, brush, stumps, wooded growth, grass, shrubs, poles, posts, signs, surface boulders, rock, fences, culverts and other vegetation and minor structures; the protection of designated wooded growth; the storage and protection of minor structures and materials which are to be replaced; and the disposal of nonsalvageable structures and materials, and necessary preliminary grading.

B. Limits of Work:

1. Perform clearing and grubbing work within the areas required for construction, or as shown on the Drawings, to a minimum depth of 6 inches below the existing grade. Clearing and grubbing to deeper depths where required to completely remove tree and vegetation roots.
2. Perform additional clearing and grubbing work within areas and to depths which, in the opinion of the Engineer, interfere with excavation and/or construction, or are not otherwise objectionable.

C. Work Not Included:

1. Clearing and grubbing work performed for the convenience of the Contractor will not be considered for payment.

1.2 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:

1. Dispose of combustible material by burning only when permitted by and in accordance with all applicable local and state laws, ordinances and code requirements.

B. Remove and dispose of nonsalvageable structures and material in accordance with all applicable local and state laws, ordinances and code requirements.

PART 2- PRODUCTS

2.1 MATERIALS

A. Provide all materials required to complete the work.

B. All timber and wood shall become the property of the Contractor unless other agreements are made between the Owner and the Contractor.

C. Repair any damage to structures to the complete satisfaction of the Owner and Engineer.

PART 3 - EXECUTION

3.1 PREPARATION

A. Carefully preserve and protect from injury all trees and/or shrubs not to be removed.

B. Right-of-way:

1. Where excavation is required on public or private rights-of-way containing trees, shrubs, other growth, or any structure or construction, obtain the Engineer's direction concerning the extent to which such obstacles can be cleared or stripped prior to performing the Work.
2. In all rights-of-way, remove only those particular growths or structures which are, in the opinion of the Engineer, essential for construction operations.
3. All other removals or damage shall be replaced or restored at the Contractors expense.

3.2 PERFORMANCE

A. Clearing:

1. Remove and dispose of all trees, brush, slash, stubs, bushes, shrubs, plants, debris and obstructions within the area to be cleared, except any areas that may be designated as 'Selective Clearing', and except as otherwise shown on the Drawings or as directed by the Engineer.
2. Remove all stumps unless otherwise directed by the Engineer.
3. Dispose of material to be removed daily as it accumulates.

B. Protection of Wooded Growth:

1. Fell trees toward the center of the area being cleared to protect trees and shrubs to be left standing.
2. Cut up, remove and dispose of trees unavoidably falling outside the area to be cleared.
3. Employ skilled workmen or tree surgeons to trim and repair all trees that are damaged but are to be left standing and paint all cut surfaces with an approved bituminous paint.

C. Selective Clearing:

1. When shown on the Drawings and when directed by the Engineer, perform selective clearing work to preserve natural tree cover,
2. Perform selective clearing work only under the direction and supervision of the Engineer.
3. Remove all dead and uprooted trees, brush, roots and other material which, in the opinion of the Engineer, are objectionable.
4. Cut flush with the ground and remove only those trees indicated by the Engineer.
5. Employ skilled workmen or tree surgeons to carefully trim all branches requiring cutting on trees to be left standing and to paint all cut surfaces with an approved bituminous paint.
6. Paint tree roots which are cut and are to be left exposed to the weather with an approved bituminous paint.

D. Grubbing:

1. Perform grubbing work beneath new roads, driveways, walks, seeded areas and other areas and as directed by the Engineer.

2. Grub out all sod, vegetation and other objectionable material to a minimum depth of 6 inches below the existing grade.
3. Completely remove all stumps, including major root systems.

E. Disposal:
1. Remove from the site and dispose of material not being burned.
2. Provide an approved disposal area unless otherwise specified.

3.3 REPLACEMENT OF MATERIALS

A. Paving, Curbing and Miscellaneous Material:
1. Remove all paving, subpaving, curbing, gutters, brick, paving block, granite curbing, flagging and minor structures that are over the area to be filled or excavated.
2. Remove and replace bituminous asphaltic and portland cement concrete in accordance with the appropriate sections of these Specifications.
3. Properly store and preserve all material to be replaced in a location approved by the Engineer.

B. Shrubs and/Bushes:
1. Remove, store, and replace ornamental shrubs and bushes to be preserved in accordance with accepted horticultural practices.

C. Topsoil:
1. When applicable, carefully remove, store, and protect topsoil in accordance with the appropriate section of this Division.

D. Responsibility:
1. Replace, at no additional cost to the Owner, materials lost or damaged because of careless removal or neglectful or wasteful storage, disposal or use of these materials.

END OF SECTION

SECTION 02115

STRIPPING AND STOCKPILING TOPSOIL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:
   1. Segregate topsoil approved by the Engineer prior to excavation, trenching and grading operations and stockpile it for use in the work.
   2. Unsuitable topsoil shall be disposed of off-site, or if approved by the Engineer used as common borrow.

B. Related Work Specified Elsewhere (When Applicable):
   1. Demolition, clearing and grubbing, grading, embankment, excavation and landscaping are specified in the appropriate sections in this division.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Topsoil shall consist of friable loam of at least two percent decayed organic matter (humus), free of subsoil, and reasonably free of clay lumps, brush, roots, weeds, and other objectionable vegetation, stones and similar objects larger than one (1) inch in any dimension, litter and other materials unsuitable or harmful to plant growth. It shall contain no toxic materials.

B. The quality of the topsoil material to be used shall be subject to approval by the Engineer.
   1. Silt content shall be suitable for use as loam topsoil for landscaping and surface restoration.

PART 3 - EXECUTION

3.1 PERFORMANCE

A. Remove topsoil from the areas that are likely to be disturbed as a result of construction operations to a depth based on the soil profile, as approved by the Engineer.

B. Remove topsoil from all designated areas prior to the performance of normal excavation.

3.2 STORAGE

A. Transport topsoil and deposit in storage piles convenient to the areas which are subsequently to receive the application of topsoil.

B. Stockpile topsoil separate from other excavated materials in areas approved by the Engineer.

C. Take all necessary precautions to prevent other excavated material and objectionable material from becoming intermixed with the topsoil before, during and after stripping and stockpiling operations.

D. Neatly trim and grade stockpiles to provide drainage from surfaces and to prevent depressions where water may become impounded.

E. Construct temporary erosion control devices for all stockpiled material, subject to the Engineer's approval.

F. All loam stripped and stockpiled shall be immediately seeded with 70% Domestic/30% Perennial Rye Grass.

G. Provide temporary erosion control facilities and materials as specified in Section 02270 around all soil storage areas.

END OF SECTION

SECTION 02156

SHEETING

PART 1- GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish, install and maintain sheeting and bracing (or other methods of excavation support and underpinning which the Contractor elects to use) as required to comply with all applicable State and Federal regulations including the Occupational Safety and Health Act.

B. Related Work Specified Elsewhere (When Applicable): structure excavation, trench excavation, backfilling, and dewatering are specified in the appropriate Sections in this Division.

1.2 DESIGN REQUIREMENTS

A. The General Contractor shall be responsible for the design and construction of the excavation support structures. The excavation support structures (sheeting systems or other special excavation techniques) shall be properly designed by a Professional Engineer registered in the State of Maine, who practices in a discipline applicable to excavation work and shall have experience in the design of excavation support systems.

B. The excavation support system shall be designed and installed to sustain all existing and expected loads and utilities, to prevent all movement to earth which could in any way cause injury to workmen, delay the work or endanger adjacent structures. If detrimental effects results from construction activities, the Contractor shall modify the design, revise construction procedures and/or take measures to mitigate and abate further movement at no cost to the Owner.

C. The internal lateral bracing shall be located so that the braces shall not pass through walls and/or slabs.

D. Prior to the installation of any portion of the temporary lateral support system, the Contractor shall furnish to the Owner precondition surveys documenting the existing conditions of the adjacent structures.

1.3 SUBMITTALS

A. Submit attached certificate of design, design calculations including estimates of the lateral and vertical displacements of the excavation lateral support systems under applied loads at critical stages and complete layout drawings of the proposed excavation system, stamped and sealed by a Professional Engineer registered in the State of Maine. The excavation support structures will be reviewed by the Project Engineer as Owner's representative for compatibility with subsurface conditions as presented in the Geotechnical Report. Such review shall not relieve the Contractor of sole responsibility for design and construction of the excavation support system as necessary to prevent damage to adjacent structures, utilities, streets adjacent to excavations and for safety of persons working within the excavated areas.

PART 2 - PRODUCTS

2.1 MATERIAL

A. All materials shall conform to all applicable State and Federal regulations including the Occupational Safety and Health Act.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. Perform preparatory work to discover, protect, maintain and restore utilities, foundations or other facilities located in close proximity of the proposed excavation lateral support system.

B. Conduct pre-excavation to remove obstructions along the alignment of the excavation lateral support system which will interfere with installation of the excavation lateral support system.

C. Install the excavation support system, including the installed wall and bracing system, outside the limits of the permanent structure. Construction tolerances (e.g., wall verticality) and lateral wall deflections as a result of excavation and other activities shall be considered in determining the plan location.

D. Excavation shall not proceed more than 2 ft. below the bracing level, anywhere within the excavation support limits, until the entire level of bracing is completely installed.

E. The first level of bracing shall be installed within 5 ft. of the ground surface prior to any excavation below this level.

3.2 INSTALLATION

A. Install sheeting in accordance with all applicable State and Federal regulations including the Occupational Safety and Health Act.

3.3 REMOVAL OF SHEETING

A. Remove all sheeting and bracing unless the removal may cause injury to adjacent structures and/or property.

B. Proceed with backfilling as specified in these Specifications. When the level of compacted backfill reaches the location of bracing and wales, remove these items from the trench or other excavation. When the level of the backfill reaches a point three feet below the existing ground grade, remove the sheeting by approved methods and equipment.

C. After removing the sheeting, complete backfilling in the usual manner.

3.4 INTERNAL LATERAL WALL BRACING (RAKERS, WALES, AND STRUTS)

A. Rakers are only allowed for the temporary lateral brace that is installed within 5 ft. of the ground surface.

B. Use wales, struts, corner braces to provide support of the excavation lateral support walls as required. Include web stiffeners, plates, brackets, or angles as required to prevent rotation, crippling or buckling of connections and points of bearing between structural steel members. Allow for eccentricities due to fabrication and assembly. Consider effects of temperature changes.

C. Install and maintain all support members in continuous tight contact with each other and with the wall being supported.

D. Preload all bracing members (including rakers, corner braces, and struts) in accordance with methods, procedures and sequence as described on the reviewed shop drawings.

Coordinate excavation work with installation of bracing and preloading. Use steel shims and steel wedges, welded or bolted in place, to maintain the preloading force in the bracing after release of the jacking equipment pressure. Wood shims or wedges shall not be used. Braces shall be preloaded to 50 percent of the maximum design load. Provide means to control the fluctuation of loading due to temperature variations.

E. Accomplish preloading by jacking struts, rakers, etc. in place against the excavation lateral support system walls, or by other methods acceptable to the Owner or Owner's Representative.

CERTIFICATE OF DESIGN

RE: Contract between
OWNER: _____
(Name)
and
CONTRACTOR: _____
(Name)
on
CONTRACT: _____
(Number) (Date)

The undersigned hereby certify that the engineer listed below:

1. Is licensed or registered to perform professional engineering work in the state of _____;
(Location of Project)
2. Is qualified by education and training to design the _____
_____
specified in Section_____of subject contract;

3. Has previously designed comparable excavation support systems;

4. Has prepared the design in full compliance with the requirements of subject contract, including all applicable laws, regulations, rules, and codes; and

5. Will inspect and supervise installation of the excavation support system and will monitor the in-place system to confirm that the system is installed and functions in accordance with the design.

CONTRACTOR	ENGINEER
By:_____	By:_____
(Signature)	(Signature)
_____	_____
(Name)	(Name)
_____	_____
(Title)	(Engineering Discipline)
_____	_____
(Date)	(Date)

END OF SECTION

SECTION 02200

EARTHWORK

PART 1- GENERAL

1.1 DESCRIPTION

A. The Work described by this Section consists of all earthwork encountered and necessary for construction of the project as indicated in the Contract Documents, and includes but is not limited to the following:
   1. Excavation
   2. Backfilling and Filling
   3. Compaction
   4. Grading
   5. Providing suitable soil material for infiltration basin construction
   6. Disposal of excess suitable material and unsuitable materials off-site.

B. Use of recycled or reprocessed aggregate or crushed stone materials is unacceptable.

1.2 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:
   1. All work shall be performed and completed in accordance with all local, state and federal regulations.
   2. The General Contractor shall secure all other necessary permits unless otherwise indicated from, and furnish proof of acceptance by, the municipal and state departments having jurisdiction and shall pay for all such permits, except as specifically stated elsewhere in the Contract Documents.

B. Line and Grade:
   1. The Contractor shall establish the lines and grades in conformity with the Drawings and maintain same to properly perform the work.

C. Testing Methods:
   1. Gradation Analysis: Where a gradation is specified the testing shall be in accordance with ASTM C-l 17-90 and ASTM C-I 36-93 (or latest revision).
   2. Compaction Control:
      a) Unless otherwise indicated, wherever a percentage of compaction for backfill is indicated or specified, it shall be the in-place density divided by the maximum density and multiplied by 100. The maximum density shall be the density at optimum moisture as determined by ASTM Standard Methods of Test for Moisture-Density Relations of Soil Using 10-lb. Hammer and IS-in. Drop, Designation D-l557-91 (Modified Proctor), or latest revision, unless otherwise indicated.
      b) The in-place density shall be determined in accordance with ASTM Standard Method of Test for Density of Soil in Place by the Sand Cone method, Designation D 1556-90, (or latest revision) or Nuclear method Designation D2922.
      c) Wherever specifically indicated, maximum density at optimum moisture may be determined by ASTM Standard Methods of Test for Moisture Density Relations of Soils, ASTM D-698-91 (Standard Proctor).

d) An Independent Testing Laboratory will be retained by the Owner to conduct all laboratory and field soil sampling and testing, and to observe earth work and foundation construction activities. Laboratory testing will consist of sieve analyses, natural water content determinations, and compaction tests. Field testing will consist of in-place field density tests and determination of water contents

1.3 SUBMITTALS

A. Collection of samples and testing of all materials for submittals shall be performed by the Independent Testing Laboratory and paid for by the Contractor until the materials are approved by the Owner or Engineer.

B. Submit test results in accordance with the procedure specified in the General and Supplementary Conditions.

C. Submit test results (including gradation analysis) and source location for all borrow material to be used at least 10 working days prior to its use on the site. Contractor shall identify and provide access to borrow sites.

D. Submit moisture density curve for each type of soil (on site or borrow material) to be used for fill beneath structures or pavement.

1.4 TESTS

The Independent Testing Laboratory shall conform to the following procedures and standards:

A. Submit test results in accordance with the procedure specified in the General and Supplementary Conditions.

B. All testing shall be performed by a qualified Independent Testing Laboratory acceptable to the Engineer and Contractor at the Owner's expense unless otherwise indicated (see Section 01400 - Quality Control).

C. Paved Areas and Building Slab Subgrade: Make at least one field density test of subgrade for every 2,000 sq. ft. of paved area or building slab, but in no case less than 3 tests. In each compacted fill layer, make one field density test for every 2,000 sq. ft. of overlaying building slab or paved area, but in no case less than 3 tests.

D. Trenches: Field density test in trenches shall be taken at 75 linear foot intervals on every' third lift.

E. Foundation Wall Backfill: Take at least one (1) field density tests per lift per wall at locations and elevations as designated by the Engineer.

F. In addition to the above tests the Independent Testing Laboratory will perform additional density tests at locations and times requested by the Engineer.

G. Additional density testing will be required by the Engineer if the Engineer is not satisfied with the apparent results of the Contractor's compaction operation.

1. If the test results fail to meet the requirements of these specifications, the Contractor shall undertake whatever action is necessary, at no additional cost to the Owner, to obtain the required compaction. The cost of retesting will be paid by Owner. The cost of retesting will be determined by Engineer and Owner will invoice Contractor for this cost. If unpaid after 60 days, the invoice amount for retesting will be deducted from the Contract Price. No allowance will be considered for delays in the performance of the work.
2. If the test results pass and meet the requirements of these Specifications, the cost of the testing service will be borne by the Owner, but no allowance will be considered for delays in the performance of the work.

1.5 JOB CONDITIONS

A. Site Information:

1. Data on indicated subsurface conditions are not intended as representations or warranties of accuracy or continuity between soil borings. It is expressly understood that Owner and Engineer will not be responsible for interpretations or conclusions drawn there from by the Contractor. Data are made available for the convenience of Contractor.
2. Additional test borings and other exploratory operations may be made by Contractor at no additional cost to Owner.

B. Existing Utilities and Structures:

1. The locations of utilities and structures shown on the Drawings are approximate as determined from physical evidence on or above the surface of the ground and from information supplied by the utilities. The Engineer in no way warranties that these locations are correct. It shall be the responsibility of the Contractor to determine the actual locations of any utilities or structures within the project area.

PART 2- PRODUCTS

2.1 SOIL MATERIAL

A. Aggregate Base Gravel, Type E: Shall be screened or crushed gravel of hard durable particles free from vegetable matter, lumps or balls of clay, reprocessed materials, and other deleterious substances. Type E Aggregate for base shall not contain particles of rock that will not pass the 6 inch square mesh sieve. The gradation of the part that passes a 3-inch sieve shall meet the following grading requirements:

Sieve Designation	Percent by Weight Passing Square Mesh Sieves
¼ inch	25-100
No. 40	0-50
No. 200	0-7.0

B. Aggregate Base Gravel, Type D: Shall be screened or crushed gravel of hard durable particles free from vegetable matter, lumps or balls of clay, reprocessed materials, and other deleterious substances. Type D Aggregate for base shall not contain particles of rock that will not pass the 6 inch square mesh sieve. The gradation of the part that passes a 3-inch sieve shall meet the following grading requirements:

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves
¼ inch	25-70
No. 40	0-30
No. 200	0-7.0

C. Crushed Gravel Surfacing, Type A: Shall be screened or crushed gravel of hard durable

particles free from vegetable matter, lumps or balls of clay, reprocessed materials, and other deleterious substances. Type A Aggregate for base shall not contain particles of rock that will not pass the 6 inch square mesh sieve. The gradation of the part that passes a 3-inch sieve shall meet the following grading requirements:

Sieve Designation	Percent by Weight Passing Square Mesh Sieves
½ inch	45-70
¼ inch	30-55
No. 40	0-25
No. 200	0-5.0

D. Common Borrow (Common Fill): Shall consist of approved material from on-site areas within the limits of construction or off-site areas required for the construction of the work where designated. Common borrow (Common Fill) shall be free from frozen material, perishable rubbish, peat, organic highly plastic clay and silt, weak or compressible materials, and other unsuitable material.

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves
4 inch	100
3 inch	90-100
No.4	25-90
No. 200	0-15
Plasticity Index of less than 6	

E. Screened Stone: Shall be a well graded stone consisting of clean, hard, and durable particles or fragments, free from vegetable or other objectionable matter, meeting the following gradation requirements:

Sieve Designation	Percent by Weight Passing Square Mesh Sieve
1 inch	100
3/4 inch	90-100
3/8 inch	20-55
No.4	0-10
No. 8	0-5

F. Select Fill: Shall consist of well graded granular material free of organic material, loam, wood, trash, snow, ice, frozen soil and other objectionable material and having no rocks with a maximum dimension of over 4 inches and meeting the following gradation requirements, except where it is used for pipe bedding in which case the maximum size shall be 2 inches.

Sieve Designation	Percent by Weight Passing Square Mesh Sieve
4 inch	100
3 inch	90-100
½ inch	50-95
No.4	35-90
No. 16	20-70
No. 50	5-45
No. 200	0-8
Plasticity index of less than 6	

2.2 CONCRETE

A. If concrete is required for excess excavation, provide 3,000 psi concrete.

2.3 FILTER FABRIC

A. If filter fabric is required, refer to Section 02260.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions under which excavating, backfilling, filling, compaction and grading are to be performed and notify the Engineer in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.2 EXCAVATION

A. General:
   1. Excavation consists of removal and disposal of all material encountered when establishing line and grade elevations required for execution of the work.
   2. The Contractor shall make excavations in such manner and to such widths as will give suitable room for building the structures or laying and jointing the piping; shall furnish and place all sheeting, bracing, and supports; shall do all cofferdamming, pumping, and draining; and shall render the bottom of the excavations firm, dry and acceptable in all respects.
   3. All excavation shall be classified as either earth or ledge.
      a) Earth Excavation shall consist of the removal, hauling and disposal of all earth materials encountered during excavation including but not limited to native soil or fill, pavement (bituminous or concrete), existing sewers and manholes, ashes, loam, clay, swamp muck, debris, soft or disintegrated rock or hard pan which can be removed with a backhoe, or a combination of such materials, and boulders measuring less than one cubic yard per boulder.
         1. Removal of surface boulders and rock fences of all sizes in the construction limits shall be part of earth excavation without additional cost to the Owner.
      b) Ledge Excavation: Shall consist of the removal, hauling, and disposal of all ledge or rock encountered during excavation. 'Ledge' and "rock' shall be defined as any natural compound, natural mixture that in the opinion of the

Engineer can be removed from its existing position and state only by drilling and blasting, wedging, sledging, boring or breaking up with power operated tools. No boulder, ledge, slab, or other single piece of excavated material less than two cubic yards in total volume shall be considered to be rock unless, in the opinion of the Engineer it must be removed from its existing position by one of the methods mentioned above.

4. The Contractor shall not have any right of property in any materials taken from any excavation. Do not remove any such materials from the construction site without the approval of the Engineer. The Contractor shall dispose of unsuitable and excess material in accordance with the applicable sections of the Contract Documents.

B. Additional Excavation: When excavation has reached required subgrade elevations, notify the Engineer who will observe the conditions.
   1. If material unsuitable for the structure or paved area or pipeline (in the opinion of the Engineer) is found at off-site or below the grade to which excavation would normally be carried in accordance with the Drawings &/or Specifications, the Contractor shall remove such material to the required width and depth and replace it with thoroughly compacted select fill, screened stone, crushed stone, or concrete as directed by the Engineer.
   2. All excavated materials designated by the Engineer as unsuitable shall become the property of the Contractor and disposed of at off site locations in accordance with all State and local laws and the provisions of the Contract Documents.

C. Unauthorized Excavation: Shall consist of removal of materials beyond indicated subgrade elevations or dimensions without specific authorization of Engineer. Unauthorized excavation, as well as remedial work required by the Engineer shall be at the Contractor's expense. Remedial work required is as follows:
   1. Under footings, foundation bases, or retaining walls, fill unauthorized excavation with select fill or screened stone compacted to 95%, Provide 12" minimum select fill or screened stone directly under footings. Concrete fill may be used to bring elevations to proper position, when acceptable to Engineer.
   2. If the bottom of a trench is excavated beyond the limits indicated, backfill the resulting void with thoroughly compacted screened stone, unless otherwise indicated.
   3. Elsewhere, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Engineer.

D. Structural Excavation:
   1. Shall consist of the removal, hauling, disposal, of all material encountered in the excavation to permit proper installation of structures.
   2. Excavations for structures shall be carried to the lines and subgrades shown on the Drawings.
   3. Excavate areas large enough to provide suitable room for building the structures.
   4. The extent of open excavation shall be controlled by prevailing conditions subject to any limits designated by the Engineer.
   5. Provide, install, and maintain sheeting and bracing as necessary to support the sides of the excavation and to prevent any movement of earth which could diminish the width of the excavation or otherwise injure the work, adjacent structures, or persons and property in accordance with all state and OSHA safety standards.

6. Erect suitable fences around structure excavation and other dangerous locations created by the work, at no additional cost to the Owner.
7. Exposed subgrade surfaces shall remain undisturbed, protected, and maintained as uniform, plane areas and shape to receive the foundation components of the structure.
   a. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10', and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, other construction, and for inspection.
   b. In excavating for footings and foundations, take care not to disturb bottom of excavation. Excavate by hand to final grade and trim bottoms to required lines and grades to leave solid base to receive the structure.
   c. If a structure is to be constructed within the embankment, the fill shall first be brought to a minimum of 3 feet above the base of the footing. A suitable excavation shall then be made as though the fill were undisturbed earth.

E. Trench Excavation: Shall consist of removal, hauling and disposal of all material encountered in the excavation to the widths and depths shown on the Drawings to permit proper installation of underground utilities.
   1. Excavate trenches to the uniform width shown on the Drawings sufficiently wide to provide sufficient space for installation, backfilling, and compaction. Every effort should be made to keep the sides of the trenches firm and undisturbed until backfilling has been completed and consolidated.
   2. Trenches shall be excavated with approximately vertical sides between the elevation of the center of the pipe and an elevation one foot above the top of the pipe.
   3. Grade bottoms of trenches as indicated for pipe and bedding to establish the indicated slopes and invert elevations, notching under pipe joints to provide solid bearing for the entire body of the pipe, where applicable.
      a. All utility and process pipeline trenches shall have the subgrade compacted before trench bedding placement, refer to Part 3.2.E herein for the specific requirements.
   4. If pipe is to be laid in embankments or other recently filled material, the material shall first be placed to the top of the fill or to a height of at least two feet above the top of the pipe; whichever is the lesser. Particular care shall be taken to ensure maximum consolidation of material under the pipe location. The pipe trench shall be excavated as though in undisturbed material.
   5. Unless otherwise specifically directed or permitted by the Engineer, begin excavation at the low end of sewer and storm lines and proceed upgrade.
   6. Perform excavation for force mains and water mains in a logical sequence.
   7. The extent of open excavation shall be controlled by prevailing conditions subject to any limits prescribed by the Engineer.
   8. As the excavation progresses, install such shoring arid bracing necessary to prevent caving and sliding and to meet the requirements of the state and OSHA safety standards, as outlined in the appropriate section of this Specification.

F. Protection of Persons, Property and Utilities:
   1. Barricade open excavations occurring as part of this work and post with warning lights in compliance with local and State regulations.
   2. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other

hazards created by earthwork operations. Exercise extreme caution and utilize sheeting, bracing, and whatever other precautionary measures that may be required.

3. Rules and regulations governing the respective utilities shall be observed in execution of all work. Active utilities and structures shall be adequately protected from damage, and removed or relocated only as indicated or specified. Inactive and abandoned utilities encountered in excavation and grading operations shall be removed, plugged or capped only with written authorization of the utility owner. Report in writing to the Engineer, the locations of such abandoned utilities. Extreme care shall be taken when performing work in the vicinity of existing utility lines, utilizing hand excavation in such areas, as far as practicable.
4. Repair, or have repaired, all damage to existing utilities, structures, lawns, other public and private property which results from construction operations, at no additional expense to the Owner, to the complete satisfaction of the Engineer, the utility, the property owner, and the Owner.

G. Use of Explosives:
1. Do not bring explosives onto site or use in work without prior written permission from authorities having jurisdiction. Contractor is solely responsible for handling, storage, and use of explosive materials when their use is permitted.
2. All blasting shall be performed in accordance with all pertinent provisions of the "Manual of Accident Prevention in Construction" of the Associated General Contractors of America, Inc.

H. Stability of Excavations:
1. Slope sides of excavations to comply with all codes and ordinances having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated.
2. Maintain sides and slopes of excavations in a safe condition until completion of backfilling.

I. Shoring and Bracing:
1. Provide materials for shoring and bracing, such as sheet piling, uprights, stringers and cross-braces, in good serviceable condition.
2. Provide trench shoring and bracing to comply with local codes and authorities having jurisdiction. Refer to Specification Section 02156.
3. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Install shoring and bracing as excavation progresses.

J. Material Storage and Off-Site Disposal:
1. Stockpile excavated materials which are satisfactory for use on the work until required for backfill or fill. Place, grade and shape stockpiles for proper drainage and protect with temporary seeding or other acceptable methods to control erosion.
2. Locate and retain soil materials away from edge of excavations.
3. Dispose of excess soil materials and unsuitable soil materials by loading and hauling these materials to off site locations obtained by the Contractor.

K. Dewatering:
1. To ensure proper conditions at all times during construction, the Contractor shall provide and maintain ample means and devices (including spare units kept ready for. immediate use in case of breakdowns) with which to intercept and/or remove promptly and dispose properly of all water entering trenches and other excavations (including surface and subsurface waters).

2. Excavations shall be kept dry until the structures, pipes, and appurtenances to be built therein have been completed to such extent that they will not be floated or otherwise damaged. Refer to Specification Section 02401.

L. Cold Weather Protection:
1. Protect excavation bottoms against freezing when atmospheric temperature is less than 35^0F.
2. No frozen material shall be used as backfill or fill and no backfill shall be placed on frozen material.

M. Separation of Surface Material:
1. The Contractor shall remove only as much of any existing pavement as is necessary for the execution of the work.
2. Prior to excavation, existing pavement shall be cut where in the opinion of the Engineer it is necessary to prevent damage to the remaining road surface.
3. Where pavement is removed in large pieces, it shall be disposed of before proceeding with the excavation.
4. From areas within which excavations are to be made, loam and topsoil shall be carefully removed and separately stored to be used again as directed; or, if the Contractor prefers not to separate surface materials, he shall furnish, as directed, loam and topsoil at least equal in quantity and quality to that excavated.

N. Dust Control:
1. During the progress of the work, the Contractor shall conduct his operations and maintain the area of his activities, including sweeping and sprinkling of streets as necessary, so as to minimize the creation and dispersion of dust.
2. If the Engineer decides that it is necessary to use calcium chloride for more effective dust control, the contractor shall furnish and spread the material, as directed.

3.3 BACKFILL and FILL

A. General:
1. Backfilling shall consist of replacing material removed to permit installation of structures or utilities, as indicated in the Contract Documents.
2. Filling shall consist of placing material in areas to bring them up to grades indicated on the Drawings.
3. The Contractor shall provide and place all necessary backfill and fill material, in layers to the required grade elevations.
4. Backfill excavations as promptly as work permits, but not until completion of the following:
   a. Acceptance by Engineer of construction below finish grade including, where applicable, damp-proofing, and perimeter insulation.
   b. Inspection, approval, and recording locations of underground utilities.
   c. Removal of concrete formwork.
   d. Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Temporary sheet piling driven below bottom of structures shall be removed in manner to prevent settlement of the structure or utilities, or cut off and left in place if required.
   e. Removal of trash and debris.
   f. Permanent or temporary horizontal bracing is in place on horizontally supported walls.
   g. Density testing having results meeting requirements specified herein.
5. In general, and unless otherwise indicated, material used for backfill of trenches

and excavations around but not adjacent to structures shall be suitable excavated material which was removed in the course of making the construction excavation or common borrow. Unless otherwise specified or allowed by the Engineer the backfill and fill shall be placed in layers not to exceed 8 inches in thickness.

6. All fill and backfill under structures and pavement, and adjacent to structures, shall be compacted crushed stone or select fill as specified or as indicated on the Drawings. The fill and backfill materials shall be placed in layers not exceeding 8 inches in thickness.
7. All structures (including manholes) shall be placed on a 12-inch mat of screened stone unless otherwise indicated on the Drawings. Refer to the Drawings on fill requirements tank and building structures,
   a. Refer to Part 3.2 for Subgrade Compaction Requirements before pipelines, manholes, tanks, and structures are placed.
8. Suitable excavated material shall meet the following requirements:
   a. Free from large clods, silt lumps or balls of clay.
   b. Free from stones and rock fragments with larger than 4 inch max. dimension.
   c. Free from organics, peat, etc.
   d. Free from frozen material.
9. Do not backfill with, or on, frozen materials.
10. Before placing any material for support of structures, the subgrade shall be adequately dewatered, compacted and tested.
11. Remove, or otherwise treat as necessary, previously placed material that has frozen prior to placing backfill.
12. Do not mechanically or hand compact material that is, in the opinion of the Engineer, too wet.
13. Do not continue backfilling until the previously placed and new materials have dried sufficiently to permit proper compaction.
14. The nature of the backfill materials will govern the methods best suited for their placement and compaction. Compaction methods and required percent compaction is covered in Compaction section.
15. Before compaction, moisten or aerate each layer as necessary to provide a water content necessary to meet the required percentage of maximum dry density for each area classification specified.
16. Do not allow large masses of backfill material to be dropped into the excavation in such a manner that may damage pipes and structures.
17. Place material in a manner that will prevent stones and lumps from becoming nested.
18. Completely fill all voids between stones with fine material.
19. Do not place backfill on or against new concrete until it has attained sufficient strength to support loads without distortion, cracking, and other damage.
20. Deposit backfill and fill material evenly on all sides of structures to avoid unequal soil pressures.
21. Keep stones or rock fragments with a dimension greater than two inches at least one foot away from the pipe or structure during backfilling.
22. Leave sheeting in place when damage is likely to result from its withdrawal.
23. Completely fill voids left by the removal of sheeting with screened stone which is compacted thoroughly.

B. Pipe Bedding, Initial Backfill and Trench Backfill

1. Place bedding and backfill in layers of uniform thickness specified herein, and as

shown on the Drawings.

2. Thoroughly compact each layer by means of a suitable vibrator or mechanical tamper.
3. Install pipe bedding and initial backfill in layers of uniform thickness not greater than eight (8) inches.
4. Deposit the remainder of the backfill in uniform layers not greater than eight inches.
5. Provide underground sewer marking tape for the full length of sewer trenches as shown on the Drawings. Marking tape shall be SETON #210 SEW or equivalent.
6. Where soft silt and clay soils are encountered the trench shall be excavated six inches below the normal bedding and backfilled with 6-inches of compacted common borrow.
7. Backfill trenches with concrete where trench excavations pass within 18 inches of column or wall footings and which are carried below the bottom of such footings, or which pass under wall footings. Place concrete to the level of the bottom of adjacent footings.
8. The following schedule gives the bedding requirements for various types of pipe for all locations, unless specified otherwise. Distances refer to vertical thickness below the pipe.

PIPE BEDDING REQUIREMENTS IN TRENCHES

DI, concrete and Culvert pipe	6 inches min. crushed stone or select fill
PVC, ABS, FRP and PE Pipe	6 inches min. crushed stone.
Sanitary Line	6 inches min. crushed stone.

9. The following schedule gives the initial backfill requirements for various types of pipes. Distances refer to vertical thickness above the top of the pipe.

INITIAL BACKFILL

DI, Concrete, and Culvert Pipe	crushed stone or select fill 12 inches min. over top of pipe.
PVC, ABS, FRP & PE Pipe	12 inches min. crushed stone over top of pipe.
Sanitary Line	12 inches min. crushed stone fill over the top of the pipe.

10. Special bedding and backfill requirements shown on the Drawings supersede requirements of this section.

C. Improper Backfill:

1. When excavation and trenches have been improperly backfilled, and when settlement occurs, reopen the excavation to the depth required, as directed by the

Engineer.

2. Refill and compact the excavation or trench with suitable material and restore the surface to the required grade and condition.
3. Excavation, backfilling, and compacting work performed to correct improper backfilling shall be performed at no additional cost to the Owner.

D. Ground Surface Preparation:
1. Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow, strip, scarify or break-up sloped surface steeper than 1 vertical to 4 horizontal.
2. When existing ground surface has a density less than that specified under "compaction for the particular area classification, break up the ground surface, pulverize, moisture-condition to the optimum moisture content, and compact to required depth and percentage of maximum density.

3.4 COMPACTION

A. General:
1. Control soil compaction during construction to provide not less than the minimum percentage of density specified for each area classification.

B. Percentage of Maximum Density Requirements:
1. Compact soil to not less than the following percentages of maximum dry density determined in accordance with ASTM Dl557 as indicated.
   a. Structures: Compact each layer of backfill or fill material below or adjacent to structures to at least 95% of maximum dry density (ASTM D1557).
   b. Off Traveled Way Areas: Compact each layer of backfill or fill material to at least 90% of maximum dry density (ASTM D1557).
   c. Walkways: Compact each layer of backfill or fill material to at least 95% of maximum dry density (ASTM D1557).
   d. Roadways, Drives and Paved Areas: Compact each layer of fill, subbase material, and base material to at least 95% of maximum dry density (ASTM Dl557).
   e. Pipes: Compact bedding material and each layer of backfill to at least 90% maximum dry density (ASTM Dl557). Where backfilling with excavated material, compact to native field density.

C. Moisture Control:
1. Where subgrade or a layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade, or layer of soil material, in quantities controlled to prevent free water appearing on surface during or subsequent to compaction operations.
2. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.
3. Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing or pulverizing until moisture content is reduced to a satisfactory level.

D. Compaction Methods: The Contractor may select any method of compaction that is suitable to compact the material to the required density.
1. General: Whatever method of compacting backfill is used, care shall be taken that stones and lumps shall not become nested and that all voids between stones shall be completely filled with fine material. All voids left by the removal of sheeting

shall be completely backfilled with suitable materials and thoroughly compacted.

2. Tamping or Rolling: If the material is to be compacted by tamping or rolling, the material shall be deposited and spread in uniform, parallel layers not exceeding the uncompacted thicknesses specified. Before the next layer is placed, each layer shall be tamped as required so as to obtain a thoroughly compacted mass. Care shall be taken that the material close to the excavation side slopes, as well as in all other portions of the fill area, is thoroughly compacted. When the excavation width and the depth to which backfill has been placed are sufficient to make it feasible, and it can be done effectively and without damage to the pipe or structure, backfill may, on approval, be compacted by the use of suitable rollers, tractors, or similar powered equipment instead of by tamping. For compaction by tamping or rolling, the rate at which backfilling material is deposited shall not exceed that permitted by the facilities for its spreading, leveling, and compacting as furnished by the Contractor.

E. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, re-shape, and compact to required density prior to further construction.

3.5 GRADING

A. General:
   1. Grading shall consist of that work necessary to bring all areas to the final grades.
   2. Uniformly grade areas within limits of work requiring grading, including adjacent transition areas.
   3. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.

B. Grading Outside Building Lines:
   1. Grade areas adjacent to building to drain away from structures and to prevent ponding.
   2. Grade surfaces to be free from irregular surface changes, and as follows:
      a. Lawn or Unpaved Areas: Finish grade areas to receive topsoil to within not more than 1" above or below the required subgrade elevations.
      b. Walks: Shape surface of areas under walks to line, grade and cross-section, with finish surface not more than 1/2" above or below the required subgrade elevation.
      c. Pavements: Shape surface of areas under pavement to line, grade and cross-section, with finish surface not more than 3/8" above or below the required subgrade elevation,

C. Grading Surface of Fill Under Building Slabs:
   1. Grade surface to be smooth and even, free of voids, and compacted as specified, to the required elevation.
   2. Provide final grades within a tolerance of 1/2" when tested with a 10' straight edge.

D. Compaction:
   1. After grading, compact subgrade surfaces to the depth and percentage of maximum density for each area classification.

E. Protection of Graded Areas:
   1. Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

2. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

3.6 BASE COURSE AND LEVELING COURSE

A. General:
   1. Base course consists of placing the specified materials in layers to support a leveling course or paved surface, as indicated in the Drawings.

B. Grade Control:
   1. During construction, maintain lines and grades including crown and cross-slope of base course and leveling course.

C. Placing:
   1. Place base course on prepared subbase conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting base materials.
   2. Place leveling course on prepared base course, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compaction.

D. Shaping and Compacting:
   1. All layers of aggregate base course and leveling course shall be compacted to the required density immediately after placing. As soon as the compaction of any layer has been completed, the next layer shall be placed.
   2. The Contractor shall bear full responsibility for and make all necessary repairs to the base leveling courses and the subgrade until the full depth of the base leveling courses is placed and compacted. Repairs shall be made at no additional cost to the Owner.
   3. If the top of any layer of the aggregate base or leveling course becomes contaminated by degradation of the aggregate or addition of foreign materials, the contaminated material shall be removed and replaced with the specified material at the Contractor's expense.

END OF SECTION

SECTION 02260

FILTER FABRIC

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Furnish all materials and install filter fabric of the types, dimensions and in the location(s) shown on the Drawings and specified herein.

B. Related Work Specified Elsewhere:

1. Temporary Erosion Control and Riprap and Stone Ditch Protection are specified in the appropriate sections of this Division.

1.2 QUALITY ASSURANCE

A. A competent laboratory must be maintained by the manufacturer of the fabric at the point of manufacture to insure quality control.

B. During all periods of shipment and storage, the fabric shall be wrapped in a heavy duty protective covering to protect the fabric from direct sunlight, ultraviolet rays, temperatures greater than 140^0F, mud, dirt, dust and debris.

1.3 SUBMITTALS

A. Manufacturer shall finish certified test reports with each shipment of material attesting that the fabric meets the requirements of this Specification.

PART 2- PRODUCTS

2.1 MATERIALS

A. Filter fabric for use in stabilization, drainage, underdrains, erosion control, landscaping and beneath structures shall be formed in widths of not less than six (6) feet and shall meet the requirements of Table 1. Both woven and non-woven geotextiles are acceptable; however no 'slit-tape' woven fabrics will be permitted for drainage, underdrain, and erosion control applications.

Table I

Mechanical Property	Geotextile Test Method	Minimum Permissible Value
Grab Tensile Strength (both directions)	ASTM D4595-86	120 pounds
Grab Elongation	ASTM D4632-86	50 percent
Mullen Burst Strength	ASTM D3786-87	210 psi
Puncture Strength	ASTM D3787	60 pounds

Trapezoid Tear Strength	ASTM D4533-85	50 pounds
Water Flow Rate	ASTM D4491-85	120 gal/min/sf
Equivalent Opening Size	ASTM D4751	80
Coefficient of Permeability	ASTM D4491-85	0.2 cm/sec

The geotextile shall have property values expressed in "typical" values that meet or exceed the values stated above as determined by the most recent test methods specified above.

B. Filter fabric for use in reinforcement and under riprap shall meet the requirements of Table 2. Woven and non-woven geotextiles are acceptable.

Table 2

Geotextile Mechanical Property	Test Method	Minimum Permissible Value
Grab Tensile Strength (both directions)	ASTM 4595-86	195 pounds
Grab Elongation	ASTM D4632-86	20 percent
Mullen Burst Strength	ASTM D3786-87	340 psi
Puncture Strength	ASTM D3787	85 pounds
Trapezoid Tear Strength	ASTM D453385	85 pounds
Equivalent Opening Size (EOS)	ASTM D4751	U.S. Std. Sieve number(s) between #20 & # 100

The geotextile shall meet or exceed the 'typical' values stated above as determined by the most recent test methods specified above.

C. Filter Fabric for use in siltation fencing shall be the following:
   1. Environfence 100X (Mirafi)
   2. Supac 4NP (Phillip 66)
   3. Exxon 180 Siltfence
   4. Amoco 1380 Silt Stop
   5. Harris Siltfence
   6. Or equivalent

PART 3 - EXECUTION

3.1 Install filter fabric as shown on the drawings or as directed in appropriate specifications in this division or in accordance with manufacturer's instructions or as directed by the Engineer.

END OF SECTION

SECTION 02270

TEMPORARY EROSION CONTROL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. The work under this section shall include provision of all labor, equipment, materials and maintenance of temporary erosion control devices as specified herein, of the types shown on the Drawings and as directed by the Engineer.
2. Erosion control measures shall be provided as necessary to correct conditions that develop prior to the completion of permanent erosion control devices or as required to control erosion that occurs during construction operations.
3. Construction operations shall comply with all federal, state and local regulations pertaining to erosion control and construction site storm water management.
4. After awarded the Contract, prior to commencement of construction activities, meet with the Engineer to discuss erosion control requirements and develop a detailed erosion control plan submittal.

B. Related Work Specified Elsewhere:

1. Site work is specified in appropriate sections of this Division.

C. Design Criteria:

1. Conduct all construction in a manner and sequence that causes the least practical disturbance of the physical environment.
2. Stabilize disturbed earth surfaces in the shortest time and employ such temporary erosion control devices as may be necessary until such time as adequate soil stabilization has been achieved.
3. Comply with "Maine Erosion and Sediment Control Handbook for Construction: Best Management Practices" by the Cumberland County Soil and Water Conservation District and the Maine Department of Environmental Protection dated March 2003 (as revised).

1.2 SUBMITTALS

A. The Contractor shall furnish the Engineer, in writing, his work plan and plan sized drawings (scale 1 inch = 40 lf) giving proposed locations for all erosion control structures and device denoting name and locations, and proposed locations for storage of topsoil and excavated material before beginning construction. A schedule of work shall accompany the work plan. Acceptance of this plan will not relieve the Contractor of the responsibility of completion of the work as specified.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Baled Hay:
   1. At least 14" by 18' by 30" securely tied to form a firm bale, staked as necessary to hold the bale in place.
   2. Maintain on site for emergency use only, a minimum of 50 bales of hay.

B. Sand Bags:
   1. Heavy cloth bags of approximately one cubic foot capacity filled with crushed stone or coarse sand.

C. Mulches:
   1. Loose hay, straw, peat moss, wood chips, bark mulch, crushed stone, wood excelsior, or wood fiber cellulose.

D. Matting for erosion control:
   1. Shall consist of undyed and unbleached smolder resistant jute yarn woven into a uniform, open, plain weave mesh. Jute matting shall be furnished in rolled strips as follows:

Width:	48 inches, plus or minus one inch 78 warp ends per width of cloth 41 weft ends per yard
Weight:	To average between 1.35 pound and 1.80 pounds per linear yard. Tolerance: plus or minus 5%

   2. Stakes for pegging erosion matting shall be hardwood approximately 1 inch x inches and of sufficient length. Stakes shall be free from defect and capable of remaining in the ground at least two (2) years.

E. Permanent Seed:
   1. Permanent seed shall be as specified in Section 02480 Landscaping.

F. Temporary Seeding:
   1. Use species appropriate for soil conditions and season and subject to approval by the Engineer.

H. Water:
   1. The Contractor shall provide water and equipment to control dust, as directed by the Engineer.

I. Filter Fabrics:
   1. Filter fabric shall be of one of the commercially available brands such as Mirafi, Typar or equivalent. Fabric types for particular applications shall be approved by the Engineer prior to installation.

2.2 CONSTRUCTION REOUIREMENTS

A. Temporary Erosion Checks:
   1. Temporary erosion checks shall be constructed in ditches and other locations as necessary.
   2. Baled hay, sand bags or siltation fence may be used in an arrangement to fit local

conditions.

B. Temporary Berms:
   1. Temporary harriers of rip-rap shall be constructed along the toe of embankments to prevent erosion and sedimentation.

C. Temporary Seeding:
Areas to remain exposed for a time exceeding 3 weeks shall receive temporary seeding as indicated below:

Season	Seed	Rate
Summer (5/15 - 8/15)	Sudangrass	40 lbs/acre
Late Summer/Early Fall (8/15 - 9/15)	Oats	80 lbs/acre
	Annual Ryegrass	40 lbs/acre
Fall (9/15 - 10/I)	Winter Rye	112 lbs/acre
Winter (10/1 - 4/1)	Mulch w/ Dormant Seed	80 lbs/acre*
Spring (4/1 - 7/1)	Oats	80 lbs/acre
	Annual Ryegrass	40 lbs/acre

* seed rate only

D. Sedimentation Basin:
   1. Sedimentation basins shall be areas where water is temporarily delayed slowed down, constructed where required by site conditions or as or directed by the Engineer.
   2. Capacity shall be equal to the volume of sediment expected to be trapped at the basin during the planned useful life of the structure, or if the periodic removal of debris is practical, the capacity may be proportionately reduced.
   3. Design shall be in accordance with the Standards for Ponds, Grade Stabilization Structure or USDA Soil Conservation Service Engineering Memorandum No. 27 &/or as shown on the Drawings.

E. Siltation fences shall consist of porous filter fabric with a wire mesh backing and shall be supported by posts as per manufacturer's recommendations. Fabric shall be approved by the Engineer.

F. Mulch All Areas Receiving Seeding:
Use either wood cellulose fiber mulch (750 lbs/acre); or straw mulch with chemical tack (as per manufacturers specifications). Netting for small areas may be permitted. Biodegradable netting is required in areas to be exposed to drainage flow.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Temporary Erosion Checks:
   1. Temporary erosion checks shall be constructed in all ditches and drainage swales at 50 foot horizontal spacing and at other locations designated by the Engineer. The Engineer may modify the Contractor's arrangement of silt fences, bales and bags to fit local conditions.
   2. Baled hay, silt fences, or sandbags, or some combination, may be used in other areas as necessary to inhibit soil erosion.
   3. Provide matting for erosion control on all side slopes of 1 foot rise to 2.5 foot

horizontal and steeper, and at all other locations designated on the Drawings.

4. Siltation fence, if called for in the plans, shall be located and installed as shown.
5. Sedimentation ponds shall be sited and constructed to the grades and dimensions necessary for site conditions and will include drainage pipe and an emergency spillway.

B. Maintenance:

Erosion control features shall be installed prior to excavation wherever appropriate. Temporary erosion control features shall remain in place and shall be maintained until a satisfactory growth of grass is established. The Contractor shall be responsible for maintaining erosion control features throughout the life of the construction contract. Maintenance will include periodic inspections by the Owner or Engineer for effectiveness of location, installation and condition with corrective action taken by the Contractor as appropriate.

C. Removing and Disposing of Materials:

1. When no longer needed, material and devices for temporary erosion control shall be removed and disposed of as approved by the Engineer.
2. When removed, such devices may be reused in other locations provided they are in good condition and suitable to perform the erosion control for which they are intended.
3. When dispersed over adjacent areas, the material shall be scattered to the extent that it causes no unsightly conditions nor creates future maintenance problems.
4. Sedimentation basins, if no longer required, will be filled in, the pipe removed, the surface loamed and grass cover shall be established.

END OF SECTION

SECTION 02401

DEWATERING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Furnish, operate and maintain, as incidental to the project, dewatering equipment for the control, collection and disposal of ground and surface water where necessary to complete the work.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

3.1 PERFORMANCE

A. General:

1. Keep work areas dewatered until the structures, pipes, and appurtenances to be built there have been completed to such an extent that they will not be damaged by water.
2. Thoroughly brace or otherwise protect against flotation all pipelines and structures which are not stable.

B. Disposal of Water:

1. Dispose of water pumped or drained from the construction site in a suitable manner to avoid siltation of adjacent wetlands or water bodies, injury to public health, damage to public and private property, and damage to the work completed or in progress.
2. Provide suitable temporary channels for water that may flow along or across the construction site.

C. Damage:

1. Any damage resulting from the dewatering operations, or the failure of the Contractor to maintain the work in a suitably dry condition shall be repaired by the Contractor at no additional cost to the Owner.

D. Temporary Underdrains:

1. When necessary, temporary underdrains may be placed in excavations.
2. Underdrain pipe shall be perforated corrugated metal, polyethylene or P.V.C. pipe.
3. Entirely surround the underdrain and fill the space between the underdrain and the pipe or structure with free draining material.

E. Excavation Sump Pumping:
   1. When necessary and where appropriate to the geotechnical conditions encountered, excavations may be over excavated up a depth of 2.0 feet or more and filled with screened stone to allow sump pumping of groundwater.
   2. The system shall be installed with suitable screens and filters so that pumping of fines does not occur.

F. Well and Wellpoint System:
   1. If necessary, dewater the excavations and trenches with an efficient well or wellpoint system to drain the soil and prevent saturated soil from flowing into the excavated wells and area.
   2. Wellpoint and well system shall be of the type designed for dewatering work and shall be installed with suitable screens and filters so that pumping of fines does not occur.
   3. Pumping units shall be capable of maintaining sufficient suction to handle large volumes of air and water at the same time.

END OF SECTION

SECTION 02419

GRAVEL SURFACING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. This work shall consist of furnishing and placing one or more courses of granular material on a prepared surface in accordance with the specifications in reasonably close conformity with the lines, grades, thicknesses and typical cross sections, as shown on the plans or established by the Engineer.

PART 2- PRODUCTS

2.1 ROADWAY GRAVEL

Roadway gravel shall be aggregate subbase-gravel and/or aggregate base-gravel as described in these Specifications.

PART 3 - EXECUTION

3.1 PLACING

A. If the required compacted depth of roadway gravel exceeds 9 inches the courses shall be constructed in 2 or more layers of approximately equal thicknesses. The maximum completed thickness of any roadway gravel layer shall not exceed 9 inches.

B. Each layer of aggregate shall be placed over the full width of the section. When conditions restrict operations over the full width, the Engineer may authorize the Contractor to place less than full width layers. When the Contractor places material to complete the full width, the exposed edge of the previously placed aggregate shall be cleaned of all contamination before additional roadway gravel is placed adjacent thereto.

C. Roadway gravel courses may be placed upon frozen surfaces when such surfaces have been properly constructed.

D. The material as spread shall be well mixed with no pockets of either fine or coarse material. Segregation of large or fine particles will not be allowed.

3.2 SHAPING AND COMPACTING

A. Compaction of each layer of aggregate subbase and roadway gravel shall continue until a density of not less than 95 percent of the maximum density has been achieved for the full width of the layer. The maximum density shall be determined in accordance with AASHTO T-ISO, Method D. Field density tests will be made by the sand cone method in accordance with AASHTO T-l91 or at the option of the Owner's Representative, by use of Nuclear devices in accordance with ASTM D2922 or by the water balloon test methods in accordance with AASHTO T-205.

B. The surface of each layer shall be maintained during compaction operations in such manner that a uniform texture is produced and the aggregate firmly keyed. The moisture content of the material shall be maintained at the proper percent to attain the required compaction.

3.3 SURFACE TOLERANCE

A. The completed surface of the designated course shall be shaped and maintained to a tolerance, above or below the required cross sectional shape, of 1/2 inch.

END OF SECTION

SECTION 02431

CATCH BASINS, GRATES AND FRAMES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Construct catch basins, grates, frames and brick masonry in conformance with the dimensions and locations shown on the Drawings.

1.2 QUALITY ASSURANCE

A. Precast Catch Basin Base, Barrel and Top Sections:
   1. Conform to ASTM C478-72 (AASHTO M199-795) except as modified herein, on the Drawings, or as directed by the Engineer.
   2. Average strength of 4,000 psi at 28 days
   3. Testing:
      a. Determine concrete strength by tests on 6 inch by 12 inch vibrated test cylinders cured in the same manner as the bases, barrels and tops, and tops.
      b. Have tests conducted at manufacturer's plant or at an approved testing laboratory.
      c. Have not less than 2 tests made for each 100 vertical feet of precast catch basin sections.

B. Frames and Covers:
   1. Acceptable Manufacturers:
      a. Etheridge Foundry Company
      b. Neenah Foundry Company
      c. F. L. LeBaron Foundry Company
      d. Or equivalent.

C. Masonry:
   1. Brick: Shall comply with the ASTM Standard Specifications for Sewer Brick (made from clay or shale), Designation C32, for Grade SS, hard brick. (AASHTO M91-78).
   2. Cement: ASTM C-150.(AASHTO M85-791)
   3. Hydrated Lime: ASTM C-207.
   4. Sand: ASTM C33. (AASHTO M6-65 C197A)).

1.3 SUBMITTALS TO THE ENGINEER

A. Submit shop Drawings and manufacturer's literature in conformance with the Standard General Conditions of the Construction Contract.

B. Bases, Barrel Sections and Tops: Submit test results and receive approval from the Engineer prior to delivery to the site.

PART 2 - PRODUCTS

2.1 PRECAST CATCH BASIN SECTIONS

A. Dimensions, as shown on the Drawings.
B. Use flat tops or eccentric cones as appropriate. Exterior face of cone sections shall not flare out beyond the vertical.
C. Joints: Bell-and-spigot or tongue-and-groove formed on machine rings to insure accurate joint surfaces.
D. Constructed to support an HS-20 wheel loading.
E. Openings:
   1. Provide openings in the risers to receive pipes entering the catch basin of the types and materials approved by the Engineer.
   2. Make openings at the manufacturing plant or cut openings in the field.
   3. Size: To provide a uniform annular space between the outside wall of pipe and the riser.
   4. Location: To permit setting of the entering pipes at the correct elevations.
F. Joints:
   1. Joint gaskets to be flexible self seating butyl rubber joint sealant installed according to manufacturer's recommendations. For cold weather applications, use adhesive with joint sealant as recommended by manufacturer. Acceptable Materials:
      a. Kent-Seal No. 2
      b. Ram-Nek
      c. Or equivalent.
   2. Joints between precast sections shall conform to related standards and manufacturer's instructions.

2.2 FRAMES AND GRATES

A. All essential details of design shall conform to the Drawings. Standard castings differing in non-essential details may be approved by Engineer.
B. All frames and grates shall be made surfaces to prevent rocking under traffic.
C. Grate castings will be smooth with no sharp edges.
D. Constructed to support an HS-10 loading.

2.3 MASONRY

A. Brick:
   1. Sound, hard, uniformly burned, regular and uniform in shape and size, compact texture, and satisfactory to the Engineer.
   2. Immediately remove rejected brick from the work.
B. Mortar:
   1. Composition (by volume):
      a. 1 part portland cement.
      b. 1/2 part hydrated lime.
      c. 4-1/2 parts sand.
   2. The proportion of cement to lime may vary from 1:1/4 for hard bnck to 1:3/4 for softer brick, but in no case shall the volume of sand exceed 3 times the sum of the volume of cement and lime.

C. Cement:
   1. Shall be Type II portland cement.

D. Hydrated Lime:
   1. Shall be Type S.

E. Sand:
   1. Shall consist of inert natural sand.
   2. Grading:

Sieve	Percent Passing
3/8	100
4	95-100
8	80-100
16	50-85
50	10-30
100	2-10
Fineness Modulus	2.3 - 3.1

PART 3 - EXECUTION

3.1 PERFORMANCE

A. Precast Catch Basin Sections:
   1. Perform jointing in accordance with manufacturer's recommendations and as approved by the Engineer.
   2. Install barrels and tops level and plumb
   3. Make all joints water tight.
   4. Solidly fill annular spaces around pipes entering the catch basin with non-shrink grout or other material approved by the Engineer.
   5. Cut openings (as required) carefully to prevent damage to barrel sections and tops. Damaged barrel sections and tops shall be replaced by the Contractor at no additional expense to the Owner.

B. Pipe Connections to Catch Basins: Connect pipes to catch basins with joint design and materials approved by the Engineer.

C. Masonry:
   1. Laying Brick:
      a. Use only clean bricks in brickwork for catch basins.
      b. Moisten the brick by suitable means until they are neither so dry as to absorb water from the mortar or so wet as to be slippery when laid.
      c. Lay each brick in a full bed and joint of mortar without requiring subsequent grouting, flushing, or filling, and thoroughly bond as directed.
      d. Construct all joints in a neat workmanlike manner construct the brick surfaces inside the manholes so they are smooth with no mortar extending beyond the bricks and no voids in the joints. Maximum mortar joints shall be 1/2 inch.
   2. Curing:
      a. Protect brick masonry from tying too rapidly by using burlaps which are kept moist, or by other approved means.
      b. Protect brick masonry from the weather and frost as required.

D. Frames and Grates:
   1. Set all frames in a full bed of mortar, true to grade and concentric with the catch basin opening.
   2. Completely fill all voids beneath the bottom flange to make a watertight fit.
   3. Place a ring of mortar at least one inch thick around the outside of the bottom flange, extending to the outer edge of the catch basin all around its circumference.
   4. Clean the frame seats before setting the covers in place.

E. Bedding and Backfilling:
   1. Bedding material of catch basin shall be 6 inches of crushed stone (see Section 02200).
   2. Backfill 18 inches all around catch basin with common borrow.

END OF SECTION

SECTION 02434

CULVERTS AND STORM DRAINS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included.
   1. Provide and install culvert or storm drain pipe with inlet and outlet ends sections of the type(s), size(s) and in the location(s) shown on the Drawings and as specified herein.

B. Related Work Specified Elsewhere:
   1. Excavation and backfill, dewatering, pavement, borrow and bedding material are specified in the appropriate sections in this division.

1.2 SUBMITTALS

A. Submit, in duplicate, sworn certificates of inspections and tests performed at the location of manufacturers.

B. Submit shop drawings in accordance with the General Conditions of the Construction Contract.

1.3 DELIVERY, STORAGE AND HANDLING

A. Exercise care when handling pipe to prevent damage of any nature to pipe and finish.

B. Immediately remove damaged materials and replace at no additional cost to the Owner.

C. Store materials above ground on platforms, skids or other adequate supports.

1.4 FIELD OUALITY CONTROL

A. Acceptance will be on the basis of tests of materials and inspection of the complete product.

B. Inspection may be made at the place of manufacture or on the construction site after delivery, or both, and the pipe shall be subject to rejection at any time due to failure to meet all of the specification requirements, even though sample pipe units may have been accepted as satisfactory at the place of manufacture.

C. Immediately remove from the project site all rejected pipe.

PART 2- PRODUCTS

2.1 MATERLALS

A. Pipe shall be one of the following culvert pipes:
   1. Bituminous Coated Corrugated Metal Pipe (CMP)
   2. Corrugated Aluminum Pipe (CMP)

B. Pipe wall thickness shall be a minimum of 12 gauge (0.109 inches) for all materials.

C. Materials for pipes shall conform to AASHTO Standards.
   1. Bituminous Coated Corrugated Metal Pipe: These pipes and the coupling bands shall conform to the requirements of AASHTO M 36 for the specified sectional dimensions and gauges. Special sections, such as elbow and flared end section shall conform to the applicable requirements of A.ASHTO M 36. Modification of coupling bands resulting in strength requirements which equal or exceed the requirements of AASHTO M 36 will be allowed upon approval of the Engineer. After fabrication, the pipe shall be coated inside and outside in accordance with AASHTO M 190, Type A.
   2. Corrugated Aluminum Pipe: These pipes shall conform to the requirements of AASHTO M 196. Special sections, such as elbows, and metal end sections shall conform to the applicable requirements of AASHTO M 196.

PART 3- EXECUTION

3.1 INSPECTION

A. Examine areas to receive piping for the following:
   1. Obstructions that adversely affect the installation and quality of the work.
   2. Deviations beyond allowable tolerances for clearances.
B. Examine pipe and fittings before installation to assure no defective materials are incorporated.
C. Start the work only when conditions are satisfactory.
D. Remove and replace all defective materials at no additional cost to the Owner.

3.2 INSTALLATION

A. Do not install pipe, nor backfill, between December 15 and April 1 without the written permission of the Engineer.
B. Begin laying the pipe at the downstream end.
C. Place metal pipe with the longitudinal laps of seams at the sides and the outside laps of circumferential joints pointing up grade.
D. Lay paved or partially lined pipe with the lining on the bottom.
E. Join flexible pipe sections and metal end sections by coupling bands.
F. Assemble the plates for structural plate arches according to the manufacturer's assembly instructions and as shown on the Drawings.

END OF SECTION

SECTION 02480

LANDSCAPING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Perform the following items of work as required to complete the work of this section as shown on the Drawings and as specified hereunder:
   a. Spread stockpiled topsoil and furnish and spread any additional topsoil, required to meet the requirements of this section.
   b. Furnish and sow grass seed/or sod in all areas within the work area to the extent indicated on the Drawings, and in existing grass areas which have been damaged or disturbed by the work of this Contract.
   c. Provide maintenance services as specified hereunder.
2. Examine all other sections of the Specifications and all Drawings for the relationship of the work under this section and the work of other trades. Cooperate with all trades in performing the work under this section.

1.2 SUBMITTALS AND TESTING

A. Seed:

1. Furnish the Engineer with duplicate signed copies of a statement from the vendor, certifying that each container of seed delivered to the project site is fully labeled in accordance with the Federal Seed Act and is at least equal to the specification requirements.
2. This certification shall appear in, or with, all copies of invoices for the seed.
3. Each lot of seed shall be subject to sampling and testing, at the discretion of the Engineer, in accordance with the latest rules and regulations under the Federal Seed Act.

B. Topsoil:

1. Inform the Engineer, within 30 days after the award of the Contract, of the sources from which the topsoil is to be furnished. It is the intent of this section that all topsoil which can be recovered from the site shall be used. Furnish additional topsoil as required.
2. Obtain representative soil samples, taken from several locations in the area under consideration for topsoil removal, to the full stripping depth.
3. Have soil samples tested by an independent soils testing laboratory, approved by the Engineer, at the Contractor's expense.
4. Have soil samples tested for physical properties and pH (or lime requirement), for organic matter, available phosphoric acid, and available potash, in accordance with standard practices of soil testing for agricultural use.
5 Approval, by the Engineer, to use topsoil for use in the work will be dependent upon the results of the soils tests.

C. Lime and Fertilizer:

1. Furnish the Engineer with duplicate copies of invoices for all lime and fertilizer used on the project showing the total minimum carbonates and minimum percentages of the material furnished that pass the 90 and 20 mesh sieves and the

grade furnished.

2. Each lot of lime and fertilizer shall be subject to sampling and testing at the discretion of the Engineer.
3. Sampling and testing shall be in accordance with the official methods of the Association of Official Agricultural Chemists.
4. Upon completion of the project, a final check may be made comparing the total quantities of fertilizer and lime used to the total area seeded. If the minimum rates of application have not been met, the Engineer may require the Contractor to distribute additional quantities of these materials to meet the minimum rates.

1.3 DELIVERY, STORAGE AND HANDLING

A. Seed:
   1. Furnish all seed in sealed standard containers, unless exception is granted in writing by the Engineer.
   2. Containers shall be labeled in accordance with the United States Department of Agriculture's rules and regulations under the Federal Seed Act in effect at the time of purchase.

B. Fertilizer:
   1. Furnish all fertilizer in unopened original containers.
   2. Containers shall be labeled with the manufacturer's statement of analysis.

1.4 JOB CONDITIONS

A. Topsoil:
   1. Do not place or spread topsoil when the subgrade is frozen, excessively wet or dry, or in any condition otherwise detrimental, in the opinion of the Engineer, to the proposed planting or to proper grading.

B. Seeding and Planting:
   1. Work Seasons - Perform seeding and planting work only between the dates of I May to 20 June and 15 August to 1 October, except as otherwise directed in writing by the Engineer.
   2. Weather Conditions:
      a. Do not perform seeding work when weather conditions are such that beneficial results are not likely to be obtained, such as drought, excessive moisture, or high winds.
      b. Stop the seeding work when, in the opinion of the Engineer, weather conditions are not favorable.
      c. Resume the work only when, in the opinion of the Engineer, conditions become favorable, or when approved alternate or corrective measures and procedures are placed into effect.

PART 2 - PRODUCTS

2.1 MATERIALS FOR GRADING AND SEEDING

A. Topsoil:
   1. Additional topsoil from offsite, if required to meet minimum depths, shall be friable topsoil, typical of cultivated topsoils of the locality, containing at least three percent of decayed organic matter (humus). It shall be taken from a well drained arable site. It shall be reasonably free from subsoil, stones, earth, clods, sticks, roots, or other objectionable extraneous matter or debris, and contain no

toxic materials.

B. Fertilizer:

1. Fertilizer shall be used to counteract soil deficiencies as indicated by the soil analysis and as approved by the Engineer. It should be a complete fertilizer, a standard product complying with the state and federal fertilizer laws, part of the elements of which are derived from organic sources, containing the following percentages by weight:

Nitrogen	10N - Minimum 75 percent organic
Phosphorus	6 P -
Potash	4K-

The fertilizer shall be delivered to the site in the original unopened containers bearing the manufacturer's guaranteed statement of analysis, or a manufacturer's certificate of compliance covering analysis shall be furnished to the Engineer. The fertilizer shall be spread at the rate of 17 to 20 lbs/1000 sq-ft.

C. Lime:

1. Provide lime which is ground limestone containing not less than 85 percent of total carbonate and of such fineness that 90 percent will pass a No. 20 sieve and 50 percent will pass a No. 100 sieve.
2. Coarser materials will be acceptable provided the specified rates of application are increased proportionately on the basis of quantities passing a No. 100 sieve. No additional payment will be made to the Contractor for the increased quantity.

D. Soil Enrichers:

1. They shall be one of the following materials:
   a. Peat Moss - Finely shredded and consisting of not less than 90 percent organic matter.
   b. Sawdust - rotten.
2. They shall be natural and suited to horticultural use. They shall not contain lumps, roots or other foreign matter over two inches in diameter. They shall be free from noxious weeds, seeds and other elements harmful to lawns. They shall be subject to inspection approval by the Engineer at the source and upon delivery and shall contain not more than 35 percent moisture by weight at the time of incorporation into the soil.

E. Mulch for Hydro Seeding:

1. Mulch material shall meet the following requirements:
   a. Hay or straw - Hay or straw mulch shall consist of long fibered hay or straw, reasonably free from noxious weeds or other undesirable material. No material shall be used which is so wet, decayed, or compacted as to inhibit even and uniform spreading. No chopped hay, grass clippings or other short fibered material shall be used unless directed.
   b. Wood cellulose fiber - Wood cellulose fiber mulch shall consist of natural wood cellulose fiber containing no materials which will inhibit seed germination or plant growth. Sufficient non-toxic water soluble green dye shall be added to provide a definite color contrast to the ground surface to aid in even distribution. Wood fiber mulch shall be supplied in uniform packages not exceeding 100 pounds each. Each package shall be marked to show the air dry weight.

F. Mulch Binder for Hydroseeding:

Material for mulch binder shall be emulsified asphalt.

a. Emulsified asphalt mulch binder shall be a type acceptable to the Engineer and maybe

diluted with water to assure even distribution.

G. Grass Seed Mixture

Fresh, clean, new crop seed. Seed may be mixed by an approved method on the site, or may be mixed by the dealer. If the seed is mixed on the site, each variety shall be delivered in the original containers which shall bear the dealer's guaranteed statement of the composition of the mixture and the percentage of putty of each variety. The Dealers Guarantee Statement shall be delivered to the Engineer.

2. Grass seed shall be composed of the following varieties which shall be mixed in the proportions and shall test to 97 percent minimum purity, minimum 85 percent germination, and weed seed content not to exceed 0.10 percent.

Percent Proportion by Weight:

a. Roadside and Detention Basin Sideslopes Mixture (Slopes):
   1) Creeping Red Fescue - 40 percent.
   2) Kentucky Bluegrass - 25 percent.
   3) Kentucky 31 Fescue - 30 percent.
   4) Annual Rye Grass - 5 percent.

b. Lawn Areas:
   1) Kentucky 31 Fescue - 25 percent.
   2) Chewing Fescue - 15 percent.
   3) Creeping Red Fescue - 15 percent.
   4) Pennfine Perennial Rye - 25 percent.
   5) Lynn Perennial Rye - 10 percent.
   6) Common Annual Rye - 10 percent.

3. Sow grass seeds uniformly at a rate of 5 to 7 pounds per 1000 sq. ft surface area.

H. Sod:

1. Preferable two year growth, at least 95 percent weed-free, solid landscaping sod composed of perennial fescues, Kentucky bluegrasses. Submit one 12 by 12 inch piece of sod, with source location, for approval of the Engineer, before ordering sod for the work.

2.2 MATERIALS FOR PLANTING

A. Water:
   1. The Contractor shall arrange and pay for water required for the planting. Water shall be clean and suitable for domestic consumption.

B. Manure:
   1. Manure shall be well rotted, unleached, horse or cow manure or a combination of both. It shall be free from any chemicals used to hasten decomposition artificially, or any other injurious substance.
   2. Manure shall be at least nine months old and not more than two years old, free from sawdust, hay, tanbark or wood shavings, or refuse of any kind. Manure shall consist of not more than 25 percent straw or other acceptable material.

C. Stakes shall be white cedar or approved equal, of size and length as shown on the Drawings.

D. Hose for guying shall be new black or green two-ply fiber garden hose, not less than 1/2 inch inside diameter. Seconds rejected by the factory are acceptable.

E. Burlap for wrapping shall be first quality burlap at least eight ounces in weight and six

inches in width.

F. Wire for tree guys shall be galvanized annealed steel wire, No. 14 gauge, as detailed.

G. Tree paint shall be waterproof, adhesive and elastic, free from kerosene, coal tar creosote or any other material injurious to the life of the trees. Tree paint shall contain an antiseptic.

H. Pine bark mulch shall be clean, shredded, free of weeds, seeds, insects and extraneous materials.

2.3 STORAGE OF MATERIAL

A. Materials such as fertilizers, ground limestone, etc. shall be stored in weatherproof storage areas and in such a manner that their effectiveness will not be impaired.

PART 3 – EXECUTION

3.1 PREPARATION

A. Equipment:

1. Provide all equipment necessary for the proper preparation of the ground surface and for the handling and placing of all required materials.
2. Demonstrate to the Engineer that the equipment will apply materials t the specified rates.

B. Subsoil Preparation:

1. Before spreading topsoil, the subgrade shall be raked by approved means. Remove all stones greater than four inches and all debris or rubbish to a depth of six inches. Such materials shall be removed from the site.

C. Screening:

1. All topsoil shall be screened clear of all stones greater than one inch, sticks, plants, and all ether foreign materials before being spread.
2. During the screening of topsoil, commercial fertilizers and lime as required by the soil analysis shall be mixed with the topsoil so that they are evenly distributed throughout the screened topsoil.
3. At the completion of this operation, topsoil is referred to as improved topsoil for the purpose of this specification and the Drawings.

3.2 SEED AND SOD BED PREPARATION

A. Spread improved topsoil uniformly over subgrade and all areas where the existing grade has been changed and areas disturbed by construction operations except for those areas indicated on the site plans to be paved. No subsoil, topsoil, or improved topsoil shall be handled in any way when in a wet or frozen condition.

B. Fine rake surface to receive seed or sod.

C. After natural settlement and a light rolling, the completed work shall conform to the lines, grades, pitches, and spot elevations shown on the plans.

D. Seeding may be done immediately thereafter, provided the seed bed has remained in a good friable condition and has not become wet.

3.3 SEASON

A. Do all seeding work within the dates herein specified.

B. If special conditions exist which may warrant a variance in the above dates, submit a written request to the Engineer stating the conditions and proposed variance. Permission for the variance will be given if in the opinion of the Engineer, the variance is warranted.

C. If seeding is authorized between May 15 and August 15, annual rye shall be sown separately in addition to the specified seed mix. Sow at the rate of six to eight pounds per 1000 square feet.

3.4 SEEDING AND SODDING

A. Immediately before seeding and sodding, the ground shall be restored as necessary to a loose friable condition by discing or other approved method to a depth of not less than two inches. The surface shall be cleared of all debris and of all stones one inch or more in diameter.

B. Seed all areas to be seeded with the specified grass seed, sowing evenly with an approved mechanical seeder at the rate specified in the seed mix schedule. Sow one half the seed in one direction and the other half at right angles to the first seeding. Cultipacker or approved similar equipment may be used to cover the seed and to firm the seed bed in one operation. In areas inaccessible to Cultipacker, the seeded ground shall be lightly raked and rolled in two directions with a water ballast roller Extreme care shall be taken during seeding and raking to insure that no change shall occur in the finished grades and that the seed is not raked from one spot to another.

C. The hydraulic spray method of sowing seed may be used where approved by the Engineer, This work shall be done with an approved machine operated by a competent crew. Seed and fertilizing materials shall be mixed with water in the tank of the machine and kept thoroughly agitated so the materials are uniformly mixed and suspended in the water at all times during operation. The spraying equipment must be designed and operated to distribute seed and fertilizing materials evenly and uniformly on the designated areas at the required rates. If the Engineer finds the application uneven or otherwise unsatisfactory, he may require the hydraulic spray method to he abandoned and the balance of the work done as specified herein. Seed must be lightly raked into the surface of the soil unless seeding is to be followed within 24 hours by mulching.

1. Applying Mulch - At the option of the Contractor, any of the following types of mulch material may be applied.
   a. Hay or straw mulch shall be spread evenly and uniformly over the designated areas. Unless other directed, mulch shall be applied to a thickness of 1". Too heavy application of mulch shall be avoided and lumps and thick spots shall be thinned. Unless otherwise authorized, the mulch shall be anchored in place by uniformly applying an asphalt mulch binder. Application of a concentrated stream of mulch binder will not be allowed. Asphalt mulch binder may be omitted when authorized by the Engineer and when there is a danger of the asphalt contaminating the surface of nearby structures, houses, vehicles, or other objects. Other methods of anchoring mulch may be used subject to the approval of the Engineer.
   b. Wood fiber mulch shall be applied as a water-borne slurry. The wood fiber and

water shall be thoroughly mixed and sprayed on the area to be covered so as to form a uniform mat of mulch at the rate of not less than 30 pounds per 1,000 square feet unit of area. Wood fiber mulch may be mixed with the proper quantities of seed, fertilizer and lime as required in this section, or may be applied separately after seeding has been carried out. In the latter case, it must be applied within 24 hours after seeding.

2. Maintenance - The Contractor shall maintain the mulch by repairing any damaged mulch and by correcting any shifting of the mulch due to wind, water or other causes, until an acceptable growth of grass has been achieved, regardless of the acceptance status of the seeding. He shall supply additional mulch necessary as a result of damage or seed failure. Repairs to mulched areas and furnishing of additional mulch shall be incidental to this item. If wood fiber is used, any reseeding will require additional wood fiber mulch.

D. Do not perform broadcast seeding work during windy weather.

E. Compacting:
   1. Compact the entire area immediately after the seeding operations have been completed.
   2. Compact by Means of a cultipacker, roller, or other equipment approved by the Engineer weighing 60 to 90 pounds per linear foot of roller.
   3. If the soil is of such type that a smooth or corrugated roller cannot be operated satisfactorily, use a pneumatic roller (not wobbly wheel) that has tires of sufficient size to obtain complete coverage of the soil.
   4. When using a cultipacker or similar equipment, perform the final rolling at right angles to the prevailing slopes to prevent water erosion, or at right angles to the prevailing wind to prevent dust.

F. Thoroughly wet soil surfaces before sodding. Place sod pieces tightly together, tamping gently into position as the work progresses. After each area of sodding is completed, roll the entire surface in two directions with a water ballast roller, and soak the newly sodded areas.

G. After the grass has started, all of the areas greater than five square feet which fail to show a uniform stand of grass for any reason whatsoever shall be reseeded repeatedly until all areas are covered with a satisfactory growth of grass.

H. At the time of the first cutting, set mower blades two inches high. All lawns shall receive at least three mowings before acceptance.

I. Maintenance shall also include all temporary protection fences, barriers and signs and all other work incidental to proper maintenance.

J. Maintain grass areas until a full stand of grass is indicated, which will be a minimum of 45 days after all seeding or sodding work is completed, and shall not necessarily relate to Substantial Completion of the General Contract.

K. Protection and maintenance of grass areas shall consist of watering, weeding, cutting, repair of any erosion and reseeding as necessary to establish a uniform stand of the specified grasses, and shall continue until Provisional Acceptance by the Engineer of the work of this section. It shall also include the furnishing and applying of such pesticides as are necessary to keep grass areas free of insects and disease. All pesticides shall be approved by Engineer prior to use.

3.5 SEEDING AND SODDING INSPECTION FOR PROVISIONAL ACCEPTANCE

A. The Engineer shall inspect all work for Provisional Acceptance upon written request of the Contractor. The request shall be received at least ten calendar days before the anticipated date of inspection.

B. Upon completion and reinspection of all repairs or renewals necessary in the judgment of the Engineer, the Engineer shall certify in writing to the Owner as to the Provisional Acceptance of the work of this section.

C. Upon approval of the Provisional Acceptance by the Owner, the Owner will assume maintenance of the lawn areas.

3.6 GUARANTY

A. The Contractor shall submit a written guarantee to the Engineer, after Provisional Acceptance of grass, covering reseeding of grass areas which do not survive through one fill growing season after the date of Provisional Acceptance, at no cost to the Owner.

3.7 CLEAN-UP

A. Any soil or similar material which has been brought on to paved areas by hauling operations or otherwise shall be removed promptly, keeping these areas clean at all time.

B. Upon completion of work under this section all excess stones, debris, and soil resulting from work under this section, which have not previously been cleaned up, shall be removed from the project site.

3.8 PLANTING METHOD

A. The Contractor shall excavate plant pits, furnish and place all plants, and then maintain them in a satisfactory manner until final acceptance.

B. All pits shall be of size and shape as recommended by the supplier.

C. For tree and shrub planting, soil used for backfilling shall be improved topsoil as recommended by soil analysis, with the following additions:

1. For deciduous plants use a mixture of four parts topsoil and one part of manure.
2. For evergreen plants use a mixture of four parts topsoil and one part of peat moss as specified under Soil Enrichers.

D. Plant pits within or near paved areas shall be prepared prior to the laying of the pavement. 'Where tree pits in paved areas are to be covered with mulch, trees shall be placed at sufficient depth below finished grade to allow for the depth of the mulch.

E. Plants shall be set plumb and straight, and at such a level that after settlement, a normal or natural relationship of the crown of the plant with the ground surface is established. Each plant shall be planted in the center of the pit. 'When balled, burlapped and platformed plants are set, the platform shall first be removed from the pit and the soil shall be carefully tamped under and around the base of each ball to fill all voids. All burlap, ropes, and wires shall be removed from the sides and tops of balls, but no burlap shall be pulled out from under the balls, except for plastic burlap, which shall be completely removed from the pit.

F. All seals shall remain unbroken and visible on plant material until final inspection by Engineer. The Contractor shall remove all seals immediately after final inspection.

3.9 PLANTING SEASON

A. Do all planting work within the dates herein specified.

3.10 PRUNING, PAINTING, SPRAYING

A. Pruning:
   1. Each tree and shrub planted shall be pruned to preserve the natural character of the plant and in a manner appropriate to the particular requirements of the landscape design. In general, approximately one third of the wood shall be removed by thinning or shortening branches, but no leaders shall be cut.
   2. All pruning shall be done with sharp tools. All pruning cuts shall be made (lush and clean, especially where lower branches have been removed from collected trees.

B. Painting:
   1. Pruning cuts over one-half inch in diameter shall be painted with tree paint specified under 'Materials" on all exposed cambium as well as other exposed living tissues.

3.11 STAKING

A. All staking shall be done immediately after wrapping. Stakes shall be driven perpendicular into the ground around the periphery of the ball of the tree. Plants shall stand plumb after staking.

3.12 WATERING

A. Plantings shall be watered in a satisfactory manner during and immediately after planting, not less than twice per week, until provisional acceptance.
B. Suitable water for maintaining plants shall be provided by the Owner. The Contractor shall furnish the hose and hose connections from the outlets where water is furnished. Contractor is responsible for all watering until provisional acceptance.

3.13 MAINTENANCE SERVICES

A. Contractor shall provide a minimum of two (2) mowings of all seeded and sodded restoration area on the project site after final completion of the work and all required mowings before final completion.
B. Maintenance shall begin immediately after each plant is planted. Plants shall be watered, mulched, weeded, fertilized, cultivated and otherwise maintained and protected until provisional acceptance.
C. Guys shall be tightened and repaired. Defective work shall be corrected as soon as possible after defects become apparent, and weather and season permit.

3.14 TREE SURGERY

A. Existing trees shall be trimmed of all dead and diseased limbs at the direction of the Engineer. All cuts shall be made close to the trunk and those over one inch in diameter shall be covered with an acceptable tree paint manufactured for this specific purpose. In the case of important large trees where a small amount of cavity work would prolong their lives, such work should be done. The services of a qualified tree surgeon are recommended.

3.15 INSPECTION AND PROVISIONAL ACCEPTANCE

A. The Engineer will inspect all planting work for provisional acceptance upon request of the Contractor.

B. The Contractor shall furnish fill and complete written instructions for maintenance of the planting to the Owner at the time of provisional acceptance.

C. After all necessary corrective work has been completed and maintenance instructions have been received by the Owner, the Engineer will certify in writing the provisional acceptance of the planting.

3.16 GUARANTEE PERIOD

A. All plants shall be guaranteed by the Contractor for a period of not less than one full year from time of provisional acceptance.

B. At the issuance of provisional acceptance, the Owner shall take over maintenance of the planting. Nevertheless, the guarantee of all plant material will remain with the Contractor. The Contractor shall ascertain that the Owner properly waters and maintains all planting during the one year guarantee period.

C. At the end of the guarantee period, any plant that is missing, dead, not true to name or size as specified, or not in satisfactory growth, as determined by the Engineer, shall be replaced. In case of reasonable doubt or question regarding the condition and satisfactory establishment of a rejected plant, the Engineer may allow such a plant to remain through another complete growing season, at which time the rejected plant, if found to be dead, in an unhealthy or badly impaired condition, shall be replaced at once. The Contractor will not be required to replace an inspected and accepted plant more than once.

D. Replacements shall be plants of the same kind and size as specified in the Plant List. They shall be furnished and planted as specified herein. The cost of replacement shall be borne by the Contractor, except where it can be definitely shown that loss resulted from Owner's failure to maintain planting as instructed.

3.17 FINAL INSPECTION AND FINAL ACCEPTANCE

A. At the end of the guarantee period, inspection will be made by the Engineer, at the request of the Contractor.

B. After all necessary corrective work has been completed, the Engineer will certify in writing the final acceptance of the planting.

3.18 CLEANUP

A. Upon completion of work under this section, all excess stones, debris and soil resulting from planting work shall be removed from project site. The site shall be restored to a better condition than was present prior to construction.

END OF SECTION

SECTION 02510

CEMENT CONCRETE SIDEWALKS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: This work shall consist of the construction of new cement concrete sidewalks and driveways in accordance with these specifications and in reasonably close conformity with the lines and grades shown on the Drawings or established by the Engineer.

B. Related Work Specified Elsewhere: (When Applicable) Earthwork, aggregate base and subbase, bituminous concrete paving and granite curbs are specified in the appropriate sections in this Division.

1.2 RELATED DOCUMENTS

A. State of Maine, Department of Transportation, Standard Specifications, dated December 2002 as revised.

1.3 QUALITY ASSURANCE

A. Materials: Use only materials furnished by a bulk cement concrete producer regularly engaged in the production of Portland cement concrete.

B. Submittals: A certificate of compliance shall be furnished to the Engineer that the materials supplied comply with the specification requirements.

PART 2- PRODUCTS

2.1 MATERIALS

A. The Portland cement concrete shall conform to the requirements of AASHTO M85 Type II with a moderate heat of hydration and with the following exceptions:
   1. The autoclave expansion shall be limited to a maximum of 0.20 percent.
   2. There will be no requirements for tensile strength.
   3. Only one brand of cement shall be used on any one contract unless otherwise permitted, in writing, be the Engineer.

B. The welded wire fabric for reinforcement shall conform to the requirements of AASHTO MS 5-73, unless otherwise specified.

C. The pre-molded expansion joint material shall be non-extruding and resilient bituminous type and shall conform to the requirements of AASHTO M213.

PART 3 - EXECUTION

3.1 EXCAVATION

A. Excavation shall be to the depth and width that will permit the installation and bracing of the forms. The foundation shall be shaped and compacted to a firm even surface conforming to the section shown on the Drawings. All soft and yielding subbase material shall be removed and replaced with acceptable select fill material.

3.2 FORMS

A. Forms shall be of wood or metal and shall extend for the fall depth of the concrete. All forms shall be true, free from warp and of sufficient strength to resist the pressure of the concrete without springing. Bracing and staking of forms shall be such that the forms remain in both horizontal and vertical aliment until their removal.

3.3 PLACING CONCRETE

A. The foundation shall be thoroughly moistened immediately prior to placing the concrete. The proportioning, mixing and placing of the concrete shall be in accordance with good construction practices, as stated in the requirements of the MHD specifications.

3.4 FINISHING

A. The surface shall be finished to produce a broom like pattern.
B. No plastering of the surface with mortar will be permitted.

3.5 JOINTS

A. Joints shall be located as shown on the plans. Slabs shall be placed alternately and the joints coated with an approved bituminous material before placing the adjacent slab.
B. When a concrete sidewalk is constructed adjacent to a curb, building, retaining wall, light pole base or other fixed structure, a 1/4 inch thick pre-molded joint filler shall be used between the slab and the structure.

3.6 CURING

A. Concrete shall be cured for at least 72 hours. Curing shall be by moist burlap or mats, white-pigmented curing compound or by other approved methods. During the curing period, all traffic, both pedestrian and vehicular, shall be excluded. Vehicular traffic shall be excluded for such additional time as may be directed.

END OF SECTION

SECTION 02513

BITUMINOUS CONCRETE PAVING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:
   1. Furnish all plant, labor, equipment arid materials required to install bituminous concrete pavement courses, including sidewalks, driveways, temporary and permanent trench paving and restoration of pavement markings as needed.
   2. Remove bituminous asphaltic and/or Portland cement pavement, and replace bituminous asphaltic pavement, sub-base, binder courses and surface courses, including temporary pavement, within the necessary area(s) and as directed by the Engineer. -
   3. Keep pavement removal to a minimum width suitable for the required construction.
   4. Apply pavement markings to the permanent paving as specified.

B. Work Not Included: Removal and replacement of paving for the convenience of the Contractor will not be considered for payment.

C. Related Work Specified Elsewhere (When Applicable):
   1. Excavation, backfill, aggregate base and subbase.

1.2 QUALITY ASSURANCE

A. Materials: Use only materials furnished by a bulk bituminous concrete producer regularly engaged in the production of hot mixed, hot laid bituminous concrete.

B. Equipment: Provide, maintain and operate pavers, dump trucks, tandem, 3-wheel and pneumatic tired rollers well suited to the mixtures being placed. Provide, maintain and operate hand equipment as required. When applicable, provide, maintain and operate trimming equipment and materials.

C. Mix Requirements, Method of Placement and Compaction: State of Maine, Department of Transportation, Standard Specifications, dated December 2002 as revised. Specifications for mixing, placing and compacting bituminous concrete surfaces are applicable to this work.

1.3 SUBMITTALS

A. A certificate of compliance shall be furnished to the Engineer that the materials supplied comply with the specification requirements.

B. Delivery slips shall be furnished with each load of mix delivered to the project. Information shall include:
   1. Vehicle identification.
   2. Date.
   3. Project.
   4. Identification of material
   5. Gross, tare and net weights.
   6. Signed by the bituminous concrete producer.
   7. Stamped by a licensed public weighmaster.

PART 2- PRODUCTS

2.1 MATERIALS

A. Class 1 Bituminous Concrete.

General - These mixtures shall be composed of mineral aggregate, mineral filler, if required, and bituminous material.

2. Composition of the mixture - The mineral aggregates, filler, if required, and bituminous material shall be proportioned and mixed as hereinafter specified to conform with the composition by weight tabulated in Table A, herein. Sufficient approved mineral filler shall be used to correct any deficiencies in grading of aggregate.

3. Job Mix Formula - The composition limits in Table A are master ranges of tolerances of materials in general. In order to obtain standard texture, density and stability, the Contractor will furnish to the Engineer a specific job mix formula for the particular uniform combination of materials and sources of supply to be used on each project. The job mix formula for each mixture shall establish a single percentage of aggregate passing each required sieve size, a single percentage of bituminous material to be added to the aggregate and the number of seconds for dry mixing time and the number of seconds for wet mixing time. AASHO-T195 (Ross Count) with a coating factor of 98% will be used when necessary to evaluate proper mixing time. The job mix formula shall also specify a single source of uniform blend of particular sources for fine aggregate, a single source of supply for mineral filler and for asphalt. Two or more job mix formula may be approved for a particular plant; however, only material conforming to one job mix formula will be permitted to be used on any given calendar day. The job mix formula shall bind the Contractor to furnish paving mixtures not only within the master ranges, but also conforming to the exact formula thus set up for the project, within allowable tolerances as follows:

Asphalt	±0.4%
No. 4 and larger sieves	±7.0%
No. 8 and smaller sieves*	±4.0%
*Except passing No. 200 sieve	±2.0%

4. Asphalt cement shall be:

AC-5
AC-10
AC-20
AC-40

TABLE A
*PERCENT BY WEIGHT
PASSING
SQUARE OPENING SIEVES

Standard Sieves	Base Course	Binder Course	Surface Course	**Dense Mix	Surface Treatment	***Patching Mix
2"	100					
1 ½"	90-100					
1"	65-90	100				
¾"	55-80	80-100				
½"	40-65	55-80	100	100		100
3/8"			80-100	80-100	100	90-100
No.4	20-45	28-50	50-76	55-80	80-100	50-65
8	15-33	20-38	37-54	48-63	64-85	24-36
16			26-40	36-49	46-68	14-28
30	8-17	8-22	17-31	24-38	26-50	8-25
50	4-12	5-15	10-23	14-27	13-31	5-21
100			6-16	6-18	7-17	3-15
200	0-4	0-5	2-7	4-8	3-8	2-8
Bitumen	4-5	4.5-5.5	5.5-7.0	7-8	7-8	4-6

* Percentages shown in table above for aggregate sizes are stated as proportional percentages of integral total aggregate for the mix.

** Dense mix including approved anti-stripping compound shall be furnished and used for protective (bottom) courses of pavement on bridges, and elsewhere shown on the plans.

***Patching mix shall include 1% of hydrated lime based on weight of total aggregate.

No job mix formula will be approved which specifies:
More than 45% passing No. 8 for Top Course.
More than 55% passing No. 8 for Dense Mix.
Less than 4% passing No. 200 for Top Course.

Should a change of sources of materials be made, a new job mix formula shall be established by the Contractor before the new material is used. When unsatisfactory results or other conditions make it necessary, the Engineer may establish a new job mix formula.

The aggregate will be accepted in stockpile at the plant site. The bituminous material will be accepted on certification.

If the Contractor elects to furnish bituminous concrete from more than one plant, the job mix formula must be adhered to be all plants.

B. Mineral Filler:
   1. Limestone dust, Portland cement, or other inert material complying with ASTM D 242 or AASHTO M 17.
C. Tack Coat:
   1. Emulsified type, Grade RS-I, CR8-I, HFMS-l, CSS-1, 1h
D. Pavement markings shall conform to AASHTO Designation M248-74 for ready-mixed white and yellow traffic paints.

PART 3 - EXECUTION

3.1 GENERAL

A. Grade Control:
   1. The Contractor shall establish and maintain the required lines and grades, including crown and cross-slope, for each course during construction operations.
B. Trench areas shall receive initial paving as the work progresses where trenches are in paved streets. Not more than 300 linear feet of backfill trench shall be left unpaved.
C. Reset all existing manholes to finished grade as required at no additional cost to the Owner.

3.2 PAVEMENT REMOVAL

A. General:
   1. Exercise extreme care in the removal of pavement so that pavement will not be unnecessarily disturbed or destroyed.
   2. Mechanically cut pavement to be removed to a straight line, unless otherwise directed by the Engineer.

3.3 SURFACE PREPARATION

A. Prime and tack coats shall conform to the State of Maine, Department of Transportation, Standard Specifications.
B. Prime Coat:
   1. Apply at the rate of 0.50 gallons per square yard over compacted base. Apply material to penetrate and seal, but not flood, surface. Cure and dry as long as necessary to attain penetration and evaporation of the dilution agent.
C. Tack Coat:
   1. Apply to contact surfaces of previously constructed asphalt or Portland cement concrete and surfaces abutting or projecting into asphalt concrete pavement. Distribute at rate of 0.05 to 0.15 gallons per square yard of surface.

3.4 PLACING THE MIX

A. General:
   1. Place asphalt concrete mixture on prepared surface. Minimum allowable temperature for placing is 225^0F. Maximum shall be 325^0F. Place in areas inaccessible to paving machine and small areas by hand. Place each course to required grade, cross-slope and compacted thickness.
B. Protection:
   1. After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened to the extent that the pavement will not be damaged.

3.5 PAVEMENT MARKINGS

A. Material, approved by the Engineer, is to be furnished and applied after the installation of permanent paving.

B. Apply pavement markings in accordance with existing markings. Match paint color, marking dimensions, layout and other details with existing markings in the vicinity of the project.

END OF SECTION

SECTION 02601

MANHOLES, COVERS AND FRAMES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Construct manholes, covers, frames, brick masonry, inverts and apply waterproofing in conformance with the dimensions, elevations, and locations shown on the Drawings and as specified herein.

B. Related Work Specified Elsewhere (when applicable):
   1. Final sewer testing is specified in this Division.
   2. Pipe, excavation, backfill, paving and dewatering are specified in the appropriate Sections in this Division.
   3. Concrete and grout are specified in Division 3.

1.2 QUALITY ASSURANCE

A. Precast Manhole Base, Barrel and Top Sections:
   1. Conform to ASTM C478-84 (AASHTO M199-82) except as modified herein, and on the Drawings.
   2. Average strength of 4,000 psi at 28 days.
   3. Testing:
      a. Determine concrete strength by tests on 6-inch by 12-inch vibrated test cylinders cured in the same manner as the bases, barrels and tops.
      b. Have tests conducted at the manufactures plant or at a testing laboratory approved by the Engineer.
      c. Have not less than 2 tests made for each 100 vertical feet of precast manhole sections.

B. Manhole Steps
   1. Acceptable Manufacturers:
      a. Aluminum Company of America.
      b. Reliance Steel Products, Inc.
      c. M. A. Industries, Inc.
      d. Or equivalent.

C. Frames and Covers:
   1. Acceptable Manufacturers:
      a. Etheridge Foundry Co.
      b. Neenah Foundry Co.
      c. E. L. LeBaron Foundry Company.
      d. Or equivalent.

D. Masonry:
   1. Brick: Shall comply with the ASTM Standard Specifications for Sewer Brick (made from clay or shale), Designation C32, for Grade SS, hard brick. (AASHTO M91-78).

2. Cement: ASTM C-ISO (AASHTO M85-791).
3. Hydrated Lime: ASTM C-207
4. Sand: ASTM C33 (AASHTO M6-65 (1974)).

E. Waterproofing:
1. Acceptable Manufacturers:
a. Minwax Fibrous Brush Coat, Minwax Co., N.Y., N.Y.
b. Tremco 121 Foundation Coating, Tremco Mfg. Co., Newark, N.J.
c. Or approved equal.

1.3 SUBMITTALS TO THE ARCHITECT/ENGINEER

A. Submit shop drawings and manufacturer's literature in conformance with Section 01340 and the Standard General Conditions of the Construction Contract.

B. Precast Manhole Sections: Submit test results and receive approval from the Engineer prior to delivery to the site.

PART 2- PRODUCTS

2.1 PRECAST MANHOLE SECTIONS

A. Dimensions, shall be as shown on the Drawings:
1. Base & Riser Sections:
a. Diameter: As shown on the Drawings.
b. Length: As required.
e. Wall Thickness: Not less than 5 inches.
d. Joints: Bell-and-spigot or tongue-and-groove formed on machine rings to insure accurate joint surfaces.
2. Tops:
a. Diameter: Eccentric cone type, 24 inches I.D. at top, 48 inches I.D. at bottom unless otherwise shown on the Drawings.
b. Length: 4 feet.
c. Wall thickness: Not less than 5 inches at the base, tapering to not less than 8 inches at the top.
d. Joints: Bell-and-spigot or tongue-and-groove formed on machine rings to insure accurate joint surfaces.
e. Exterior face of cone sections shall not flare out beyond the vertical.
3. Flat Slab Tops:
a. Location: Where shallow installations do not permit the use of a cone-type top and where indicated on the Drawings.
b. Slab thickness: Not less than 8 inches.
c. Constructed to support an HS-20 wheel loading.

B. Openings:
1. Provide openings in the risers to receive pipes entering the manhole.
2. Make openings at the manufacturing plant.
3. Size: To provide a uniform annular space between the outside wall of pipe and riser.
4. Location: To permit setting of the entering pipes at the correct elevations.
5. Openings shall have a flexible watertight union between pipe and the manhole

base.

a. Cast into the manhole base and sized to the type of pipe being used.
b. Type of flexible joint being used shall be approved by the Engineer. Install materials according to the Manufacturer's instructions.
   1. Lock Joint Flexible Manhole Sleeve made by Interpace Corporation.
   2. Kor N Seal made by National Pollution Control System. Inc.
   3. Press Wedge II made by Press-Seal Gasket Corporation.
   4. A-Lok Manhole Pipe Seal made by A-Loc Corporation.
   5. Or equivalent.

C. Joints:
   1. Joint gaskets to be flexible self seating butyl rubber joint sealant installed according to manufacturer's recommendations. For cold weather applications, use adhesive with joint sealant as recommended by manufacturer. Acceptable Materials:
      a. Kent-Seal No. 2
      b. Ram-Nek
      c. Or equivalent.
   2. Joints between precast sections shall conform to related standards and manufacturer's instructions.
   3. All manholes greater than 6 ft. diameter and all manholes used as wet wells, valve pits and other dry-pit type structures shall be installed with exterior joint collars. The joint collar shall be installed according to the manufacturer's instructions. Acceptable materials:
      a. Mac Wrap exterior joint sealer as manufactured by Mar-Mac Manufacturing Company.
      b. Or equivalent.

D. Waterproofing:
   1. The exterior surface of all manholes shall be given two coats of bituminous waterproofing material at a application rate of 75 to 100 square feet per gallon, per coat.
   2. The coating shall be applied after the manholes have cured adequately and can be applied by brush or spray in accordance with the manufacturer's written instruction.
   3. Sufficient time shall be allowed between coats to permit sufficient drying so that the application of the second coat has no effect on the first coat.

E. Frost Protective Wrapping:
   I. The frost protective wrap shall be constructed of an ultraviolet resistant polyethylene material and shall be a minimum thickness of 6 mils.

2.2 FRAMES AND COVERS

A. Standard Units:
   1. Made of cast iron conforming to ASTM A48-76, Class 30 minimum.
   2. Have machined bearing surfaces to prevent rocking.
   3. Castings shall be smooth with no sharp edges.
   4. Constructed to support an HS-20 wheel loading.
   5. Dimensions and Style shall conform to the Drawings, Standard castings differing in non-essential details are subject to approval by the Engineer:

a. Covers - solid with sewer in 3-inch letters diamond pattern, and concealed pickholes.
b. Frame - 24-inch diameter clear opening, with flange bracing ribs, unless otherwise shown on the drawings.

6. Frames cast-in-place in concrete covers shall provide top flange, 24 inch diameter clear opening, frame height as required by slab thickness.
   a. Acceptable Units: LeBaron Type SF, Neenah R-1960-A or approved equal.
7. Minimum weight of frame and cover shall be 430 lbs.

B. Water Tight Units:
1. Same features as above for Standard Units, with 24-inch diameter minimum clear opening.
2. Sealing features:
   a. Inner lid held by a bronze tightening bolt in a locking bar.
   b. Neoprene gasket
   c. Water tight pick hole.
3. Minimum weight of frame and cover shall be 510 lbs.

2.3 MANHOLE STEPS

A. Aluminum or polyethylene coated steel safety type desired with a minimum concentrated live load of 300 pounds.
B. Thoroughly clean all surfaces to be embedded with a suitable cleaning agent to ensure that the surfaces are free from all foreign matter such as dirt, oil and grease.
C. Aluminum surfaces to be embedded shall be given a protective coating of an approved heavy-bodied bituminous material. The steps shall become thoroughly dry before being placed into the concrete.
D. All steps shall be cast into walls of the precast section so as to form a continuous ladder with a distance of 12-inches between steps.

2.4 MASONRY

A. Brick:
1. Sound, hard, uniformly burned, regular and uniform in shape and size, compact texture, and satisfactory to the Engineer.
2. Immediately remove rejected brick from the work.

B. Mortar:
1. Composition (by volume):
   a. 1 part portland cement.
   b. 1/2 part hydrated lime.
   c. 4-1/2 parts sand.
2. The proportion of cement to lime may vary from 1:1/4 for hard brick to 1:3/4 for softer brick, but in no case shall the volume of sand exceed 3 times the sum of the volume of cement and lime.

C. Cement shall be Type II portland cement.
D. Hydrated lime shall be Type

E. Sand:
1. Shall consist of inert natural sand.
2. Grading:

Sieve	Percent Passing
#3/8	100
4	95-100
8	80-100
16	50-85
50	10-30
100	2-10
Fineness Modulus	2.3 -3.1

PART 3 - EXECUTION

3.1 PERFORMANCE

A. Precast Manhole Sections:
1. Perform jointing in accordance with manufacturer's recommendations and as approved by the Engineer.
2. Install riser sections and tops level and plumb.
3. Make all joints watertight.
4. When necessary, cut openings carefully to prevent damage to barrel sections and tops. Solidly fill annular spaces around pipes entering the manholes with non-shrink ~rout or sealant approved by the Engineer. Replace damaged manhole sections and tops at no additional cost to the Owner.
5. When manhole steps are included in the Work, install barrel sections and tops so that steps are in alignment.

B. Drop Manholes:
1. The difference in elevation between the invert of the inlet pipe to the invert of the outlet pipe shall not exceed 24 inches without use of a drop structure.
2. Where difference in elevation exceeds 24 inches, construct a drop manhole as shown on the Drawings or as directed by the Engineer.

C. Adjust to Grade:
I. Adjust tops of manholes to grade with brick masonry.
2. Concrete rings are not acceptable for adjusting to grade.

D. Pipe Connections to Manholes: Connect pipes to manholes with joint design and materials approved by the Engineer.

E. Invert Channels:
1. Smooth and semicircular in shape conforming to the inside of the adjacent sewer section.
2. Make changes in direction of flow with smooth curves having a radius as large as permitted by the size of the manhole
3. Stop the pipes at the inside face of the manhole where changes of direction occur.
4. Form invert channels with brick.
5. Shape invert to make smooth transition in vertical grade.
6. Slope the floor of the manhole to the flow channel, as shown on the Drawings.

F. Masonry:
1. Laying Brick:

a. Use only clean bricks in brickwork for manholes.
b. Moisten the brick by suitable means until they are neither so dry as to absorb water from the mortar nor so wet as to be slippery when laid.
c. Lay each brick in a full bed and joint of mortar without requiring subsequent grouting, flushing, or filling, and thoroughly bond as directed.
d. Construct all joints in a neat workmanlike manner. Construct the brick surfaces inside the manholes so they are smooth with no mortar extending beyond the bricks and no voids in the joints. Maximum mortar joints shall be 1/2 inch.
e. Outside faces of brick masonry shall be plastered with mortar from ¼-inch to 3/S-inch thick.
f. Completed brickwork shall be watertight.

2. Curing:
   a. Protect brick masonry from drying too rapidly by using burlaps which are kept moist, or by other approved means.
   b. Protect brick masonry from the weather and frost as required.

G. Frames and Covers:
1. Set all frames in a full bed of mortar, true to grade and concentric with the manhole opening.
2. Completely fill all voids beneath the bottom flange to make a watertight fit.
3. Place a ring of mortar at least one inch thick around the outside of the bottom flange, extending to the outer edge of the manhole all around its circumference.
4. Clean the frame seats before setting the covers in place.

H. Plugging and Patching:
1. Fill all exterior cavities with non-shrink grout and with bituminous waterproofing once the concrete and mortar has set.
2. Touch up damaged water proofing.

I. Cleaning:
1. Thoroughly clean manholes, steps, frames and covers of all debris and foreign matter.

J. Beddingand Backfilling:
1. Bedding of manholes shall be 6 inches of 3/4" screened stone.
2. Backfill a minimum of 18 inches all around manhole with gravel borrow.

K. Frost Protective Wrap:
1. The Contractor shall comply with the manufacturer's instructions for the particular conditions of installations in each case.
2. Clean each manhole exterior of all dirt and remove any sharp protrusions.
3. Apply two (2) 6-inch wide vertical strips of bituminous waterproofing material and/or duct tape from the top to bottom of the manhole per layer.
4. Prior to installing pipe through each manhole or valve pit, wrap each manhole to the maximum depth of frost penetration, but not less than 5 feet below grade, with four (4) layers of the polyethylene material by beginning the wrap at the adhesive strip and proceeding around the manhole, valve pit, etc., continuously by overlapping the adhesive strip by 24 inches on the final layer. Cut the polyethylene wrap in areas where piping exits the manhole. The size of the cut is to be equivalent to the pipe's outside diameter.
5. Tuck and pleat the polyethylene wrap at the top of each manhole in a continuous manner, minimizing the size of each fold. Extend the polyethylene wrap past the top of the

manhole frame and temporarily tuck the remainder inside the frame, until final backfill and paving.

6. In paved areas, cut the polyethylene wrap flush with the manhole rim after the pavement is in place.
7. In unpaved areas, pull the polyethylene wrap together, and tie around frame with galvanized wire.
8. Protect the installed frost harrier from harmful weather exposures and from possible physical abuses, where possible by prompt installation of concealing work or, where that is not possible, by temporary covering or enclosure.
9. Backfill around the manhole/frost barrier with material as outlined in Section 02200 - Earthwork.

3.2 MANHOLE TESTING

A. General:
   1. Perform either a vacuum test or an exfiltration test on all manholes.
   2. All testing must be performed in the presence of the Engineer.
   3. Suitably plug all pipes entering each manhole and brace plugs to prevent blow out.

B. Exfiltration Tests After Backfilling:
   1. Fill each manhole with water to the top of the manhole frame.
   2. A period of up to 2 hours may be permitted, if the Contractor so wishes, to allow for absorption.
   3. At the end of the absorption period, refill each manhole with water to the top of the manhole frame and begin the 8-hour test period.
   4. At the end of the S-hour test period, refill each manhole to the top of the manhole frame and measure the volume of water added. The leakage for each manhole shall not exceed 1/16 gallon per foot of diameter per vertical foot (above ground water) per S-hour period.

C. Infiltration Tests:
   1. When the groundwater is above the bottom of the manhole, infiltration testing may be performed on that portion of the manhole below water level.
   2. After a 60-minute period, if no water is visibly moving down the interior surfaces of a manhole, the portion of the manhole below groundwater may be considered to be satisfactorily watertight.
   3. The remaining portion above the groundwater level must be tested for exfiltration as specified above.

D. Vacuum Test:
   1. The manhole shall be tested by a vacuum test after assembly of the manhole, connection piping and backfilling.
   2. Plug all lifting holes completely with non-shrink grout.
   3. Properly tighten all boot clamps and brace all plugs to prevent them from being sucked into the manhole.
   4. Install the testing equipment according to the manufacturer's instructions.
   5. A vacuum of 10 inches of Hg shall be drawn on the manhole and the loss of 1 inch of Hg vacuum timed. The manhole shall be considered to have passed the test if the time for the loss of 1 inch of Hg vacuum is two (2) minutes or longer.
   6. If the manhole fails the initial test, the Contractor shall locate the leak(s) and make repairs. The manhole shall be retested until a satisfactory test result is obtained.
   7. If a satisfactory vacuum test cannot be obtained, the manhole shall be water exfiltration tested and repaired as necessary.

E. Manhole Repairs:
   1. Correct leakage by reconstruction, replacement of gaskets &/or other methods as approved by the Engineer.
   2. The use of lead-wool or expanding mortar will not be permitted.

F. After the manholes have been backfilled and prior to final acceptance, any signs of leaks or weeping visible inside the manholes shall be repaired and the manhole made watertight.

END OF SECTION

SECTION 02630

POLYVINYL CHLORIDE (PVC) DRAINAGE PIPE

PART 1 - GENTRAL

1.1 DESCRIPTION

A. Work Included: Furnish and install PVC drainage pipe and fittings of the type (s) and size (s) and in the location (s) shown on the Drawings and as specified herein.

B. Related Work Specified Elsewhere: 'Pipe & Pipe Fittings - General" is specified in this Division.

1.2 OUALITY ASSURANCE

A. Standards:
   1. Pipe and fittings (interior) shall conform to ASTM D-2665.
   2. Pipe and fittings (exterior) shall conform to ASTM D-3034.
   3. Solvent cement shall meet the requirements of ASTM D-2564.
   4. Shall have NSF seal of approval.

B. Acceptable Manufacturers:
   1. Certain-Teed Products, Corp.
   2. J-M Manufacturing.
   3. Harvel.
   4. Cabot.
   5. Or approved equal.

PART 2- PRODUCTS

2.1 MATERIALS

A. Pipe Outside Buildings:
   1. Pipe & Fittings:
      a. Virgin Type I, Grade I, or Type I, Grade 2 or as shown on the Drawings.
      b. Pipe and Fittings: Gasketed style utilizing twin gasket coupling or single gasket bell and spigot type.
      c. Pipe Lengths: Laying length of 20 feet minimum.

B. Piping Inside Building:
   1. Pipe and Fittings:
      a. Solvent weld type with drainage type fittings.
      b. Type I, Grade I, or Type I, Grade 2 or as shown on the Drawings.
   2. Joints:
      a. Solvent weld using approved pipe manufacturer's solvent.
      b. Couplings: Same schedule as pipe.

C. Adapters: When applicable, provide adapters for connecting PVC to pipe constructed from other materials.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Jointing:
   1. Clear each pipe length, coupling and fitting of all debris and dirt before installing.
   2. Provide and use coupling pullers for joining the pipe.
   3. Shove home each length of pipe against the pipe previously laid and hold securely in position.
   4. Do not pull or cramp joints.

B. Fabrication:
   1. Cutting:
      a. Use a hand saw or pipe cutter with blades (not rollers).
      b. Examine all cut ends for possible cracks caused by cuffing.
   2. Connecting:
      a. Solvent weld connections as recommended by the manufacturer.
      b. Connect pipe and fittings only when temperature is above the minimum recommended by the manufacturer.
      c. Threaded adapters shall be connected only with plastic male into metal female.

END OF SECTION

SECTION 02650

BURIED UTILITY MARKINGS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:
   1. This work shall consist of providing utility line markings installed above all buried lines installed as part of this contract as indicated on the Drawings and replacing existing markings disturbed as part of this contract.

B. Related Work Specified Elsewhere:
   1. Pipe, excavation, backfill, insulation are specified in the appropriate Sections in this Division.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials and color shall be in accordance with latest AASHTO specifications for pipe and utility marking.

B. For ferrous pipe material use 0.004" minimum polyethylene film; 6" wide clearly marking type of buried utility

C. For non-ferrous pipe material (e.g. Concrete, PVC, PE, etc.) use detection tape composite of polyethylene and metallic core 6" wide clearly marking type of buried utility.

D. Seton Identification Products, New Haven, CT, or equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Marking tape shall be installed over utility lines centerline and buried 24" below grade.

B. Markings damaged during opening of trench shall be reinstalled with 2' overlap at broken sections.

END OF SECTION

SECTION I: General Information

A. PLANS AND SPECIFICATIONS

1. SUBMITTALS:

An applicant proposing to construct a water and or sewerage system for public use and dedication to the Portland Water District shall submit 1 set of plans and specifications to Asset Management and Planning Department, 225 Douglass St, Portland ME 04104. The plans shall show plan and profile of the proposed water or sewer main, pump station plan and details, right of way boundaries, other utilities, limits of paving, ledge profile or test borings and any other physical or topographical feature relevant to the installation and maintenance of the main or pump station.

All drawings, specifications and engineer's reports submitted for approval shall be prepared by or under the supervision of a registered professional engineer or others legally qualified to practice in the State of Maine. A cover letter shall be submitted with each set of plans and specifications giving a description of work.

2. REVIEW:

The District's goal is to review plans within thirty (30) days after receipt. An ability to serve letter will be issued to the applicant within this period. Comments will be returned to the consultant. If the applicant does not respond within sixty (60) days, the plans shall be considered inactive. In such cases a new submission shall be made. All plans will be stamped upon receipt and reviewed in order of receipt.

3. APPROVAL:

Following review and approval, plans shall be stamped "approved" and a letter of approval shall be issued to the developer or their agent. Approvals are valid for a period of eighteen (18) months from date of issue. If construction is not in progress at the end of that period, District approval is void. Plans and specifications may have to be submitted as a new project, if deemed necessary by the District to conform to the most current specifications.

4. FINAL PLANS FOR CONSTRUCTION:

Prior to construction submit two paper sets depicting approved water and or sewer main/pump station configuration and an electronic version in AutoCad format of the final Planning Board signed plans. No construction shall begin or inspector assigned until these plans are received by the District.

Where available, control shall be based on the Maine State Plane Coordinate System NAD 1983 West.

B. PROJECT ACCEPTANCE

Water

Upon completion the utilities must be dedicated to the District. A Certificate of Title and Project Acceptance form must be executed. Water mains shall not be activated until final inspection is complete. Upon final inspection and approval of the facilities and satisfaction of all District requirements, the District will accept the facilities in writing. The developer will be responsible for any repairs as a result of construction or defects for a period of one (1) year from date of acceptance. Any charges incurred during that year shall be paid by the Developer. A District inspector shall be present for all repair work.

Wastewater

Final acceptance will be in accordance with existing Contractual arrangements with the respective municipality. All systems must be installed in accordance with District standard details, specifications, submitted design information and design specifications. 1 set of 24" x 36" as-built reproducible mylars and an electronic version in either .dxf of .dwg format shall be provided prior to acceptance.

C. EASEMENTS

Easements shall be required for all water mains, sewer lines and appurtenances except where installed within the public way of the State or the Municipality. Such easements shall not be less than forty (40) feet in width. Combined water and sewer easements shall be not less than forty (40) feet in width with both pipes ten (10) feet from the edges of the easement. The District reserves the right to require additional easement width if construction and maintenance activities require it. All easements shall include the right of ingress and egress as well as the right to install and maintain water and sewer lines. If necessary, easements shall extend to adjacent properties for orderly extensions of service.

All appurtenances (blow-offs, hydrants, etc.), if not within the pipeline easement limits, shall be provided with an easement ten (10) feet by ten (10) feet centered around the appurtenance.

No buildings or permanent structures shall be constructed within the easement, except if the easement includes a roadway. In a roadway easement, pavement and other utilities will be allowed. Any utility crossings shall be generally perpendicular and shall maintain a vertical separation of one (1) foot except as noted below in Section D.

No trees, shrubs, structures, fences or obstacles shall be placed within an easement that would render the easement inaccessible by equipment. Any person who constructs a structure within the utility easement shall be liable for the cost of removal and/or any damage to the utility.

D. SEPARATION OF WATER AND SEWER LINES

1. There shall be no physical connection between a drinking water supply line and a sewer or appurtenance.

2. Water lines shall be laid at least ten (10) feet horizontally from a sewer or sewer manhole whenever possible; the distance measured from edge to edge. When local conditions prevent a horizontal separation of ten (10) feet, the water line may be laid closer to a sewer or sewer manhole provided that:

    a) The bottom (invert) of the water main shall be eighteen (18) inches above the top of the sewer and the edge to edge distance shall be no less than five (5) feet.
    b) Where this vertical/horizontal separation cannot be obtained, the sewer shall be constructed of AWWA approved Ductile Iron water pipe, pressure tested without leakage prior to backfilling.

3. Water lines crossing sewers shall be laid to provide a separation of at least eighteen (18) inches between the bottom of the water line and the top of the sewer, whenever possible. When local conditions prevent this vertical separation, the following construction shall be used:

    a) Sewers passing over or under water lines shall be constructed of AWWA approved Ductile Iron water pipe.

    b) Water lines passing under sewers shall, in addition, be protected by the following:

        i. A vertical separation of at least (18) eighteen inches between the bottom of the sewer and the top of the water line.
        ii. Adequate structural support for the sewers to prevent excessive deflection of the joints and the settling on and breaking of the water line.
        iii. One full length of waterline be centered at the point of the crossing so that the joints shall be equidistant and as far as possible from the sewer.

SECTION II: Work Associated With Water Line Construction

A. GENERAL

1. MAIN EXTENSION AGREEMENT:

After final plans depicting the approved water main configuration and right of way and or easements have been received, the District and the developer/contractor shall enter into a main extension agreement. At this time, the developer will deposit the following estimated fees:

a) ***Public Fire Protection Fee:***
($2.80/ft for all towns except Raymond and Scarborough, $5.60/ft for these two towns) This fee applies when a main can be extended in the future beyond the end of the main extension in an existing local or state road. The footage is the distance from the last hydrant installed to the end of the main. This allows the prorated share of the cost of a future hydrant to be escrowed and applied to the installation cost when installed.

b) ***Planning & Engineering Fee:***
This fee is estimated based on the size and complexity of the project.

c) ***Inspection Fee:***
$300/day (estimated)

d) ***Service Application Fee:***
$25/service

e) ***5/8" Meter Installation Fee:***
$139/service (cost for larger size meters available upon request)

f) ***Main Application Fee:***
$100

g) ***M.D.O.T. Street Opening Permit Fees (if applicable).***
State opening permit must be obtained by P.W.D.

After the project is completed, the District will reconcile all costs associated with the project and either provide a refund if total costs are less than the deposited amount or request payment for costs in excess of the deposited amount.

2. LEGAL LOCATION PERMITS:

The Developer or agent shall submit a legal location permit (state or municipal) to the District. The District will sign the permit and submit to the State or Municipality.

3. INSPECTION:

An inspector from the District or a consultant working for the District will be assigned to each project to ensure that all work is completed and materials are installed in compliance with these specifications. All work must be inspected prior to backfilling. During the course of the work the inspector will report to the Engineering Supervisor on the progress of the work. Any deviation from the approved plans or specifications must be approved by the District before incorporation into the work.

The Contractor shall schedule with the District for inspection services a minimum of 5 working days prior to construction.

B. DESIGN CRITERIA

1. PIPE SIZE/TYPE:

All distribution mains 4" and larger shall be ductile iron per material specifications except under special site conditions where the District will specify a different pipe type or wrapping of the ductile iron. All distribution mains smaller than 4" shall be P.V.C. per material specifications. All main distribution pipe lines shall be of a size to adequately serve the needs of the proposed development and any potential extensions thereof, but in any event shall not be less than eight (8) inches in diameter except as may otherwise be permitted herein:

The minimum size of the pipe where public fire protection is to be provided or required shall be eight (8) inches in diameter. Dead-ends shall be minimized by looping all mains where practical. Where dead-ends are necessary they shall be provided with a fire hydrant, or blow-off assembly. The nominal pipe diameter of water mains without public fire protection shall not be less than four (4) inches.

The District may request that the size of the main be increased beyond the required size for the project. This is sometimes necessary to facilitate the future expansion of the system beyond the scope of the developer's project. In this case the District will pay to the developer the difference in cost between the two sizes.

2. DEPTH OF COVER:

Water pipe shall be laid with a cover of five and one-half (5 ½') feet measured from established finished grade to the top of the pipe. The contractor shall establish adequate elevation control to ensure that upon final grading 5 ½' of cover over water lines has been maintained. It shall be the Contractor's responsibility and expense to verify the cover at any location questioned by the District. Any potential changes in alignment or grade of roadways shall be considered in the original utility design. Any deviation from the 5 ½' of cover shall be approved by the Engineering Supervisor.

3. GATE VALVE LOCATIONS:

Gate valves shall be installed at all pipe junctions and street intersections in such a manner as to control and cut off flows in all segments of the system. A minimum of two (2) valves are required at tees. A valve may be required beyond the last service if the main can be extended in the future. In all other areas gate valves will be required every 1000 feet, except as otherwise may be approved by the District. Additional gate valves may be required under certain situations, such as looped systems, where it is necessary to isolate certain sections of the system.

4. PRESSURE/FLOW REQUIREMENTS:

All distribution systems shall be capable of providing a minimum working pressure of 40 p.s.i. at each service connection under maximum day demand conditions, plus the required fire flow as determined by the Insurance Services Office (ISO) or the local fire department. The consultant will provide the estimated peak demand for the project and the District will determine whether the project meets the pressure/flow requirements.

In the event that the 40 p.s.i. minimum pressure cannot be met, the developer/owner can request limited service for each service connection in question. The District will determine whether adequate conditions exist to grant limited service.

C. WATER LINE CONSTRUCTION

1. DUTIES OF THE CONTRACTOR:

Install the water mains so as to supply the District, upon completion, with a satisfactory, watertight pipeline, laid to proper line and grade, and in accordance with these specifications and approved plans to the satisfaction of the District, and will leave the site in condition which is suitable, not only to the District, but to those abutting the right-of-way, right-of-way grantors, and any municipal or state authorities having jurisdiction over the areas involved.

Obtain all street opening permits from cities or towns covering any pipelines to be laid in the public way and shall be responsible for fees levied by any regulatory agencies which are applicable to the work covered by this specification.

Establish line and grade for the pipeline and right-of-way boundaries where the pipeline is to be laid in right-of-way outside of a public way.

Familiarize himself with all obstructions which he can foresee, such as existing pipes, services, conduits, ducts, sewers or any other such obstructions which might interfere with the construction, and he agrees to make arrangements with the owners of such facilities so as to save the District harmless from any damages thereto caused by his operations and to make whatever arrangements might be necessary to move or remove and replace these facilities so as to permit the construction of this pipeline, all at his own expense.

Purchase all pipe, fittings, valves, gaskets and piping accessories, including but not limited to services, air valves and hydrants, in accordance with District specifications.

Make any changes which may be required, such as the removing or restoring of the property of others in the land through which this line will cross in right-of-way or otherwise. The Contractor will place all pipe, fittings, valves and all the attendant facilities in place in the proper trench, to proper line and to proper grade, as called for in the plans and specifications and to the satisfaction of the District's representative.

Make all connections to the District system in accordance with standard District practice and under District inspection. The Contractor must disinfect all tools or equipment coming in contact with the water in a 5% hypochlorite solution.

Provide trench and excavation for the purpose of testing, chlorinating, and connecting the new main into existing pipe and promptly backfill such trench and patch and restore the surface as necessary. Provide and maintain trench barricades, warning signs, warning lights, traffic control, as required by applicable safety regulations and organizations with jurisdiction over traffic control.

Shall perform leakage tests and disinfect the completed main.

Upon completion of the work to the District's satisfaction, transfer to the District, free and clear of liens, damage claims or law suits all right, title and interest to all piping and appurtenances.

The following specifications for the performance of the work are part applicable, but do not necessarily constitute the full and complete specifications for the work. Such reasonable additional requirements as the Engineer may specify must be followed.

No valve, hydrant or other facility of the Portland Water District shall be operated by the Contractor or his agents. The District will, upon reasonable request of the Contractor, furnish men and equipment for such activity.

Provide a minimum of 4 days notice to the District prior to any required shutdown.

2. INSTALLATION OF TEMPORARY WATER SYSTEMS:

In order to maintain uninterrupted water service to District customers, the Contractor shall provide temporary above ground water systems. The temporary water systems consist of mains, services and fire department outlets. The above ground systems shall be installed only for the duration of deep water main replacement and removed promptly after main replacement is complete. Connections to an existing water source shall be installed and provided by the District. All material for the temporary water systems, except as otherwise indicated, shall be supplied by the contractor. Currently the District has approved 2 manufacturers for the temporary mains and 100-psi poly tube for individual services. Only authorized District personnel shall operate control valves attached to these systems.

Temporary Water Systems Approved Pipe

Certainteed Certa-Lok Yellowmine	Restrained Joint PVC pressure pipe and fittings
AquaMine (Victaulic Co)	Restrained Joint PVC pressure pipe and fittings

Temporary above ground water mains shall be installed in a manner to both protect the public water supply and to minimize customer service interruption. To allow the District to notify it's affected customers, the Contractor shall provide the District a minimum of 5 working days notice prior to installing any temporary lines.

The size and approximate location of the temporary systems are shown on the drawings.. The Contractor must obtain the approval of the District for any changes prior to installation of the system.

Temporary mains shall typically be installed behind sidewalks or along the edge, and within the public right of way. The mains shall follow a uniform straight course and shall not bow to accommodate long sections of pipe. Temporary mains shall not be installed on private property. The route of services lines installed from the mains to houses shall be acceptable to the property owner.

The Contractor shall follow the pipe manufactures installation guidelines when installing temporary systems. Additionally, an approved joint lubrication for the installation of potable water pipe shall be used on all joints prior to connecting pipe.

Source: The District will provide necessary connections at fire hydrants including an approved backflow device and meter. A chlorine tap will also be provided.

Disinfections: All 2" diameter and larger temporary mains shall be chlorinated, sampled, and tested for bacteria prior to activating any portion of the temporary mains. (See disinfection specification for deep mains).

Leakage test: All systems shall be watertight. A static pressure test shall be performed on all systems prior to disinfecting any portion of the system.

Test Procedure

1. Install a pressure gauge at furthest end of the system.
2. Open main feed valve to fully charge the system with water and bleed all air.
3. Record the static pressure reading.
4. Close main feed valve.
5. The system must hold static pressure for a minimum of 30 minutes.

Driveway crossings: A gravel or cold patch raised berm shall be placed over temporary mains to prevent vehicles from dragging along the ridge.

Sidewalk crossings: A gravel or cold patch raised berm shall be placed over temporary mains to eliminate tripping hazards. In areas where the berm would prevent rainwater drainage plywood ramps shall be installed the full width of the sidewalk and over the temporary mains

Roadway crossings: Temporary mains shall be buried just below the surface of the roadway. The pipe shall be protected with clean sand or material free from rocks, as the rocks tend to punch through the pipe when exposed to heavy traffic. The use of cold patch or QPR as fill material is acceptable.

Curbing or esplanade rise: To accommodate curb rise, pre-fabricated certa-lock bends and/or elbows shall be used. Sweeping or bending the actual pipe is not an acceptable method unless the sweep lies flat on the ground and is not obstructing walkways. A traffic barrel shall be placed near the curb at offset connections to protect the offsets from being damaged by vehicles.

Cutting pipe: Follow manufacturer's installation instructions. All joints, including those on cut lengths of pipe, shall be grooved to provide a restrained joint. Pre-fabricated bends, elbows, and tees shall be used when changing direction.

Blow off: A 1" blow off shall be installed at the ends of all temporary mains. The blow off shall be constructed using a 1" brass female curb stop.

Isolation valves: Shall be 2" brass female curb stops for 2" mains and 4" resilient wedge valves for 4" mains (grip rings shall be used for 4" valves). Valves shall be located as shown on the plan. The valves are attached to the mains using pre-fabricated adapters.

Service line connections: All temporary individual service lines shall be ¾" poly tube rated at a minimum working pressure of 100 psi. The service lines shall be connected to a 2"x 3/4" factory tapped restrained joint coupling, then a ¾" close brass nipple, a ¾" female curb stop and a brass poly tube adapter ¾" insert x male. The tube shall be extended to a sill cock (outside faucet) and connected using the same poly tube adapter. Prior to connecting the service, a garden hose connection, including a brass boiler drain or sill cock valve shall be installed in the line. All service lines shall be flushed prior to activating mains. *See Detail sheets (1,2,3)*

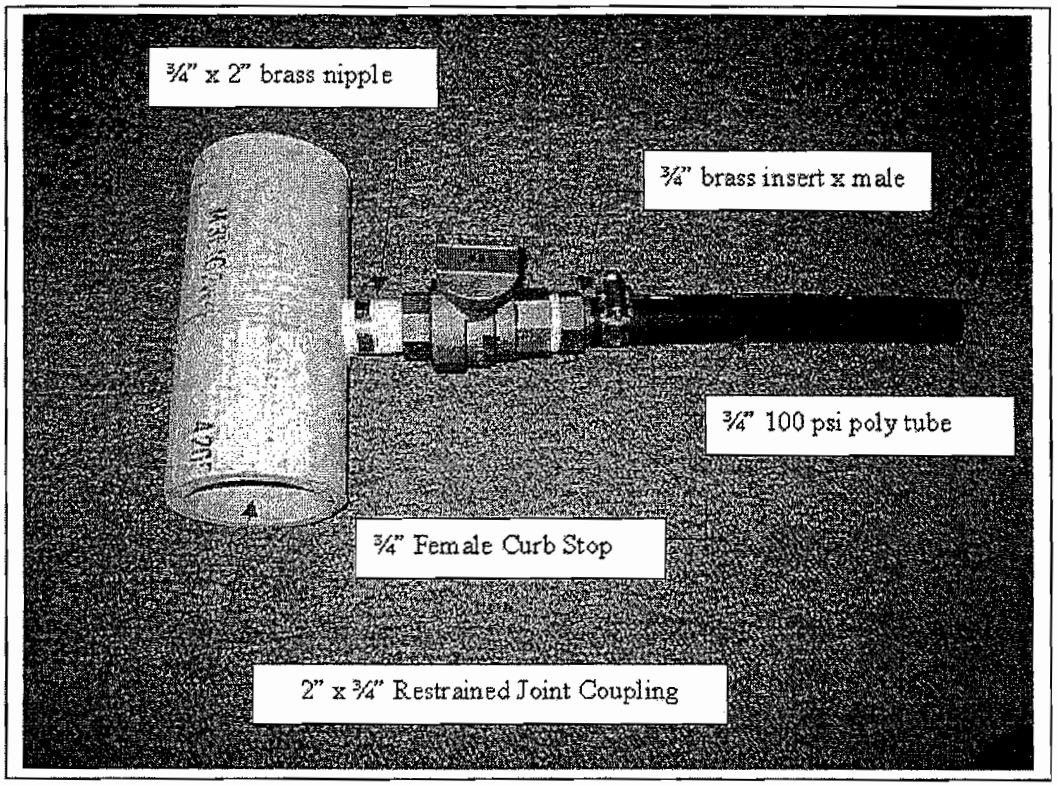
Anti-siphon sill cocks: Only District authorized personnel shall disassemble anti-siphon sill cocks. Excavating and connecting into existing deep service lines may be required where properties have malfunctioning sill cocks or no exterior plumbing.

Shutting off meters
After activating the temporary lines, all meters shall be shut off. Only District authorized personnel may de-activate meters.

Maintenance of temporary water systems: The contractor shall be responsible for maintaining the temporary systems during the regular workday including making repairs to the systems. The District's Inspector must be on site prior to any work, or repairs being performed on the temporary water systems. District crews will respond to all after hour's emergencies. All affected customers shall be notified as soon as possible prior to any service interruption.
It is expected that contractors will keep an inventory of readily available repair parts on hand enabling them to quickly respond to any type of problem. Restrained joints shall be maintained. The use of non-restrained joint couplings is prohibited. Joint leaks shall be cut out. The use of stainless steel wrap around repair clamps over pinholes is acceptable.

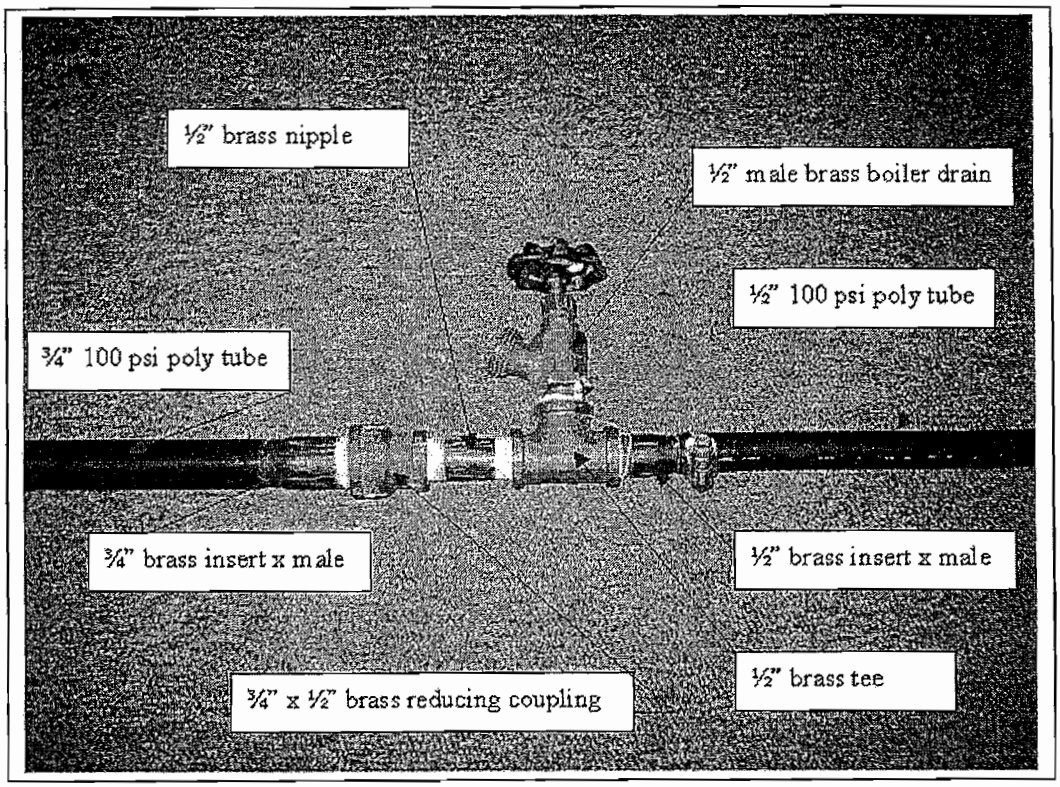
2" x ¾" Factory Tapped Restrained Joint Coupling
and associated fittings.

(Section 1)



Temporary service line boiler drain assembly used for customer garden hose connection.

(Section 2)

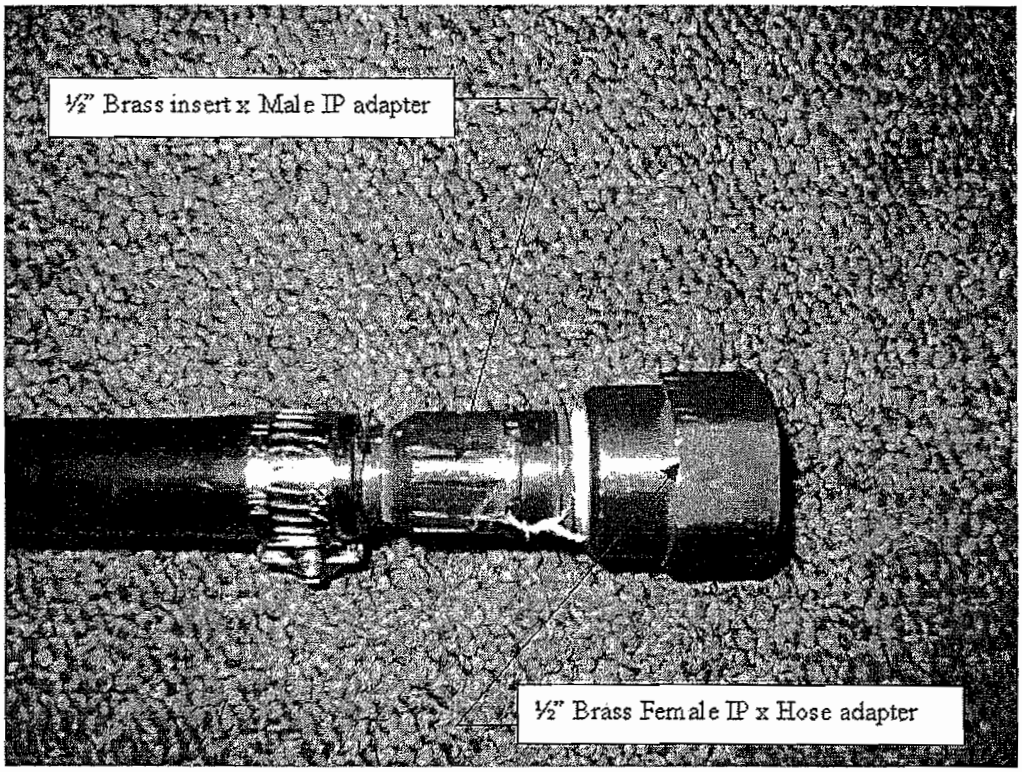


Temporary water Service – Final Connection to customer sill cock

The final house connection shall be a non-swivel, rigid connection as shown.

(Section 3)

revised 7-10-03



3. EXCAVATION:

The Contractor will make application for all necessary street or highway opening permits necessary for the pursuit of the work. No street or highway opening shall be made by the Contractor until the appropriate permit has been received and is in hand, and when such opening shall be made, it shall be done in strict accordance with the terms of the permit.

When any pavement, regardless of type, must be cut, it shall be done in a neat and symmetrical manner by use of a saw, chisel, or other suitable method. In no case shall pavement be torn up with a backhoe bucket except between and inside of cuts previously made as above. Should any further pavement be broken, outside of the cuts, as by blasting, such damaged pavement shall be cut out in a neat and orderly fashion.

The trench shall be dug so that the pipe can be laid to the alignment and depth required and shall be excavated in advance only to the extent necessary for the proper pursuit of the work; the amount excavated ahead may be controlled by the District representative. The trench shall be kept dewatered, such that no drainage water shall enter the pipe, and the end of the pipe shall be temporarily plugged off at night or over weekends, or whenever the work is suspended, or in cases where unstable material could cause a cave-in to enter into the exposed end of the pipe. The trench width shall be the minimum necessary to properly lay and joint the pipe, permitting whatever bracing or sheathing may be necessary in unstable material. The bottom of the trench shall be smooth and even and should be as nearly undisturbed as possible so that the barrel of the pipe may be laid in a flat bottom trench on good solid material. Shallow holes should be dug at the joints so that the barrel of the pipe shall be in contact as much as possible with the solid floor of the trench. In ledge installation or in boulders or other large stones, there shall be at least 6" clearance between the barrel of the pipe and any ledge. These clearances are the minimum to be permitted between any part of the pipe or appurtenance being laid and any part or projection or point of a rock, boulder or stone. The bottom of the trench may for a short distance, near the center of the pipe length, be left slightly low to permit the withdrawal of the slings with which the pipe is placed in the trench. This material shall be replaced and compacted mechanically when the pipe is in place. Likewise, if for any reason the bottom of the trench should be excavated below the desired grade, suitable material may be replaced to bring the bottom of the trench up to the proper grade before pipe is put in place. This material is to be mechanically compacted so as to give it a smooth, solid base for the pipe, subject to the approval of the District representative. When the bottom of the trench at subgrade is found to be unstable or to include cinders or other types of refuse, or vegetable or other organic material, or large pieces or fragments of inorganic material or stone or rock, any such undesirable material shall be removed and replaced with suitable material before the pipe is placed. Such material as is used to replace unsuitable material in a trench bottom shall be compacted in layers of no more than 8" by mechanical means before the pipe is placed on it. In the case of unstable material, the District inspector may, at his discretion, order crushed stone or gravel to be used to stabilize the pipe bed before pipe is placed in the trench.

All structural excavations and trenches shall be sheeted or braced as required for the safe pursuit of the work, the protection of structures, the protection of other utilities, and as required by any Federal, state or municipal laws, ordinances or regulations.

The Contractor shall be responsible for the design, adequacy and maintenance of all sheeting, sheet piling, bracing or other temporary structures or supports required.

When the sheeting or shoring cannot be removed without endangering the new work, other structures or the security of the banks, it shall be left in place.

4. PIPE LAYING:

4.1 Handling of Materials into Trench

Proper implements, tools and facilities shall be provided and used by the Contractor for the safe and convenient handling of all materials. Pipe fittings and accessories shall be carefully lowered into the trench, piece by piece, by means of derrick, crane, slings and other suitable tools and equipment, in a manner such as to prevent damage to the material or to its protective coating and linings. No chain or slings shall be passed through the inside bore of any pipe or valve or fitting. Under no circumstances shall piping materials be dropped or dumped into the trench.

4.2 Cleaning of Materials

All lumps, blisters, excess coating material or other foreign matter shall be removed or cleaned from the pipe, with particular attention being given to the spigot end, which enters into the bell of the next adjacent pipe. Also, the inside of the bell shall be cleaned and wiped dry and clean before any joint material is applied to it. All foreign matter shall be removed from the inside of pipe, fittings, valves, and the interior cleaned and kept clean. Particular attention shall be given to the cleaning of surfaces to which gaskets are to be applied, and especially to the inside grooving of the push-on pipe bells.

4.3 Laying Pipe

Every possible precaution shall be taken to prevent foreign material from entering into the pipe as it is being placed in the trench. Likewise, no foreign matter shall be allowed to enter into the joint area between pipes. If there is any question as to foreign material having gotten into the joint, the joint shall be taken apart and checked and made up again in the proper manner. The inside of every pipe, as it is lowered into the trench, shall be checked for any dirt or stone or other debris, or any material whatsoever which may be inside the pipe, and such extraneous material shall be cleared out and the pipe made completely clean before it is jointed into the next pipe in the trench. Precautions shall be taken such that no backfill material shall enter the open end of the pipe already laid in the trench, and every effort shall be made to prevent trench water from entering the pipe. Whenever pipe laying is not in progress, a watertight plug or other effective means shall be used for keeping any extraneous material from entering into the pipe. Any water in the trench shall be kept down by pumps, such that it will be below the invert of the pipe already laid. Sump holes may be dug in the bottom of the trench, off center of the pipe, for the purpose of keeping the pump suction below the gradient of the bottom of the pipe. No pipe shall be laid in water or when, in the opinion of the PWD representative, conditions are not suitable for laying.

4.4 Cutting Pipe

Any pipe which must necessarily be cut on the job in order to put fittings, valves or other accessories in the proper place, shall be done in a workmanlike manner satisfactory to the District. In case of "push-on" joint pipe, proper chamfering must be done on the ends of any cut pipe before an attempt is made to enter it into a bell. In the case of mechanical joints, a smooth, square, neat cut must be made. On Ductile iron pipe a saw or abrasive wheel type of equipment shall be used. On cast iron pipe smaller than 12", wheel cutters or other approved method may be used, but in no case shall any cement lining of iron pipe be harmed in the cutting. No so-called "cold cutters" will be allowed on the job. All cuts shall be square and even, with no ragged, rough ends. Any unevenness shall be ground smooth. Pipe shall be cut no closer than 2' from the bell.

4.5 Bell Ends To Face Direction Of Laying

The pipe shall be laid with the bell ends facing the direction of the laying, unless otherwise permitted by the District.

4.6 Blocking

Permanent blocking necessary to support the pipe in the trench shall be done only with specific authorization and approval of the District. Temporary blocking under valves and fittings for support prior to the building of permanent supports or anchors is allowed.

4.7 Jointing Of Pipe

All joint areas on the pipe shall be cleaned and free from irregularities before an attempt is made to make up any joints. Joints, when made, shall be done in the manner prescribed by the manufacturer of

the pipe. In the case of rubber gasket joints, these joints shall be made up in accordance with the American Standard specifications for the jointing of cast iron pressure pipe and fittings including torque. ASA #A21.11 (AWWA #C111).

In the case of flanged joints, flange faces shall be thoroughly cleaned before making up such joints, so that no paint globs or any other projections or rust or other foreign matter remain on the faces of the flanges and that they are smooth, clean iron. Bolts and nuts shall be tightened evenly, being tightened in pairs on opposite sides of the pipe, until all are equally torqued. When completely tightened, the bolts should be long enough so that all nuts are "full".

Solid long body sleeves per specifications shall be used when connecting new pipe of all sizes. When joining a new section of pipe to an existing section of unknown O.D., a "duo" sleeve shall be used for sizes up to and including 16". The "duo" sleeve will accommodate the increased O.D. of older cast iron pipe. For connecting to a section of pipe with an unknown O.D. above 16", an approved steel coupling may be used. The existing pipe O.D. shall be measured prior to ordering the coupling.

4.8 Permissible Deflection of Joints

Whenever it may be necessary to deflect pipe from a straight line, either vertically, horizontally, or other direction to change the direction of laying, in all sizes 12" and smaller, the allowable deflection shall be 3 degrees per joint, or 16 inches per 20' length; in larger sizes, 1 1/2 degrees, or 6 inches per 20' length. Every possible precaution shall be taken to be sure that each joint is properly made up and that the pipe is "home".

4.9 Setting Valves & Fittings

All valves, fittings, plugs and/or caps shall be set and jointed into the pipe, and blocked and anchored as shown on the plans. The location of these features along the line shall be in accordance with the general plans for the pipeline. Any unconnected outlets shall be valved and securely plugged with adequate and appropriate pipe plugs or blind flanges, as called for on the plans (See Sec 4.14). 'Mechanical Joint' bends, plugs, sleeves and caps shall be restrained with a PWD approved restrainer.

4.10 Valve Boxes (See Standard Detail)

All valves 12" and smaller shall be fitted with a standard valve box set so as to not come in contact with the valve body and concentric with the operating nut, straight, square and plumb. The top shall be set to the proper surface grade and, after backfilling and settlement have taken place, these valve box top sections shall be straightened, reset or adjusted as necessary. All valves shall be supplied with proper boxes and/or chambers, as called for in the plans and these specifications. At least two permanent location measurements to the valve must be obtained. Backfill around valve boxes shall be mechanically tamped within a five-foot radius of the valve box. Backfill at valve chambers shall be mechanically tamped for a distance of 30 feet along the trench, both upstream and downstream from the ends of the chamber.

4.11 Hydrants

Hydrants shall be installed in accordance with the District's standard details. The hydrant tee and the hydrant base shall be appropriately braced. Trenching for hydrant and branch shall be done in accordance with Section 3 herein. All appurtenant piping and jointing shall be done in accordance with Section 4 herein.

4.12 Services

Services shall be tapped on the side of the main in accordance with the District's standard details. Service piping shall be copper and conform to the Maine State Plumbing Code for buried cold water service lines. Enough slack shall be placed in the material to prevent stretching or pulling from main. A service shut off (curb stop) with rod shall be placed in a service box 6" from the right of way line in the public way. Any service box located in a paved area except sidewalks shall be installed inside a full sized gate box top section. At least two permanent location measurements to the service shut off must be obtained. Services shall have 5-1/2 feet of cover along the entire length of the service. For new main extensions, the service shall be installed at the center of the lot to be served. The only exception will be when a foundation is already on the lot. In that case, the service can be installed anywhere along the foundation frontage to the road. For new services installed on existing mains, the service shall be installed a minimum of 10 feet from the property line. One inch and three quarter inch corporations shall be threaded into the main. One and a half and two inch corporations shall be

threaded into an approved tapping saddle. Trenching and backfilling shall be done in accordance with Sections 3 and 5 herein. All fire services greater than 2" that have a domestic service tapped at the street line (combined service) shall have individual shut-offs (fire and domestic) at the street line. Additional gate valves may be necessary under certain situations. Any such combined service shall require chlorination/dechlorination. All domestic services 2" and larger shall require chlorination/dechlorination.

4.13 Protective Wrapping

Where shown on the plans, special plastic sleeves or envelopes shall be slipped over the pipe and sealed together with plastic adhesive tape. Care shall be exercised such that these sleeves shall be intact and sealed together when backfill is placed, and during the backfill operation, likewise, care shall be taken not to puncture the material.

4.14 Pipe Endings

ALL dead-end sections of pipe shall end with a hydrant where possible; otherwise a blow off. This shall include all stubs (including fire services 4" and larger) as well as the main runs.

4.15 Abandoning Pipe & Services

All abandoned water mains shall be terminated with a mechanical joint cap or push-on plug. No brick and mortar will be allowed. Abandon service pipe by shutting corporation and cutting pipe close to the corporation. The associated curb stop, box and rod shall be removed. For water service lines larger than 2", and all hydrants, mains and valves, the connection at the main shall be excavated and removed and a solid piece of pipe sleeved into its place.

5. BACKFILLING:

5.1 Material

All backfill material shall be free from cinders, ashes, refuse, organic matter, boulders, rocks, stones or other material which, in the opinion of the District, is unsuitable for the purpose. However, from one foot above the top of the pipe to the top of the trench, material containing stones up to 8" in their greatest dimension may be used unless otherwise directed by the District. When the type of backfill material is not otherwise specified on the drawings, the material excavated from the trench may be used as backfill upon its approval by the District, provided that unsuitable stone, etc., as above, are sorted out. Where any specific type of backfill material is indicated on the plans, such notation shall be followed and native material will be hauled away and disposed of to make way for the specified material. Pipe in ledge trench is to be backfilled with select material.

5.2 Backfill In Right-Of-Way (Untraveled)

From a point one foot above the pipe to the surface, backfill material may be placed by machine, but shall be worked over in such a manner as to minimize future settlement of this material. The backfill material shall be mounded up to an excess depth of 3" to 6" over the trench to allow for future settlement, and before the Contractor finishes and the job is accepted, this situation shall be reviewed and any necessary fill added so that there is no depression left due to settlement of the trench at any point. The above is the minimum requirement, and when highway or street requirements are more stringent, such requirements shall be met.

5.3 Backfill Within Public Streets, Highways and Traveled Areas

Backfilling in public right-of-way, along the streets or highways in or along shoulder, berm or backslope shall be done in accordance with the specifications and requirements of the state or municipality, whichever is responsible for the street or highway involved. Responsibility for the fulfillment of permit conditions or any other applicable requirements of the street or highway authority shall be the obligation of the Contractor. Surface restoration shall be carried out to the satisfaction of the street or highway authority or as shown on the plans. The trench shall be topped out with gravel a depth meeting municipal or state specifications.

Where the trench crosses or follows highways, streets or other areas such as driveways, parking areas, etc., or wherever there will be vehicular traffic with or without a pavement over the trench the backfill from a point one foot above the pipe shall be placed in 8" layers if compacted by manual plate equipment or 24" lifts with approved roller type equipment. Compaction of granular material shall be by means of a mechanical vibratory compactor. Other material shall be compacted by pneumatic or other

mechanical compaction methods. In all cases a gravel or stone base shall be placed to a depth at least equal to the existing road base, but in no case less than one foot of depth.

5.4 Backfill In Ledge Trenches

Backfill around the pipe in ledge trench shall be either sand or fine gravel (6" below and 12" above the pipe), but in cases where corrosive conditions may prevail due to the type of ledge or other material which has been excavated, clay may be specified on the plans or by the Engineer. In cases where granular material is used, a complete clay dam shall be put in the backfill at least every 100' along the trench where the surface gradient is other than horizontal.

5.5 Backfilling – Structures

The excavation for thrust blocks and other structures shall be refilled with such of the excavated materials and in such order as may from time to time be directed by the District. Whenever the excavated materials are unsuitable, the Contractor shall furnish suitable backfill materials. This material shall be a uniformly graded bankrun gravel having no stones larger than 6 inches.

The backfill around structures must be carefully placed in layers not to exceed 8" and tamped and brought up evenly around all sides of the structure. The material shall be thoroughly tamped with mechanical or vibratory compactors and water added, if necessary, to obtain 90 percent laboratory density as determined by the Standard Method of Test for Compaction and Density of Soils AASHO Designation T-99.

Backfilling around pipes outside the structures shall be in accordance with the pipe laying specifications.

5.6 Operation In Freezing Weather

In freezing weather, no backfill material which is frozen shall be placed in the trench, but if backfilling must be done, new unfrozen material must be brought to the site and the frozen material disposed of elsewhere.

Should the excavation take place in sustained periods of freezing weather, the sides and bottom of the trench shall be protected to prevent freezing of the material to the satisfaction of the District.

5.7 Open Trench

Backfilling shall follow pipe laying as closely as reasonable, so that a minimum of trench shall be open at any time. The regulations of the highway authorities shall be observed as regards the amount of trench to be open at any one time. Over night, and especially over weekends and holidays, the amount of open trench shall be kept at an absolute minimum. Any caved-in trench, especially after heavy rain and flooding, shall be cleaned out and the bottom consolidated before any additional pipe shall be laid.

6. FILLING AND TESTING:

6.1 Upon completion of backfilling, the Contractor shall fill the pipeline with water from the Portland Water District's system and conduct a pressure and leakage test in accordance with Section 4 of AWWA Standard C600-82 and the following procedures.

6.2 The Contractor shall not operate any existing District valves for filling, flushing or testing the new main. The District will provide the necessary personnel upon request.

6.3 Under the inspection of the District, the Contractor shall slowly fill the new main and ensure that all air has been expelled from the main, hydrants, air valves and service leads. Once all air is expelled, the Contractor shall flush the new main at a minimum velocity of 2.5 feet per second turning the over the volume of water in the main a minimum of 3 times. The "scour" flow rate shall be calculated by the District and verified in the field. The Contractor shall be responsible for all dechlorination and disposal of all flushing water and providing any necessary hoses or equipment for flushing and prevent unnecessary erosion.

6.4 The Contractor shall excavate and provide a tap for pressure and leak testing and chlorination. The chlorine tap shall be installed within ten feet of the source if practical. Otherwise, install the tap immediately outside of existing pavement. The Contractor is responsible for all work associated with

the excavation, including proper trench protection, barricades, traffic control and proper backfilling and compaction upon successful completion of the test. Upon completion of the test all fittings and pipe shall be removed and all corporations shut.

6.5 The Contractor shall conduct the pressure and leak test and provide the required testing equipment after the new main has been properly filled and flushed, unless otherwise arranged with the District.

The pressure and leak test shall be conducted as follows:

a) Purge all air from the line.

b) Decrease pressure in the main to be tested approximately 20 p.s.i. Observe test gauge to ensure the pressure doesn't rise due an existing valve or tapping valve leaking by. This is done to ensure that no undisinfected water from the installed main enters the existing main while performing the actual test.

a) A pressure test pump will be connected to the new main at the testing point. The pressure will be slowly increased to 150 psi and allowed to stabilize (+/- 2.5 psi) for a minimum of 15 minutes.

b) A reservoir of potable water shall be connected to the test pump and the initial level of water recorded.

c) The pump pressure shall be maintained at 150 psi for one hour with all makeup water withdrawn from the reservoir.

d) After one hour, the water level in the reservoir will be measured and the volume of water drawn from the reservoir calculated and compared with the following allowable leakage:

$$\text{Allowable leakage (gal/hr)} = \frac{\text{Pipe length (feet)} \times \text{Nominal diameter (inches)}}{10{,}900}$$

e) If any test discloses leakage greater than that specified above, the Contractor shall, at his own expense, locate and make repairs as necessary until the leakage is within the specified allowance. No repair clamps of any kind will be allowed. Repair shall consist of removing leaking section and replacing with couplings and pipe.

7. DISINFECTION:

7.1 Scope

This specification becomes a standard part of the contract documents and covers the disinfecting and flushing of water mains within the Portland Water District distribution system. Unless specified otherwise, all procedures apply to new mains, cleaned mains, cleaned and relined mains, repaired mains, and mains which have been out of service for a long period of time.

In certain circumstances, the Director of Water Services or designee may waive or alter the requirements in this specification where it is determined that no reasonable threat of contamination constituting a health hazard or aesthetic deterioration exists in the water main in question.

7.2 Keeping the Pipe Clean And Dry

Precautions shall be taken by the Contractor to protect the interiors of pipes, fittings, and valves against contamination:

- Pipe delivered for construction shall be strung and protected so as to prevent entrance of any foreign material.
- Pipe shall not be laid in water, or when trench conditions or weather conditions are unsuitable for such work.

- All openings in the pipeline shall be closed with watertight plugs when pipe laying is stopped at the close of the day's work or for other reasons.
- Joints of all pipe in the trench shall be completed before work is stopped.
- The surface of the joint rings shall be thoroughly cleaned with an approved soap solution and all foreign matter removed from the pipe and fittings before the pipe is lowered in the trench.
- If dirt enters the pipe, it shall be removed and the interior of all affected pipe and fittings shall be swabbed with a 5% Hypochlorite solution or other commercially available household bleach immediately before they are installed.
- Pipes and services in the ground shall be closed off when not under construction.

7.3 Pre-Flushing

The District shall flush the source water, as near the shut off as possible prior to tying-in to ensure that contaminants or debris are not introduced into the new pipe.

7.4 Flushing

The main shall be flushed through a hydrant at the end of the main at a velocity not less than 2.5 ft./sec. If no hydrant is installed at the end of the main, the Contractor shall provide a tap large enough to develop a velocity in the main of at least 2.5 ft./sec. The gallons per minute to achieve 2.5 ft./sec velocities for different diameter pipes are provided in Table 1.

Table 1 Gallons per minute required to obtain 2.5 feet per second flushing velocity

Main Size (in.)	Gallons per minute
6	200
8	400
12	900
16	16000

District water at no cost to the Contractor will be available to the work site for use in disinfecting and flushing mains. The Contractor shall furnish all necessary pipe and hose connections. The Contractor shall exercise care in the use of the water to prevent contamination of the existing water supply. Measures shall be taken prior to flushing to provide adequate drainage during flushing. Drainage shall be away from the main, and flooding of the trench shall be prevented. The volume of water flushed shall be measured or calculated and reported to the District Inspector.

Wherever the conditions allow, the new water main shall be kept isolated from the active distribution system using a physical separation until satisfactory bacteriological testing has been completed and the disinfectant water flushed out. Water required to fill the new main for hydrostatic pressure testing, disinfection, and flushing shall be supplied through a temporary connection between the distribution system and the new main. The temporary connection shall include a double check valve assembly backflow preventer and shall be disconnected (physically separated) from the new main during the hydrostatic pressure test. It will be necessary to reestablish the temporary connection after completion of the hydrostatic pressure test to flush out the disinfectant water prior to final connection of the new main to the distribution system.

7.5 Methods of Disinfection

The Contractor shall disinfect all portions of the water main that was worked on as well as any portion(s) of the network that was taken out-of-service to allow completion of the contract. The chlorine solution to be used must be Sodium Hypochlorite.

NOTE – The use of Calcium Hypochlorite granules left in the main to be dissolved on filling of the main is not an approved method.

The contractor must completely fill out a request for the sanitary release of the pipeline on the appropriate Water Services Department form. On the reverse side of the request form a sketch shall clearly illustrate:

- The section, size, and location of the pipeline for which the request for sanitary release is made;
- The existing main where the new main is to be connected;
- The point of application of the chlorine-water solution;

- The location, type, and size of the sampling points
- Which valves connected to the new location of pipeline is to be open and/or closed during the sampling.

NOTE: The Contractor shall obtain a signature of approval from the Director of Water Services or designee. The Contractor is to give the form with the sketch to the sample collector at time of sampling.

7.5.1 Continuous Feed Method

The continuous feed method consists of completely filling the main to remove all air pockets, flushing the completed main to remove particulates, and filling the main with chlorinated potable water so that after a 24±4-hour holding period in the main there will be a free chlorine residual of not less than 10 mg/L at all locations of the main.

Prior to being chlorinated, the main shall be filled to eliminate air pockets and shall be flushed to remove particulates. The flushing velocity in the main shall be not less than 2.5 ft/sec unless the Director of Water Services or designee determines that conditions do not permit the required flow to be discharged to waste.

NOTE – Flushing is no substitute for preventive measures during construction.

At a point not more than 10 ft. downstream from the beginning of a new main, water entering the new main shall receive a dose of chlorine pumped at a constant rate such that the water at any location will have not less than 25 mg/L of chlorine. To assure that this concentration is provided, the District representative shall measure the chlorine concentration at regular intervals at available blow-offs or hydrants in accordance with procedures described in the current editions of "Standard Methods for the Examination of Water and Wastewater" or using an appropriate chlorine test kit.

Table 2 gives the amount of chlorine required for each 100 ft. of pipe of various diameters. Solutions of 1% chlorine shall be prepared with Sodium Hypochlorite. During the application of chlorine, valves shall be closed so that the strong chlorine solution in the main being treated will not flow into water mains in active service. Chlorine application shall not cease until the entire main is filled with heavily chlorinated water. The chlorinated water shall be retained in the main for at least 24±4 hours, during which time all valves and hydrants in the section treated shall be operated in order to disinfect the appurtenances. At the end of this 24±4-hour period, the treated water in all the portions of the main shall have a residual of not less than 10 mg/L of free chlorine.

Table 2 Chlorine Required to Produce 25 mg/L Concentration in 100 feet of Pipe by diameter

Pipe size (in.)	Volume (gals in 100 feet of Pipe)	15% Chlorine solution gals per 100 feet of Pipe	1% Chlorine solution gals per 100 feet of Pipe
4	65	2 oz.	0.2 (1 ½ pts)
6	150	3 oz.	0.4(1 ½ qts)
8	260	5 oz.	0.6 (2 ½ qts)
10	410	1 cup	1.0 Gal
12	590	1 Pint	1.4
16	920	1Quart	2.3
24	2350	1 ½ Quarts	5.8
30	3680	2 ½ Quarts	9.1
36	5290	0.9	13.0
42	7200	1.2	18.0
48	9400	1.5	23.0
54	11900	2.0	30.0
60	14690	2.5	36.0

NOTE: To make 1% chlorine solution. Using Sodium Hypochlorite, dilute the hypochlorite according to the percent available chlorine on the container. For example, if you have 5%

household bleach, place 1 gallon in 4 gallons of water. You then have 5 gallons of 1% solution.

7.5.2 Slug Method (Emergency Use Only)

At a point not more than 10 ft. downstream from the beginning of the new main, water entering the new main shall receive a dose of chlorine fed at a constant rate such that the water will have not less than 100 mg/L of free chlorine. To assure that this concentration is provided, the District representative shall measure the chlorine concentration at regular intervals along the main where taps and/or hydrants have been provided. The chlorine shall be applied continuously and for sufficient period to develop a solid column or 'slug' of chlorinated water that will, as it moves through the main, expose all interior surfaces to a concentration of approximately 100 mg/L for at least 3 hours.

The free chlorine residual shall be measured in the slug as it moves through the main. If at any time it drops below 50 mg/L, the Contractor shall stop the flow, chlorination equipment shall be relocated at the head of the slug, and as flow is resumed, chlorine shall be applied to restore the free chlorine in the slug to not less than 100 mg/L.

As the chlorinated water flows past fittings and valves, related valves and hydrants shall be operated so as to disinfect appurtenances and pipe branches.

7.6 Flushing After Disinfection

After the applicable retention period, the heavily chlorinated water shall be flushed from the main into the sewer until chlorine measurements show that the concentration in the water leaving the main is no higher than that generally prevailing in the system. Where domestic sewers are not available, the heavily chlorinate shall be dechlorinated. The replacement water shall be allowed to remain in the pipeline for 24 hrs.(+/- 4 hrs.) prior to sampling for physical, bacteriological, and chemical testing.

7.7 Analytical Tests

After the appropriate retention time (24±4 hours or 3 hours for the slug method), after flushing and before the water main is placed into service, a sample or samples shall be collected for sanitary analysis by a District representative. Suitable sample piping shall be furnished by the Contractor to allow sample collection. The sampling point or points shall provide samples, which are representative of the water in all sections of the main for which sanitary approval is requested. All samples shall be collected in a manner as to avoid contamination from the environment surrounding the main. Rubber or synthetic hose shall not be connected to the main to collect a representative sample. The area around the sampling point of the main shall not be filled with water. At least one sample shall be taken from each main, and in the case where a main is greater than 1000 feet, one sample from each 500 feet of line. The samples shall be submitted to the District Laboratory for bacteriological, chemical, and physical analysis. The following analyses shall be completed and reported on the appropriate form. Total chlorine residual, Total Coliform (Membrane Filtration method), pH, and turbidity.

7.8 Final Flushing

Disinfected water mains shall be flushed within 4 hours of being placed into service. Flushing shall be designed to restore water quality to that of the source water, immediately prior to being placed into service. The length of time of flushing shall depend on the size and length of the water main, however at least three volumes of water should flow through the entire length of the main. Pipe volumes can be calculated by using Table 2 and adjusting for the full length of the main.

7.9 Redisinfection

If the initial disinfection and flushing fail to produce satisfactory analytical results, the main may be reflushed and shall be resampled. If check samples show the presence of coliform organisms, then the main shall be rechlorinated by the Contractor, using the continuous feed method of chlorination, until satisfactory results are obtained.

7.10 Miscellaneous

The District Laboratory, at no expense to the Contractor, will analyze two sets of samples. However, should the initial disinfection fail to produce satisfactory samples, a charge of $100 will be made to the Contractor for each set of additional samples required.

7.11 Final Connection

Water mains and appurtenances must be completely installed, flushed, tested for leakage, disinfected, and satisfactory bacteriological sample results received prior to permanent connections being made to the active distribution system where the new main was isolated from the existing system. Sanitary construction practices must be followed during installation of the final connection to insure that there is no contamination of the new or existing water main with foreign material or groundwater.

The new pipe, fittings, and valve(s) required for the connection will be spray-disinfected or swabbed with a minimum 1 – 5% solution of chlorine just prior to being installed.

7.12 Dechlorination

Contact the local sewer authority before discharging the highly chlorinated water to the sewer. The discharge of water to the environment with chlorine concentrations greater than the ambient distribution system chlorine residual is prohibited. The highly chlorinated water must be dechlorinated before being discharged to the environment. The method of dechlorination is at the discretion of the contractor as long as the procedure does not cause harm to the environment.

PORTLAND WATER DISTRICT

WATER MAIN SANITARY RELEASE FORM

CONTRACTOR NAME _____

CONTRACTOR ADDRESS _____

_____

Project location (Street(s), City _____

Pipe Description - Length _____ Diameter _____Type _____

Chlorination Method - Continuous Feed ___ Slug ___

Beginning Chlorine Concentration (start of retention time) _____
Ending Chlorine Concentration (start of flushing)_____

Number of samples required for analysis _____

Sample Location (show # and location(s) on reverse side)

Sample Date	Sample #	Chlorine Residual (ppm)	Misc. Bacteria/100ml	Coliform Bacteria Cfu/100ml	pH	Turbidity

Sampler _____

PWD Inspector _____

Contractor Signature _____

Title_____
Date_____

SECTION III: Water Main Materials Specifications

Portland Water District
225 Douglass Street – P.O. Box 3553
Portland, ME 04104-3553
(207) 774-5961

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BOLTS AND NUTS

General Description of Properties Required:

1.	Stainless Steel:	Type 304 – contains the addition of Molybdenum to the nickel-chromium steels.
2.	High Strength/: Low Alloy Steel	Trade name for cold formed T-head bolts containing alloying elements such as copper, nickel, and chrome (Cor-Ten)

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Revised: 2/5/03

VALVE BOXES

1.0 SPECIFICATIONS: Reference Standard Details

1.1 The valve box bottom section shall be slide-type with bell-type base.
Manufacturer: North American Manufacture

1.2 The valve box top section shall be slide-type 36 inches long (minimum). No top flange and no "bead" or bottom flange.
Manufacturer: North American Manufacture

1.3 The valve box cover shall be a 2" drop-type cover to fit the 7-1/4" opening of the top section.
Manufacturer: Bibby St-Croix (No substitute)

1.4 The valve box intermediate (mid) section shall be slide-type with a minimum 3" belled bottom. Base section No. 645 may be used as an alternate.
Manufacturer: North American Manufacture

1.5 Material shall be cast iron or ductile free from defects.

1.6 Interior and exterior of all components shall be bituminous coated with a minimum of 4 mils dry film thickness.

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SPECIFICATION FOR SERVICE BOX AND ROD

Reference Standard Details.

1.0 Service Box Specifications - Approved Manufacturer: Laroche, Clow Canada

1.1 Shall be 1.0" (in.) Schedule 40 steel pipe with top having 1.0" N.P.T. pipe threads for screw-on cover or coupling.

1.2 Shall be Erie style with 6' (ft.) slide-type riser.

2.0 Service Box Cover Specifications – Approved Manufacturer: Bibby, Laroche, Clow Canada

2.1 Shall be Quincy type (heavy duty) cover that screws on (1.1 above).

2.2 Shall be tapped with a 1" rope thread with a solid brass plug with pentagon operating head.

3.0 Service Box Foot Piece Specifications – Approved Manufacturer: Laroche

3.1 The standard foot piece shall be heavy duty (Ford style or equal) cast iron design.

3.2 The large, heavy-duty foot piece shall have an arch that will fit over 2" ball-valve curb-stops.

4.0 Service Rod Specifications – Approved Manufacturer: North American Manufacture

4.1 Shall have a self aligning design.
a) 36" length for all services.
b) 24" length for air valves.

4.2 Shall be of round rod and constructed of stainless steel (304).

4.3 Shall have a yoke design that is an integral part of the rod.

4.4 The curb-stop attachment pin shall be a brass cotter pin.

4.5 The rod "wrench-flat" shall have a minimum thickness of ¼" tapered to 1/16" and width of 5/8" or ½".

4.6 Diameter:
a) ½", ¾" and 1" services use ½" diameter.
b) 1 ½" and 2" services use 5/8" diameter.

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SPECIFICATION FOR CURB STOPS

1.0 SPECIFICATIONS: Conforming to AWWA C-800.

1.1 ¾" to 2" shall be ball valve design with brass ball that is teflon coated or brass ball with teflon seats.

1.2 The ball shall be supported by seats which are water tight in either direction.

1.3 The valve shall have a full-port opening.

1.4 The valve shall open with ¼ turn (90°) with a check or stop.

1.5 The valve shall not have a drain.

1.6 The valve stem shall have 2 "O" rings and a bronze ring lock which holds the stem solidly in the valve body.

1.7 The valve body shall be of heavy duty design.

1.8 The valve working pressure shall be 300 p.s.i.

Approved Manufacturers:

a) A.Y. McDonald
b) Cambridge Brass
c) Ford Meter Box Co.
d) Mueller Co.

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CORPORATION STOPS

1.0 SPECIFICATIONS CONFORMING TO AWWA C-800:

1.1 1" to 2" shall be ball valve design with brass ball that is teflon coated or brass ball with teflon seats. Corporation inlets shall be cc threads and outlets shall be copper pac joint (c.p.j.).

1.2 The valve shall be supported by 2 seats for water tight shut-off in either direction.

1.3 The valve shall have a full port opening.

1.4 The body of the corporation-stop shall be of heavy duty design.

1.5 The valve working pressure shall be 300 p.s.i.

Approved Manufacturers:

a) A.Y. McDonald
b) Cambridge Brass
c) Ford Meter Box Co.
d) Mueller Co.

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SPECIFICATION FOR SERVICE SADDLES

1.0 SPECIFICATIONS:

1.1 The service saddle shall have the "larger sized" body, the same as associated with the "service repair" saddle, which shall have a minimum diameter of 6 in. and multiple "O" ring type sealing.

1.2 The saddle body shall be constructed of epoxy coated ductile iron.

1.3 The sealing gasket(s) shall be either Buna-N rubber or SBR rubber (ASTM D2000)

1.4 Service saddles shall be installed with all 1 1/2" and 2" corporation stops (cc only).

1.5 Saddles on C-900 PVC pipe : stainless steel straps will be used.

Approved Manufacturer/Type:

	Size	Tap	Saddle
	2" – 21/4"	¾", 1" cc	Smith-Blair 315, Ford FC 202
	4" (C-900 PVC)		Smith-Blair 317, Ford FC 202
	4" - 12" D.I.	¾"- 11/2" cc	Smith Blair 331
	4" - 12" D.I.	2" cc	Smith-Blair 313
	16"	¾"-2" cc	Smith-Blair 313
	20" – 36"	¾"-2"cc	Smith-Blair 366

Portland Water District
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DUCTILE IRON FITTINGS

INCLUDING BENDS, REDUCERS, OFF-SETS, TEES AND SLEEVES

1.0 SPECIFICATIONS:

1.1 Material shall be ASTM A536 latest, grade 70-50-05, in accordance with AWWA C110 (latest revision) for fittings larger than 24" and C153 (latest revision) for fittings 3" thru 24".

1.2 Fittings shall be cement lined AWWA C104 (latest revision) or fusion bonded epoxy coated with a 5 mil nominal thickness per AWWA C550 and C116.

1.3 Interior seal coated AWWA C104 with minimum of 4 mils dry film thickness.

1.4 Exterior bituminous coated, 4 mils minimum dry film thickness or fusion bonded epoxy coated with a 5 mil nominal thickness per AWWA C550 and C116.

1.5 Sleeves shall not be cement lined, but shall be bituminous coated inside to 4 mils dry film thickness. All sleeves shall be long body type.

1.5 Mechanical joint with accessories furnished: D.I. glands, gaskets, Cor-Ten T-bolts and nuts.

1.6 a) Class 350 pressure rating in accordance with AWWA C153 - 3"-24" sizes.
b) Class 250 pressure rating in accordance with AWWA C110 - 30"-48" sizes.

1.7 The "compact design" fittings must provide adequate space for the MJ joint and accessories to be installed without special tools (i.e. Lowell wrench can be used).

Approved Manufacturer:
All Manufacturers

Portland Water District
225 Douglass Street – P.O. Box 3553
Portland, ME 04104-3553
(207) 774-5961

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CUT-IN SLEEVE

1.0 Specifications:

1.1 The sleeve shall be mechanical joint to plain-end type.

1.2 The sleeve shall fit over either AB or CD pattern pipe.

1.3 Coatings: a) Interior – Seal-coated – AWWA C104-74, Min. 4 mils D.F.T.

b) Exterior – Bituminous coated, Min. 4 mils D.F.T.

1.4 Mechanical joint accessories shall be furnished: Glands, with duck-tipped for AB and plain gaskets for CD and Cor-Ten tee bolts and nuts.

1.5 Cut-in sleeves shall have at least one stop-screw in sizes up through 10" and at least 2 stop screws in 12" size.

1.6 The stop-screw "O" ring shall be recessed into the body of the sleeve between stop screw and body.

Accepted Manufacturer: Mueller

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Revised: 8/22/03

TAPPING SLEEVES

1. For sizes 12" and smaller tapping sleeve shall be ductile iron:

    1.1 Tapping sleeve shall be mechanical joint with recessed outlet flange for tapping valve.

    1.2 Tapping sleeve shall conform to AWWA C-207, Class D, with rated maximum working pressure of 200 psi.

    1.3 The side rubber gaskets shall be rectangular in cross-section and fit into grooved channels in the casting. These gaskets shall extend the entire length of the sleeve and shall not require cutting or trimming to match MJ end gaskets.

    1.4 Tapping sleeve shall be AB-CD pattern to permit use of plain rubber and duck-tipped gaskets for various O.D. piping sizes.

    1.5 Mechanical joint with accessories furnished; glands, gaskets, and Cor-Ten T-bolts and nuts or equal.

    1.6 All flange outlet bolts shall be 304 stainless steel.

    1.7 Interior and exterior to be bituminous coated with a minimum of 4 mils dry film thickness or fusion bonded epoxy coated.

    1.8 The sleeve shall be provided with a ¾" F.I.P.T. test port and brass lug.

2. For sizes 16" and larger tapping sleeve shall be fabricated steel:

    2.1 Body and Flange - A-36

    2.2 Coating - Fusion-bonded epoxy coating with minimum D.F.T. of 5 mils, inside and out.

    2.3 Bolts, Nuts - 304 Stainless Steel.

    2.4 Gaskets - SBR.

    2.5 Flange - AWWA Class D plate flange with ANSI 150# drilling, proper recessing for Tapping Valves.

    2.6 Sleeves shall be provided with 3/4" F.I.P.T. test port and plug.

Approved Manufacturer (4"-12")
a) AFC
b) Mueller Co.
c) U.S. Pipe
d) Tyler / Union

Approved Manufacturer (16" and larger)
a) Romac FTS 420
b) Ford FTSC
c) Smith-Blair 622
d) JCM 412

Portland Water District
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FIRE HYDRANT

1.0 SPECIFICATION – GENERAL:

1.1 The hydrant shall meet the requirements of AWWA standard C-502, latest revision.

1.2 The hydrant shall open right.

1.3 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.

1.4 Nozzles shall be:

a) 2 each - 2-1/2" National Standard Thread

b) 1 each - 4-1/2" National Standard Thread

1.5 Port covers shall be supplied without chains and shall have the same size pentagon operator as specified in 1.3(b) above.

1.6 Traffic model hydrant with breakaway feature

1.7 Barrel length(s) shall be:

a) 6 ft. cover, 6-1/2 ft. bury; or

b) 5-1/2 ft. cover, 6 ft. bury.

c) 5 ft. cover, 5'-6" bury

1.8 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;

1.9 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 304 stainless steel or silicone bronze.

1.10 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:

1. Surface preparation blast clean SSPC-SP-6;
2. Primer Sherwin Williams Red Oxide E61RC21, 1.5 mils, dry;
3. Finish coat Sherwin Williams – Regal Yellow, F78Y30, 1.5 mils, dry or sufficient paint to hide the second coat;
4. Total dry film thickness - 3 mils minimum.

e) Coatings for bonnet, operating nut, port cap:

1. Surface preparation: Blast clean, SSPC-SP-6;
2. Exterior primer
3. Exterior Aluminum
4. Total dry film thickness: 3 mils minimum.

1.11 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.

Approved Hydrants:

1) Clow Eddy – with lower stem machined from bar stock
2) American Darling B62-B-1

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(207) 774-5961

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RESILIENT SEATED GATE VALVE

1.0 Specification:

1.1 Valve shall meet the latest revision of the AWWA C-515 standard.

1.2 Valve shall have a smooth unobstructed water way which shall be a minimum diameter of the valve.

1.3 Valve ends to be specified and shall be furnished with Cor-ten (or equal) bolts and nuts.

1.4 Valve shall be rated for zero leak rate at 200 psi differential working pressure and have a 400 psi hydrostatic test for structural integrity.

1.5 Sealing:

Valve shall have 2 "O" rings situated such that the "O" rings above the thrust collar can be replaced with the valve under pressure and in the open position.

1.6 Stem:

Valve stem shall be:

a) open right with a stem nut made of grade D,E manganese bronze;
b) non-rising;
c) designed with a thrust collar integrally cast to the stem;
d) designed with two (2) thrust washers, placed one above and one below the stem thrust collar;
e) constructed of grade D,E manganese bronze;
f) such that the thrust washers are made of a synthetic polymer with physical properties required.

1.7 Valve Body:

The body, including the stuffing box and the bonnet shall be constructed of cast iron or ductile iron, meeting the latest revision of AWWA C-153.

1.8 Valve Wedge Shall:

a) be constructed of ductile iron (less guiding mechanism);
b) be fully encapsulated and permanently bonded with a resilient elastomer;
c) be constructed such to allow the flushing of any interior exposed surface during operations.

1.9 Coatings:

a) The internal and external valve body, including the stuffing box, bonnet, and interior of the wedge shall be fusion bonded epoxy coated with 8 mils D.F.T.
b) Interior shall meet latest version of AWWA C-550.
c) Shall be holiday free, interior and exterior, per testing method described in AWWA C-550, Sec. 5.1.

1.10 Operating Nut:

The operating nut shall be two (2) inch square ductile iron;

a) with a countersunk hold down nut (made of 316 stainless steel or silicone bronze). This applies to stems that are tapered;
b) or, with a stainless steel pin inserted thru the stem. This applies to stems of full diameter.

1.11 Bolts:

The seal plate and bonnet bolts shall be 316 or 304 stainless steel.

2.0 General Provisions:

2.1 Vendor shall identify any and all exceptions to the specifications.

2.2 Vendor shall provide standard brochures for item quoted.

2.3 Vendor may be required to supply a valve for inspection and determination of coating process.

3.0 Acceptance:
The following valves have been inspected and approved for use by the Portland Water District:

a) U.S.P. Metroseal
b) AFC Series 2500
c) Mueller A-2360
d) Clow Series F6100

Portland Water District
225 Douglass Street – P.O. Box 3553
Portland, ME 04104-3553
(207) 774-5961

Issued: 2/10/99
Revised:

BUTTERFLY VALVES

1.0 SPECIFICATION:

Valves of 16" nominal size and larger shall be rubber-seated "Butterfly" valves. Butterfly valves and their operators shall conform generally, to AWWA standard C504, short body pattern Class 150B, and specifically to the following requirements:

1.1 The valve bodies shall be of cast or ductile iron. Buried valves shall have mechanical joint ends per AWWA CIII. Non-buried valves shall have two ANSI B16.1 Class 125 flanges. The bolt holes at the valve shaft hubs may be drilled and tapped on either or both flanges.

1.2 The valve shafts shall be in two parts, inserted from each side of the valve. The disc pins or bolts shall be fastened to prevent loss, loosening in service, and shall be sealed as necessary to prevent leakage through the disc. Valve shafts shall be stainless steel. Carbon steel shafts with stainless steel journals are not permitted. Shaft seals shall be the "O" ring type or self adjusted packing.

1.3 The valve disc shall be cast of either ductile iron or alloy iron and epoxy coated. The disc periphery shall be accurately machined or faced to form a 360 degree seating surface uninterrupted by shaft holes. The disc and shaft geometry shall be such that the seat rubber is not compressed when the valve is fully open.

1.4 The natural rubber, insert type valve seat shall be mechanically retained in place, independent of cementing or bonding agents. The mating seat material shall be stainless steel.

1.5 The stub shaft of all valves 16" and larger shall have a two way thrust bearing adequate to hold the disc centered in the valve seat.

1.6 The valve operators shall be manual, totally enclosed, grease packed, and of traveling nut and lever design. The gear housing shall be suitable for buried and submerged service; special provisions shall be made to seal the gear housing from water infiltration from the ground or along the valve shaft into the housing. The space between the valve body and the gear box shall be one iron casting designed so as to provide access sufficient to inspect and replace the "O" ring seals. Operating stems shall be fitted with standard AWWA 2" square operating nuts. All valves shall turn to the RIGHT to open.

1.7 The number of turns to fully open or shut valves shall be at least as follows:

For a	16" valve,	30 turns, min.
	20" valve,	40 turns, min.
	24" valve,	40 turns, min.
	30" valve,	44 turns, min.
	36" valve,	136 turns, min.
	42" valve,	215 turns, min.

1.8 The internal and external valve body shall be epoxy coated to C-550 with a minimum of 5 mils dry film thickness.

1.9 Seal plate and end cover bolts shall be 304 stainless steel, and valve ends as specified will be furnished with Cor-Ten, or equal, bolts and nuts.

Approved Manufacturers:

a) Henry Pratt "Groudhog" Class 150 B
b) Muellier: "Lineseal III" Class 150 B
c) Clow / M&H / Kennedy Class 150 B
    1) 16"-24" – Style 4500
    2) 30"-48" – Style 1450

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Issued: 11/30/84
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DUCTILE IRON PIPE

1.0 SPECIFICATION

1.1 a) Ductile iron pipe shall meet requirements of AWWA Standard C-151 (latest revision) and be cement lined and seal coated to meet AWWA Standard C-104 (latest revision).

b) Joints shall meet requirements of AWWA C-111 (latest revision).

1.2 Interior seal coated, bituminous paint oil cut, emulsion not acceptable, thickness minimum of 2 mils dry film thickness.

1.3 Exterior bituminous coated with minimum of 2 mils dry film thickness.

1.4 Class 52 wall thickness, 4 inch diameter through 12 inch diameter inclusive.

1.5 Class 51 wall thickness, 16 inch diameter and larger.

1.6 State nominal laying length and mark shorter lengths near bell.

1.7 Mechanical joint pipe to be furnished with gland, gaskets and Cor-Ten bolts and nuts.

Approved Manufacturers:

a) American Cast Iron Pipe
b) Griffin Pipe
c) U.S. Pipe
d) Clow Pipe
e) McWain Pipe (Not Atlantic States)

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PVC WATER PIPE

For all water main installations that are less than 4" I.D. (4" and larger use ductile iron), the District will require use of 2" I.D. PVC plastic water pipe meeting the following: Under special site conditions the District does require the use of C-900 PVC in sizes larger than 4".

I. PIPE SPECIFICATIONS (2"):

1. Diameter:
   A. The I.D. shall be a minimum of 2"
   B. The O.D. shall be a maximum of 2.38"
   C. The minimum wall thickness shall be 0.113"

2. Pressure Rating:
   The minimum working pressure rating shall be 200 PSI (SDR-21).
   The pipe shall conform to standard ASTM 2241.

3. Pipe Length:
   The pipe shall be provided in 20' lengths.
   *Shorter lengths may be allowed and/or field cut following manufacturer,s recommended procedures.

4. Gaskets:
   The gasket or O-Ring material shall be rubber meeting ASTM F 477 and of the "permanent use" type.

II. FITTINGS:

1. Standard AWWA C900 fittings are not available in the 2" I.D. and therefore "steel pipe" class fittings, or Certa-Lok Yelomine couplings and fittings meeting ASTM D 3139 shall be used.

2. The normal nomenclature for "steel fittings" is schedule 40 or schedule 80, with the respective pressure ratings of 280 PSI and 400 PSI. Both of these fitting classes are acceptable for use.

III. SERVICE CONNECTIONS:

1. All service connections shall be made with tapping saddles* per Portland Water District specifications or by use of tees meeting the above noted fitting specifications.
   *(Smith-Blair #315 w/S.S. straps, Ford FC 202)

IV. INSTALLATION:

1. Follow manufacturer's instructions.

2. An eight gauge bare copper wire shall be fastened to the buried PVC pipe to facilitate electronic pipe locating. The wire shall be fastened at two locations per length and not at any joint.

V. The District requires 200 PSI (SDR-14) PVC pipe for other sizes such as 4", 6", 8", and 12". Pipe shall conform to AWWA C-900.

Approved Manufacturer/Type:
1. Johns-Mansville / Blue Brute
2. Certainteed / Yelomine
3. Victaulic / AquaMine

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Portland, ME 04104-3553
(207) 774-5961

Issued: 2/5/03
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PIPE JOINT RESTRAINER

1.0 Pipe Restraints:

1.1 Use in conjunction with Mechanical joint fittings.

1.2 The joint restraint ring and its wedging components shall be made of ductile iron conforming to ASTM A536-80.

1.3 Dimensions of the restrainer must allow use with standard M.J. bell conforming to AWWA C111 and AWWA C153.

1.4 Restainer must restrain up to 350 psi of working pressure in 3" to 16 " size and 250 psi of working pressure in 18" to 48" size with a 2:1 safety factor.

1.5 Torque limiting twist off nuts shall be used to insure proper actuation of the restraining wedges (used on a,b,c below).

Approved Manufacturers:
a) Sigma Super Lug
b) Ford Uni-Flange Series 1400
c) Ebba Mega Lug
d) Romac Grip Ring
e) Star Grip Series 300

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(207) 774-5961

STAINLESS STEEL REPAIR CLAMPS

1.0 SPECIFICATIONS:

1.1 The sleeve shall be of full circle design, either one piece or two piece, for pipe sizes 2" thru 12".

1.2 Body: Shall be 18-8 stainless steel shell.

1.3 Gasket:

a) Shall be full length and diameter of the body size;

b) This gasket shall form a multiple O-ring, or grid, sealing barrier for the entire length and circumference;

c) Shall be virgin SBR rubber (ASTM D2000 AA 415).

1.4 Lugs, sidebar, and lifting bar shall be heavy gauge 18-8 stainless steel with TIG/MIG welding and chamical passivation of all welds.

1.5 Bolts and Nuts shall be Teflon coated 18-8 heavy gauge stainless steel.

1.6 Armor: The armor, or bridging plate between the side bars shall be heavy gauge 18-8 stainless steel bonded to the gasket to bridge the lug area.

Approved Manufacturer:
a) All

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CAST IRON OR DUCTILE IRON SPLIT REPAIR SLEEVE

1.0 SPECIFICATION:

1.1 Split repair sleeve shall be mechanical joint.

1.2 The side rubber gaskets shall be rectangular to cross-section and fit into grooved channels in the casting. These gaskets shall extend the entire length of the sleeve.

1.3 Split repair sleeve shall be AB-CD pattern to permit use of plain rubber and duck-tipped gaskets for various O.D. piping sizes.

1.4 Mechanical joint with accessories furnished; glands, gaskets and Cor-Ten T-bolts and nuts or equal.

1.5 All side bolts shall be 304 stainless steel or silicone bronze.

1.6 Interior and exterior to be bituminous coated with a minimum of 4 mils D.F.T.

1.7 The sleeve shall be provided with a 2" F.I.P.T. test port with brass plug.

Approved Manufacturer:
a) All

SECTION IV: Documents

PORTLAND WATER DISTRICT
225 Douglass Street – P.O. Box 3553
Portland, ME 04104-3553
(207) 774-5961

CERTIFICATE OF TITLE AND PROJECT ACCEPTANCE

KNOW ALL MEN BY THESE PRESENTS: that a corporation doing business as _____ of _____, and State of Maine, hereinafter called "DEVELOPER" and a corporation doing business as _____ of _____, County of _____, and State of Maine, hereinafter called "CONTRACTOR" in consideration of One Dollar ($1.00) and other valuable considerations paid by PORTLAND WATER DISTRICT (the "DISTRICT"), a quasi-municipal corporation with a principal office in Portland, Maine, the receipt of which consideration is hereby acknowledged, does hereby GRANT, SELL, TRANSFER, AND DELIVER unto the said DISTRICT, its successors and assigns, the following personal property:

New ____ water main extension in _____ in _____, Maine.
____ new ____ inch domestic water services installed from the new mains.
____ public hydrants.

TO HAVE AND TO HOLD, all of the said personal property to the said PORTLAND WATER DISTRICT, its successors and assigns to its and their own use and behold forever.

AND, the developer/Contractor hereby covenants with the said DISTRICT, its successors and assigns, that it is the lawful owner of all the said personal property, that it is free from all encumbrances; that Developer/Contractor has good right to sell the same as aforesaid; and that it will WARRANT AND DEFEND the same unto the DISTRICT, its successors and assigns against the lawful claims and demands of all persons.

AND, the said PORTLAND WATER DISTRICT, having inspected the instillation of the said personal property, finds that it substantially complies with the terms of the agreement between the District, the Developer and the Contractor dated as of the ____ day of _____, 20__.

This date shall mark the commencement of all warrantees and guarantees required by the Contract Documents and such warrantees and guarantees shall be fully effective, notwithstanding the fact that the District has inspected such property.

IN WITNESS WHEREOF, the parties hereto have caused this Certificate of Title and Project Acceptance to be executed by their duly authorized officials.

PORTLAND WATER DISTRICT

By _____

_____ witness

_____ title

_____ developer

By _____

_____ witness

_____ title

_____ developer

By _____

_____ witness

_____ title

PORTLAND WATER DISTRICT
225 Douglass Street – P.O. Box 3553
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(207) 774-5961

MAIN EXTENSION AGREEMENT (Developer)

Agreement No.
F.C.W.O No.

THIS AGREEMENT made this ___th day of _____ _____ by and between the Portland Water District, a quasi municipal corporation located at Portland, Maine, hereinafter called the "District", and _____ of _____, ME hereinafter called _____.

ID/SS#:

WITNESSETH:

WHEREAS, the Depositor desires to have the District extend its water facilities in the City of _____, County of Cumberland and State of Maine, as follows:

Install ___ DI water main in _____
Install ___ public fire hydrants .
Install ___ 1" domestic services.

Deposit required $ _____.00

WHEREAS, the Water Main Extension Rules of the Maine Public Utilities Commission require a written agreement for such extension.

NOW THEREFORE, in consideration of the mutual promises hereinafter set forth, the parties agree as follows:

1) Prior to the construction of facilities, the Depositor shall advance with the District the sum of **$ __,_____.00,** which sum is the District's estimated cost of construction of said water main extension and related appurtenances, fire protection, service and meter. Said sum shall be deposited in two installments as follows:

a) Upon execution of this Agreement, an advance in the sum of $ N/A, to cover the costs of materials and supplies and detailed engineering design, which advance is not refundable to the extent that any portion of the advance is actually spent by the District for detailed engineering design or for materials and supplies which cannot readily be used by the District for other projects;

2) Water facilities constructed under this agreement, located outside of the development, are subject to refundable customer contributions. During a ten-year period after the connection of the first customer to the main extension, each new customer connected to the outside facilities will pay a customer contribution as calculated pursuant to rule of the Public Utilities Commission prior to obtaining service. The contribution will be collected by the District and forwarded to the Depositor(s). (See reverse side of this form for PUC contribution calculation).

3) Where the facilities are being installed in other than an accepted public way, the Depositor shall furnish the District, from the owner of record, a properly executed permanent easement, free of encumbrances, entitling the District to construct, own, operate, maintain, repair and replace the above-described facilities.

4) The District shall construct, in the normal course of its operations, the above-described water main, public fire protection allocation and service, after receipt of such advance, provided the Depositor furnishes suitable access to the site, and at the request of the Director of Engineering of the District, line stakes and grade stakes at the site.

5) Within 60 days following the District's determination of the final expenses incurred for the extension, including main, public fire protection allocation and service, the advance made hereunder shall be adjusted to the actual cost of construction, either by the District's return to the Depositor of any excess amount, or by additional payment to the advance by the Depositor to the District covering the deficiency.

6) If the lines and grades of the street or way are not acceptable by the municipality and the utility, or valid permanent easements covering the water main extension satisfactory to the District have not been executed, the District reserves the right to use any remaining advance towards upgrading the main to meet utility specifications. The District reserves the right not to accept a main until it has been inspected and tested and meets utility specifications. Any inspection or test shall be at the expense of the person

requesting service or acceptance. The District further reserves the right to refuse to commence water service until the main has been brought up to utility specification.

7) The District shall bill or deduct from any advance refund otherwise due the Depositor, (i) the cost of any relocation of the District's facilities due to any change of the line or grade of any street or way; and (ii) any costs of the District for repairing or rebuilding facilities of the District at the above-described location if damaged by the Depositor or his agent at any time prior to acceptance of the street or way by the municipality.

8) The District shall have full ownership of all of the facilities constructed pursuant to this agreement. The District will have a continuing obligation for the future maintenance of these facilities, and the right to make further extensions continuously and laterally from said extension without obligation to this agreement.

9) This contract is subject to the rules of the State of Maine Public Utilities Commission governing water main extensions (65-407 C.M.R. 65), which are hereby incorporated by reference into this contract. In the event of a conflict between this contract and the Commission's water main extension rule, the rule shall govern. The parties understand that the provisions of this contract are subject to alteration by a decision or rule of the Public Utilities Commission.

10) Disputes arising under this contract or under the Public Utilities Commission water main extension rule may be referred pursuant to that rule to the Commission for resolution.

11) This Agreement shall bind and inure to the benefit of the heirs, executors, administrators, successors and assigns of the parties hereto. Words of the singular number may include the plural, and words of the plural number may include the singular.

IN WITNESS WHEREOF, the parties hereto, being duly authorized, have hereunto set their hands the day and year first above-written.

WITNESS:

PORTLAND WATER DISTRICT

By

_____

Its
Depositor

_____

_____

_____

Customer Contributions by Customers Outside Development: If a main extension must cross property other than that within the development prior to reaching the development, and customers located on the property outside the development are connected to the main extension within ten years following connection of the first customer at any location on the extension, those customers shall be required to make a customer contribution. The total cost of the main extension shall be allocated between the development and the area outside the development on the basis of the number of feet within the development and the number of feet outside the development. After determining the total cost of the portion of the main extension outside the development on the basis of this allocation, customers outside the development should be required to make a contribution. For the purpose of determining the contribution or reallocating contributions when subsequent customers outside the development are connected, the developer shall be considered the equivalent of the number of customers within the development or the number of services constructed, whichever is greater, as if all those customers or services were located at the termination of the portion of the extension located outside the development. If a development is master metered, the number of customers within the development, for purposes of this subsection, shall be considered as the number of residential, commercial or industrial units or establishments.

PORTLAND WATER DISTRICT
225 Douglass Street – P.O. Box 3553
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(207) 774-5961

THREE PARTY AGREEMENT

THIS AGREEMENT made this ___th day of _____ _____ by and between the Portland Water District, hereinafter called "the DISTRICT", acting herein through its General Manager, and _____ _____ _____ doing business as _____ of _____, County of _____, and State of Maine, hereinafter called "Developer" and _____ _____ _____ doing business as _____ of _____, County of _____, and State of Maine hereinafter called "Contractor".

The Developer and Contractor are hereinafter referred to as the "Developer/Contractor" and their obligations and liability under this Agreement shall be joint and several.

W I T N E S S E T H:

That for and in consideration of the payments and agreements hereinafter mentioned:

1) The Developer/Contractor will commence and complete the construction of: instillation of water fixtures, such as mains, services and hydrants in _____ in _____, Maine hereinafter called "the PROJECT".

2) The Developer/Contractor will furnish all of the material, supplies, tools, equipment, labor and other services necessary for the construction and completion of the PROJECT.

3) The Developer/Contractor will notify the District of his proposed starting and completion dates at least ten business days prior to the start of construction.

4) The Developer/Contractor agrees to perform all of the work described in the Contract Documents and comply with the terms therein at no direct cost to the District, except that the District will make refunds in accordance with the terms of Main Extension Agreement Number _____ dated _____.

5) The term "Contract Documents" means and includes the following
   a) Agreement
   b) Developer/Contractor's Schedule of Unit Prices
   c) Maintenance Bond
   d) Certificate of Title and Project Acceptance
   e) General Conditions
   f) Supplemental General Conditions
   g) Drawings prepared by - _____ Numbered - _____ and Dated - _____
   h) Specifications prepared or issued by the District.

The Schedule of unit Prices, Maintenance Bond, Certificate of Title and Project Acceptance, General conditions, Supplemental Conditions, Drawings and Specifications designated above are contained in the Portland Water District "Specifications and Procedures and their terms are expressly incorporated herein and made a part hereof.

6) Developer/Contractor shall reimburse fully and completely indemnify and save harmless the DISTRICT from any and all loss, damage, liability , claim, action, cost and expense (including attorneys' fees) caused by or arising out of the construction of the PROJECT, including without limitation any and all such costs and expenses incurred to assure the safety, protection and continuity of future operations which are deemed necessary by the DISTRICT, specifically including, but not limited to, costs of inspection.

7) The failure of the DISTRICT to enforce or insist upon compliance with any of the terms or conditions of this Agreement shall not constitute a general waiver or relinquishment of any said terms or conditions but the same shall be and remain in full force and effect at all times.

8) This Agreement contains the entire understanding of the parties with respect to the subject matter hereof and may not be amended or modified except by a writing signed by the parties.

9) This Agreement shall be governed by Maine law and shall be binding upon all parties hereto and their respective heirs, personal representatives, administrators and assigns.

IN WITNESS WHEREOF, the parties hereto have executed, or caused to be executed by their duly authorized officials, this Agreement in triplicate, each of which shall be deemed an original on the date first above mentioned.

SEAL

PORTLAND WATER DISTRICT

By _____

_____
witness

_____
title

SEAL

_____
developer

By _____

_____
witness

_____
title

SEAL

_____
developer

By _____

_____
witness

_____
title

SECTION V: Work Associated With Sewer Construction

A. GENERAL

1. PROJECT COORDINATION

The District provides wastewater collection, interception, and treatment services under a Charter and/or Agreements with its Member Municipalities. In general, the District will accept additional sewerage infrastructure when designed in accordance to State/Local Code, general engineering practice, and published District Standards and Details. This specification includes limited District standards intended to convey the general nature and quality of acceptable infrastructure.

All project submittals shall include a detailed design documenting the basis for the selection, sizing, and general design of the infrastructure. This shall include, at a minimum, the number of units and expected flows, factors and assumptions used in sizing sewers, force mains, pump stations, and other infrastructure.

All project submittals shall include a detailed project schedule that clearly identifies the dates or timeframes associated with Planning Committee Submittals and Approvals, construct start dates, testing and start-up of infrastructure, acceptance by the District, and expected commissioning of systems.

The District reserves the right to recover costs associated with the review of any submittals, analysis of capacity to serve, inspection, and field-testing and start-up. Any fees will be in accordance with the fee schedule published in Part II – Work Associated with Water Line Construction A. 1.

The District will not accept or operate any infrastructure until the project has been completed and tested in accordance with any submittals and District Standards and Details. As-built drawings must be provided before any infrastructure will be accepted or operated by the District.

2. INSPECTION

An inspector from the District, a consultant working for the District, or an inspector retained by the local municipality (with responsibility for the oversight of sewerage infrastructure to be installed) will be assigned to each project to ensure that all work is completed and materials are installed in compliance with all submittals and these specifications. During the course of the work the inspector will report to the Engineering Supervisor on the progress of the work. The District, or its representative, before incorporation into the work, must approve any deviation from the approved plans or specifications.

The Contractor shall schedule with the District for inspection services a minimum of 3 working days prior to construction. The District cannot guarantee an inspector for the project without this notice. Start-up and acceptance testing of systems will require a 14 working day notice.

B. DESIGN CRITERIA

In general, the District will accept additional sewerage infrastructure when designed in accordance to State/Local Code, general engineering practice, and published District Standards and Details. This specification includes limited District standards intended to convey the general nature and quality of acceptable infrastructure.

C. STANDARD SPECIFICATIONS AND DETAILS

1. SEWERS AND DRAINS

PART 1 GENERAL

1.01 This section shall define the standards associated with the following:

1. Sanitary sewer pipe
2. Forcemain pipe
3. House service pipes
4. Storm sewer pipe

1.02 RELATED WORK:

1.03 SUBMITTALS:

A. **Manufacturer's** product data and installation instructions.

B. **Certified copies** of tests on pipe units.

C. **Construction Records**: Record depth and location of the following:

1. House service capped ends, cleanouts, bends in house service, connection points to sewer main.
2. Bends, thrust blocks in force mains.
3. Repairs to existing pipes.

Record neatly in a permanently bound notebook and submit at Substantial Completion. Provide access to records for the District at all times. Submit copies to the District on a weekly basis.

PART 2 - PRODUCTS

2.01 PIPE AND FITTINGS:

A. **General**: Provide fittings of same type and class of materials as pipe. Provide commercially manufactured wyes or tee/wyes for service connections. Fitting must have single piece gasket.

B. **PVC Non-Pressure Pipe and House Services (Sewer):** 4" through 12" Diameter: ASTM D3034 or ASTM D3033, strength requirement SDR 35; push-on joints, ASTM D3212; gaskets, ASTM F477.

C. **PVC Pressure Pipe (Forcemain):**

1. Less than 4" Diameter: ASTM D2441, strength requirement SDR 21; push-on joints, ASTM D3139; gaskets, ASTM F477.

2. 4" Diameter and Larger: ASTM D2241, Class 150, strength requirement DR 18, with cast iron pipe outside diameters; push-on joints, ASTM D3132; gaskets, ASTM F477. All fittings to be ductile iron mechanical joint, AWWA C110 with 250 psi minimum pressure rating.

D. **Storm Sewer Pipe**: Polyethylene drainage pipe with corrugated exterior and smooth wall interior, highway grade, AASHTO M252, ASTM F405, by American Drainage Systems, or approved equal.

E. **Reinforced Concrete Pipe**: ASTM C76; Class IV, O-ring gasket joints with rubber gaskets, meeting MDOT specifications.

F. **Ductile Iron Pipe**: AWWA C151; thickness Class 52 AWWA C150; double cement lined, AWWA C104; push-on joints or mechanical joints with rubber gaskets, AWWA C111; fittings, AWWA C110.

G. **Underdrain**: Perforated, corrugated polyethylene pipe with smooth wall interior, AASHTO M252, ASTM F405, by American Drainage Systems, or approved equal.

2.02 MISCELLANEOUS:

A. Flexible Couplings: Use and location shall be approved by the District.

1. Type A: Dresser Style 53 as manufactured by Dresser, or approved equal.

2. Type B: Neoprene sleeve with stainless steel bands by Fernco, or approved equal.

B. Pipe Supports: Saddle type, steel, painted, adjustable, by ITT Grinnell, or approved equal.

C. Geotextile Fabric: Propex 4508 by Amoco Fabrics Co., or approved equal.

D. Forcemain Marking Tape: Lineguard III by Tri-Sales, Inc., 2" wide, green; detectable with magnetic locators, or approved equal.

E. Rigid Insulation: Extruded closed-cell rigid foamed polystyrene, 2 inch thickness, width of trench, Styrofoam HI-60, by Dow Chemical, or approved equal.

F. Air and Vacuum Valves:

1. Construction: Cast iron body and cover, ASTM A126; Stainless steel concave float, ASTM A240 T304; Stainless steel float stem, ASTM A581 T303; Buna-N needle and seat; Brass plug, ASTM B124. Operating pressure from 0 to 150 psi.

2. Outlet: 1-inch diameter. Provide a short nipple and a return elbow with piping as shown on the Drawings.

3. Inlet: 2-inch diameter. Provide taps, piping and valves as shown on the Drawing.

4. Coating: Red oxide phenolic primer paint.

5. Model: APCO 443 Sewage Combination Air Valve as manufactured by Valve and Primer Corporation, or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION OF GRAVITY PIPE AND FITTINGS:

A. Methods: Install in accordance with manufacturer's recommendations. Use a laser beam for line and grade unless otherwise permitted by the District. Secure each length of pipe with bedding before placing next length. Plug open ends when work is suspended. Bed pipe as shown on Drawings. A 30-inch minimum cover over the top of PVC pipe and DIP pipe should be provided before the trench is wheel-loaded.

B. Grade and Line:

1. Grade and Line shall be sufficient to provide minimum velocities of 2.0 fps. Lay pipe to line and grade shown on the Drawings as reviewed and approved by the District. If grade is not shown, determine elevations of start and finish points for each run of pipe. Lay pipe to a uniform grade between these points.

2. Line and grade may be adjusted as approved by the District, when required by field conditions.

C. Conditions: Lay pipe in the dry. Do not use installed pipe to remove water from work area.

D. Flush and clean all pipe and remove all debris and materials. Flushing and cleaning methods shall be in accordance to District Standards and approved by the District. Gravity flushing is not acceptable.

E. Connections to Manholes and Catchbasins: Any connections shall be in accordance with District Standards. Connections to existing structures must not result in additional infiltration. Any joints shall be located within 3 feet of inside surface of manholes and catch basins.

F. House Service Fittings and Leads:

1. Size of service leads 4" unless otherwise indicated.

2. Depth and location of service to be determined in field, as approved by the District.

3. Provide tee/wye or wye fittings on main line pipe. Extend services to a edge of Right-of-Way as determined by the District.

4. Provide clean outs as required.

6. Plug, or cap, and stake ends of new service. Provide stake that extends from plug or cap to 1 foot above ground surface. Provide the District with measurements of pipe installed and in obtaining swing ties to ends of leads.

7. All service connections must be shown on as-built drawings.

3.02 INSTALLATION OF FORCEMAINS AND PRESSURE PIPE:

A. Grade and Line: Lay pipe to line and grade as approved by the District. Do not allow positive-negative grade discontinuities. See Article 3.01 B above.

B. Methods, Conditions, and Connections to Manholes: See Articles 3.01 above.

C. Install warning tape continuously from the pump stations to the end of each force main. At ends of rolls and repairs, splice tape with 3-foot overlap connected with duct tape. Supply the District with one full roll for future repairs. Extend to grade of each manhole and at pump stations.

D. Thrust Protection: Provide thrust protection at all bends in forcemains in accordance with Standards and as approved by the District.

3.03 UTILITIES TO BE ABANDONED: Close open ends of abandoned underground utilities that are not indicated to be removed. Provide sufficiently strong closures, such as caps or brick and mortar, acceptable to the District to withstand hydrostatic or earth pressure that may result after ends of abandoned utilities have been closed. CONTRACTOR may remove abandoned utilities with written permission of the District or Town.

3.04 INSULATION:

A. Install as shown on approved Drawings.

B. Provide 2-inch minimum thickness for sewer, forcemain, and water main, compacted sand layers directly above and below insulation.

3.05 TESTING OF SANITARY SEWERS:

A. General: Test all sanitary sewer pipes after backfilling. Install all house service leads on main line before testing. Perform tests in presence of the District. A maximum of 1000 feet of pipe may be installed but not tested at any time.

B. Gravity Sewer Leakage Tests: Use low pressure air test as follows:

1. Plug ends of section to be tested.

2. Supply air slowly to the pipe to be tested until the air pressure inside the pipe is 4.0 psi greater than the average back pressure of any groundwater submerging the pipe.

3. Disconnect air supply and allow a minimum of two minutes for stabilization of pressure.

4. Following stabilization period measure drop in pressure over the test period within the following times:

Nominal Pipe Size (in.)	Test Period (min.)
4	4
6	4
8	6
10	6
12	7
15	8
18	9
21	11
24	13

5. Acceptable drop: No more than 1.0 psi.

C. Forcemain and Pressure Sewer Tests: Use hydrostatic test as follows:

1. Fill section of pipe with water and expel all air.

2. Pressurize to 1.5 times the normal operating pressure but not less than 60 psi.

3. Measure leakage over a 2-hour test period.

4. Acceptable leakage: Less than 10 gallons per day per inch diameter per mile of pipe tested.

D. Deflection Test for PVC Gravity Sewer Pipe: Test 100% of pipe with "GO-NO-GO" gauge allowing maximum deflection per ASTM D3034, Appendix X1, Table X1.1.

E. TV Inspection: All sewers and drains shall be inspected by an approved CONTRACTOR using TV pipe inspection. Defects in materials and/or workmanship found during the inspection shall be corrected by the CONTRACTOR.

F. Repair and/or replace all pipes not passing tests, using materials and methods approved by the District, and retest.

2. *MANHOLES/PRECAST CONCRETE STRUCTURES*

PART 1 - GENERAL

1.01 This section defines the standards associated with the following:

1. Precast Manholes
2. Drop Manholes
3. Precast Wet Well and Valve Pit
4. Catch Basins
5. Inverts
6. Risers
7. Frames, Covers, and Grates

1.02 RELATED WORK:

1.03 QUALITY ASSURANCE:

A. General: Provide complete manhole and precast concrete structures capable of supporting AASHTO H20 loading. All precast concrete shall comply with ASTM C913 "Standard Specification for Precast Concrete Water and Wastewater Structures."

B. Precast Manhole and Catch Basin Components: Comply with ASTM C478.

C. Antifloatation Slab Design Certificate: The CONTRACTOR may provide the precast structures requiring antifloatation slabs as one complete unit. If provided as a monolithic unit, submit a certificate of design signed by a Professional Engineer registered in the State of Maine, certifying that the structure including the slab has been designed to withstand all forces including soil, traffic and hydrostatic in accordance with all applicable laws, regulations, rules and codes.

1.04 SUBMITTALS:

A. Shop Drawings: Submit for precast manholes and all precast concrete items. Show components to be used, elevations of top of precast sections, base and pipe inverts, location of pipe penetrations, steps, for each manhole. Verify finish grade elevation at each proposed manhole location in the field.

B. Product Data: Submit manufacturers' product data and installation instructions for frames, covers, grates, precast items, manhole sleeves, joint sealants, and frost barrier.

PART 2 - PRODUCTS

2.01 MANHOLES (INCLUDES WET WELL):

A. Base Sections: Precast monolithic construction with steps (no steps in wet well).

B. Barrel Sections: Precast with steps (no steps in wet well).

C. Top Sections: Precast eccentric cone with steps. Use flat cover for wet well, if shown on Drawings or approved by the District.

D. Steps: Polypropylene reinforced with steel rod. Meet OSHA requirements, minimum width 16". Cast into concrete.

E. Pipe to Manhole Connections:

1. Pipe diameter 6" or larger: Flexible manhole sleeves shall be CP series manufactured by Interpace Corp., or approved equal. Size to fit diameter and type of pipe without use of gaskets.

2. Pipe diameter less than 6": Thermoplastic pipe sleeve shall be Link-Seal Century Line Model CS100 by Thunderline Corp. with sleeve seal equal to "Link-Seal" by Thunderline Corp., or approved equal.

F. Joints Between Precast Sections: Watertight, shiplap-type seal with two rings of one-inch diameter butyl rubber sealant.

2.02 DROP AND VALVE MANHOLES:

A. General: Conform to requirements for manholes. Provide pipe and accessories as shown on Drawings.

B. Riser Support Bracket: 10 gauge, Type 304, No. 3 finish stainless steel.

2.03 CATCH BASINS:

A. Base Sections: Precast monolithic construction.

B. Barrel Sections: Precast monolithic construction.

C. Top Sections: Precast eccentric cone. Use flat cover for wet well, if shown on Drawings or approved by the District.

D. Joints Between Precast Sections: Watertight, shiplap-type seal with two rings of one-inch diameter butyl rubber sealant.

2.04 INVERTS:

A. 180 Degree Straight Through Manholes: One piece molded fiberglass invert with integral pipe connections that are factory precast integral with the manhole base, "Fiberliner 2000 Invert System" as manufactured by Fiberliner 2000 New England, Inc, Tel. (508) 349-7401; or approved equal.

B. Non Straight Through Manholes: One-piece plastic composite invert, "Reliner" as manufactured by Reliner – Duran, Inc. Tel. (860) 434-0277; or approved equal. Provide concrete backfill with brick table.

1. Concrete: 3000 psi..

2. Sewer Brick: ASTM C32, Grade SS, hard brick.

3. Mortar: Type M, ASTM C270. Use Type II portland cement, Type S lime. Proportions for Mortar: 1 part portland cement, 1/4 part hydrated lime, 3 to 3 3/4 parts sand.

2.05 RISERS:

3. General: Rubber riser rings are preferred.

1. Rubber adjustment riser rings manufactured from a rubber fibrepolyurethane prepolymer composite, "Infra-Riser" as manufactured by GNR Technologies Inc., Tel. (514) 366-6116; or approved equal.

2. No more than 3 courses of brick may be used. Any work must be acceptable to the District.

2.06 FRAMES, COVERS, AND GRATES:

A. Material: Cast iron, ASTM A48 Class 30.

B. Manhole Frames and Covers: For manholes 6' or more in vertical height, use minimum 24" diameter opening. For manholes 6' or less in vertical height , use a min. 28" diameter opening. Weight of 350 pounds, labeled with "SEWER" in 3" high raised letters on cover for sewer manholes. Standard frames and covers shall be Model M267S by Etheridge Foundry, or approved equal.

C. Hatches: Hatches shall be equipped with heavy forged brass hinges, stainless steel hinge pins, spring operators, automatic hold open arm with release handle, 1/4" diamond plate cover and locking mechanism. Single leaf with grab bar Bilco Type J and double leaf with grab bar Bilco Type JD, or approved equal. Sizes as indicated on Drawings as approved by the District.

2.07 FLOOR BOXES: Floor boxes to be cast-in-place. Floor boxes to be constructed of cast iron with bronze bushings to preserve stem alignment, Clow Model F-5695, or approved equal.

2.08 MISCELLANEOUS:

A. Manhole Cover Lifting Tools: Provide two (2) cover lift lifting tools by Etheridge Foundry, or approved equal, compatible with manhole covers provided.

B. Frost Barrier: U.V. resistant, high grade polyethylene, minimum thickness six (6) mils.

C. Joint Sealants:

1. Butyl Rubber Sealant: One (1) inch diameter strips manufactured by Kent Seal, or approved equal.

2. Butyl Rubber Caulking: Conform to AASHTO M-198, Type B.

D. Sewer Manhole Inverts: Provide inverts as specified or as shown. Configuration to be as required by connecting pipes and as shown on Drawings.

PART 3 - EXECUTION:

3.01 INSTALLATION OF MANHOLES/PRECAST STRUCTURES:

A. Placement: Place precast bases and structures on compacted bedding material so bottom of structure is plumb and pipe inverts are at proper elevations. Place manhole barrel and top sections in the appropriate height combinations. Plug all lifting holes inside and out with non-shrink grout. Construct manhole inverts in accordance with specifications.

B. Joints: Follow manufacturers instructions for sealing joints between precast sections. Provide two rings of 1 inch diameter butyl rubber sealant. Point joints inside and out with butyl caulk.

C. Frame and Covers:

1. Set to final grade as shown on the Drawings and as specified. Provide adequate temporary covers to prevent accidental entry until final placement of frame and cover is made.

2. Use two rings of 1 inch diameter butyl rubber sealant between frame and rubber riser. Provide downward force to frame so as to compress the joint, provide a watertight seal, and prevent future settlement. Point compressed joint with butyl rubber caulk sealant.

3. Set manhole frames and covers to final grade only after pavement base course has been applied, or after final grading of gravel roads.

D. Inverts: As specified.

E. Steps: Replace any steps that are out of plumb and proper horizontal placement.

F. Frost Barriers: Wrap each manhole to the maximum excavation depth or not less than 6 feet below grade, with a minimum of four layers of 6 mils each of the polyethylene.

1. Clean manhole exterior of all dirt and remove any protrusions.

2. Apply a 6-inch wide vertical strip of bituminous waterproofing adhesive from the top of manhole to the greatest excavation depth, but not in excess of 6 feet.

3. Start poly wrap at adhesive strip and proceed around manhole continuously, overlapping adhesive strip a minimum of 24 inches on the final layer.

4. Tuck and pleat poly at top in a continuous manner, minimizing size of folds. Extend poly past top of manhole frame and temporarily tuck remainder inside frame, until final backfill and paving.

5. Paved areas: Cut poly flush with manhole rim after pavement is in place.

6. Unpaved areas: Pull loose ends of poly together, remove excess air and tie off end with galvanized wire. Bury with manhole below grade.

3.02 LEAKAGE TESTING - MANHOLES:

A. General: Tests must be observed by the District. Manholes must be complete, including backfill, for final test acceptance except for shelf and invert. Plug all pipes and other openings in the manhole walls prior to test.

B. Exfiltration Test:

1. Plug pipes into and out of MH and secure plugs.

2. Lower groundwater table (GWT) to below MH. Maintain GWT at this level throughout test. Provide means of determining GWT level at any time throughout test.

3. Fill MH with water to top of cone.

4. Allow a period of time for absorption (determined by CONTRACTOR).

5. Refill to top of cone.

6. Determine volume of leakage in an 8 hour (min) test period and calculate rate.

7. Acceptable leakage rate: Not more than 1 gallon per vertical foot per 24 hours.

8. The District reserves the right to require an infiltration test if the District is not satisfied with the exfiltration test.

C. Vacuum Test:

1. Manholes may be vacuum tested in lieu of the exfiltration test. The vacuum tests must be performed prior to backfilling the manhole, filling joints, and constructing the manhole inverts and benches. All pipe connections shall be made prior to the test.

2. Plug pipe openings and securely brace the plugs and pipe.

3. Set the tester onto the top section of the manhole and inflate the compression band to effect a seal between the structure and the vacuum base.

4. Connect the vacuum pump to the outlet port, open the valve, start the motor and draw a vacuum of 10" mercury.

5. Close the valve and monitor the vacuum gauge.

6. The test shall pass if the vacuum holds at 10" mercury or drops no lower than 9" within the following times:

Depth of Manhole (feet)	Time (min.)
0 - 10	3.0
10 - 15	3.5
15 - 20	4.0
20 - 25	4.5
>25	5.0

7. If the vacuum drops in excess of the prescribed rate, the CONTRACTOR shall locate the leak, make proper repairs, and retest the manhole.

8. If the unit fails the test after repair, the unit shall be water exfiltration tested.

3.03 REPAIRS:

A. Determine causes of all leaks and repair them. Perform earthwork required if manhole has been backfilled.

B. Perform repairs using methods and materials approved by the District. Remove and replace or reconstruct manhole if necessary. Remove and replace defective sections if required by the District.

3. SUBMERSIBLE PUMP STATION

This specification is to be used by Consulting Engineers who are specifying submersible pump stations to be owned and/or operated by the Portland Water District (PWD). Certain items herein need to be specified by the Consulting Engineer. Special circumstance may require deviations from this specification; these should be discussed with the PWD Engineering Department (207-774-5961).

PART 1 – GENERAL

1.01 PUMP STATION DESIGN REFERENCES:

A. Submersible Pump Station Description (This Document)

B. Generic Wastewater Pump Station Control Panel Drawing

C. Pump Station Electric Layout Drawings (3 drawings)

D. Telemetry Panel Bill of Materials (To be supplied upon request)

E. General Electrical Specifications

1.02 DESCRIPTION OF WORK: Furnish, install and test submersible wastewater pump station(s) as specified herein and shown on the Drawings, including:

A. Pre-cast concrete wet well

B. Pre-cast concrete valve manhole

C. Pumps and motors

D. Slide-away coupling, base and rail system

E. Piping and valves

F. Electrical, controls, and alarms

G. Miscellaneous components

1.03 SUBMITTALS:

A. Submit five (5) copies of all submittals. The Consulting Engineer shall also review all submittals for compliance with this specification and be responsible for final approval of the submittals. Submittals shall include the following:

1. Complete layout drawings illustrating all construction details, dimensions and elevations, plus any manufacturer instructions on installation and/or handling.
2. List of materials, shop drawings, manufactures literature, operating instructions and maintenance data necessary to determine the structures, materials and equipment to be supplied by the CONTRACTOR meet the requirements of this specification.
3. Pump manufacturer's performance curves showing total head, power and efficiency over the specified capacity range of each pump.
4. Submit calculations demonstrating that the pump station and valve pit have a factor of safety of at least 1.15 against flotation assuming the groundwater level is at finish grade and the structures are empty.
5. Complete layout and schematic drawings of the electrical and instrumentation system. Drawings shall show all devices, wiring, terminal blocks, wire numbers, terminal block numbers, etc. Drawings shall clearly show all connections to existing wiring and instrumentation that shall remain as part of the final product.
6. The pump station manufacturer shall combine all the above information into a common submittal package.

1.04 QUALITY ASSURANCE:

A. Qualification of the manufacturer: Minimum of 5 years experience in the design and manufacturer of submersible pump stations for wastewater. One manufacturer shall provide all structures, equipment and appurtenances, regardless of their original manufacturer. The CONTRACTOR shall be responsible for the satisfactory operation of the entire system.

1.05 GUARANTEE:

A. The CONTRACTOR shall guarantee for one year from substantial completion that the pump station, including the structure and all its equipment will be free from defects in materials and workmanship.

B. The CONTRACTOR shall obtain a 5 year warranty from the access hatch manufacturer, in the name of the Portland Water District, against defects in materials and workmanship, covering parts and labor.

1.06 TOOLS AND ACCESSORIES:

A. The CONTRACTOR shall furnish any specialty tools required to adjust, operate, maintain and repair the equipment. Any such tool shall be delivered prior to the acceptance of the pump station.

1.07 SUBSTITUTIONS:

A. All materials shall be supplied by the manufacturer(s) listed unless the statement "or equal" is specifically used for that item. All substitutions shall be clearly identified in the CONTRACTOR's submittals. The OWNER shall reserves the right to reject any substitution it considers not to be equal to that specified herein.

PART 2 – PRODUCTS

2.01 PRECAST CONCRETE ENCLOSURES:

A. The wet well and valve pit shall be designed and fabricated:

1. To the dimensions shown on the contract drawings or as modified and approved by the Owner during the submittal process.

2. To withstand all dead and live loads, and to the requirements of ASTM C478.
3. For HS-20 wheel loading.
4. To resist buoyant forces.

B. Concrete Requirements

1. Cement shall be Portland Cement conforming to ASTM C-150.
2. Min. 28 day compressive strength of concrete 4000 psi.
3. Reinforcing steel min. yield stress 40,000 psi.
4. Min. concrete cover 1".
5. Min. cement content 564 lbs. per cubic yard.
6. Entrained air 4.5% +/- 1%.

C. Concrete Testing: The pump station manufacturer shall collect test cylinders from the same concrete batch used to manufacturer the components supplied for this project. Test cylinders shall be cured in the same manner as the actual components. Test cylinders shall be tested at 7 days and 28 days. The test results shall be sent to the OWNER.

D. Horizontal Joints: Shiplay type, sealed with two 1" butyl rubber sealant strips.

E. Exterior Waterproofing: Waterproof all exterior below grade surfaces with HLM 1300S by Sonneborn or equal; 55 mils thick. Waterproofing is to be field applied to a dry surface under manufacturers recommended ambient conditions.

F. Interior Coating: Coat interior of pump station wet well and standby tank with coal tar epoxy; 3 coats with total dry film thickness not less than 15 mils.)

2.02 SEWAGE PUMPS:

A. Pumps: For each pump station provide two submersible, non-clog, horizontal discharge, wastewater pumps as specified herein and manufactured by Barnes Pumps, Inc. of Mansfield, Ohio or equal. Pumps shall be designed to pump raw, unscreened wastewater. The pumps shall be designed to operate in a lead-lag sequence.

B. Size: Each pump shall meet the design flow conditions.

C. Materials: the volute, seal plates, impeller and motor housing shall be constructed from ASTM A-48 class 30 cast iron. Pumps shall be painted with water based air dry enamel of 2.0 mil minimum thickness. All exposed hardware shall be 300 series stainless steel. All gaskets shall be compression square ring type.

D. Impeller: The impellers shall be of the non-clog design with pump out vanes on the backside. The impeller shall be dynamically balanced to ISO G6.3 specifications. The impeller shall be trimmed to meet specific performance characteristics prior to balancing.

E. Seal: Pump shall have a double mechanical seal of the single spring design operating in an oil-filled seal cavity. A moisture sensor detection system shall be integrated as standard within the oil-filled cavity, with appropriate alarming provided. Seal faces shall be carbon for the rotating face and ceramic for the stationary face.

F. Slide-away coupling, base and rail system: Discharge base shall be supplied by the pump manufacturer and designed to support the total weight of the pump. Slide away coupling shall be an integral part of the mechanism and shall be so constructed that, when lowered onto the discharge base, the knife action of the vertical metal to metal seal provides a self-sealing, non-clogging unit. It shall have guides for ease of raising and lowering on stainless steel rails. The base shall be bolted directly to the floor. The vertical flanged elbow shall be 125 lb. ANSI standard.

G. Motors: The motor's rotor and stator assembly shall be of the standard frame design and secured to the pump seal plate by threaded fasteners allowing for easy serviceability. The motor shall be constructed with the windings operating in a sealed housing that contains clean dielectric oil for heat dissipation making it capable of operating in a totally, partially or non-submerged condition for extended periods of time without damage due to the heat generated. Protection against excessive

temperature shall be provided by a heat sensor thermostat attached to the starter windings and connected in series with the automatic starting circuit in the control panel.

H. Shaft: The pump/motor shaft shall be of 416 stainless steel.

I. Tests: Each unit shall be given a factory certified test. A copy of the test results shall be supplied to the Portland Water District prior to equipment start-up.

2.03 PIPING AND VALVES

A. Ductile Iron Pipe:

1. Pipe: AWWA C151, class 53, size as shown on the Drawings.
2. Flanged fittings, gaskets, bolts & nuts: AWWA C110, fittings shall be cast iron, 175 psi pressure rating; gaskets shall be full faced.
3. Mechanical joint fittings: AWWA C110, AWWA C11, cast iron, 250 psi pressure rating.

B. Check Valves: Equal to Clow sized as shown on Drawings. Iron body, bronze mounted, outside lever and weight, ANSI #125 flanges.

C. Gate Valves shall be resilient seated gate valves meeting the latest AWWA C-509 standard.

1. Valve shall have a smooth unobstructed water way, be rated for zero leak rate at 200 psi differential working pressure and have a 400 psi hydrostatic test for structural integrity.
2. Valve disc or wedge shall be constructed of ductile iron (less guiding mechanism) and be fully encapsulated and permanently bonded with a resilient elastomer.
3. The internal and external valve body, including the stuffing box, bonnet and interior of the wedge shall be epoxy coated with 8 mils D.F.T. Interior shall meet latest version of AWWA C-550.
4. Valve shall open left.
5. Valve shall be one of the following: U.S.P. Metroseal, Waterous Series 500 (AFC), Muller A-2360 or Clow F6100 Series.

D. Bolts & Nuts: Hex head, UNC, Type 304 stainless steel.

E. Hangers and Supports:

1. For ductile iron pipe: Supports: 4" adjustable, cast iron saddle, lock nut nipple and reducer, assembled; equal to ITT Grinnel Fig. 264. Hangers: ½" galvanized hanger rods, threaded both ends; welded steel wall bracket equal to ITT Grinnel Fig. 195; adjustable clevis equal to ITT Grinnel Fig. 260.

F. Miscellaneous

1. Pipe Sleeves: Hot dipped galvanized steel pipe sleeves with waterstop collars as manufactured by Thunderline Corp.; "Link-Seal" compatible.
2. Link Seal: Mechanical type rubber seal with stainless steel bolts and units as manufactured by Thunderline Corp.
3. Manhole Boot: Flexible manhole sleeve equal to CP series manufactured by Interpace Corp. sized to fit diameter and type of pipe without the use of gaskets.

2.04 MISCELLANEOUS COMPONENTS

A. Valve Manhole and Pump Station Access Hatches: Double door access cover by Bilco, or equal. Door leaf shall be ¼" aluminum diamond pattern plate to withstand 150 pounds per square foot. Doors shall be equipped with heavy forged brass hinges, stainless steel hinge pins, automatic hold open arm with release handle and have a recessed hasp covered by a hinged lid flush with the hatch surface designed to allow the door to be secured by a padlock. Sizes as shown on drawings. Warranty period shall be no less than five years.

B. Stainless Steel Chains: For removing pumps from wet well; size 3/8 inch minimum.

C. Davit Arm Base Plate: Provide and install davit arm base plate(s) as shown on the drawings. The base plate shall be by DB Industries and designed to be compatible with a model L1830, DB Industries davit arm and meet the following requirements:

1. Rated working load: 350 pounds
2. Base height: 15.75 inches; base width: 12 inches by 12 inches
3. Zinc plated steel construction

2.05 FINISHES

A. General: Prepare surfaces and apply finishes as recommended by finish manufacturer. Paint shall be as manufactured by Tnemec Company or equal. All surfaces shall be coated with the type of paint indicated below and applied at the dry film thickness (DFT) in mils per coat as noted:

1. Metal (excluding galvanized and stainless steel):
   a. Prime – Polyamide epoxy primer, No. 66-1211 hi-build epoxoline by Tnemec or equal (3 mils DFT).
   b. First coat – Polyamide epoxy, No. 66 series hi-build epoxoline by Tnemec or equal (5 mils DFT).
   c. Second coat – Polyamide epoxy, No. 66 series hi-build epoxoline by Tnemec or equal (5 mils DFT).

2.06 ELECTRICAL POWER AND CONTROL SYSTEM:

A. General:

1. Provide complete electrical power and control system to the weather head on utility pole. Electrical power shall be a minimum of 110 volt, single phase, 60 Hertz, **the power requirements shall be determined by the ENGINEER**. The electrical system shall include supplying, installing and testing the utility pole (if required by CMP), wiring, electrical meter, disconnects, control devices, conduit and appurtenances to make a fully functional system. Additional details are provided herein and on the Drawings.
2. Supply all materials, devices and equipment in conformance with:
   a. Underwriter's Laboratory, Inc.
   b. National Electric Manufacturers Association
   c. American National Standards Institute
   d. National Electric Code
   e. Local Power Company
3. Supply and install conduit, wiring and weather head on the utility pole. Supply and install an electrical meter per Central Maine Power's (CMP) requirements. The CONTRACTOR is responsible for coordinating its activities with CMP.
4. The Power panel shall be contained in an exterior enclosure with a solid door(s). Fasten all electrical components to removable sub-plates with screws and lock washers. Tap sub-plates to accept screws. Do not use self-tapping screws. The main control panel shall be provided with a 100 watt, incandescent light, light switch and a utility receptacle that shall remain accessible and functional whether or not the inner door is open.
5. The Control panel shall be constructed following the Generic Wastewater Control Panel drawings and the Instrumentation Specifications.
6. General Control Description: The control system shall allow the pumps to be operated in either manual or automatic modes. The control loop for each pump shall incorporate a hand-off-auto switch, on-off and lead-lag control using an ultrasonic level indicator and a Programmable Logic Controller (PLC), time delay relay and motor overload relay. Alarms and pump status shall be displayed on the interior door of the control panel and transmitted via telemetry to the Portland Water District's Douglass Street facility as described below. The following items shall be mounted on the inner door of the main control panel (please refer to the Generic Wastewater Control Panel drawings for the complete details):

Pump 1 H-O-A switch	Pump 2 H-O-A switch
Pump 1 over-load reset button	Pump 2 over-load reset button
Pump 1 Run Light (green)	Pump 2 Run Light (green)
Pump 1 Seal Alarm (red)	Pump 2 Seal Alarm (red)
Pump 1 Overload (red)	Pump 2 Overload (red)
Pump 1 Temp Alarm (red)	Pump 2 Temp Alarm (red)
High-high wet well light (red)	110 volt GFI receptacle
Hydro-Ranger programmer	

7. Pump run status, motor overload, high motor temperature and pump seal leak alarm lights shall be displayed on the Control Panel swing-out panel, and grouped by the pump. Each of these alarms will be sent individually to the telemetry panel.

B. Components in wet well: Comply with National Electric Code requirements for Class I, Group D, Division 1 locations.

C. Enclosures:

1. At minimum, the control panel, telemetry panel and miscellaneous electrical devices shall be mounted on a sheet of marine plywood attached to pressure treated 6" x 6" wooden posts. The plywood sheet shall be braced with pressure treated 2" x 4"s or unistrut suitable for exterior use. Additional details are provided on the drawings. For residential areas, it is strongly recommended to enclose the above equipment in a 10'x12' building set on a concrete pad.
2. The telemetry panel enclosure shall be 16"x30"x36" for all applications, and it will be constructed of factory painted metal with a NEMA 4 rating (ref: Telemetry Panel Bill of Materials for details).
3. The Control Panel enclosures, within 1000 feet of salt water (mean high tide line), shall be:
   a. Exterior Enclosures: NEMA Type 3R, 4 or 4X, materials of construction shall be stainless steel with stainless steel hardware. Enclosures shall be lockable with a padlock. The telemetry panel will have a door stop kit that will have an easy disengagement to allow full swing of the door. Enclosures shall have a built in pocket for storing the panel's as-built wiring diagram.
   b. Interior Enclosure: NEMA Type 4X or 12, materials of construction shall be stainless steel or fiberglass with stainless steel hardware. Enclosures shall have a built in pocket for storing the panel's as-built wiring diagram.
4. The Power Panel at all other locations:
   a. Exterior Enclosures: NEMA Type 3R, 4 or 4X, materials of construction shall be steel with stainless steel hardware. Enclosures shall be factory painted to ensure rust resistance. The telemetry panel will have a door stop kit that will have an easy disengagement to allow full swing of the door. Enclosures shall be lockable with a padlock. Enclosures shall have a built in pocket for storing the panel's as-built wiring diagram.
   b. Interior Enclosures: NEMA Type 4, 4X or 12, materials of construction shall be steel or non-metallic with stainless steel hardware. Enclosures shall be factory painted to ensure rust resistance. Enclosures shall have a built in pocket for storing the panel's as-built wiring diagram.
5. No electrical devices or terminal blocks within the enclosures shall be located within 18" of the ground or concrete pad.

D. Main Disconnect Switch: Disconnect switches shall be heavy duty and be designed to accept a padalock as manufactured by Square D, or equal. Main disconnect switch may be incorporated as part of the main circuit breaker

E. Main Circuit Breakers: Normal duty molded case, bolt in type, interrupting capacity 10,000 amperes RMS symmetrical at 120/240 volts, manufactured by General Electric, Westinghouse or Square-D. Minimum size: 100 Amps.

F. Surge Suppressor: Provide protection from lightning and electrical surges. Surge suppressor shall have a peak surge current rating of be 80,000 amps per phase and include auxiliary dry contacts. The surge suppressor shall be The Protector, P-Plus model as manufactured by Innovative Technology, Inc of Brooksville, Florida or approved equal.

1. Single Phase: Model P1S120/240+C.
2. Three Phase: Model P3Y120/208+C.

G. Emergency Power Outlet: 600 volt, 100 amp, manufactured by Killarc, model number WRWJS-1004, no substitutes.

H. Manual Transfer Switch: Industrial duty as manufactured by Square-D or approved equal.

I. Control Power:

1. Control Power Transformer: Industrial duty as manufactured by Cutler-Hammer or approved equal.
2. Distribution Panel: Provide separate 100 amp circuit breaker if main circuit breaker is larger than 100 amps.
3. Circuit breakers: Shall be as manufactured by General Electric or equal, normal duty molded case, bolt in type, interrupting capacity of 10,000 amperes RMS symmetrical at 120/240 volts.

J. Motor Branch Components & Motor Control Circuit:

1. General: Provide highest quality industrial components. Provide separate circuit protection, motor starter, and overload relay for each pump. Motor starter overload relay shall have auxiliary N.O. contract (closed on tripping) to activate "Motor Overload" alarm. Provide a motor winding over temperature thermostat in the motor which shall activate a "High Temperature" alarm. The pump seal leak detector shall activate a "Seal Leak" alarm.
2. Circuit Protection: Heavy duty circuit breaker, interrupting capacity 10,000 amperes at 240 volts, sealed by manufacturer after calibration. Provide padlocking operating mechanism for each breaker. Label circuit breakers to indicate circuit protected.
3. Motor Starters: NEMA rated, size 1 or above magnetic, open frame, contacts shall be replaceable without removing starter from mounted position, provide under-voltage release and overload protection on all three phases; provide capacity for addition at least 2 auxiliary contacts. Overload relays shall have visual trip indication and manual reset. All starters shall be Square D, Allen Bradley, Westinghouse, or approved equal.
4. Overload Thermal Units: Shall be supplied by the motor starter manufacturer and sized for the pumps specified herein.
5. Overload reset buttons shall be mounted on the face of the interior control panel to allow operators to rest the overloads without opening the panel door.
6. Circuit Breakers for Controls and Miscellaneous 120 volt Items: Shall be as manufactured by General Electric or equal, normal duty molded case, bolt in type, interrupting capacity of 10,000 amperes RMS symmetrical at 120 volts.
7. Ground Fault Interrupt Circuit Breakers shall be UL listed Class A.
8. All circuit breakers shall be labeled to indicate circuit protected.
9. Hand-Off-Auto Selector Switches: 3-way selector switches, industrial grade, oil tight construction, equal to Allen-Bradley, or approved equal, 300 volt rated. When a selector switch is in the hand mode the pump shall be energized regardless of wet well level, when in the auto mode the pumps on and off depending on wet well level, based upon the control system.
10. Time Delay Relay: Electro Mechanical Design, contacts rated at 10 amperes minimum at 120 volts. Provide a time delay to prevent both pumps from starting simultaneously, Allen Bradley or approved equal.

11. Push buttons shall be industrial grade, oil tight construction equal to Allen-Bradley or approved equal. Pilot lights shall be 120 volt.

12. Labels for all devices on the front of the telemetry and control panels shall be provided. Labels shall be aluminum or heavy duty plastic legend plates. Legend plates shall be attached to the panel by screws, rivets or be an integral part of the device. Stick on labels are not acceptable. Individual letters shall be at least 0.14" high.

13. Elapsed Time Meter: Provide an industrial grade elapsed time meter (ETM) for each pump. The ETMs shall be flush mounted, 120 volt, water resistant construction, contain at least seven digits capable of recording up to 99,999.99 hours and recording in increments of 0.01 hours. Digits shall be at least 0.14 inches high.

14. Relays shall be industrial grade cube relays as manufactured by Idec, Allen Bradley or equal.

K. Level Control System

1. An ultrasonic level measuring devise shall provide level control, level indication and specified auxiliary alarms. The devise shall be a HydroRanger as manufactured by Milltronics (no substitutes allowed) with an XPS-15 transducer. Please refer to the Generic Wastewater Pump Station Control Panel drawings for the complete wiring details.

2. Provide a single low voltage non-mercury float switch for the high-high wet well level alarm. The float switches shall be housed in an unbreakable steel shell encased in polyurethane. Cable conductors shall be a minimum of #16 AWG. The float switch shall be wired to an intrinsically safe relay. Please refer to the Generic Wastewater Pump Station Control Panel drawings for the complete wiring details.

L. Provide thermostatically controlled heater in the control panel to minimize condensation and insure operation of the electronic/electrical equipment during cold weather. Calculate based on - 30° F ambient. Heater is to be controlled by thermostat built into control panel. Heater shall be designed so as not to damage enclosure or components.

M. Wire & Wiring: Run all wiring outside of the electrical panels in conduits. Run signal and instrument wiring in separate conduits from line voltage wiring.

1. Type: THWN or THHW, 600 volts. Color Codes and Identification:

Control Panel:

a.	Line and load circuits, AC or DC power	-	Black
b.	AC control circuit at less than line voltage	-	Red
c.	Equipment grounding conductor	-	Green
d.	Current carrying common	-	White
e.	Hot with circuit breaker open	-	Orange

Telemetry Panel: (To be supplied upon request)

2. Sizing:

a. Electrical control circuit within panels minimum 14 AWG.

b. 4-20 mA signal wiring and telemetry panel wiring shall be no smaller than 18 AWG.

c. Wiring in conduit minimum 14 AWG; size per voltage drop limitations on control circuit.

d. Motor branch wiring minimum 10 AWG; size per NEC.

3. Provide shielded instrument cable where recommended by manufacturer of signal or instrumentation systems or subsystems.

4. WAGO Brand Terminal blocks for the telemetry panel shall be:

Terminal Strip Specifications

Spec #	Application	WAGO terminal	WAGO end/sep (orange)	WAGO stops	Color
1	Analog Input	280-874	280-373	249-116	grey
2	Analog Outputs	280-874	280-373	249-116	grey
3	Descrete Inputs	281-619	281-341	249-116	grey
4	Descrete Outputs	281-619	281-341	249-116	grey
5	Line AC Power	281-629	281-341	249-116	blue
6	24 VDC Power	281-663	281-335	249-116	red
7	DC Ground	281-664	281-335	249-116	black
8	System Ground	281-657	281-335	249-116	yellow-green
9	Intrinsic Safe Analogs	281-695	209-191	249-116	light grey
10	Intrinsic Safe Discretes	281-695	209-191	249-116	light grey
11	Intrinsic Safe System Ground	281-657	281-335	249-116	yellow-green

5. All of the telemetry wire ends shall be covered with the appropriate WAGO brand wire ferrules. They shall be as follows:

Wire Ferrule Specifications

Spec #	Application	WAGO #	Color
1	12 AWG	216-207	grey
2	14 AWG	216-205	yellow
3	16 AWG	216-204	black
4	18 AWG	216-203	red
5	20 AWG	216-202	grey
6	22 AWG	216-201	white
7	Crimping Tool	206-204	

6. All field and cabinet wires will labeled clearly with either the tagname of the applicable signal, or with an appropriate identifier, using a plastic heat shrink label.
7. Use slotted plastic wire ways within the control panel for routing wires.
8. Bundle all wires not within slotted plastic wire ways. Do not bundle in slotted plastic wire ways.
9. Control wires entering or leaving the control panel shall be attached to a terminal strip. The individual connections on the terminal strip shall be numbered.
10. Identification of conductors: Provide permanently attached wire number 1" from each end of each wire at every termination point. For fully visible wires not more than 4" long, provide one number at midpoint. Provide wire numbers matching terminal strip numbers. Number progressively from left to right or top to bottom. Do not use alphabetical identification.

N. Conduit and Fittings:

1. Rigid conduit: Galvanized steel, provide for general use.
2. Liquid tight flexible metal conduit: Smooth, flexible galvanized steel core with abrasion resistant, liquid tight PVC cover; provide for all connections to motors.

O. Utility receptacles shall be a 110 volt, 20 amp, duplex, GFI receptacles. Receptacles shall be Arrowhart 5735-S.

P. Wet well Junction Box: Provide at least two Class 1, Division 1, Group D rated junction box for installation outside of wet well. Units shall be complete with corrosion resistant terminal strips for making up all connections. During installation and hookup, coat all wire connections with NO-OX to prevent corrosion of contacts by moisture. Label all wires to identify their destination and use.

2.07 TELEMETRY SYSTEM: (To be supplied upon request)

A. General: The CONTRACTOR shall furnish and install a complete telemetry system as herein specified and shown on the Generic Wastewater Pump Station Control Panel drawings. The pump station telemetry system shall utilize a PLC based radio modem to communicate with the Portland Water District's master wastewater station (see the attached bill of materials).

B. Enclosure: The telemetry shall be housed in the Control Panel enclosure (refer to the Telemetry Panel Bill of Materials for the specific type) to be furnished by the Contractor. Termination of field wiring by the Contractor shall be via the details illustrated in the Generic Wastewater Control Panel drawings.

C. The Contractor will verify the following field contacts to "I" and "O" registers of the PLC :

1. High-high wet well level switch discrete input
2. Power loss relay discrete input
3. All pump Auto switch indicator discrete inputs
4. All pump seal failure discrete inputs
5. All pump overload discrete inputs
6. All pump high temperature switch discrete inputs
7. All pump run status discrete inputs
8. Generator fault discrete input (if required)
9. Transfer switch set to CMP discrete input (if required)
10. Transfer switch set to generator discrete input (if required)
11. Loss of echo from the Milltronics HydroRanger discrete input
12. Remote radio power switch discrete output
13. Wet well level indication analog input

D. The Owner will provide the final PLC program and the services required to include the new pump station in the master telemetry system.

2.08 FACTORY TESTING ASSEMBLY:

A. Test motors, pumps, controls, and electrical panels for proper operation. Make corrections and adjustments prior to shipping pump station.

B. Factory assemble and "match mark" all pre-cast items for ease of installation.

PART 3 – EXECUTION

3.01 INSTALLATION:

A. General: Comply with instructions of pump station manufacturer. Provide five (5) Operation and Maintenance Manuals to OWNER prior to installation of pump stations. As-built electrical drawings may be provided after start-up.

B. Placement: Place pre-cast items as shown on the Drawings so structure is plumb and pipes are at proper elevation. Plug all lifting holes inside and out with non-shrink grout. Pump station manufacturer shall assist CONTRACTOR in assemble of the pump station. CONTRACTOR shall notify OWNER 3 working days in advance of setting the pump station wet well and valve pit.

C. Power Supply: Coordinate installation with power company. Provide complete system from pump station to point of connection to CMP facilities.

3.02 INITIAL STARTUP:

A. Provide at least one factory trained manufacturer's representative for field assembly and start-up of the pump station.

B. The wet well level will be controlled using the HydroRanger auxiliary control contacts and the on-board HydroRanger control logic. When the telemetry system has been started, the PLC control logic will take over the primary level control.

3.03 FIELD TESTING:

A. Process Equipment Tests: Test pump stations for proper operation for a minimum of 3 consecutive days. Each pump must operate for a minimum of two hours during the test. Provide water for tests if adequate wastewater flow is not available. Test the control system for all functions including the operation of lead and lag pumps and alternating of pumps. At start and end of test period operate each pump at the design head and measure and record pumping capacity, motor speed, and horsepower. Test all functions of the alarm system. Schedule all tests with the OWNER. The OWNER shall have the option to witness all tests.

B. Piping: Test pump lines as force mains.

C. Telemetry System Tests: Coordinate test with the OWNER to verify pump status, alarms and level indication are received at the Control panel.

D. Defects and Adjustments: Correct defects, replace defective equipment, and make adjustments to provide a properly operating system. Repeat tests if required by OWNER.

E. Notify OWNER at least 14 working days prior to tests.

3.04 OPERATOR INSTRUCTION:

A. Provide 2 hours of instruction on the use of the Milltronics HydroRanger and the PanelView display.

3.05 OPERATIONS & MAINTENANCE MANUALS:

A. Provide five (5) sets of operations & maintenance (O&M) manuals containing the following information for all equipment and systems provided by the CONTRACTOR:

1. Manufacture's specifications and cut sheets.
2. Manufacture's operations and maintenance manuals.
3. **As-built** mechanical/civil drawings based on the pump station manufacturer's submittals.
4. **As-built** electrical schematic diagrams showing control logic. This diagram may be based on the pump station manufacturer's submittals.
5. **As-built** instrumentation drawings showing all components, wiring, wiring numbers, terminal blocks, and tie points to existing equipment or wiring. These shall be based on the Generic Wastewater Pump Station Control Panel drawings.

B. Laminate in clear plastic one copy of the as-built electrical schematic diagrams and instrumentation drawings and place these in the interior control panel enclosure.

C. Provide electronic copies (PDF) of all manufactures O&M materials.

D. As-built electrical schematic diagrams and wiring drawings shall be drawn using a CAD program fully compatible with AutoCAD release 14. Provide an electronic copy of each drawing to the Portland Water District.

4. *TELEVISION INSPECTION OF SEWER LINES*

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK:

A. The CONTRACTOR shall furnish all materials, tools, labor and equipment necessary to visually inspect and document the installed or rehabilitated gravity sewer lines by means of a closed-circuit television system.

1.02 SUBMITTALS

A. The CONTRACTOR shall submit log sheets upon completion of the CCTV inspection that shall include stationing, manhole numbers, findings and other pertinent data. (See documentation below)

B. The CONTRACTOR shall provide three (3) copies of the video inspection tape. The tape shall be clearly labeled with the date of inspection and the segment of sewer line inspected. The tapes shall include any initial or pre-rehabilitation pipeline inspections and the repaired or post-rehabilitation pipeline inspection results.

1.03 PRODUCTS

A. EQUIPMENT:

1. VHS video system shall be used which utilizes 1/2-inch recording tapes and the SLP mode.

2. The television camera used for the inspection shall be one specifically designed and constructed for such inspection. Lighting for the camera shall be suitable to allow a clear picture for the entire periphery of the pipe. The camera shall be operative in 100 percent humidity conditions. The camera, television monitor and other components of the video system shall be capable of producing a minimum 650 line resolution color video picture. Picture quality and definition shall be to the satisfaction of the DISTRICT and, if unsatisfactory, equipment shall be removed and no payment made for the unsatisfactory inspection. The camera head shall be pan-and-tilt type with the ability to rotate 360° to view the entire internal circumference of the pipe. The equipment must continuously indicate time, date, and station on the tape. The operator shall narrate to describe conditions or other services encountered.

1.04 EXECUTION

A. INSPECTION:

1. Manual winches, power winches, TV cable and powered rewinds or other devices that do not obstruct the camera view or interfere with proper documentation of the sewer conditions shall be used to move the camera through the sewer line. The rate of movement through the pipeline shall be no more than 1 ft/sec. If, during the inspection, the television camera shall not pass through the entire manhole section, the CONTRACTOR shall reset up his equipment in a manner so that the inspection can be performed for the opposite manhole. The CONTRACTOR is required to repeat the TV inspection of areas repaired subsequent to the original TV inspection.

2. Whenever non-remote powered and controlled winches are used to pull the television camera through the line, telephones or other suitable means of communication shall be set up between the two winches and the monitor control.

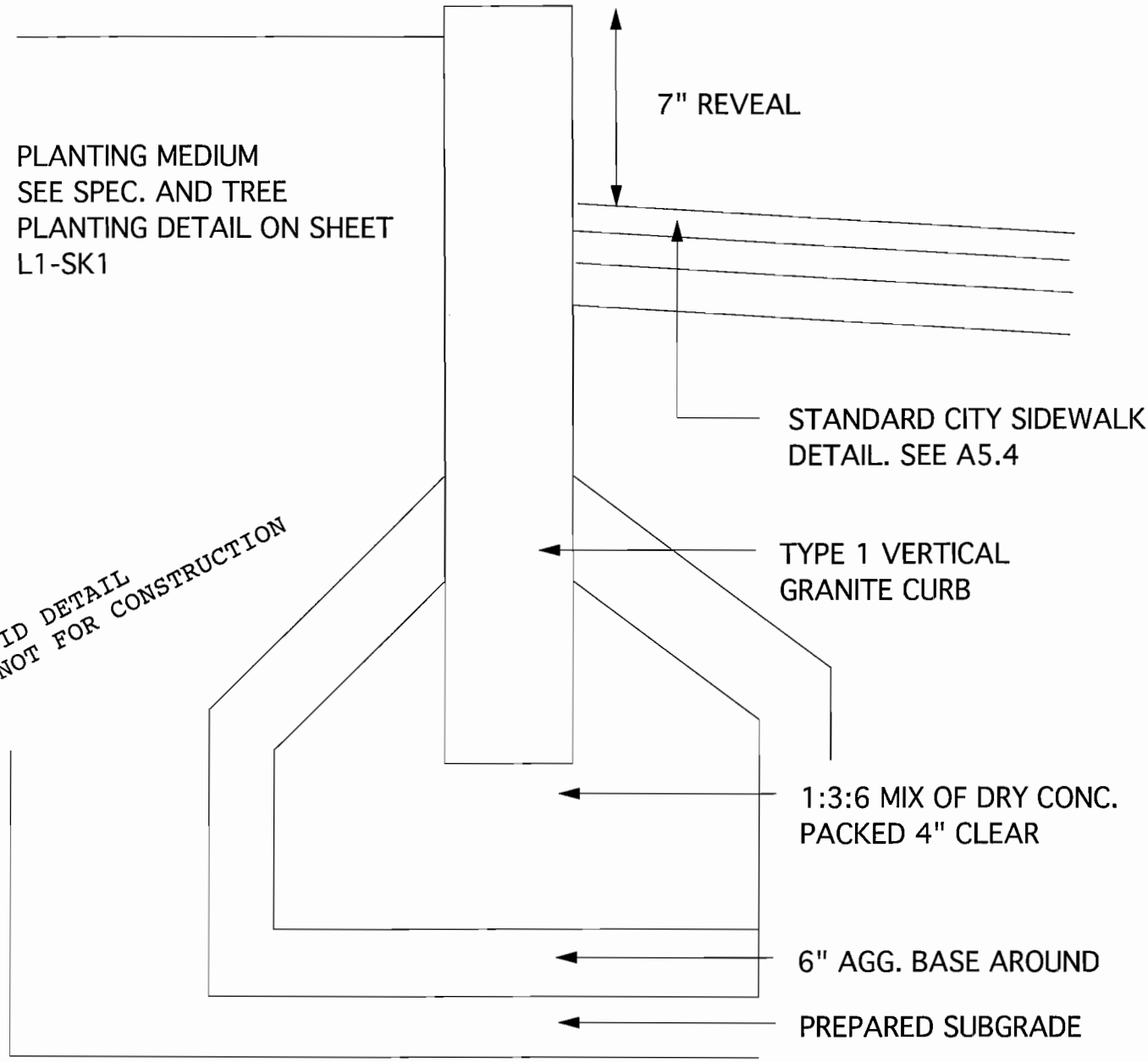
B. DOCUMENTATION:

1. Printed location records shall be kept by the CONTRACTOR that shall clearly show the exact location, in relation to adjacent manholes, of each infiltration point discovered by the television camera. In addition, other points of significance such as locations of laterals, unusual conditions, collapsed sections, and other discernible features shall be recorded and a copy of such records shall be supplied to the DISTRICT.

3. Video tapes of the entire inspection shall be provided to the DISTRICT upon completion of the inspection. The tape playback shall be at the speed that is recorded. The CONTRACTOR shall be required to have all tapes and necessary playback equipment readily accessible for review by the DISTRICT during the project.

Section 022403

See L3 – SK 1 and L3 SK 2 to follow



SHERIDAN HEIGHTS

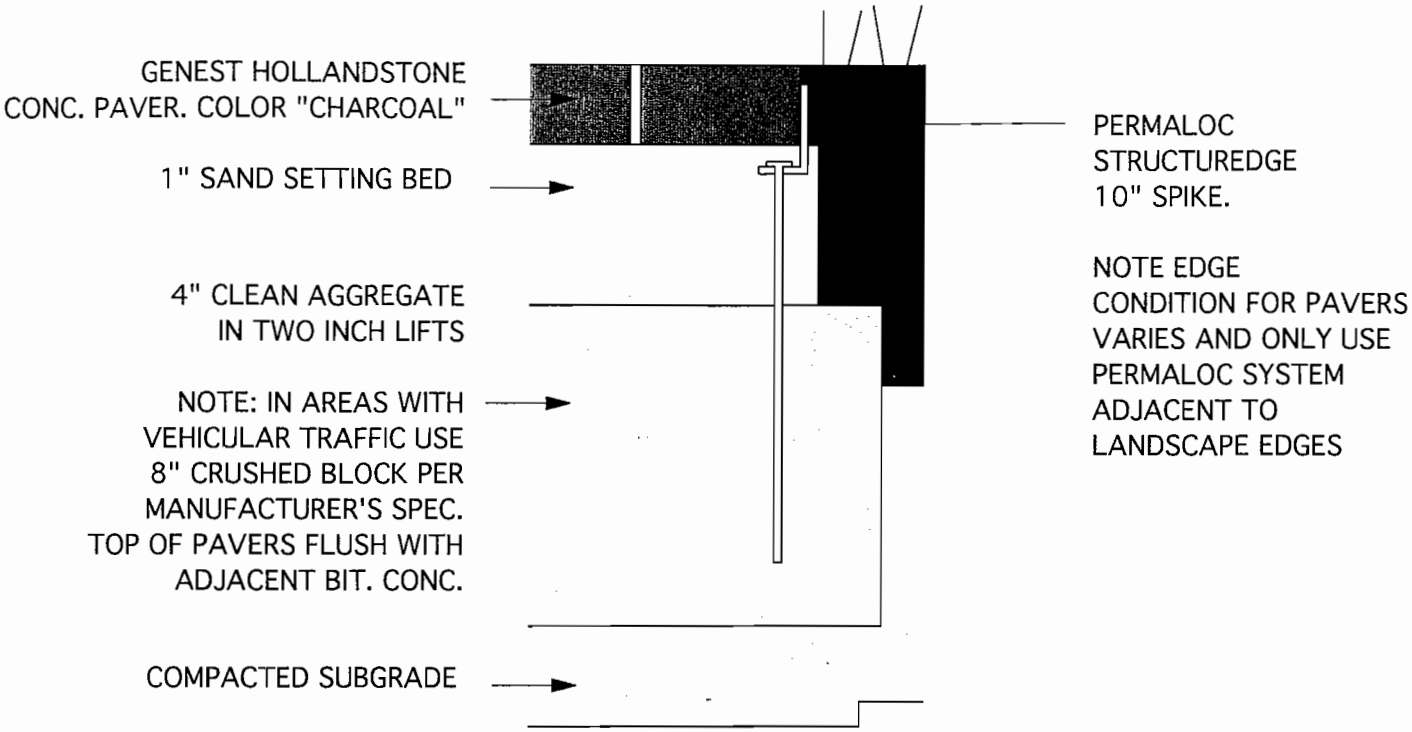
L3-SK1 PLANTER CURB @ SIDEWALK DETAIL (REFER TO L1-SK1 FOR PLAN VIEW) NOT TO SCALE

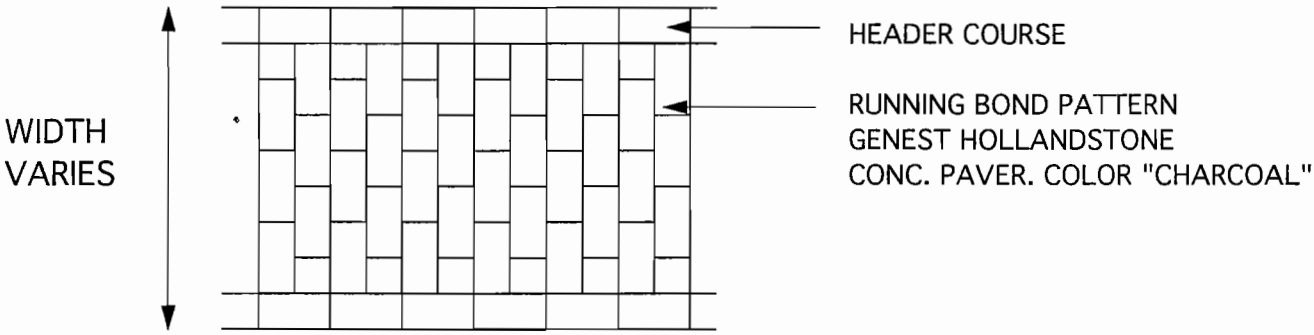
LANDSCAPE ARCHITECT

MRLD, LLC
87 MAIN STREET
YARMOUTH, ME 04096
207 846 4966

DEVELOPER

SHERIDAN STREET, LLC
477 CONGRESS STREET, 5TH FLOOR
PORTLAND, ME 04101
207 523 3410





SHERIDAN HEIGHTS

L3-SK2 CONCRETE PAVER DETAIL SECTION AND PAVING PATTERN
(REFER TO L1-SK1 FOR PLAN VIEW LOCATION)
NOT TO SCALE - 2.16.07 BID SET NOT FOR CONSTRUCTION

LANDSCAPE ARCHITECT

MRLD, LLC
87 MAIN STREET
YARMOUTH, ME 04096
207 846 4966

DEVELOPER

SHERIDAN STREET, LLC
477 CONGRESS STREET, 5TH FLOOR
PORTLAND, ME 04101
207 523 3410

Section 04810 Unit Masonry Assemblies

2.1.A Add: "CMUs wholly below finished grade level to be smooth face."

Add: "2.2.A.5 Fire rating: UL certified."

Section 06100 Rough Carpentry:

Add: "1.3.G Unit Kitchen/vanities – Section 11451"

Add on row of 2 x 4 blocking at all bath hardware (towel bars etc) See 11451-1 for blocking instructions for other cabinetry.

Section 07531 EPDM Membrane Roofing:

2.2.D Delete: "3-inch wide"
Replace with: "6-inch wide"

2.3.A Delete: "Carlisle Dens-Deck Prime glass mat gypsum wall board, 5/8-inch thick"
Replace with: "high density fiberboard, 1/2-inch thick, over all foam roof insulation"

2.5.B Delete: "Cold Fluid-Applied Adhesive: Manufacturer's standard cold fluid- applied adhesive formulated to adhere roof insulation to substrate"
Replace with: "All EPDM layers to be secured with factory coated steel screw fasteners and metal or plastic plates, meeting corrosion-resistance provisions in FMG 4470, designed for fastening roof membrane to substrate and acceptable to membrane manufacturer.

Specification 07620 Sheet Metal Flashings & Trim

2.1.A Add: "All flashings to be aluminum unless otherwise noted. All flashings to be pre-finished grey to match fiber cement trim color. For Add-alternate # 1 roof edge & curb flashing to be pre-finished white."

2.3.B.1 Delete: "Rivet joints for additional strength"

Section 08710 Finish Hardware

Doors 100.1, 101.1, 102.2 103.1, 105.1,106.1 & 107.1 to have aluminum thresholds to meet ADA requirements.

Section 09600 Carpet

All carpet to receive 8 # rebounded pad under

Section 10800 Toilet and Bath Accessories

All bathrooms to receive ¼" beveled plate glass mirrors to match the counter width below less 2 inches in width x 36" tall; set 1.5 inches above the backsplash.

Section 11451

The listed cabinets show each piece and part – any additional fillers shall be provided as needed.

Section 15400-1

The laundry sink in the Mechanical Room 210 is a Fiat FL1 with Gerber # 49-244 Laundry Faucet.

SHERIDAN STREET, LLC
477 Congress Street, 5th Floor
Portland, Maine 04101-3427
207 523 3410 Office
207 773 8597 Fax

ADDENDUM NO. 2

To the Contract Documents for the Sheridan Heights project.

Owner: Sheridan Street, LLC

February 26, 2007

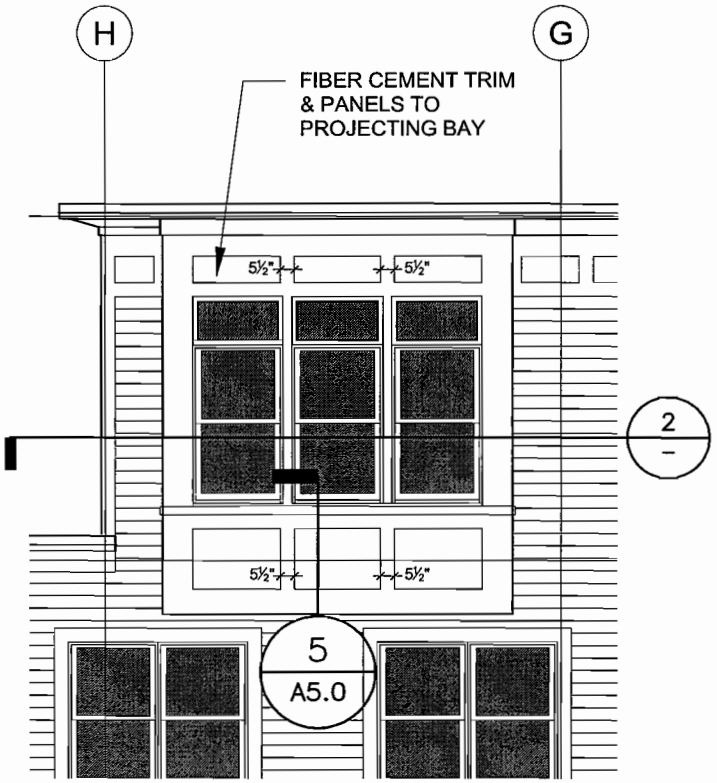
This Addendum modifies, amends and supplements designated parts of the Contract Documents, Project Manual and Drawings for the Sheridan Heights Drawings dated February 5, 2007 and Addendum No. 1 dated February 14, 2007 and is hereby made a part thereof by reference. This Addendum is binding as though inserted in its entirety in the locations specified herein. It shall be the responsibility of the General Contractor to notify all Subcontractors and Suppliers that will be bidding the project for the various parts of the work of any changes or modifications in the Addendum.

Greg Shinberg, Project Manager
Shinberg Consulting, LLC

INDEX

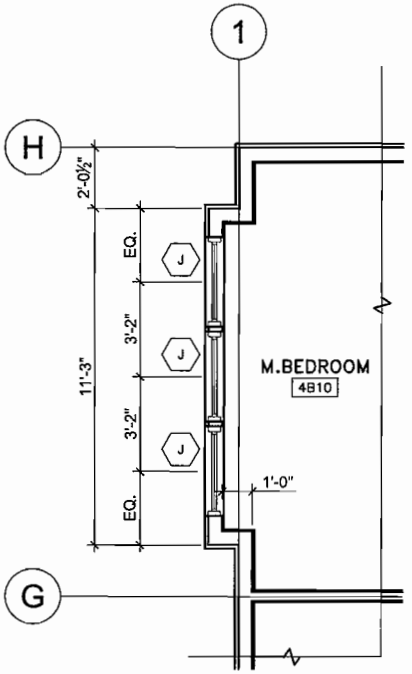
The following drawings are provided on 8.5" x 11" to follow:

1. ASK 2 by TFH Architects
2. ASK 3 by TFH Architects
3. ASK 4 by TFH Architects
4. ASK 5 by TFH Architects
5. ASK 6 by TFH Architects
6. CSK 1 by SGC Engineering
7. CSK 2 by SGC Engineering
8. CSK 3 by SGC Engineering



1 — PART ELEVATION - NORTH
1/4" = 1'-0"

NOTE: REFER TO A2.1



2 — PART PLAN - 4TH FLOOR
1/4" = 1'-0"

NOTE: REFER TO A1.3

BID SET
Not for Construction
02. 26. 07

SHERIDAN HEIGHTS

PROPOSED CONDOMINIUMS AT
135 SHERIDAN STREET, PORTLAND, MAINE
FOR SHERIDAN ST. LLC

TFH ARCHITECTS
100 COMMERCIAL STREET
PORTLAND MAINE 04101
TELEPHONE 207 775 6141
ARCHITECTURE PLANNING

CONSULTANTS:

REFER TO TITLE SHEET FOR CONSULTANT INFORMATION

OWNERS' REPRESENTATIVE

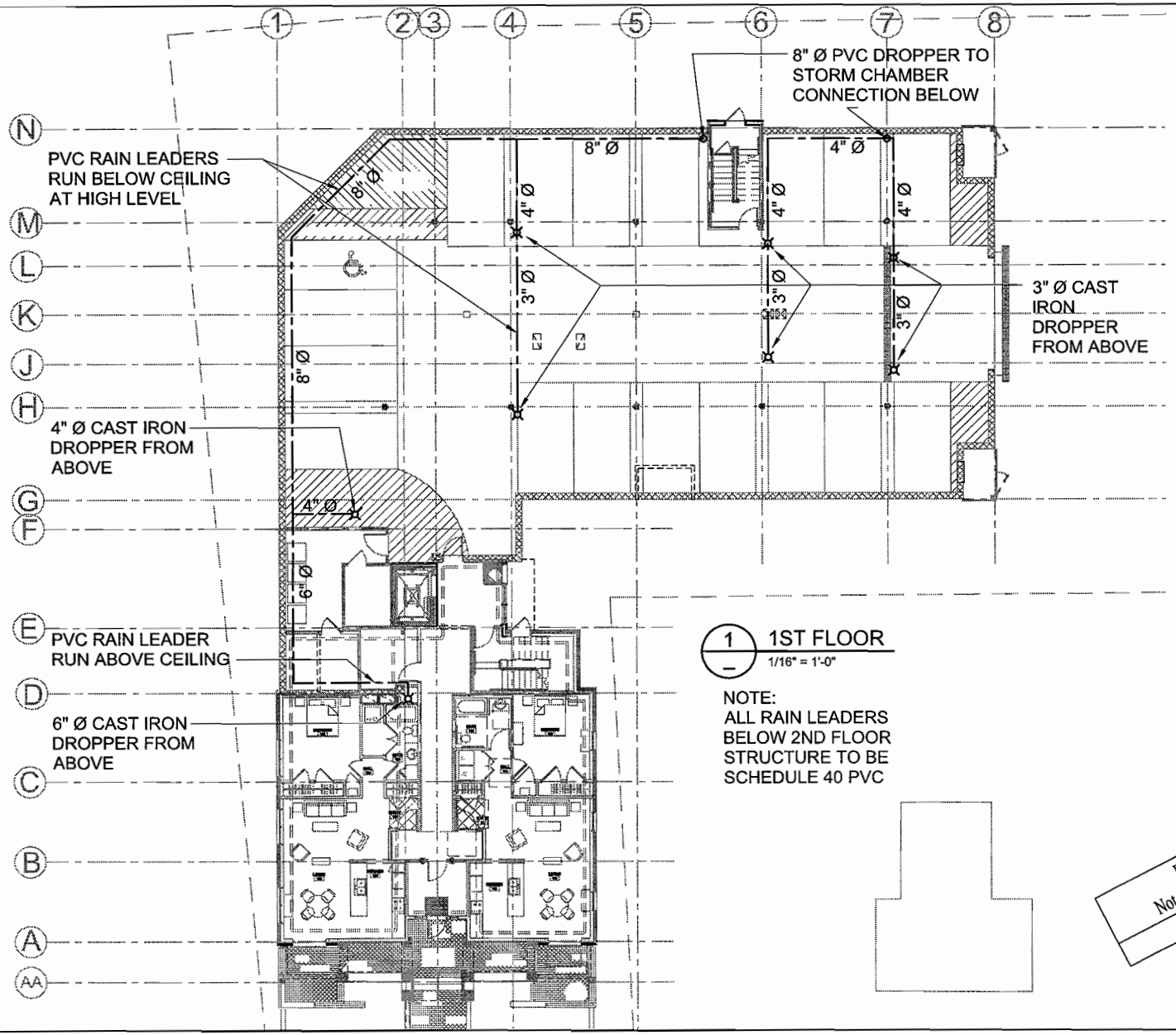
shinberg CONSULTING, LLC
477 CONGRESS ST, 5TH FLOOR,
PORTLAND, ME 04101
TEL: 207 523 3410

DATE:	02.26.07
PROJECT No.	0507
DRAWN BY:	RTL
CHECKED BY:	TST
SCALE:	As Shown

SHEET TITLE:

UNIT 4B
WINDOW

ASK
2



1 1ST FLOOR
1/16" = 1'-0"

NOTE:
ALL RAIN LEADERS BELOW 2ND FLOOR STRUCTURE TO BE SCHEDULE 40 PVC

BID SET
Not for Construction
02.26.07

MAG NORTH
PROJECT NORTH

SHERIDAN HEIGHTS

PROPOSED CONDOMINIUMS AT
135 SHERIDAN STREET, PORTLAND, MAINE
FOR SHERIDAN ST. LLC

TFH ARCHITECTS
100 COMMERCIAL STREET
PORTLAND MAINE 04101
TELEPHONE 207 775 6141
ARCHITECTURE PLANNING

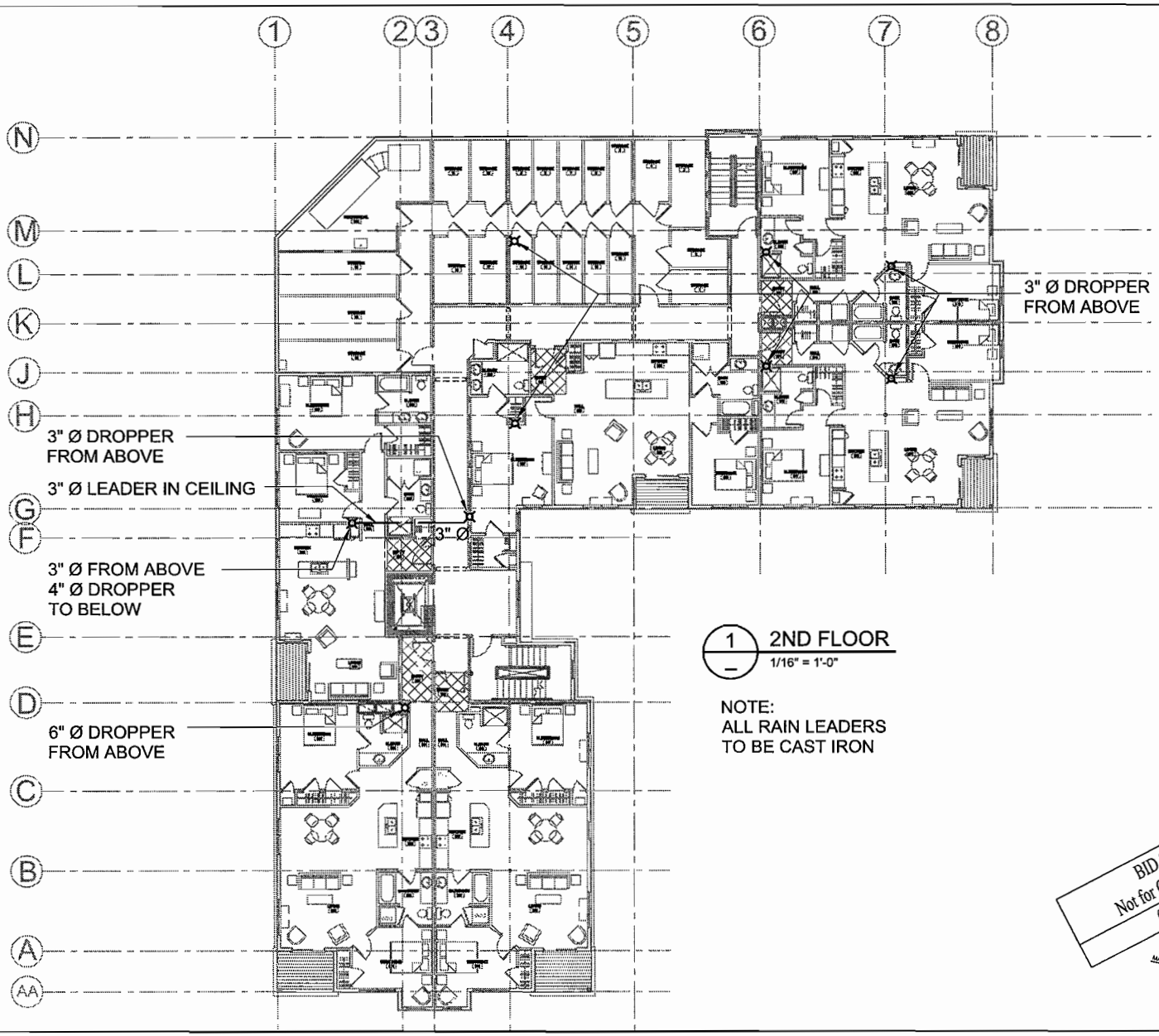
CONSULTANTS:
REFER TO TITLE SHEET FOR CONSULTANT INFORMATION

OWNERS' REPRESENTATIVE
shinberg CONSULTING, LLC
477 CONGRESS ST, 5TH FLOOR,
PORTLAND, ME 04101
TEL: 207 523 3410

DATE:	02.26.07
PROJECT No.	0507
DRAWN BY:	RTL
CHECKED BY:	TST
SCALE:	As Shown

SHEET TITLE:
ROOF DRAIN LEADERS

ASK 3



1 2ND FLOOR
1/16" = 1'-0"

NOTE:
ALL RAIN LEADERS TO BE CAST IRON

BID SET
Not for Construction
02. 26. 07

SHERIDAN HEIGHTS

PROPOSED CONDOMINIUMS AT
135 SHERIDAN STREET, PORTLAND, MAINE
FOR SHERIDAN ST. LLC

TFH ARCHITECTS
100 COMMERCIAL STREET
PORTLAND MAINE 04101
TELEPHONE 207 775 6141
ARCHITECTURE PLANNING

CONSULTANTS:

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OWNERS' REPRESENTATIVE
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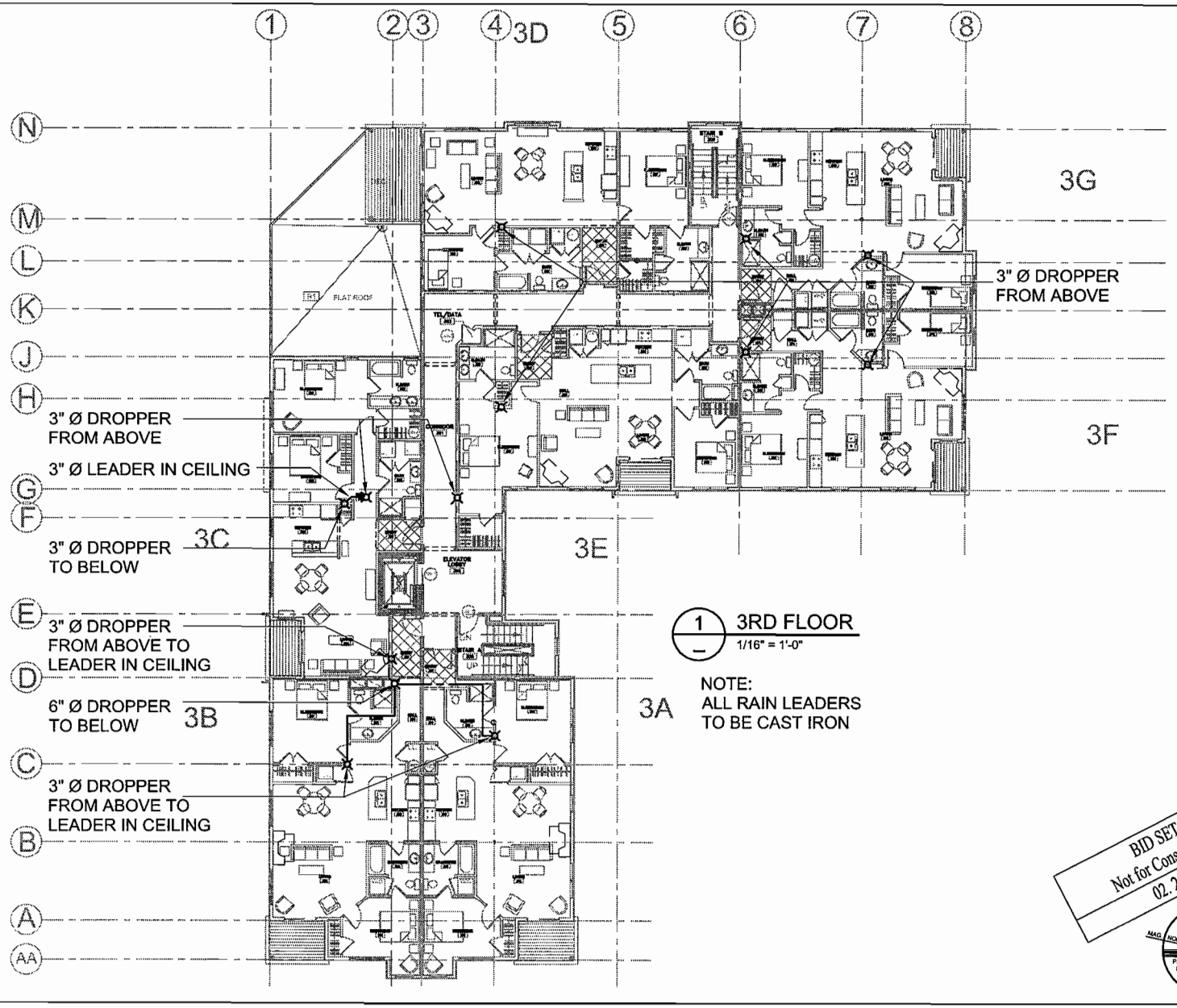
PORTLAND, ME 04101
TEL: 207 523 3410

DATE:	02.26.07
PROJECT No.	0507
DRAWN BY:	RTL
CHECKED BY:	TST
SCALE:	As Shown

SHEET TITLE:

ROOF DRAIN LEADERS

ASK 4



1 — 3RD FLOOR
1/16" = 1'-0"

NOTE:
ALL RAIN LEADERS TO BE CAST IRON

BID SET
Not for Construction
02.26.07

SHERIDAN HEIGHTS

PROPOSED CONDOMINIUMS AT
135 SHERIDAN STREET, PORTLAND, MAINE
FOR SHERIDAN ST. LLC

TFH ARCHITECTS
100 COMMERCIAL STREET
PORTLAND MAINE 04101
TELEPHONE 207 775 6141
ARCHITECTURE PLANNING

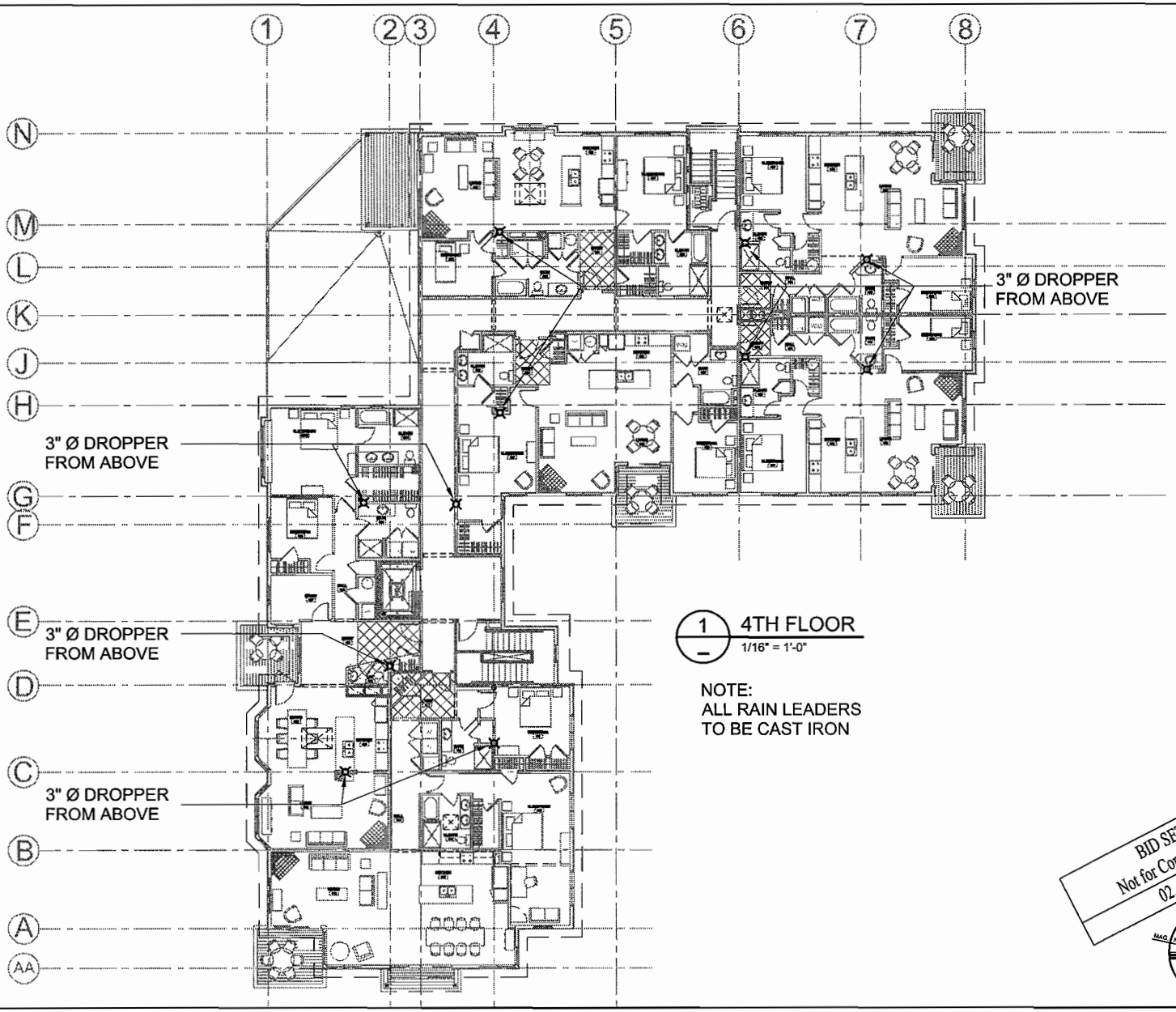
CONSULTANTS:
REFER TO TITLE SHEET FOR CONSULTANT INFORMATION

OWNERS' REPRESENTATIVE
shinberg CONSULTING, LLC
477 CONGRESS ST, 5TH FLOOR,
PORTLAND, ME 04101
TEL: 207 523 3410

DATE:	02.26.07
PROJECT No.	0507
DRAWN BY:	RTL
CHECKED BY:	TST
SCALE:	As Shown

SHEET TITLE:
ROOF DRAIN LEADERS

ASK 5



1 — 4TH FLOOR
1/16" = 1'-0"

NOTE:
ALL RAIN LEADERS TO BE CAST IRON

BID SET
Not for Construction
02.26.07

MAG. NORTH
PROJECT NORTH

SHERIDAN HEIGHTS

PROPOSED CONDOMINIUMS AT
135 SHERIDAN STREET, PORTLAND, MAINE
FOR SHERIDAN ST. LLC

TFH ARCHITECTS
100 COMMERCIAL STREET
PORTLAND MAINE 04101
TELEPHONE 207 775 6141
ARCHITECTURE PLANNING

CONSULTANTS:

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OWNERS' REPRESENTATIVE
shinberg CONSULTING, LLC
477 CONGRESS ST, 5TH FLOOR
PORTLAND, ME 04101
TEL: 207 523 3410

DATE:	02.26.07
PROJECT No.	0507
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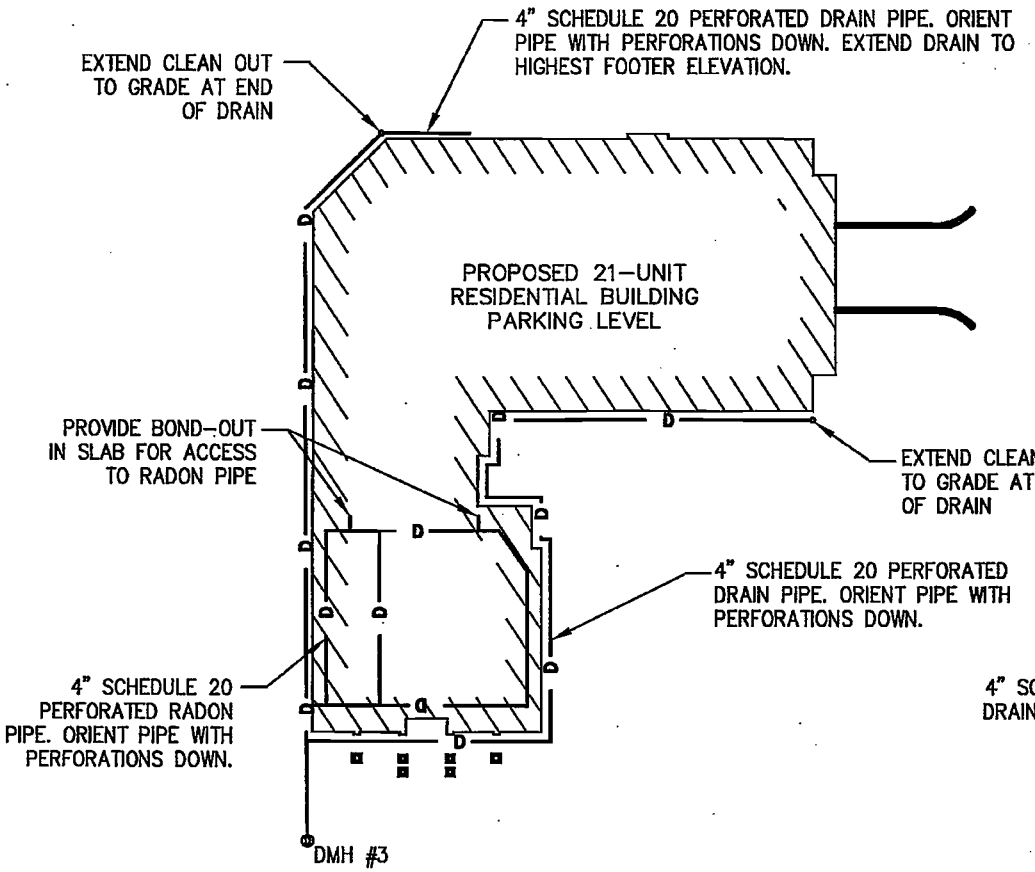
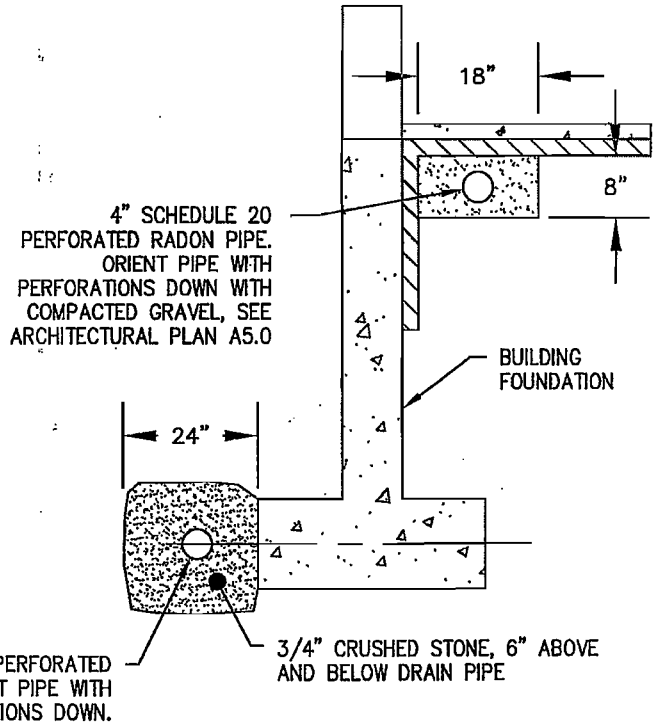
CHECKED BY:	TST
SCALE:	As Shown

SHEET TITLE:

ROOF DRAIN LEADERS

ASK 6





FOUNDATION DRAIN DETAIL

NOT TO SCALE

FOUNDATION DRAIN PLAN

SHERIDAN HEIGHTS

121 & 135 SHERIDAN STREET

PORTLAND, MAINE 04101

SGC ENGINEERING, LLC

- Civil Design & Survey Engineering
- Environmental & Regulatory Permitting
- Electrical Power Systems Engineering

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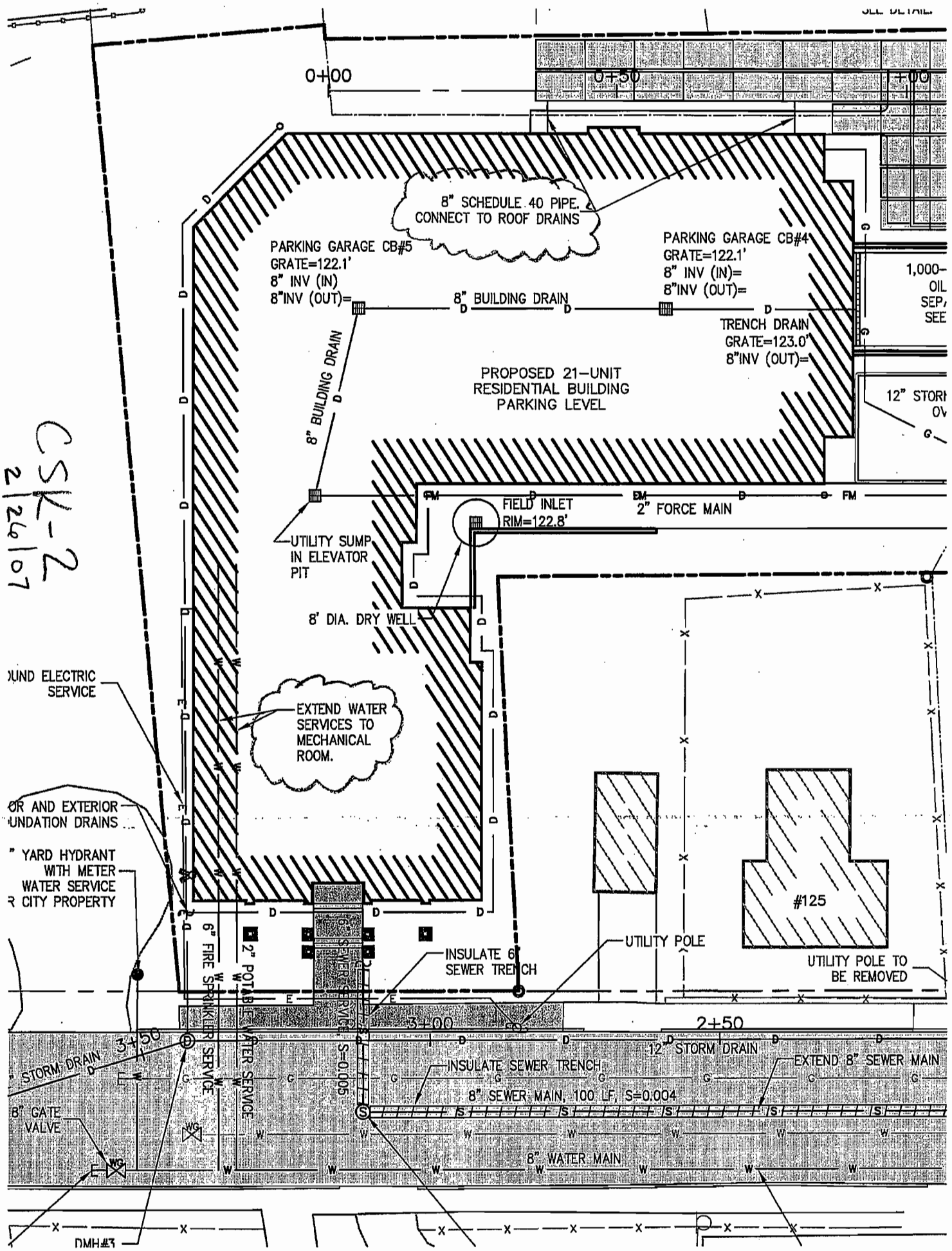
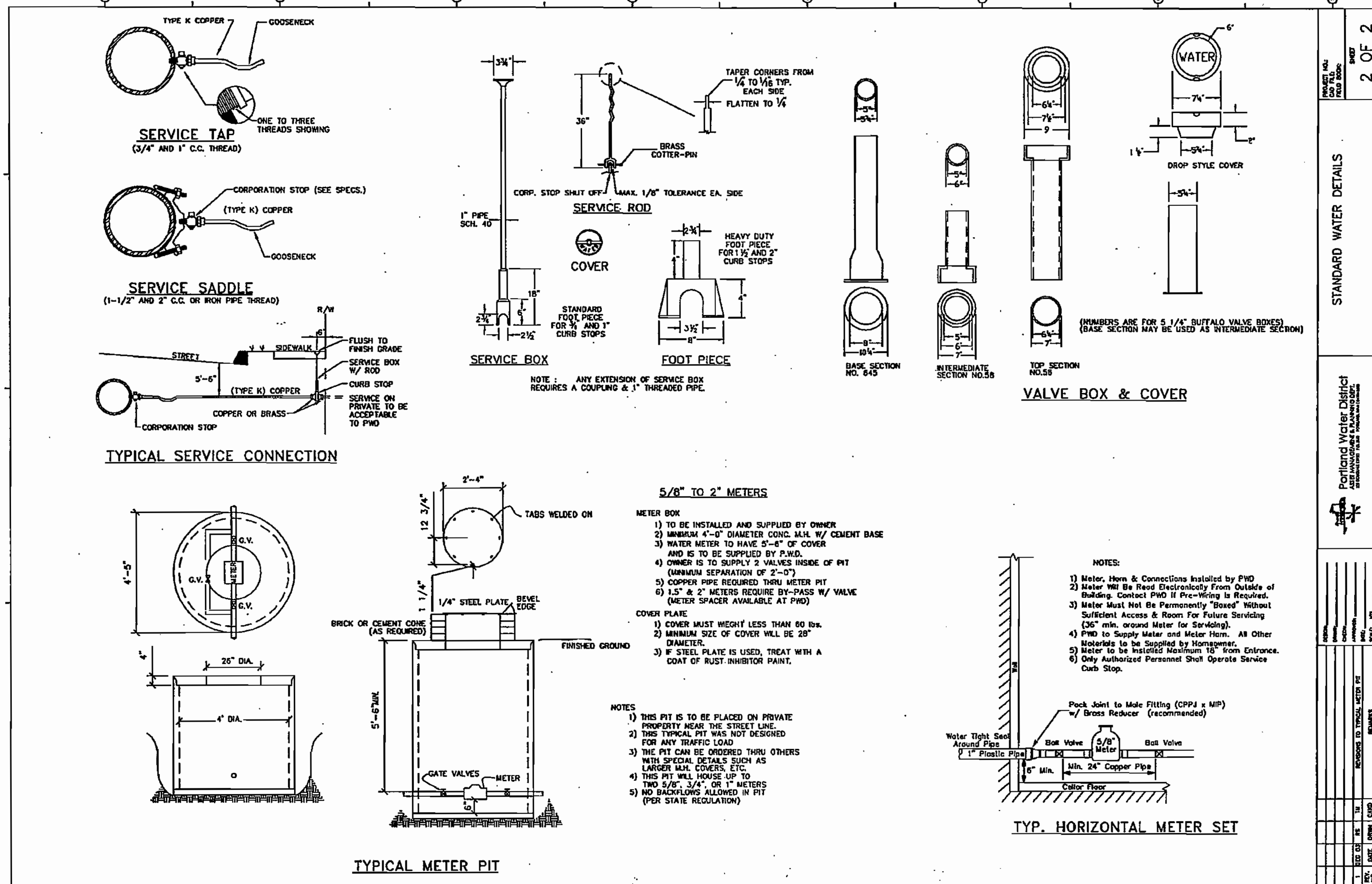
Target Technology Center
20 Godfrey Drive, Suite 200
Orono, Maine 04473
Tel: 207-866-6571
Fax: 207-866-6501

DATE: 02-26-07 SCALE: 1" = 40' DRAWN: MRR FILE: SITE PLAN 468001

C SK-1


0+00
0+50
1+00
8" SCHEDULE 40 PIPE, CONNECT TO ROOF DRAINS
PARKING GARAGE CB#5
GRATE=122.1'
8" INV (IN)
8"INV (OUT)=
8" BUILDING DRAIN
PARKING GARAGE CB#4
GRATE=122.1'
8" INV (IN)=
8"INV (OUT)=
TRENCH DRAIN
GRATE=123.0'
8"INV (OUT)=
8" BUILDING DRAIN
PROPOSED 21-UNIT RESIDENTIAL BUILDING PARKING LEVEL
1,000-
OIL
SEP,
SEE
12" STORM
OV
FIELD INLET
RIM=122.8'
2" FORCE MAIN
UTILITY SUMP IN ELEVATOR PIT
8' DIA. DRY WELL
EXTEND WATER SERVICES TO MECHANICAL ROOM.
UND ELECTRIC SERVICE
OR AND EXTERIOR UNDATION DRAINS
" YARD HYDRANT WITH METER
WATER SERVICE
R CITY PROPERTY
6" FIRE SPRINKLER SERVICE
2" POTABLE WATER SERVICE
6" SEWER SERVICE S=0.005
INSULATE 6" SEWER TRENCH
UTILITY POLE
#125
UTILITY POLE TO BE REMOVED
3+00
2+50
3+50
12" STORM DRAIN
INSULATE SEWER TRENCH
EXTEND 8" SEWER MAIN
8" SEWER MAIN, 100 LF, S=0.004
8" GATE VALVE
8" WATER MAIN
DMH#3

CSK-2
2/26/07



TYPE K COPPER
GOOSENECK
ONE TO THREE THREADS SHOWING
SERVICE TAP
(3/4" AND 1" C.C. THREAD)
CORPORATION STOP (SEE SPECS.)
(TYPE K) COPPER
GOOSENECK
SERVICE SADDLE
(1-1/2" AND 2" C.C. OR IRON PIPE THREAD)
R/W
STREET
SIDEWALK
FLUSH TO FINISH GRADE
SERVICE BOX W/ ROD
CURB STOP
SERVICE ON PRIVATE TO BE ACCEPTABLE TO PWD
5'-6"
(TYPE K) COPPER
COPPER OR BRASS
CORPORATION STOP
TYPICAL SERVICE CONNECTION
1" PIPE SCH. 40
18"
6"
2½"
STANDARD FOOT PIECE FOR ¾ AND 1" CURB STOPS
SERVICE BOX
NOTE : ANY EXTENSION OF SERVICE BOX REQUIRES A COUPLING & 1" THREADED PIPE.
36"
BRASS COTTER-PIN
TAPER CORNERS FROM ¼ TO 1/16 TYP. EACH SIDE
FLATTEN TO ¼
CORP. STOP SHUT OFF
MAX. 1/8" TOLERANCE EA. SIDE
SERVICE ROD
COVER
HEAVY DUTY FOOT PIECE FOR 1½ AND 2" CURB STOPS
3½"
8"
FOOT PIECE
BASE SECTION NO. 645
INTERMEDIATE SECTION NO.58
TOP SECTION NO.58
WATER
DROP STYLE COVER
(NUMBERS ARE FOR 5 1/4" BUFFALO VALVE BOXES)
(BASE SECTION MAY BE USED AS INTERMEDIATE SECTION)
VALVE BOX & COVER
4'-5"
G.V.
METER
26" DIA.
4' DIA.
2'-4"
12 3/4"
TABS WELDED ON
1 1/4"
1/4" STEEL PLATE
BEVEL EDGE
BRICK OR CEMENT CONE (AS REQUIRED)
FINISHED GROUND
5'-6"MIN.
GATE VALVES
TYPICAL METER PIT
5/8" TO 2" METERS
METER BOX
1) TO BE INSTALLED AND SUPPLIED BY OWNER
2) MINIMUM 4'-0" DIAMETER CONC. M.H. W/ CEMENT BASE
3) WATER METER TO HAVE 5'-6" OF COVER AND IS TO BE SUPPLIED BY P.W.D.
4) OWNER IS TO SUPPLY 2 VALVES INSIDE OF PIT (MINIMUM SEPARATION OF 2'-0")
5) COPPER PIPE REQUIRED THRU METER PIT
6) 1.5" & 2" METERS REQUIRE BY-PASS W/ VALVE (METER SPACER AVAILABLE AT PWD)
COVER PLATE
1) COVER MUST WEIGHT LESS THAN 60 lbs.
2) MINIMUM SIZE OF COVER WILL BE 28" DIAMETER.
3) IF STEEL PLATE IS USED, TREAT WITH A COAT OF RUST INHIBITOR PAINT.
NOTES
1) THIS PIT IS TO BE PLACED ON PRIVATE PROPERTY NEAR THE STREET LINE.
2) THIS TYPICAL PIT WAS NOT DESIGNED FOR ANY TRAFFIC LOAD
3) THE PIT CAN BE ORDERED THRU OTHERS WITH SPECIAL DETAILS SUCH AS LARGER M.H. COVERS, ETC.
4) THIS PIT WILL HOUSE UP TO TWO 5/8", 3/4", OR 1" METERS
5) NO BACKFLOWS ALLOWED IN PIT (PER STATE REGULATION)
NOTES:
1) Meter, Horn & Connections Installed by PWD
2) Meter Will Be Read Electronically From Outside of Building. Contact PWD If Pre-Wiring Is Required.
3) Meter Must Not Be Permanently "Boxed" Without Sufficient Access & Room For Future Servicing (36" min. around Meter for Servicing).
4) PWD to Supply Meter and Meter Horn. All Other Materials to be Supplied by Homeowner.
5) Meter to be Installed Maximum 18" from Entrance.
6) Only Authorized Personnel Shall Operate Service Curb Stop.
Pack Joint to Male Fitting (CPPJ x MIP) w/ Brass Reducer (recommended)
Water Tight Seal Around Pipe
1" Plastic Pipe
Ball Valve
5/8" Meter
6" Min.
Min. 24" Copper Pipe
Cellar Floor
TYP. HORIZONTAL METER SET
STANDARD WATER DETAILS
Portland Water District
SHEET
2 OF 2
REVISIONS TO TYPICAL METER PIT
REMARKS

C.SK3

The following drawings are provided on 24" x 36" to be attached:

1. Sheet C 8 by SGC Engineering dated 2/26/07 based upon the City of Portland Parks and Public Works Department Engineering Division Sheridan Street Plan 8 Profile dated June 1987
2. Sheet C 9 by SGC Engineering dated 2/26/07 based upon the City of Portland Parks and Public Works Department Engineering Division Sheridan Street Plan 8 Profile dated June 1987

Note that these 2 drawings are the basis for Add Alternate # 7

ADDENDUM TO ARCHITECTURAL DRAWINGS

Re: Sheridan Heights, 135 Sheridan Street, Portland Maine
Original Drawings: February 5, 2007; "Bid Set, Not For Construction"

Date: 02.26.07

Drawings A1.3 & A1.15

Delete type P window, (located in unit 4B, room 4B10).
Replace with (3) type J windows, with (1) 2x6 stud each side of the center window.
Refer to ASK-2, issued here.

Drawing A1.20

Change: Ceiling height at garage door.
Delete: BC 8'-6" between grids 7 & 8 only.
Replace with: BC 9'-0" between grids 7 & 8 only.

Drawing A2.1

North Elevation
Delete the 4th floor triple window, between grids H&G.
Replace with (3) type J windows, with fiber cement trim between each window.
Refer to ASK-2, issued here.

Drawing A7.1

D107.2: Reduce head height of garage door from 8'-0" to 7'-6".

Drawing A7.0

Delete window type P

Drawing A7.2 - Door Details

Glazed exterior doors: All fixed or operable glazed panels, with bottom edge of the glass within 60 inches of the floor, to be clear insulated tempered glass panels (ie. glazing type GL-4).

Door type E: Change glazing from type GL-4 to GL-3 (clear tempered glass).

Door type O, P, Q & V: Change glazing of transom windows from type GL-4 to GL-1 (clear insulated glass).

Door type V: Add screen.

Drawings ASK-3, ASK-4, ASK5, ASK-6

Rain leader layouts issued here. Note that all pipe is Cast Iron thru the building – the pipe transitions to Schedule 40 PVC once entering the garage space

Drawing G1.1 – Partition Types

Wall types

All wall types with acoustic insulation & resilient channel are to be constructed with acoustic sealant at all perimeter edges as shown on A5.2 (details 15 & 16).

Section 00400 Allowances

Allowance No. 4: City of Portland street opening permits - $22,500

Section 00410 – Bid Form

Add Alternates

Add Number 7 – Delete extension of 8 inch water main as shown on Plan C4 and replace with the extension of the 8 inch water main (and other work as shown) as depicted on Plan C8 and C9 attached.

Section 02200 – Sitework

See CSK 2 for connecting pipe from building to storm chambers;

See CSK 2 for detail of where the 2 and 6 inch water services are to extended into the building at the Mechanical Room 104 (shown on A1.0 as the Elec / Tele Sprinkler Room);

The location for the 1 inch water shut offs shall be in the water meter pit as shown on CSK 3; See CSK 3 for the Water Meter Pit details;

The location and installation details for the radon pipe is shown on CSK 1;

Provide geotextile fabric over the storm chambers to be Mirafi 600X or equal;

The connecting pipe between the storm chambers to be 8 inch Sch 40 SDR 35 PVC pipe;

Provide 10 inspection covers for the storm chambers – locate at corners and at center of each of the two groups of chambers;

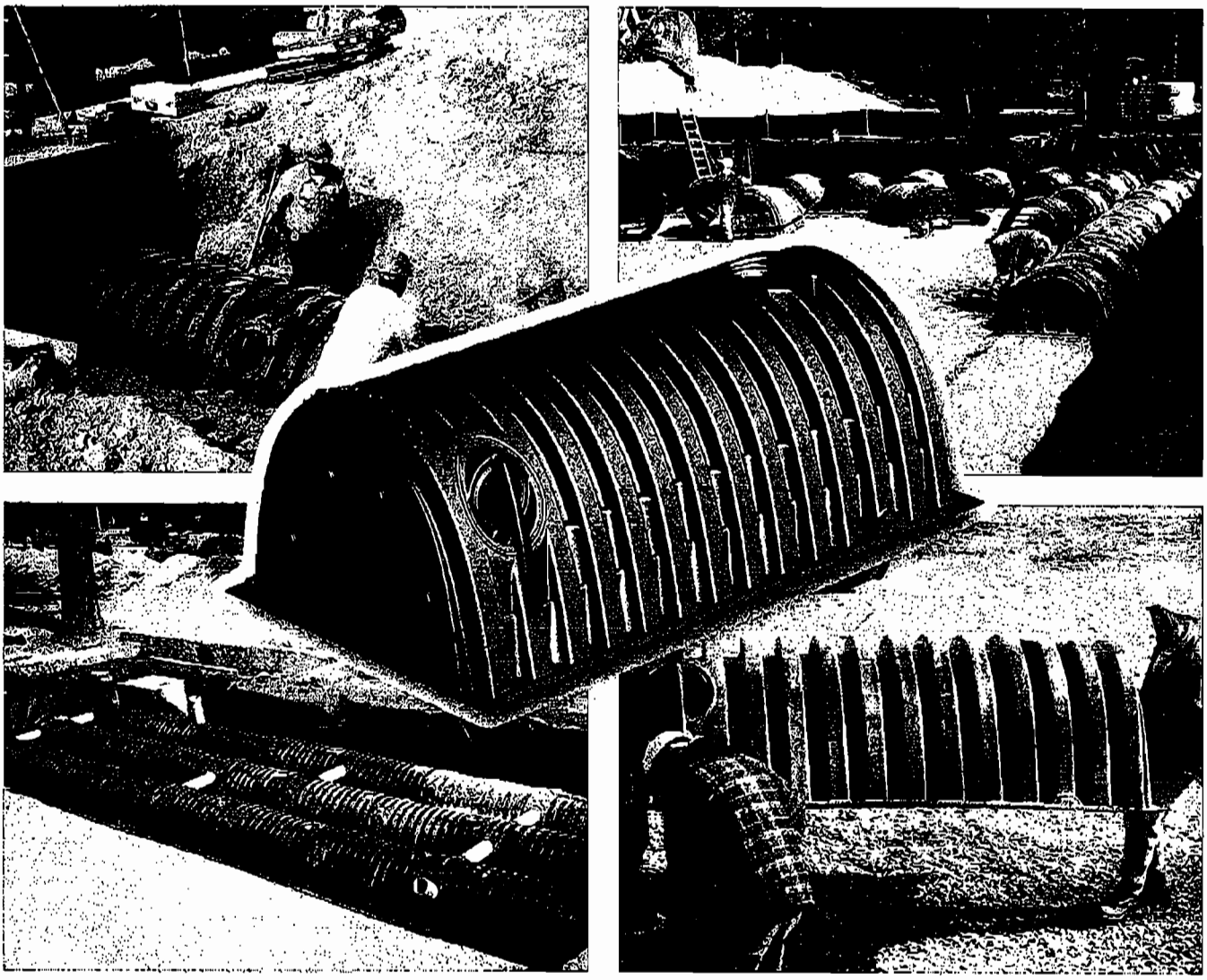
Note that the City of Portland Street Opening permits to be carried as an allowance (see Allowance # 4 listed above)

The molded storm chambers butt together for a standard connection (see info to follow)

Additional storm chamber specifications and specs for Freezeless Yard Hydrant to follow:

StormChamber™

Installation Brochure



StormWater Management brought to you by Hydrologic Solutions

BEFORE YOUR STORMCHAMBERS™ ARRIVE

1. StormChambers™ will arrive either on a flat bed trailer or in an enclosed van. If in an enclosed van, we will try our best to have the driver load the pallets at the tail of the van. However, be prepared with a long chain, metal cable, or strong rope or straps to drag a pallet from the nose of the van. A forklift is the easiest way to unload pallets of StormChambers™.
2. A full pallet of StormChambers™ will weigh approximately 1,700 pounds, will be about 5' wide, 8.5' long, and approximately 8.5' high.

MATERIALS NEEDED

1. Wire cutters to remove the metal bands that secure the StormChambers™ to their pallets.
2. Two 6'-10' lengths of 2x4 studs to use as levers to separate the palletized StormChambers™.
3. 3" drywall screws to close in the bases of the StormChambers™ until the stone is placed around them.
4. Light weight stabilization netting to go under the StormChambers™ to prevent movement of stone – shipped with the StormChambers™.
5. Heavy weight stabilization netting, to be centered below each inspection/clean out riser to prevent removal of stone and soil when vacuum – cleaned with a vacuum truck. Also to be placed under each StormChamber™ to receive storm water from storm drain inlet pipes, to function as a "splash pan" to prevent erosion of underlying stone and soil – shipped with the StormChambers™.
6. 1"-2" crushed, washed, hard stone for the trench base and to backfill around the StormChambers™.
7. 4 ounce non – woven filter fabric to be used at the interface between the stone and soil backfill and to cover trench side walls. Use Mirafi 140N, Mirafi 140NC, Synthetic Industries 401, or AMOCO 4545 or 4535 filter fabric.
8. 4' sections of 8" (unless otherwise specified), smooth walled Schedule 40 or SDR 35 or equivalent pipe for the interconnections between rows of StormChambers™ (check plans for number and location of interconnections).
9. Unless otherwise specified, 10" smooth walled Schedule 40 or SDR 35 or equivalent pipe for inspection/clean out risers (check plans for number and location of risers).
10. Three small angle irons and 0.5" screws for each inspection/clean out riser to support riser onto top portals of StormChambers™.
11. Cleanout caps or tops for inspection/clean out risers.
12. Unless otherwise specified, one casting for each inspection/clean out riser in pavement (East Jordan V – 8450 or equivalent).
13. Unless otherwise specified, concrete and related materials to form 6' x 9' reinforced pads to hold castings for inspection/clean out risers.

EQUIPMENT NEEDED

1. Forklift or other type of equipment to unload StormChambers™ (see above).
2. Excavator to dig the trench from the sides and to place stone and soil backfill.
3. Two battery or power operated screw guns to connect bases of overlapping StormChambers™.
4. Saws – All, router bit on a drill, or key hole saw to cut open side and top portals in StormChambers™.
5. Light weight, tracked dozer, not exceeding 1,100 lbs/sf to grade backfill.
6. Hand – operated compactor, small roller, or tracked vehicle for fill compaction. Tracked vehicle must not exceed 1,100 lbs/sf; hand operated compactor or vibratory roller must not exceed a dynamic force of 20,000 lbs.
7. Transit or laser.
8. Stone bucket.

PLEASE NOTE THAT ALL PHOTOGRAPHS AND ILLUSTRATIONS ARE FOR ILLUSTRATIVE PURPOSES ONLY. PLEASE RELY ON WHAT THE ENGINEER SPECIFIES.

WHEN YOUR STORMCHAMBERS™ ARRIVE

1. Unloading – see "Before Your StormChambers™ Arrrive", above. As a last resort, the pallets can be dragged off of the trailer and dropped on the ground. This will not injure the StormChambers™.
2. Confirm the total number of StormChambers™ and contact HydroLogic Solutions immediately if the count is incorrect.
3. Confirm the number of Start, Middle and End StormChambers™. Each pallet should be marked with the number of each.

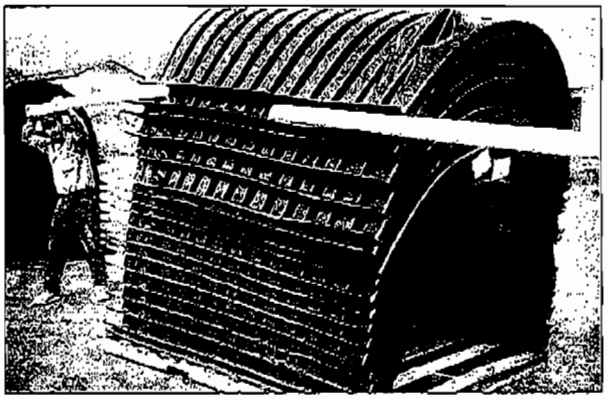
TRENCH PREPARATION

1. Do not excavate trench until dry weather is forecast long enough to allow at least coverage of the StormChamber™ system with filter fabric prior to raining to avoid soil filling void spaces in the stone.
2. Excavate to a width and length sufficient to accommodate the number of StormChambers™ plus a minimum one foot border around the entire bed. The bottom of the bed must be level, unless otherwise specified.
3. If the StormChamber™ system was designed for infiltration and heavy clays are encountered, it is recommended that pea gravel and sharp concrete sand be tilled into the top one foot of trench bed prior to placing the stone base.
4. Do not use heavy equipment on the excavated trench bed in order to avoid soil compaction.
5. If use of heavy equipment on the excavated trench bed can not be avoided, scarify the trench bottom and break up soil clumps before adding the stone base.

Line trench walls, not trench bottom, with 4oz. non – woven filter fabric.

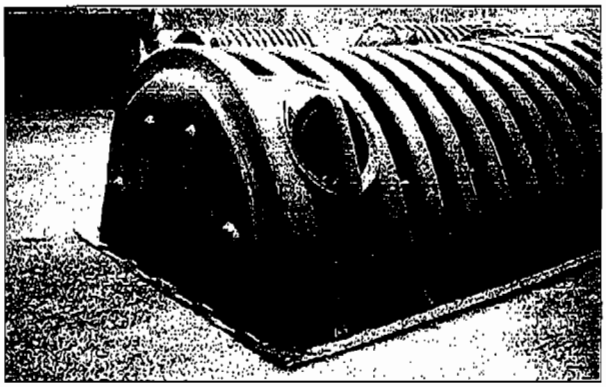
6. Line trench walls with a 4 – ounce non – woven filter fabric such as Mirafi 140N or 140NC, Synthetic Industries 401, or AMOCCO 4545 or 4535. Overlap adjacent filter fabric by at least 2'. Do not place filter fabric under the StormChambers™. The filter fabric will clog, restricting the infiltration capability of the StormChamber™ system.
7. Unless otherwise specified, place 6" of crushed, washed, 1" to 2" hard stone on the bottom of the level and zero grade trench.
8. If it becomes impractical to level the stone base by hand, use a low pressure, tracked dozer, not exceeding 1,100 lbs/sf, maintaining at least 6" of stone under the tracks at all times.
9. Do not use excavated trench as a sedimentation trap or basin during construction. The fine soil particles will accumulate at the soil boundary and restrict the infiltration capability of the system.

STORMCHAMBER™ INSTALLATION



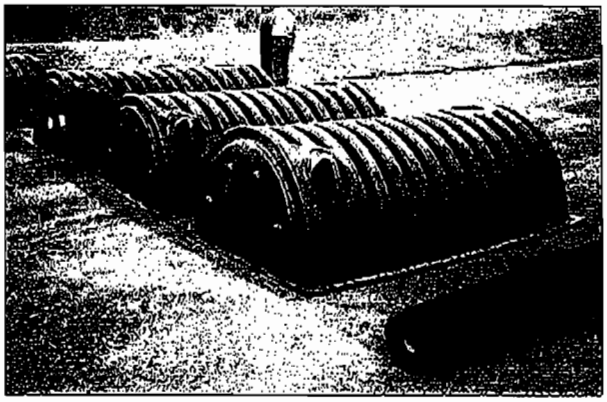
You may need to use 2x4's to separate chambers.

1. You may need assistance in separating the StormChambers™. Based on weather and transit conditions, sometimes the StormChambers™ become tightly compacted. Separate StormChambers™ using two 2x4 studs along one of its sides for leverage. Do not use any damaged units – contact HydroLogic Solutions immediately.



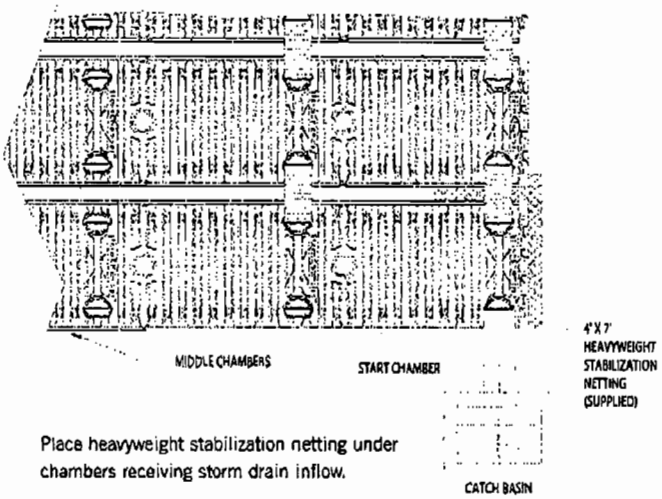
Row placement begins at inflow end of chamber system with Start Model StormChambers™.

2. Start building the StormChamber™ system with the Start Model StormChamber™ at the inflow end of the StormChamber™ system. The Start Models are completely closed at the end with the two side portals.



Place lightweight stabilization netting under StormChambers™.

3. Roll out two rows of the light weight stabilization netting (provided with the StormChambers™) perpendicular to the rows of where the Start StormChambers™ will be placed. Overlap the rows by approximately 1'. Keep the netting flat; if moved, re – straighten and flatten out.

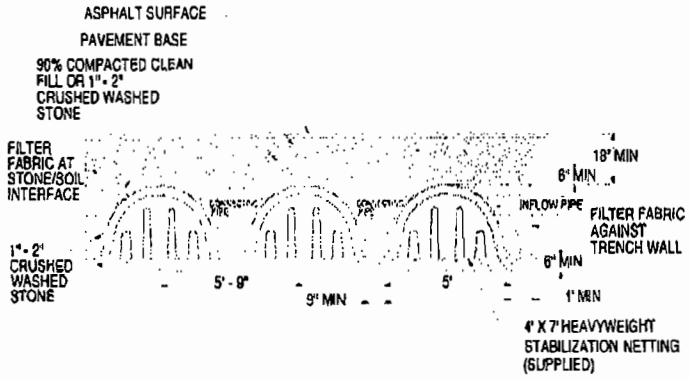


Place heavyweight stabilization netting under chambers receiving storm drain inflow.

4. Place one piece of the heavy weight stabilization netting (provided with the StormChambers™) perpendicular to and under each StormChamber™ that will be receiving inlet storm drain pipes. Place on top of the light weight netting and place one edge of the netting under, and slightly extending beyond, the closed end wall of the StormChamber™. Have the netting extend equally beyond both sides of the StormChamber™. The purpose of the heavy weight stabilization netting is to function as a "splash pan," preventing excavation of the underlying stone and soil, while allowing infiltration to occur.

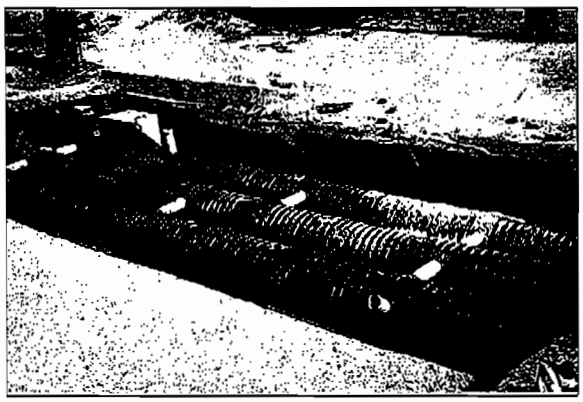
STORMCHAMBER™ INSTALLATION

(CONTINUED)



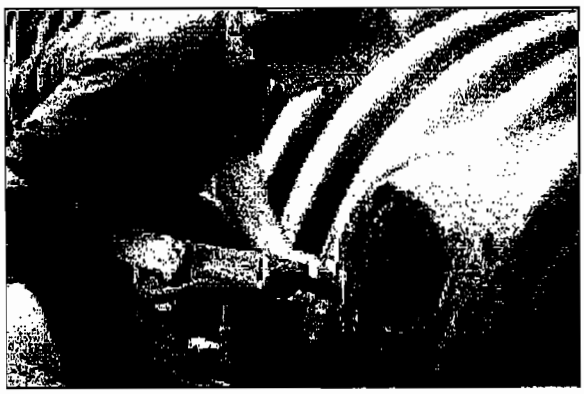
Space StormChambers™ at least 9" apart at the base at the end wall.

5. Place the Start Model StormChambers™ (completely closed at the end with the two side portals), spaced a minimum of 5' 9" apart at the center line of the end walls (9" apart at the base at the end walls). Position the closed ends at least 1' from the trench wall.



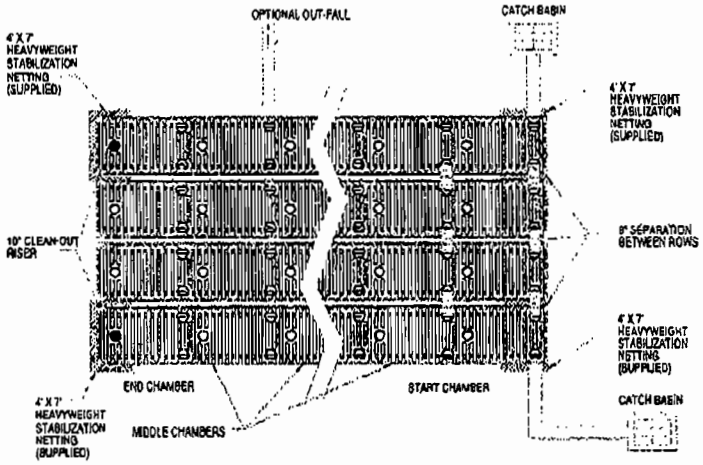
Insert smooth wall PVC row connecting pipes.

7. Mark the midpoints of 8" ID (unless otherwise specified) smooth wall pipe and insert into the adjacent StormChambers™ where specified so that the marked midpoint is centered between the two adjacent StormChambers™. Pipe length should be sufficient to extend 6" – 12" into both adjacent StormChambers™.



Cut out side portals for smooth wall PVC inflow drainpipe and row connecting pipes. Cut out indentation guides are provided for 8', 10' and 12' pipes.

6. Cut open the side portals for the inflow storm drain pipes (size and location specified on the plans) and lateral connecting pipes between StormChamber™ rows (8" ID Schedule 40 or SDR 35 smooth walled PVC, unless otherwise specified) with a reciprocating saw, router bit on a drill, or keyhole saw along the defined indented circle. If the cut extends more than 0.5" beyond the indented circle, place a piece of the filter fabric over the hole, cut an X just short of the width of the opening, and insert the pipe. The connection does not need to be water tight. 12" ID smooth walled pipe is the largest diameter pipe that can be inserted into the side portals. In order to facilitate placement, install the lateral connecting pipes in the specified StormChambers™ before attaching the next StormChamber™ in the row.

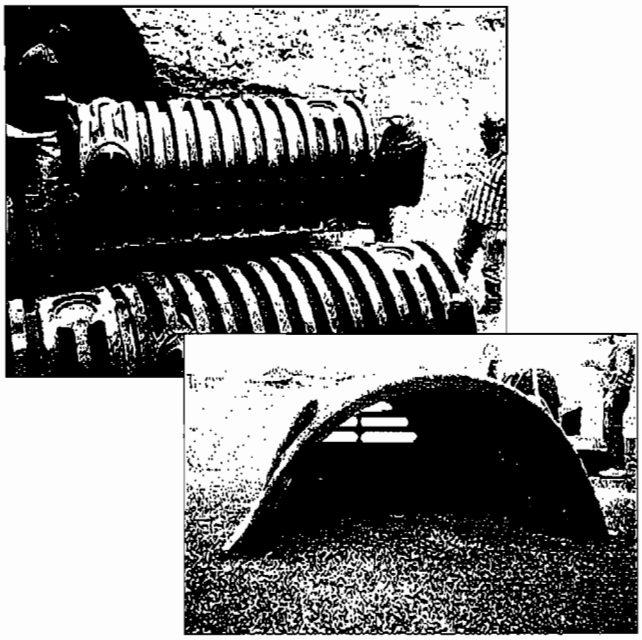


Example of typical StormChamber™ layout.

8. If the locations of row – connecting pipes are not specified, add 8" pipes across all rows directly opposite where the inflow storm drain pipe(s) is inserted. This will typically connect at least all the Start Model StormChambers™ of each row. Additional connections across all rows of StormChambers™ should be made so that the total diameter of pipe connections between any pair of rows is approximately equal to the total diameter of all inflow storm drain pipes. For example, a StormChamber™ system with one 12" inflow drain pipe would require 2, 8" pipes between each row of StormChambers™.

STORMCHAMBER™ INSTALLATION

(CONTINUED)

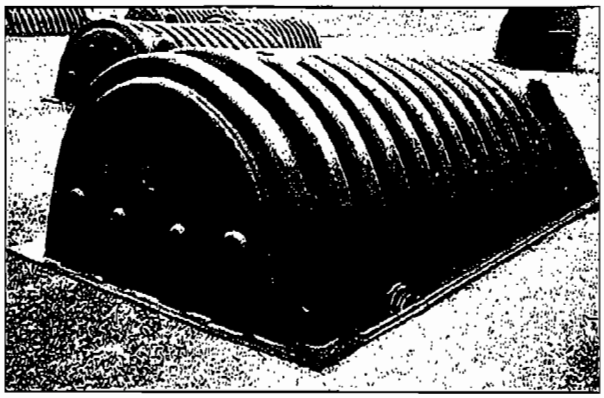


Place first rib of next chamber over last rib of previous chamber.

9. Roll out additional light weight stabilization netting, overlaying the previous sheet by 1' and place the first rib of a Middle Model (completely open at side portal end, partially open at top portal end) over the last rib of each of the Start Model StormChambers™.

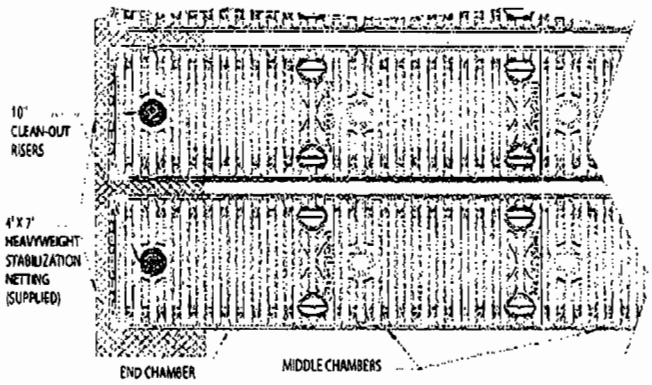
Screw StormChamber™ together to prevent stone inflow.

10. Screw the Middle Model StormChambers™ to the Start Models near their base on both sides with regular 3" dry wall screws. One screw on each side should be sufficient to temporarily hold the StormChambers™ together until the stone is placed. The gap between the two StormChambers™ near their base must be closed enough to prevent stone from migrating into them to prevent the potential for finished surface subsidence.



End each row with and end model StormChamber™ which is closed at the top portal end and open at the side portal end.

11. Continue placing and screwing the rest of the StormChambers™, one at a time, as necessary, inserting any additional lateral – connecting pipes as specified, leaving at least 1' between the end of the End Model (completely open at the side portal end, completely closed at the top portal end) and the trench wall.



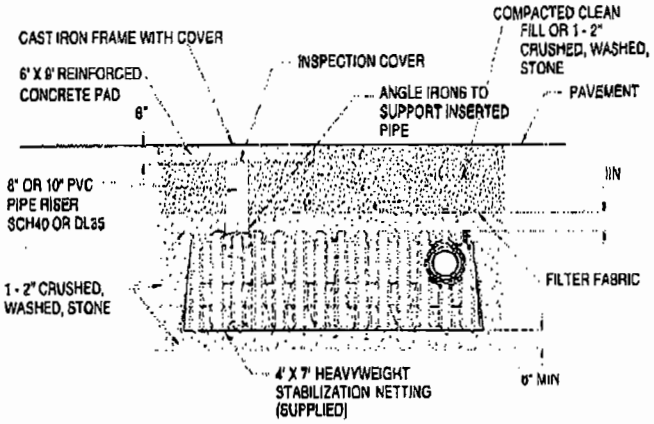
Place heavyweight stabilization netting under chambers with cleanout risers.

12. Place one piece of the heavy duty stabilization netting under the top portal end of each StormChamber™ that will be installed with a 10" PVC riser for access by a vacuum truck for clean out. Extend the netting equally beyond both sides of the StormChamber™ and extend about 1' beyond the end wall of the StormChambers™. The purpose of the netting is to prevent the stone and soil from being sucked up by the vacuum truck.

13. For large StormChamber™ systems it may be necessary to install and backfill a few Stormchambers™ of all rows at a time.

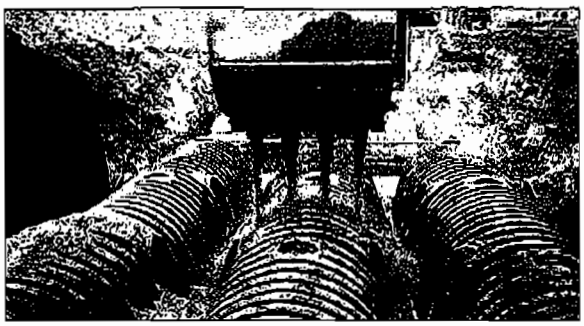
STORMCHAMBER™ INSTALLATION

(CONTINUED)



Install cleanout/inspection risers pipes.

14. Cut a hole in the top portal for a 10" ID smooth walled SDR 35 or PVC Schedule 40 riser – along the larger of the two indented circles, unless an 8" pipe is specified. If the cut extends more than 0.5" beyond the cut out, place a piece of the filter fabric over the hole, cut an X slightly shorter than the width of the opening, and insert the pipe. Attach three small angle irons equally spaced approximately 1' up from the end of the pipe. Use 0.5" screws on riser pipe to prevent restricting insert of vacuum truck clean out tube. It is not necessary to screw the angle irons to the StormChamber™. The purpose of the angle irons is simply to support the pipe until the backfill is placed. Insert the bottom 1' of pipe into the top portal and backfill. Attach top of riser pipe to a "Fernco Type" rubber cap, or to a cleanout cover assembly, as specified on the plans. Place an access casting in a concrete pad above, once all fill is placed, for risers in pavement.



Deposit 1" – 2" crushed, washed, hard stone directly along the centerline of the StormChambers™.

15. Deposit 1" – 2" crushed, washed, hard stone directly along the centerline of the StormChambers™ to evenly flow down each side to keep the StormChambers™ in proper alignment. Do not place the stone directly against the closed end walls at the start and end of the rows. Let the stone fall in place at the StormChamber™ end from the top of the StormChamber™. Add stone to at least 6" above the StormChambers™.

16. Level the stone cover with a vibratory compactor, not to exceed a dynamic force of 10,000 lbs, or with a low pressure, tracked vehicle not exceeding 1,100 lbs/sf.

IMPORTANT: If low pressure, tracked dozer is used, do not run dozer on anything less than 6" of stone above the StormChambers™. Spread stone in small piles to prevent movement of the StormChambers™. Caution must be exercised when placing stone on top of the StormChambers™ so that excessive pressure is not applied directly on the StormChambers™ by equipment "buckets".

17. Cover the stone with 4 ounce non – woven filter fabric. Overlap adjacent sheets by at least 2'.

BACKFILLING

1. Backfill soil must be free from large stones and large organic material (e.g. tree limbs and root stumps), and must be capable of being compacted to at least 90% of the Standard Proctor Test (AASHTO Method T – 99). If not, crusher run or other suitable backfill material must be used. The same type of stone surrounding the StormChambers™ can also be extended up to the pavement sub grade, if desired.

2. Backfill and compaction of the soil backfill must be achieved in lifts 6" – 8" high. Grading of lifts should start in one corner of the system with a low pressure, tracked dozer, with a pressure not exceeding 1,100 lbs/sf, keeping at least 1' of fill in front of the blade at all times. Compact lifts to 90% Standard Proctor with tracked vehicles not exceeding 1,100 lbs/sf, or with a hand operated compactor or vibratory roller not exceeding a dynamic force of 20,000 lbs.

3. Restrict wheeled vehicles to a maximum axle load of 8,000 pounds with 6" of fill over the StormChambers™ and 16,000 pounds with 12" of fill.

4. Keep the StormChamber™ system closed or protected from receiving sediment until the site is completely stabilized.

IMPORTANT: After compaction of backfill and setting of final grade, avoid parking on or traversing over the StormChamber™ installation with heavily loaded trucks and heavy equipment until paved.

IMPORTANT: These instructions assume accepted construction procedures and loaded trucks that do not exceed specified DOT load limits. Uncustomary loads or improper load distributions in vehicles may require additional cover. Contact HydroLogic Solutions for installation under abnormal conditions. Installations not in compliance with these instructions will void the warranty.

Contact HydroLogic Solutions for technical assistance at 1.877.426.9128 or email us at info@hydrologicsolutions.com.

CONTACT INFORMATION

info@hydrologicsolutions.com (Email Us) (877) 426-9126 (Toll-Free) (703) 491-9656 (Fax)
PO Box 672, Occoquan, Virginia 22125 (703) 492-0686 (Voice) www.hydrologicsolutions.com

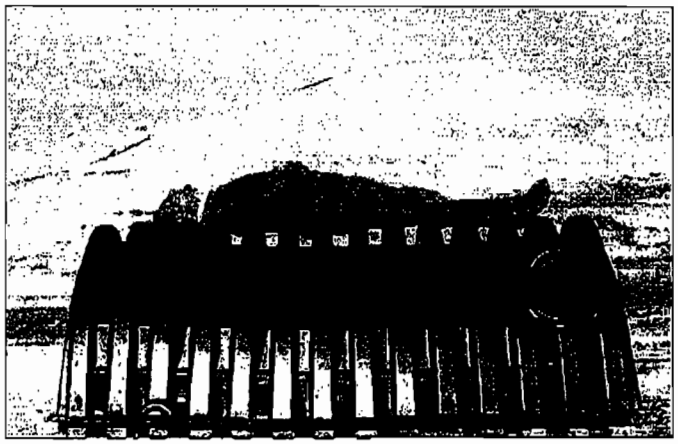
HYDROLOGIC SOLUTIONS LIMITED WARRANTY

HydroLogic Solutions will warranty the structural integrity of each HydroLogic Solutions StormChamber™ in accordance with the installation instructions and is warranted to the original purchaser against defective materials and workmanship for 10 years from the date of purchase. It is the responsibility of the purchaser to inspect the StormChamber™ units prior to installation and to inform HydroLogic Solutions of any defect prior to installation. HydroLogic Solutions will only be responsible for supplying replacement StormChamber™ unit(s). HydroLogic Solutions' liability specifically excludes the cost of removal and/or installation of the units.

There are no other warranties with respect to the units, including no warranties of merchantability or fitness for a particular purpose. This warranty does not extend to incidental, consequential, special, or indirect damages. The company shall not be liable for penalties or liquidated damages, including loss of production and profits, labor and materials, overhead costs, or other loss or expense incurred by buyer. Specifically excluded from warranty coverage is damage to the units due to ordinary wear and tear, alteration, accident, misuse, abuse or neglect of the units, improper construction protocols, installation of the units not consistent with HydroLogic Solutions' installation instructions, placement by buyer of improper materials into buyer's system, or any other event not caused by the company. HydroLogic Solutions shall not be responsible for any loss or damage to the buyer, the units, or any third party resulting from its installation or shipment. Buyer shall be solely responsible for ensuring that installation of the system is completed in accordance HydroLogic Solutions' installation instructions and with all applicable laws, codes, rules and regulations.

Inspect all shipment within 5 days of receipt of StormChambers™. Failure to advise HydroLogic Solutions of defects on shipments within this period will constitute acceptance of the shipment.

This warranty shall not apply to any party other than the original buyer. Furthermore, no company representative has the authority to modify or change this warranty in any manner.

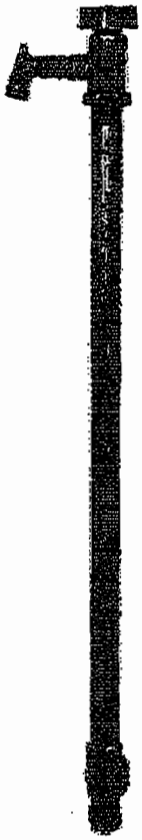


The StormChamber™ is protected by the following U.S. Patents: 6,361,248; 6,612,777; 469,187; 465,545. Canadian Patents: 2,356,592. Other U.S. and Canadian Patents Pending.

Model Y30

Freezeless Yard Hydrant

(This unit offers not anti-siphon or backflow protection)



POST HYDRANTS are intended for use on golf courses, in parks and recreation areas and landscaped areas around buildings.

ONE PIECE VARIABLE FLOW PLUNGER - Large cushion type seal for longer life - is not easily damaged and assures shut-off even when foreign particles are present. Automatic drain feature - plunger opens drain to prevent freezing.

REPLACEMENT PARTS – Head nut assembly can be removed for ready access to internal parts.

PACKING NUT ASSEMBLY - Adjustable packing nut secured with lock nut. Teflon impregnated packing

OPERATION – Wheel handle. -- OPTIONAL – Tee Key

FINISH – Brass head casting. – OPTIONAL – Chrome head casting

Specifications
FEMALE INLET – ¾" N.P.T.
CASING – 1" Galvanized steel pipe
OPERATING ROD – 3/8" Galvanized steel pipe -- OPTIONAL - 1" brass pipe outer casing; 3/8" brass pipe operating rod.
DRAIN HOLE – Tapped-1/8" N.P.T.
NOZZLE – ¾" Brass male hose nozzle
MAX PRESSURE - 125 p.s.i.
MAX TEMPERATURE - 120 degrees F.

Made in the U.S.A.

Shipping							
BURY DEPTH	1'	2'	3'	4'	5'	6' *	7' *
Shipping Weight (lbs)	8	10	13	15	17	19	21
Must ship via Truck due to length and weight.							

Please contact your authorized Woodford Representative for information on placing an order.
When ordering specify model and bury depth

**Spec Sheet

**You must have Adobe Acrobat Reader to view and print the above spec sheet. Click the icon below for a free copy.

Section 02350 Paving

The ramp to the parking garage to be asphalt;

The type of curb used is a standard bituminous curb detail.

Section 02403 Landscaping

The gravity block retaining wall to be Genest Highland Block or equal.

Section 08016 Overhead Doors

Provide sectional doors by Overhead Door Corporation or equal;

Submit manufacturers product data , installation instructions and shop drawings prior to fabrication and installation;

The garage door to be 7'6" tall (not 8' tall);

Door to be Thermacore Insulation Steel Sectional Doors – panel thickness to be 1 – 5/8"; exterior surface to be ribbed , textured; Ext steel .016" hot dipped galvanized; End stiles 16 gauge; Standard springs 10,000 cycles; Insulation CFC free and HCCFC free polyurethane fully encapsulated; Thermal Values - R value of 14.86; U value of 0.067; Air infiltration 0.08 cfm at 15 mph, 0.08 sfm at 25 mph; Double end stiles; Photo eye – entrapment protection using photoelectric sensors; Timer to close door after operation;

The electric door operator shall be the standard – duty Model JST door control system or equal. Provide 20 push button Operator Control Units;

The track to be low headroom track with front spring assembly;

The clutch shall be adjustable disc type;

The duty cycle shall accommodate standard usage, up to 60 cycles per hour during peak usage;

Primary reduction is 6 – rib poly J belt and pulley. Secondary reduction is by chain and sprocket. All moving shafts shall incorporate ball bearings;

Brake shall be solenoid actuated, drum and shoe type standard on jackshaft and ½ HP trolley units.

Motor shall be ½ horsepower continuous duty with instant reverse and automatic reset thermal overload. Motor shall be UL listed. Motor shall comply with NEMA 56, open drip-proof connection;

Control system shall use a heavy duty reversing contactor, electronically and mechanically interlocked with 24 VAV three button open/close/stop control that allows for constant or

momentary contact door open and close functions. System shall also accommodate connection of sensing edge and / or photocell device and connection of single button control stations and connection of three wire radio controls;

Section 08700 Finish Hardware

Grade 1 Lever locksets should be included in all pre hung doors;

Doors 100.1, 102.2, 107.1 and 109.3 to receive keyless entry (by others); Provide one hardwired 15 A circuit to each door jamb for electric strike plates to be on house panel;

Section 10600 Mail Boxes

See allowance of $1,200 as listed in Addendum 1 Section 00400

Section 15300 Special Piping

Delete gas booster.

Section 15400 Plumbing

The Plumbing Fixture Schedule P 1 calls out Aker fiberglass showers - use Aker or equal; the Whirlpool tubs are Kohler or equal as listed in P 1;

The custom showers (pans) are to be built as noted on the Interior Finish Legend on Sheet F940;

The static water pressure at the closest hydrant is 67 psig. No water pressure booster will be needed as per page 5 item 3 of the Mechanical Outline by Bennett Engineering;

Section 15600 HVAC

Note 1 of the first paragraph on Page 15600 -1 states that the gas fired boiler for radiant heat – delete reference to radiant heat; The heat is provided thru 7" Slant Fin baseboard heat (or equal).

Section 16400 Electrical Distribution

Provide one ceiling mounted outlet in garage at the ½ HP motor for the garage door opener. To be wired into house panel;

Add one designated 20 A circuit at each P Tac unit as shown on levels 1 and 2 in units 1A, 1B, 2A, 2B, 2C, 2E, 2F and 2G;

In each unit, provide one duplex outlet within 1 foot of all Cable TV outlets shown;

The Building service size is 1200 A;

Doors 100.1, 102.2, 107.1 and 109.3 to receive keyless entry (by others); Provide one hardwired 15 A circuit to each door jamb for electric door strikes to be on house panel;

SHERIDAN STREET, LLC
477 Congress Street, 5th Floor
Portland, Maine 04101-3427
207 523 3410 Office
207 773 8597 Fax

ADDENDUM NO. 3

To the Contract Documents for the Sheridan Heights project.

Owner: Sheridan Street, LLC

February 26, 2007

This Addendum modifies, amends and supplements designated parts of the Contract Documents, Project Manual and Drawings for the Sheridan Heights Drawings dated February 5, 2007 and Addendum No. 1 dated February 14, 2007 and is hereby made a part thereof by reference. This Addendum is binding as though inserted in its entirety in the locations specified herein. It shall be the responsibility of the General Contractor to notify all Subcontractors and Suppliers that will be bidding the project for the various parts of the work of any changes or modifications in the Addendum.

Greg Shinberg, Project Manager
Shinberg Consulting, LLC

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Clarification:

The ASK drawings provided in Addendum No. 2 were printed on 8.5" x 11" format and were drawn in 11" x 17' format – thus they are not to scale.

ADDENDUM TO ARCHITECTURAL DRAWINGS

Re: Sheridan Heights, 135 Sheridan Street, Portland Maine
Original Drawings: February 5, 2007; "Bid Set, Not For Construction"

Date: 03/01/07

Specification Section 10520

2.2.C Delete: "UL-rated 2-A:10:B:C, 10-lb (2.3-kg) nominal capacity"
Replace with: "UL-rated 4-A:80:B:C, 10-lb (2.3-kg) nominal capacity."

2.3.B.4.a Delete: "Flat trim for Recessed Cabinets: ¼ to 5/16-inch (6 to 8mm) backbend depth."

Add:

2.3.B.10 Fire Rated Cabinets: Cabinets are to be fire rated to match the rating of the wall they are located on. Cabinets are to be labeled to show the rating provided.

2.4.A Delete: "Provide manufacture's standard baked enamel paint for the following."
Replace with: "Provide manufacture's standard anodic finish for the following. Color as selected by architect from the manufacture's standard range".

Delete:

2.4.C "Aluminum Baked-Enamel Organic Finish: Thermosetting, modified-acrylic enamel primer/topcoat system complying with AAMA 603.8 except with a minimum dry film thickness of 1.5 mils (0.04 mm), medium gloss. 1. Color: As selected from manufacturer's standard"

Drawing G1.1 – Partition Types

Wall types

All wall types with acoustic insulation & resilient channel are to be constructed with acoustic sealant at all perimeter edges as shown on A5.2 (details 15 & 16).

Two Hour Fire Rated Partitions

Type 2B Delete: "UL 301, FM WP-360, GA WP-4135, 40 NGC-2363"
Replace with: "UL 334"

Drawing A7.2 - Door Details

Glazed exterior doors: All fixed or operable glazed panels, with bottom edge of the glass within 60 inches of the floor, to be clear insulated tempered glass panels (ie. glazing type GL-4).

Door type E: Change glazing from type GL-4 to GL-3 (clear tempered glass).

Door type O, P, Q & V: Change glazing of transom windows from type GL-4 to GL-1 (clear insulated glass).

Door type V: Add screen.

Drawing A5.0

Detail 1 Add: "¾" extruded polystyrene insulation behind sheetrock to strapped concrete foundation wall."

Section 00410 Bid Form

Add Alternate Number 5 Clarification. The materials to be removed have been tested and qualify as demolition materials that can be hauled to the Portland Riverside facility.

Section 02200 – Sitework

Add Alternate Number 5 Clarification. The materials to be removed have been tested and qualify as demolition materials that can be hauled to the Portland Riverside facility.

Section 06100 Rough Carpentry

Response to RFI :

Drawings A3.0, A3.1 & A3.2 show sheetrock ceilings framed to the bottom of the joists while drawings F1.20, F1.21, F1.22, F1.23 show dropped ceilings & soffits.

Response:

Fire rated separations must be provided at each floor/ceiling. Un-rated dropped ceilings & soffits may be built below the fire rated ceiling assemblies.

Response to RFI

Is there any fire retardant lumber in the project (Benchmark RFI #1, item 3)?

Response:

Fire retardant lumber is not required for Sheridan Heights.

Section 08700 Finish Hardware

Grade 1 Lever locksets should be included in all pre hung doors;

Doors 100.1, 102.2, 107.1 and 109.3 to receive keyless entry (by others); Provide one hardwired 15 A circuit to each door jamb for electric strike plates to be on house panel;

Section 08000 Doors / Windows

All entry doors to the units (1A1, 1B1, 2A1, 2B1 etc) shall be constructed with 45 min steel jambs and aluminum thresholds. The doors shall be solid core masonite; All doors to be finished as per the finish schedules and be provided paint primed;

All interior doors within the units shall be solid core masonite with wood jambs that may be finger- jointed and shall be paint primed;

Section 09260 Gypsum Board Assemblies

Response to RFI

Drawings A3.0, A3.1 & A3.2 show sheetrock ceilings framed to the bottom of the joists while drawings F1.20, F1.21, F1.22, F1.23 show dropped ceilings & soffits.

Response:
Fire rated separations must be provided at each floor/ceiling. Un-rated dropped ceilings & soffits may be built below the fire rated ceiling assemblies.

Section 10600 Mail Boxes

See allowance of $1,200 as listed in Addendum 1 Section 00400

Section 15300 Special Piping

Delete gas booster.

Section 15400 Plumbing

The Plumbing Fixture Schedule P 1 calls out Aker fiberglass showers - use Aker or equal; the Whirlpool tubs are Kohler or equal as listed in P 1;

The custom showers (pans) are to be built as noted on the Interior Finish Legend on Sheet F940;

The static water pressure at the closest hydrant is 67 psig. No water pressure booster will be needed as per page 5 item 3 of the Mechanical Outline by Bennett Engineering;

Section 15600 HVAC

Note 1 of the first paragraph on Page 15600 -1 states that the gas fired boiler for radiant heat – delete reference to radiant heat; The heat is provided thru 7" Slant Fin baseboard heat (or equal).

Section 16000 Electrical

Clarification:

The Lighting Fixture Schedule is located on Plan F1.20 K-11

RFI:

1.Gas or Electric Range –

ANSWER: *Electric*

2. Fire Alarm System -
   A. Basic residential unit interconnected system - 21 separate systems with no monitoring
   Or
   B. Building wide supervised system

ANSWER: *See spec section 16100-4 paragraph 2.09.* State what you carry for a system in your bid.

3.What are the electrical requirements for HVAC in each unit?

ANSWER*: Electrical Design build contractor is responsible for reviewing mechanical plans and specs and carrying cost for complete installation.* State what you carry in your bid.

4. What are the electrical requirements for the stack washer and dryers for each unit - 30 amp or 30 amp and 20 amp outlets at each location ?

ANSWER: *30 amp and 20amp at each location.*

SHERIDAN STREET, LLC
477 Congress Street, 5th Floor
Portland, Maine 04101-3427
207 523 3410 Office
207 773 8597 Fax

ADDENDUM NO. 4

To the Contract Documents for the Sheridan Heights project.

Owner: Sheridan Street, LLC

March 5, 2007

This Addendum modifies, amends and supplements designated parts of the Contract Documents, Project Manual and Drawings for the Sheridan Heights Drawings dated February 5, 2007 and Addendums Nos. 1, 2 and 3 and is hereby made a part thereof by reference. This Addendum is binding as though inserted in its entirety in the locations specified herein. It shall be the responsibility of the General Contractor to notify all Subcontractors and Suppliers that will be bidding the project for the various parts of the work of any changes or modifications in the Addendum.

Greg Shinberg, Project Manager
Shinberg Consulting, LLC

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Note that the following sections were not used:

12500 Window Treatments
10650 Metal Shelving

See the attached CSK 1 and CSK 2 by Gawron Turgeon Architects.

Section 00410 Bid Form

REVISED BID FORM

Line # 2 Sitework – provide the cost for Sheeting or whatever method used to hold the hillside back as a part of the total Sitework total.

Provide a price as noted above in 00410 for the Sheet Pile cost to maintain the integrity of the hillside;

Section 09300 Ceramic Tile

1. T4 shall be installed at the 102 Elevator Lobby as an accent tile; Refer to A1/F1.0
2. Refer to CSK1 for location of accent tile in Master Bathrooms;
3. All areas that receive a floor tile to receive 3/8" ULC plywood under the tiled nailed to the ¾ sturdideck as required under standard ANSI specs as listed below.
4. Tile for shower units as follows:
    - T6 – Dal Tile Porcelain wall tile; Valle D'Asota 6.5" x 5.5"; field color TBS
    - T6a – Dal Tile Porcelain floor tile; Valle D'Asota mosaic tile color TBS
    - Provide waterproofing at shower units.
    - Ceramic Tile guidelines – ANSI Tile Installation Standards ANSI Tile Installation Standards: Comply with parts of ANSI A108 Series "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules
    - TCA Installation Guidelines: TCA's "Handbook for Ceramic Tile Installation". Comply with TCA installation methods indicated in ceramic tile installation schedules-Interior Finish legend
    - Refer to CSK2– Fireplace elevation.

Section 09302 Vinyl

5. VCB1 Vinyl cove base to be 4" x 1/8"
6. VCB1 shall be provided at GWB in Rooms

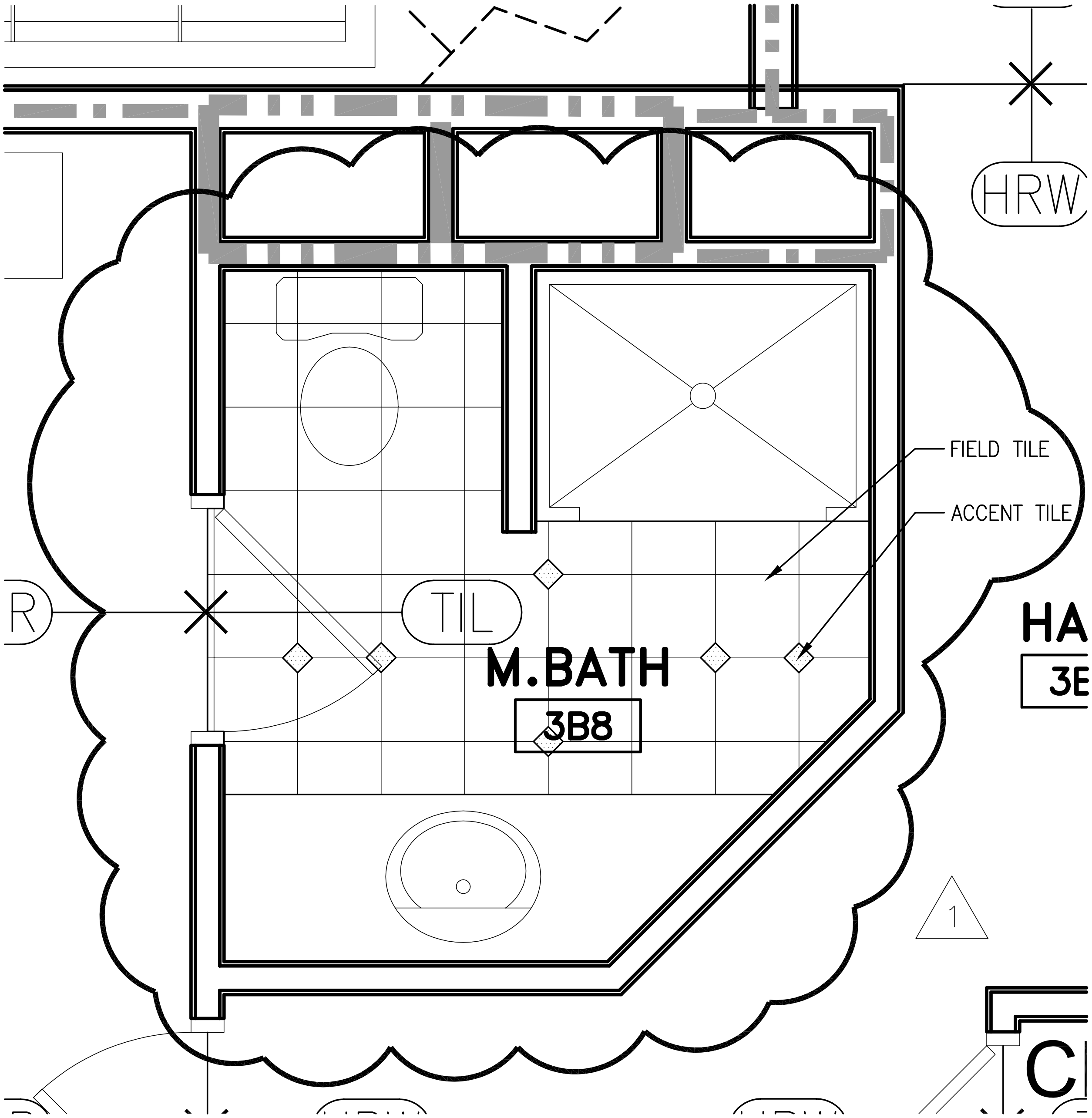
Section 09550 Wood Flooring

Clarification – see Interior Finish Legend Sheet F940 for wood flooring instructions. See Finish Schedules on F941, F942 and F943.

Install red rosin paper under all places that have 1/3 maple flooring installed.

Section 09600 Carpet

1. 101 Entry Lobby shall be a combination of C1/C2. Provide 25% C1 and 75% C2 – random pattern;
2. C2 shall be Shaw Contract, Feeling Plush Collection, Radiance Tile
3. C3 shall be Shaw Contract, Feeling Plush Collection, Lustre Broadloom
4. Provide carpets at Units per specifications as identified on Interior Legend;



A1 FLOOR PATTERN PLAN

1/2"=1'-0" MASTER BATH TILE PATTERN 3RD AND 4TH FLOOR ONLY

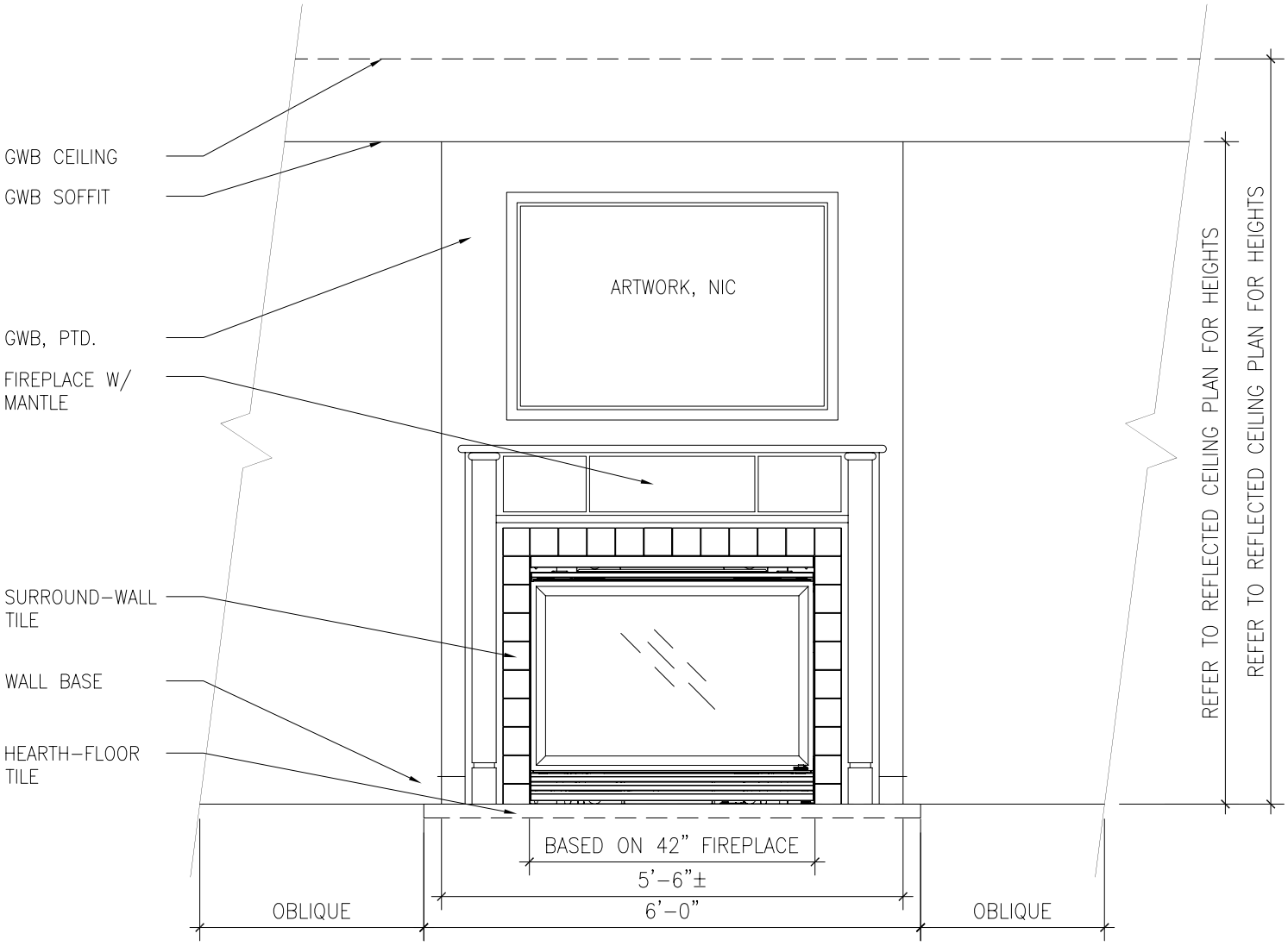
GAWRON TURGEON ARCHITECTS
29 Black Point Road
Scarborough, ME 04074
www.gawronturgeon.com
Tel. 207 . 883 . 6307
Fax. 207 . 883 . 0361

SHERIDAN HEIGHTS

M. BATH TILE PATTERN PLAN - 3RD & 4TH FL.

DATE:	03.02.07	SCALE:	AS NOTED
PROJECT #	110206	DRAWN BY:	SCN

CSK
1



NOTES
1. COORDINATE SIZE OF FIREPLACE UNIT WITH PREFABRICATED ADJUSTABLE FIREPLACE SURROUND.
2. COORDINATE FLOORING TRANSITION BETWEEN CARPET TO TILE HEARTH.
3. COORDINATE INTERIOR ELEVATION WITH ARCHITECTURAL DRAWINGS.
4. COORDINATE SIZE OF TILE WITH DESIGNER IF FIREPLACE INSERT IS ALTERED FROM DIMENSION INDICATED ON ELEVATION

A1 ELEVATION-UNIT FIREPLACE, TYPICAL

1/2"=1'-0"

GAWRON TURGEON ARCHITECTS
29 Black Point Road
Scarborough, ME 04074
www.gawronturgeon.com
Tel. 207 . 883 . 6307
Fax. 207 . 883 . 0361

SHERIDAN HEIGHTS

FIREPLACE ELEVATION

DATE:	03.02.07	SCALE:	AS NOTED
PROJECT #	110206	DRAWN BY:	LAP

CSK
2

SECTION 00200 – INSTRUCTIONS TO BIDDERS

Sheridan Heights

1. All bidders will be contracted directly with the Owner:
   Sheridan Street, LLC, 477 Congress Street, 5th floor, Portland, Maine 04101
   See contract documents for the applicable Owner contract.

2. At the time of the opening of proposals, each bidder will be presumed to have inspected the site and to have read and to be thoroughly familiar with the plans and contract documents, including all addenda. In order to receive any addenda, bidders are asked to record their contact information with the appropriate plan depository. Addenda's will then be faxed upon release. If bidders are unavailable by fax they are to make arrangements with the appropriate plan depository for notification. The failure or omission of any bidder to receive or examine any form, instrument or documents shall in no way relieve the bidder from any obligation in respect to his proposal. The Owner reserves the right to accept or reject any or all proposals as may best serve the interest of the Owner.

3. Bids are to be received at: **The offices of Sheridan Street, LLC.**
   Before **3:00 PM, February 28, 2007.**

   Two original copies are required. Bids will be collated then read aloud and recorded. The Owner will then review the bids and will then notify the selected General Contractor. Faxed bids are not acceptable.

4. The Owner reserves the right to reject, with or without cause, any or all proposals submitted, to waive any informalities therein, or to accept any proposal where it may appear to be in the Owner's best interest.

5. No proposal may be withdrawn during a period of ninety (90) calendar days immediately following the opening thereof.

6. Proposals shall be clearly written in full without erasures or deletions. No exceptions or qualifications of the proposal will be accepted. The General Contractor shall include all sales and use taxes, inspection or permit fees.

7. Proposals shall be signed by an officer of the company. The title of the officer must be stated.

8. No contract may be assigned, sublet or transferred without the written consent of the Owner.

9. Subcontractors may be required to furnish a statement of their business experience, record of accomplishments and financial responsibility at the discretion of the Owner.

10. The Owner shall retain ten percent (10%) of each payment due the general contractor through 50% of the project as outlined in the schedule of values, as part security for the fulfillment of the contract by the general contractor. Subsequent to

50% of project completion, retainage will be reduced to 0% of each payment, for a net of five (5%) to the project completion.

11. The proposal shall be based on the materials, methods, equipment and products as specified. Any materials, methods, equipment or products not herein specified, but deemed worthy of consideration by the general contractor, may be introduced by a separate letter attached to his proposal. He shall state the cost comparison with the specified materials, methods, equipment or products and the reason for the suggested substitution.
It shall be understood by the general contractor that the attached letter describing the proposed change will not be used in determining the low general contract proposal submitted unless the general contractor shall have submitted their list to the Architect/Engineer ten (10) days prior to the date set for the receipt of their respective proposals and shall be received written approval by the Architect/Engineer.

12. Requests for information should be directed through:

Shinberg Consulting, LLC
By fax: **(207) 773-8597**
By hand: **477 Congress Street, 5th floor, Portland, Maine 04101**
By email: **Greg Shinberg <gls@gwi.net>**

All RFI's will be responded to in Addendum form, no direct answers will be given. All RFI's are to be submitted 7 days prior to the bid due date in order to assure an adequate response time.

13. OSHA – Safety Regulations. This project is subject to compliance with all requirements of the Occupational Safety and Health Administration, Volume 36, No. 105 of the Federal Register; U.S. Department of Labor published Saturday, May 29, 1971, as amended.

14. Any proposal that contains an escalation clause will be invalid.

15. General Contractors, subcontractors and vendors are responsible for reviewing the complete bid package. This includes but is not limited to: drawings, project manual, geotechnical engineering services reports and addenda.

16. Schedule (Required Key Dates): Contractor to include in their bid an outline of the construction schedule (based on key dates shown below)

February 28, 2007	General Contractor Construction Bids Due to Owner
April 2, 2007	Construction Start Date
March 7, 2008	Certificate of Occupancy

17. General Contractors are open to bid the project as a panelized construction system as it may be a schedule accommodating and cost effective option. The panelized option must include appropriate shop drawing review procedures.

18. There is no sales tax exemption on this project.

19. Bid bonds are not required.

20. A Site Walk is scheduled for Wednesday, February 14 at 1 PM. The meeting will commence at the field office of Sheridan Street, LLC located in the west end of house located at 121 Sheridan Street.

21. The Table of Contents designates responsibility for the sections as follows: TFH (TFH Architects); SC (Shinberg Consulting, LLC) BE (Bennett Engineering)

GEOTECHNICAL ENGINEERING SERVICES
PROPOSED HOUSING STRUCTURE
135 SHERIDAN STREET
PORTLAND, MAINE

06-1271 **December 6, 2006**

Prepared for:

Shinberg Consulting, LLC
Attention: Greg Shinberg
477 Congress Street, 5th Floor
Portland, ME 04101

Prepared by:

S.W.COLE ENGINEERING, INC.

286 Portland Road
Gray, Maine 04039

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06-1271

December 6, 2006

Shinberg Consulting, LLC
Attention: Greg Shinberg
477 Congress Street, 5th Floor
Portland, ME 04101

Subject: Geotechnical Engineering Services
Proposed Housing Structure
135 Sheridan Street
Portland, Maine

Dear Mr. Shinberg:

In accordance with our Agreement, dated October 30, 2006, we have observed test pit explorations and made a geotechnical evaluation relative to foundations associated with the proposed building construction. Our scope of work was limited to observation of test pit explorations, an assessment of bearing capacity of the foundation soils, recommendations for subgrade preparation, foundation drainage and foundation backfill recommendations. This report summarizes our findings and recommendations and its contents are subject to the limitations set forth in Attachment A.

1.0 PROPOSED CONSTRUCTION

Based on a site plan by SGC Engineering, LLC, we understand the L-shaped, 5-level structure will be wood-framed and have a footprint on the order of 9,300 SF. We understand that the proposed ground finished floor elevation will be 121.0 feet. The ground floor of the easterly portion of the structure will be for interior parking while the westerly portion will be for housing. A paved parking area is proposed for the southern end of the site with a paved ramp leading to the proposed interior unheated parking area. We understand that the interior parking area will be a concrete slab. An access drive will connect the parking area to Sheridan Street.

2.0 EXPLORATION AND TESTING

Thirteen test pit explorations (TP-1 through TP-10, TP-E, TP-F, and TP-G) were made at the site on November 3, 2006 by Leavitt Construction using a Volvo EC160B

excavator. The test pit work was coordinated and subcontracted by Shinberg Consulting, LLC. The test pit locations were selected by SGC Engineering and yourself. The approximate locations of the test pits are shown on the Exploration Location Plan, attached as Sheet 1. Sheet 1 is based on an existing conditions plan provided by SGC Engineering. The test pits were excavated to depths of 6 to 16 feet below the existing ground surface. Logs of the test pits are attached as Sheets 2 through 8. A key to the notes and symbols used on the logs is attached as Sheet 9. Laboratory testing consisting of grain size analyses and moisture content testing was performed on selected samples. Moisture content test results are shown on the test pit logs. Results of grain size testing are attached as Sheets 10 to 12.

3.0 SITE AND SUBSURFACE CONDITIONS

3.1 Site Conditions

The site is located on the northeasterly side of Sheridan Street. Based on a site plan provided by SGC Engineering, the ground surface at the site varies from about elevation 120 on the westerly side (Sheridan Street) to about elevation 155 at the northeast corner. The site was reportedly used as a borrow pit in the past. The site is relatively flat from the west to southeast, varying from about elevation 120 on the westerly side to about elevation 126 in the southeast. The proposed building area is generally open and grassed with some small trees and shrubs around the edge of the proposed building area. A 1.5± horizontal to 1 vertical slope exists at the northeast corner of the proposed building area which rises from about elevation 135 near the building corner to about elevation 155 within about 20 to 30 feet from the building corner. Existing houses are located to the west and southwest of the proposed building.

3.2 Subsurface Conditions

In general the test pits encountered fill overlying native sand and gravel. The fill generally consisted of sand, gravel, silt, bricks and some metal, glass, and wood debris. Test pits TP-6 and TP-10 encountered ash fill overlying the native sand and gravel. The fill varied in thickness from about 1 foot in the northwest corner to about 15 feet near the center of the southern wing of the building. A refusal surface, possibly a boulder bedrock, was encountered in test pit TP-8 at a depth of 13 feet. Refer to the attached logs for more detailed descriptions of the subsurface findings at each of the test pit locations.

3.3 Groundwater Conditions

Free groundwater seepage was observed in test pit TP-F at about 15 feet below the existing ground surface. Free groundwater was not observed in the other test pits. In general, groundwater should be expected to fluctuate seasonally and during periods of heavy precipitation and snowmelt.

4.0 EVALUATION AND RECOMMENDATIONS

4.1 General

Based on the subsurface findings and our understanding of the proposed construction, it is our opinion that foundation support of the proposed building appears feasible using conventional spread footing foundations and on-grade floor slabs provided the existing site fills are removed and replaced with compacted fills. Based on existing site grading and proposed finish floor elevations, we anticipate a tapered cut from west to east of as much as 12 to 15 feet to achieve ground floor grade. Deep cuts will be needed in the northeast corner of the building for foundations.

The fill at the site is unsuitable for support of the building due to the uncontrolled placement of the fill and the ash and debris encountered. We recommend the existing site fills be removed and replaced with compacted fill in the area of the building. A test boring to determine the Seismic Site Class not requested. The native soils encountered in the test pits are generally a mix of sands and gravels that do not exhibit the characteristics of Site Class E or F soils as described in Table 1615.1 of the 2003 International Building Code.

4.2 Subgrade Preparation

Site preparation should begin with construction of an erosion control system to protect drainage ways and areas outside the construction limits. Where native sands and gravels are exposed, they should be densified prior to placement of concrete or new compacted fill. The existing fill in the building area should be replaced with a material meeting the gradation requirements of MDOT 703.20 Gravel Borrow. Some of the on-site sandy fill may meet the requirements of Gravel Borrow and be suitable for re-use as compacted fill beneath the building area. The on-site sandy fill will need to be separated from other unsuitable fill and screened to remove oversize particles and gradation testing should be performed to determine its suitability for reuse. Fill placed

within the building area should be compacted to at least 95 percent of the maximum dry density as determined by ASTM D1557. S. W. COLE ENGINEERING, INC. should observe the excavation of the existing fill and provide field density testing to confirm the required compaction is achieved. The zone of compacted Gravel Borrow should continue outside the building perimeter, extending at least two feet beyond the outside edge of exterior footings and downward at a 1 horizontal to 1 vertical slope to the native densified subsoils.

4.3 Excavation

We recommend that all topsoil, organics, fill soils and any existing utilities be removed from beneath the proposed building. The existing fills need to be completely removed from beneath the building area to expose the naturally deposited sand and gravel. Excavation outside the building area should continue laterally one foot for each one foot of overexcavation. In general, the on-site fill soils are not suitable for reuse below foundations or slabs or as backfill against foundations, but it may be possible to reuse the sandy fill for compacted gravel borrow or trench backfill below paved areas or common fill provided they are screened of miscellaneous debris and cobbles and boulders and the material is at a moisture content which is consistent with the required compaction.

Groundwater seepage may be encountered during excavation work, particularly during precipitation and in deeper excavation areas. Ditching, sumping and pumping dewatering techniques should be adequate to control groundwater within foundation excavation. Groundwater and runoff will need to be controlled to protect soil subgrades. Excavations must be properly shored and/or sloped in accordance with OSHA trenching regulations to prevent sloughing and caving of the sidewalls during construction. It is anticipated that sheet piling or other shoring methods will be required at the northeast corner of the building, adjacent to the existing slope.

4.4 Backfill and Compaction

The on-site fills are frost susceptible and are not suitable for reuse as backfill adjacent to foundations or below slabs. Gravel Borrow should be used to raise grades to footing and slab levels where the existing fill is excavated. Structural fill should be utilized for foundation backfill and directly below slabs-on-grade.

The structural fill should be a clean, non-frost susceptible soil meeting the following gradation requirements:

Structural Fill	
Sieve Size	Percent Finer by Weight
4 inch	100
3 inch	90 to 100
¼ inch	25 to 90
No. 40	0 to 30
No. 200	0 to 5

MDOT 703.20 Gravel Borrow should be a granular material with no particles greater than 6 inches and the portion passing the 3 inch sieve should meet the following gradation requirements.

MDOT 703.20 Gravel Borrow	
Sieve Size	Percent Finer by Weight
¼ inch	0 to 70
No. 200	0 to 10

4.5 Spread Footings

To protect spread footings and foundation underdrains from freezing temperatures, perimeter footings should be cast at least 4.5 feet below exterior finish grades. For footings bearing on properly prepared subgrades we recommend the following geotechnical parameters

- Net allowable bearing pressure = 3.0 ksf or less (densified native soils or compacted fill over densified native soils)
- Base friction factor = (tan δ) = 0.35 (mass concrete to native sand and gravel or compacted fill)
- Passive lateral earth pressure coeff. (K_p) = 3.0 (compacted structural fill)
- Active lateral earth pressure coeff. (K_a) = 0.3 (compacted structural fill)

- Active lateral earth pressure coeff. (K_a) = 0.75 (sloping backfill, maximum slope of 30 degrees)
- At-rest lateral earth pressure coeff. (K_o) = 0.5 (compacted structural fill)
- Total unit weight of backfill (γ_t) = 135 pcf (compacted structural fill)
- Angle of Internal Friction (ϕ) = 30 degrees (compacted structural fill)

Note: Lateral earth pressure coefficients assume positive foundation drainage prevents hydrostatic buildup behind foundation walls.

4.6 Floor Slabs

4.6.1 Heated Areas

We recommend that the first floor slab be underlain with at least 12 inches of compacted structural fill. Slab-on-grade floors may be designed using a subgrade reaction modulus of 150 pci provided the concrete slab is underlain by properly prepared subgrades.

For slab-on-grade floors we recommend that a 15-mil vapor retarder be placed directly below the floor slab concrete. The vapor retarder should have a permeance that is less than the floor covering being applied on the slab and should be installed according to the manufacturer's recommended methods including taping all joints and wall connection. Flooring suppliers should be consulted relative to acceptable vapor retarder systems for use with their products. The vapor retarder must have sufficient durability to withstand direct contact with sub-slab fill and construction activity.

We recommend that control joints be installed within floor slabs to accommodate shrinkage in the concrete as it cures. In general, control joints are usually installed at 10 to 15 foot spacing; however, the actual spacing of control joints should be determined by the structural engineer. We recommend that floor slabs be wet-cured for a minimum of 7 days after casting as a measure to reduce the potential for curling of the concrete and excessive shrinkage. We further recommend that consideration be given to using a curing paper or curing compound after the wet-cure period to improve the quality of the completed floor slab.

4.6.2 Unheated and Interior Parking Areas

We recommend that excavations beneath the slabs in unheated areas continue to native sand and gravel or to at least 4.5 feet below finish grade, whichever is encountered first. These areas should be backfilled with compacted non-frost susceptible granular fill meeting the Gravel Borrow gradation to limit abrupt heave or differential movement. The zone of non-frost susceptible material below entrance slabs should transition up to any adjacent pavement subbase or loam at a 3H:1V slope or flatter. We recommend that slabs in unheated areas be underlain with at least 12 inches of compacted structural fill. Slab-on-grade floors may be designed using a subgrade reaction modulus of 150 pci provided the concrete slab is underlain by properly prepared subgrades.

4.7 Entrance Slabs and Sidewalks

Entrance approaches, sidewalks and exterior slabs should be designed to reduce the effects of differential frost action between doorways and entrances. We recommend that excavations beneath the entire width of entrances, sidewalks, and exterior slabs continue to at least 4.5 feet below finish grade. These areas should be backfilled with compacted non-frost susceptible granular fill meeting the Structural Fill gradation to limit abrupt heave or differential movement. The zone of non-frost susceptible material adjacent to exterior foundations and below entrance slabs and sidewalks should transition up to any adjacent pavement subbase or loam at a 3H:1V slope or flatter.

4.8 Foundation Drainage

We recommend that a perimeter foundation drain system be provided adjacent to the exterior side of exterior footings. An underdrain should also be provided for any elevator pit areas. We also recommend that a subslab underdrains be placed under the lower level and be connected to the perimeter underdrains. The foundation drains should be placed at least 4.5 feet from freezing temperatures and should consist of 4-inch diameter rigid underdrain pipe having perforations of ¼ to ½ inches. We recommend that at least 6 inches of crushed stone bedding be provided around the foundation drains and that the stone be wrapped with a geotextile filter fabric having an apparent opening size of at least 70. The foundation drainage system must have a positive gravity outlet.

Exterior foundation backfill should be sealed with a surficial layer of clayey or loamy soil in areas that are not to be paved or occupied by entrance slabs to reduce direct surface

water infiltration into the backfill. Roof drains should be routed in separate non-perforated pipes, also placed below the frost depth. Utilities in non-heated areas, extending through slabs or asphalt paving into underlying soils, should have a gasket at grade to prevent surface water from entering the underlying fills and to allow some differential movement.

4.9 Reuse of Existing Soils

The on-site fills are likely suitable for use as common fills outside the building area. The native sand and gravel is suitable for use as fill below the building, backfill against foundations, and in pavement areas. The ash fill may be suitable for use as common fill in grassed areas and as subgrade fill in paved areas. Some of the on-site sandy fill may meet the requirements of Gravel Borrow and also may be used as subgrade fill in paved areas. On-site fill will need to be screened to remove oversize particles and gradation testing should be performed to determine its suitability for reuse.

4.10 Paved Area Subgrade Preparation

In paved areas the existing on-site fills should be excavated to subgrade elevation and then proof-rolled with a steel drum roller to densify the subgrade prior to placing new subbase fill. It should be anticipated that if the existing fills are not removed from beneath paved areas, some differential settlement and frost heaving can occur which can affect subsurface utilities. It is understood that pavement sections will be provided by others.

4.11 Additional Study

It should be noted that seismic site class evaluation and evaluation of the global slope stability of the slope at the northeasterly corner were not included in our scope of work. Seismic site class and global stability evaluations would require supplemental exploration work, laboratory testing and geotechnical evaluation. Supplemental exploration work would include test borings.

4.12 Design Review and Construction Testing

S. W. COLE ENGINEERING, INC. should be retained to review the final design and specifications to determine that our earthwork recommendations have been properly interpreted and implemented.

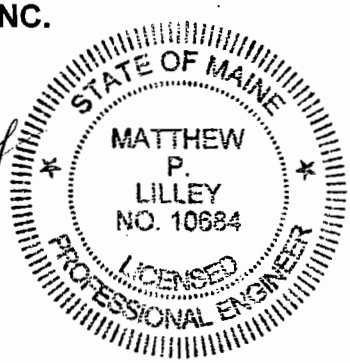
A soils and concrete testing program should also be implemented during construction to observe compliance with the design concepts, plans, and specifications. S. W. COLE ENGINEERING, INC. is available to provide field and laboratory testing services for soil, concrete, masonry, steel, and fireproofing construction materials.

5.0 CLOSURE

It has been a pleasure to be of assistance to you with this phase of your project. If you have any questions, please do not hesitate to contact us.

Sincerely,

S. W. COLE ENGINEERING, INC.



Matthew P. Lilley, P. E.
Geotechnical Engineer

MPL:mpl/pfb

c: Price Structural Engineers (David Price)
SGC Engineering, Inc. (John Riordan)

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Attachment A - Limitations

This report has been prepared for the exclusive use of Shinberg Consulting, LLC for specific application to the Proposed Housing located at 135 Sheridan Street in Portland, Maine. S. W. COLE ENGINEERING, INC. has endeavored to conduct the work in accordance with generally accepted soil and foundation engineering practices. No warranty, expressed or implied, is made.

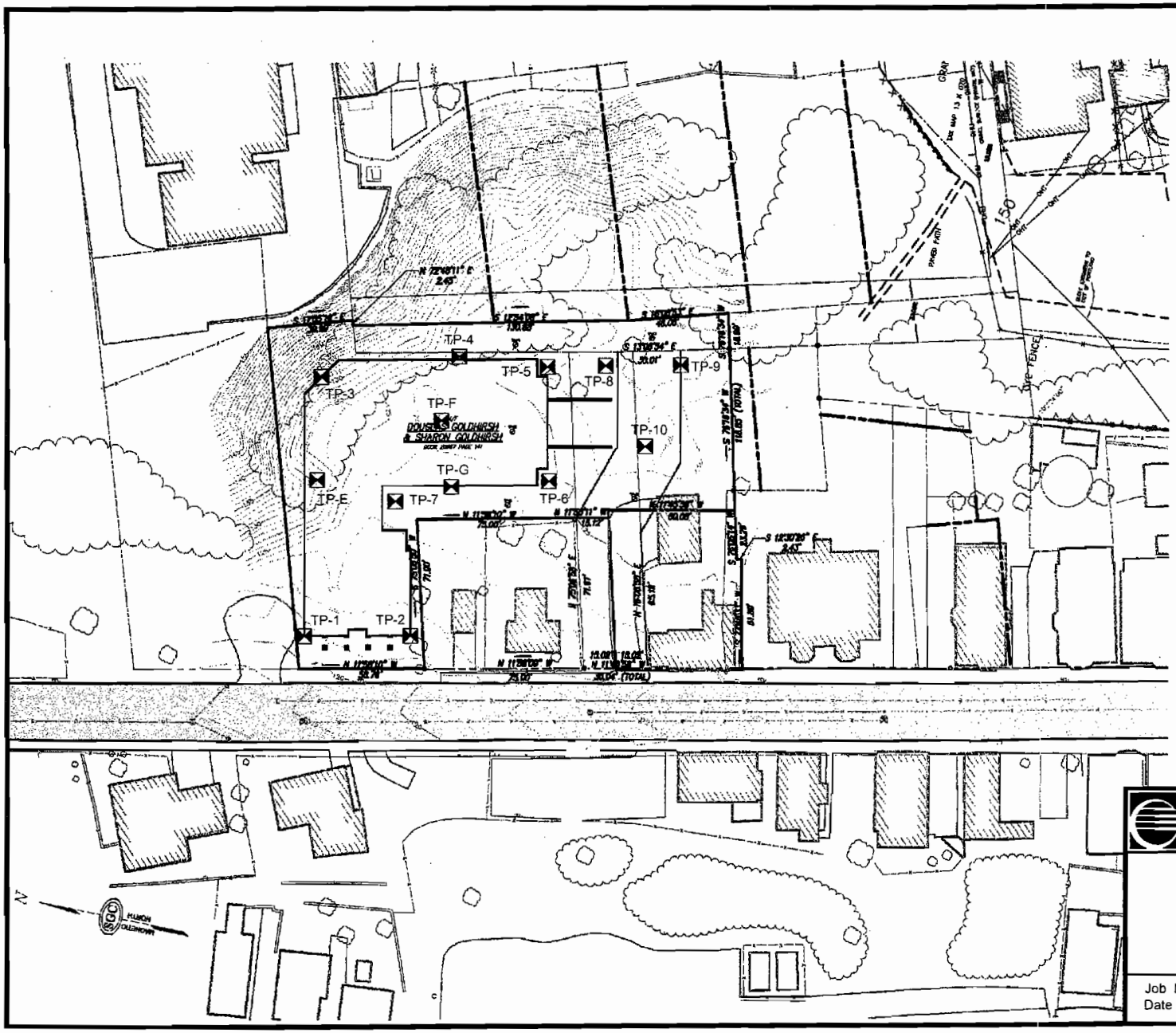
The soil profiles described in the report are intended to convey general trends in subsurface conditions. The boundaries between strata are approximate and are based upon interpretation of exploration data and samples.

The analyses performed during this investigation and recommendations presented in this report are based in part upon the data obtained from subsurface explorations made at the site. Variations in subsurface conditions may occur between explorations and may not become evident until construction. If variations in subsurface conditions become evident after submission of this report, it will be necessary to evaluate their nature and to review the recommendations of this report.

Observations have been made during exploration work to assess site groundwater levels. Fluctuations in water levels will occur due to variations in rainfall, temperature, and other factors.

S. W. COLE ENGINEERING, INC.'s scope of work has not included the investigation, detection, or prevention of any Biological Pollutants at the project site or in any existing or proposed structure at the site. The term "Biological Pollutants" includes, but is not limited to, molds, fungi, spores, bacteria, and viruses, and the byproducts of any such biological organisms.

Recommendations contained in this report are based substantially upon information provided by others regarding the proposed project. In the event that any changes are made in the design, nature, or location of the proposed project, S. W. COLE ENGINEERING, INC. should review such changes as they relate to analyses associated with this report. Recommendations contained in this report shall not be considered valid unless the changes are reviewed by S. W. COLE ENGINEERING, INC.



GENERAL NOTES:

1) SGC ENGINEERING, LLC HAS BEEN RETAINED PURSUANT TO A PROFESSIONAL SERVICES AGREEMENT BETWEEN SHERIDAN STREET, LLC AND SGC ENGINEERING LLC, DATED JUNE 12, 2006.

2) ALL SURVEY WORK COMPLETED BY BACK BAY ENDEAVOR INC. AS SHOWN IN MAP REFERENCE 1.

3) NO SUBSURFACE INVESTIGATION HAS BEEN PERFORMED BY SGC ENGINEERING, LLC. DIG-SAFE SHOULD BE CONTACTED PRIOR TO COMMENCING ANY EXCAVATION. (888-344-7233).

MAP REFERENCES:

1) A PLAN ENTITLED "BOUNDARY SURVEY/EXISTING CONDITIONS PLAN" DATED JULY 14, 2006 PREPARED BY BACK BAY ENDEAVOR INC.

2) A PLAN ENTITLED "SHERIDAN STREET PLAN & PROFILE STA. 44+00 TO 54+00+" DATED JUNE 1937 PREPARED BY WOODARD & CURRAN INC.

LEGEND

⊠ Approximate Test Pit Location

NOTE :

Base plan provided by SGC Engineering, LLC.

S.W.COLE ENGINEERING, INC.

SHINBERG CONSULTING, LLC

EXPLORATION LOCATION PLAN

Proposed Housing
135 Sheridan Street
Portland, Maine

Job No. 06-1271 S
Date : 11/14/06

Scale 1" = 40'±
Sheet 1

S.W.COLE ENGINEERING, INC.

TEST PIT LOGS

PROJECT/CLIENT: 135 SHERIDAN STREET / SHINBERG CONSULTING , LLC
PROJECT NO.: 06-1271
LOCATION: PORTLAND, MAINE
SWC REP.: MPL
BACKHOE FIRM: LEAVITT EARTHWORKS
OPERATOR: BRUCE

TEST PIT TP-1

DATE: 11/3/2006 SURFACE ELEVATION: _____ LOCATION: SEE SHEET 1

SAMPLE NO.	SAMPLE DEPTH	DEPTH (FT)	STRATUM DESCRIPTION	TEST RESULTS
		0.2'	TOPSOIL	
		1.0'	BLACK SAND AND GRAVEL (FILL), TRACE ASH	
			TAN SAND AND GRAVEL, OCCASIONAL COBBLES COARSE TO FINE SAND	
		7.0'	BOTTOM OF EXPLORATION	

COMPLETION DEPTH: 7.0' DEPTH TO WATER: NOT OBSERVED

TEST PIT TP-2

DATE: 11/3/2006 SURFACE ELEVATION: _____ LOCATION: SEE SHEET 1

SAMPLE NO.	SAMPLE DEPTH	DEPTH (FT)	STRATUM DESCRIPTION	TEST RESULTS
		0.2'	TOPSOIL	
			BLACK SAND AND GRAVEL AND BRICK (FILL), TRACE ASH	
		3.5'		
		6.0'	TAN SAND AND GRAVEL, OCCASIONAL COBBLES COARSE TO FINE SAND	
			BOTTOM OF EXPLORATION	

COMPLETION DEPTH: 6.0' DEPTH TO WATER: NOT OBSERVED

S.W.COLE ENGINEERING, INC.

TEST PIT LOGS

PROJECT/CLIENT: 135 SHERIDAN STREET / SHINBERG CONSULTING , LLC
PROJECT NO.: 06-1271
LOCATION: PORTLAND, MAINE
SWC REP.: MPL
BACKHOE FIRM: LEAVITT EARTHWORKS
OPERATOR: BRUCE

TEST PIT TP-3

DATE: 11/3/2006 SURFACE ELEVATION: _____ LOCATION: SEE SHEET 1

SAMPLE NO.	SAMPLE DEPTH	DEPTH (FT)	STRATUM DESCRIPTION	TEST RESULTS
		1.0'	TOPSOIL	
			BLACK SILTY SAND (FILL), SOME GRAVEL AND BRICK	
		4.5'		
			TAN SAND AND GRAVEL COARSE TO FINE SAND	
		8.0'		
			BOTTOM OF EXPLORATION	

COMPLETION DEPTH: 8.0' DEPTH TO WATER: NOT OBSERVED

TEST PIT TP-4

DATE: 11/3/2006 SURFACE ELEVATION: _____ LOCATION: SEE SHEET 1

SAMPLE NO.	SAMPLE DEPTH	DEPTH (FT)	STRATUM DESCRIPTION	TEST RESULTS
		1.0'	TOPSOIL	
			BROWN SILTY SAND WITH GRAVEL (FILL) OCCASIONAL COBBLE AND BOULDERS, BRICK	
		8.0'		
		9.0'	BROWN SAND AND GRAVEL	
			BOTTOM OF EXPLORATION	

COMPLETION DEPTH: 9.0' DEPTH TO WATER: NOT OBSERVED

S.W.COLE ENGINEERING, INC.

TEST PIT LOGS

PROJECT/CLIENT: 135 SHERIDAN STREET / SHINBERG CONSULTING , LLC
LOCATION: PORTLAND, MAINE
BACKHOE FIRM: LEAVITT EARTHWORKS OPERATOR: BRUCE

PROJECT NO.: 06-1271
SWC REP.: MPL

TEST PIT TP-5

DATE: 11/3/2006 SURFACE ELEVATION: _____ LOCATION: SEE SHEET 1

SAMPLE NO.	SAMPLE DEPTH	DEPTH (FT)	STRATUM DESCRIPTION	TEST RESULTS
		0.2'	TOPSOIL	
			BROWN SILTY SAND WITH GRAVEL (FILL) OCCASIONAL COBBLES AND BOULDERS	
		6.0'		
			TAN SAND AND GRAVEL	
		9.0'		
			BOTTOM OF EXPLORATION	

COMPLETION DEPTH: 9.0' DEPTH TO WATER: NOT OBSERVED

TEST PIT TP-6

DATE: 11/3/2006 SURFACE ELEVATION: _____ LOCATION: _____

SAMPLE NO.	SAMPLE DEPTH	DEPTH (FT)	STRATUM DESCRIPTION	TEST RESULTS
		0.1'	TOPSOIL	
			BLACK, GRAY, AND RED ASH (FILL), TRACE BRICK	
		10.0'		
			TAN SAND AND GRAVEL	
		15.0'		
			BOTTOM OF EXPLORATION	

COMPLETION DEPTH: 15.0' DEPTH TO WATER: NOT OBSERVED

S.W.COLE ENGINEERING, INC.

TEST PIT LOGS

PROJECT/CLIENT: 135 SHERIDAN STREET / SHINBERG CONSULTING , LLC
LOCATION: PORTLAND, MAINE
BACKHOE FIRM: LEAVITT EARTHWORKS OPERATOR: BRUCE

PROJECT NO.: 06-1271
SWC REP.: MPL

TEST PIT TP-7

DATE: 11/3/2006 SURFACE ELEVATION: _____ LOCATION: SEE SHEET 1

SAMPLE NO.	SAMPLE DEPTH	DEPTH (FT)	STRATUM DESCRIPTION	TEST RESULTS
		0.2'	TOPSOIL	
		4.0'	BLACK SAND (FILL), SOME GRAVEL AND BRICK TRACE ASH, OCCASIONAL BOULDERS AND DEBRIS	
		7.0'	TAN SAND AND GRAVEL, OCCASIONAL COBBLES COARSE TO FINE SAND	
			BOTTOM OF EXPLORATION	

COMPLETION DEPTH: 7.0' DEPTH TO WATER: NOT OBSERVED

TEST PIT TP-8

DATE: 11/3/2006 SURFACE ELEVATION: _____ LOCATION: _____

SAMPLE NO.	SAMPLE DEPTH	DEPTH (FT)	STRATUM DESCRIPTION	TEST RESULTS
		13.0'	BROWN SILTY SAND WITH GRAVEL (FILL) OCCASIONAL COBBLES AND BRICK, TRACE DEBRIS AND ASH	
			BOTTOM OF EXPLORATION - REFUSAL POSSIBLE BOULDER OR BEDROCK	

COMPLETION DEPTH: 13.0' DEPTH TO WATER: NOT OBSERVED

S.W.COLE ENGINEERING, INC.

TEST PIT LOGS

PROJECT/CLIENT: 135 SHERIDAN STREET / SHINBERG CONSULTING , LLC
LOCATION: PORTLAND, MAINE
BACKHOE FIRM: LEAVITT EARTHWORKS OPERATOR: BRUCE

PROJECT NO.: 06-1271
SWC REP.: MPL

TEST PIT TP-9

DATE: 11/3/2006 SURFACE ELEVATION: _____ LOCATION: SEE SHEET 1

SAMPLE NO.	SAMPLE DEPTH	DEPTH (FT)	STRATUM DESCRIPTION	TEST RESULTS
		1.0'	TOPSOIL	
		6.0'	GRAY SAND AND ASH (FILL)	
		8.0'	TAN SAND	
		11.0'	GRAY SILTY SAND WITH GRAVEL (GLACIAL TILL)	
			BOTTOM OF EXPLORATION	

COMPLETION DEPTH: 11.0' DEPTH TO WATER: NOT OBSERVED

TEST PIT TP-10

DATE: 11/3/2006 SURFACE ELEVATION: _____ LOCATION: SEE SHEET 1

SAMPLE NO.	SAMPLE DEPTH	DEPTH (FT)	STRATUM DESCRIPTION	TEST RESULTS
		0.2'	TOPSOIL	
		12.0'	GRAY ASH (FILL)	
		14.0'	TAN SAND AND GRAVEL	
			BOTTOM OF EXPLORATION	

COMPLETION DEPTH: 14.0' DEPTH TO WATER: NOT OBSERVED

S.W.COLE ENGINEERING, INC.

TEST PIT LOGS

PROJECT/CLIENT: 135 SHERIDAN STREET / SHINBERG CONSULTING , LLC
LOCATION: PORTLAND, MAINE
BACKHOE FIRM: LEAVITT EARTHWORKS OPERATOR: BRUCE

PROJECT NO.: 06-1271
SWC REP.: MPL

TEST PIT TP-E

DATE: 11/3/2006 SURFACE ELEVATION: _____ LOCATION: SEE SHEET 1

SAMPLE NO.	SAMPLE DEPTH	DEPTH (FT)	STRATUM DESCRIPTION	TEST RESULTS
		0.5'	TOPSOIL	
		1.0'	BLACK SAND (FILL), ASH, BRICK	
			TAN SAND AND GRAVEL COARSE TO FINE SAND	
		7.0'	BOTTOM OF EXPLORATION	

COMPLETION DEPTH: 7.0' DEPTH TO WATER: NOT OBSERVED

TEST PIT TP-F

DATE: 11/3/2006 SURFACE ELEVATION: _____ LOCATION: SEE SHEET 1

SAMPLE NO.	SAMPLE DEPTH	DEPTH (FT)	STRATUM DESCRIPTION	TEST RESULTS
		0.1'	TOPSOIL	
			SILTY SAND (FILL), SOME GRAVEL, BRICK TRACE ASH, OCCASIONAL COBBLES BOULDERS TO 6' SIZE	
		15.0'		
		16.0'	TAN SAND, MEDIUM TO FINE SAND	
			BOTTOM OF EXPLORATION	

COMPLETION DEPTH: 16.0' DEPTH TO WATER: SEEPAGE @ 15'

S.W.COLE ENGINEERING, INC.

TEST PIT LOGS

PROJECT/CLIENT: 135 SHERIDAN STREET / SHINBERG CONSULTING , LLC
PROJECT NO.: 06-1271
LOCATION: PORTLAND, MAINE
SWC REP.: MPL
BACKHOE FIRM: LEAVITT EARTHWORKS
OPERATOR: BRUCE

TEST PIT TP-G

DATE: 11/3/2006 SURFACE ELEVATION: _____ LOCATION: SEE SHEET 1

SAMPLE NO.	SAMPLE DEPTH	DEPTH (FT)	STRATUM DESCRIPTION	TEST RESULTS
		0.1'	TOPSOIL	
		1.0'	BLACK SAND (FILL), SOME GRAVEL, BRICK, METAL DEBRIS OCCASIONAL COBBLES, TRACE ASH	
			TAN SAND AND GRAVEL COARSE TO FINE SAND	
		12.0'	BOTTOM OF EXPLORATION	

COMPLETION DEPTH: 12.0' DEPTH TO WATER: NOT OBSERVED

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. - based on laboratory unconfined compressive 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. based on 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. RQD is computed from recovered core samples.
γ_T	-	total soil weight
γ_B	-	buoyant soil weight

Description of Proportions:

0 to 5% TRACE
5 to 12% SOME
12 to 35% "Y"
35+% AND

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.

S.W.COLE ENGINEERING, INC.

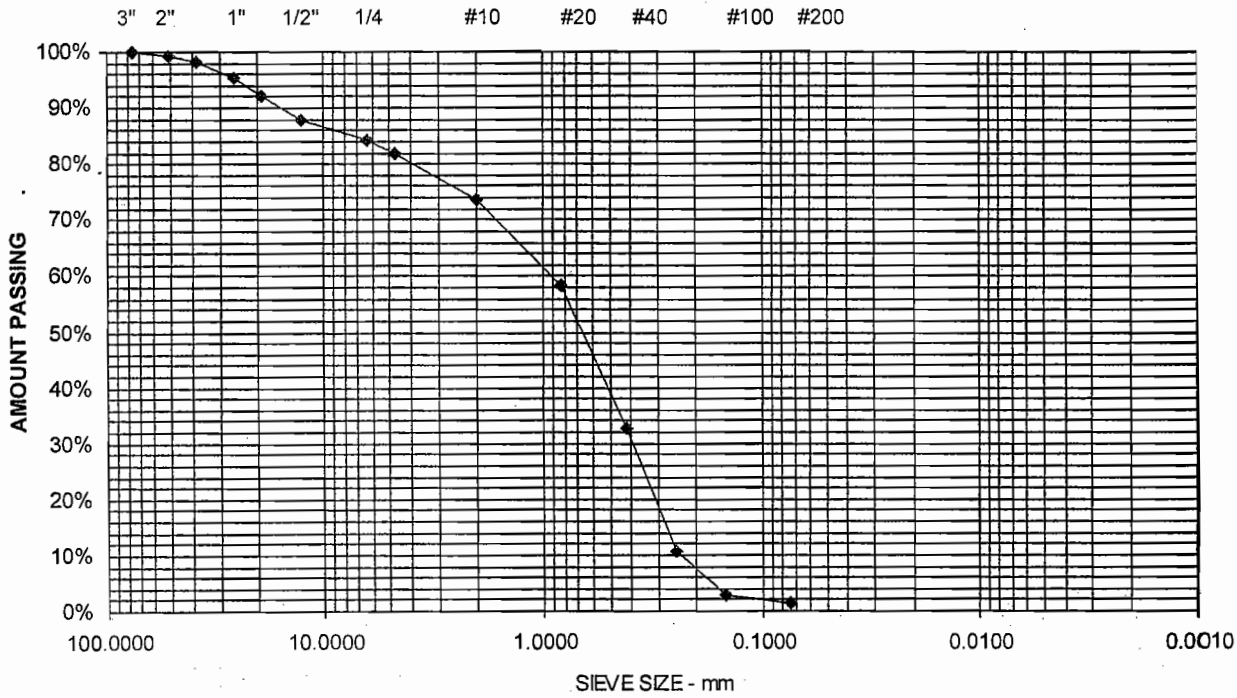
Report of Gradation

ASTM C-117 & C-136

Project Name: PORTLAND - 135 SHERIDAN STREET - HOUSING - GEOTECHNICAL ENGINEERING SERVICES
Client: SHINBERG CONSULTING, LLC
Material Source: TP - 3

Project Number: 06-1271
Lab ID: 5972G
Date Received: 11/6/2006
Date Complete: 11/8/2006
Tested By: JUSTIN BISSON

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
150 mm	6"	100	
125 mm	5"	100	
100 mm	4"	100	
75 mm	3"	100	
50 mm	2"	99	
38.1 mm	1-1/2"	98	
25.0 mm	1"	96	
19.0 mm	3/4"	92	
12.5 mm	1/2"	88	
6.3 mm	1/4"	84	
4.75 mm	No. 4	82	18.2% Gravel
2.00 mm	No. 10	74	
850 um	No. 20	58	
425 um	No. 40	33	80.4% Sand
250 um	No. 60	11	
150 um	No. 100	3	
75 um	No. 200	1.4	1.4% Fines



Comments:

S.W.COLE ENGINEERING, INC.

Report of Gradation

ASTM C-117 & C-136

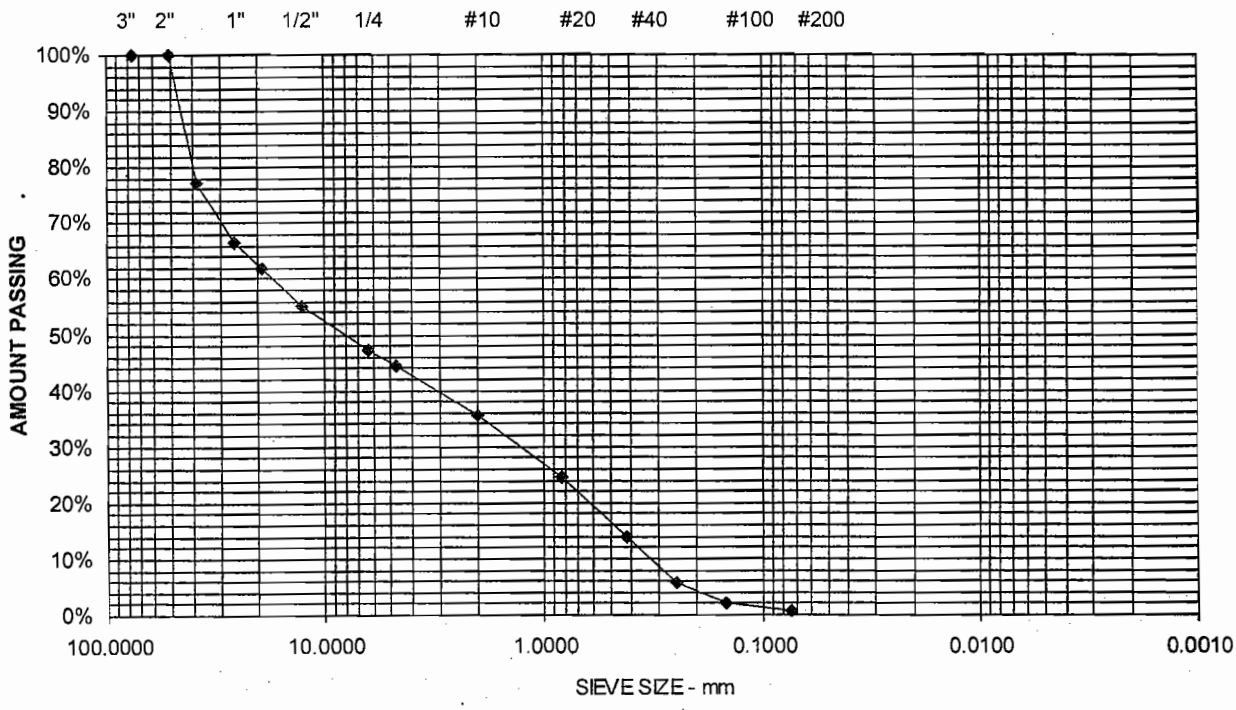
Project Name PORTLAND - 135 SHERIDAN STREET - HOUSING - GEOTECHNICAL ENGINEERING SERVICES

Client SHINBERG CONSULTING, LLC

Material Source TP - 4

Project Number 06-1271
Lab ID 5975G
Date Received 11/6/2006
Date Complete 11/7/2006
Tested By JUSTIN BISSON

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
150 mm	6"	100	
125 mm	5"	100	
100 mm	4"	100	
75 mm	3"	100	
50 mm	2"	100	
38.1 mm	1-1/2"	77	
25.0 mm	1"	67	
19.0 mm	3/4"	62	
12.5 mm	1/2"	55	
6.3 mm	1/4"	47	
4.75 mm	No. 4	45	55.4% Gravel
2.00 mm	No. 10	36	
850 um	No. 20	25	
425 um	No. 40	14	43.8% Sand
250 um	No. 60	6	
150 um	No. 100	2	
75 um	No. 200	0.8	0.8% Fines



Comments:

S.W.COLE ENGINEERING, INC.

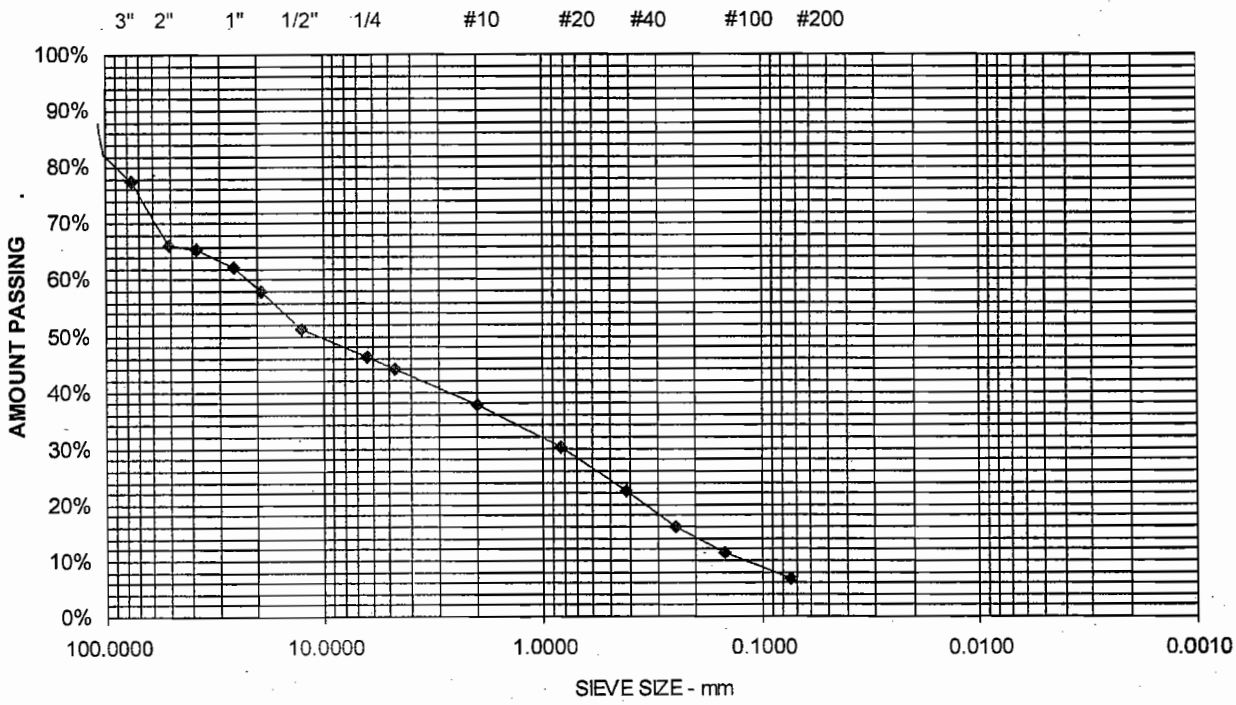
Report of Gradation

ASTM C-117 & C-136

Project Name: PORTLAND - 135 SHERIDAN STREET - HOUSING - GEOTECHNICAL ENGINEERING SERVICES
Client: SHINBERG CONSULTING, LLC
Material Source: TP - 5

Project Number: 06-1271
Lab ID: 5976G
Date Received: 11/6/2006
Date Complete: 11/9/2006
Tested By: JUSTIN BISSON

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
150 mm	6"	100	
125 mm	5"	100	
100 mm	4"	82	
75 mm	3"	78	
50 mm	2"	66	
38.1 mm	1-1/2"	65	
25.0 mm	1"	62	
19.0 mm	3/4"	58	
12.5 mm	1/2"	51	
6.3 mm	1/4"	46	
4.75 mm	No. 4	44	55.9% Gravel
2.00 mm	No. 10	38	
850 um	No. 20	30	
425 um	No. 40	23	37.3% Sand
250 um	No. 60	16	
150 um	No. 100	11	
75 um	No. 200	6.8	6.8% Fines



Comments:

SECTION 00410 – BID FORM

BID FROM _____ (Name)

_____ (Address)

_____

The proposal must be submitted to:

Sheridan Street, LLC
477 Congress Street, 5th Floor
Portland, Maine 04101

Attention: Greg Shinberg, Project Manager Shinberg Consulting, LLC

Name of firm submitting this proposal _____

1. General Requirements: $ _____
2. Sitework: $ _____
3. Concrete: $ _____
4. Masonry: $ _____
5. Metals: $ _____
6. Wood & Plastic: $ _____
7. Thermal & Moisture: $ _____
8. Doors & Windows: $ _____
9. Finishes: $ _____
10. Specialties: $ _____
11. Equipment: $ _____
12. Furnishings: $ _____
13. Special Construction: $ _____
14. Conveying Systems: $ _____
15. Mechanical: $ _____
16. Electrical: $ _____
17. Performance & Pmt Bond: $ _____

TOTAL BID LUMP SUM: **$** _____

IN WORDS $ _____

Add Alternates:

1. White Roof $ _____
2. Andersen 400 Series Windows $ _____
3. Fire Place at 3rd Floor $ _____
4. Add Skylights at 4th Floor $ _____
5. $ _____
6. $ _____

ADDENDA: The undersigned further acknowledges receipt of addenda as listed below and represents that any additions or modifications to, or deletions from, the work called for in these addenda, are included in the Base Bid Sum.

Addendum No. Date _____

Addendum No. Date _____

Addendum No. Date _____

(Note: If no addenda have been received, write in "NONE.")

DECLARATION:

The undersigned declares, by executing this proposal, that:

A. This proposal shall remain valid, for acceptance by The Owner for a period of not less than ninety (90) days from the bid due date.

B. All requirements concerning licensing and all other local, state and national laws have been or will be complied with and that no legal requirements will be violated in the execution of the work if the proposal is accepted.

C. No person, persons or company other than the firm listed below or otherwise indicated hereinafter have any interest whatsoever in the proposal or the contract that may be entered into as a result thereof. This proposal is submitted in good faith, without collusion or fraud.

D. The person or persons signing this proposal is/are fully authorized to sign on behalf of the conditions and provisions thereof.

SIGNED: _____ TITLE: _____

SUBMITTED THIS: _____ DAY OF: _____

NAME OF FIRM: _____

STREET ADDRESS:

_____

CITY: _____ STATE: _____ ZIP: _____

(Complete and strike out words that do not apply)

OPERATING AS: _____

A CORPORATION UNDER THE LAWS OF THE STATE OF

_____

A PARTNERSHIP (GIVE FULL NAMES OF ALL PARTNERS)

_____

_____

SECTION 00500

AIA DOCUMENT A101 – 1997

STANDARD FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

SECTION 00520

AIA DOCUMENT A401 – 1997

STANDARD FORM OF AGREEMENT BETWEEN CONTRACTOR AND SUB-CONTRACTOR

SECTION 00610

AIA DOCUMENT A312 - 1984

PERFORMANCE AND PAYMENT BOND

AIA® Document G704™ – 2000

Certificate of Substantial Completion

PROJECT:
(Name and address):
Sheridan Street LLC
121, 135 Sheridan Street, Portland, Maine

PROJECT NUMBER: 0507/
CONTRACT FOR: General Construction
CONTRACT DATE:

OWNER: ☐
ARCHITECT: ☐
CONTRACTOR: ☐
FIELD: ☐
OTHER: ☐

TO OWNER:
(Name and address):
Sheridan Street LLC
477 Congress Street, 15th Floor,
Portland, ME 04101

TO CONTRACTOR:
(Name and address):

PROJECT OR PORTION OF THE PROJECT DESIGNATED FOR PARTIAL OCCUPANCY OR USE SHALL INCLUDE:

The Work performed under this Contract has been reviewed and found, to the Architect's best knowledge, information and belief, to be substantially complete. Substantial Completion is the stage in the progress of the Work when the Work or designated portion is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use. The date of Substantial Completion of the Project or portion designated above is the date of issuance established by this Certificate, which is also the date of commencement of applicable warranties required by the Contract Documents, except as stated below:

Warranty **Date of Commencement**

TFH Architects		
ARCHITECT	**BY**	**DATE OF ISSUANCE**

A list of items to be completed or corrected is attached hereto. The failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. Unless otherwise agreed to in writing, the date of commencement of warranties for items on the attached list will be the date of issuance of the final Certificate of Payment or the date of final payment.

Cost estimate of Work that is incomplete or defective: $ 0.00

The Contractor will complete or correct the Work on the list of items attached hereto within Zero (0) days from the above date of Substantial Completion.

CONTRACTOR	**BY**	**DATE**

The Owner accepts the Work or designated portion as substantially complete and will assume full possession at (time) on (date).

Sheridan Street LLC		
OWNER	**BY**	**DATE**

The responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance shall be as follows:
(Note: Owner's and Contractor's legal and insurance counsel should determine and review insurance requirements and coverage.)

AIA® Document G706A™ – 1994

Contractor's Affidavit of Release of Liens

PROJECT: *(Name and address)* Sheridan Street LLC 121, 135 Sheridan Street, Portland, Maine **TO OWNER:** *(Name and address)* Sheridan Street LLC 477 Congress Street, 15th Floor, Portland, ME 04101	**ARCHITECT'S PROJECT NUMBER:** 0507 **CONTRACT FOR:** General Construction **CONTRACT DATED:**	OWNER: ☐ ARCHITECT: ☐ CONTRACTOR: ☐ SURETY: ☐ OTHER: ☐

STATE OF:
COUNTY OF:

The undersigned hereby certifies that to the best of the undersigned's knowledge, information and belief, except as listed below, the Releases or Waivers of Lien attached hereto include the Contractor, all Subcontractors, all suppliers of materials and equipment, and all performers of Work, labor or services who have or may have liens or encumbrances or the right to assert liens or encumbrances against any property of the Owner arising in any manner out of the performance of the Contract referenced above.

EXCEPTIONS:

SUPPORTING DOCUMENTS ATTACHED HERETO:

1. Contractor's Release or Waiver of Liens, conditional upon receipt of final payment.

2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment suppliers, to the extent required by the Owner, accompanied by a list thereof.

CONTRACTOR: *(Name and address)*

BY: _____
(Signature of authorized representative)

_____
(Printed name and title)

Subscribed and sworn to before me on this date:

Notary Public:
My Commission Expires:

AIA® Document G706™ – 1994

Contractor's Affidavit of Payment of Debts and Claims

PROJECT: *(Name and address)* Sheridan Street LLC 121, 135 Sheridan Street, Portland, Maine	**ARCHITECT'S PROJECT NUMBER:** 0507 **CONTRACT FOR:** General Construction	OWNER: ☐ ARCHITECT: ☐ CONTRACTOR: ☐ SURETY: ☐
TO OWNER: *(Name and address)* Sheridan Street LLC 477 Congress Street, 15th Floor, Portland, ME 04101	**CONTRACT DATED:**	OTHER: ☐

STATE OF:
COUNTY OF:

The undersigned hereby certifies that, except as listed below, payment has been made in full and all obligations have otherwise been satisfied for all materials and equipment furnished, for all work, labor, and services performed, and for all known indebtedness and claims against the Contractor for damages arising in any manner in connection with the performance of the Contract referenced above for which the Owner or Owner's property might in any way be held responsible or encumbered.

EXCEPTIONS:

SUPPORTING DOCUMENTS ATTACHED HERETO:

1. Consent of Surety to Final Payment. Whenever Surety is involved, Consent of Surety is required. AIA Document G707, Consent of Surety, may be used for this purpose

Indicate Attachment ☐ Yes ☒ No

The following supporting documents should be attached hereto if required by the Owner:

1. Contractor's Release or Waiver of Liens, conditional upon receipt of final payment.
2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment suppliers, to the extent required by the Owner, accompanied by a list thereof.
3. Contractor's Affidavit of Release of Liens (AIA Document G706A).

CONTRACTOR: *(Name and address)*

BY: _____
(Signature of authorized representative)

_____
(Printed name and title)

Subscribed and sworn to before me on this date:

Notary Public:
My Commission Expires:

AIA® Document G707™ – 1994

Consent Of Surety to Final Payment

PROJECT: *(Name and address)* Sheridan Street LLC 121, 135 Sheridan Street, Portland, Maine	**ARCHITECT'S PROJECT NUMBER:** 0507 **CONTRACT FOR:** General Construction	OWNER: ☐ ARCHITECT: ☐ CONTRACTOR: ☐
TO OWNER: *(Name and address)* Sheridan Street LLC 477 Congress Street, 15th Floor, Portland, ME 04101	**CONTRACT DATED:**	SURETY: ☐ OTHER: ☐

In accordance with the provisions of the Contract between the Owner and the Contractor as indicated above, the
(Insert name and address of Surety)

, SURETY,

on bond of
(Insert name and address of Contractor)

, CONTRACTOR,

hereby approves of the final payment to the Contractor, and agrees that final payment to the Contractor shall not relieve the Surety of any of its obligations to
(Insert name and address of Owner)

Sheridan Street LLC
477 Congress Street, 15th Floor, Portland, ME 04101

, OWNER,

as set forth in said Surety's bond.

IN WITNESS WHEREOF, the Surety has hereunto set its hand on this date:
(Insert in writing the month followed by the numeric date and year.)

_____
(Surety)

_____
(Signature of authorized representative)

Attest:
(Seal):

_____
(Printed name and title)

SECTION 00700

AIA DOCUMENT A201 - 1992

GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

AIA® Document G702™ – 1992

Application and Certificate for Payment

TO OWNER:	Sheridan Street LLC 477 Congress Street, 15th Floor, Portland, ME 04101	**PROJECT:**	Sheridan Street LLC 121, 135 Sheridan Street, Portland, Maine	**APPLICATION NO:** 001 **PERIOD TO:** **CONTRACT FOR:** General Construction **CONTRACT DATE:** **PROJECT NOS:** 0507 / /	**Distribution to:** OWNER: ☐ ARCHITECT: ☐ CONTRACTOR: ☐ FIELD: ☐ OTHER: ☐
FROM CONTRACTOR:		**VIA ARCHITECT:**	TFH Architects 100 Commercial Street, Portland, ME 04101		

CONTRACTOR'S APPLICATION FOR PAYMENT

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

1. ORIGINAL CONTRACT SUM		$ 0.00
2. Net change by Change Orders		$ 0.00
3. CONTRACT SUM TO DATE (Line 1 ± 2)		$ 0.00
4. TOTAL COMPLETED & STORED TO DATE (Column G on G703)		$ 0.00
5. RETAINAGE:		
a. 0 % of Completed Work (Column D + E on G703)	$ 0.00	
b. 0 % of Stored Material (Column F on G703)	$ 0.00	
Total Retainage (Lines 5a + 5b or Total in Column I of G703)		$ 0.00
6. TOTAL EARNED LESS RETAINAGE (Line 4 Less Line 5 Total)		$ 0.00
7. LESS PREVIOUS CERTIFICATES FOR PAYMENT (Line 6 from prior Certificate)		$ 0.00
8. CURRENT PAYMENT DUE		$ 0.00
9. BALANCE TO FINISH, INCLUDING RETAINAGE (Line 3 less Line 6)	$ 0.00	

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

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

CONTRACTOR:

By: _____ Date: _____

State of:

County of:

Subscribed and sworn to before me this day of

Notary Public:

My Commission expires:

ARCHITECT'S CERTIFICATE FOR PAYMENT

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

AMOUNT CERTIFIED ..... $ 0.00

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

ARCHITECT:

By: _____ Date: _____

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

SECTION 01010 - SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Site drawings prepared by: SGC Engineers,
Landscape drawings prepared by: MRLD
Foundation & structural drawings prepared by: Price Structural Engineers
Building drawings prepared by: TFH Architects
Mechanical & electrical drawings prepared by: Bennett Engineering
Interior Finish Drawings prepared by: Gawron Turgeon Architects

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections apply to all sections.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. The work consists of the construction of Sheridan Heights, located at 135 Sheridan St, Portland, Maine. The building consists of:
Gross floor area of +/- 38,570 square feet, including the following:
(4) Floors
(21) Residential units (with one, two or three bedrooms),
(1) Covered garage
(1) Elevator

B Contract documents for the work were prepared by:
TFH Architects PA, 100 Commercial Street, Suite 212, Portland. 04101 &
Shinberg Consulting, LLC, 477 Congress Street, Portland, ME 04101

C The work consists of all site work, utilities, foundation, concrete slabs, framing (walls floors and roof), finishes, insulation, doors and hardware, plumbing, electrical and mechanical systems.

D The work will be performed under the responsibility of a single prime contractor.

1.3 CONTRACTOR USE OF PREMISES

A. Use of the Site: Confine operations to areas within contract limits indicated by the site property lines and as agreed upon in writing by the abutting property owners and/or City. Do not disturb portions of the site beyond the area in which the Work is indicated.

1.4 OWNER RESPONSIBILITY

A. The General Contractor will be responsible for sharing information learned from previous experience with wood framed buildings.

B. The Owner will share knowledge learned from previous experience with the completion residential dwelling buildings

END OF SECTION 01010

SECTION 01027 - APPLICATIONS FOR PAYMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Site drawings prepared by: SGC Engineers,
Landscape drawings prepared by: MRLD
Foundation & structural drawings prepared by: Price Structural Engineers
Building drawings prepared by: TFH Architects
Mechanical & electrical drawings prepared by: Bennett Engineering
Interior Finish Drawings prepared by: Gawron Turgeon Architects

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections apply to all sections.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements governing the Contractor's Applications for Payment.

1.3 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of the Contractor's Construction Schedule.

B. Coordination: Each subcontractor shall coordinate preparation of its Schedule of Values for its part of the Work with preparation of the Contractors' Construction Schedule.

1. Correlate line items in the Schedule of Values with other required administrative schedules and forms, including:

   a. Contractor's Construction Schedule.
   b. Application for Payment forms.
   c. List of subcontractors.

2. Submit the Schedule of Values to the Architect at the earliest possible date but no later than 7 days before the date scheduled for submittal of the initial Applications for Payment.

C. Format and Content: Use the Project Manual table of contents as a guide to establish the format for the Schedule of Values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the Schedule of Values:

a. Project name and location.
b. Name of the Architect.
c. Project number.
d. Contractor's name and address.
e. Date of submittal.

2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:

a. Related Specification Section or Division.
b. Description of Work.
c. Name of subcontractor.
d. Name of manufacturer or fabricator.
e. Name of supplier.
f. Change Orders (numbers) that affect value.
g. Dollar value.

1. Percentage of Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

3. Provide a breakdown of the Contract Sum in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Break principal subcontract amounts down into several line items.
4. Round amounts to nearest whole dollar; the total shall equal the Contract Sum.
5. Schedule Updating: Update and resubmit the Schedule of Values prior to the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.4 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by the Architect and paid for by the Owner.

1. The initial Application for Payment, the Application for Payment at time of Substantial Completion, and the final Application for Payment involve additional requirements.

B. Payment-Application Times: The date for each progress payment is the 15th day of each month. The period covered by each Application for Payment starts on the day following the end of the preceding period and ends 15 days prior to the date for each progress payment.

C. Payment-Application Forms: Use AIA Document G702 and Continuation Sheets G703 as the form for Applications for Payment.

D. Application Preparation: Complete every entry on the form. Include notarization and execution by a person authorized to sign legal documents on behalf of the Contractor. The Architect will return incomplete applications without action.

1. Entries shall match data on the Schedule of Values and the Contractor's Construction Schedule. Use updated schedules if revisions were made.
2. Include amounts of Change Orders and Construction Change Directives issued prior to the last day of the construction period covered by the application.

E. Transmittal: Submit 3 signed and notarized original copies of each Application for Payment to the Architect by a method ensuring receipt within 24 hours. One copy shall be complete, including waivers of lien and similar attachments, when required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information related to the application, in a manner acceptable to the Architect.

F. Waivers of Mechanics Lien: With each Application for Payment, submit waivers of mechanics liens from subcontractors, sub-subcontractors and suppliers for the construction period covered by the previous application.

1. Submit partial waivers on each item for the amount requested, prior to deduction for retainage, on each item.
2. When an application shows completion of an item, submit final or full waivers.
3. The Owner reserves the right to designate which entities involved in the Work must submit waivers.

G. Initial Application for Payment: Administrative actions and submittals, that must precede or coincide with submittal of the first Application for Payment, include the following:

1. List of subcontractors.
2. Schedule of Values.
3. Contractor's Construction Schedule (preliminary if not final).
4. Submittal Schedule (preliminary if not final).
5. List of Contractor's staff assignments.
6. Copies of building permits.
7. Copies of authorizations and licenses from governing authorities for performance of the Work.
8. Initial progress report.
9. Report of pre-construction meeting.
10. Certificates of insurance and insurance policies.
11. Performance and payment bonds.
12. Data needed to acquire the Owner's insurance.
13. Initial settlement survey and damage report, if required.

H. Application for Payment at Substantial Completion: Following issuance of the Certificate of Substantial Completion, submit an Application for Payment.

1. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
2. Administrative actions and submittals that shall precede or coincide with this application include:

    a. Occupancy permits and similar approvals.
    b. Warranties (guarantees) and maintenance agreements.
    c. Maintenance instructions.
    d. Changeover information related to Owner's occupancy, use, operation, and maintenance.
    e. Final cleaning.
    f. Application for reduction of retainage and consent of surety.
    g. Advice on shifting insurance coverages.
    h. List of incomplete Work, recognized as exceptions to Architect's Certificate of Substantial Completion.
    i. Ten percent retainage on all progress payments will be required until the project is at least 50% complete. At 50% completion the contractor may request, in writing to the Owner, to reduce the retainage on any future progress payments to 0% while maintaining the existing balance until the time of substantial completion.

I. Final Payment Application: Administrative actions and submittals that must precede or coincide with submittal of the final Application for Payment include the following:

1. Completion of Project closeout requirements.
2. Completion of items specified for completion after Substantial Completion.
3. Ensure that unsettled claims will be settled.
4. Ensure that incomplete Work is not accepted and will be completed without undue delay.
5. Transmittal of required Project construction records to the Owner.
6. Certified property survey.
7. Proof that taxes, fees, and similar obligations were paid.
8. Removal of temporary facilities and services.
9. Removal of surplus materials, rubbish, and similar elements.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 01270

SECTION 01040 - COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Site drawings prepared by: SGC Engineers,
Landscape drawings prepared by: MRLD
Foundation structural drawings prepared by: Price Structural Engineers
Building drawings prepared by: TFH Architects
Mechanical & electrical drawings prepared by: Bennett Engineering
Interior Finish Drawings prepared by: Gawron Turgeon Architects

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections apply to all sections.

1.2 SUMMARY

A. This Section includes administrative and supervisory requirements necessary for coordinating construction operations including, but not necessarily limited to, the following:

1. General project coordination procedures.
2. Administrative and supervisory personnel.
3. Cleaning and protection.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Project Meetings" for progress meetings, coordination meetings and pre-installation conferences.
2. Division 1 Section "Submittals" for preparing and submitting the contractor's Construction Schedule.
3. Division 1 Section "Materials and Equipment" for coordinating general installation.
4. Division 1 Section "Contract Closeout" for coordinating contract closeout.

1.3 COORDINATION

A. Coordinate construction operations included in various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections that depend on each other for proper installation, connection and operations.

1. Schedule construction operations in the sequence required to obtain

the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.

2. Coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.
3. Make provisions to accommodate items scheduled for later installation.

B. Where necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports and attendance at meetings.

1. Prepare similar memoranda for the Owner and separate contractors where coordination of their work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and assure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of schedules.
2. Installation and removal of temporary facilities.
3. Delivery and processing of submittals.
4. Progress meetings.
5. Project closeout activities.

1.4 SUBMITTALS

A. Submit to the Architect and the Owner for their record a list of all subcontractors with address and telephone numbers and post copies in the Project meeting room and the temporary field office.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 GENERAL COORDINATION AND PROVISIONS

A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

B. Coordinate temporary enclosures with required inspections and tests to minimize the necessity of uncovering completed construction for that purpose.

3.2 CLEANING AND PROTECTION

A. Clean and protect construction in progress and adjoining materials in place, during handling and installation. Apply protective covering where required to assure protection from damage or deterioration at Substantial Completion.

B. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to assure operability without damaging effects.

C. Limiting Exposure: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging or otherwise deleterious exposure during the construction period. Where applicable, such exposure include, but are not limited to, the following:

1. Excessive static or dynamic loading.
2. Excessive internal or external pressures.
3. Excessively high or low temperatures.
4. Thermal shock.
5. Excessively high or low humidity.
6. Air contamination or pollution.
7. Water or ice.
8. Solvents.
9. Chemicals.
10. Light.
11. Radiation.
12. Puncture.
13. Abrasion.
14. Heavy traffic.
15. Soiling, staining and corrosion.
16. Bacteria.
17. Rodent and insect infestation.
18. Combustion.
19. Electrical current.
20. High-speed operation.
21. Improper lubrication.
22. Unusual wear or other misuse.
23. Contact between incompatible materials.
24. Destructive testing.
25. Misalignment.
26. Excessive weathering.
27. Unprotected storage.
28. Improper shipping or handling.
29. Theft.
30. Vandalism.

END OF SECTION 01040

SECTION 01050 - FIELD ENGINEERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Site drawings prepared by: SGC Engineers,
Landscape drawings prepared by: MRLD
Foundation & structural drawings prepared by: Price Structural Engineers
Building drawings prepared by: TFH Architects
Mechanical & electrical drawings prepared by: Bennett Engineering
Interior Finish Drawings prepared by: Gawron Turgeon Architects

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections apply to all sections.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements necessary for field-engineering services including, but not necessarily limited to, the following:

1. Land survey layout work.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Coordination" for procedures for coordinating field engineering with other construction activities.
2. Division 1 Section "Submittals" for submitting Project record surveys.
3. Division 1 Section "Contract Closeout" for submitting final property survey with Project Record Documents and recording of Owner-accepted deviations from lines and levels.

1.3 SUBMITTALS

A. Certificates: Submit a certificate signed by the land surveyor or professional engineer certifying the location and elevation of improvements.

B. Initial Property Survey of Existing Conditions: To be provided by the Owner.

C. Project Record Documents: Submit a record of Work performed and record survey data as required under provisions of "Submittals" and "Project Closeout" Sections.

1.4 QUALITY ASSURANCE

A. Surveyor Qualifications: Engage a land surveyor registered in the state where the Project is located, to perform required land-surveying services.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Identification: The Owner's survey will identify existing control points and property line corner stakes.

B. Verify layout information shown on the Drawings, in relation to the property survey and existing benchmarks, before proceeding to lay out the Work. Locate and protect existing benchmarks and control points. Preserve permanent reference points during construction.

1. Do not change or relocate benchmarks or control points without prior written approval. Promptly report lost or destroyed reference points or requirements to relocate reference points because of necessary changes in grades or locations.
2. Promptly replace lost of destroyed Project control points. Base replacements on the original survey control points.

C. Establish and maintain a minimum of 2 permanent benchmarks on the site, referenced to data established by survey control points.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

D. Existing Utilities and Equipment: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning site work, investigate and verify the existence and location of underground utilities and other construction.

1. Prior to construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer and water-service piping.

3.2 PERFORMANCE

A. Work from lines and levels established by the property survey. Establish benchmarks and markers to set lines and levels at each story of construction and elsewhere as needed to locate each element of the Project. Calculate and measure required dimensions within indicated or recognized tolerances. Do not scale Drawings to determine dimensions.

1. Advise entities engaged in construction activities of marked lines and levels provided for their use.
2. As construction proceeds, check every major element for line, level and plumb.

B. Surveyor's Log: Maintain a surveyor's log of control and other survey work. Make this log available for reference.

1. Record deviations from required lines and levels, and advise the Architect when deviations that exceed indicated or recognized tolerances are detected. On Project Record Drawings, record deviations that are accepted and not corrected.
2. On completion of foundation walls, major site improvements and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles and elevations of construction and site work.

C. Site Improvements: Locate and lay out site improvements, including pavements, stakes for grading, fill and topsoil placement, utility slopes and invert elevations.

D. Building Lines and Levels: Locate and lay out batter boards for structures, building foundations, column grids and locations, floor levels and control lines and levels required for mechanical and electrical work.

E. Exiting Utilities: Furnish information necessary to adjust, move or relocate existing structures, utility poles, lines, services or other appurtenances located in or affected by construction. Coordinate with local authorities having jurisdiction.

END OF SECTION 01050

SECTION 01200 - PROJECT MEETINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. | | |
|---|---|
| Site drawings prepared by: | SGC Engineers, |
| Landscape drawings prepared by: | MRLD |
| Foundation & structural drawings prepared by: | Price Structural Engineers |
| Building drawings prepared by: | TFH Architects |
| Mechanical & electrical drawings prepared by: | Bennett Engineering |
| Interior Finish Drawings prepared by: | Gawron Turgeon Architects |

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections apply to all sections.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements necessary for project meetings including, but not necessarily limited to, the following:

1. Pre-construction conferences.
2. Pre-installation conferences.
3. Progress meetings.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Coordination" for procedures for coordinating project meetings with other construction activities.
2. Division 1 Section "Submittals" for submitting the Contractor's Construction Schedule.

1.3 PRE-CONSTRUCTION CONFERENCE

A. Schedule a pre-construction conference before starting construction of Sheridan Heights, at a time convenient to the Owner and the Architect. Hold the conference at the Project Site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.

B. Attendees: Authorized representatives of the Owner, Architect and their consultants, the Contractor and its superintendent; major subcontractors; manufacturers; supplies and other concerned parties shall attend the conference. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work. The Owner and/or the Architect will be responsible for leading the meeting.

C. Agenda: Discuss items of significance that could affect progress, including the following:

1. Tentative construction schedule.
2. Critical work sequencing.
3. Designation of responsible personnel.
4. Procedures for processing field decisions and Change Orders.
5. Procedures for processing Applications for Payment.
6. Distribution of Contract Documents.
7. Submittal of Shop Drawings, Product Data and Samples. (Contractor to provide a list of submissions along with approximate submission dates).
8. Preparation of record documents.
9. Use of the premises.
10. Parking availability.
11. Office, work and storage areas.
12. Equipment deliveries and priorities.
13. Safety procedures.
14. First aid.
15. Security.
16. Housekeeping.
17. Working hours.

1.4 PRE-INSTALLATION CONFERENCES

A. Conduct a pre-installation conference at the Project Site before each construction activity that requires coordination with other construction.

B. Attendees: The Installer and representatives of manufacturers and fabricators involved in or affected by the installation, and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise the Architect of scheduled meeting dates.

1. Review the progress of other construction activities and preparations for the particular activity under consideration at each pre-installation conference, including requirements for the following:

a. Contract Documents.
b. Options.
c. Related Change Orders.
d. Purchases.
e. Deliveries.
f. Shop Drawings, Product Data and quality-control samples.
g. Review of mockups.
h. Possible conflicts.
i. Compatibility problems.
j. Time schedules.
k. Weather limitations.

l. Manufacturer's recommendations.
m. Warranty requirements.
n. Compatibility of materials.
o. Acceptability of substrates.
p. Temporary facilities.
q. Space and access limitations.
r. Governing regulations.
s. Safety.
t. Inspecting and testing requirements.
u. Required performance results.
v. Recording requirements.
w. Protection.
x. Procedures for working on abutting properties.

2. Record significant discussions and agreements and disagreements of each conference, and the approved schedule. Promptly distribute the record of the meeting to everyone concerned, including the Owner and the Architect.
3. Do not proceed with the installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of Work and reconvene the conference at the earliest feasible date.

1.5 PROGESS MEETINGS

A. Conduct progress meetings at the Project Site or other designated site at regular intervals, but not less than every two weeks. Notify the Owner and the Architect of scheduled meeting dates. Coordinate dates of meetings with preparation of the payment request.

B. Attendees: In addition to representatives of the Owner and the Architect, each subcontractor, supplier or other entity concerned with current progress or involved in planning, coordination or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.

C. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the status of the Project.

1. Contractor's Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time or ahead or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to insure that current and subsequent activities will be completed within the Contract Time.
2. Review the present and future needs of each entity present, including the following:

a. Interface requirements.
b. Time.
c. Sequences.
d. Status of submittals.
e. Deliveries.
f. Off-site fabrication problems.
g. Access.
h. Site utilization.
i. Temporary facilities and services.
j. Hours of work.
k. Hazards and risks.
l. Housekeeping.
m. Quality and work standards.
n. Change Orders.
o. Documentation of information for payment requests.

D. Reporting: No later than 3 days after each meeting, distribute minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.

1. Schedule Updating: Revise the Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 01200

SECTION 01210 ALLOWANCES

PART 1 – GENERAL

1.1 SUMMARY

A. This section includes administrative and procedural requirements governing allowances.

1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. If necessary, additional requirements will be issued by Change Order.

B. Type of allowances include the following:

1. Lump-sum allowances.

1.2 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.

B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

C. Purchase products and systems selected by Architect from the designated supplier.

1.3 SUBMITTALS

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

B. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

1.4 COORDINATION

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

1.5 LUMP-SUM ALLOWANCES

A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner under allowance and shall include taxes, freight and delivery to project site.

B. Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit and similar costs related to products and materials ordered by Owner under allowance shall be included as part of the Contract Sum and not part of the allowance.

PART 2 – PRODUCTS (not used)

PART 3 – EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

3.3 SCHEDULE OF ALLOWANCES

A. Allowance No. 1: _____

B. Allowance No. 2: _____

C. Allowance No. 3: _____

D. Allowance No. 4: _____

E. Allowance No. 5: _____

END OF SECTION 01210

SECTION 01311 - SCHEDULES AND REPORTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Site drawings prepared by: SGC Engineers,
Landscape drawings prepared by: MRLD
Foundation & structural drawings prepared by: Price Structural Engineers
Building drawings prepared by: TFH Architects
Mechanical & electrical drawings prepared by: Bennett Engineering
Interior Finish Drawings prepared by: Gawron Turgeon Architects

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections apply to all sections.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for schedules and reports required for proper performance of the Work, including:

1. Contractor's construction schedule.
2. Submittal schedule.
3. Daily construction reports.
4. Field correction reports.
5. Special reports.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Applications for Payment" specifies requirements for submittal of the Schedule of Values.
2. Division 1 Section "Project Meetings" specifies requirements for submittal and distribution of meeting and conference minutes.
3. Division 1 Section "Quality Control" specifies requirements for submittal of inspection and test reports.
4. Division 1 Section "Materials and Equipment" specifies requirements for submittal of the list of products.

1.3 SUBMITTAL PROCEDURES

A. Coordination: Coordinate preparation and processing of schedules and reports with performance of other construction activities.

1.4 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Prepare a comprehensive, fully developed, horizontal bar-chart-type, contractor's construction schedule. Base the schedule on the Preliminary Construction Schedule and whatever updating and feedback was received since the start of the Project.

B. Cost Correlation: At the head of the schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of Work performed as of the dates used for preparation of payment requests.

1. Refer to Division 1 Section "Applications for Payment" for cost reporting and payment procedures.

C. Distribution: Following response to the initial submittal, print and distribute copies to the Architect, Owner, subcontractors, and other parties required to comply with scheduled dates. Post copies in the Project meeting room and temporary field office.

1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.

D. Schedule Updating: Revise the schedule after each meeting, event, or activity where revisions have been recognized or made. Issue the updated schedule concurrently with the report of each meeting.

1.5 SUBMITTAL SCHEDULE

A. After development and acceptance of the Contractor's Construction Schedule, prepare a complete schedule of submittals. Submit the schedule within 10 days of the date required for submittal of the Contractor's Construction Schedule.

1. Coordinate Submittal Schedule with the list of subcontracts, Schedule of Values and the list of products as well as the Contractor's Construction Schedule.

B. Prepare the schedule in chronological order. Provide the following information:

1. Scheduled date for the first submittal.
2. Related Section number.
3. Submittal category.
4. Name of the subcontractor.
5. Description of the part of the Work covered.
6. Scheduled date for resubmittal.
7. Scheduled date for the Architect's final release or approval.

C. Distribution: Following the Architect's response to the initial submittal, print

and distribute copies to the Architect, Owner, subcontractors, and other parties required to comply with submittal dates indicated.

1. Post copies in the Project meeting room and temporary field office.
2. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned part of the Work and are no longer involved in construction activities.

D. Schedule Updating: Revise the schedule after each meeting or other activity where revisions have been recognized or made. Issue the updated schedule concurrently with the report of each meeting.

1.6 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at the site. Submit duplicate copies to the Architect at weekly intervals:

1. List of subcontractors at the site.
2. List of separate contractors at the site.
3. Approximate count of personnel at the site.
4. High and low temperatures, general weather conditions.
5. Accidents.
6. Meetings and significant decisions.
7. Unusual events (refer to special reports).
8. Stoppages, delays, shortages, and losses.
9. Meter readings and similar recordings.
10. Emergency procedures.
11. Orders and requests of governing authorities.
12. Change Orders received, implemented.
13. Services connected, disconnected.
14. Equipment or system tests and startups.
15. Partial Completions, occupancies.
16. Substantial Completions authorized.

B. Field Correction Reports: When the need to take corrective action that requires a departure from the Contract Documents arises, prepare a detailed report. Include a statement describing the problem and recommended changes. Indicate reasons the Contract Documents cannot be followed. Submit a copy to the Architect immediately.

1.7 SPECIAL REPORTS

A. General: Submit special reports directly to the Owner within one day of an occurrence. Submit a copy to the Architect and other parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant

nature occurs at the site, prepare and submit a special report. List the chain of events, persons participating, response by the Contractor's personnel, an evaluation of the results or effects and similar pertinent information. Advise the Owner in advance when such events are known or predictable.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 01311

SECTION 01330 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Site drawings prepared by: SGC Engineers,
Landscape drawings prepared by: MRLD
Foundation structural drawings prepared by: Price Structural Engineers
Building drawings prepared by: TFH Architects
Mechanical & electrical drawings prepared by: Bennett Engineering
Interior Finish Drawings prepared by: Gawron Turgeon Architects

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections apply to all sections.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for submitting Product Data, Samples, and other miscellaneous submittals.

B. Related Sections include the following:

1. Division 1 Section "Payment Procedures" for submitting Applications for Payment.
2. Division 1 Section "Project Management and Coordination" for submitting Coordination Drawings.
4. Division 1 Section "Closeout Procedures" for submitting warranties.
5. Division 1 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Architect's responsive action.

B. Informational Submittals: Written information that does not require Architect's approval. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL PROCEDURES

A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing,

delivery, other submittals, and related activities that require sequential activity.

2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

    a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

B. Submittals Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.

C. Processing Time: Allow enough time for submittal review, including time for re-submittals, as follows. Time for review shall commence on Architect's receipt of submittal.

1. Initial Review: Allow 10 days for initial review of each submittal. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
4. If intermediate submittal is necessary, process it in same manner as initial submittal.
5. Allow 10 days for processing each re-submittal.
6. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing.

D. Identification: Place a permanent label or title block on each submittal for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 4 by 5 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Include the following information on label for processing and recording action taken:

    a. Project name.
    b. Date.
    c. Name and address of Architect.
    d. Name and address of Contractor.
    e. Name and address of subcontractor.
    f. Name and address of supplier.
    g. Name of manufacturer.
    h. Unique identifier, including revision number.
    i. Number and title of appropriate Specification Section.
    j. Drawing number and detail references, as appropriate.
    k. Other necessary identification.

E. Deviations: Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals.

F. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions of the Contract Documents, initial submittal may serve as final submittal.

1. Additional copies submitted for maintenance manuals will be marked with action taken and will be returned.

G. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will received from sources other than Contractor.

1. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements of the Contract Documents, including minor variations and limitations. Include the same label information as the related submittal.
2. Include Contractor's certification stating that information submitted complies with requirements of the Contract Documents.
3. Transmittal Form: Use AIA Document G810.

H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

I. Use for Construction: Use only final submittals with mark indicating action taken by Architect in connection with construction.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

A. General: Prepare and submit Action Submittals required by individual Specification Sections.

1. Number of Copies: Submit four copies of each submittal, unless otherwise indicated. Architect will return two copies. Mark up and retain one returned copy as a Project Record Document.
2. Number of Copies: Submit copies of each submittal, as follows, unless otherwise indicated:

a. Initial Submittal: Submit a preliminary single copy of each submittal where selection of options, color, pattern, texture, or similar characteristics is required. Architect will return submittal

with options selected.

b. Final Submittal: Submit four copies, unless copies are required for operation and maintenance manuals. Submit five copies where copies are required for operation and maintenance manuals. Architect will retain two copies; remainder will be returned. Mark up and retain one returned copy as a Project Record Document.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

a. Manufacturer's written recommendations.
b. Manufacturer's product specifications.
c. Manufacturer's installation instructions.
d. Standard color charts.
e. Manufacturer's catalog cuts.
f. Wiring diagrams showing factory-installed wiring.
g. Printed performance curves.
h. Operational range diagrams.
i. Mill reports.
j. Standard product operating and maintenance manuals.
k. Compliance with recognized trade association standards.
l. Compliance with recognized testing agency standards.
m. Application of testing agency labels and seals.
n. Notation of coordination requirements.

C. Samples: Prepare physical units of materials or products, including the following:

1. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
2. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from the same material to be used for the Work, cured and finished in manner specified, and physically identical with the product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
3. Preparation: Mount, display, or package Samples in manner specified to facilitate review of qualities indicated. Prepare Samples to match

Architect's sample where so indicated. Attach label on unexposed side that includes the following:

a. Generic description of Sample.
b. Product name or name of manufacturer.
c. Sample source.

5. Submit Samples for review of kind, color, pattern, and texture for a final check of these characteristics with other elements and for a comparison of these characteristics between final submittal and actual component as delivered and installed.

   a. If variation in color, pattern, texture, or other characteristic is inherent in the product represented by a Sample, submit at least three sets of paired units that show approximate limits of the variations.
   b. Refer to individual Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.

6. Number of Samples for Initial Selection: Submit one full set[s] of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

D. Schedule of Values: Comply with requirements in Division 1 Section "Application for Payment."

2.2 INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by other Specification Sections.

1. Number of Copies: Submit two copies of each submittal, unless otherwise indicated. Architect will not return copies.
2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
3. Test and Inspection Reports: Comply with requirements in Division 1 Section "Quality Control."

B. Contractor's Construction Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation."

C. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements.

D. Material Certificates: Prepare written statements on manufacturer's

letterhead certifying that material complies with requirements.

E. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements in Division 1 Section "Closeout Procedures"

F. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:

1. Preparation of substrates.
2. Required substrate tolerances.
3. Sequence of installation or erection.
4. Required installation tolerances.
5. Required adjustments.
6. Recommendations for cleaning and protection.

G. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.

H. Material Safety Data Sheets: Submit information directly to Owner. If submitted to Architect, Architect will not review this information but will return it with no action taken.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Review each submittal and check for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Architect will review each submittal, make marks to

indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken.

C. Informational Submittals: Architect will review each submittal and will not return it, or will reject and return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

END OF SECTION 01330

SECTION 01500 - CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Site drawings prepared by: SGC Engineers,
Landscape drawings prepared by: MRLD
Foundation & structural drawings prepared by: Price Structural Engineers
Building drawings prepared by: TFH Architects
Mechanical & electrical drawings prepared by: Bennett Engineering
Interior Finish Drawings prepared by: Gawron Turgeon Architects

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections apply to all sections.

1.2 SUMMARY

A. This Section includes requirements for construction facilities and temporary controls, including temporary utilities, support facilities, and security and protection.

B. Temporary utilities include, but are not limited to, the following:

1. Water service and distribution.
2. Temporary electric power and light.
3. Telephone service.
4. Sanitary facilities, including drinking water.

C. Support facilities include, but are not limited to, the following:

1. Temporary project identification signs and bulletin boards.
2. Waste disposal services.
3. Construction aids and miscellaneous services and facilities.

D. Security and protection facilities include, but are not limited to, the following:

1. Temporary fire protection.
2. Environmental protection.

1.3 SUBMITTALS

A. Temporary Utilities: Submit reports of tests, inspections, meter readings, and similar procedures performed on temporary utilities.

B. Implementation and Termination Schedule: Within 15 days of the date established for commencement of the Work, submit a schedule indicating

implementation and termination of each temporary utility.

1.4 QUALITY ASSURANCE

A. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following:

1. Building code requirements.
2. Health and safety regulations.
3. Utility company regulations.
4. Police, fire department, and rescue squad rules.
5. Environmental protection regulations.

B. Standards: Comply with NFPA241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations," ANSIA10 Series standards for "Safety Requirements for Construction and Demolition," and NECA Electrical Design Library "Temporary Electrical Facilities."

1. Electrical Service: Comply with NEMA, NECA, and UL standards and regulations for temporary electric service. Install service in compliance with NFPA70 "National Electric Code."

C. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

1.5 PROJECT CONDITIONS

A. Temporary Utilities: Prepare a schedule indicating dates for implementation and termination of each temporary utility. At the earliest feasible time, when acceptable to the Owner, change over from use of temporary service to use of permanent service. The cost of electricity temporary and permanent will be the Owner's responsibility.

B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Relocate temporary services and facilities as the Work progresses. Do not overload facilities or permit them to interfere with progress. Take necessary fire-prevention measures. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist on-site.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide new materials. If acceptable to the Architect, the Contractor may use undamaged, previously used materials in serviceable

condition. Provide materials suitable for use intended.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Engage the appropriate local utility company to install temporary service or connect to existing service. Where company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with company recommendations.

1. Arrange with company and existing users for a time when service can be interrupted, if necessary, to make connections for temporary services.
2. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.
3. Obtain easements to bring temporary utilities to the site where the Owner's easements cannot be used for that purpose.
4. Use Charges: Cost or use charges for temporary facilities are chargeable to the Owner.

B. Water Service: Install water service and distribution piping of sizes and pressures adequate for construction until permanent water service is in use.

1. Sterilization: Sterilize temporary water piping prior to use.

C. Temporary Telephones: At Contractor's option provide temporary telephone service throughout the construction period for all personnel engaged in construction activities. Install telephone on a separate line for each temporary office and first-aid station.

D. Sanitary facilities include temporary toilets, wash facilities, and drinking-water fixtures. Comply with regulations and health codes for the type, number, location, operation, and maintenance of fixtures and facilities. Install where facilities will best serve the Project's needs.

1. Provide toilet tissue, paper towels, paper cups, and similar disposable

materials for each facility. Provide covered waste containers for used material.

E. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy. Use of pit-type privies will not be permitted.

3.3 SUPPORT FACILITIES INSTALLATION

A. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities.

1. Where heat is needed and the permanent building enclosure is not complete, provide temporary enclosures where there is no other provision for containment of heat. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
2. Install tarpaulins securely, with incombustible wood framing and other materials. Close openings of 25 sq. ft. or less with plywood or similar materials.
3. Close openings through floor or roof decks and horizontal surfaces with load-bearing, wood-framed construction.
4. Where temporary wood or plywood enclosure exceeds 100 sq. ft. in area, use UL-labeled, fire-retardant-treated material for framing and main sheathing.

B. Project Identification and Temporary Signs: Prepare project identification and other signs of size indicated. Install signs where indicated to inform the public and persons seeking entrance to the Project. Support on posts or framing of preservative-treated wood or steel. Do not permit installation of unauthorized signs.

1. Project Identification Signs: Engage an experienced sign painter to apply graphics. Comply with details provided by the Architect:

a. Project name.
b. Owner's name.
c. Architect's name.
d. Contractor's name.
e. Lending institutions.
f. Product graphic builders.

C. Collection and Disposal of Waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 degF Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material lawfully.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Except for use of permanent fire protection as soon as available, do not change over from use of temporary security and protection facilities to permanent facilities until Substantial Completion, or longer, as requested by the Architect.

B. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA10 "Standard for Portable Fire Extinguishers" and NFPA241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations."

1. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable stairwell.
2. Store combustible materials in containers in fire-safe locations.
3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for fighting fires. Prohibit smoking in hazardous fire-exposure areas.
4. Provide supervision of welding operations, combustion-type temporary heating units, and similar sources of fire ignition.

C. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed, provide lighting, including flashing red or amber lights.

D. Enclosure Fence: Before excavation begins, install an enclosure fence with lockable entrance gates. Locate where indicated, or enclose the entire site or the portion determined sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs, and other animals from easily entering the site, except by the entrance gates.

1. Provide open-mesh, chain-link fencing with posts set in a compacted mixture of gravel and earth.

E. Security Enclosure and Lockup: Install substantial temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.

1. Storage: Where materials and equipment must be stored, and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.

F. Environmental Protection: Provide protection, operate temporary facilities,

and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways, and subsoil might be contaminated or polluted or that other undesirable effects might result. Avoid use of tools and equipment that produce harmful noise. Restrict use of noise-making tools and equipment to hours that will minimize complaints from persons or firms near the site.

3.5 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.

B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
2. Protection: Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

C. Termination and Removal: Unless the Architect requests that it be maintained longer, remove each temporary facility when the need has ended, when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are the Contractor's property. The Owner reserves the right to take possession of project identification signs.
2. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where the area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil in the area. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at the temporary entrances, as required by the governing authority.
3. At Substantial Completion, clean and renovate permanent facilities used during the construction period including, but not limited to, the following:

    a. Replace air filters and clean inside of ductwork and housings.
    b. Replace significantly worn parts and parts subject to unusual

operating conditions.

c. Replace lamps burned out or noticeably dimmed by hours of use.

END OF SECTION 01500

SECTION 01700 - PROJECT CLOSEOUT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Site drawings prepared by: SGC Engineers,
Landscape drawings prepared by: MRLD
Foundation & structural drawings prepared by: Price Structural Engineers
Building drawings prepared by: TFH Architects
Mechanical & electrical drawings prepared by: Bennett Engineering
Interior Finish Drawings prepared by: Gawron Turgeon Architects

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections apply to all sections.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements necessary for project meetings including, but not necessarily limited to, the following:

1. Inspection procedures.
2. Project record document submittal.
3. Operation and maintenance manual submittal.
4. Submittal of warranties.
5. Final cleaning.

B. Closeout requirements for specific construction activities are included in the appropriate Sections in Divisions 2 through 16.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for certification of Substantial Completion, complete the following. List exceptions in the request.

1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the portion of the Work claimed as substantially complete.

a. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Sum.
b. If 100 percent completion cannot be shown, include a list of incomplete items, the value of incomplete construction and reasons the Work is not complete.

2. Advise the Owner of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications and similar documents.
4. Obtain and submit releases enabling the Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates and similar releases.
5. Submit record drawings, maintenance manuals, final project photographs, damage or settlement surveys, property surveys and similar final record information.
6. Deliver tools, spare parts, extra stock and similar items.
7. Make final changeover of permanent locks and transmit keys to the Owner. Advise the Owner's personnel of changeover in security provisions.
8. Complete startup testing of systems and instruction of the Owner's operation and maintenance personnel. Discontinue and remove temporary facilities from the site, along with mockups, construction tools and similar elements.
9. Complete final cleanup requirements, including touchup painting.
10. Touch up and otherwise repair and restore marred, exposed finishes.

B. Inspection Procedures: On receipt of a request for inspection, the Architect will either proceed with inspection or advise the Contractor of unfilled requirements. The Architect will prepare the Certificate of Substantial Completion following inspection or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.

1. The Architect will repeat inspection when requested and assured that the Work is substantially complete.
2. Results of the completed inspection will form the basis of requirements for final acceptance.

1.4 FINAL ACCEPTANCE

A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payments, complete the following. List exceptions in the request.

1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include insurance certificates for products and completed operations where required.
2. Submit an updated final statement, accounting for final additional changes to the Contract Sum.
3. Submit a certified copy of the Architect's final inspection list of items to be completed or corrected, endorses and dated by the Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance and shall be endorsed and dated by the Architect.

B. Re-inspection Procedure: The Architect will re-inspect the Work upon receipt of notice that the Work, including inspection list items from earlier inspections, has been completed, except for items whose completion is delayed under circumstances acceptable to the Architect.

1. Upon completion of re-inspection, the Architect will prepare a certificate of final acceptance. If the Work is incomplete, the Architect will advise the Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.
2. If necessary, re-inspection will be repeated.

1.5 RECORD DOCUMENT SUBMITTALS

A. General: Do not use record documents for construction purposes. Protect record documents from deterioration and loss in a secure, fire-resistant location. Provide access to record documentation for the Architect's reference during normal working hours.

B. Record Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark which drawing is most capable of showing conditions fully and accurately. Where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

1. Mark record sets with red erasable pencil. Use other colors to distinguish between variations in separate categories of the Work.
2. Mark new information that is important to the Owner but was not shown on Contract Drawings or Shop Drawings.
3. Note related change-order numbers where applicable.
4. Organize record drawing sheets into manageable sets. Bind sets with durable-paper cover sheets; print suitable titles, dates and other identification on the cover of each set.

C. Record Specifications: Maintain one complete copy of the Project Manual, including addenda. Include with the Project Manual one copy of other written construction documents, such as Change Orders and modifications issued in printed form during construction.

1. Mark these documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications.
2. Give particular attention to substitutions and selection of options and information on concealed construction that cannot otherwise be readily discerned later by direct observation.
3. Note related record drawing information and Product Data.
4. Upon completion of the Work, submit record specifications to the Architect for the Owner's records.

D. Record Product Data: Maintain one copy of each Product Data submittal. Note related Change Orders and markup of record drawings and specifications.

1. Mark these documents to show significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the site and from the manufacturer's installation instructions and recommendations.
2. Give particular attention to concealed products and portions f the Work that cannot otherwise be readily discerned later by direct observation.

E. Record Sample Submitted: Immediately prior to Substantial Completion, the Contractor shall meet with the Architect and the Owner's personnel at the Project Site to determine which Samples are to be transmitted to the Owner for record purposes. Comply with the Owner's instructions regarding delivery to the Owner's storage area.

F. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record keeping and submittals in connection with actual performance of the Work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records and place in good order. Identify miscellaneous records properly and bind or file, ready for continued use and reference. Submit to the Architect for the Owner's records.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 01700

SECTION 01730 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Site drawings prepared by: SGC Engineers,
Landscape drawings prepared by: MRLD
Foundation & structural drawings prepared by: Price Structural Engineers
Building drawings prepared by: TFH Architects
Mechanical & electrical drawings prepared by: Bennett Engineering
Interior Finish Drawings prepared by: Gawron Turgeon Architects

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections apply to all sections.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for operation and a single project maintenance manual, including the following:

1. Preparing and submitting operation and maintenance manuals for building operating systems and equipment.
2. Preparing and submitting instruction manuals covering the care, preservation, and maintenance of architectural products and finishes.
3. Instruction of the Owner's operating personnel in the operation and maintenance of building systems and equipment.
4. 11 x 17 As-built plans and elevations.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Product Data and Samples" specifies preparation of Shop Drawings and Product Data.
2. Division 1 Section "Contract Closeout" specifies general closeout requirements.
3. Division 1 Section "Contract Closeout" specifies general requirements for submitting project record documents.
4. Appropriate Sections of Divisions 2 through 16 specify special operation and maintenance data requirements for specific pieces of equipment or building operating systems.

1.3 QUALITY ASSURANCE

A. Maintenance Manual Preparation: In preparation of maintenance manuals, use personnel thoroughly trained and experienced in operation and maintenance of equipment or system involved.

1. Where maintenance manuals require written instructions, use personnel skilled in technical writing where necessary for communication of essential data.
2. Where maintenance manuals require drawings or diagrams, use draftsmen capable of preparing drawings clearly in an understandable format.

B. Instructions for the Owner's Personnel: Use experienced instructors thoroughly trained and experienced in operation and maintenance of equipment or system involved to instruct the Owner's operation and maintenance personnel.

1.4 SUBMITTALS

A. Submittal Schedule: Comply with the following schedule for submitting operation and maintenance manuals:

1. Before Substantial Completion, when each installation that requires operation and maintenance manuals is nominally complete, submit 2 draft copies of each manual to the Architect for review. Include a complete index or table of contents of each manual.

    a. The Architect will return 1 copy of the draft with comments within 15 days of receipt.

2. Submit 1 copy of data in final form at least 5 days before final inspection. The Architect will return this copy within 5 days after final inspection, with comments.
3. After final inspection, make corrections or modifications to comply with the Architect's comments. Submit the specified number of copies of each approved manual to the Architect within 5 days of receipt of the Architect's comments.

B. Form of Submittal: Prepare operation and maintenance manuals in the form of an instructional manual for use by the Owner's operating personnel. Organize into suitable sets of manageable size. Where possible, assemble instructions for similar equipment into a single binder.

1. Binders: For each manual, provide heavy-duty, commercial-quality, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to receive 8-1/2-by-11- inch paper. Provide a clear plastic sleeve on the spine to hold labels describing contents. Provide pockets in the covers to receive folded sheets.

    a. Where 2 or more binders are necessary to accommodate data, correlate data in each binder into related groupings according to the Project Manual table of contents. Cross-reference other binders where necessary to provide essential information for proper operation or maintenance of the piece of equipment or system.

b. Identify each binder on front and spine, with the printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter covered. Indicate volume number for multiple volume sets of manuals.

2. Dividers: Provide heavy paper dividers with celluloid-covered tabs for each separate Section. Mark each tab to indicate contents. Provide a typed description of the product and major parts of equipment included in the Section on each divider.
3. Text Material: Where maintenance manuals require written material, use the manufacturer's standard printed material. If manufacturer's standard printed material is not available, provide specially prepared data, neatly typewritten, on 8-1/2-by-11-inch 20-lb/sq. ft. white bond paper.
4. Drawings: Where maintenance manuals require drawings or diagrams, provide reinforced, punched binder tabs on drawings and bind in with text.

    a. Where oversize drawings are necessary, fold drawings to the same size as text pages and use as a foldout.
    b. If drawings are too large to be used practically as a foldout, place the drawing, neatly folded, in front or rear pocket of binder. Insert a typewritten page indicating drawing title, description of contents, and drawing location at the appropriate location in the manual.

1.5 MANUAL CONTENT

A. In each manual include information specified in the individual Specification Section and the following information for each major component of building equipment and its controls:

1. General system or equipment description.
2. Design factors and assumptions.
3. Copies of applicable Shop Drawings and Product Data.
4. System or equipment identification, including:

    a. Name of manufacturer.
    b. Model number.
    c. Serial number of each component.

5. Operating instructions.
6. Emergency instructions.
7. Wiring diagrams.
8. Inspection and test procedures.
9. Maintenance procedures and schedules.
10. Precautions against improper use and maintenance.
11. Copies of warranties.
12. Repair instructions including spare parts listing.
13. Sources of required maintenance materials and related services.

14. Manual index.

B. Organize each manual into separate Sections for each piece of related equipment. As a minimum, each manual shall contain a title page; a table of contents; copies of Product Data, supplemented by Drawings and written text; and copies of each warranty, bond, and service contract issued.

1. Title Page: Provide a title page in a transparent, plastic envelope as the first sheet of each manual. Provide the following information:

   a. Subject matter covered by the manual.
   b. Name and address of the Project.
   c. Date of submittal.
   d. Name, address, and telephone number of the Contractor.
   e. Name and address of the Architect.
   f. Cross-reference to related systems in other operation and maintenance manuals.

2. Table of Contents: After title page, include a typewritten table of contents for each volume, arranged systematically according to the Project Manual format. Include a list of each product included, identified by product name or other appropriate identifying symbol and indexed to the content of the volume.

   a. Where a system requires more than one volume to accommodate data, provide a comprehensive table of contents for all volumes in each volume of the set.

3. General Information: Provide a general information Section immediately following table of contents, listing each product included in the manual, identified by product name. Under each product, list the name, address, and telephone number of the subcontractor or Installer and the maintenance contractor. Clearly delineate the extent of responsibility of each of these entities. Include a local source for replacement parts and equipment.
4. Product Data: Where the manuals include manufacturer's standard printed data, include only sheets that are pertinent to the part or product installed. Mark each sheet to identify each part or product included in the installation. Where the Project includes more than one item in a tabular format, identify each item, using appropriate references from the Contract Documents. Identify data that is applicable to the installation, and delete references to information that is not applicable.
5. Written Text: Prepare written text to provide necessary information where manufacturer's standard printed data is not available, and the information is necessary for proper operation and maintenance of equipment or systems. Prepare written text where it is necessary to provide additional information or to supplement data included in the manual. Organize text in a consistent format under separate headings for different procedures. Where necessary, provide a logical sequence of instruction for each operation or maintenance procedure.

6. Drawings: Provide specially prepared drawings where necessary to supplement manufacturer's printed data to illustrate the relationship of component parts of equipment or systems or to provide control or flow diagrams. Coordinate these drawings with information contained in project record drawings to assure correct illustration of the completed installation.

    a. Do not use original project record documents as part of operation and maintenance manuals.

7. Warranties, Bonds, and Service Contracts: Provide a copy of each warranty, bond, or service contract in the appropriate manual for the information of the Owner's operating personnel. Provide written data outlining procedures to follow in the event of product failure. List circumstances and conditions that would affect validity of warranty or bond.

1.6 MATERIAL AND FINISHES MAINTENANCE MANUAL

A. Submit 3 copies of each manual, in final form, on material and finishes to the Architect for distribution. Provide one section for architectural products, including applied materials and finishes. Provide a second section for products designed for moisture protection and products exposed to the weather.

    1. Refer to individual Specification Sections for additional requirements on care and maintenance of materials and finishes.

B. Architectural Products: Provide manufacturer's data and instructions on care and maintenance of architectural products, including applied materials and finishes.

    1. Manufacturer's Data: Provide complete information on architectural products, including the following, as applicable:

        a. Manufacturer's catalog number.
        b. Size.
        c. Material composition.
        d. Color.
        e. Texture.
        f. Reordering information for specially manufactured products.

    2. Care and Maintenance Instructions: Provide information on care and maintenance, including manufacturer's recommendations for types of cleaning agents to be used and methods of cleaning. Provide information on cleaning agents and methods that could prove detrimental to the product. Include manufacturer's recommended schedule for cleaning and maintenance.

C. Moisture Protection and Products Exposed to the Weather: Provide

complete manufacturer's data with instructions on inspection, maintenance, and repair of products exposed to the weather or designed for moisture-protection purposes.

1. Manufacturer's Data: Provide manufacturer's data giving detailed information, including the following, as applicable:

    a. Applicable standards.
    b. Chemical composition.
    c. Installation details.
    d. Inspection procedures.
    e. Maintenance information.
    f. Repair procedures.

1.7 EQUIPMENT AND SYSTEMS MAINTENANCE MANUAL

A. Submit 2 copies of each manual, in final form, on equipment and systems to the Architect for distribution. Provide separate manuals for each unit of equipment, each operating system, and each electric and electronic system.

1. Refer to individual Specification Sections for additional requirements on operation and maintenance of the various pieces of equipment and operating systems.

B. Equipment and Systems: Provide the following information for each piece of equipment, each building operating system, and each electric or electronic system.

1. Description: Provide a complete description of each unit and related component parts, including the following:

    a. Equipment or system function.
    b. Operating characteristics.
    c. Limiting conditions.
    d. Performance curves.
    e. Engineering data and tests.
    f. Complete nomenclature and number of replacement parts.

2. Manufacturer's Information: For each manufacturer of a component part or piece of equipment, provide the following:

    a. Printed operation and maintenance instructions.
    b. Assembly drawings and diagrams required for maintenance.
    c. List of items recommended to be stocked as spare parts.

3. Maintenance Procedures: Provide information detailing essential maintenance procedures, including the following:

    a. Routine operations.
    b. Troubleshooting guide.

c. Disassembly, repair, and reassembly.
d. Alignment, adjusting, and checking.

4. Operating Procedures: Provide information on equipment and system operating procedures, including the following:

   a. Startup procedures.
   b. Equipment or system break-in.
   c. Routine and normal operating instructions.
   d. Regulation and control procedures.
   e. Instructions on stopping.
   f. Shutdown and emergency instructions.
   g. Summer and winter operating instructions.
   h. Required sequences for electric or electronic systems.
   i. Special operating instructions.

5. Servicing Schedule: Provide a schedule of routine servicing and lubrication requirements, including a list of required lubricants for equipment with moving parts.
6. Controls: Provide a description of the sequence of operation and as-installed control diagrams by the control manufacturer for systems requiring controls.
7. Coordination Drawings: Provide each Contractor's Coordination Drawings.

   a. Provide as-installed, color-coded, piping diagrams, where required for identification.

8. Valve Tags: Provide charts of valve-tag numbers, with the location and function of each valve.
9. Circuit Directories: For electric and electronic systems, provide complete circuit directories of panelboards, including the following:

   a. Electric service.
   b. Controls.
   c. Communication.

C. Schedule: Provide complete information in the equipment and systems manual on products specified in the following Sections:

1. Pipe Markers: Section 15190 - Mechanical Identification.
2. Air-Cooled Condensers: Section 15670 - Condensing Units.
3. Chillers: Section 15685 - Water-Cooled Centrifugal Chillers.
4. Air-Handling Units: Section 15854 - Central-Station Air-Handling Units.
5. Fans: Section 15860 - Centrifugal Fans.
6. Filters: Section 15886 - Air Filters.
7. Diffusers: Section 15933 - Air Terminals.
8. Lighting Fixtures: Section 16515 - Interior Lighting.
9. Generator Sets: Section 16620 - Packaged Engine Generator Systems.
10. Telephones: Section 16740 - Telephone Systems.

1.8 INSTRUCTIONS FOR THE OWNER'S PERSONNEL

A. Prior to final inspection, instruct the Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Provide instruction at mutually agreed upon times.

1. For equipment that requires seasonal operation, provide similar instruction during other seasons.
2. Use operation and maintenance manuals for each piece of equipment or system as the basis of instruction. Review contents in detail to explain all aspects of operation and maintenance.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 01730

SECTION 01740 - WARRANTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Site drawings prepared by: SGC Engineers,
Landscape drawings prepared by: MRLD
Foundation & structural drawings prepared by: Price Structural Engineers
Building drawings prepared by: TFH Architects
Mechanical & electrical drawings prepared by: Bennett Engineering
Interior Finish Drawings prepared by: Gawron Turgeon Architects

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections apply to all sections.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for warranties required by the Contract Documents, including manufacturers standard warranties on products and special warranties.

1. Refer to the General Conditions for terms of the Contractor's period for correction of the Work.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Submittals" specifies procedures for submitting warranties.
2. Division 1 Section "Contract Closeout" specifies contract closeout procedures.
3. Divisions 2 through 16 Sections for specific requirements for warranties on products and installations specified to be warranted.
4. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.

C. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products. Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.3 WARRANTY REQUIREMENTS

A. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted construction.

B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.

D. Owner's Recourse: Expressed warranties made to the Owner are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which the Owner can enforce such other duties, obligations, rights, or remedies.

1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

E. Where the Contract Documents require a special warranty, or similar commitment on the Work or part of the Work, the Owner reserves the right to refuse to accept the Work, until the Contractor presents evidence that entities required to countersign such commitments are willing to do so.

1.4 SUBMITTALS

A. Submit written warranties to the Architect prior to the date certified for Substantial Completion. If the Architect's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Architect.

1. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Architect within 15 days of completion of that designated portion of the Work.

B. When the Contract Documents require the Contractor, or the Contractor and a subcontractor, supplier or manufacturer to execute a special warranty, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to

the Owner, through the Architect, for approval prior to final execution.

C. Form of Submittal: At Final Completion compile 2 copies of each required warranty properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.

D. Bind warranties and bonds in heavy-duty, commercial-quality, durable 3-ring, vinyl-covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.

1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address, and telephone number of the Installer.
2. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project title or name, and name of the Contractor.
3. When warranted construction requires operation and maintenance manuals, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

END OF SECTION 01740

SECTION 03300 CAST-IN-PLACE CONCRETE AND REINFORCEMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mix design, placement procedures, and finishes.

B. Related Sections include the following:

1. Division 2 Section "Earthwork" for drainage fill under slabs-on-grade.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

1.4 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

B. Design Mixes: For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mix water to be withheld for later addition at Project site.

C. Steel Reinforcement Shop Drawings: Details of fabrication, bending, and placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement." Include material, grade, bar schedules, stirrup spacing, bent bar diagrams, arrangement, and supports of concrete reinforcement. Include special reinforcement required for openings through concrete structures.

D. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:

1. Cementitious materials and aggregates.
2. Form materials and form-release agents.
3. Steel reinforcement and reinforcement accessories.
4. Fiber reinforcement.
5. Admixtures.
6. Waterstops.
7. Curing materials.
8. Floor and slab treatments.
9. Bonding agents.
10. Adhesives.
11. Vapor retarders.
12. Epoxy joint filler.
13. Joint-filler strips.
14. Repair materials.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed concrete Work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.

1. Manufacturer must be certified according to the National Ready Mixed Concrete Association's Certification of Ready Mixed Concrete Production Facilities.

C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.

E. ACI Publications: Comply with the following, unless more stringent provisions are indicated:

1. ACI 301, "Specification for Structural Concrete."
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

1.6 HANDLING

A. Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 - PRODUCTS

1.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete (at areas exposed to view): Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.
2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

a. High-density overlay, Class 1, or better.
b. Medium-density overlay, Class 1, or better, mill-release agent treated and edge sealed.
c. Structural 1, B-B, or better, mill oiled and edge sealed.
d. B-B (Concrete Form), Class 1, or better, mill oiled and edge sealed.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.

D. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

E. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that will leave no corrodible metal closer than 1 inch (25 mm) to the plane of the exposed concrete surface.
2. Furnish ties that, when removed, will leave holes not larger than 1 inch (25 mm) in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

1.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

B. Steel Bar Mats: ASTM A 184/A 184M, assembled with clips.

1. Steel Reinforcement: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed bars.

C. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

1.3 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected or CRSI Class 2 stainless-steel bar supports.
2. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.

B. Joint Dowel Bars: Plain-steel bars, ASTM A 615/A 615M, Grade 60 (Grade 420). Cut bars true to length with ends square and free of burrs.

1.4 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type II.

1. Fly Ash: ASTM C 618, Class C or F.

B. Normal-Weight Aggregate: ASTM C 33, uniformly graded, and as follows:

1. Class: Severe weathering region, but not less than 3S.
2. Nominal Maximum Aggregate Size: 3/4 inch (19 mm).

C. Water: Potable and complying with ASTM C 94.

1.5 ADMIXTURES

A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.

B. Air-Entraining Admixture: ASTM C 260.

C. Water-Reducing Admixture: ASTM C 494, Type A.

1.6 FIBER REINFORCEMENT

A. Synthetic Fiber: Fibrillated polypropylene fibers engineered and designed for use in concrete, complying with ASTM C 1116, Type III, 1/2 to 1-1/2 inches (13 to 38 mm) long.

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

1. Fibrillated Fibers:

a. Fibrasol F; Axim Concrete Technologies.
b. Fibermesh; Fibermesh, Div. of Synthetic Industries.
c. Forta; Forta Corporation.
d. Grace Fibers; W. R. Grace & Co., Construction Products Div.

1.7 WATERSTOPS

A. Flexible Rubber Waterstops: CE CRD-C 513, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.
1. Profile: As indicated.

B. Flexible PVC Waterstops: CE CRD-C 572, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.
1. Profile: As indicated.

C. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Rubber Waterstops:

a. Greenstreak.
b. Progress Unlimited Inc.
c. Westec Barrier Technologies; Div. of Western Textile Products, Inc.
d. Williams Products, Inc.

2. PVC Waterstops:

   a. Greenstreak.
   b. Meadows: W. R. Meadows, Inc.
   c. Murphy: Paul Murphy Plastics Co.
   d. Progress Unlimited Inc.
   e. Sternson Group.
   f. Tamms Industries Co.; Div. of LaPorte Construction Chemicals North America, Inc.
   g. Vinylex Corporation.
   h. Westec Barrier Technologies; Div. of Western Textile Products, Inc.

D. Self-Expanding Strip Waterstops: Manufactured rectangular or trapezoidal strip, sodium bentonite or other hydrophylic material for adhesive bonding to concrete.

1. Products: Subject to compliance with requirements, provide one of the following (uon):

   a. Volclay Waterstop-RX; Colloid Environmental Technologies Co.
   b. Conseal CS-231; Concrete Sealants Inc.
   c. Swellseal Joint; De Neef Construction Chemicals (U.S.) Inc.
   d. Hydrotite; Greenstreak.
   e. Mirastop; Mirafi Moisture Protection, Div. of Royal Ten Cate (USA), Inc.
   f. Adeka Ultra Seal; Mitsubishi International Corporation.
   g. Superstop; Progress Unlimited Inc.

1.8 VAPOR RETARDERS

A. Vapor Retarder: As specified on foundation drawings.

1.9 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete. Curing compound still required at areas receiving evaporation retarder.

B. Water: Potable.

C. Clear, Solvent-Borne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, 18 to 22 percent solids.

F. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

G. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

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

1. Evaporation Retarder:

   a. Cimfilm; Axim Concrete Technologies.
   b. Finishing Aid Concentrate; Burke Group, LLC (The).
   c. Spray-Film; ChemMasters.
   d. Aquafilm; Conspec Marketing & Manufacturing Co., Inc.
   e. Sure Film; Dayton Superior Corporation.
   f. Eucobar; Euclid Chemical Co.
   g. Vapor Aid; Kaufman Products, Inc.
   h. Lambco Skin; Lambert Corporation.
   i. E-Con; L&M Construction Chemicals, Inc.
   j. Confilm; Master Builders, Inc.
   k. Waterhold; Metalcrete Industries.
   l. Rich Film; Richmond Screw Anchor Co.
   m. SikaFilm; Sika Corporation.
   n. Finishing Aid; Symons Corporation.
   o. Certi-Vex EnvioAssist; Vexcon Chemicals, Inc.

2. Clear, Solvent-Borne, Membrane-Forming Curing Compound:

   a. AH Clear Cure; Anti-Hydro International, Inc.
   b. Spartan-Cote; Burke Group, LLC (The).
   c. Spray-Cure & Seal 15; ChemMasters.
   d. Conspec #1-15 percent solids; Conspec Marketing & Manufacturing Co., Inc.
   e. Day-Chem Cure and Seal; Dayton Superior Corporation.
   f. Diamond Clear; Euclid Chemical Co.
   g. Nitocure S; Fosroc.
   h. Cure & Seal 309; Kaufman Products Inc.
   i. Lambco 120; Lambert Corporation.
   j. L&M Dress & Seal 18; L&M Construction Chemicals, Inc.
   k. CS-309; W. R. Meadows, Inc.
   l. Seal N Kure; Metalcrete Industries.
   m. Rich Seal 14 percent UV; Richmond Screw Anchor Co.
   n. Kure-N-Seal; Sonneborn, Div. of ChemRex, Inc.
   o. Flortec 14; Sternson Group.
   p. Cure & Seal 14 percent; Symons Corporation.
   q. Clear Seal 150; Tamms Industries Co., Div. of LaPorte Construction Chemicals of North America, Inc.
   r. Acrylic Cure; Unitex.
   s. Certi-Vex AC 309; Vexcon Chemicals, Inc.

3. Clear, Waterborne, Membrane-Forming Curing Compound:

   a. AH Clear Cure WB; Anti-Hydro International, Inc.
   b. Klear Kote WB II Regular; Burke Chemicals.
   c. Safe-Cure & Seal 20; ChemMasters.
   d. High Seal; Conspec Marketing & Manufacturing Co., Inc.
   e. Safe Cure and Seal; Dayton Superior Corporation.
   f. Aqua Cure VOX; Euclid Chemical Co.
   g. Cure & Seal 309 Emulsion; Kaufman Products Inc.
   h. Glazecote Sealer-20; Lambert Corporation.
   i. Dress & Seal WB; L&M Construction Chemicals, Inc.
   j. Vocomp-20; W. R. Meadows, Inc.
   k. Metcure; Metalcrete Industries.
   l. Cure & Seal 150E; Nox-Crete Products Group, Kinsman Corporation.
   m. Rich Seal 14 percent E; Richmond Screw Anchor Co.
   n. Kure-N-Seal WB; Sonneborn, Div. of ChemRex, Inc.
   o. Florseal W.B.; Sternson Group.
   p. Cure & Seal 14 percent E; Symons Corporation.
   q. Seal Cure WB 150; Tamms Industries Co., Div. of LaPorte Construction Chemicals of North America, Inc.
   r. Hydro Seal; Unitex.
   s. Starseal 309; Vexcon Chemicals, Inc.

4. Clear, Waterborne, Membrane-Forming Curing Compound, 18 to 22 Percent Solids:

   a. Klear Kote WB II 20 percent; Burke Chemicals.
   b. Safe-Cure & Seal 20; ChemMasters.
   c. Conspec 21; Conspec Marketing & Manufacturing Co., Inc.
   d. Diamond Clear VOX; Euclid Chemical Co.
   e. SureCure Emulsion; Kaufman Products Inc.
   f. Glazecote Sealer-20; Lambert Corporation.
   g. Dress & Seal WB; L&M Construction Chemicals, Inc.
   h. Vocomp-20; W. R. Meadows, Inc.
   i. Metcure 0800; Metalcrete Industries.
   j. Cure & Seal 200E; Nox-Crete Products Group, Kinsman Corporation.
   k. Rich Seal 18 percent E; Richmond Screw Anchor Co.
   l. Kure-N-Seal W; Sonneborn, Div. of ChemRex, Inc.
   m. Florseal W.B.; Sternson Group.
   n. Cure & Seal 18 percent E; Symons Corporation.
   o. Seal Cure WB STD; Tamms Industries Co., Div. of LaPorte Construction Chemicals of North America, Inc.
   p. Hydro Seal 800; Unitex.
   q. Starseal 0800; Vexcon Chemicals, Inc.

5. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound:

   a. Spray-Cure & Seal Plus; ChemMasters.

b. UV Super Seal; Lambert Corporation.
c. Lumiseal Plus; L&M Construction Chemicals, Inc.
d. CS-309/30; W. R. Meadows, Inc.
e. Seal N Kure 30; Metalcrete Industries.
f. Rich Seal 31 percent UV; Richmond Screw Anchor Co.
g. Cure & Seal 31 percent UV; Symons Corporation.
h. Certi-Vex AC 1315; Vexcon Chemicals, Inc.

6. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound:

a. Klear-Kote Cure-Sealer-Hardener, 30 percent solids; Burke Group, LLC (The).
b. Polyseal WB; ChemMasters.
c. UV Safe Seal; Lambert Corporation.
d. Lumiseal WB Plus; L&M Construction Chemicals, Inc.
e. Vocomp-30; W. R. Meadows, Inc.
f. Metcure 30; Metalcrete Industries.
g. Vexcon Starseal 1315; Vexcon Chemicals, Inc.

1.10 RELATED MATERIALS

A. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork.

B. Epoxy Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Shore A hardness of 80 per ASTM D 2240.

C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

D. Epoxy-Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements, and as follows:

1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

E. Reglets: Fabricate reglets of not less than 0.0217-inch- (0.55-mm-) thick galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

F. Dovetail Anchor Slots: Hot-dip galvanized steel sheet, not less than 0.0336 inch (0.85 mm) thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

1.11 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3 to 6 mm) or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi (29 MPa) at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Topping: Traffic-bearing, cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch (6 mm).

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3 to 6 mm) or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5700 psi (39 MPa) at 28 days when tested according to ASTM C 109/C 109M.

1.12 CONCRETE MIXES

A. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases, as follows:

1. Proportion normal-weight concrete according to ACI 211.1 and ACI 301.

B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the laboratory trial mix basis.

C. Proportion normal-weight concrete mix as follows:
1. See Structural Drawings.

D. Cementitious Materials: For concrete exposed to deicers, limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements.

E. Maximum Water-Cementitious Materials Ratio: 0.45 for concrete exposed to deicers or subject to freezing and thawing while moist.

F. Maximum Water-Cementitious Materials Ratio: 0.45 for concrete subject to severe or very severe sulfate exposure.

G. Air Content: Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content as follows within a tolerance of plus 1 or minus 1.5 percent, unless otherwise indicated:

1. Air Content: 6 percent for 1-inch- (25-mm-) nominal maximum aggregate size.

H. Do not air entrain concrete to trowel-finished interior floors and suspended slabs. Do not allow entrapped air content to exceed 3 percent.

I. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

J. Synthetic Fiber: Uniformly disperse in concrete mix at manufacturer's recommended rate, but not less than 1.5 lb/cu. yd. (0.90 kg/cu. m).

K. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
4. Accelerator: W.R. Grace

1.13 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

1.14 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and furnish batch ticket information.

PART 3 - EXECUTION

1.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:

1. Class A, 1/8 inch (3 mm) (exposed areas).
2. Class B, 1/4 inch (6 mm) (unexposed areas).

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.

1. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

1.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use Setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor bolts, accurately located, to elevations required.
2. Install reglets to receive top edge of foundation sheet waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
3. Install dovetail anchor slots in concrete structures as indicated.

1.3 REMOVING AND REUSING FORMS

A. General: Formwork, for sides of beams, walls, columns, and similar parts of the Work, that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 7 days after placing concrete provided concrete is hard enough to not be damaged by form-removal operations and provided curing and protection operations are maintained.

B. Leave formwork, for beam soffits, joists, slabs, and other structural elements, that supports weight of concrete in place until concrete has achieved the following:

1. At least 70 percent of 28-day design compressive strength.

C. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

D. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

1.4 SHORES AND RESHORES

A. Comply with ACI 318 (ACI 318M), ACI 301, and recommendations in ACI 347R for design, installation, and removal of shoring and reshoring.

B. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

1.5 VAPOR RETARDERS

A. Vapor Retarder: Vapor retarder shall be not less than 15 mils thick and polyolefin material. Place, protect, and repair vapor-retarder sheets according to ASTM E 1643, and manufacturer's written instructions.

1.6 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire fabric in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

1.7 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Form from preformed galvanized steel, plastic keyway-section forms, or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness, as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.

2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Terminate full-width joint-filler strips not less than 1/2 inch (12 mm) or more than 1 inch (25 mm) below finished concrete surface where joint sealants, specified in Division 7 Section "Joint Sealants," are indicated.
2. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Dowel Joints: Install dowel sleeves and dowels or dowel bar and support assemblies at joints where indicated.

1. Use dowel sleeves or lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

1.8 WATERSTOPS

A. Flexible Waterstops: Install in construction joints as indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of Work. Field-fabricate joints in waterstops according to manufacturer's written instructions.

B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, bonding or mechanically fastening and firmly pressing into place. Install in longest lengths practicable.

1.9 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Concrete slabs shall encase steel columns on all sides except where prevented by designated floor openings.

C. Do not add water to concrete during delivery, at Project site, or during placement, unless approved by Architect.

D. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams

or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation.

E. Deposit concrete in forms in horizontal layers no deeper than 24 inches (600 mm) and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic, to avoid cold joints.

1. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.
2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the vibrator. Place vibrators to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix constituents to segregate.

F. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

G. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When air temperature has fallen to or is expected to fall below 40 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.

4. Prior to placing concrete, contractor shall take necessary precautions to maintain concrete temperature continuously above 50 deg F and in a moist condition for the first seven days after concrete placement. Precautions shall include, but not be limited to concrete blankets and tenting with external heat source if necessary. Contractor shall measure and record daily concrete temperatures with High / Low concrete thermometers during seven day period. The seven day requirement may be reduced to three days if High Early Strength concrete is used.

H. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

1.10 FINISHING FORMED SURFACES

A. General: Coordinate with Architect's requirements.

B. Rough-Formed Finish (permitted at non-exposed concrete only): As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched. Remove fins and other projections exceeding ACI 347R limits for class of surface specified.

C. Smooth-Formed Finish (required at exposed concrete): As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch (3 mm) in height.

1. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, or painting.
2. Do not apply rubbed finish to smooth-formed finish.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

1.11 FINISHING FLOORS AND SLABS

A. General: Comply with recommendations in ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. General: Comply with Architect's requirements.

C. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes.

1. Apply scratch finish to surfaces indicated and to surfaces to receive concrete floor topping or mortar setting beds for ceramic or quarry tile, portland cement terrazzo, and other bonded cementitious floor finishes.

D. Float Finish: Required at areas to be covered by wood floor and elsewhere as specified by the owner. Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces indicated, to surfaces to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

E. Trowel Finish: Required at areas specified by owner. After applying float finish, apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system

2. Finish and measure surface so gap at any point between concrete surface and an unleveled freestanding 10-foot- (3.05-m-) long straightedge, resting on two high spots and placed anywhere on the surface, does not exceed the following:

a. 1/8 inch (3.2 mm).

F. Trowel and Fine-Broom Finish: Required at sloped areas adjacent to drains. Apply a partial trowel finish, stopping after second troweling, to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.

G. Broom Finish: Required where specified by owner. Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

H. Slip-Resistive Aggregate Finish: Before final floating, apply slip-resistive aggregate finish where indicated and to concrete stair treads, platforms, and ramps. Apply according to manufacturer's written instructions and as follows:

1. Uniformly spread 25 lb/100 sq. ft. (12 kg/10 sq. m) of dampened slip-resistive aggregate over surface in one or two applications. Tamp aggregate flush with surface, but do not force below surface.
2. After broadcasting and tamping, apply float finish.
3. After curing, lightly work surface with a steel wire brush or an abrasive stone, and water to expose slip-resistive aggregate.

I. Mineral Dry-Shake Floor Hardener Finish: After initial floating, apply mineral dry-shake materials to surfaces according to manufacturer's written instructions and as follows:

1. Uniformly apply mineral dry-shake materials at a rate of 100 lb/100 sq. ft. (49 kg/10 sq. m), unless greater amount is recommended by manufacturer.
2. Uniformly distribute approximately two-thirds of mineral dry-shake materials over surface by hand or with mechanical spreader, and embed by power floating. Follow power floating with a second mineral dry-shake application, uniformly distributing remainder of material, and embed by power floating.
3. After final floating, apply a trowel finish. Cure concrete with curing compound recommended by dry-shake material manufacturer and apply immediately after final finishing.

1.12 MISCELLANEOUS CONCRETE ITEMS

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

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

1.13 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with recommendations in ACI 305R for hot-weather protection during curing.

1. Concrete shall be maintained above 50 degrees F, and in a moist condition for at least the first seven days after placement. This may be reduced to three days if high early strength concrete is used in approved mix design.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing by one or a combination of the following methods:

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces, by one or a combination of the following methods:

1. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
2. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

1.14 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least six months. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semirigid epoxy joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

1.15 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 (1.2-mm) sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension in solid concrete but not less than 1 inch (25 mm) in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.

4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least 3/4 inch (19 mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

1.16 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include those specified in this Article.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mix exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.

2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of four standard cylinder specimens for each composite sample.

    a. Cast and field cure one set of four standard cylinder specimens for each composite sample.

6. Compressive-Strength Tests: ASTM C 39; test two laboratory-cured specimens at 7 days and two at 28 days.

    a. Test two field-cured specimens at 7 days and two at 28 days.
    b. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at age indicated.

C. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.

D. Strength of each concrete mix will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).

E. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-and 28-day tests.

F. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

G. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of

concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect. Costs associated with reinspecting or retesting deficient areas will be paid for by the Contractor.

END OF SECTION 03300

SECTION 03450 - PLANT-PRECAST ARCHITECTURAL CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes precast architectural concrete units:

1. Lintels to front porch.
2. Window sills.
3. Caps to brick walls.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide precast architectural concrete units and connections capable of withstanding design loads within limits and under conditions indicated.

1.3 SUBMITTALS

A. Product Data: For each product indicated.

B. Design Mixes: For each concrete mix.

C. Shop Drawings: Detail fabrication and installation of precast architectural concrete units. Indicate member locations, plans, elevations, dimensions, shapes, cross sections, limits of each finish, and types of reinforcement, including special reinforcement.

1. Comprehensive engineering analysis signed and sealed by the qualified professional engineer responsible for its preparation.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator who assumes responsibility for engineering precast architectural concrete units to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

B. Design Standards: Comply with ACI 318 and the design recommendations in PCI MNL 120, "PCI Design Handbook--Precast and Prestressed Concrete."

C. Quality-Control Standard: Comply with PCI MNL 117, "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products."

D. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural

Welding Code--Steel"; and AWS D1.4, "Structural Welding Code--Reinforcing Steel."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store units at Project site to prevent cracking, distorting, warping, staining, or other physical damage, and so markings are visible.

B. Lift and support units only at designated lifting and supporting points shown on Shop Drawings.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel Reinforcing:

1. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.
2. Plain-Steel Wire: ASTM A 82, as drawn.
3. Supports: Manufacturer's bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place according to PCI MNL 117.

B. Concrete:

1. Portland Cement: ASTM C 150, Type I or Type III, gray, of same type, brand, and source.
2. Normal-Weight Aggregates: Except as modified by PCI MNL 117, ASTM C 33, with coarse aggregates complying with Class 5S.
3. Coloring Admixture: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures, temperature stable, nonfading, and alkali resistant.

    a. Color: To match MGA Cast Stone color as shown on the elevations (MGA Cast Stone: Tel. (207) 926-5993).

C. Steel Connections:

1. Carbon-Steel Shapes and Plates: ASTM A 36/A 36M.
2. Carbon-Steel Bolts and Studs: ASTM A 307, Grade A; carbon-steel, hex-head bolts and studs; carbon-steel nuts; and flat, unhardened steel washers.
3. Finish: For exterior steel items, steel in exterior walls, and items indicated for galvanizing, apply zinc coating by hot-dip process according to ASTM A 123/A 123M, after fabrication, and ASTM A 153/A 153M, as applicable.

    a. Galvanizing Repair Paint: DOD-P-21035A or SSPC-Paint 20.

D. Sand-Cement Grout: Portland cement, ASTM C 150, Type I, and clean, natural sand, ASTM C 144. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

2.2 CONCRETE MIXES

A. Normal-Weight Concrete Face and Backup Mixes: Proportion mixes by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 5000 psi.
2. Maximum Water-Cementitious Materials Ratio: 0.45.

B. Water Absorption: 12 to 14 percent by volume, tested according to PCI MNL 117.

C. Add 5% to 6% air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 117.

2.3 FABRICATION

A. Anchorage Hardware: Fabricate with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware, and secure in place during precasting operations.

B. Furnish loose steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing precast architectural concrete units to supporting and adjacent construction.

C. Cast-in reglets, slots, holes, and other accessories in precast architectural concrete units to receive windows, cramps, dowels, reglets, waterstops, flashings, and other similar work as indicated.

D. Reinforcement: Comply with recommendations in CRSI's "Manual of Standard Practice" and PCI MNL 117 for fabricating, placing, and supporting reinforcement.

E. Reinforce precast architectural concrete units to resist handling, transportation, and erection stresses.

F. Prestress tendons for precast architectural concrete units by either pretensioning or posttensioning methods. Comply with PCI MNL 117.

G. Mix concrete according to PCI MNL 117 and requirements in this Section. After concrete batching, no additional water may be added.

H. Place face mix to a minimum thickness after consolidation of the greater of 1 inch or 1.5 times the maximum aggregate size, but not less than the minimum reinforcing cover.

I. Place concrete in a continuous operation to prevent seams or planes of weakness from forming in precast concrete units. Comply with requirements in PCI MNL 117 for measuring, mixing, transporting, and placing concrete.

1. Place backup concrete to ensure bond with face mix concrete.

J. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items. Use equipment and procedures complying with PCI MNL 117.

K. Comply with ACI 306.1 procedures for cold-weather concrete placement.

L. Comply with ACI 305R recommendations for hot-weather concrete placement.

M. Identify pickup points of precast architectural concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each precast architectural concrete unit on a surface that will not show in finished structure.

N. Cure concrete, according to requirements in PCI MNL 117, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture.

O. Discard precast architectural concrete units that are warped, cracked, broken, spalled, stained, or otherwise defective unless repairs are approved by Architect.

P. Fabricate precast architectural concrete units straight and true to size and shape with exposed edges and corners precise and true so each finished panel complies with PCI MNL 117 product tolerances as well as position tolerances for cast-in items.

Q. Typical edges: Long edges to be chamfered. Short ends to have 1/16-inch radius. Window sills to have 1/2-inch radiused upper sill.

2.4 FINISHES

A. Finish exposed-face surfaces of precast architectural concrete units to match approved design reference sample and as follows:

1. PCI and APA's "Architectural Precast Concrete--Color and Texture Selection Guide," of plate numbers indicated.
2. Etched Smooth-Surface Finish: Free of pockets, sand streaks, and honeycombs, with uniform color and texture.

B. Finish exposed top, bottom and back surfaces of precast architectural concrete

units to match face-surface finish.

2.5 SOURCE QUALITY CONTROL

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install precast architectural concrete. Provide temporary supports and bracing as required to maintain position, stability, and alignment as units are being permanently connected.

1. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.

B. Anchor precast architectural concrete units in position by bolting, welding, grouting, or as otherwise indicated.

C. Welding: Perform welding in compliance with AWS D1.1 and AWS D1.4, with qualified welders.

1. Repair damaged steel surfaces by cleaning and applying a coat of galvanized repair paint to galvanized and repriming damaged painted surfaces.

D. Install precast architectural concrete units level, plumb, square, true, and in alignment without exceeding the noncumulative erection tolerances of PCI MNL 117, Appendix I.

E. Repair exposed exterior surfaces of precast architectural concrete units to match color, texture, and uniformity of surrounding precast architectural concrete if permitted by Architect.

F. Clean exposed surfaces of precast concrete units after erection to remove weld marks, other markings, dirt, and stains.

END OF SECTION 03450

SECTION 04810 - UNIT MASONRY ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes unit masonry assemblies consisting of the following:

1. Concrete masonry units (CMUs).
2. Decorative concrete masonry units.
3. Face brick.
4. Motar and grout.
5. Reinforcement.
6. Ties and anchors.
7. Embedded flashing.
8. Masonry accessories.

C. See Division 7 Section "Sheet Metal Flashing and Trim for exposed sheet metal flashing.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For reinforcing steel. Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.

C. Samples for each type and color of exposed masonry units.

D. Material Certificates: For each type of product indicated. Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards.

1. For masonry units include material test reports substantiating compliance with requirements.

E. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1.3 PROJECT CONDITIONS

A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 COLORS, TEXTURES, AND PATTERNS

A. Concrete Masonry Units:
Split face block: 1200 & 400 series. Color as shown on the elevations
Smooth face block: 1200 & 800 series. Color as shown on the elevations.

B. Face Brick: 4"D x 8"W x 2 ½"H nominal size. Color as shown on the drawings.

C. Motar and Grout: As selected by Architect for all masonry.

D. Masonry Joint Sealant and Caulking: As selected by Architect for all masonry.

2.2 CONCRETE MASONRY UNITS (CMUS)

A. Concrete Masonry Units: ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2150 psi (14.8 MPa).
2. Integral waterproofing
3. Weight Classification: Normal weight.
4. Pattern and Texture for Decorative Units:

    a. Standard pattern, smooth-face finish.
    b. Standard pattern, split-face finish.

2.3 FACE BRICK

A. General: Provide shapes indicated and as follows:

1. For applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
2. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

B. Face Brick: ASTM C 216.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3000 psi (20.7 MPa).
2. Initial Rate of Absorption: Less than 30 g/30 sq. in. (30 g/194 sq. cm) per

minute when tested per ASTM C 67.

3. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."

2.4 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction.

B. Hydrated Lime: ASTM C 207, Type S.

C. Masonry Cement: ASTM C 91.

D. Aggregate for Mortar: ASTM C 144.

E. Aggregate for Grout: ASTM C 404.

2.5 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60 (Grade 420).

B. Masonry Joint Reinforcement: ASTM A 951; mill galvanized, carbon-steel wire for interior walls and hot-dip galvanized, carbon-steel wire for exterior walls.

1. Wire Size for Side Rods: W1.7 or 0.148-inch (3.8-mm) diameter.
2. Wire Size for Cross Rods: W2.8 or 0.188-inch (4.8-mm) diameter.
3. Wire Size for Veneer Ties: W1.7 or 0.148-inch (3.8-mm) diameter.
4. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches (407 mm) o.c.
5. Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.
6. Multiwythe Masonry:

    a. Adjustable (two-piece) type, with one side rod at each face shell of backing wythe and with ties that extend into facing wythe. Ties engage eyes or slots in reinforcement and extend at least halfway through facing wythe but with at least 5/8-inch (16-mm) cover on outside face. Ties have hooks or clips to engage a continuous wire in the facing wythe.

7. Veneers Anchored with Masonry-Veneer Anchors: Single 0.188-inch (4.8-mm-) diameter, hot-dip galvanized, carbon-steel continuous wire.

2.6 TIES AND ANCHORS

A. Materials:

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 153/A 153M, Class B-2 coating.
2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, hot-dip galvanized after fabrication to comply with ASTM A 153/A 153M.
3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch (16-mm) cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches (50 mm) parallel to face of veneer.

C. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches (100 mm) wide.

1. Wire: Fabricate from 3/16-inch (4.8-mm-) diameter, hot-dip galvanized steel wire.

D. Partition Top anchors: 0.097-inch (2.5-mm-) thick metal plate with 3/8-inch (10-mm-) diameter metal rod 6 inches (150 mm) long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.

E. Rigid Anchors: Fabricate from steel bars 1-1/2 inches (38 mm) wide by 1/4 inch (6.4 mm) thick by 24 inches (600 mm) long, with ends turned up 2 inches (50 mm) or with cross pins.

1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.

F. Adjustable Masonry-Veneer Anchors

1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:

a. Structural Performance Characteristics: Capable of withstanding a 100-lbf (445-N) load in both tension and compression without deforming or developing play in excess of 0.05 inch (1.3 mm).

2. Masonry-Veneer Anchors: Units consisting of a metal anchor section and a connector section designed to engage a continuous wire embedded in the veneer mortar joint.

a. Anchor Section: Rib-stiffened, sheet metal plate with screw holes top and bottom, and slotted holes for inserting connector section.
b. Connector Section: Rib-stiffened, sheet metal bent plate; sheet metal clip; or wire tie and rigid extruded vinyl clip designed to engage continuous wire. Size connector to extend at least halfway through veneer but with at least 5/8-inch (16-mm) cover on outside face.

c. Fabricate sheet metal anchor sections and other sheet metal parts from 0.067-inch (1.7-mm-) thick, stainless-steel sheet.
d. Fabricate wire connector sections from 0.188-inch (4.8-mm-) diameter, stainless-steel.

2.7 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing, where flashing is exposed or partly exposed and where indicated, complying with Division 7 Section "Sheet Metal Flashing and Trim."

1. Metal Drip Edges: Fabricate from stainless steel. Extend at least 3 inches (75 mm) into wall and 1/2 inch (13 mm) out from wall, with outer edge bent down 30 degrees and hemmed.
2. Metal Flashing Terminations: Fabricate from stainless steel. Extend at least 3 inches (75 mm) into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch (19 mm) and down into joint 3/8 inch (10 mm) to form a stop for retaining sealant backer rod.

B. Flexible Flashing: For flashing not exposed to the exterior, use the following, unless otherwise indicated:

1. Copper-Laminated Flashing: 5-oz./sq. ft. (1.5-kg/sq. m) copper sheet bonded with asphalt between 2 layers of glass-fiber cloth.

C. Sealants for Sheet Metal Flashings: As specified in Division 7 Section "Sheet Metal Flashing and Trim."

D. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer.

2.8 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; formulated from neopreneurethane or PVC.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall.

C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

D. Weep/Vent Products: Use the following, unless otherwise indicated:

1. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-

resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch (3 mm) less than depth of outer wythe, in color selected from manufacturer's standard.

a. Available Products:

1) Advanced Building Products Inc.; Mortar Maze weep vent.
2) Dayton Superior Corporation, Dur-O-Wal Division; Cell Vents.
3) Heckmann Building Products Inc.; No. 85 Cell Vent.
4) Hohmann & Barnard, Inc.; Quadro-Vent.
5) Wire-Bond; Cell Vent.

E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.

1. Provide one of the following configurations:

a. Strips, full-depth of cavity and 10 inches (250 mm) wide, with dovetail shaped notches 7 inches (175 mm) deep.
b. Sheets or strips full depth of cavity and installed to full height of cavity.

2. Available Products:

a. Advanced Building Products Inc.; Mortar Break.
b. Archovations, Inc.; CavClear Masonry Mat.
c. Dayton Superior Corporation, Dur-O-Wal Division; Polytite MortarStop.
d. Mortar Net USA, Ltd.; Mortar Net.

2.9 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains from new masonry without damaging masonry. Use product approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

1. Available Manufacturers:

a. Diedrich Technologies, Inc.
b. EaCo Chem, Inc.
c. ProSoCo, Inc.

2.10 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.

2. Limit cementitious materials in mortar for exterior and reinforced masonry to portland cement and lime.
3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification.

1. For masonry below grade or in contact with earth, use Type M.
2. For reinforced masonry, use Type S.
3. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
4. For interior non-load-bearing partitions, Type O may be used instead of Type N.

C. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
2. Provide grout with a slump of 8 to 11 inches (200 to 280 mm) as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Use full-size units without cutting if possible. If cutting is required, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

B. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

C. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

D. Comply with tolerances in ACI 530.1/ASCE 6/TMS 602 and with the following:

1. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet (3 mm in 3

m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.

3.2 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

C. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

D. Fill cores in hollow concrete masonry units with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

3.3 MORTAR BEDDING AND JOINTING

A. Lay hollow brick and concrete masonry units as follows:

1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

3.4 CAVITY WALLS

A. Bond wythes of cavity walls together using one of the following methods:

1. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 2.67 sq. ft. (0.25 sq. m) of wall area spaced not to exceed 16 inches (406 mm) o.c. horizontally and 16 inches (406 mm) o.c. vertically. Stagger ties in alternate courses. Provide

additional ties within 12 inches (305 mm) of openings and space not more than 36 inches (915 mm) apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches (610 mm) o.c. vertically.

2. Masonry Joint Reinforcement: Installed in horizontal mortar joints.

    a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.
    b. Where bed joints of wythes do not align, use adjustable (two-piece) type reinforcement with continuous horizontal wire in facing wythe attached to ties.

3. Masonry Veneer Anchors: Comply with requirements for anchoring masonry veneers.

B. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.

3.5 MASONRY JOINT REINFORCEMENT

A. General: Install in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).

B. Interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

3.6 ANCHORING MASONRY VENEERS

A. Anchor masonry veneers to wall framing with masonry-veneer anchors to comply with the following requirements:

1. Fasten anchors through sheathing to wall framing and to concrete and masonry backup with metal fasteners of type indicated. Use two fasteners.
2. Embed tie sections in masonry joints. Provide not less than 2 inches (50 mm) of air space between back of masonry veneer and face of sheathing.
3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
4. Space anchors as indicated, but not more than 16 inches (406 mm) o.c. vertically and 32 inches (813 mm) o.c. horizontally with not less than 1 anchor for each 2.67 sq. ft. (0.25 sq. m) of wall area. Install additional anchors within 12 inches (305 mm) of openings and at intervals, not exceeding 36 inches (914 mm), around perimeter.

3.7 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.

B. Install flashing as follows, unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing as recommended by flashing manufacturer.
2. At lintels and shelf angles, extend flashing a minimum of 6 inches (150 mm) into masonry at each end. At heads and sills, extend flashing 6 inches (150 mm) at ends and turn up not less than 2 inches (50 mm) to form end dams.
3. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch (13 mm) back from outside face of wall and adhere flexible flashing to top of metal drip edge.

C. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:

1. Use specified weep/vent products to form weep holes.
2. Space weep holes 24 inches (600 mm) o.c., unless otherwise indicated.

D. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in Part 2 "Miscellaneous Masonry Accessories" Article.

E. Install vents in head joints in exterior wythes at spacing indicated. Use specified weep/vent products to form vents.

1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.8 REINFORCED UNIT MASONRY INSTALLATION

A. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.

B. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts

and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than 60 inches (1520 mm).

3.9 CLEANING

A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.
2. Protect adjacent surfaces from contact with cleaner.
3. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
4. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

3.10 MASONRY WASTE DISPOSAL

A. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.

1. Do not dispose of masonry waste as fill within 18 inches (450 mm) of finished grade.
2. Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04810

04860 – STONE VENEER ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes stone veneer assemblies consisting of the following:

1. Exterior granite stone veneer panels.
2. Motar, grout and anchors.
3. Cementitious backer units.
4. Embedded flashing.

B. See Division 4 Section "Unit Masonry Assemblies" for concrete masonry units and face brick veneer assemblies.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Stone Samples: For each color, grade, finish, and variety of stone required.

C. Qualification Data: For Installer.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: An installer who employs experienced stone masons and stone fitters who are skilled in installing stone veneer assemblies similar in material, design, and extent to those indicated for this Project and whose projects have a record of successful in-service performance.

1.4 PROJECT CONDITIONS

A. Protection of Stone Veneer Assemblies: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work.

B. Stain Prevention: Immediately remove mortar and soil to prevent them from staining the face of stone veneer assemblies.

C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried.

D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 STONE

A. Granite Building Stone Standard: ASTM C 615.

B. Finish: Granite stone veneer panels to have a "Thermal finish", to be uniform across the piece and uniform for all granite veneer pieces in the project.

C. Color: Granite stone veneer panels color to be "Stanstead Gray" (gray and white) color to be uniform across the piece and uniform for all granite veneer pieces in the project.

2.2 MORTAR AND GROUT MATERIALS

A. Products: Subject to compliance with requirements, provide products by the following:

1. LATICRETE International Inc. or approved equal by Architect.

B. Latex-Portland Cement Mortar: ANSI A118.4.

C. Polymer-Modified Grout: ANSI A118.7, color as selected by Architect from manufacturers standard offering

D. Epoxy Adhesive: ANSI A118.3, with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

E. Water: Potable.

2.3 MISCELLANEOUS MATERIALS

A. Cementitious Backer Units: ANSI A118.9 in maximum lengths available to minimize end-to-end butt joints.

1. Thickness: 1/2 inch.
2. Products: Subject to compliance with requirements, provide products by the following:

a. Custom Building Products; Wonderboard or approved equal by Architect.

2.4 VENEER ANCHORS

A. Materials:

1. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304.
2. Stainless-Steel Sheet: ASTM A 666, Type 304.

B. Adjustable Veneer Anchors: 2-piece assemblies that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to wall, for attachment over sheathing to wood studs, and that are capable of withstanding a 100-lbf load in both tension and compression without deforming or developing play in excess of 0.05 inch.

1. Veneer Anchors: Units with rib-stiffened, sheet metal anchor section with screw holes top and bottom and with raised rib-stiffened strap stamped into center to provide a slot for a connector section designed to engage continuous wire embedded in the veneer mortar joint.

2.5 STONE FABRICATION

A. General: Fabricate stone panels in sizes and shapes necessary to comply with requirements indicated, including details on Drawings.

B. Finish exposed faces and edges of stone to comply with requirements indicated.

PART 3 - EXECUTION

3.1 SETTING OF STONE VENEER, GENERAL

A. Accurately mark stud centerlines on face of building paper or building wrap before beginning stone installation.

B. Perform necessary field cutting as stone is set. Use power saws to cut stone. Cut lines straight and true, with edges eased slightly to prevent snipping.

C. Install embedded flashing at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.

3.2 CONSTRUCTION TOLERANCES

A. Variation from Plumb: For vertical lines and surfaces, do not exceed 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch in 40 feet or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 1/4 inch in 20 feet or 1/2 inch in 40 feet or more.

B. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets,

horizontal grooves, and other conspicuous lines, do not exceed 1/4 inch in 20 feet or 1/2 inch in 40 feet or more.

C. Variation of Linear Building Line: For position shown in plan, do not exceed 1/2 inch in 20 feet or 3/4 inch in 40 feet or more.

3.3 INSTALLATION OF ANCHORED STONE VENEER ASSEMBLIES

A. Anchor stone veneer to framing with veneer anchors as follows:

1. Fasten each anchor section through sheathing to framing with two screws.
2. Embed connector section in mortar joints to within 1-1/2 inches of face.

B. Space veneer anchors not more than 18 inches o.c. vertically and 32 inches o.c. horizontally, with not less than 1 veneer anchor per 2.67 sq. ft. of wall area. Install additional veneer anchors within 12 inches of openings, sealant joints, and perimeter at intervals not exceeding 12 inches.

C. Set stone in full bed of mortar/adhesive with full head joints, unless otherwise indicated. Build veneer anchors into mortar joints as stone is set.

3.4 POINTING

A. Prepare stone-joint surfaces for pointing with mortar by removing dust and mortar particles. Where setting mortar was removed to depths greater than surrounding areas, apply pointing mortar in layers not more than 3/8 inch deep until a uniform depth is formed.

B. Point stone joints by placing and compacting pointing mortar in layers not more than 3/8 inch deep. Compact each layer thoroughly and allow to become thumbprint hard before applying next layer.

C. Tool joints, when pointing mortar is thumbprint hard, with a smooth jointing tool to produce the following joint profile:

1. Joint Profile: Concave.

3.5 ADJUSTING AND CLEANING

A. In-Progress Cleaning: Clean stone veneer assemblies as work progresses. Remove mortar fins and smears before tooling joints.

B. Final Cleaning: After mortar is thoroughly set and cured, clean stone veneer assemblies as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.

2. Test cleaning methods on mockup; leave one-half of panel uncleaned for comparison purposes.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner.
4. Wet wall surfaces with water before applying cleaner; remove cleaner promptly by rinsing thoroughly with clear water.
6. Clean stone veneer assemblies with proprietary acidic cleaner applied according to manufacturer's written instructions.

3.6 EXCESS MATERIALS AND WASTE

A. Disposal as Fill Material: Dispose of clean masonry waste, including mortar and excess or soil-contaminated sand, by crushing and mixing with fill material as fill is placed.

1. Do not dispose of masonry waste as fill within 18 inches of finished grade.

END OF SECTION 04860

SECTION 05120 STRUCTURAL STEEL

PART 4 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Structural steel.
2. Grout.

B. Related Sections include the following:

1. Division 1 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.
2. Division 9 painting Sections for surface preparation and priming requirements.

1.3 DEFINITIONS

A. Structural Steel: Elements of structural-steel frame, as classified by AISC's "Code of Standard Practice for Steel Buildings and Bridges," that support design loads.

1.4 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand ASD-service loads indicated and comply with other information and restrictions indicated.

1. Select and complete connections using schematic details indicated and AISC's "Manual of Steel Construction, Allowable Stress Design," Part 4.
2. Engineering Responsibility: Fabricator's responsibilities include using a qualified professional engineer to prepare structural analysis data for structural-steel connections.

B. Construction: Type 2, simple framing.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication of structural-steel components. Provide two prints and one reproducible of each shop drawing. Do not fabricate steel prior to approval of shop drawings.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
5. For structural-steel connections indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer licensed in the state of Maine responsible for their preparation.

C. Welding certificates: Provide certificates showing current AWS certification for individuals performing shop welds or field welds.

D. Qualification Data: For Installer, fabricator, and professional engineer.

E. Mill Test Reports: Signed by manufacturers certifying that the following products comply with requirements:

1. Structural steel including chemical and physical properties.
2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
3. Direct-tension indicators.
4. Tension-control, high-strength bolt-nut-washer assemblies.
5. Shear stud connectors.
6. Shop primers.
7. Nonshrink grout.

F. Source quality-control test reports.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector.

B. Fabricator Qualifications: A qualified fabricator who participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant for Complex Steel Building Structures.

C. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."

D. Comply with applicable provisions of the following specifications and documents:

1. AISC's "Code of Standard Practice for Steel Buildings and Bridges."
2. AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."
3. AISC's "Specification for the Design of Steel Hollow Structural Sections."
4. AISC's "Specification for Allowable Stress Design of Single-Angle Members."
5. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from erosion and deterioration.

1. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.
2. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.8 COORDINATION

A. Furnish anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 5 - PRODUCTS

1.1 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A 992/A 992M, ASTM A 572/A 572M, Grade 50 (345), Fy=50 ksi.

B. Channels, Angles, M, S-Shapes: ASTM A 36/A 36M, ASTM A 572/A 572M, Grade 50 (345).

C. Plate and Bar: ASTM A 36/A 36M or ASTM A 572/A 572M, Grade 50 (345).

D. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, C structural tubing, Fy=46 ksi.

E. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.

1. Weight Class: Standard (unless noted otherwise)
2. Finish: Black, except where indicated to be galvanized.

F. Welding Electrodes: Comply with AWS requirements.

1.2 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts; ASTM A 563 (ASTM A 563M) heavy hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M) hardened carbon-steel washers.

1. Finish: Plain.

B. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy hex, round head steel structural bolts with splined ends; ASTM A 563 (ASTM A 563M) heavy hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M) hardened carbon-steel washers.

1. Finish: Plain.

C. Headed Anchor Rods: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6), straight.

1. Nuts: ASTM A 563 (ASTM A 563M) heavy hex carbon steel.
2. Plate Washers: ASTM A 36/A 36M carbon steel.
3. Washers: ASTM F 436 (ASTM F 436M) hardened carbon steel.
4. Finish: Mechanically deposited zinc coating, ASTM B 695, Class 50.

D. Clevises, Turnbuckles: ASTM A 108, Grade 1035, cold-finished carbon steel.

E. Eye Bolts and Nuts: ASTM A 108, Grade 1030, cold-finished carbon steel.

F. Sleeve Nuts: ASTM A 108, Grade 1018, cold-finished carbon steel.

1.3 PRIMER

A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer.

B. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20; ASTM A 780.

1.4 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to

consistency suitable for application and a 30-minute working time. Compressive strength shall equal or exceed 5000 psi.

1.5 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC's "Specification for Structural Steel Buildings—Load and Resistance Factor Design," except where drawings indicate more restrictive tolerance requirements.

1. Camber structural-steel members where indicated.
2. Identify high-strength structural steel according to ASTM A 6/ A 6M and maintain markings until structural steel has been erected.
3. Mark and match-mark materials for field assembly.
4. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.

C. Bolt Holes: Drill, or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Steel Wall-Opening Framing: Select true and straight members for fabricating steel wall-opening framing to be attached to structural steel. Straighten as required to provide uniform, square, and true members in completed wall framing.

F. Holes: Provide holes required for securing other work to structural steel and for passage of other work through steel framing members.

1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
2. Base-Plate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

1.6 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Pretensioned

B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.

1.7 SHOP PRIMING

A. Shop prime steel surfaces except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
2. Surfaces to be field welded.
3. Surfaces to be high-strength bolted with slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials.
5. Galvanized surfaces.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:

1. SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1.8 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/ A 123M.

1. Fill vent holes and grind smooth after galvanizing.
2. Galvanize anchor bolts to be used for future construction.

1.9 SOURCE QUALITY CONTROL

A. Unless certified by AISC, owner may engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.

1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. Bolted Connections: Shop-bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1 and the following inspection procedures, at testing agency's option:

1. Liquid Penetrant Inspection: ASTM E 165.
2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
3. Ultrasonic Inspection: ASTM E 164.
4. Radiographic Inspection: ASTM E 94.

PART 6 - EXECUTION

1.1 EXAMINATION

A. Verify elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments, with steel erector present, for compliance with requirements.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

1.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.

1.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."

B. Base and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting base and leveling plates. Clean bottom surface of base and leveling plates.

1. Set base and leveling plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of base plate.

3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or leveling plate before packing with grout.
4. Promptly pack grout solidly between bearing surfaces and base or leveling plates so no voids remain. Pockets in concrete piers containing steel shear lugs below base plates shall be fully grouted so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1.

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

1.4 FIELD CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Pretensioned

B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.

1. Comply with AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design" for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

1.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.

B. Bolted Connections: Shop-bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Welded Connections: Field welds will be visually inspected according to AWS D1.1.

1. In addition to visual inspection, field welds will be tested according to AWS D1.1 and the following inspection procedures, at testing agency's option:

    a. Liquid Penetrant Inspection: ASTM E 165.
    b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
    c. Ultrasonic Inspection: ASTM E 164.
    d. Radiographic Inspection: ASTM E 94.

D. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents. Costs associated with reinspecting or retesting deficient areas will be paid for by the Contractor.

1.6 REPAIRS AND PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists and accessories, leveling plates, and abutting structural steel.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

C. Touchup Painting: Cleaning and touchup painting are specified in Division 9 painting Sections.

END OF SECTION 05120

SECTION 05310 STEEL DECK

PART 7 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Composite form deck.

B. Related Sections include the following:

1. Division 3 Section "Cast-in-Place Concrete" for concrete fill and reinforcing steel.
2. Division 9 Section "Painting" for repair painting of painted deck.

1.3 SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, deck openings, special jointing, accessories, and attachments to other construction.

C. Product Certificates: Signed by steel deck manufacturers certifying that products furnished comply with requirements.

D. Welding Certificates: Copies of certificates for welding procedures and personnel.

E. Product Test Reports: From a qualified testing agency indicating that each of the following complies with requirements, based on comprehensive testing of current products:

1. Mechanical fasteners.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed steel deck similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

C. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

D. AISI Specifications: Calculate structural characteristics of steel deck according to AISI's "Specification for the Design of Cold-Formed Steel Structural Members."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 8 - PRODUCTS

1.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Steel Deck:

a. BHP Steel Building Products USA Inc.
b. Consolidated Systems, Inc.
c. Epic Metals Corp.
d. Marlyn Steel Products, Inc.
e. Nucor Corp.; Vulcraft Div.
f. Roof Deck, Inc.
g. United Steel Deck, Inc.
h. Verco Manufacturing Co.
i. Wheeling Corrugating Co.; Div. of Wheeling-Pittsburgh Steel Corp.

2. Cellular Floor Deck with Electrical Distribution

a. BHP Steel Building Products USA Inc.
b. Centria.
c. Consolidated Systems, Inc.
d. United Steel Deck, Inc.
e. Walker Systems, Inc.; Div. of Wiremold, Inc.

2.3 COMPOSITE FORM DECK

A. Composite Steel Form Deck: Fabricate ribbed-steel sheet composite deck panels to comply with "SDI Specifications and Commentary for Noncomposite Steel Form Deck," in SDI Publication No. 29, the minimum section properties indicated, and the following:

1. Prime-Painted Steel Sheet: ASTM A 611, top and bottom surface shop primed with gray or white baked-on, lead- and chromate-free rust-inhibitive primer complying with performance requirements of FS TT-P-664.
2. Profile Depth: 2.0 inch.
3. Design Uncoated-Steel Thickness: 0.0359 inch.
4. Span Condition: Triple span or more.
5. Side Laps: Overlapped

2.4 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 (4.8 mm) minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), not less than 0.0359-inch (0.91-mm) design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Steel Sheet Accessories: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.

G. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 29 for overhang and slab depth.

H. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.

I. Flat Sump Plate: Single-piece steel sheet, 0.0747 inch (1.90 mm) thick, of same material and finish as deck. For drains, cut holes in the field.

J. Repair Paint: Lead- and chromate-free rust-inhibitive primer complying with performance requirements of FS TT-P-664.

PART 9 - EXECUTION

1.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

1.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 29, manufacturer's written instructions, and requirements in this Section.

B. Install temporary shoring before placing deck panels, if required to meet deflection limitations.

C. Locate decking bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to decking.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of decking, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

I. Provide and install additional deck supports at unsupported deck edges where necessary.

1.3 FLOOR DECK INSTALLATION

A. Fasten floor deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:

1. Weld Diameter: 5/8 inch (16 mm), nominal.
2. Weld Spacing: Space and locate welds as indicated.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of 1/2 of the span or 24 inches on center and as follows:

1. Mechanically fasten with self-drilling No. 10 (4.8-mm-) diameter or larger carbon-steel screws.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm), with end joints as follows:

1. End Joints: Lapped or butted at Contractor's option.

D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations, unless otherwise indicated.

E. Floor Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of decking. Weld cover plates at changes in direction of floor deck panels, unless otherwise indicated.

1.4 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing agency to perform field quality-control testing.

B. Field welds will be subject to inspection.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace work that does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

1.5 REPAIRS AND PROTECTION

A. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.

1. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
2. Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Division 9 Section.

B. Repair Painting: Wire brushing, cleaning and repair painting of rust spots, welds, and abraded areas of both deck surfaces are included in Division 9 Section.

C. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05310

SECTION 05500 - METAL FABRICATIONS

PART 10 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
1. Steel framing and supports for mechanical and electrical equipment.
2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
3. Loose Lintels
4. Shelf angles.
5. Loose bearing and leveling plates.
6. Steel weld plates and angles for casting into concrete not specified in other Sections.
7. Metal bollards.
8. Metal floor plate and supports.
9. Elevator pit ladder.

B. Products furnished, but not installed, under this Section include the following:

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.

C. Related Sections include the following:

1. Division 3 Section "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, wedge-type inserts and other items indicated to be cast into concrete.
2. Division 4 Section "Unit Masonry Assemblies" for installing loose lintels, anchor bolts, and other items indicated to be built into unit masonry.
3. Division 5 Section "Structural Steel."

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance of Ladders: Provide ladders capable of withstanding the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

B. Shop Drawings: Show fabrication and installation details for metal fabrications.

1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
2. Provide templates for anchors and bolts specified for installation under other Sections.
3. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Mill Certificates: Signed by manufacturers of stainless-steel sheet certifying that products furnished comply with requirements.

D. Welding certificates.

1.4 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."
2. AWS D1.3, "Structural Welding Code--Sheet Steel."

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
2. Provide allowance for trimming and fitting at site.

1.6 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

B. Coordinate installation of steel weld plates and angles for casting into concrete that are specified in this Section but required for work of another Section. Deliver such items to Project site in time for installation.

PART 11 - PRODUCTS

1.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
2. Products: Subject to compliance with requirements, provide one of the products specified.
3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

1.2 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

1.3 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

C. Rolled-Stainless-Steel Floor Plate: ASTM A 793.

D. Steel Tubing: ASTM A 500, cold-formed steel tubing.

E. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

1.4 FASTENERS

A. General: Unless otherwise indicated, provide Type **[316]** stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Provide stainless-steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.

C. High Strength Anchor Rods: ASTM F 1554, Grade 105 ksi.

D. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

1.5 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Shop Primers: Provide primers that comply with Division 9

C. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79.

1. Use primer with a VOC content of [**420 g/L (3.5 lb/gal.)**] or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

D. Zinc-Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.

1. Use primer with a VOC content of 420 g/L (3.5 lb/gal.) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Products:

a. Benjamin Moore & Co.; Epoxy Zinc-Rich Primer CM18/19.
b. Carboline Company; Carbozinc 621.
c. ICI Devoe Coatings; Catha-Coat 313.
d. International Coatings Limited; Interzinc 315 Epoxy Zinc-Rich Primer.
e. PPG Architectural Finishes, Inc.; Aquapon Zinc-Rich Primer 97-670.
f. Sherwin-Williams Company (The); Corothane I GalvaPac Zinc Primer.
g. Tnemec Company, Inc.; Tneme-Zinc 90-97.

E. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

G. Nonshrink, Metallic Grout: Factory-packaged, ferrous-aggregate grout complying with ASTM C 1107, specifically recommended by manufacturer for heavy-duty loading applications.

H. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

I. Concrete Materials and Properties: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa), unless otherwise indicated.

1.6 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work true to line and level with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts, unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

1.7 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.

1. Fabricate units from slotted channel framing where indicated.
2. Furnish inserts if units are installed after concrete is placed.

C. Galvanize miscellaneous framing and supports where indicated.

D. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

1.8 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Weld adjoining members together to form a single unit where indicated.

B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span but not less than 8 inches (200 mm), unless otherwise indicated.

C. Galvanize loose steel lintels located in exterior walls.

D. Prime loose steel lintels located in exterior walls with zinc-rich primer.

1.9 SHELF ANGLES

A. Fabricate shelf angles from steel angles of sizes indicated.

1. Provide mitered and welded units at corners.
2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches (50 mm) larger than expansion or control joint.

B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.

C. Galvanize shelf angles located in exterior walls.

D. Prime shelf angles located in exterior walls with zinc-rich primer.

E. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

1.10 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Galvanize plates after fabrication.

C. Prime plates with zinc-rich primer.

1.11 STEEL WELD PLATES AND ANGLES

1. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with not less than two integrally welded steel strap anchors for embedding in concrete.

1.12 METAL BOLLARDS

A. Fabricate metal bollards from Schedule 40 steel pipe

1. Cap bollards with 1/4-inch- (6.4-mm-) thick steel plate.
2. Where bollards are indicated to receive push-button controls for door operators, provide necessary cutouts for push-button controls and hole for wire.

B. Fabricate bollards with 3/8-inch- (9.5-mm-) thick steel baseplates for bolting to concrete slab. Drill baseplates at all 4 corners for 3/4-inch (19-mm) anchor bolts.

1. Where bollards are to be anchored to sloping concrete slabs, angle baseplates for plumb alignment of bollards.

C. Fabricate sleeves for bollard anchorage from steel pipe with 1/4-inch- (6.4-mm-) thick steel plate welded to bottom of sleeve. Make sleeves not less than 8 inches (200 mm) deep and 3/4 inch (19 mm) larger than OD of bollard.

D. Fabricate internal sleeves for removable bollards from Schedule 40 steel pipe or 1/4-inch (6.4-mm) wall-thickness steel tubing with an OD approximately 1/16 inch (1.5 mm) less than ID of bollards. Match drill sleeve and bollard for 3/4 inch (19 mm) steel machine bolt.

1.13 PIPE GUARDS

A. Fabricate pipe guards from 3/8-inch- (9.5-mm-) thick by 12-inch- (300-mm-) wide steel plate, bent to fit flat against the wall or column at both ends and to fit around pipe with 2-inch (50-mm) clearance between pipe and pipe guard. Drill each end for two 3/4-inch (19-mm) anchor bolts.

B. Galvanize pipe guards after fabrication.

1.14 METAL FLOOR PLATE

A. Fabricate from rolled-steel floor plate of thickness indicated below:

1. As indicated.

B. Provide angle supports as indicated.

C. Provide flush bar drop handles for lifting removable sections, one at each end of each section.

PART 12 - EXECUTION

1.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction.

Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

1.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Anchor supports for operable partitions securely to and rigidly brace from building structure.

C. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.

1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.

D. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article.

1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

1.3 INSTALLING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.

1. Use nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations, unless otherwise indicated.
2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

1.4 INSTALLING METAL BOLLARDS

A. Anchor bollards to existing construction with [**expansion anchors**] [**anchor bolts**] [**through bolts**]. Provide four 3/4-inch (19-mm) bolts at each bollard, unless otherwise indicated.

1. Embed anchor bolts at least 4 inches (100 mm) in concrete.

B. Anchor bollards in concrete [**with pipe sleeves preset and anchored into concrete**] [**in formed or core-drilled holes not less than 8 inches (200 mm) deep and 3/4 inch (19 mm) larger than OD of bollard**]. Fill annular space around bollard solidly with nonshrink, nonmetallic grout; mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch (3 mm) toward bollard.

C. Anchor bollards in place with concrete footings. Center and align bollards in holes 3 inches (75 mm) above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.

D. Anchor internal sleeves for removable bollards in [**concrete by inserting into pipe sleeves preset into concrete**] [**formed or core-drilled holes not less than 8 inches (200 mm) deep and 3/4 inch (19 mm) larger than OD of sleeve**]. Fill annular space around internal sleeves solidly with nonshrink, nonmetallic grout; mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch (3 mm) toward internal sleeve.

E. Anchor internal sleeves for removable bollards in place with concrete footings. Center and align sleeves in holes 3 inches (75 mm) above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace sleeves in position until concrete has cured.

F. Place removable bollards over internal sleeves and secure with 3/4-inch (19-mm) machine bolts and nuts. After tightening nuts, drill holes in bolts for inserting padlocks. Owner will furnish padlocks.

G. Fill bollards solidly with concrete, mounding top surface to shed water.

1. Do not fill removable bollards with concrete.

1.5 INSTALLING PIPE GUARDS

A. Provide pipe guards at exposed vertical pipes in parking garage where not protected by curbs or other barriers. Install by bolting to wall or column with expansion anchors. Provide four 3/4-inch (19-mm) bolts at each pipe guard. Mount pipe guards with top edge 26 inches (660 mm) above driving surface.

1.6 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 painting Sections.

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05500

SECTION 05521 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Steel pipe railings.
2. Architectural steel mesh for infill.

B. See Division 9 Section "High-Performance Coatings" for finish coatings on exterior galvanized metal.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide railings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails:

a. Uniform load of 50 lbf/ ft. applied in any direction.
b. Concentrated load of 200 lbf applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Top Rails of Guards:

a. Uniform load of 50 lbf/ ft. applied in any direction.
b. Concentrated load of 200 lbf applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.

3. Infill of Guards:

a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
b. Uniform load of 25 lbf/sq. ft. applied horizontally.
c. Infill load and other loads need not be assumed to act concurrently.

B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.3 SUBMITTALS

A. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by a qualified professional engineer responsible for their preparation.

B. Samples: For each exposed finish required.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Steel Pipe Railings:

a. Pisor Industries, Inc.
b. Sharpe Products.
c. Wagner, R & B, Inc.; a division of the Wagner Companies.
d. Local Fabricators as approved by Architect.

2.2 METALS

A. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.

B. Steel and Iron:

1. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
2. Plates, Shapes, and Bars: ASTM A 36/A 36M.
3. Woven-Wire Mesh: Intermediate-crimp, 2-inch woven-wire mesh, made from 0.135-inch nominal diameter wire complying with ASTM A 510.

2.3 MISCELLANEOUS MATERIALS

A. Fasteners:

1. Steel Railings: Plated steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.

B. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

C. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79.

D. Shop Primer for Galvanized Steel: Zinc-dust, zinc-oxide primer compatible with finish paint systems indicated, and complying with SSPC-Paint 5.

E. Grout and Anchoring Cement: Factory-packaged, nonshrink, nonmetallic grout complying with ASTM C 1107; or water-resistant, nonshrink anchoring cement; recommended by manufacturer for exterior use.

2.4 FABRICATION

A. General: Fabricate railings to comply with design, dimensions, and details indicated, but not less than that required to support structural loads.

B. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

C. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings.

D. Form changes in direction by bending.

E. Form curves by bending in jigs to produce uniform curvature; maintain cross section of member throughout bend without cracking or otherwise deforming exposed surfaces.

F. Close exposed ends of railing members with prefabricated end fittings.

G. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated.

H. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work, unless otherwise indicated.

I. Woven-Wire Mesh Infill Panels: Fabricate infill panels from woven-wire mesh crimped into 1-by-1/2-by-1/8-inch metal channel frames.

2.5 FINISHES

A. Steel and Iron:

1. Galvanized Railings: Hot-dip galvanize indicated railings, after fabrication, to comply with ASTM A 123/A 123M. Provide hot-dip

galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

2. Shop-Primed Galvanized Railings: After galvanizing, clean railings, treat with metallic-phosphate process, and apply primer to comply with SSPC-PA 1.
3. Shop-Primed Steel Finish: Prepare to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning" and apply primer to comply with SSPC-PA 1.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation.

1. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
2. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

B. Anchor posts in concrete by inserting into preset steel pipe sleeves and grouting annular space.

C. Attach handrails to wall with wall brackets.

1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
2. For wood stud partitions, use hanger or lag bolts set into wood backing between studs.

D. Adjusting and Cleaning:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting.
2. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05521

SECTION 06100 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Related Documents: The drawings and the general provisions of the contract, including General and Supplementary Conditions and Division 1 Specification sections apply to work of this section.

B. Examine all other sections of the Specifications for requirements that affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.2 DESCRIPTION OF WORK

A. Work covered by this Section includes the furnishing of all labor, material, equipment and accessories, and the performing of all operations in connection with the wood framing, other carpentry as indicated on the Drawings and/or specified within this Section.

B. The work covered by this Section includes, but is not necessarily limited to, the following:

1. Furnishing and installing all rough carpentry, including miscellaneous grounds, blocking, sills, plates, shoes, shims, and furring, framing, framing anchors, exterior sheathing, and fasteners.
2. Furnishing & installing all exterior roof top screens, including posts, frames, plywood panels.
3. Furnishing and installing plywood wall back up panels and backer boards for telephone and electrical equipment.
4. Drilling concrete and masonry and drilling and tapping of metal work as required for installation of rough carpentry.
5. Any other items of carpentry necessary to complete work properly.

C. Walls and floors may be assembled off site as panelized components. Submit complete shop drawings showing framing layout, connection details, site-applied sheathing details and all other bracing, bearing and framing details necessary for erection and complete construction if panelized construction is used.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Miscellaneous Carpentry - Section 06105.

B. Insulation - Section 07210.

C. Flashing and Sheet Metal - Section 07620.

D. Caulking and Sealants - Section 07920.

E. Glazing - Section 08800.

F. Finish Hardware - Section 08710.

1.4 QUALITY ASSURANCE

A. Codes and Standards:

1. International Building Code (IBC) - 2003
2. AITC Timber Construction Manual - 1994
3. ANSI / AF&PA National Design Specification For Wood Construction - 2003

PART 2 - PRODUCTS

2.1 LUMBER

A. Lumber shall conform to American Softwood Lumber Standard Voluntary Product Standard PS20-70. Lumber shall bear the grade and trademark of the Association under whose rules it is produced and a mark of mill identification.

B. Protect all lumber and keep dry, both in transit and at the job site.

C. All lumber shall be well seasoned and contain not more than 15% moisture content (marked "S-Dry").

D. All two inch, non-pressure treated, nominal framing lumber shall have the following minimum base values, unless otherwise noted:

1. Extreme Fiber Stress in Bending, Fb = 875 psi.
2. Horizontal Shear, Fv = 135 psi.
3. Compression Perpendicular to Grain, FcÁ = 425 psi.
4. Compression Parallel to Grain, Fc = 1150 psi.
5. Tension Parallel to Grain, Ft = 450 psi.
6. Modulus of Elasticity, E = 1,400,000 psi.

E. All two inch, pressure treated, nominal framing lumber shall have the following minimum base values, unless otherwise noted:

1. Extreme Fiber Stress in Bending, Fb = 1650 psi.
2. Horizontal Shear, Fv = 175 psi.
3. Compression Perpendicular to Grain, FcÁ = 565 psi.
4. Compression Parallel to Grain, Fc = 1750 psi.
5. Tension Parallel to Grain, Ft = 900 psi.
6. Modulus of Elasticity, E = 1,700,000 psi.

E. Engineered Wood Products: Provide engineered wood products manufactured by either of the following or approved alternate.

1. TrusJoist/MacMillan.
2. Boise Cascade.

F. Stair Treads: 1-1/4 inch thick engineered wood approved for stair tread use by appropriate building codes.

2.2 PLYWOOD

A. General:

1. Each panel shall be identified with appropriate American Plywood Association grade-trademark, showing panel type, span rating, thickness, veneer grade, species group member, edge detail (where applicable), and exposure grade.
2. Each panel shall meet requirements of U.S. Product Standard PS 1 for Construction and Industrial Plywood, or APA Performance Standards where applicable.
3. Panels shall be square-edged except as noted below for flooring panels.

B. Exposure Classification: All panels shall be APA "Exposure 1" panels, unless noted otherwise on the Drawing Set, or qualified below:

1. In areas of high humidity, or in locations permanently exposed to weather, panels shall be APA "Exterior".
2. "Exposure 2" panels may be used if only moderate construction delays are anticipated.
3. "Interior" grade panels may be used only if the panels will be fully protected from weather, both during and after construction.

C. Finish:

1. Plywood with one face exposed-to-view shall be APA A-D Veneer Grade or better.
2. Plywood which is not exposed to view shall be APA C-D Plugged Grade or better.

D. Sheathing & Sub-floor materials:

Refer to notes on Structural drawing S1.1.

2.3 PRESERVATIVE TREATED LUMBER

A. The following wood members shall be Southern Yellow Pine Treated with CCA to 0.4 #/CF in accordance with AWPA C-18. Wood shall be air dried or kiln-dried to reduce maximum moisture content to 15 percent. Each piece shall bear the AWPA stamp, indicating the plant number, preservative symbol, symbol of standard, date of treatment and moisture content after treatment:

1. Wood sills plates, rough bucks and frames in exterior masonry wall openings.
2. Wall plates and furring in contact with exterior masonry or concrete.
3. Nailers that are set into, or are in contact with, concrete or masonry.
4. Blocking and nailers for roof deck, sub-fascia members, roof cants and saddles.
5. Lumber in contact with the ground, embedded in or in contact with concrete or masonry and all exterior trim.

B. Cut Surfaces: Cut surfaces of preservative-treated materials shall be brush coated with at least two coats of the same preservative used in the pressure treatment.

C. Odors and Compatibility: Treated wood exposed in the final structure shall be free from objectionable odors and shall not be harmful or corrosive to adjacent materials or anchorages.

D. Plywood Backer Panels:

1. Plywood telephone and electrical backer panels, roof framing, and any other wood designated as fire-retardant treated on drawings, shall be pressure-treated with fire-retardant 2 chemicals to achieve a UL FR-S rating, designating a surface-burning characteristics rating of 25 or less for flame-spread, fuel contributed, and smoke developed, per ASTM E 84, in compliance with AWPA C 20 (lumber) and AWPA C 27 (plywood). Each piece shall be dried to a 15-to-19 percent moisture content after treatment.
2. Acceptable products include: Koppers Dricon, Osmose Flame-Proof, and Hoover Pro-Tex.
3. Strength reduction factors used in the design of fire retardant treated wood shall be in accordance with the NFPA "National Design Specification."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Wood Framing:

1. General Requirements:

   a. Wood construction practices shall conform to recommendations of the NFPA "National Design Specification" and the AITC "Timber Construction Manual".
   b. All members are to be installed as shown on the drawings.
   c. When individual members have built-in camber, the members shall be placed with camber up.
   d. No cutting of holes or notches in trusses for pipe, conduit or other reasons will be allowed.
   e. All bearing surfaces shall be horizontal and even over the entire width of support.
   f. Accurately and properly fit and brace all work. Secure in proper position and orientation. Framing, studding and blocking shall be as indicated on the Design Drawings, or as required by the work.
   g. Cooperate with all other trades as required.
   h. Use acoustical sealant along shoe and header of all party walls.

2. Concrete or Masonry Contact: All wood material in contact with concrete or masonry shall be given two coats of green Cuprinol wood preservative. Note: Wood sills shall be pressure treated, not paintable treated.
3. Cutting and Patching: Do all cutting, patching, heading and blocking required for work of all trades. Notify Telephone Company to place jacks at rough-in stages.
4. Blocking and Supports:

   a. Install 2" nominal blocking in stud partitions for anchoring all cabinets, mirrors, towel bars, grab bars, handrail brackets and other items applied to or in the walls.
   b. Set all blocking required to erect all exterior and interior woodwork, cabinets, plumbing, electrical and mechanical equipment, rough bucks and blocking for roofing work.
   c. Backing Boards: Install 3/4" plywood backer boards for electrical and mechanical trades as required.
   d. Provide pressure-treated blocking at exterior window openings in steel stud walls.

B. Plywood Installation:

1. Plywood sheathing shall be installed with face-grain perpendicular to supports and be continuous over a minimum of two spans.
2. End joints of sheets shall be staggered so that joints are not continuous along a support.
3. When framing members (including walls and roofs) are 24" or more on center, support edges of plywood sheathing perpendicular to and at midpoints between framing with metal "H" clips or solid blocking.

C. Fastening:

1. Fastening shall be as indicated in accordance with Table 2304.9.1 of the 2003 International Building Code unless otherwise noted on the Design Drawings.
2. Framing supported by concrete or masonry shall be anchored with built-in threaded bolts or lags, as indicated on the design drawings. Powder actuated fasteners shall not be substituted, except in the attachment of wall furring strips or connections to structural steel where specified on the structural drawings.
3. Fasteners shall be non-corrosive on exposed and exterior locations.

D. Firestops: Firestops of 2" nominal stock, shall be provided in all concealed spaces not otherwise cut off from passage of air from one space to another.

3.2 CLEAN-UP

A. Keep the premises and working surfaces in a neat, safe, and orderly condition at all times during execution of this portion of the work.

1. At the end of each day, or more often if necessary, remove accumulation of sawdust, cut-ends, and other debris to proper storage areas for disposal.

B. Upon completion of this portion of the work, thoroughly clean up the area.

3.3 ENGINEER'S REVIEW

A. The designated Special Inspector, or his agent, will conduct periodic reviews of the construction for compliance with the provisions of the Specifications and Drawings during the construction period. Regardless of the extent and timing of these periodic reviews, the contractor is solely responsible for establishing and maintaining his own quality control verification program to ensure compliance with the contract documents.

B. The General Contractor shall employ a licensed professional engineer to analyze and design modifications and repairs for construction not in conformance with the provisions of the Contract Documents. These modifications and repair details shall be stamped by an engineer licensed to practice in the State of Maine and submitted with calculations for approval by the Engineer of Record. Modifications shall not be made without express written approval.

END OF SECTION 06100

SECTION 06190 - METAL-PLATE-CONNECTED WOOD TRUSSES

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Related Documents: Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 1 Specification sections apply to work of this section.

B. Examine all other sections of the Specifications for requirements that affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.2 DESCRIPTION OF WORK

A. Definition: Metal-Plate-Connected Wood Trusses include planar structural units consisting of metal plate connected members which are fabricated from dimension lumber and which have been cut and assembled prior to delivery to the job site.

B. Types of fabricated wood trusses are indicated on the drawings.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Section 06100 - Rough Carpentry

1.4 QUALITY ASSURANCE

A. TPI Standards: Comply with all requirements and recommendations of the following Truss Plate Institute (TPI) publications:

1. ANSI/TPI 1 1995, "National Design Standard for Metal-Plate-Connected Wood Truss Construction" including Commentary and Appendices
2. TPI DSB-1989, "Recommended Design specification for Temporary Bracing of Metal-Plate-Connected Wood Trusses."
3. TOI HIB-1991, "Commentary and Recommendations for Handling, Installing & Bracing Metal-Plate-Connected Wood Trusses."
4. TPI DSB-89, "Temporary Bracing of Metal-Plate-Connected Wood Trusses."

B. Wood Structural Design Standard: Comply with all requirements and recommendations of the National Forest Products Association's NDS-1991, "National Design Specification for Wood Construction."

C. Lumber Standard: Comply with PS20-70 and with applicable rules of the respective grading inspecting agencies for species and grade of lumber indicated.

D. Connector Plate Manufacturer's Qualifications: Provide truss connector plates manufactured by a Truss Plate Institute member firm

E. Fabricator's Qualifications: Provide trusses by a firm which has a record of successfully fabricating trusses similar to type indicated and participates in the TPI "Quality Control Inspection Program" as a licensee authorized to apply TPI marks to trusses.

F. Uniformity of Manufacture for Connector Plates: Provide metal connector plates from a single manufacturer.

1.5 SUBMITTALS:

A. The Engineer shall receive all submittals a minimum of two weeks prior to the start of fabrication. The Contractor shall have received and approved all submittals prior to review by the Engineer. All review by the Architect, Engineer and Contractor of submittals shall be completed prior to fabrication and installation of any material or product.

B. Product Data: Submit fabricator's technical data covering lumber, metal plates, hardware, fabrication process and treatment (if any).

1. Submit certificate, signed by an officer of fabricating firm, indicating that trusses to be supplied for project comply with indicated requirements.

C. Shop Drawings:

1. General: Submit shop drawings, prepared under the supervision of a professional engineer, showing species, sizes and stress grade of lumber to be used; pitch, span, camber, configuration and spacing for each type of truss required; type, size, material, finish, design value and location of metal connector plates; and bearing and anchorage details.
2. Design: To the extent engineering design considerations are indicated as the Fabricator's responsibility, submit design analysis and test reports indicating loading, section modulus, assembled allowable stress, stress diagrams and calculations and similar information needed for analysis and to ensure that trusses comply with requirements.
3. Engineer Stamp: Provide shop drawings that have been signed and stamped by a structural engineer licensed to practice in the State of

Maine.

4. TPI Approval: All drawing submittals must bear a TPI stamp.

1.6 DELIVERY, STORAGE, HANDLING

A. Handle and store trusses with care, and in accordance with manufacturer's instructions and TPI recommendations to avoid damage from bending, overturning or other cause for which truss is not designed to resist or endure.

B. Time delivery and erection of trusses to avoid extended on-site storage and to avoid delaying work of other trades whose work must follow erection of trusses.

PART 2 - PRODUCTS

2.1 LUMBER

A. General: Factory mark each plate of lumber with type, grade, mill and grading agency.

B. Sizes: Nominal sizes are indicated except as shown by detail dimensions. Provide actual sizes as required by PS20-70 for dressed lumber, S4S, unless otherwise indicated.

C. Moisture Content: Provide seasoned lumber with a maximum moisture content of 19% at time of dressing.

D. Lumber Grade: Lumber members will be graded in accordance with the following grading agency requirements:

1. Eastern Woods: NELMA or NHPMA
2. Western Woods: WWPA
3. Southern Pine: SPIB

2.2 METAL CONNECTOR PLATES, FASTENERS AND ANCHORAGES

A. Connector Plate Material: Use metal not less than "0.036" thick, coated thickness, (Contractor's option if more than one metal indicated).

1. Galvanized Sheet Steel: ASTM A 446, Grade A, Coating G60.
2. Electrolytic Zinc Coated Steel Sheet: ASTM A 591, Coating Class C, with minimum structural quality equivalent to ASTM A 446, Grade A.

2.3 FABRICATION

A. Cut truss members to accurate lengths, angles and sizes to produce close

fitting joints with wood-to-wood bearing in assembled units.

B. Fabricate metal connector plates to size, configuration, thickness and anchorage details required for types of joint designs indicated.

C. Assemble truss members in design configuration indicated using jigs or other means to ensure uniformity and accuracy of assembly with close fitting joints. Position members to produce design camber indicated.

D. Connect truss members by means of metal connector accurately located and securely fastened to wood members by means indicated or approved.

PART 3 - EXECUTION

3.1 GENERAL

A. Erect and brace trusses to comply with the recommendations of the Manufacturer and the TPI publications referenced above.

B. Erect trusses with plane of truss webs vertical (plumb) and parallel to each other, located accurately at design spacings indicated.

C. Hoist units in place by means of lifting equipment suited to sizes and types of trusses required, applied at designated lift points as recommended by fabricator, exercising care not to damage truss members or joints by out-of-plane bending or other causes.

D. Provide temporary bracing as required to maintain trusses plumb, parallel and in location indicated, until permanent bracing is installed.

E. Anchor trusses securely at all bearing points to comply with methods and details indicated.

F. Install permanent bracing and related components to enable trusses to maintain design spacing, withstand live and dead loads including lateral loads, and to comply with other indicated requirements.

G. Do not cut or remove truss members.

3.2 ENGINEER'S REVIEW

A. The Engineer of Record will conduct periodic reviews of the construction for compliance with the provisions of the Specifications and Drawings during the construction period.

B. The General Contractor shall employ a licensed professional engineer to analyze and design modifications and repairs for construction not in conformance with the provisions of the Contract Documents. These

modifications and repair details shall be stamped by an engineer licensed to practice in the State of Maine and submitted with calculations for approval by the Engineer of Record. Modifications shall not be made without express written approval.

END OF SECTION 06190

SECTION 06401 – EXTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Exterior wood balustrades & handrails
2. Exterior decking.
3. Exterior wood/plastic composite screens
4. Wood trim at main entry doors.

1.2 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product.
B. Mock-ups: Balustrades at 1st floor, Balustrades at 4th floor

PART 2 - PRODUCTS

2.1 EXTERIOR DECKS & SCREENS

A. Balustrade framing: 2x framing to exterior balustrades & ground floor terrace screens to be Douglas fir Select Structural Light Framing grade, unless specified otherwise by the structural engineer. Eased edges. Stain grade finish.

B. Balustrade slats: Douglas Fir with eased edges. Size as shown on the drawings. Clear finish.

C. Balustrade handrails: Hardwood "Ipe". Size as detailed. Eased edges. Clear finish.

D. Decks: Decking surface to be Trex "Origins" wood/plastic composite, Size, finish & color as shown on elevations.

C. Rooftop mechanical screens: Slats to be Trex "Origins" wood/plastic composite. Size, finish & color as shown on elevations.

D. Entry Door Trim: Exterior casing & head trim to exterior doors & sidelights at main entry & elevator lobby to be mahogany.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction. All work to be free from tool marks, blemishes.

B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.

C. Hardwood handrails: Ipe - seal all end cuts, immediately after trimming to length, to prevent end checking.

D. Slats: Wood & wood/plastic composite slats to be cut full length, to match balustrade or screen panel width, without intermediate cuts or joints.

E. As a minimum, securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in the 2003 International Building Code.

F Backprime any unpainted work before installation. Color match wood for clear finish at joints for uniform appearance.

END OF SECTION 06401

SECTION 07160 - BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Cold-applied, asphalt emulsion dampproofing.

1.2 SUBMITTALS

A. Product Data: For each type of bituminous dampproofing indicated.

PART 2 - PRODUCTS

2.1 BITUMINOUS DAMPPROOFING

A. Odor Elimination: For interior and concealed-in-wall uses, provide bituminous dampproofing material warranted by manufacturer to be substantially odor free after drying for 24 hours under normal conditions.

B. Cold-Applied, Asphalt Emulsion Dampproofing:

1. Grade: Trowel, ASTM D 1227, Type III or IV.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ChemRex, Inc.; Sonneborn Building Products Div.
b. Euclid Chemical Co.
c. Karnak Chemical Corporation.
d. Koppers Industries, Inc.
e. Meadows, W. R., Inc.

2.2 MISCELLANEOUS MATERIALS

A. Primer: Asphalt primer, ASTM D 41.

B. Glass Fabric: Woven glass fabric treated with asphalt, ASTM D 1668, Type I.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Weather Limitations: Proceed with dampproofing only when existing and forecasted weather conditions will permit work to be performed according to manufacturer's written recommendations and warranty requirements.

B. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has thoroughly cured.

C. Preparation: Clean substrate of projections and substances detrimental to work; comply with written recommendations of prime materials manufacturer.

1. Install cant strips and similar accessories as indicated and as recommended by prime materials manufacturer.
2. Fill voids, seal joints, and apply bond breakers, if any, as recommended by prime materials manufacturer, including at construction joints.
3. Install separate flashings and corner protection stripping, as recommended by prime materials manufacturer and where indicated.
4. Prime substrate as recommended in writing by prime materials manufacturer.

D. Protection of Other Work: Do not allow liquid and mastic compounds to enter and clog drains and conductors. Prevent spillage and migration onto other surfaces of work by masking or otherwise protecting adjoining work.

E. Application: Apply dampproofing to the following surfaces.

1. Where indicated on Drawings.

F. Reinforcement: At changes in plane or where otherwise shown as "reinforced," install lapped course of glass fabric in first coat of dampproofing compound before it thickens.

G. Apply vertical dampproofing down walls from finished-grade line to top of footing, extend over top of footing, and down minimum of 6 inches over outside face of footing. Extend 12 inches onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.

3.3 COLD-APPLIED, ASPHALT EMULSION DAMPPROOFING

A. Trowel Grade: Trowel apply coat of mastic asphalt emulsion dampproofing onto substrate at minimum rate of 7 gal./100 sq. ft., to produce average, dry film thickness of 60 mils but not less than 30 mils at any point.

3.4 PROTECTION AND CLEANING

A. Protect exterior, below-grade dampproofing membrane from damage until backfill is completed. Remove overspray and spilled materials from surfaces not intended to receive dampproofing.

END OF SECTION 07160

SECTION 07161 - MODIFIED CEMENT WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Polymer-modified, cement-based waterproofing.

B. See Division 7 Section "Joint Sealants" for elastomeric sealants in concrete and masonry walls and floors.

C. See Division 9 Section "Painting" for paint finishes to be applied over waterproofing.

1.2 SUBMITTALS

A. Product Data: For each type of product specified.

1.3 QUALITY ASSURANCE

A. Applicator Qualifications: An experienced applicator who has completed modified cement waterproofing similar in material, design, and extent to that indicated for this Project and whose work has resulted in application with a record of successful in-service performance.

1.4 WARRANTY

A. Special Warranty: Written warranty, signed by Applicator and countersigned by Contractor agreeing to repair or replace waterproofing that does not comply with requirements or that fails to perform as required, and to maintain watertight conditions within specified warranty period. Warranty includes responsibility for removing and replacing other work that conceals modified cement waterproofing.

1. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Polymer-Modified, Cement-Based Waterproofing:

    a. Cem-Kote CW; Gemite Products, Inc.
    b. Masterseal 510; Master Builders, Inc.
    c. Blokcoat; Metalcrete Industries.
    d. SikaTop Seal 107; Sika Corporation.
    e. Sonoblock; Sonneborn, Div. of Chemrex, Inc.

2.2 MATERIALS

A. Portland Cement: ASTM C 150, Type I.

B. Slurry-Coat Aggregate: ASTM C 144, sand.

C. Trowel-Coat Aggregate: ASTM C 33, fine aggregate.

D. Water: Potable.

E. Polymer-Modified, Cement-Based Waterproofing: One- or two-component, polymer-modified, cementitious waterproofing compound containing a blend of portland cement, graded aggregates, water-reducing agents, and admixtures for control of set time and shrinkage to produce a waterproofing mortar suitable for vertical or overhead application below or above grade.

1. Cured application shall be breathable and resist positive and negative hydrostatic pressure.
2. Properties of cured waterproofing shall meet or exceed the following:

    a. Compressive Strength: 4000 psi at (27.6 MPa) seven days, or 6000 psi (41.4 MPa) at 28 days when tested according to ASTM C 109/C 109M.
    b. Flexural Strength: 600 psi (4137 kPa) at seven days, or 750 psi (5171 kPa) at 28 days when tested according to ASTM C 348.

PART 3 - EXECUTION

3.1 APPLICATION

A. General: Comply with waterproofing manufacturer's written instructions, unless more stringent requirements are indicated.

B. Mix waterproofing components according to waterproofing manufacturer's written instructions.

C. Protect all adjacent surfaces. Dampen wall surface with water before applying waterproofing.

D. Apply waterproofing to interior, below-grade walls according to waterproofing manufacturer's written instructions.

E. Apply waterproofing coating evenly and fill voids and pores of substrate with waterproofing slurry. Keep tools clean and free from build-up.

F. Apply the number of coats at the rates recommended by the manufacturer for each coat. After allowing previous coat to cure, dampen the wall before applying additional coats.

G. Mist-cure waterproofing for two to three days immediately after application as recommended by the manufacturer.

H. Wet-cure waterproofing when temperatures are above 85 deg F (29 deg C), relative humidity is below 30 percent, wind speed exceeds 15 mph (24 km/h), or waterproofing is exposed to direct sunlight for 72 hours after placement.

I. Waterproofing Treatment Extensions: Apply treatment to columns that are integral with walls to be treated, and extend treatment onto interior, nontreated walls that intersect exterior, treated walls, for a distance of 24 inches (610 mm) for cast-in-place concrete and 48 inches (1219 mm) for masonry. Where floors (but not walls) are treated, extend treatment 12 inches (305 mm) high onto exterior walls and onto both exterior and interior columns. Unless otherwise indicated, extend treatment to every surface of substrate in area indicated for treatment, including stair treads and risers, pipe trenches, pipe chases, pits, sumps, and similar offsets and features.

3.2 PROTECTION

A. Protect applied modified cement waterproofing from rapid drying, severe weather exposure, and water accumulation. Maintain completed Work in moist condition for not less than seven days by covering with impervious sheeting or by other curing procedures recommended by waterproofing manufacturer.

END OF SECTION 07161

SECTION 07190 - WATER REPELLENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes film-forming water-repellent coatings for the following exterior surfaces:

1. Precast concrete units.
2. Concrete masonry units.
3. Stone veneer.

B. See Division 7 Section for "Joint Sealants."

C. See Division 9 painting Section for paints and coatings.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For each type of water repellent and substrate indicated, 12 by 12 inches in size, with specified water-repellent treatment applied to half of each Sample.

C. Manufacturer Certificates: Signed by manufacturers certifying that water repellents comply with requirements.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for assemblies.

E. Warranty: Special warranty specified in this Section.

1.3 QUALITY ASSURANCE

A. Test Application: Apply a finish sample for each type of water repellent and substrate required. Duplicate finish of approved sample.

1. Locate each test application as directed by Architect.
2. Final approval by Architect of water-repellent application will be from test applications.

1.4 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer and Applicator agree(s) to repair or replace materials that fail to maintain water

repellency specified in Part 1 "Performance Requirements" Article within specified warranty period.

1. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 FILM-FORMING WATER REPELLENTS

A. Acrylic, Film-Forming Water Repellent: Clear, breathing coating of acrylic resins; with a water-based, solvent-based, or acrylic emulsion solution containing less than 15 percent solids by volume; and with 3.3 lb/gal. or less of VOCs.

1. Available Products:

a. ChemMasters; Enviropel Methacrylate.
b. Gemite Products, Inc.; Gem-Guard Stain OP.
c. Nox-Crete Products Group; Sparkl-Seal E.
d. Seal-Krete, Inc.; S-K Waterproofer Sealer.
e. Sonneborn Building Products, a division of ChemRex.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrate of substances that might interfere with penetration or performance of water repellents. Test for moisture content, according to water-repellent manufacturer's written instructions, to ensure that surface is dry enough.

B. Protect adjoining work, including sealant bond surfaces, from spillage or blow-over of water repellent. Cover adjoining and nearby surfaces of aluminum and glass if there is the possibility of water repellent being deposited on surfaces. Cover live plants and grass.

C. Coordination with Sealants: Do not apply water repellent until sealants for joints adjacent to surfaces receiving water-repellent treatment have been installed and cured.

1. Water-repellent work may precede sealant application only if sealant adhesion and compatibility have been tested and verified using substrate, water repellent, and sealant materials identical to those used in the work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATION

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect the substrate before application of water repellent and to instruct Applicator on the product and application method to be used.

B. Apply a heavy-saturation spray coating of water repellent on surfaces indicated for treatment using low-pressure spray equipment. Comply with manufacturer's written instructions for using airless spraying procedure, unless otherwise indicated.

3.3 CLEANING

A. Immediately clean water repellent from adjoining surfaces and surfaces soiled or damaged by water-repellent application as work progresses. Repair damage caused by water-repellent application. Comply with manufacturer's written cleaning instructions.

END OF SECTION 07190

SECTION 07210 - BUILDING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Board insulation under slabs-on-grade.
2. Board insulation at foundation wall.
3. Board insulation at cavity wall.
4. Batt insulation at walls and ceilings.
5. Blown-in insulation at attic floors.
6. Insulation baffles at eaves.
7. Vapor retarders.

B. See Division 9 Section "Gypsum Board Assemblies" and "Gypsum Board Shaft-Wall Assemblies" for installation in framed assemblies including sound insulation.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for insulation products.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of building insulation through one source.

B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1. Surface-Burning Characteristics: ASTM E 84.
2. Fire-Resistance Ratings: ASTM E 119.
3. Combustion Characteristics: ASTM E 136.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location.

Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Extruded-Polystyrene Board Insulation:

   a. DiversiFoam Products.
   b. Dow Chemical Company.
   c. Owens Corning.
   d. Tenneco Building Products.

2. Glass-Fiber Batt Insulation:

   a. CertainTeed Corporation.
   b. Johns Manville Corporation.
   c. Knauf Fiber Glass.
   d. Owens Corning.

2.2 INSULATING MATERIALS

A. General: Provide insulating materials that comply with requirements and with referenced standards.

1. Preformed Units: Sizes to fit applications indicated; selected from manufacturer's standard thicknesses, widths, and lengths.

B. Extruded-Polystyrene Board Insulation: ASTM C 578, of type and density indicated below, with maximum flame-spread and smoke-developed indices of 75 and 450, respectively:

1. Type IV, 1.60 lb/cu. ft., unless otherwise indicated.

C. Unfaced Glass-Fiber Batt Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from glass; with maximum flame-spread and smoke-developed indices of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

D. Faced Glass-Fiber Batt Insulation: ASTM C 665, Type III (blankets with reflective membrane facing), Class A (membrane-faced surface with a flame spread of 25 or less); Category 1 (membrane is a vapor barrier), faced with foil-scrim-kraft, foil-scrim, or foil-scrim-polyethylene vapor-retarder membrane on one face; consisting of fibers manufactured from glass.

2.3 BLOWN-IN CELLULOSIC INSULATION

A. Self-Supported, Blown-In Cellulosic Insulation: ASTM C 1149, Type III (materials containing an adhesive mixed with water during application; intended for application on attic floors), chemically treated for flame-resistance, processing, and handling characteristics.

2.4 VAPOR RETARDERS

A. Polyethylene Vapor Retarder: ASTM D 4397, 6 mils thick, with maximum permeance rating of 0.13 perm.

B. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

2.5 AUXILIARY INSULATING MATERIALS

A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.

B. Eave Ventilation Baffles: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide cross ventilation between insulated attic spaces and vented eaves.

2.6 INSULATION FASTENERS

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

1. Adhesively Attached, Spindle-Type Anchors:

    a. AGM Industries, Inc.; Series T TACTOO Insul-Hangers.
    b. Eckel Industries of Canada Limited; Stic-Klip Type N Fasteners.
    c. Gemco; Spindle Type.

2. Anchor Adhesives:

    a. AGM Industries, Inc.; TACTOO Adhesive.
    b. Eckel Industries of Canada Limited; Stic-Klip Type S Adhesive.
    c. Gemco; Tuff Bond Hanger Adhesive.

B. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of thickness indicated securely in position indicated with self-locking washer in place; and complying with the following requirements:

1. Plate: Perforated galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
2. Spindle: Copper-coated, low carbon steel, fully annealed, 0.105 inch in diameter, length to suit depth of insulation indicated.

C. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch thick galvanized steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter.

1. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:

a. Where indicated.

D. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for Sections in which substrates and related work are specified and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances harmful to insulations or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

3.3 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice and snow.

C. Extend insulation in thickness indicated to envelop entire area to be insulated.

Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Water-Piping Coordination: If water piping is located on inside of insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.

E. Apply single layer of insulation to produce thickness indicated, unless multiple layers are otherwise shown or required to make up total thickness.

3.4 INSTALLATION OF PERIMETER AND UNDER-SLAB INSULATION

A. On vertical surfaces, set units in adhesive applied according to manufacturer's written instructions. Use adhesive recommended by insulation manufacturer.

3.5 INSTALLATION OF GENERAL BUILDING INSULATION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Seal joints between closed-cell (nonbreathing) insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.

C. Set vapor-retarder-faced units with vapor retarder to warm side of construction, unless otherwise indicated. Do not obstruct ventilation spaces, except for firestopping.

1. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.

D. Install glass-fiber blankets in cavities formed by framing members according to the following requirements:

1. Use blanket widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
2. Place blankets in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.

E. For wood-framed construction, install glass-fiber blankets according to ASTM C 1320 and as follows:

1. With faced blankets having stapling flanges, secure insulation by inset, stapling flanges to sides of framing members.

F. Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:

1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application indicated.
2. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation below indicated thickness.
3. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.

G. Apply self-supported, blown-in cellulosic insulation according to manufacturer's written instructions. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked. After insulation is applied, make it flush with face of framing by using method recommended by insulation manufacturer.

H. Stuff glass-fiber, loose-fill insulation into miscellaneous voids and cavity spaces where shown. Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft..

3.6 INSTALLATION OF VAPOR RETARDERS

A. General: Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure in place with adhesives or other anchorage system as indicated. Extend vapor retarder to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.

B. Seal vertical joints in vapor retarders over framing by lapping not less than two wall studs. Fasten vapor retarders to framing at top, end, and bottom edges; at perimeter of wall openings; and at lap joints. Space fasteners 16 inches o.c.

C. Firmly attach vapor retarders to substrates with mechanical fasteners or adhesives as recommended by vapor-retarder manufacturer.

D. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarder.

E. Repair any tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarder.

3.7 PROTECTION

A. Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07210

SECTION 07460 - FIBER CEMENT SIDING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Fiber-cement siding and trim.

B. See Division 9 Section "Gypsum Sheathing" for air infiltration barrier.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: Full-size units of each type of product in each color, texture, and pattern required.

PART 2 - PRODUCTS

2.1 FIBER CEMENT SIDING AND TRIM

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cemplank, Inc.
2. CertainTeed Corp.
3. GAF Materials Corporation.
4. James Hardie Inc.

B. Fiber-Cement Siding and Trim Boards: Lap siding and trim boards made from fiber-cement that complies with ASTM C 1186, Type A, Grade II; is classified as noncombustible when tested according to ASTM E 136; and has a flame-spread index of 25 or less when tested according to ASTM E 84.

1. Pattern and Texture:
   Lap siding: 5-inch & 8 inch exposure, smooth finish to the exterior.
   Trim boards: 5/4-inch nominal thick, with 5-inch, 8-inch nominal width except where detailed otherwise. Smooth finish to exterior.
   Panel siding: 5/16-inch thick. Smooth finish to exterior.

2. Factory Priming:
   Manufacturer's standard acrylic primer for field finish painting.

2.4 ACCESSORIES

A. Fiber Cement Siding and Trim Accessories: Provide starter strips, edge trim, corner cap, and other items as recommended by siding and trim manufacturer for building configuration.

1. Provide accessories made from same material as siding and trim, unless otherwise indicated.
2. Provide accessories matching color and texture of siding and trim, unless otherwise indicated.
3. Fasteners: Use fasteners as recommended by siding and trim manufacturer.

a. Fiber Cement Siding: All nailing to be by manufacturers details, with stainless-steel fasteners installed in a uniform pattern.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Coordinate installation with flashings and other adjoining construction to ensure proper sequencing.

B. Comply with siding and trim manufacturer's written installation instructions unless more stringent requirements apply.

END OF SECTION 07460

SECTION 07531 - EPDM MEMBRANE ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes adhered EPDM membrane roofing system to the following areas:

1. Building roof (Refer to Section 07541 Mechanically Attached PVC roofing for Add/Alternate item 1).
2. Decks.
3. Elevator lobby porch canopy.

1.2 SUBMITTALS

A. Product Data: For each product indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other Work.

C. Samples: For each product included in membrane roofing system.

D. Research/evaluation reports.

E. Maintenance data.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's warranty.

B. Source Limitations: Obtain components for membrane roofing system from same manufacturer as roofing membrane.

C. Preinstallation Conference: Conduct conference at Project site.

1.4 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period. Failure includes roof leaks.

1. Warranty Period: Fifteen (15) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 EPDM ROOFING MEMBRANE

A. EPDM Roofing Membrane: ASTM D 4637, Type I, non-reinforced uniform, flexible sheet made from EPDM, and as follows:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Carlisle SynTec Incorporated.
   b. Celotex Corporation.
   c. Firestone Building Products Company.
   d. Johns Manville International, Inc.

2. Thickness: 60 mils nominal.

2.2 AUXILIARY MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing.

B. Sheet Flashing: 60-mil- thick EPDM, partially cured or cured, according to application.

C. Bonding Adhesive: Manufacturer's standard bonding adhesive.

D. Seaming Material: Manufacturer's standard synthetic-rubber polymer primer and 3-inch wide minimum, butyl splice tape with release film.

E. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.

F. Miscellaneous Accessories: Provide lap sealant, water cutoff mastic, metal termination bars, metal battens, pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, in-seam sealants, termination reglets, cover strips, and other accessories.

2.3 SUBSTRATE BOARDS

A. Substrate Board: UL tested fire rated underlayment to be Carlisle "Dens-Deck Prime" glass mat gypsum wall board, 5/8-inch thick.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening substrate panel to roof deck.

2.4 ROOF INSULATION

A. Polyisocyanurate Board Insulation: ASTM C 1289, Type I, Class 1 aluminum foil facer on both major surfaces.

B. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.5 INSULATION ACCESSORIES

A. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.

B. Cold Fluid-Applied Adhesive: Manufacturer's standard cold fluid-applied adhesive formulated to adhere roof insulation to substrate.

PART 3 - EXECUTION

3.1 SUBSTRATE BOARD

A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.

3.2 INSULATION INSTALLATION

A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with membrane roofing system manufacturer's written instructions for installing roof insulation.

C. Install tapered insulation under area of roofing to conform to slopes indicated.

D. Install one or more layers of insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2 inches or greater, install 2 or

more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.

E. Mechanically Fastened and Adhered Insulation: Install each layer of insulation and secure first layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.

1. Fasten first layer of insulation to resist uplift pressure at corners, perimeter, and field of roof.
2. Install subsequent layers of insulation in a cold fluid-applied adhesive.

3.3 ADHERED ROOFING MEMBRANE INSTALLATION

A. Install roofing membrane over area to receive roofing according to membrane roofing system manufacturer's written instructions. Unroll roofing membrane and allow to relax before installing.

B. Accurately align roofing membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

C. Bonding Adhesive: Apply bonding adhesive to substrate and underside of roofing membrane at rate required by manufacturer and allow to partially dry. Do not apply bonding adhesive to splice area of roofing membrane.

D. Mechanically fasten roofing membrane securely at terminations, penetrations, and perimeter of roofing.

E. Adhesive Seam Installation: Clean both faces of splice areas, apply splicing cement, and firmly roll side and end laps of overlapping roofing membranes according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of roofing membrane terminations.

F. Tape Seam Installation: Clean and prime both faces of splice areas, apply splice tape, and firmly roll side and end laps of overlapping roofing membranes according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of roofing membrane terminations.

G. Repair tears, voids, and lapped seams in roofing that does not meet requirements.

3.4 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean splice areas, apply splicing cement, and firmly roll side and end laps of overlapping sheets to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet flashing terminations.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform roof tests and inspections and to prepare test reports.

B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Architect.

C. Repair or remove and replace components of membrane roofing system where test results or inspections indicate that they do not comply with specified requirements.

END OF SECTION 07531

SECTION 07541 MECHANICALLY-ATTACHED PVC ROOFING

PART 1 - GENERAL CONDITIONS

1.01 DESCRIPTION

A. Scope

Add/Alternate Item 1.
To install a mechanically-attached thermoplastic roofing membrane, flashings and other components to the main roof only (ie. to the 4th floor roof).

B. Related Work

The work includes but is not limited to the installation of:

1. Substrate Preparation
2. Wood Blocking
3. Insulation
4. Roof Membrane
5. Fasteners
6. Adhesive for Flashings
7. Roof Membrane Flashings
8. Metal Flashings
9. Sealants

C. Upon successful completion of work the following warranties may be obtained:

1. Manufacturer's Warranty
2. Roofing Contractor Warranty

1.02 QUALITY ASSURANCE

A. This roofing system shall be applied only by a Roofing Contractor (the Applicator) authorized by the manufacturer prior to bid.

B. Upon completion of the installation and the delivery to manufacturer by the Applicator of a certification that all work has been done in strict accordance with the contract specifications and the manufacturer's requirements, an inspection shall be made by a Technical Representative of the manufacturer to review the installed roof system.

C. There shall be no deviation made from the Project Specification or the approved shop drawings without prior written approval by the Owner, the Owner's Representative and manufacturer.

D. All work pertaining to the installation of the membrane and flashings shall only be completed by Applicator personnel trained and authorized by membrane manufacturer in those procedures.

1.03 SUBMITTALS

At the time of bidding, the Applicator shall submit to the Owner (or Representative) the following:

A. Copies of Specification.

B. Samples of each primary component to be used in the roof system and the manufacturer's current literature for each component.

C. Written approval by the insulation manufacturer (as applicable) for use and performance of the product in the proposed system.

D. Sample copy of manufacturer's warranty.

E. Sample copy of Applicator's warranty.

F. Dimensioned shop drawings which shall include:

1. Outline of roof with roof size and elevations shown.
2. Profile details of flashing methods for penetrations.
3. Technical acceptance from the manufacturer.

G. Certifications by manufacturers of roofing and insulating materials that all materials supplied comply with all requirements of the identified ASTM and other industry standards or practices.

H. Certification from the Applicator that the system specified meets all identified code and insurance requirements as required by the Specification.

I. Material Safety Data Sheets (MSDS)

1.04 CODE REQUIREMENTS

The applicator shall submit evidence that the proposed roof system meets the requirements of the local building code and has been tested and approved or listed by the following test organizations. These requirements are minimum standards and no roofing work shall commence without written documentation of the system's compliance, as required in the "Submittals" section of this specification.

1. Class 1-90 (for high wind exposure)

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. All products delivered to the job site shall be in the original unopened containers or wrappings bearing all seals and approvals.

B. Handle all materials to prevent damage. Place all materials on pallets and fully protect from moisture.

C. Membrane rolls shall be stored lying down on pallets and fully protected from the weather with clean canvas tarpaulins. Unvented polyethylene tarpaulins are not accepted due to the accumulation of moisture beneath the tarpaulin in certain weather conditions that may affect the ease of membrane weldability.

D. As a general rule all adhesives shall be stored at temperatures between 40° F (5° C) and 80° F (27° C). Read instructions contained on adhesive canister for specific storage instructions.

E. All flammable materials shall be stored in a cool, dry area away from sparks and open flames. Follow precautions outlined on containers or supplied by material manufacturer/supplier.

F. Any materials which the owner's representative and/or the manufacturer determine to be damaged are to be removed from the job site and replaced at no cost to the owner.

1.06 JOB CONDITIONS

A. The manufacturer's materials may be installed under certain adverse weather conditions but only after consultation with the manufacturer, as installation time and system integrity may be affected.

B. Only as much of the new roofing as can be made weather-tight each day, including all flashing and detail work, shall be installed. All seams shall be heat welded before leaving the job site that day.

C. All work shall be scheduled and executed without exposing the interior building areas to the effects of inclement weather. The existing building and its contents shall be protected against all risks.

D. All surfaces to receive new insulation, membrane or flashings shall be dry. Should surface moisture occur, the Applicator shall provide the necessary equipment to dry the surface prior to application.

E. All new and temporary construction, including equipment and accessories, shall be secured in such a manner as to preclude wind blow-off and subsequent roof or equipment damage.

F. Uninterrupted water-stops shall be installed at the end of each day's work and shall be completely removed before proceeding with the next day's work. Water-stops shall not emit dangerous or unsafe fumes and shall not remain in contact with the finished roof as the installation progresses. Contaminated membrane shall be replaced at no cost to the Owner.

G. The Applicator is cautioned that certain membranes are incompatible with asphalt, coal tar, heavy oils, roofing cements, creosote and some preservative materials. Such materials shall not remain in contact with the manufacturer's membranes. The Applicator shall consult the manufacturer regarding compatibility, precautions and recommendations.

H. Arrange work sequence to avoid use of newly constructed roofing as a walking surface or for equipment movement and storage. Where such access is absolutely required, the Applicator shall provide all necessary protection and barriers to segregate the work area and to prevent damage to adjacent areas. A substantial protection layer consisting of plywood over felt or plywood over insulation board shall be provided for all new and existing roof areas that receive rooftop traffic during construction.

I. Prior to and during application, all dirt, debris and dust shall be removed from surfaces either by vacuuming, sweeping, blowing with compressed air and/or similar methods.

J. The Applicator shall follow all safety regulations as required by OSHA and any other applicable authority having jurisdiction.

K. All new roofing waste material (i.e., scrap roof membrane, release paper, empty cans of adhesive) shall be immediately removed from the site by the Applicator and properly transported to a legal dumping area authorized to receive such material.

L. The Applicator shall take precautions that storage and/or application of materials and/or equipment does not overload the roof deck or building structure.

M. Flammable adhesives and deck primers shall not be stored and not be used in the vicinity of open flames, sparks and excessive heat.

N. Applicator shall immediately stop work if any unusual or concealed condition is discovered and shall immediately notify Owner of such condition in writing for correction at the Owner's expense (letter copy to manufacturer).

O. Site cleanup, including both interior and exterior building areas that have been affected by construction, shall be completed to the Owner's satisfaction.

P. All landscaped areas damaged by construction activities shall be repaired at no cost to the Owner.

Q. Note: The Applicator shall conduct fastener pullout tests in accordance with the latest version of the SPRI/ANSI Fastener Pullout Standard to help verify condition of the deck/substrate and to confirm expected pullout values.

R. The membrane shall not be installed under the following conditions without consulting the manufacturer's Technical Dept. for precautionary steps:

1. The roof assembly permits interior air to pressurize the membrane underside.
2. The wall/deck intersection permits air entry into the wall flashing area.

S. Precautions shall be taken when using adhesives at or near rooftop vents or air intakes. Adhesive odors could enter the building. Coordinate the operation of vents and air intakes in such a manner as to avoid the intake of adhesive odor while ventilating the building. Keep lids on unused cans at all times.

T. Protective wear shall be worn when using solvents or adhesives or as required by job conditions.

U. Membranes are slippery when wet or covered with snow, frost, or ice. Working on surfaces under these conditions is hazardous. Appropriate safety measures must be implemented prior to working on such surfaces. Always follow OSHA and other relevant fall protection standards when working on roofs.

1.07 WARRANTIES

A. Membrane Warranty
Upon successful completion of the work to manufacturer's satisfaction and receipt of final payment, the Membrane Warranty shall be issued.

B. Applicator/Roofing Contractor Warranty

The Applicator shall supply the Owner with a separate workmanship warranty. In the event any work related to roofing, flashing, or metal is found to be within the Applicator warranty term, defective or otherwise not in accordance with the Contract Documents, the Applicator shall repair that defect at no cost to the Owner. The Applicator's warranty obligation shall run directly to the Owner, and a copy shall be sent to the membrane manufacturer.

C. Owner Responsibility
Owner shall notify both the membrane manufacturer and the Applicator of any leaks as they occur during the time period when both warranties are in effect.

PART 2 - PRODUCTS

2.01 GENERAL

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Sarnafil Inc.
2. Or equal approved by Architect

B. Components to be used that are other than those supplied or manufactured by the membrane supplier may be submitted for review and acceptance by the manufacturer. The manufacturer's acceptance of any other product is only for a determination of compatibility with its products and not for inclusion in the membrane manufacturer's warranty. The specifications, installation instructions, limitations, and/or restrictions of the respective manufacturers must be reviewed

by the Owner's Representative for acceptability for the intended use with the membrane manufacturer's products.

2.02 MEMBRANE

A. Polyester reinforced membrane.

B. Membrane shall conform to ASTM D4434 (latest version), "Standard for Polyvinyl Chloride Sheet Roofing," Classification: Type III.

1. 60 mil (1.5 mm), thermoplastic membrane with polyester reinforcement.

C. Certified Polymer Thickness

1. Membrane manufacturer is to certify that the polymer thickness is of the polymer thickness specified. Certification is to be signed by the membrane manufacturer's quality control manager. ASTM +/- tolerance for membrane thickness is not accepted.

D. Color of Membrane

1. White, initial reflectivity of 0.83, initial emissivity 0.90, Solar reflective index (SRI) of >104.

E. Typical Physical Properties

Parameters	ASTM Test Method	Minimum ASTM Requirement	Typical Membrane Physical Properties
Reinforcing Material	-		Polyester
Overall Thickness, min., inches (mm)	D751	0.045 (1.14)	[0.0__inches]
Breaking Strength, min., lbf/in. (KN/m)	D751	200 (35.0)	230 (40.0)
Elongation at Break, min.	D751	15%	20%
Seam strength*, min. (% of breaking strength)	D751	75	85
Retention of Properties After Heat Aging	D3045	-	-
Breaking Strength, min., (% of original)	D751	90	95
Elongation, min., (% of original)	D751	90	90
Tearing Strength, min., lbf (N)	D1004	45.0 (200)	50 (220)
Low Temperature Bend, -40°F (-40°C)	D2136	Pass	Pass
Accelerated Weathering Test (Florescent Light, UV exposure)	G154	5,000 Hours	Pass
Cracking (7x magnification)	-	None	None
Discoloration (by observation)	-	Negligible	Negligible
Crazing (7 x magnification)	-	None	None
Linear Dimensional Change	D1204	0.5% max.	0.1%
Weight Change After Immersion in Water	D570	± 3.0% max.	2.5%
Static Puncture Resistance, 33 lbf (15 kg)	D5602	Pass	Pass
Dynamic Puncture Resistance, 14.7 ft-lbf (20 J)	D5635	Pass	Pass

* Failure occurs through membrane rupture not seam failure. Physical Properties shown are prior to applying felt backing, if specified.

2.03 FLASHING MATERIALS

A. Wall/Curb Flashing

1. Membrane
   A polyester reinforced membrane used for mechanically-attached flashings to approved substrate. Consult manufacturer's Product Data Sheet for adhesive rates and additional information.

2. Composite Flashing
   A PVC-coated, heat-weldable sheet metal capable of being formed into a variety of shapes and profiles. Finish to be a 25 gauge, G90 galvanized metal sheet with a 20 mil (1 mm) unsupported membrane laminated on one side.

B. Perimeter Edge Flashing

1. Flashing

A PVC-coated, heat-weldable sheet metal capable of being formed into a variety of shapes and profiles. Flashing is 25 gauge, G90 galvanized metal sheet with a 20 mil (1 mm) unsupported membrane laminated on one side. Consult Product Data Sheet for additional information.

C. Miscellaneous

1. Multi-Purpose Sealant
   A proprietary sealant used at flashing terminations. Consult Product Data Sheet for additional information.

2. Adhesive
   A solvent-based reactivating-type adhesive used to attach membrane to flashing substrate. Consult Product Data Sheets for additional information.

2.04 INSULATION/OVERLAYMENT/RECOVER BOARD

A. Insulation
Expanded polystyrene closed-cell foam insulation. Consult Product Data Sheets for additional information.

B. DensDeck® (first layer)
A siliconized gypsum, fire-tested hardboard with glass-mat facers. DensDeck is provided in a 4 ft x 8 ft (1.2 m x 2.4 m) board size and in thicknesses of 1/2 inch and 5/8 inch (13 mm and 16 mm). Consult Product Data Sheet for size, thickness and additional information.

C. DensDeck® Prime (top layer)
A fire-tested, gypsum hardboard with glass-mat facers and a pre-primed surface on one side. DensDeck Prime is provided in a 4 x 8 ft (1.2 x 2.4 m) board size and in thickness of 1/4. Consult Product Data Sheet for size, thickness and additional information.

2.05 ATTACHMENT COMPONENTS

A. Fasteners
Used with various fasteners to attach insulation boards to roof deck. Use a 3 inch (75 mm) square or round, 26 gauge stamping of SAE 1010 steel with an AZ 55 Galvalume coating. Consult manufacturer's Product Data Sheet for additional information.

B. Plate – Pre-assembled
Combination of a 3 inch round plate and a #12 fastener used to attach insulation boards to steel or wood roof decks. Pre-assembled plate consists of a 3 inch (75 mm) round, 26 gauge stamping of SAE 1010 steel with an AZ 55 Galvalume coating and the fastener with modified buttress thread. The fastener shank diameter is approximately 0.168 inch (4 mm) and the thread diameter is approximately 0.214 inch (5 mm).

C. Insulation and Deck Fasteners
A corrosion-resistant fastener used with plates to attach insulation boards to steel or wood roof decks. #12 fastener has a modified buttress thread, a shank diameter of approximately 0.168 inch (4 mm) and a thread diameter of approximately 0.214 inch (5 mm). The driving head has a diameter of approximately 0.435 inch (11 mm) with a #3 Phillips recess for positive engagement. Consult manufacturer's Product Data Sheet for additional information.

D. Membrane Fasteners
A #15, heavy-duty, corrosion-resistant fastener used to attach insulation or disks to attach roof membrane to steel or wood roof decks. Fastener has a shank diameter of approximately 0.21 inch (5.3 mm) and the thread diameter is approximately 0.26 inch (6.6 mm). The driving head has a diameter of approximately 0.435 inch (11 mm) with a #3 Phillips recess for positive engagement. Consult manufacturer's Product Data Sheet for additional information.

2.06 MISCELLANEOUS FASTENERS AND ANCHORS

A. All fasteners, anchors, nails, straps, bars, etc. shall be post-galvanized steel, aluminum or stainless steel. Mixing metal types and methods of contact shall be assembled in such a manner as to avoid galvanic corrosion. Fasteners for attachment of metal to masonry shall be expansion type fasteners with stainless steel pins. All concrete fasteners and anchors shall have a minimum embedment of 1¼ inch (32 mm) and shall be approved for such use by the fastener manufacturer. All miscellaneous wood fasteners and anchors used for flashings shall have a minimum embedment of 1 inch (25 mm) and shall be approved for such use by the fastener manufacturer.

2.07 RELATED MATERIALS

A. Wood Nailer
Treated wood nailers shall be installed at the perimeter of the entire roof and around such other roof projections and penetrations as specified on Project Drawings. Thickness of nailers must match the insulation thickness to achieve a smooth transition. Wood nailers shall be treated for fire and rot resistance (wolmanized or osmose treated) and be #2 quality or better lumber. Creosote or asphalt-treated wood is not acceptable. Wood nailers shall conform to Factory Mutual Loss Prevention Data Sheet 1-49. All wood shall have a maximum moisture content of 19% by weight on a dry-weight basis.

PART 3 - EXECUTION

3.01 PRE-CONSTRUCTION CONFERENCE

A. The Applicator, Owner's Representative/Designer and Manufacturer(s) shall attend a pre-construction conference.

B. The meeting shall discuss all aspects of the project including but not limited to:

1. Safety
2. Set up
3. Construction schedule
4. Contract conditions
5. Coordination of the work

3.02 SUBSTRATE CONDITION

A. Applicator shall be responsible for acceptance or provision of proper substrate to receive new roofing materials.

B. Applicator shall verify that the work done under related sections meets the following conditions:

1. Roof curbs, nailers, equipment supports, vents and other roof penetrations are properly secured and prepared to receive new roofing materials.
2. All surfaces are smooth and free of dirt, debris and incompatible materials.
3. All roof surfaces shall be free of water, ice and snow.

3.03 SUBSTRATE PREPARATION

The roof deck and existing roof construction must be structurally sound to provide support for the new roof system. The Applicator shall load materials on the rooftop in such a manner as to eliminate risk of deck overload due to concentrated weight. The Owner's Representative shall ensure that the roof deck is secured to the structural framing according to local building code and in such a manner as to resist all anticipated wind loads in that location.

A. 24 Gauge Existing Standing Seam Deck

1. Steel Deck:

a) Existing steel deck - The roof deck is reported to be 24 gauge (minimum) grade D and should have been conforming and be installed to the local code's current requirements. Pull tests should be run to confirm the holding power of the fasteners.

3.04 WOOD NAILER INSTALLATION

A. Install continuous wood nailers at the perimeter of the entire roof and around roof projections and penetrations as shown on the Detail Drawings.

B. Nailers shall be anchored to resist a minimum force of 300 pounds per lineal foot (4,500 Newtons/lineal meter) in any direction. Individual nailer lengths shall not be less than 3 feet (0.9 meter) long. Nailer fastener spacing shall be at 12 inches (0.3 m) on center or 16 inches (0.4 m) on center if necessary to match the structural framing. Fasteners shall be staggered 1/3 the nailer width and installed within 6 inches (0.15 m) of each end. Two fasteners shall be installed at ends of nailer lengths. Nailer attachment shall also meet the requirements of the current Factory Mutual Loss Prevention Data Sheet 1-49.

C. Thickness shall be as required to match substrate and/or insulation height to allow a smooth transition.

D. Any existing nailer woodwork which is to remain shall be firmly anchored in place to resist a minimum force of 300 pounds per lineal foot (4,500 Newtons/lineal meter) in any direction and shall be free of rot, excess moisture or deterioration. Only woodwork shown to be reused in Detail Drawings shall be left in place. All other nailer woodwork shall be removed.

3.05 INSULATION INSTALLATION

General Criteria:

A. Insulation shall be installed according to insulation manufacturer's instructions.

B. Insulation shall be neatly cut to fit around penetrations and projections.

C. Mechanical Attachment

1. Insulation shall be mechanically fastened to the deck with approved fasteners and plates at a rate according to the insulation manufacturer's, FM's and manufacturer's recommendations for fastening rates and patterns. The quantity and locations of the fasteners and plates shall also cause the insulation boards to rest evenly on the roof deck/substrate so that there are no significant and avoidable air spaces between the boards and the substrate. Each insulation board shall be installed tightly against the adjacent boards on all sides.

2. Fasteners are to be installed consistently in accordance with fastener manufacturer's recommendations. Fasteners are to have minimum penetration into structural deck recommended by the fastener manufacturer and membrane manufacturer.

3. Use fastener tools with a depth locator and torque-limiting attachment as recommended or supplied by fastener manufacturer to ensure proper installation.

3.06 MEMBRANE ATTACHMENT

A. The surface of the insulation or substrate shall be inspected prior to installation of the roof membrane manufacturer. The substrate shall be clean, dry, free from

debris and smooth with no surface roughness or contamination. Broken, delaminated, wet or damaged insulation boards shall be removed and replaced.

B. General

1. The membrane is to be attached with fasteners and bar according to manufacturer's requirements.
2. Membrane overlaps shall be shingled with the flow of water where possible.
3. Full-width rolls shall be fastened perpendicular to the direction of the steel deck flutes, wood plank, pre-cast or cementitious wood fiber panel where possible.
4. Tack welding of full or half-width rolls for purposes of temporary restraint during installation is not permitted. Consult manufacturer's Technical Department for further information.

C. Perimeter and Corner Areas

1. Over the properly installed and prepared substrate surface, membrane half-width rolls are to be installed either parallel or perpendicular to the entire perimeter edge according to the manufacturer's guidelines. The number of adjacent half-rolls will be determined by building height and width and other conditions according to the manufacturer's guidelines. Fasteners are installed along the edge of the membrane on the fastening line at a spacing recommended by the manufacturer. Disks are held-back 1 inch (25 mm), and disks are held-back 1-1/4 inch (31.8 mm) from the outer edge of the membrane. The adjacent half-roll is positioned to overlap the fastened edge of the first half-roll by 5-1/2 inches. The 5-1/2 inch overlap will allow the top membrane to extend 2-1/2 inches pas the disk for heat-welding. Fasteners shall clamp the membrane tightly to the substrate. In corner areas where perimeter half-rolls intersect, add rows of fasteners and disks over the top the half-rolls and weld a cover strip above them for water-tightness. See manufacturer's Detail Drawings.

D. Interior Area

1. Over the properly installed and prepared substrate surface, membrane full-width rolls are to be installed perpendicular to the steel deck flutes. Fasteners and disks are installed along the edge of the membrane on the fastening line at a spacing determined by the membrane manufacturer. Disks are held-back 1 inch (25 mm) from the outer edge of the membrane. The adjacent full-roll is positioned to overlap the fastened edge of the first full-roll by 5-1/2 inches (140 mm) in accordance with the overlap lines marked on it's edge. The 5-1/2 inch (140 mm) overlap will allow the top membrane to extend 2-1/2 inches (63 mm) past the disks for heat-welding. Fasteners shall clamp the membrane tightly to the substrate. See Detail Drawings.

2. Hot-air weld overlaps according to manufacturer's recommendations. Seam test cuts shall be taken at least 3 times per day.

3.07 HOT-AIR WELDING OF SEAM OVERLAPS

A. General

1. All seams shall be hot-air welded. Seam overlaps should be 5-1/2 inches (140 mm) wide for disks when automatic machine-welding and 4 inches (100 mm) wide when hand-welding, except for certain details.

2. Welding equipment shall be provided by or approved by the manufacturer. All mechanics intending to use the equipment shall have successfully completed a training course provided by the manufacturer's Technical Representative prior to welding.

3. All membrane to be welded shall be clean and dry.

B. Hand-Welding

Hand-welded seams shall be completed in two stages. Hot-air welding equipment shall be allowed to warm up for at least one minute prior to welding.

1. The back edge of the seam shall be welded with a narrow but continuous weld to prevent loss of hot air during the final welding.

2. The nozzle shall be inserted into the seam at a 45 degree angle to the edge of the membrane. Once the proper welding temperature has been reached and the membrane begins to "flow," the hand roller is positioned perpendicular to the nozzle and rolled lightly. For straight seams, the 1-1/2 inch (40 mm) wide nozzle is recommended for use. For corners and compound connections, the 3/4 inch (20 mm) wide nozzle shall be used.

C. Machine Welding

1. Machine welded seams are achieved by the use of manufacturer's automatic welding equipment. When using this equipment, manufacturer's instructions shall be followed and local codes for electric supply, grounding and over current protection observed. Dedicated circuit house power or a dedicated portable generator is recommended. No other equipment shall be operated simultaneously off the generator.

2. Metal tracks may be used over the deck membrane and under the machine welder to minimize or eliminate wrinkles.

D. Quality Control of Welded Seams

1. The Applicator shall check all welded seams for continuity using a rounded screwdriver. Visible evidence that welding is proceeding correctly is smoke during the welding operation, shiny membrane surfaces, and an uninterrupted

flow of dark grey material from the underside of the top membrane. On-site evaluation of welded seams shall be made daily by the Applicator at locations as directed by the manufacturer's representative. One inch (25 mm) wide cross-section samples of welded seams shall be taken at least three times a day. Correct welds display failure from shearing of the membrane prior to separation of the weld. Each test cut shall be patched by the Applicator at no extra cost to the Owner.

3.08 MEMBRANE FLASHINGS

All flashings shall be installed concurrently with the roof membrane as the job progresses. No temporary flashings shall be allowed without the prior written approval of the Owner's Representative and the manufacturer. Approval shall only be for specific locations on specific dates. If any water is allowed to enter under the newly completed roofing, the affected area shall be removed and replaced at the Applicator's expense. Flashing shall be adhered to compatible, dry, smooth, and solvent-resistant surfaces. Use caution to ensure adhesive fumes are not drawn into the building.

A. Adhesive for Membrane Flashings

1. Over the properly installed and prepared flashing substrate, adhesive shall be applied according to instructions found on the Product Data Sheet. The adhesive shall be applied in smooth, even coats with no gaps, globs or similar inconsistencies. Only an area which can be completely covered in the same day's operations shall be flashed. The bonded sheet shall be pressed firmly in place with a hand roller.

2. No adhesive shall be applied in seam areas that are to be welded. All panels of membrane shall be applied in the same manner, overlapping the edges of the panels as required by welding techniques.

B. Manufacturer's requirements and recommendations and the specifications shall be followed. All material submittals shall have been accepted by manufacturer prior to installation.

C. All flashings shall extend a minimum of 8 inches (0.2 m) above roofing level unless otherwise accepted in writing by the Owner's Representative and manufacturer's Technical Department.

D. All flashing membranes shall be consistently adhered to substrates. All interior and exterior corners and miters shall be cut and hot-air welded into place. No bitumen shall be in contact with the membrane.

E. All flashing membranes shall be mechanically fastened along the counter-flashed top edge.

F. Flashings shall be terminated according to manufacturer's recommended details.

3.09 METAL FLASHINGS

A. Metal details, fabrication practices and installation methods shall conform to the applicable requirements of the following:

1. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) - latest issue.

B. Metal, other than that provided by the manufacturer, is not covered under the manufacturer's warranty.

C. Complete all metal work in conjunction with roofing and flashings so that a watertight condition exists daily.

D. Metal shall be installed to provide adequate resistance to bending to allow for normal thermal expansion and contraction.

E. Metal joints shall be watertight.

F. Metal flashings shall be securely fastened into solid wood blocking or existing metal substrate. Fasteners shall penetrate the wood nailer a minimum of 1 inch (25 mm).

G. Airtight and continuous metal hook strips are required behind metal fascias. Hook strips are to be fastened 12 inches (0.3 m) on center into the existing sheet metal backup..

H. Counter flashings shall overlap base flashings at least 4 inches (100 mm).

3.10 METAL BASE FLASHINGS/EDGE METAL

All flashings shall be installed concurrently with the roof membrane as the job progresses. No temporary flashings shall be allowed without the prior written approval of the Owner's Representative and manufacturer. Acceptance shall only be for specific locations on specific dates. If any water is allowed to enter under the newly completed roofing due to incomplete flashings, the affected area shall be removed and replaced at the Applicator's expense.

A. Metal flashings shall be formed and installed per the Detail Drawings and approved by the membrane manufacturer.

1. All metal flashings shall be fastened into solid wood nailers or existing metal wall panel with two rows of post galvanized flat head annular ring nails, 4 inches (100 mm) on center staggered. Fasteners shall penetrate the nailer a minimum of 1 inch (25 mm).

2. Metal shall be installed to provide adequate resistance to bending and allow for normal thermal expansion and contraction.

B. Adjacent sheets of composite flashing shall be spaced ¼ inch (6 mm) apart. The joint shall be covered with 2 inch (50 mm) wide aluminum tape. A 4 inch

minimum (100 mm) wide strip of flashing membrane shall be hot-air welded over the joint. Exercise caution at perimeter of roof. Workers shall follow OSHA safety procedures.

3.11 EDGE-TITE METAL

A. Position the membrane over the roof edge and down outside face of wall covering wood nailer(s) completely. Allow ½ inch (13 mm) excess membrane. Hot-air weld all seams making sure there are no voids in welds.

B. Apply a 3/8 inch (10 mm) bead of sealant to the intersection of the right angle of the clean base rail. Install base rail from right to left as seen from rooftop, lapping joints 1 inch (25 mm).

C. Fasten base rail into the side of the nailer 12 inches (0.3 m) on center using #12 x 1-5/8 inch corrosion-resistant fasteners provided with Edge-Tite. Field cut sections as necessary. A second row of fastening may be required based upon site conditions. Exercise caution at perimeter of roof. Workers shall follow OSHA safety procedures.

D. Position spring clips at 6 foot (1.8 m) centers on base rail. Locate spring clips at fascia cover laps and at mid-span of fascia cover.

E. Fascia covers are installed from right to left as seen from rooftop. Position fascia cover on top of base rail and overlap preceding panel by 1 inch (25 mm) at notches provided. Snap covers into place. Field cut where necessary. Exercise caution at perimeter of roof. Workers shall follow OSHA safety procedures.

3.12 COMPLETION

Prior to demobilization from the site, the work shall be reviewed by the Owner's Representative and the Applicator. All defects noted and non-compliances with the Specifications or the recommendations of the manufacturer shall be itemized in a punch list. These items must be corrected immediately by the Applicator to the satisfaction of the Owner's Representative and the membrane manufacturer prior to demobilization.

All Warranties referenced in this Specification shall have been submitted and have been accepted at time of contract award.

END OF SECTION 07541

SECTION 07620 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Formed roof drainage system.
2. Formed low-slope roof flashing and trim.
3. Formed wall flashing and trim.

1.2 SUBMITTALS

A. Product Data: For each product indicated.

B. Shop Drawings: Show layouts, profiles, shapes, seams, dimensions, and details for fastening, joining, supporting, and anchoring sheet metal flashing and trim.

1.3 QUALITY ASSURANCE

A. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

PART 2 - PRODUCTS

2.1 SHEET METALS

A. Aluminum Sheet: ASTM B 209, Alloy 3003, 3004, 3105, or 5005, Temper suitable for forming and structural performance required, but not less than H14.

B Zinc-Tin Alloy-Coated Copper Sheet: ASTM B 370, Temper H00 or H01, cold-rolled copper sheet, coated on both sides with a zinc-tin alloy (50 percent zinc, 50 percent tin).

2.2 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation.

B. Felt Underlayment: ASTM D 226, Type II (No. 30), asphalt-saturated organic

felt, nonperforated.

C. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads.

1. Nails for Copper Sheet: Copper or hardware bronze, 0.109 inch minimum and not less than 7/8 inch long, barbed with large head.

D. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, heavy bodied for hooked-type expansion joints with limited movement.

F. Bituminous Gasket or Sealant: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat.

2.3 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated. Shop fabricate items where practicable. Obtain field measurements for accurate fit before shop fabrication.

B. Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.

1. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
2. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.

C. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA recommendations.

D. Expansion Provisions: Where lapped or bayonet-type expansion provisions in the Work cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with elastomeric sealant concealed within joints.

E. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.

F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal, and in thickness not less than that of metal being secured.

2.4 ROOF DRAINAGE SHEET METAL FABRICATIONS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Architectural Products Co.
2. Hickman, W. P. Company.
3. MM Systems Corporation.
4. Petersen Aluminum Corp.

B. Hanging Gutters: Fabricate painted aluminum gutters of 0.0320 inch (0.8 mm) thick aluminum to cross section indicated, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch long sections. Furnish flat-stock gutter spacers and gutter brackets fabricated from same metal as gutters, of size recommended by SMACNA but not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, gutter bead reinforcing bars, and gutter accessories from same metal as gutters.

C. Downspouts: Fabricate downspouts complete with mitered elbows. Furnish with metal hangers, from same material as downspouts, and anchors.

D. Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape indicated complete with outlet tubes, exterior flange trim, and built-in overflows.

2.5 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof Edge Flashing (Gravel Stop) and Fascia Caps: Fabricate in minimum 96-inch long, but not exceeding 10-foot- long, sections. Furnish with 6-inch wide joint cover plates.

B. Copings: Fabricate in minimum 96-inch long, but not exceeding 10-foot- long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and interior leg. Miter corners, seal, and solder or weld watertight.

2.6 WALL SHEET METAL FABRICATIONS

A. Openings Flashing in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch high end dams.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Torch cutting of sheet metal flashing and trim is not permitted.

B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by fabricator or manufacturers of dissimilar metals.

C. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.

D. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and elastomeric sealant.

E. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

1. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.

F. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with elastomeric sealant concealed within joints.

G. Provide back flashing as shown on drawings lapping 10-inches each side of joint. But joints will not be allowed.

H. Fasteners: Use fasteners of sizes that will penetrate substrate not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.

I. Seal joints with elastomeric sealant as required for watertight construction.

3.2 ROOF DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof drainage items to produce complete roof

drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.

B. Hanging Gutters: Join sections with riveted and soldered joints or with lapped joints sealed with elastomeric sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchored gutter brackets spaced not more than 36 inches apart. Provide end closures and seal watertight with sealant. Slope to downspouts.

1. Install gutter with expansion joints at locations indicated but not exceeding 50 feet apart. Install expansion joint caps.

C. Downspouts: Join sections with 1-1/2-inch telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c. in between.

D. Conductor Heads: Anchor securely to wall with elevation of conductor head rim 1 inch below gutter discharge.

3.3 ROOF FLASHING INSTALLATION

A. General: Install sheet metal roof flashing and trim to comply with performance requirements and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight.

B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49.

1. Interlock bottom edge of roof edge flashing with continuous cleats anchored to substrate at 16-inch centers.

C. Copings: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49.

1. Interlock exterior bottom edge of coping with continuous cleats anchored to substrate at 16-inch centers.
2. Anchor interior leg of coping with screw fasteners and washers at 18-inch centers.

D. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Secure in a waterproof manner. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with elastomeric sealant.

E. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Install flashing as

follows:

1. Turn lead flashing down inside vent piping, being careful not to block vent piping with flashing.
2. Seal with elastomeric sealant and clamp flashing to pipes penetrating roof except for lead flashing on vent piping.

3.4 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Openings Flashing in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings.

END OF SECTION 07620

SECTION 07710 - MANUFACTURED ROOF SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

4. Gravel stops and counterflashings.
5. Gravity roof drains.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show layouts of manufactured roof specialties, including plans and elevations. Identify factory- vs. field-assembled work.

C. Samples: For each type of manufactured roof specialty indicated with factory-applied color finishes.

D. Product Test Reports: Verifying compliance of roof edge flashings with performance requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Architectural Products Co.
2. Hickman, W. P. Company.
3. MM Systems Corporation.
4. Petersen Aluminum Corp.
5. Jen Fan Company.

2.2 EXPOSED METALS

A. Aluminum Sheet: ASTM B 209, alloy and temper recommended by manufacturer for use and finish indicated, finished as follows:

1. Surface: Smooth, flat finish.

2. High-Performance Organic Finish: Three-coat, thermocured system with color coats containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2604.

B. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by manufacturer for type of use and finish indicated, finished as follows:

1. High-Performance Organic Finish: Three-coat, thermocured system with color coats containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2604.

2.3 CONCEALED METALS

A. Aluminum Sheet: ASTM B 209, alloy and temper recommended by manufacturer for use and structural performance indicated, mill finished.

B. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by manufacturer for type of use and structural performance indicated, mill finished.

2.4 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, separators, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to withstand design loads.

1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.

C. Elastomeric Sealant: ASTM C 920, elastomeric polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

D. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, heavy bodied for hooked-type expansion joints with limited movement.

E. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.5 GRAVEL STOPS

A. Gravel Stops: Manufactured, one-piece, formed-metal gravel stop in section lengths not exceeding 12 feet, with a horizontal flange and vertical leg fascia

terminating in a drip edge, continuous hold-down cleat, and concealed splice plates of same material, finish, and shape as gravel stop. Provide mitered and welded or soldered corner units.

1. Fabricate from the following exposed metal:

   a. Aluminum: 0.032 inch thick.

2. Color: As selected by Architect from manufacturer's full range.

2.6 COUNTERFLASHINGS

A. Counterflashings: Manufactured units in lengths not exceeding 12 feet designed to snap into reglets and compress against base flashings with joints lapped, from the following exposed metal in thickness indicated:

   1. Aluminum: 0.032 inch thick.

2.7 GRAVITY ROOF VENTS

A Gravity roof Vents: Model BGH non-mechanical attic vent by Jen Fan company, or equal approved by Architect, with 12"x12" throat area (18"x18" hood) 144 square inches free ventilation air area minimum. Galvanized steel construction with 8" roof curb with flashing for flat roof application. Factory baked enamel finish – standard color, selected by architect.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install manufactured roof specialties according to manufacturer's written instructions. Anchor manufactured roof specialties securely in place and capable of resisting forces specified in performance requirements. Use fasteners, separators, sealants, and other miscellaneous items as required to complete manufactured roof specialty systems.

   1. Install manufactured roof specialties with provisions for thermal and structural movement.
   2. Torch cutting of manufactured roof specialties is not permitted.

B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

C. Install manufactured roof specialties level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil-canning, buckling, or tool marks.

D. Install manufactured roof specialties to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.

E. Expansion Provisions: Provide for thermal expansion of exposed manufactured roof specialties. Space movement joints at a maximum of 12 feet with no unplanned joints within 18 inches of corners or intersections.

F. Fasteners: Use fasteners of type and size recommended by manufacturer but of sizes that will penetrate substrate not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.

G. Seal joints with sealant as required by manufacturer of roofing specialties.

3.2 GRAVEL STOPS INSTALLATION

A. Install cleats, cant dams, and other anchoring and attachment accessories and devices with concealed fasteners.

B. Anchor roof edgings to resist uplift and outward forces according to performance requirements.

3.3 COUNTERFLASHING INSTALLATION

A. Counterflashings: Coordinate installation of counterflashings with installation of base flashings. Insert counterflashings in reglets or receivers and fit tightly to base flashings. Extend counterflashings 4 inches over base flashings. Lap counterflashing joints a minimum of 4 inches and bed with sealant.

END OF SECTION 07710

SECTION 07720 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Roof hatches.
2. Skylights (**Add Alternate Item 4**)
3. Gravity roof vents.

1.2 SUBMITTALS

A. Product Data: For each type of roof accessory indicated.

B. Shop Drawings: Show fabrication and installation details for roof accessories.

1.3 QUALITY ASSURANCE

A. Sheet Metal Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap flashing to coordinate with type of roofing indicated.

PART 2 - PRODUCTS

2.1 METAL MATERIALS

A. Galvanized Steel Sheet: ASTM A 653/A 653M, G90 coated and mill phosphatized for field painting.

B. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, AZ50 coated.

C. Aluminum Sheet: ASTM B 209, alloy and temper recommended by manufacturer for type of use and finish.

1. Clear Anodic Finish: Architectural Class II, complying with AAMA 611.

2.2 MISCELLANEOUS MATERIALS

A. Acrylic Glazing: ASTM D 4802, thermoformable, monolithic sheet, category as standard with manufacturer, Type UVA (formulated with UV absorber), Finish 1 (smooth or polished).

2.3 ROOF HATCHES

A. Roof Hatches: Fabricate roof hatches with insulated double-wall lids and insulated single-wall curb frame with integral deck mounting flange and lid frame counterflashing. Fabricate with welded or mechanically fastened and sealed corner joints. Provide continuous weathertight perimeter gasketing and equip with corrosion-resistant or hot-dip galvanized hardware.

1. Available Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Bilco Company; Type NB-50.
    b. J. L. Industries, Inc.
    c. Milcor Inc.; a Gibraltar Company.
    d. Nystrom, Inc.

2. Loads: Fabricate roof hatches to withstand 40-lbf/sq. ft. external and 20-lbf/sq. ft. internal loads.
3. Type and Size: Single-leaf lid, 30 by 54 inches.
4. Curb and Lid Material: Aluminum sheet, 0.090 inch thick.
5. Insulation: Polyisocyanurate board.
6. Lid Liner: Manufacturer's standard metal liner of same material and finish as metal curb.
7. Fabricate units to minimum height of 12 inches, unless otherwise indicated.
8. Hardware: Galvanized steel spring latch with turn handles, butt- or pintle-type hinge system, and padlock hasps inside and outside.

    a. Provide 2-point latch on covers larger than 84 inches.

2.4 SKYLIGHTS

A **Add/alternate Item 4**:
Provide & install skylights. Size & location as shown on the drawings. Refer to plans & window schedule. Provide weathertight installation to roof.

1. Available Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a Wasco Skylighting Systems
    b Or equal approved by Architect

2. Glazing: Double glazed, insulated, low E coating.

3. Frame finish: Kynar

5. Color: As selected by Architect.

2.5 GRAVITY ROOF VENTS

A. Dropout-Type Heat and Smoke Vents: Manufacturer's standard gravity-operated, automatic smoke and heat vents with integral double-wall insulated curbs and frame with welded or sealed mechanical corner joints, integral condensation gutter, cap flashing, and heat-sensitive dome glazing that will deform and drop out of vent opening within 5 minutes of exposure to a simulated fire represented by a time-temperature gradient that reaches an air temperature of 500 deg F within 5 minutes.

1. Available Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. C/S Group.
   b. Custom Curb, Inc.
   c. Milcor Inc.; a Gibraltar Company.
   f. Naturalite Skylight Systems.
   d. Wasco Products, Inc.

2. Loads: Fabricate heat and smoke vents to withstand a minimum 40-lbf/sq. ft. external live load and 30-lbf/sq. ft. uplift.

   a. Dome glazing shall have a thickness capable of resisting 40-lbf/sq. ft. external and 20-lbf/sq. ft. internal loads.

3. Regulatory Requirements: Comply with UL 793 and NFPA 204.
4. Heat and Smoke Vent Compliance: Provide units that have been tested and UL listed.
5. Integral Curb and Framing Material: Aluminum sheet, 0.090 inch thick.
6. Insulation: Polyisocyanurate board.
7. Exterior Curb Liner: Manufacturer's standard metal liner of same material and finish as metal curb.
8. Fabricate integral curbs to minimum height of 12 inches, unless otherwise indicated.
9. Sloping Roofs: Where slope of roof deck exceeds 1:48, fabricate curbs with height tapered to match slope to level tops of units.
10. Dome Glazing: Double acrylic glazing.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install roof accessories according to manufacturer's written instructions. Anchor roof accessories securely in place and capable of resisting forces specified. Use fasteners, separators, sealants, and other miscellaneous items as required for completing roof accessory installation. Install roof accessories to resist exposure to weather without failing, rattling, leaking, and fastener disengagement.

B. Install roof accessories to fit substrates and to result in watertight performance.

C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of uncoated aluminum roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing exposed-to-view components of roof accessories directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of polyethylene underlayment.
3. Bed flanges in thick coat of asphalt roofing cement where required by roof accessory manufacturers for waterproof performance.

D. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.

E. Seal joints with elastomeric sealant as required by manufacturer of roof accessories.

END OF SECTION 07720

SECTION 07841 - THROUGH-PENETRATION FIRESTOP SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items.

1.2 PERFORMANCE REQUIREMENTS

A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.

B. Fire-Rated Assemblies: Provide fire-rated assemblies with fire ratings as determined per ASTM E 814 or UL 1479.

1. Fire-rated assemblies shall extend through ceilings to bottom of floor deck above to form a continuous rated separation typical.

C. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.

1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
2. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.
3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

D. For through-penetration firestop systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For each through-penetration firestop system, submit

documentation, including illustrations, from a qualified testing and inspecting agency, showing each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item.

1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular through-penetration firestop condition, submit illustration, with modifications marked, approved by through-penetration firestop system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

C. Qualification Data: For Installer.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FMG according to FMG 4991, "Approval of Firestop Contractors."

B. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:

1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
2. Through-penetration firestop systems are identical to those tested per testing standard referenced in "Part 1 Performance Requirements" Article. Provide rated systems bearing classification marking of qualified testing and inspecting agency.

C. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

D. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined by Owner's inspecting agency and building inspector, if required by authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the through-penetration firestop systems indicated for each application that are produced by one of the following manufacturers:

1. Johns Manville.
2. Nelson Firestop Products.
3. Specified Technologies Inc.
4. 3M; Fire Protection Products Division.

2.2 FIRESTOPPING

A. Compatibility: Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.

B. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated.

PART 3 - EXECUTION

3.1 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

A. General: Install through-penetration firestop systems to comply with Part 1 "Performance Requirements" Article and with firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

C. Install fill materials for firestop systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

D. Identification: Identify through-penetration firestop systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of edge of the firestop systems so that labels will be visible to anyone seeking to remove penetrating items or firestop systems. Use mechanical fasteners for metal labels. Include the following information on labels:

1. The words "Warning - Through-Penetration Firestop System - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Through-penetration firestop system designation of applicable testing and inspecting agency.
4. Date of installation.
5. Through-penetration firestop system manufacturer's name.
6. Installer's name.

3.2 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner will engage an independent inspecting agency to inspect through-penetration firestops. Independent inspecting agency shall comply with ASTM E 2174 requirements including those related to qualifications, conducting inspections, and preparing test reports.

B. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

C. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued and firestop installations comply with requirements.

END OF SECTION 07841

SECTION 07920 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes joint sealants for the following applications, including those specified by reference to this Section:

1. Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
2. Exterior joints in horizontal traffic surfaces.
3. Interior joints in vertical surfaces and horizontal nontraffic surfaces.
4. Interior joints in horizontal traffic surfaces.

B. See Division 8 Section "Glazing" for glazing sealants.

1.2 PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.3 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch wide joints formed between two 6-inch long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

C. Compatibility and adhesion test reports.

D. Product test reports.

1.4 QUALITY ASSURANCE

A. Mockups: Build mockups incorporating sealant joints, as follows, to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution:

1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by

reference to this Section.

1.5 WARRANTY

A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two (2) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

C. Suitability for Immersion in Liquids. Where elastomeric sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247 and qualify for the length of exposure indicated by reference to ASTM C 920 for Class 1 or 2. Liquid used for testing sealants is deionized water, unless otherwise indicated.

D. Single-Component Neutral- and Basic-Curing Silicone Sealant:

1. AvailableProducts:

a. Dow Corning Corporation; 790.

b. GE Silicones; SilPruf LM SCS2700.
c. Tremco; Spectrem 1 (Basic).

2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 100/50.
4. Use Related to Exposure: NT (nontraffic).

E. Single-Component Mildew-Resistant Neutral-Curing Silicone Sealant:

1. AvailableProducts:

a. Pecora Corporation; 898.
b. Tremco; Tremsil 600 White.

2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.
4. Use Related to Exposure: NT (nontraffic).

F. Multicomponent Nonsag Urethane Sealant:

1. AvailableProducts:

a. Schnee-Morehead, Inc.; Permathane SM 7200.
b. Sika Corporation, Inc.; Sikaflex - 2c NS TG.
c. Sonneborn, Division of ChemRex Inc.; NP 2.
d. Tremco; Vulkem 227.

2. Type and Grade: M (multicomponent) and NS (nonsag).
3. Class: 25.
4. Uses Related to Exposure: T (traffic) and NT (nontraffic).

G. Multicomponent Nonsag Immersible Urethane Sealant:

1. AvailableProducts:

a. Pacific Polymers, Inc.; Elasto-Thane 227 R Type II (Gun Grade).
b. Pecora Corporation; Dynatred.
c. Tremco; Vulkem 227.

2. Type and Grade: M (multicomponent) and NS (nonsag).
3. Class: 25.
4. Uses Related to Exposure: T (traffic)NT (nontraffic) and I (immersible), Class 1.

2.3 SOLVENT-RELEASE JOINT SEALANTS

A. Butyl-Rubber-Based Solvent-Release Joint Sealant: Comply with ASTM C 1085.

1. AvailableProducts:

a. Bostik Findley; Bostik 300.
b. Fuller, H. B. Company; SC-0296.
c. Sonneborn, Division of ChemRex Inc.; Sonneborn Multi-Purpose Sealant.
d. Tremco; Tremco Butyl Sealant.

2.4 LATEX JOINT SEALANTS

A. Latex Sealant : Comply with ASTM C 834, Type O P, Grade NF.

B. AvailableProducts:

1. Bostik Findley; Chem-Calk 600.
2. Pecora Corporation; AC-20+.
3. Schnee-Morehead, Inc.; SM 8200.
4. Sonneborn, Division of ChemRex Inc.; Sonolac.
5. Tremco; Tremflex 834.

2.5 ACOUSTICAL JOINT SEALANTS

A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 that effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. AvailableProducts:

a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.

B. Acoustical Sealant for Concealed Joints: Manufacturer's standard, nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.

1. AvailableProducts:

a. Pecora Corporation; BA-98.
b. Tremco; Tremco Acoustical Sealant.

2.6 JOINT-SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.

D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.7 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants.

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant.

a. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after

cleaning operations above by vacuuming or blowing out joints with oil-free compressed air.

2. Remove laitance and form-release agents from concrete.

   a. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer,. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.2 INSTALLATION

A. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

B. Acoustical Sealant Application Standard: Comply with recommendations in ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

G. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.3 JOINT SEALANT SCHEDULE

	TYPE	POLYMER	EXPOSURE/TRAFFIC	USES/APPLICATIONS
A.	Elastomeric in in in listed	Silicone	Exterior joints in vertical surfaces and non-traffic horizontal surfaces.	Control and expansion joints cast-in-place concrete. Control and expansion joints precast concrete. Control and expansion joints stone veneer. Aluminum windows and between windows and other materials. Aluminum storefront and entrances and between storefront and entrances and other materials. Joints between materials above and frames of doors and windows. Other joints as indicated.
B.	Elastomeric environments.	Silicone	Interior moving and non-moving joints in vertical and horizontal non-traffic surfaces.	Tile control and expansion joints. Joints in Sanitary and food processing Wet or damp, non-mechanical room areas.
C.	Elastomeric	Two-part Urethane	Exterior joints in horizontal traffic surfaces.	Control, expansion, and isolation joints in cast-in-place concrete slabs. Joints in paving. Other joints as indicated.

D.	Elastomeric	Silicone or Two-part Urethane.	Interior moving joints in vertical surfaces and horizontal non-traffic surfaces.	Control and expansion joints on exposed interior surfaces of exterior walls. Joints between tops of non-load-bearing unit masonry walls and underside concrete slabs and beams. Vertical control joints on exposed surfaces of interior unit masonry and concrete walls and partitions. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
E.	Elastomeric	Two-Part Urethane	Interior horizontal traffic joints.	Flooring control and expansion joints
F.	Elastomeric	Two-Part Immersible Urethane	Interior and Exterior areas that are immersed in or under retained water.	Exterior and interior concrete pits, sumps and retention areas.
G.	Solvent Release Sealants	Butyl Sealant	Interior or concealed exterior.	Concealed sheet metal sealants. Sealing thresholds.
H.	Latex	Acrylic Latex Sealants	Interior	Interior non-moving exposed sealants in gypsum drywall construction.
I.	Acoustical	Latex and Synthetic Rubber	Interior	Interior sealants in acoustically rated construction.

END OF SECTION 07920

SECTION 08110 - STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes steel doors and frames.

1.2 SUBMITTALS

A. Product Data: For each product indicated. Include door designation, type, level and model, material description, label compliance, fire-resistance ratings, and finishes.

B. Door Schedule. Use same reference designations indicated on Drawings.

1.3 QUALITY ASSURANCE

A. Steel Door and Frame Standard: Comply with ANSI A 250.8, unless more stringent requirements are indicated.

B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Amweld Building Products, Inc.
2. Ceco Door Products; a United Dominion Company.
3. Curries Company.
4. Steelcraft; a division of Ingersoll-Rand.
5. Or equal approved by Architect

2.2 MATERIALS

A. Hot-Rolled Steel Sheets: ASTM A 569/A 569M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

A. Cold-Rolled Steel Sheets: ASTM A 366/A 366M, Commercial Steel (CS), or ASTM A 620/A 620M, Drawing Steel (DS), Type B; stretcher-leveled standard of flatness.

C. Metallic-Coated Steel Sheets: ASTM A 653/A 653M, Commercial Steel (CS), Type B, with an A40 zinc-iron-alloy (galvannealed) coating; stretcher-leveled standard of flatness.

D. Electrolytic Zinc-Coated Steel Sheet: ASTM A 591/A 591M, Commercial Steel (CS), Class B coating; mill phosphatized; suitable for unexposed applications; stretcher-leveled standard of flatness where used for face sheets.

2.3 DOORS

A. Interior Doors: Complying with ANSI 250.8 for level and model and ANSI A250.4 for physical-endurance level indicated.

1. Level 1 and Physical Performance Level C, Model 1 (Full Flush).

B. Exterior Doors: Complying with ANSI A250.8 for level and model and ANSI A250.4 for physical-endurance level indicated.

1. Level 1 and Physical Performance Level C, Model 1 (Full Flush).

2.4 FRAMES

A. General: ANSI A250.8; conceal fastenings, unless otherwise indicated.

B. Frame Steel Sheet Thickness:

1. 0.053-inch for level 1 steel doors.
2. 0.053-inch for wood doors.

C. Door Silencers: Three silencers on single-door frames and two silencers on double-door frames.

D. Supports and Anchors: Not less than 0.042-inch thick zinc-coated steel sheet.

1. Masonry Wall Anchors: 0.177-inch diameter, steel wire complying with ASTM A 510 may be used in place of steel sheet.

E. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Zinc-coat items that are to be built into exterior walls according to ASTM A 153/A 153M, Class C or D as applicable.

2.5 FABRICATION

A. General: Fabricate steel door and frame units to comply with ANSI A250.8 free

from defects including warp and buckle. Where practical, fit and assemble units in manufacturer's plant.

B. Exterior Doors: Fabricate doors, panels, and frames from metallic-coated steel sheet. Close top and bottom edges of doors flush as an integral part of door construction or by addition of 0.053-inch thick, metallic-coated steel channels with channel webs placed even with top and bottom edges.

A. Interior Door and Panel Faces: Fabricate exposed faces of doors and panels, including stiles and rails of nonflush units, from cold-rolled steel sheet.

C. Core Construction: Manufacturer's standard core construction that produces a door complying with SDI standards.

D. Clearances for Non-Fire-Rated Doors: Not more than 1/8 inch at jambs and heads, except not more than 1/4 inch between pairs of doors. Not more than 3/4 inch at bottom.

E. Clearances for Fire-Rated Doors: As required by NFPA 80.

F. Door-Edge Profile: Beveled edge.

G. Tolerances: Comply with SDI 117.

H. Prepare doors and frames to receive mortised and concealed hardware according to final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements in ANSI A250.6 and ANSI A115 Series specifications for door and frame preparation for hardware.

I. Frame Construction:

1. Fabricate frames with mitered or coped and continuously welded corners and seamless face joints. Provide temporary spreader bars.

J. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Project site.

K. Locate hardware as indicated or, if not indicated, according to ANSI A250.8.

L. Glazing Stops: Manufacturer's standard, formed from 0.032-inch thick steel sheet.

1. Provide nonremovable stops on outside of exterior doors and on secure side of interior doors for glass, louvers, and other panels in doors.
2. Provide screw-applied, removable, glazing stops on inside of glass, louvers, and other panels in doors.

2.6 FINISHES

A. Prime Finish: Manufacturer's standard, factory-applied coat of rust-inhibiting

primer complying with ANSI A250.10 for acceptance criteria.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Placing Frames: Comply with provisions in SDI 105, unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.

1. Wall Anchors: Provide at least three anchors per jamb. For openings 90 inches or more in height, install an additional anchor at hinge and strike jambs.
2. Gypsum Board Partitions: For in-place partitions, install knock-down, drywall slip-on frames.
3. Fire-Rated Frames: Install according to NFPA 80.

B. Door Installation: Comply with ANSI A250.8. Shim as necessary to comply with SDI 122 and ANSI/DHI A115.1G.

1. Fire-Rated Doors: Install within clearances specified in NFPA 80.

C. After installation, remove protective wrappings from doors and frames and touch up prime coat with compatible air-drying primer.

END OF SECTION 08110

SECTION 08212 - STILE AND RAIL WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes interior stile and rail wood doors.

B. See Division 8 Section "Glazing" for glass vision panels in stile and rail wood doors.

1.2 SUBMITTALS

A. Product Data: For each type of door.

1. Include adhesive manufacturer's product data indicating urea-formaldehyde content.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and other pertinent data.

C. Samples: For each species and finish required.

1.3 QUALITY ASSURANCE

A. Quality Standard for Doors of Stock Design and Construction: Comply with WDMA I.S.6, "Industry Standard for Wood Stile and Rail Doors."

B. Safety Glass: Provide products complying with testing requirements in 16 CFR 1201, for Category II materials, unless those of Category I are expressly indicated and permitted.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Assemble exterior doors and sidelites, including components, with wet-use adhesives.

B. Provide doors made with adhesives and composite wood products that do not contain added urea-formaldehyde resins.

2.2 STILE AND RAIL DOORS

A. Available Manufacturers:

1. Simpson Door Company.
2. Or approved equal by Architect.

2.3 FABRICATION

A. Fabricate stile and rail wood doors in sizes indicated for Project-site fitting.

B. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting.

C. Factory machine doors for hardware that is not surface applied.

D. Glazed Openings: Glaze doors at factory with glass of type and thickness indicated, complying with Division 8 Section "Glazing."

2.4 SHOP PRIMING

A. Doors for Opaque Finish: Shop apply one coat of wood primer specified in Division 9 Section "Painting" to faces and edges of doors.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install wood doors to comply with manufacturer's written instructions and with referenced quality standard, and as indicated.

1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.

B. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

END OF SECTION 08212

SECTION 08311 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Fire-rated access doors and frames.

1.2 SUBMITTALS

A. Product Data: For each type of access door indicated.

B. Coordination Drawings: Drawn to scale and coordinating access door and frame installation with ceiling support, ceiling-mounted items, and concealed Work above ceiling.

C. Samples: For each exposed finish.

1.3 QUALITY ASSURANCE

A. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 and that are labeled and listed by UL, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction per test method indicated.

B. Size and Location Verification: Determine specific locations and sizes for access doors needed to gain access to concealed equipment, and indicate on schedule.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel Sheet:

1. Cold-Rolled: ASTM A 366/A 366M, Commercial Steel (CS), or ASTM A 620/A 620M, Drawing Steel (DS), Type B; stretcher-leveled standard of flatness.

a. Electrolytic zinc-coated steel sheet, complying with ASTM A 591/A 591M, Class C coating, may be substituted at fabricator's option.

B. Aluminum Sheet: ASTM B 209, alloy and temper recommended by aluminum

producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of alloy 5005-H15.

C. Aluminum Extrusions: ASTM B 221, alloy 6063-T6.

D. Paint:

1. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664; selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide sound foundation for field-applied topcoats despite prolonged exposure.

2.2 ACCESS DOORS AND FRAMES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. J. L. Industries, Inc.
2. Larsen's Manufacturing Company.
3. Milcor Limited Partnership.
4. Nystrom Building Products Co.

B. Flush, Fire-Rated Access Doors and Frames with Exposed Trim:

1. Material: Prime-painted steel sheet.
2. Locations: Walls and ceilings, as indicated on Drawings.

a. Attic Access Hatch: Provide attic access hatch with 24 by 44 inches rough opening and pull down aluminum ladder.

3. Fire-Resistance Rating: 2 hour.
4. Temperature-Rise Rating: 250 deg F at the end of 30 minutes.
5. Door: Flush panel with core of mineral-fiber insulation enclosed in sheet metal; minimum thickness of 0.036 inch.
6. Frame: Minimum 0.060-inch thick sheet metal with 1-inch wide, surface-mounted trim.
7. Hinges: Continuous piano hinge.
8. Latch: Self-latching bolt operated by key with interior release.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Advise installers of other work about specific requirements relating to access door and floor door installation, including sizes of openings to receive access door and frame, as well as locations of supports, inserts, and anchoring

devices.

B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.

C. Install access doors with frames flush with adjacent finish surfaces or recessed to receive finish material.

D. Adjust doors and hardware after installation for proper operation.

END OF SECTION 08311

SECTION 08560 - PVC WINDOWS & DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following PVC window product types:

1. Double-hung windows.
2. Casement/awning windows.
3. Sliding doors.

B. See Division 5 Section "Metal Fabrications" for window security grilles.

C. See Division 7 Section "Joint Sealants" for perimeter sealant material and installation provisions.

1.2 PERFORMANCE REQUIREMENTS

A. Thermopane double glazed argon-filled Low E2 insulating glass:

1. Air infiltration shall be tested in accordance with AAMA/NWWDA 101/I.S.2-97. Air infiltration units are scfm/ft2. Unit air infiltration shall not exceed 0.12 scfm/ft2.
2. Water infiltration shall be tested to at least 15% of DP rating in accordance with AAMA 101 I.S.2-97. Water infiltration units are psf.
3. Uniform Structural Load shall be tested to at least 150% of DP rating in accordance with AAMA 101 I.S.2-97. Structural Load units are psf.
4. Test for Unit Thermal Performance shall be in accordance with NFRC 100-97 or NFRC 102-01 and shall not exceed 0.31 Btu/hr-ft2-F
5. Test for Condensation Resistance Factor (CRF) shall be in accordance with AAMA 1503-98.

1.3 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Certified test reports for air infiltration, water resistance, and uniform loading in accordance with applicable standards.
2. Submit Certification of Compliance certificates that identical windows have been successfully tested and meet the requirements for air infiltration and water penetration.
3. Preparation instructions and recommendations.
4. Storage and handling requirements and recommendations.
5. Installation methods.

B. Shop Drawings:

1. Plan, elevation and details showing location and installation.
2. Each type of window, door, hardware, fastener, accessory, operator, screen, and finish.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Windows & doors shall be fabricated by an AAMA Certified Fabricator.

B. Installer Qualifications: Factory trained and authorized to install window units.

C. Product Requirements: Window & door units shall bear sticker certifying conformance with AAMA/NWWDA 101/I.S.2, AAMA 1503 and Energy Star Program.

1.5 WARRANTY

A. Manufacturer shall warrant windows & doors against defects in material and workmanship under normal use and service for a period of 20 years from date of acceptance.

1. PVC finish shall be warranted against chipping, peeling, cracking, or blistering for a period of 20 years from date of acceptance.
2. Insulated glass units shall be fully warranted against visual obstruction resulting from film formation or moisture collection between the interior glass surface, excluding breakage, for a period of 20 years from date of acceptance.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:
1. Paradigm Window Solutions
2. Andersen Corporation
3. Or approved equal by Architect

B BASE-BID & ADD/ALTERNATE

1. **Base-bid**:
Paradigm: "Versatec" (Standard) Series double-hung, casement & awnings.
Andersen: 200 series “Narroline” gliding patio doors.

2. **Add/alternate Item 2**:
Andersen: 400 series “Woodwright” double-hung, casement & awnings.
Andersen 400 series “Frenchwood” gliding patio doors.

2.2 PRODUCTS

A. Provide windows & doors of combinations, types, size & locations as indicated on the drawings. Each window or door shall consist of a unit including sub-frame, frame, sash, hardware, mullions, trim, casing, insect screen, and fasteners complete.

1. **Base-bid**:

Paradigm windows:	Exterior: White,	Interior White.
	Exterior: 908 flat sill nose.	
	Interior jamb: 6 9/16-inch primed finger-jointed pine.	
Andersen doors:	Exterior: White,	Interior: White

2. **Add/alternate item 2**:

Anderson windows:	Exterior: Sandtone,	Interior: White.
Andersen Doors:	Exterior: Sandtone	Interior: White

B. Extruded PVC windows units, produced from commercial quality virgin uPVC (unplasticised polyvinyl chloride), from sections in one piece, straight, true and smooth. Provide multi-chambered PVC extruded frames and sash in accordance with the manufacturer's standard practice. Make fusion welded frame joints sufficiently strong to develop full strength of members, with an external wall thickness of .070 inch (1.8 mm). Sash shall have fusion welded mitered corners with an external wall thickness of .070 inch (1.8 mm).

C. Double Hung Components:

1. Balance Mechanism: Provide two stainless steel, constant force coil spring balances for each sash. Enclose balance springs in rustproof cases, with jamb liner covers, from the top of the bottom sash to the head of the window unit. Balance covers shall be finished to match window frame and easily removable for field service. Balances shall also have an interlocking pivot bar to maintain frame and sash alignment during installation.
2. Locking device: Provide windows up to 32 inches (813 mm) wide with one cam-action sweep sash lock and windows over 32 inches (813 mm) wide with two locks. The lower sash shall have an integral, continuous lift rail at the bottom and the upper sash shall have a continuous rail at the top.
3. Weatherstripping: All sash units shall be triple-weatherstripped where the sash meets the jamb with replaceable, silicone-treated finned pile weatherstripping. Lower sash shall also have a compressible EPDM foam bulb-type seal where it contacts the sill of the unit.

D. Casement/Awning Components:

1. Operating/Locking Mechanism: Operating and locking hardware shall be EntryGard Maxim' as manufactured by Truth Hardware, Owatonna, MN. Egress' or Washability' hinges shall be provided on casement windows as

specified. Sash-balancing friction hinges concealed between the sash and frame supplied on awning windows.

2. Weatherstripping: All sash units shall be triple-weatherstripped where the sash meets the frame with compressible EPDM foam bulb and TPR and vinyl leaf-type weatherstripping.

E Extension Jambs:

Extension jambs to suit wall thickness, are to be required only for windows & doors as indicated on the drawings. Refer to window & door schedules.

2.3 GLASS AND GLAZING

A. Window glass shall conform to ASTM C 1036 and not less than "B" quality. IG unit shall be factory glazed 3/4 inch (19 mm) insulating glass conforming to ASTM-E-774 with TruSeal Duraseal brand spacer, manufactured by TruSeal Industries 1nc., Ontario, Canada. Glazing method shall be an architectural glazing tape system designed to maintain a watertight seal between glass and sash frame.

1. Provide insulated glazing units (for all windows) with low-E coating and argon gas filled.

2.4 FABRICATION

A. Weathering Surfaces: All frame members shall be multi-chambered PVC extrusions utilizing double wall design without the need for reinforcement. Frame corners shall be fusion welded. Sash members shall be multi-chambered PVC extrusions utilizing double wall design at all glazing locations. Horizontal sash members shall be mitered and fusion welded to vertical sash members.

B. Drips and Weep Holes: Provided as required to return water to the outside.

C. Fasteners: Stainless steel type, corrosion resistance. Use flathead, cross-recessed type, exposed head screws with standard threads on windows, trim, and accessories. Screw heads shall finish flush with adjoining surfaces. Self-tapping sheet metal screws are not acceptable for material more than 1/16 inch (1.6 mm) in thickness. All sheet metal screw fasteners shall penetrate into a screw boss consisting of at least three layers of PVC profile for secure fastening and reduce pull out.

D. Provisions for Glazing: Design sash for outside double-glazing and for securing glass with manufacturer's standard glazing systems. Provide glazing channels of adequate size and depth to receive and properly support the glass and glazing accessories.

1. Glazing Thickness: Design glazed windows and rabbets suitable for glass thickness specified above.

E. Weather-stripping: Provide for ventilating sections of all windows to insure a weather tight seal meeting the infiltration tests specified herein. Use factory applied weather-stripping of manufacturer's stock type, as specified above.

F. Screens: Provide one insect screen for each operable window ventilating unit or door. Design screens to fit closely around entire perimeter of each ventilator or opening and to be rewirable. Window screens shall be easily removable from inside building, and interchangeable for same size ventilators of similar type windows, with no exposed fasteners and latches.

1. Screening: Install screening with weave parallel to frame and stretch sufficiently to present a smooth appearance. Conceal edges of screening in the spline channel. Provide all guides, stops, clips, bolts and screws as necessary, for a secure and insect tight attachment to window or door. Provide continuous extruded aluminum screen frame for screen strength.

2. **Base-bid**:
Paradigm windows: Standard full screen, frame color to match window.
Andersen doors: "Perma-Clean" screen, frame color to match door.

3. **Add/alternate Item 2**:
Andersen windows: "TruScene" full screen, frame color to match window.
Andersen doors: "Perma-Clean" retractable screen, frame to match door.

G. Finishes:

1. Exposed PVC surfaces shall be factory finished.
2. Exposed surfaces of aluminum shall be either clear anodized or give a baked enamel finish in accordance with AAMA 603.8 with total dry thickness not less than 0.8 mil (0.02 mm). The finish color shall match the vinyl window.

H. Accessories:

1. Provide windows complete with necessary hardware, fastenings, clips, fins, anchors, glazing beads, and other appurtenances necessary for complete installation and proper operation.

2. **Base-bid**:
Paradigm windows: Standard hardware, White finish.
Andersen doors: "Tribeca" hardware, White finish

2. **Add/alternate Item 2**:
Andersen windows: "Classic" lock & keeper, White finish.
Andersen doors: "Tribeca" hardware, white finish.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install windows & doors without forcing into prepared window openings.

C. Insulate perimeter of window/door frame with acceptable approved insulation material, as recommended by window/door manufacturer.

D. Set windows/doors at proper elevation, location, and reveal; plumb, square, level, and in alignment; and brace, strut, and stay properly to prevent distortion and misalignment.

E. Protect ventilators and operating parts against accumulation of dirt, and building materials by keeping ventilators tightly closed and locked to frame.

F. Bed screws in sill members, joints at mullions, contacts of windows with sills, built in fins, and sub-frames in approved sealant. Install windows/doors in a manner that will prevent entrance of water.

G. Window & Door Flashing: Install in accordance with best trade practice.

H. Anchors and Fasteners: Make ample provision for securing units to adjoining construction.

3.2 PROTECTION

A. Protect installed products until completion of project.

B. After installation of windows/doors adjust all ventilators and hardware to operate smoothly and to provide weather tight sealing when ventilators are closed and locked. Lubricate hardware and operating parts as necessary.

C. Where surfaces are in contact with, or fastened to wood or dissimilar materials, the surface shall be protected from dissimilar materials as recommended by the manufacturer. Surfaces in contact with sealant after installation shall not be coated with any type of protective material.

D. Clean interior and exterior of window/door units of mortar, plaster, paint spattering spots, sealants, and other foreign matter to present a neat clean appearance and to prevent fouling of weather-stripping surfaces and weather-stripping, and to prevent interference with the operation of hardware.

E. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 08560

SECTION 08710 - FINISH HARDWARE

PART 1--GENERAL

1.01 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions and Division 1 General Requirements, apply to the work of this section.

1.02 DESCRIPTION OF WORK

A. The work of this section includes, but is not limited to, the following:

1. Providing hardware for all doors, except doors provided with their own hardware.
2. Providing lock cylinders for all work requiring cylinders.
3. Providing the services of a qualified hardware consultant to prepare detailed schedules of hardware required for the project.

1.03 RELATED WORK

A. Carefully examine all of the Contract Documents for requirements which affect the work of this section. Other specifications sections which directly relate to the work of this section include, but are not limited to, the following:

1. Section 06410 - Custom Millwork; casework locks and hardware.
2. Section 08100 - Steel Doors and Frames; work requiring template coordination, metal astragals for fire-rated doors.
3. Section 08200 - Wood Doors; work requiring template coordination, metal astragals for fire-rated doors.
4. Section 08410 - Aluminum Entrances and Storefronts; work requiring lock cylinders.

1 .04 INTENT

A. A major intent of the work of this section is to provide hardware for every door in the project, except as indicated, so that each door functions correctly for its intended use. Provide only hardware that complies with applicable codes and requirements of authorities having jurisdiction including requirements for barrier-free accessibility.

1.05 QUALITY ASSURANCE

A. Hardware supplier shall have in his employ one or more members of the Door and Hardware Institute in good standing, who shall be responsible for preparation of the Finish Hardware Schedule. This Consultant shall be acceptable to the Architect and is to ensure that the intent requirement of this specification is fulfilled, and to certify that the work of this section meets or exceeds the requirements specified in this section and the requirements of authorities having jurisdiction.

B. Hardware supplier shall warrant and guarantee, in writing, that hardware supplied is free of defective material and workmanship. Supplier shall further warrant and guarantee for a period of one year from Owner's Use and Occupancy that the hardware shall function in a satisfactory manner without binding, collapse, or dislodging of its parts, provided the installation is made to the manufacturer's recommendations.

C. The hardware supplier shall repair or remedy, without charge, any defect of workmanship or material for which he is responsible hereunder.

1.06 SUBMITTALS

A. Submit the following in accordance with SECTION 01300-SUBMITTALS:

1. Schedule: Submit to the Architect six (6) copies of the complete hardware schedule Submit therewith complete catalog cuts and descriptive data of all products specifically scheduled therein. No materials shall be ordered or templates issued until the hardware schedule has been approved by the Architect. Form and detail of hardware schedule shall be in vertical format in conformance to the door and hardware industry standards. All hardware sets shall be clearly cross-referenced to the hardware set numbers listed in this specification.

2. Samples: If requested, submit to the Architect for approval, a complete line of samples as directed. Samples shall be plainly marked giving hardware number used in this specification, the manufacturer's numbers, types and sizes. The Architect will deliver approved samples to the project site to be stored. Samples will remain with the Architect until delivery of all hardware to the project is complete, after which time they will be turned over to the General Contractor for incorporation into the work.

3. Keying System Submission: Before cylinders are ordered, submit a complete proposed keying system for approval.

1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery of hardware shall be made to the project by the Hardware Supplier in accordance with the instructions of the General Contractor.

B. The finish hardware shall be delivered to the jobsite and received there by the General Contractor. The General Contractor shall prepare a locked storage room with adequate shelving, for all hardware. The storage room shall be in a dry, secure area, and shall not include storage of other products by other trades.

C. The General Contractor shall furnish the Hardware Supplier with receipts for all hardware and accessory items received, and shall send copies of these receipts to the Architect, if requested.

1.08 REGULATORY REQUIREMENTS

A. Conform to all applicable codes. Provide all throws, projections, coatings, knurling, opening and closing forces, and other special functions required by State and Local Building Codes, and all applicable Handicap Code requirements.

B. For fire rated openings provide hardware complying with NFPA 80 and NFPA 101 without exception. Provide only hardware tested by UL for the type and size of door installed and fire resistance rating required.

1.09 SPECIAL REQUIREMENTS

A. Hardware Supplier shall determine conditions and materials of all doors and frames for proper application of hardware.

B. The Hardware Schedule shall list the actual product series numbers. Bidders are required to follow manufacturers' catalog requirement for the actual size of door closers, brackets and holders. All door opening sizes are as noted on the Door Schedule and all hardware shall be in strict accordance with requirements of height, width, and thickness.

PART 2 --PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

Hinges	McKinney	Scranton, PA
	Stanley	New Britain, CT
	Hager	St. Louis, MO
Locksets	Schlage	Colorado Springs, CO
	Corbin/Russwin	Charlotte, NC
Exit Devices	Sargent	New Haven, CT
	Von Duprin	Indianapolis, IN
	Corbin/Russwin	Berlin, CT
Door Closers	Sargent	New Haven, CT
	LCN	Princeton, IL
Flush Bolts	Ives	New Haven, CT
	Door Controls	Dexter, MI
	Rockwood	Rockwood, PA
Door Stops	Hager	St. Louis, MO
	Ives	New Haven, CT
	Rockwood	Rockwood, PA
Push /Pulls	Rockwood	Rockwood, PA
	Burns	Erie, PA
	Ives	New Haven, CT
	Hager	St. Louis, MO
Protective Plates	Rockwood	Rockwood, PA
	Don-Jo	Sterling, MA
	Ives	New Haven, CT
Thresholds / Weatherstripping / Rain Drips	NGP	Memphis, TN
	Pemko	Memphis, TN
	Reese	Rosemount, MN
Silencers	Ives	New Haven, CT
	Glynn Johnson	Indianapolis, IN
	Rockwood	Rockwood, PA
Key Cabinet	Telkee	Glen Riddle, PA

Key Control Systems	Bechtelsville, PA
Lund	Bath, OH

2.02 MATERIALS AND QUALITY

A. All hardware shall be of the best grade of solid metal entirely free from imperfections in manufacturer and finish.

B. Qualities, weights, and sizes given herein are the minimum that will be accepted. It is the responsibility of the Hardware Supplier to supply the specified size and weight of hardware and the proper function of hardware in each case and to provide UL approved hardware at all fire-rated doors.

C. Provide, as far as possible, locks of one lock manufacturer and hinges of one hinge manufacturer. Modifications to hardware that are necessary to conform to construction shown or specified shall be provided as required for the specified operation and functional features.

2.03 HARDWARE DESIGNATIONS

A. All items of hardware are referenced by manufacturer's names and numbers. The manufacturer's names and numbers are used to define the function, design, and quality of the material to be supplied.

Substitution of products other than those listed shall be submitted to the Architect at least ten (10) days **PRIOR** to the bid date. The Architect shall be the sole judge of any proposed substitution.

2.04 TEMPLATES

A. Hardware supplier shall immediately, but not later than three (3) days after approval of his Schedule by the Architect, furnish the General Contractor with complete template information necessary for the fabrication of doors, frames, etc. No templates shall be furnished prior to the approval of the hardware schedule.

2.05 HARDWARE FOR LABELED FIRE DOORS, EXIT DEVICES AND SMOKE DOORS

A. Hardware shall conform to requirements of NFPA 80 for labeled fire doors and to NFPA 101 for exit doors, as well as to other requirements specified. Labeling and

listing by UL Building Materials Directory, for class of door being used will be accepted as evidence of conformance to these requirements. Install minimum latch throw as specified on label of individual doors. Provide hardware listed by UL except where heavier materials, larger sizes, or better grades are specified herein under paragraph entitled "Hardware Sets". In lieu of UL labeling and listing, test reports from a nationally recognized testing agency may be submitted showing that hardware has been tested in accordance with UL test methods and that it conforms to NFPA requirements. Specific hardware requirements of door or frame manufacturers which exceed sizes or weights of hardware herein listed shall be provided with no additional charge.

2.06 KEYS AND KEYING

A. The hardware supplier shall review the specific hardware functions with the Architect and owner at the time of the keying review, to assure the appropriateness of each of the hardware functions. Failure to make this review does not relieve the hardware supplier from providing the proper functions.

B. Key System: All cylinders shall be Masterkeyed and/or Grandmaster Keyed to an existing key system as directed.

1. Master Keys, Grandmaster Keys: Furnish six (6) keys for each set, if required.

2. Furnish three (3) change keys for each cylinder keyed differently; six (6) change keys for each set keyed alike, and in sets where only two (2) cylinders are keyed alike, four (4) change keys will be required. Furnish two (2) control keys.

3. All keying is to be done at the factory to avoid duplication of the new cylinders.

4. Master Keys shall be sent to the Owner by registered mail, return receipt required.

5. Supply a factory bitting list for all change keys and master keys to the Owner,

2.07 FASTENERS

A. Manufacture hardware to conform to published templates, generally prepared for machine screw installation.

B. Furnish screws for installation, with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Furnish exposed screws to match the hardware finish, or, if exposed in surfaces of other work, to match the finish of such other work as closely as possible, except as otherwise indicated.

C. Provide concealed fasteners for hardware units which are exposed when the door is closed, except to the extent no standard manufactured units of the type specified are available with concealed fasteners. Do not use thru-bolts unless specifically approved by the Architect.

D. All hardware shall be installed only with fasteners supplied by manufacturers of specific products.

2.08 PACKING AND MARKING

A. All hardware shall have the required screws, bolts and fastenings necessary for proper installation and shall be wrapped in the same package as the hardware item for which it is intended and shall match finish of hardware with which to be used.

B. Each package shall be clearly labeled indicating the portion of the work for which it is intended.

2.09 ENVIRONMENTAL CONCERN FOR PACKAGING

A. The hardware shipped to the jobsite is to be packaged in biodegradable packs such as paper or cardboard boxes and wrapping. If non-biodegradable packing such as plastic, plastic bags or large amounts of styrofoam is utilized, then the Contractor will be responsible for the disposal of the non-biodegradable packing to a licensed or authorized collector for recycling of the non-biodegradable packing.

2.10 FINISH HARDWARE DESCRIPTION

A. Hardware items shall conform to respective specifications and standards and to requirements specified herein.

B. MATERIALS AND FINISH: MATERIALS AND FINISHES SHALL BE:

1. Interior Butts: US26D
2. Door Closers: Sprayed to match hardware finish
3. Exit Devices: US32D
4. Kick, Push Plates: US32D
5. All other hardware shall be: US32D, or as scheduled

C. HINGES AND PIVOTS:

1. Number of hinges or pivots per door: two hinges or pivots are intended to be provided for doors up to and including five feet in height, and an additional hinge for each two-and-one-half feet or fraction thereof, of the height of the door. Dutch doors are to be provided with four hinges.

2. Hinges on interior doors shall be oil-impregnated bearings, steel and sized as follows, unless other wise specified in the hardware sets below:

Door thickness	Door width	Hinge Weight	Hinge
1-3/4"	40" and under	Regular	4-1/2"
1-3/4"	Over 40"	Extra heavy	4-1/2"

Width of hinge shall be determined by trim conditions

3. All bearing hinges shall have flush bearings and button tips.

4. Hinges shall be McKinney or Stanley as follows:

McKinney	Stanley	Hager	
T2714	F179	1279	Interior Use
TA2714	FBB179	BB1279	Interior Use
T4A3786	FBB168	BB1168	Interior Use
TA2314	FBB191	BB1191	Exterior Use
T4A3386	FBB199	BB1199	Exterior Use

D. DOOR CLOSERS:

1. Door closers shall have fully hydraulic, full rack and pinion action. Cylinder body shall be 1-1/2" in diameter, and double heat treated pinion shall be 11/16" in diameter.

2. Hydraulic fluid shall be of a type requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.

3. Spring power shall be continuously adjustable over the full range of closer sizes, and allow for reduced opening force for the physically handicapped. Hydraulic regulation shall be by tamper-proof, non-critical valves. Closers shall have separate adjustment for latch speed, general speed, and hydraulic back-check.

4. All closers shall have solid forged steel main arms (and forged forearms for parallel arm closers).

5. Closer arms (and metal covers when specified) shall have a powder coating finish.

6. Provide drop, mounting plates where required.

7. Do not locate closers on the side of doors facing corridors, passageways or similar type areas. Where it is necessary, due to certain conditions and approval of the Architect, to have closers in corridors, provide such closers with parallel or track type arms.

8. All door closers shall be adjusted by the installer in accordance with the manufacturer's templates and written instructions. Closers with parallel arms shall have back-check features adjusted prior to installation.

9. Closers shall conform to all applicable code requirements relative to setting closing speeds for closers and maximum pressure for operating interior and exterior doors.

10. Door closers meeting this specification are as follows:

	LCN	Sargent
Exterior	4111S-CUSH	281 - CPS
	4111S-H-CUSH	281 - CPSH
Interior	4011	281 - 0
	4111	281 - P10
	4040SE	2407 Series
	4000T	281 - OT x spec. Temp.
	4310ME-SF	2980
	4040SE-DE	2477

E. ELECTRICALLY - POWERED DOOR OPERATOR (WHERE SCHEDULED)

1. Referenced Standard: Provide unit that conforms to AAMA/BHMA A156.19 low energy operation, and to ADA Architectural Guidelines for opening force and time to close standards.

2. Products: Subject to compliance with requirements, furnish one of the following products:

   A. Horton 7000

B. LCN 4610/20 (Electrically powered "Auto-Equalizer" system).
C. Keane-Monroe Corporation, "Access Two" Series 3100.

3. General: Furnish complete system, including electro-mechanical swinging door operator and solid-state electronic control, aluminum header matching door frame, connecting hardware, and power on/off switch.

4. Operator: Opening by means of a fractional HP DC motor, through reduction gears, splined spindle, door arm and linkage assembly. If door encounters an obstacle, operator shall stop the door in the open position by electrically reducing the motor voltage and stalling. Spring closing, with closing speed controlled by the motor operating as a dynamic brake. Operator shall function as a manual door closer in the direction of swing, with or without electrical power.

   A. Operator shall be removable from the header as a unit, for servicing and replacement.

   B. Door Speed and Timing:
      a. Door opening time: Adjustable but not less than 4 seconds.
      b. Door closing time: Adjustable but not less than 4.5 seconds.
      c. Hold Open: Adjustable from 6 to 60 seconds, to allow safe passage between series of doors at entrance and vestibule.

   C. Furnish unit without power assist ("Push-N-Go") feature, or with device that allows Owner to activate or disconnect the feature after the door has been installed.

5. Header: 0.125 minimum wall thickness extruded aluminum.

6. Metal Finish: Finish covers, mounting plates, and arm system with manufacturer's standard powder-coat finish. Match finish of storefront framing system.

7. Push-Plate Control: Nominal 4 inch square or 4-1/2 inch diameter round push-plate control; stainless steel with No. 4 satin finish; with international accessibility symbol engraved and painted blue.

   A. Furnish wall-mounted or jamb mounted type, as appropriate to mounting conditions indicated on Drawings. Project requires both types.

8. The following doors will have electronic openings: 100.1; 107.1; 108.2; 109.3.

F. EXIT DEVICES:

1. Shall be Von Duprin or Sargent as follows:

Function	Von Duprin	Sargent
A	CD99NL-OP	16-8804
B	CD99EO	16-8810
C	CD99L	16-8813ET
D	99L-BE	8815ET
E	99EO-F	12-8810
F	99L-F	12-8813ET
G	99L-F-BE	12-8815ET
H	CD9927EO	16-8710
I	9927L	8713ET
J	9927L-BE	8715ET
K	CD9927EO	16/8710
L	CD9927L	16/8713ET
M	9927L-BE	8715ET
N	9927EO-F	12-8710
O	9927L-F	12-8713ET
P	9927L-F-BE	12-8715ET
Q	9927EO-F	12 R8710
R	9927L-F	12/8713ET

S	9927L-F-BE	12/8715ET

NOTE: Lever design shall match lock trim

G. FLUSH BOLTS:

1. Shall be self-latching or automatic type at label doors, manual flush bolts at non-label doors.

		Glynn Johnson	Door Controls	Rockwood
Manual	HM	FB6	780	555
	WD	FB6W	790	557
Self Latching	HM	FB51P	845	1845
	WD	FB61P	945	1945
Automatic	HM	FB31P	842	1842
	WD	FB41P	942	1942

2. Dust Proof Strikes shall be furnished at all floor locations.

H. LOCKSETS, LATCH SETS:

1. Mortise type shall be heavy-duty ANSI A156.13, Series 1000, Grade 1 Operational, 2-3/4" backset, six pin cylinder with lever handles

Manufacturer	Series	Lever Design
Schlage	ND SERIES	RHO
Corbin	CL3300	NZD

2. Lock functions as indicated in the hardware schedule shall be as follows:

Function	Schlage	Corbin
A (Storeroom)	80	57
B (Office)	50	51
C (Passage)	10	10
D (Vestibule)	60	32
E (Classroom)	70	55
F (Spec Classroom)	71	52
G (Privacy)	40	20

I. MORTISE DEADLOCKS:

1. Shall be as mortise type, ANSI A115.5, Grade 1:

Function	Schlage	Sargent	Corbin
A	L462	4874	4012
B	L460	4875	4013
C	L464	4876	4011
D	L463	4877	4017

J. PUSH PLATES, DOOR PULLS, PUSH/PULL BARS:

1. Shall be as manufactured by Rockwood, Burns or Ives.

   a. Push plates shall be 4" x 16" x .050 thickness unless otherwise listed in hardware sets.

Rockwood	70 Series
Burns	50 Series
Quality	40 Series

   b. Door pulls shall be 1" x 10"

Type A

Rockwood	BF111
Burns	BF26C
Quality	BF163-10"

Type B

Rockwood	157
Burns	39C
Quality	521

c. Push/Pull bars

Type A (Wide Stile Doors)

Rockwood	BF11147 x T1006 Mounting
Burns	BF26C x 442 x Sim. Mounting as Above
Quality	BF482 x Sim. Mounting as Above

Type B (Narrow Stile Doors)

Rockwood	15747 x T1006 Mounting
Burns	39C x 442 x Sim. Mounting as Above
Quality	484 x 10" Sim. Mounting as Above

K. KICK PLATES, ARMOR PLATES, MOP PLATES:

1. Kick plates shall be 8 in. high. Armor plates shall be 34 in. high. Mop plates shall be 4 in. high. All plates shall be 2 in. less the width of door. Plates shall be .050 thickness, bevel 4 edges, screws shall be oval head counter-sunk. The following doors will have kick plates: 100.1; 107.1

L. STOPS:

1. Shall be furnished at all doors. Wherever an opened door or any item of hardware thereon strikes a wall, at 90 degrees. Provide wall bumpers, unless otherwise indicated in hardware sets.

2. Where wall bumpers cannot be effectively used, a floor stop shall be furnished and installed.

3. Provide roller bumpers for each door where two doors interfere with each other in swinging.

Manufacturer	Wall Bumpers	Floor Stops	Roller Bumpers
Rockwood	409	440,442	456
Ives	407 1/2	436B, 438B	470 Series
Glynn Johnson	WB 50XT	FB13, FB14	RB-3

4. Where overhead stops are listed they shall be the surface mounted type as follows:

Manufacturer	Series
Glynn-Johnson	GJ450
Sargent	1540
ABH	4400

M. THRESHOLDS, WEATHERSTRIP, SEAL:

1. Thresholds shall be as detailed and furnished on all doors where shown on drawings. Thresholds shall be aluminum unless otherwise indicated. Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants".

2. Weatherstripping shall be furnished on all exterior doors unless otherwise indicated.

Product	NGP	Pemko
Threshold as detailed		
Brush Seal	A626A	18041
Auto. Door Bottom	420	2548
Door Sweep	101AV	345
Set Astragals	140 x 140P	351
Astragal	139SP	357
Rain Drip	16AD	346C
Gasketing	600A	18062

N. SILENCERS:

1. Provide silencers on all metal and wood frames. Silencers shall be Ives 20/21,

Glynn Johnson 64/65 or Rockwood 608/609.

O. KEY CABINET:

1. Furnish one (1) Aristocrat wall cabinet as manufactured by Telkee, Inc., Key Control Systems, Lund or approved equal. Cabinet shall be complete with all hooks, tags, index cards and other accessories for a complete Dual System.

2. Cabinet size shall be sufficient to accommodate all locks related to this Contract, based on two keys per lock, with an allowance for expansion of not less than 50%.

3. Key systems which are construction keyed shall have all permanent keys affixed to hooks with all index cards filled out for the complete cross references. The cabinet shall be delivered to the Contractor only when requested and shall be completely set up.

P. Provide privacy lockset at all Bedrooms, Baths, and Study Rooms; Provide passage locksets at all other interior doors.

PART 3--EXECUTION

3.01. INSPECTION

1. It shall be the general contractors responsibility to inspect all door openings and doors to determine that each door and door frame has been properly prepared for the required hardware. If errors in dimensions or preparation are encountered, they are to be corrected by the responsible parties prior to the installation of hardware.

3.02 PREPARATION

1. All doors and frames, requiring field preparation for finish hardware, shall be carefully mortised, drilled for pilot holes, or tapped for machine screws for all items of finish hardware in accordance with the manufacturers templates and instructions.

3.03 INSTALLATION/ADJUSTMENT/LOCATION

1. All materials shall be installed in a workmanlike manner following the manufacturer's recommended instructions.

2. Exit Devices shall be carefully installed so as to permit friction free operation of crossbar, touch bar, lever. Latching mechanism shall also operate freely without friction or binding.

3. Door Closers shall be installed in accordance with the manufacturer's instructions. Each door closer shall be carefully installed, on each door, at the degree of opening indicated on the hardware schedule. Arm position shall be as shown on the instruction sheets and required by the finish hardware schedule.

4. The adjustments for all door closers shall be the installers responsibility and these adjustments shall be made at the time of installation of the door closer. The closing speed and the latching speed valves, shall be adjusted individually to provide a smooth, continuous closing action without slamming. The delayed action feature or back check valve shall also be adjusted so as to permit the correct delayed action cycle or hydraulic back check cushioning of the door in the opening cycle. All valves must be properly adjusted at the time of installation. Each door closer has adjustable spring power capable of being adjusted, in the field, from size 1 thru 6. It shall be the installers responsibility to adjust the spring power for each door closer in exact accordance with the spring power adjustment chart illustrated in the door closer installation sheet packed with each door closer.

5. Installation of all other hardware, including locksets, push-pull latches, overhead holders, door stops, plates and other items, shall be carefully coordinated with the hardware schedule and the manufacturer's instruction sheets.
6. Locations for finish hardware shall be in accordance with dimensions listed in the pamphlet "Recommended locations for Builders' Hardware" published by the Door and Hardware Institute.

3.04 PROTECTION

1. All exposed portions of finish hardware shall be carefully protected, by use of cloth, adhesive backed paper or other materials, immediately after installation of the hardware item on the door. The finish shall remain protected until completion of the project. Prior to acceptance of the project by the Architect and owner, the general contractor shall remove the protective material exposing the finish hardware.

3.05 CLEANING

1. It shall be the responsibility of the general contractor to clean all items of finish hardware and to remove any remaining pieces of protective materials and labels.

3.06 INSTRUCTIONS AND TOOLS

1. It shall be the responsibility of the general contractor to provide installation and repair manuals and adjusting tools, wrenches, etc... for the following operating products:

   a. Locksets (all types)

b. Exit Devices (all types)
c. Door Closers

2. These items are included with the factory supplied material – General Contractor to collect these items and give to owner.
3. Several items listed in this specification may or may not be utilized in the hardware sets. Although these items not used specifically at this time we reserve the right to utilize these items at a later time.

3.07 HARDWARE SETS

1. Each Hardware Set listed below represents the complete hardware requirements for one opening (single door or pair of doors). Furnish the quantities required for each set for the work.

HW-1

DOORS:

END OF SECTION

SECTION 08800 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Windows.
2. Doors.
3. Glazed curtain walls.
4. Glazed entrances.
5. Storefront framing.

1.2 DEFINITIONS

A. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.

B. Deterioration of Insulating Glass: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1.3 PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:

1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:

a. Specified Design Wind Loads: As indicated, but not less than wind loads applicable to Project as required by ASCE 7 "Minimum

Design Loads for Buildings and Other Structures": Section 6.0 "Wind Loads."

b. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.
c. Thickness of Tinted and Heat-Absorbing Glass: Provide the same thickness for each tint color indicated throughout Project.

C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick.
2. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite 6.0 mm thick and a nominal 1/2-inch wide interspace.
3. Center-of-Glass Values: Based on using LBL-44789 WINDOW 5.0 computer program for the following methodologies:

a. U-Factors: NFRC 100 expressed as Btu/ sq. ft. x h x deg F.
b. Solar Heat Gain Coefficient: NFRC 200.
c. Solar Optical Properties: NFRC 300.

1.4 SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Samples: 12-inch square, for each type of glass product indicated, other than monolithic clear float glass.

C. Glazing Schedule: Use same designations indicated on Drawings.

D. Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacturer.

1.5 QUALITY ASSURANCE

A. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201 and, for wired glass, ANSI Z97.1.

B. Glazing Publications: Comply with published recommendations of glass

product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. IGMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."

C. Glazing for Fire-Rated Door Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252.

D. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the Insulating Glass Certification Council.

1.6 WARRANTY

A. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form, made out to Owner and signed by insulating-glass manufacturer agreeing to replace insulating-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: Ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS

A. Annealed Float Glass: ASTM C 1036, Type I (transparent flat glass), Quality-Q3; of class indicated.

1. Ultra-Clear (Low-Iron) Float Glass: Class I (clear); with a minimum 91 percent visible light transmission and a minimum solar heat gain coefficient of 0.87.

a. Available Products:

1. AFG Industries Inc.; Krystal Klear.
2. Pilkington Building Products North America; Optiwhite.
3. PPG Industries, Inc.; Starphire.
4. Schott Corporation; Amiran.

B. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; of class, kind, and condition indicated.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave

distortion parallel to bottom edge of glass as installed, unless otherwise indicated.

2. Provide Kind HS (heat-strengthened) float glass in place of annealed float glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
3. For uncoated glass, comply with requirements for Condition A.
4. For coated vision glass, comply with requirements for Condition C (other uncoated glass).
5. Provide Kind FT (fully tempered) float glass in place of annealed or Kind HS (heat-strengthened) float glass where safety glass is indicated.

C. Wired Glass: ASTM C 1036, Type II (patterned and wired flat glass), Class 1 (clear), Quality-Q-6; and of form and mesh pattern specified.

D. Insulating-Glass Units, General: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article and in Part 2 "Insulating-Glass Units" Article.

1. Provide Kind HS (heat-strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
2. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated for insulating-glass units are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.
3. Sealing System: Dual seal.
4. Spacer Specifications: Manufacturer's standard spacer material and construction complying with the following requirements:

    a. Spacer Material: Aluminum with mill or clear anodic finish.
    b. Corner Construction: Manufacturer's standard corner construction.

2.2 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:

1. Neoprene, ASTM C 864.
2. EPDM, ASTM C 864.
3. Silicone, ASTM C 1115.
4. Thermoplastic polyolefin rubber, ASTM C 1115.
5. Any material indicated above.

2.3 GLAZING SEALANTS

A. General: Provide products of type indicated, complying with the following requirements:

1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

B. Glazing Sealants for Fire-Resistive Glazing Products: Identical to products used in test assemblies to obtain fire-protection rating.

2.4 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

G. Perimeter Insulation for Fire-Resistive Glazing: Identical to product used in test assembly to obtain fire-resistance rating.

2.5 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite

complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

2.6 MONOLITHIC FLOAT-GLASS UNITS

A. Uncoated Clear Float-Glass Units: Class 1 (clear) Kind FT (fully tempered) float glass.

1. Thickness: 6.0 mm.
2. Self-Cleaning, Low-Maintenance Coating: Pyrolytic coating on first surface.

2.7 INSULATING-GLASS UNITS

A. Low-E Insulating-Glass Units:

1. Overall Unit Thickness and Thickness of Each Lite: 25 and 6.0 mm.
2. Interspace Content: Argon.
3. Indoor Lite: Class 1 (clear) ultra-clear (low-iron) float glass.

    a. Annealed.

4. Low-E Coating: Pyrolytic on second surface.
5. Summer Daytime U-Factor: 0.38 maximum.
6. Solar Heat Gain Coefficient: 0.61 maximum.

PART 3 - EXECUTION

3.1 GLAZING

A. General: Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

1. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
2. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
3. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
4. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass

manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

5. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
6. Provide spacers for glass lites where length plus width is larger than 50 inches.
7. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

B. Gasket Glazing (Dry): Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

1. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
2. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
3. Install gaskets so they protrude past face of glazing stops.

3.2 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.

B. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

END OF SECTION 08800

SECTION 09253 - GYPSUM SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Gypsum sheathing board.
2. Air infiltration barrier.

1.2 SUBMITTALS

A. Product Data: For each type of product specified.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain each gypsum sheathing product through one source from a single manufacturer.

B. Fire-Resistance-Rated Assemblies: Where gypsum sheathing boards are part of fire-resistance-rated assemblies, provide assemblies as follows:

1. Assemblies comply with requirements of fire-response-tested assemblies indicated by GA File Numbers in GA-600, "Fire Resistance Design Manual"; or by design designations in UL's "Fire Resistance Directory" or in certification listings of another testing and inspecting agency acceptable to authorities having jurisdiction.
2. Fire-resistance ratings were determined by fire-response testing assemblies according to ASTM E 119.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, or bundles, each bearing brand name and identification of manufacturer.

B. Store materials protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, or other causes. Neatly stack gypsum sheathing board flat on leveled supports off the ground, under cover, and fully protected from weather.

1.5 SEQUENCING AND SCHEDULING

A. Sequence installing sheathing with installing exterior cladding to comply with requirements indicated below:

1. Do not leave glass-mat gypsum sheathing board exposed to weather for more than 180 days.

PART 2 - PRODUCTS

2.1 GYPSUM SHEATHING BOARD

A. Glass-Mat Gypsum Sheathing Board: ASTM C 1177.

1. Type and Thickness: Type X, 5/8 inch thick.
2. Size: 48 by 96 inches.
3. Products: Subject to compliance with requirements, provide products by the following:

   a. Georgia-Pacific Corp.; Dens-Glass Gold or approved equal by Architect.

4. Structural Rating: Exterior gypsum sheathing board shall be rated for structural shear use as approved by Architect.

2.2 ACCESSORY MATERIALS

A. Air-Infiltration Barrier: Proprietary building wrap with flame-spread and smoke-developed ratings of less than 25 and 450, respectively, when tested according to ASTM E 84. Provide the following products:

1. Polyethylene sheet; 0.0038 to 0.0064 inch thick; formed by spinning continuous strands of fine, high-density-polyethylene interconnected fibers and bonding them together by heat and pressure; incorporating an additive to provide ultraviolet light resistance for up to 120 days; and with a water-vapor transmission rate equaling 535 g through 1 sq. m of surface in 24 hours according to ASTM E 96, Desiccant Method (Method A).

   a. Products: Subject to compliance with requirements, provide Green Gruard "Rain drop" by Pactiv Corporation, or approved equal by Architect.

B. Fasteners: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing board to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

C. Silicone Emulsion Sealant for Glass-Mat Gypsum Sheathing: Product complying with ASTM C 834, compatible with sheathing tape and gypsum sheathing, recommended by sheathing and tape manufacturers for use with

glass-fiber sheathing tape and for covering exposed fasteners.

1. Product: Subject to compliance with requirements, provide "Elmer's Siliconized Acrylic Latex Caulk" by Borden, Inc. or approved equal by Architect.

D. Glass-Fiber Sheathing Tape for Glass-Mat Gypsum Sheathing: Self-adhering glass-fiber tape, minimum 2 inches wide, 10 by 10 or 10 by 20 threads per inch, of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing board and with a history of successful in-service use.

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

   a. Perma-Tite Tape--PGM 207A; PermaGlas-Mesh, Inc.
   b. Quik-Tape; Quik-Tape, Inc.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install gypsum sheathing to comply with GA-253 and manufacturer's written instructions.

B. Cut boards at penetrations, edges, and other obstructions of the work; fit tightly against abutting construction, except provide a 3/8-inch setback where non-load-bearing construction abuts structural elements.

C. Coordinate sheathing installation with flashing and joint sealant installation so these materials are installed in the sequence and manner that prevent exterior moisture from passing through completed exterior wall assembly.

D. Apply fasteners so screw heads bear tightly against face of sheathing boards but do not cut into facing.

E. Do not bridge building expansion joints with sheathing; cut and space edges to match spacing of structural support elements.

F. Horizontal Installation: Install 24-inchwide gypsum sheathing boards horizontally with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent boards without forcing. Abut ends of boards over centers of stud flanges and stagger end joints of adjacent boards not less than one stud spacing. Screw-attach boards at perimeter and within field of board to each steel stud as follows:

G. Air-Infiltration Barrier Application: Cover sheathing with air-infiltration barrier as follows:

1. Cut back air-infiltration barrier 1/2 inch on each side of the break in supporting members at expansion- or control-joint locations.

H. Sealing Sheathing Joints: Seal joints according to sheathing manufacturer's written recommendations and as follows:

1. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing board joints and apply and trowel silicone emulsion sealant to embed sealant in entire face of tape. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

END OF SECTION 09253

SECTION 09260 - GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Resilient furring channels.
2. Interior gypsum wallboard.
3. Trim, joint treatments, and auxiliary materials.

1.2 SUBMITTALS

A. Product Data: For each product indicated.

1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: For gypsum board assemblies with fire-resistance ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

B. Sound Transmission Characteristics: For gypsum board assemblies with STC ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.

PART 2 - PRODUCTS

2.1 RESILIENT FURRING CHANNELS

A. Resilient Furring Channels, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Metal complying with ASTM C 645 requirements.

a. Protective Coating for Interior Applications: ASTM A 653/A 653M, G60, hot-dip galvanized zinc coating.

B. Resilient Sound Channels for Ceiling and Wall Assemblies:

1. Resilient Furring Channels: 1/2-inch deep, steel sheet members designed to reduce sound transmission. Asymmetrical or hat shaped,

with face attached to single flange by a slotted leg (web) or attached to two flanges by slotted or expanded metal legs.

2. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

2.2 PANEL PRODUCTS

A. Panel Size, General: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.

B. Gypsum Wallboard: ASTM C 36.

1. Regular Type: In thickness indicated and with long edges tapered.
2. Type X: In thickness indicated and with long edges tapered.

C. Proprietary, Special Fire-Resistive Type: ASTM C 36, having improved fire resistance over standard Type X, complying with requirements of fire-resistance-rated assemblies indicated, in thickness indicated, and with long edges tapered.

D. Proprietary Abuse-Resistant Gypsum Wallboard: ASTM C 36, manufactured to produce greater resistance to surface indentation and through-penetration than standard gypsum panels, with core type and in thickness indicated, and with long edges tapered.

1. Available Products:

a. National Gypsum Company; Gold Bond Hi-Abuse Wallboard.
b. United States Gypsum Co.; SHEETROCK Brand Abuse-Resistant Gypsum Panels.

E. Water-Resistant Gypsum Wallboard: ASTM C 630/C 630M, with core type and in thickness indicated.

1. Install moisture resistant gypsum wallboard in basements and all locations where plumbing fixtures exist.

F Acoustic drywall: ASTM E84/ E90/ E2126, fire rated Type X equivalent,

1. Available Products:
   a. Quiet Solution

2. Install acoustic gypsum wallboard in all locations where shown on the drawings.

2.3 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Cornerbead: Use at outside corners, unless otherwise indicated.
2. Bullnose Bead: Use where indicated.
3. LC-Bead: Use at exposed panel edges.
4. L-Bead: Use where indicated.
5. U-Bead: Use where indicated.
6. Expansion (Control) Joint: Use where indicated.
7. Curved-Edge Cornerbead: With notched or flexible flanges; use at curved openings.

2.4 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475.

B. Joint Tape:

1. Interior Gypsum Wallboard: Paper.

C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, flanges of trim accessories, and fasteners, use drying-type, all-purpose compound.

    a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use drying-type, all-purpose compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.

2.5 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Acoustical Sealant for Exposed and Concealed Joints: Nonsag, paintable, nonstaining, latex sealant complying with ASTM C 834 that effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Available Products:

    a. Pecora Corp.; AC-20 FTR Acoustical and Insulation Sealant.
    b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.

C. Acoustical Sealant for Concealed Joints: Nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.

1. Available Products:

a. Ohio Sealants, Inc.; Pro-Series SC-170 Rubber Base Sound Sealant.
b. Pecora Corp.; BA-98.
c. Tremco, Inc.; Tremco Acoustical Sealant.

D. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.

E. Isolation Strip at Exterior Walls:

1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.

F. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

PART 3 - EXECUTION

3.1 RESILIENT FURRING CHANNELS INSTALLATION

A. Resilient Sound Channels for Ceiling and Wall Assemblies: Comply with ASTM C 754, and ASTM C 840 requirements that apply to framing installation.

1. Screw furring to wood framing.

3.2 PANEL PRODUCT INSTALLATION

A. Gypsum Board: Comply with ASTM C 840 and GA-216.

1. Space screws a maximum of 12 inches o.c. for vertical applications.
2. Space fasteners in panels that are tile substrates a maximum of 8 inches o.c.
3. On ceilings, apply gypsum panels before wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.
4. On partitions/walls, apply gypsum panels horizontally (perpendicular to

framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

a. Stagger abutting end joints not less than one framing member in alternate courses of board.
b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.

5. Single-Layer Fastening Methods: Apply gypsum panels to supports with steel drill screws.
6. Multilayer Fastening Methods: Fasten base layers with screws; fasten face layers with adhesive and supplementary fasteners.
7. Laminating to Substrate: Comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.
8. Refer to engineer's drawings for special fixing instructions to structural elements.

3.3 FINISHING

A. Installing Trim Accessories: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Finishing Gypsum Board Panels: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration.

1. Prefill open joints, rounded or beveled edges, and damaged surface areas.
2. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

C. Gypsum Board Finish Levels: Finish panels to levels indicated below, according to ASTM C 840, for locations indicated:

1. Level 1: Embed tape at joints in ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies.
2. Level 4: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges at panel surfaces that will be exposed to view, unless otherwise indicated.

END OF SECTION 09260

SECTION 09265 - GYPSUM BOARD SHAFT-WALL ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Shaft enclosures.
2. Stair enclosures.

1.2 SUBMITTALS

A. Product Data: For each gypsum board shaft-wall assembly indicated.

B. Fire-Test-Response Reports:

1. Include data substantiating that elevator entrances and other items that penetrate each gypsum board shaft-wall assembly do not negate fire-resistance rating.

C. Acoustical-test-response reports.

1.3 QUALITY ASSURANCE

A. Fire-Resistance-Rated Assemblies: Provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

B. STC-Rated Assemblies: For gypsum board shaft-wall assemblies indicated to have STC ratings, provide assembly materials and construction complying with requirements of assemblies whose STC ratings were determined according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Gypsum Co.
2. G-P Gypsum Corp.

3. National Gypsum Company.
4. United States Gypsum Co.

2.2 MATERIALS AND COMPONENTS

A. General: Comply with requirements of fire-resistance-rated assemblies indicated.

1. Provide panels in maximum lengths available to eliminate or minimize end-to-end butt joints.
2. Provide auxiliary materials complying with gypsum board shaft-wall assembly manufacturer's written recommendations.

B. Gypsum Liner Panels: Manufacturer's proprietary liner panels in 1-inch thickness and with moisture-resistant paper faces.

C. Gypsum Wallboard: ASTM C 36, core type as required by fire-resistance-rated assembly indicated.

1. Edges: Tapered and featured (rounded or beveled) for prefilling.

D. Accessories: Cornerbead, edge trim, and control joints of material and shapes specified in Division 9 Section "Gypsum Board Assemblies" that comply with gypsum board shaft-wall assembly manufacturer's written recommendations for application indicated.

E. Gypsum Wallboard Joint-Treatment Materials: ASTM C 475 and as specified in Division 9 Section "Gypsum Board Assemblies."

F. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

G. Sound Attenuation Blankets: ASTM C 665 for Type I, unfaced mineral-fiber-blanket insulation produced by combining thermosetting resins with mineral fibers manufactured from slag or rock wool.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install gypsum board shaft-wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated, manufacturer's written installation instructions, and the following:

1. Division 9 Section "Gypsum Board Assemblies" for applying and finishing panels.

B. Install supplementary framing in gypsum board shaft-wall assemblies around openings and as required for blocking, bracing, and support of gravity and

pullout loads of fixtures, equipment, services, heavy trim, furnishings, and similar items that cannot be supported directly by shaft-wall assembly framing.

C. At penetrations in shaft wall, maintain fire-resistance rating of shaft-wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons, elevator floor indicators, and similar items.

D. Isolate gypsum finish panels from building structure to prevent cracking of finish panels while maintaining continuity of fire-rated construction.

E. Install control joints to maintain fire-resistance rating of assemblies.

F. Seal gypsum board shaft walls with acoustical sealant at perimeter of each assembly where it abuts other work and at joints and penetrations within each assembly. Install acoustical sealant to withstand dislocation by air-pressure differential between shaft and external spaces; maintain an airtight and smoke-tight seal; and comply with manufacturer's written instructions or ASTM C 919, whichever is more stringent.

G. In elevator shafts where gypsum board shaft-wall assemblies cannot be positioned within 2 inches of the shaft face of structural beams, floor edges, and similar projections into shaft, install 5/8-inch thick, gypsum board cants covering tops of projections.

1. Slope cant panels at least 75 degrees from horizontal. Set base edge of panels in adhesive and secure top edges to shaft walls at 24 inches o.c. with screws fastened to shaft-wall framing.

END OF SECTION 09265

SECTION 09680

CARPET

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Tufted carpet.
   2. Resilient wall base and accessories.

B. Related Sections include the following:
   1. Division 1 Section "Allowances" for additional information on allowances to be carried by this section.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance. Include installation recommendations for each type of substrate required.

B. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
   1. Carpet: 12-inch- (300-mm-) square Sample.
   2. For resilient accessories, manufacturer's standard-size samples, but not less than 12 inches (300 mm) long, of each resilient accessory color and pattern specified.

C. Product Schedule: Use same room and product designations indicated on Drawings and in schedules.

D. Maintenance Data: For carpet to include in maintenance manuals specified in Division 1. Include the following:
   1. Methods for maintaining carpet, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
   2. Precautions for cleaning materials and methods that could be detrimental to carpet.

E. CRI Labels: Provide data or certificates showing the carpet and adhesives meet the requirements of CRI Indoor Air Quality Carpet and Adhesive Testing Programs.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.

B. Fire-Test-Response Characteristics: Provide products with the critical radiant flux classification indicated in Part 2, as determined by testing identical products per ASTM E 648 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

C. Product Options: Products and manufacturers named in Part 2 establish requirements for product quality in terms of appearance, construction, and performance. Other manufacturers' products comparable in quality to named products and complying with requirements may be considered. Refer to Division 1 Section "Product Requirements."

1.4 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with CRI 104, Section 5, "Storage and Handling."

1.5 PROJECT CONDITIONS

A. General: Comply with CRI 104, Section 6.1, "Site Conditions; Temperature and Humidity."

B. Environmental Limitations: Do not install carpet until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

C. Do not install carpet over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet, install carpet before installing these items.

1.6 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Carpet Warranty: Written warranty, signed by carpet manufacturer agreeing to replace carpet that does not comply with requirements or that fails within specified warranty period. Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, and delamination.
   1. Warranty Period: 10 years from date of Substantial Completion.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Carpet: Full-width rolls equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd. (8.3 sq. m).

2. Furnish not less than 10 linear feet (3 linear m) for each type, color, pattern, and size of resilient accessory installed.

PART 2 - PRODUCTS

2.1 CARPET

A. Products: Allow $24 per square yard for carpet material only, labor to be included as part of the work of this section.

2.2 RESILIENT ACCESSORIES

A. Rubber Base: Where this designation is indicated, provide rubber wall base complying with FS SS-W-40, Type I and the following:
   1. Products: As follows:
      a. Armstrong World Industries
      b. Johnsonite.
   2. Color and Pattern: As selected by Architect from manufacturer's full range of colors and patterns produced for rubber wall base complying with requirements indicated.
   3. Style: Cove with top-set toe.
   4. Minimum Thickness: 1/8 inch (3.2 mm).
   5. Height: 4 inches (101.6 mm).
   6. Lengths: 120 feet (36.6 m) long.
   7. Outside Corners: Job formed.
   8. Inside Corners: Job formed.
   9. Surface: Smooth.

2.3 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided by or recommended by the following:
   1. Carpet manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet and that is recommended by the following:
   1. Carpet manufacturer.

C. Seaming Cement: Hot-melt adhesive tape or similar product recommended by carpet manufacturer for taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.

D. Adhesives for Accessories: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

E. Primer: Provide products recommended by carpet manufacturer. Provide primer that is compatible with adhesive.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance. Verify that substrates and conditions are satisfactory for carpet installation and comply with requirements specified.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
   1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond.
   2. Verify that adhesion and dryness characteristics have been determined as required in Division 7 Section "Vapor Retarders, Vapor Barriers, and Air Barriers" and meet flooring manufacturer's recommendations.
      a. If alkaline content is greater than 9, or is such that it may cause future delaminating of the carpet, per manufacturer's printed instructions, coordinate with General Contractor for the application of carpet manufacturer's recommended primer, adhesives and seam sealers.
   3. Subfloor finishes comply with requirements specified in Division 3 Section "Cast-in-Place Concrete" for slabs receiving carpet.
   4. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

C. For wood subfloors, verify the following:
   1. Underlayment over subfloor complies with requirements specified in Division 6 Section "Rough Carpentry."
   2. Underlayment surface is free of irregularities and substances that may interfere with adhesive bond or show through surface.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and carpet manufacturer's written installation instructions for preparing substrates indicated to receive carpet installation.

B. Cut carpet bails open to full length of rolls to allow the carpet to ventilate a minimum of 72 hours prior to installation.

C. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill minor cracks, holes, and depressions in substrates.

D. Coordinate with General Contractor for the removal of coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents.

E. Broom and vacuum clean substrates to be covered immediately before installing carpet. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

A. Direct-Glue-Down Installation: Install carpet in strict accordance with the Carpet and Rug Institute's IAQ (indoor air quality) Installation guidelines as well as with the U.S. Environmental Protection Agency's guidelines. Install carpet in accordance with the recommendations in CRI 104 and the carpet manufacturer's specifications.

B. Stair Installation: Comply with CRI 104, Section 12, "Carpet on Stairs." Provide contact cement on risers for adhesive.

C. Comply with carpet manufacturer's written recommendations for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under the door in closed position.

D. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.

E. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

F. Install pattern parallel to walls and borders.

3.4 RESILIENT ACCESSORY INSTALLATION

A. General: Install resilient accessories according to manufacturer's written installation instructions.

B. Apply resilient wall base to walls, columns, pilasters, casework and cabinets in toe spaces, locker bases, and other permanent fixtures in rooms and areas where base is required.
   1. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
   2. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
   3. Do not stretch base during installation.
   4. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.
   5. Form outside corners on job from straight pieces of maximum lengths possible, without whitening at bends. Shave back of base at points where bends occur and remove strips perpendicular to length of base that are only deep enough to produce a snug fit without removing more than half the wall base thickness.
   6. Form inside corners on job, from straight pieces of maximum lengths possible, by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce a snug fit to substrate.

C. Place resilient accessories so they are butted to adjacent materials and bond to substrates with adhesive.

3.5 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet:
   1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
   2. Remove yarns that protrude from carpet surface.
   3. Vacuum carpet using commercial machine with face-beater element.

B. Protect installed carpet to comply with CRI 104, Section 15, "Protection of Indoor Installations."

C. Protect carpet against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet manufacturer.

3.6 BUILDING VENTILATION

A. Operate the building ventilation systems at maximum outdoor air flow before, during and 72 hours after the new carpet installation. Open windows and/or doors when possible during the carpet installation.

END OF SECTION

SECTION 09900 –PAINTING (EXTERIOR)

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes surface preparation and field painting of exposed exterior items and surfaces.

1.2 SUBMITTALS

A. Product Data: For each product indicated and listing VOC content.

1.3 QUALITY ASSURANCE

A. Benchmark Samples (Mockups): Provide a full-coat benchmark field-applied finish sample, on actual materials to be used, for each type of coating and substrate required. Comply with procedures specified in PDCA P5. Samples to be minimum 4 foot by 4 foot.

1. Small Areas and Items: Architect will designate items or areas required.

1.4 PROJECT CONDITIONS

A. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain storage containers in a clean condition, free of foreign materials and residue.

B. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F.

C. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F.

D Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

E Do not apply stains in direct sun or to hot surfaces. Use natural breaks or boundaries to break up large surfaces. Avoid lap lines.

1.5 EXTRA MATERIALS

A. Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective

covering for storage and identify with labels describing contents. Deliver extra materials to Owner.

1. Quantity: 3 percent, but not less than 1 gal. or 1 case, as appropriate, of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Benjamin Moore & Co. (Benjamin Moore).
2. ICI Paint Stores, Inc. (Dulux Paint).
3. PPG Industries, Inc. (Pittsburgh Paints).
4. Sherwin-Williams Co. (Sherwin-Williams).

2.2 PAINT MATERIALS, GENERAL

A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

C. Colors: As selected from manufacturer's full range.

2.3 PREPARATORY COATS

A. Exterior Primer: Exterior alkyd or latex-based primer of finish coat manufacturer and recommended in writing by manufacturer for use with finish coat and on substrate indicated.

1. Ferrous-Metal and Aluminum Substrates: Rust-inhibitive metal primer.
2. Zinc-Coated Metal Substrates: Galvanized metal primer.
3. Where manufacturer does not recommend a separate primer formulation on substrate indicated, use paint specified for finish coat.

2.4 EXTERIOR FINISH COATS

A. Exterior Flat Acrylic Paint:

1. Benjamin Moore; Moorcraft Super Spec Flat Latex House Paint No. 171.
2. ICI Dulux Paints; 2200-XXXX Dulux Professional Exterior 100 Percent Acrylic Flat Finish.
3. Pittsburgh Paints; 6-600 Series SpeedHide Exterior House Paint Flat Latex.
4. Sherwin-Williams; A-100 Exterior Latex Flat House & Trim Paint A6 Series.

B. Exterior Semigloss Acrylic Enamel:

1. Benjamin Moore: Moorcraft Super Spec Latex House & Trim Paint #170.
2. Dulux Paint; 2406-XXXX Dulux Professional Exterior 100 Percent Acrylic Semi-Gloss Finish.
3. Pittsburgh Paints; 6-900 Series SpeedHide Exterior House & Trim Semi-Gloss Acrylic Latex Paint.
3. Sherwin-Williams; A-100 Latex Gloss A8 Series.

C. Exterior Full-Gloss Acrylic Enamel for Ferrous and Other Metals:

1. Benjamin Moore; Moore's IMC Acrylic Gloss Enamel M28.
2. Dulux Paint; 3028-XXXX Dulux Interior/Exterior Acrylic Gloss Finish.
3. Pittsburgh Paints; 90-300 Series Pitt-Tech One Pack Interior/Exterior High Performance Waterborne High Gloss DTM Industrial Enamels.
4. Sherwin-Williams; DTM Acrylic Coating Gloss (Waterborne) B66W100 Series.

D Exterior clear finish:

1. Benjamin Moore: Alkyd semi-transparent stain #328
2. Sherwin-Williams: DeckScapes: Oil-based semi-transparent stain A18C50602
3. Sikkens: Cetol1/Cetol23 Plus: Exterior translucent oil based stain

2.5 INTERIOR FINISH COATS

Refer to Interior Drawings.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with procedures specified in PDCA P4 for inspection and acceptance of surfaces to be painted.

B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

C. Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

D. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.

1. Provide barrier coats over incompatible primers or remove and reprime.

2. Cementitious Materials: Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.

3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.

   a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
   b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and back sides of wood, including cabinets, counters, cases, and paneling.
   c. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on back side.
   d. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.

E. Material Preparation:

1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.

2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.

F. Exposed Surfaces: Include areas visible when permanent or built-in fixtures, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.

1. Paint surfaces behind movable equipment the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind

permanently fixed equipment with prime coat only.

2. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.

. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.

H. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. Omit primer over metal surfaces that have been shop primed and touchup painted.

2. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance.

I. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.

J. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide total dry film thickness of the entire system as recommended by manufacturer.

K Stains: Apply stain materials no thinner than manufacturer's recommended spreading rate. Apply stains by brush according to manufacturer's written instructions. Stain end grain that will be covered after installation prior to installation. Take particular care to coat all exposed end grain.

L. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

M. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

3.2 CLEANING AND PROTECTING

A. At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.

B. Protect work of other trades, whether being painted or not, against damage from painting. Protect adjacent surfaces and landscaping from damage.

Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.

C. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.

1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.3 EXTERIOR PAINT SCHEDULE

A. Fiber Cement Siding:

1. Acrylic Finish: Two finish coats over a primer.
   a. Primer: Exterior concrete and masonry primer.
   b. Finish Coats: Exterior flat acrylic paint.

B. Fiber Cement Trim:

1. Acrylic-Enamel Finish: Two finish coats over a primer.
   a. Primer: Exterior wood primer for acrylic enamels.
   b. Finish Coats: Exterior semigloss acrylic enamel.

C. Ferrous Metal:

1. Acrylic Finish: Two finish coats over a rust-inhibitive primer.
   a. Primer: Exterior ferrous-metal primer (not required on shop-primed items).
   b. Finish Coats: Exterior full-gloss acrylic enamel for ferrous and other metal.

D. Zinc-Coated Metal:

1. Acrylic Finish: Two finish coats over a galvanized metal primer.
   a. Primer: Exterior galvanized metal primer.
   b. Finish Coats: Exterior full-gloss acrylic enamel for ferrous and other metals. Color as selected by Architect.

E Clear Finished Wood:

1. Semi-transparent stain: Two coats.

3.4 INTERIOR PAINT SCHEDULE

Refer to Interior drawings

END OF SECTION 09900

SECTION 09967 – INTUMESCENT PAINTS

PART 1 - GENERALS

1.1 SUMMARY

A. This section includes field application of intumescent coatings to structural steel, including the following:

1. Concrete covered structural steel columns, located in the 1st floor garage, as indicated on the drawings.

B. See Division 9 Section "Painting" for general field painting.

1.2 SUBMITTALS

A. Product Data: For each coating system indicated.

1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference the specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.

2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each material specified.

B. Certification by manufacturer that products supplied comply with requirements indicated that limit the amount of VOCs in coating products.

1.3 QUALITY ASSURANCE

A. Applicator Qualifications: Engage an experienced applicator who has completed high-performance coating system applications similar in material and extent to those indicated for Project and whose work has a record of successful in-service performance.

1.4 PROJECT CONDITIONS

A. Apply coatings only when project conditions are compatible with the manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Pittsburg Paints. or approved equal by Architect.

2.2 COATINGS MATERIALS, GENERAL

A. Material Compatibility: Provide primers, undercoats, and finish-coat materials that are compatible with one another and substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience. Obtain primers and undercoat materials for each coating system from the same manufacturer as the finish coats.

B. Material Quality: Provide manufacturer's highest grade of the various high-performance coatings specified. Materials not displaying manufacturer's product identification are not acceptable.

C. VOC Classification: Provide high-performance coating materials, including primers, undercoats, and finish-coat materials, that have a VOC classification of 450 g/L or less.

2.4 EXTERIOR HIGH-PERFORMANCE COATING SYSTEMS

A. Structural steel: Provide the following finish systems over exterior galvanized metal:

1. Pittsburg Paints: Firetex thin film intumescent paint, UL rated for 2 hours, or equal approved by Architect.

PART 3 - EXECUTION

3.1 APPLICATION

A. General: Apply intumescent coatings according to manufacturer's written instructions.

END OF SECTION 09967

SECTION 10200 - LOUVERS AND VENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes fixed, extruded-aluminum louvers.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide louvers capable of withstanding the effects of gravity loads and wind loads based on a uniform pressure of 20 lbf/sq. ft., acting inward or outward, without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors.

B. Thermal Movements: Provide louvers that allow for thermal movements resulting from a temperature change (range) of 120 deg F, ambient; 180 deg F, material surfaces, by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

C. Air-Performance, Water-Penetration, and Wind-Driven Rain Ratings: As demonstrated by testing manufacturer's stock units according to AMCA 500-L.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. For louvers specified to bear AMCA seal, include printed catalog pages showing AMCA Certified Ratings Seals.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other Work.

1. Verify louver openings by field measurements before fabrication and indicate measurements on Shop Drawings.

C. Samples: For each type of finish.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Louvers:

    a. Airolite Company (The).
    b. Construction Specialties, Inc.
    c. Nystrom Building Products.
    d. Ruskin Company; Tomkins PLC.

2.2 MATERIALS

A. Aluminum Extrusions: ASTM B 221, alloy 6063-T5 or T-52.

B. Fasteners: Of same basic metal and alloy as fastened metal or 300 Series stainless steel.

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.3 FABRICATION, GENERAL

A. Fabricate frames to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

B. Join frame members to each other and to louver blades with fillet welds, threaded fasteners, or both, as standard with louver manufacturer, concealed from view.

2.4 FIXED, EXTRUDED-ALUMINUM LOUVERS

A. Storm-Resistant Louver:

1. Frame and Blade Nominal Thickness: Not less than 0.060 inch for blades and 0.080 inch for frames.
2. Performance Requirements:

    a. Free Area: Not less than 5.0 sq. ft. for 48-inch wide by 48-inch high louver.
    b. Air Performance: Not more than 0.10-inch wg static pressure drop at 600-fpm free-area velocity.
    c. Wind-Driven Rain Performance: Not less than 99 percent effectiveness when subjected to a rain fall rate of 3 inches per hour and a wind speed of 29 mph at a core area intake velocity of 300 fpm.

2.5 LOUVER SCREENS

A. General: Provide screen at interior face of each exterior louver.

B. Louver Screen Frames: Same kind and form of metal as indicated for louver to which screens are attached.

C. Louver Screening:

1. Bird Screening: Aluminum, 1/2-inch square mesh, 0.063-inch wire.
2. Insect Screening: Aluminum, 18-by-16 (1.4-by-1.6-mm) mesh, 0.012-inch (0.30-mm) wire.

2.6 FINISHES

A. Aluminum, High-Performance Organic Finish: Two-coat thermocured system with fluoropolymer coats containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.

1. Color and Gloss: As selected from manufacturer's full range.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Locate and place louvers and vents level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

D. Repair damaged finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

END OF SECTION 10200

SECTION 10431 - SIGNS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes typical ADA and building signage with the following:

1. Panel signs.
2. Dimensional street address numbers above the front entry.

1.2 SUBMITTALS

A. Product Data: For each product indicated.

B. Samples: For each exposed finish.

PART 2 - PRODUCTS

2.1 MANUFACTURES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Andco Industries Corp.
2. ASI Sign Systems, Inc.
3. Vomar Products, Inc.
4. Or approved equal by Architect.

2.2 MATERIALS

A. Cast Acrylic Sheet: Cast (not extruded or continuous cast) methyl methacrylate monomer plastic sheet with minimum flexural strength of 16,000 psi per ASTM D 790 and minimum allowable continuous service temperature of 176 deg F.

1. Opaque Sheet: Colored, in colors as selected from manufacturer's full range.

B. Aluminum:
For 12-inch high street address numbers above the front entry on the front of building, as shown on the elevations: Alloy and temper recommended by manufacturer for use and finish indicated with not less than the strength and durability properties of ASTM B 209, alloy 5005-H15.

C. Fasteners: Use concealed fasteners fabricated from metals that are not

corrosive to sign material and mounting surface.

D. Anchors and Inserts: Use nonferrous metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

E. Colored Coatings for Acrylic Plastic Sheet: Use colored coatings, including inks and paints for copy and background colors, recommended by acrylic manufacturers for optimum adherence to surface and that are nonfading for application intended.

2.3 PANEL SIGNS

A. Unframed Panel Signs: Fabricate with smooth edges mechanically finished.

1. Edge Condition: Square cut.
2. Edge Color for Plastic Laminate: Same as background.
3. Corner Condition: Square.

B. Brackets and Fittings: Fabricate from extruded aluminum to suit mounting conditions indicated. Factory-paint brackets in color matching background color of sign panel.

C. Raised Copy: Machine-cut copy characters from matte-finished opaque acrylic sheet and chemically weld onto acrylic sheet forming sign panel face. Produce precisely formed characters with square cut edges free from burrs and cut marks.

1. Panel Material: Matte-finished opaque acrylic sheet.
2. Raised-Copy Thickness: 1/16 inch.

2.4 DIMENSIONAL LETTERS AND NUMBERS

A. Cutout Letters and Numbers: Solid plate material; precisely cut characters with square cut, smooth edges.

1. Metal: Aluminum.

B. Fabricated Letters and Numbers: Metal, form exposed faces and sides of characters to produce surfaces free from warp and distortion. Include internal bracing for stability and attachment of mounting accessories.

1. Aluminum Sheet: Not less than 0.090 inch thick. Fabricate by heliarc welding process.

2.5 FINISHES

A. Colors and surface textures: for exposed sign material that requires selection of materials with integral or applied colors, surface textures or other appearance characteristics, provide color matches as selected from manufacturer's full range, unless otherwise indicated.

B. Aluminum:

1. Baked-enamel finish: Thermosetting, modified-acrylic enamel system complying with AAMA 603.8, Medium gloss.

a. Color & finish: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install signs level, plumb, and at height indicated, with sign surfaces free from distortion or other defects in appearance.

B. Wall-Mounted Panel Signs:

1. Silicone-Adhesive Mounting: Use liquid silicone adhesive recommended by sign manufacturer to attach sign units to irregular, porous, or vinyl-covered surfaces. Use double-sided vinyl tape where recommended by sign manufacturer to hold sign in place until adhesive has fully cured.

C. Dimensional Letters and Numbers: Mount letters and numbers using standard fastening methods recommended by manufacturer for letter form, type of mounting, wall construction, and condition of exposure indicated. Use heavy paper template to establish letter spacing and to locate holes for fasteners.

1. Flush Mounting: With letter backs in contact with wall surface.

END OF SECTION 10431

SECTION 10520 - FIRE-PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes portable fire extinguishers and fire-protection cabinets.

1.2 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection specialties.

1. Fire Extinguishers: Include rating and classification.
2. Cabinets: Include door hardware, cabinet type, trim style, panel style, and details of installation.

B. Samples: For each exposed cabinet finish.

1.3 QUALITY ASSURANCE

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Standard for Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum: ASTM B 209 (ASTM B 209M) sheet and ASTM B 221 (ASTM B 221M) extrusions, alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated.

2.2 PORTABLE FIRE EXTINGUISHERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. J. L. Industries, Inc.
2. Kidde, Walter The Fire Extinguisher Co.
3. Larsen's Manufacturing Company.

4. Potter-Roemer; Div. of Smith Industries, Inc.

B. General: Provide fire extinguishers for each cabinet and other locations indicated.

1. Mounting Brackets: Manufacturer's standard steel, designed to secure extinguisher indicated and with plated or baked-enamel finish.

a. Provide brackets for extinguishers not located in cabinets.

2. Identification: Lettering to comply with authorities having jurisdiction for letter style, color, size, spacing, and location. Locate as directed by Architect.

a. Identify bracket-mounted extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to wall surface.

C. Multipurpose Dry-Chemical Type: UL-rated 2-A:10:B:C, 10-lb (2.3-kg) nominal capacity, in enameled-steel container.

2.3 FIRE-PROTECTION CABINETS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. General Accessory Manufacturing Co.
2. J. L. Industries, Inc.
3. Larsen's Manufacturing Company.
4. Potter-Roemer; Div. of Smith Industries, Inc.

B. Fire Protection Cabinet:

1. Cabinet Construction: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth. Miter and weld perimeter door frames.

a. Cabinet Metal: Aluminum sheet.

2. Cabinet Type: Suitable for fire extinguisher.
3. Cabinet Mounting: Semirecessed.
4. Cabinet Trim Style: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

a. Exposed Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

1. Flat Trim for Recessed Cabinets: 1/4- to 5/16-inch (6- to 8-

mm) backbend depth.

5. Cabinet Trim Material: Manufacturer's standard aluminum sheet.
6. Door Glazing: Manufacturer's standard, as follows:

   a. Clear Float Glass: ASTM C 1036, Type I, Class 1, Quality q3, 3-mm thickness.

7. Door Construction: Fabricate doors according to manufacturer's standards, of materials indicated, and coordinated with cabinet types and trim styles selected.

   a. Provide minimum 1/2-inch (13-mm-) thick door frames, fabricated with tubular stiles and rails, and hollow-metal design.
   b. Provide inside latch and lock for break-glass panels.

8. Door Hardware: Provide manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide either lever handle with cam-action latch, or exposed or concealed door pull and friction latch. Provide concealed or continuous-type hinge permitting door to open 180 degrees.

   a. Lettered Door Handle: Provide one-piece, cast-iron door handle with the word "FIRE" embossed into face.

9. Identification: Provide lettering to comply with authorities having jurisdiction for letter style, color, size, spacing, and location. Locate as directed by Architect.

2.4 FINISHES

A. Aluminum Cabinet and Door Finishes: Provide manufacturer's standard baked-enamel paint for the following:

   1. Exterior of cabinets and doors, except for those surfaces indicated to receive another finish.
   2. Interior of cabinets and doors.

B. Aluminum Anodic Finish: Class II, clear anodic coating complying with AAMA 607.1.

C. Aluminum Baked-Enamel Organic Finish: Thermosetting, modified-acrylic enamel primer/topcoat system complying with AAMA 603.8 except with a minimum dry film thickness of 1.5 mils (0.04 mm), medium gloss.

   1. Color: As selected from manufacturer's standard.

C. Surface Preparation: Clean surfaces of dirt, oil, grease, mill scale, rust, and other contaminants that could impair paint bond using manufacturer's standard methods.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine walls and partitions for suitable framing depth and blocking where semirecessed cabinets are to be installed.

B. Examine fire extinguishers for proper charging and tagging. Remove and replace damaged, defective, or undercharged units.

C. Install in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.

1. Prepare recesses for cabinets as required by type and size of cabinet and trim style.
2. Fasten mounting brackets to structure and cabinets, square and plumb.
3. Fasten cabinets to structure, square and plumb.

D. Adjust cabinet doors that do not swing or operate freely.

E. Refinish or replace cabinets and doors damaged during installation.

END OF SECTION 10520

SECTION 11450

APPLIANCES

Appliances will be supplied and installed by the Owner.

All units to have:

gas ranges

refrigerator with ice maker connection (provided by GC)

dish washer

electric washer and dryer

microwave that has internal a non ducted / filtered range hood that is located above the range

SECTION 11451

UNIT KITCHENS / VANITIES

No interior elevations of the kitchens and baths are provided. See Plan F 944 – details A17, L17 and F17 for sections drawings. Standard Cabinet Crown Molding to be Maple to match cabinets with a profile that matches the standard Brosco # 8000. The molding finish to match the maple cabinets.

Schedule K-1 designates the size of each cabinet and lists each cabinet, filler, panels etc for each unit. It is the intent of the Owner to provide cabinets that are based upon a KraftMaid brand or equal. See Plan F 940 for the cabinet details. All listed parts (fillers, end panels etc) to match the finish of the maple cabinets.

The wall cabinets on levels 1, 2 and 3 to be 36" tall; 42" tall on level 4.

Provide shop drawings to the Owners Representative for each unit prior to order. Provide samples of the following:

1. Door
2. Drawer
3. Door Hinge
4. Door and Drawer knob
5. Maple crown molding

Fasten cabinets to adjacent units and to backing. Fasten wall cabinets through back near top and bottom, at ends and not more than 18 inches between fasteners. All cabinets to be fastened with # 8 stainless steel screws with washers connected to the cabinet rails. All cabinets to be attached to each adjoining cabinet at the stiles with # 6 stainless steel screws recessed a min of 1/8 inch (2 per rail).

Install casework and countertop level and plumb to a tolerance of 1/8 inch in 8 feet.

Adjust casework and hardware so that doors and drawers are centered in the openings and operate smoothly without warp or bind. Lubricate operating hardware as recommended by the manufacturer.

Provide 1 row of 2 x 4 blocking between the studs at the kitchen and 2 rows of 2 x4 blocking at the bath base cabinets and bath linen cabinets. Provide 2 rows of 2 x 4 blocking at the kitchen wall cabinets. Coordinate all blocking with stile and rails of cabinets.

	Kitchen				Bath			
Unit	Base Cabs	Notes	Wall Cabs	Notes	Master Bath Cabs	Notes	2nd Bath Cabs	Notes
	Gen Note	All kitchen wall cabs 12" deep						
	Gen Note	All bath vanities 21" deep 33.5 " T						
	Gen Note	All toe Space to get 1/4" Maple Ply						
	Gen Note	See Finish Plan by Gawron Turgeon for information						
	Gen Note	Fin Back of Sink Island w 1/4" Maple Ply (typ at islands)						
1A	Unit Note	All cabs ADA acessible height			Gen Note	All cabs ADA acessible height		
						with 8.5" toe space		
					B42	1/4" Maple Panel @ Angle (ADA)		
	B42	2DR 2DWR	W4836	Fin End R				
	4DB 18		W3015	Cab over range and micro mate				
	B18	1DR 1DWR	W1836	Fin End L				
	B27	2DR	W3321	24" DP W/2-24x96 Fin Pan Attached @ Ref				
	SB36	2DR 2DWR Fixed Front 1/4" Maple Panel @ Angle (ADA)	W1836					
	B15	1DR 1DWR Fin End R						
	B2 (x2)	Base Filler w/Toe Kick						
1B					B42x33.5 T	Fin End L		
					LIN 84T			
	B42	2DR 2DWR	W4836	Fin End R				

	4DB 18		W3015	Cab over range				
	B18	1DR 1DWR	W1836	Fin End L				
	B27	2DR	W3321	24" DP W/2-24x96 Fin Pan Attached @ Ref				
	SB36	2DR 2DWR Fixed Front 1/4" Maple Panel @ Angle (ADA)	W1836					
	B15	1DR 1DWR Fin End R						
	B2 (x2)	Base Filler w/Toe Kick						
2A					3DB18		3DB18	Fin End L
	B30	2DR 2DWR	W3036	Fin End R	B36	Fin End R	B42	
	B24	2DR 2DWR	W3015	Cab over range				Add 1x3 painted cleat for counter to rest on
	P18	Pantry Cab 96"T	W2436	Fin End L				
	B24	2DR 2DWR w/FIN END L	W3621	24" DP W/1-24x96 Fin Pan Attached @ Ref				
	SB36	2DR						
	B1.5	FIN END PAN R						
	B2 (x2)	Base Filler w/Toe Kick						
2B					3DB18		3DB18	Fin End R
	B30	2DR 2DWR	W3036	Fin End R	B36	Fin End L	B42	
	B24	2DR 2DWR	W3015	Cab over range				Add 1 x3 painted cleat for counter to rest on
	P18	Pantry Cab 96"T	W2436	Fin End L				
	B24	2DR 2DWR w/FIN END L	W3621	24" DP W/1-24x96 Fin Pan Attached @ Ref				
	SB36	2DR						
	B1.5	FIN END PAN R						
	B2 (x2)	Base Filler w/Toe Kick						
2C					B36		B42	Fin End R
	B42	2DR 2DWR	W4236	Fin End R	B36	Fin End R		

	4DB24		W3015	Cab over range				
	P18	Pantry Cab 96"T	W2436	Fin End L				
	B36	2DR 2DWR	W3621	24" DP W/1-24x96 Fin Pan Attached @ Ref				
	SB36	2DR						
	B1.5	FIN END PAN R						
	B2 (x2)	Base Filler w/Toe Kick						
2E	P18	Pantry Cab 96"T	W3621	24" DP W/1-24x96 Fin Pan Attached @ Ref	B33		3DB18	Fin End L
	4DB24		W2436	Fin End R	B33		B36	
	B27	2DR	W3015	Cab over range				
	B30	Fin End L	W2736	W2448				
	B30	Fin End R						
	B2 (x2)	Base Filler w/Toe Kick						
2F	4DB18		W1836	Fin End R	3DB18		B36	Fin End R
	B24	2DR 2DWR	W3015	Cab over range	B42			Add maple filler to wall at angle with toe space
	B36	Fin End L	W2436	W2448				
	SB36		W3621	24" DP W/1-24x96 Fin Pan Attached @ Ref				
	B1.5	FIN END PAN R						
	B2 (x2)	Base Filler w/Toe Kick						
2G	4DB18		W1836	Fin End L	3DB18		B36	Fin End L
	B24	2DR 2DWR	W3015	Cab over range	B42			Add maple filler to wall at angle with toe space
	B36	Fin End R	W2436	W2448				
	SB36		W3621	24" DP W/1-24x96 Fin Pan Attached @ Ref				

	B1.5	FIN END PAN L						
	B2 (x2)	Base Filler w/Toe Kick						
3A					3DB18		3DB18	Fin End L
	B30	2DR 2DWR	W3036	Fin End R	B36	Fin End R	B42	
	B24	2DR 2DWR	W3015	Cab over range				Add 1x3 painted cleat for counter to rest on
	P18	Pantry Cab 96"T	W2436	Fin End L				
	B24	2DR 2DWR w/FIN END L	W3621	24" DP W/1-24x96 Fin Pan Attached @ Ref				
	SB36	2DR						
	B1.5	FIN END PAN R						
	B2 (x2)	Base Filler w/Toe Kick						
3B					3DB18		3DB18	Fin End R
	B30	2DR 2DWR	W3036	Fin End R	B36	Fin End L	B42	
	B24	2DR 2DWR	W3015	Cab over range				Add 1x3 painted cleat for counter to rest on
	P18	Pantry Cab 96"T	W2436	Fin End L				
	B24	2DR 2DWR w/FIN END L	W3621	24" DP W/1-24x96 Fin Pan Attached @ Ref				
	SB36	2DR						
	B1.5	FIN END PAN R						
	B2 (x2)	Base Filler w/Toe Kick						
3C					B36		B42	Fin End R
	B42	2DR 2DWR	W4236	Fin End R	B36	Fin End R		
	4DB24		W3015	Cab over range				
	P18	Pantry Cab 96"T	W2436	Fin End L				
	B36	2DR 2DWR	W3621	24" DP W/1-24x96 Fin Pan Attached @ Ref				
	SB36	2DR						
	B1.5	FIN END PAN R						

	B2 (x2)	Base Filler w/Toe Kick						
3D					3DB18		3DB18	
	B24	2DR 2DWR	W2436	Fin End R	B42		B42	Fin End R
	B24		W3015	Cab over range				
	P18	Pantry Cab 96"T	W2436	Fin End L				
	B36	2DR 2DWR	W3621	24" DP W/1-24x96 Fin Pan Attached @ Ref				
	SB36							
	B1.5	FIN END PAN R						
	B2 (x2)	Base Filler w/Toe Kick						
3E	P18	Pantry Cab 96"T	W3621	24" DP W/1-24x96 Fin Pan Attached @ Ref	B33		3DB18	Fin End L
	4DB24		W2436	Fin End R	B33		B36	
	B27	2DR	W3015	Cab over range				
	B30	Fin End L	W2736	Fin End L				
	B30	Fin End R						
	B2 (x2)	Base Filler w/Toe Kick						
3F	4DB18		W3036	Fin End R	3DB18		B36	Fin End R
	B24	2DR 2DWR	W3015	Cab over range	B42			Add maple filler to wall at angle with toe space
	B36	Fin End L	W2436	Fin End L				
	SB36		W3621	24" DP W/1-24x96 Fin Pan Attached @ Ref				
	B1.5	FIN END PAN R						
	B2 (x2)	Base Filler w/Toe Kick						
3G	4DB18		W3036	Fin End R	3DB18		B36	Fin End L

	B24	2DR 2DWR	W3015	Cab over range	B42			Add maple filler to wall at angle with toe space
	B36	Fin End R	W2436					
	SB36		W3621	24" DP W/1-24x96 Fin Pan Attached @ Ref				
	B1.5	FIN END PAN L						
	B2 (x2)	Base Filler w/Toe Kick						
4A	B1.5	FIN END PAN L&R	W3642	FIN END PAN L&R	B33		3DB18	Fin End L
	B36	2DR 2DWR Fin End L	W3021	Cab over range	B33	Fin End R	B42	
	B30	2DR 2DWR	W3042	Fin End L				
	P30	Pantry Cab 102"T	W3627	24" DP W/1-24x96 Fin Pan Attached @ Ref				
	B30	Fin End L						
	SB36							
	B1.5	FIN END PAN R						
	B2 (x2)	Base Filler w/Toe Kick						
4B	P18	Pantry Cab 102"T	W3627	24" DP W/1-24x96 Fin Pan Attached @ Ref	B30		3DB24	
	B24	2DR 2DWR	W2442	Fin End R	3DB18		B48	Fin End R
	B30	2DR 2DWR	W3021	Cab over range	B30	Fin End R		
	B24	2DR 2DWR	W3042					
	SB36							
	B18	1DR 1DWR						
4D					3DB18		3DB18	
	B24	2DR 2DWR	W2442	Fin End R	B42		B42	Fin End R
	B24		W3021	Cab over range				
	P18	Pantry Cab 96"T	W2442	Fin End L				
	B36	2DR 2DWR	W3627	24" DP W/1-24x96 Fin Pan Attached @ Ref				
	SB36							

	B1.5	FIN END PAN R						
	B2 (x2)	Base Filler w/Toe Kick						
4E	P18	Pantry Cab 96"T	W3627	24" DP W/1-24x96 Fin Pan Attached @ Ref	B33		3DB18	Fin End L
	4DB24		W2442	Fin End R	B33		B36	
	B27	2DR	W3021	Cab over range				
	B30	Fin End L	W2742	Fin End L				
	B30	Fin End R						
	B2 (x2)	Base Filler w/Toe Kick						
4F	4DB18		W3042	Fin End R	3DB18		B36	Fin End R
	B24	2DR 2DWR	W3021	Cab over range	B42			Add maple filler to wall at angle with toe space
	B36	Fin End L	W2442	Fin End L				
	SB36		W3627	24" DP W/1-24x96 Fin Pan Attached @ Ref				
	B1.5	FIN END PAN R						
	B2 (x2)	Base Filler w/Toe Kick						
4G	4DB18		W3042	Fin End R	3DB18		B36	Fin End L
	B24	2DR 2DWR	W3021	Cab over range	B42			Add maple filler to wall at angle with toe space
	B36	Fin End R	W2442					
	SB36		W3627	24" DP W/1-24x96 Fin Pan Attached @ Ref				
	B1.5	FIN END PAN L						
	B2 (x2)	Base Filler w/Toe Kick						

SECTION 14240 - HYDRAULIC ELEVATORS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes hydraulic passenger elevators.

B Related sections include:
Section 5500: Metal Fabrications

1.2 SUBMITTALS

A. Product Data: Include capacities, sizes, performances, operations, safety features, finishes, and similar information for each elevator required.

B. Shop Drawings: Show plans, elevations, sections, and large-scale details indicating service at each landing, machine room layout, relationships with other construction, and locations of equipment and signals. Indicate maximum and average power demands.

C. Samples: For each exposed finish.

D. Manufacturer Certificates: Signed by elevator manufacturer certifying that hoistway, pit, and machine room layout and dimensions, as shown on Drawings, and electrical service, as shown and specified, are adequate for elevator system being provided.

E. Maintenance manuals.

F. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with local governing regulations and with applicable provisions in ASME A17.1, "Safety Code for Elevators and Escalators."

B. Accessibility Requirements: In addition to local governing regulations, comply with Section 4.10 in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines (ADAAG)."

1.4 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, provide 12 months' full maintenance service. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide hydraulic elevators by one of the following:

1. Canton Elevator Inc.
2. Otis Elevator Co.
3. Stanley Elevator Co.
4. ThyssenKrupp Elevator
5. or approved equal by Architect.

2.2 MATERIALS AND COMPONENTS

A. General: Provide manufacturer's standard elevator systems, published by manufacturer as included in standard preengineered elevator systems and as required for a complete system.

B. Pump Units: Positive-displacement type with a maximum of 10 percent variation between no load and full load and with minimum pulsations.

1. Pump: Mounted on top of oil tank with vibration isolation mounts and enclosed in prime-painted steel enclosure lined with 1-inch thick, glass-fiber insulation board or submersible, suspended inside tank from vibration isolation mounts.
2. Motor Starting: Solid state.

C. Hydraulic Silencers: Containing pulsation-absorbing material in a blowout-proof housing at pump unit.

D. Protective Cylinder Casings: PVC pipe casings complying with ASME A17.1, of sufficient size to provide not less than 1-inch clearance from cylinder, and extending above pit floor.

E. Car Frame and Platform: Welded steel units.

F. Finish Materials:

1. Enameled-Steel Sheet: Cold-rolled steel sheet complying with ASTM A 366/A 366M, matte finish, stretcher-leveled standard of flatness; hot-rolled steel sheet complying with ASTM A 569/A 569M may be used for door frames. Provide with factory-applied enamel finish.

a. Colors: As selected from manufacturer's full range.

2. Plastic Laminate: High-pressure type complying with NEMA LD 3, Type HGS.

a. Colors, Textures, and Patterns: As selected from manufacturer's full range.

2.3 OPERATION SYSTEMS

A. Provide manufacturer's standard microprocessor operation system of the type indicated.

1. Single Elevator: Provide "selective collective automatic operation" as defined in ASME A17.1.

B. Security Features: Security features do not affect emergency firefighters' service.

1. Secured Landing Feature: Allows each landing to be secured or cleared. If landing is secured, car buttons for that landing do not register a call unless landing access code is entered within a predetermined time period after landing button is pressed. Access codes are programmed at each car operating panel using a security keyswitch. Secured landing feature is activated and deactivated by a security keyswitch at the main landing.

2. Car-to-Lobby Feature: Feature, activated by a keyswitch at main lobby, that causes all cars in a group to return immediately to lobby and open doors for inspection. On deactivation by keyswitch, cars complete calls registered before keyswitch activation and resume normal operation.

2.4 SIGNAL EQUIPMENT

A. General: Satin stainless-steel signal equipment with hall-call and car-call buttons that light when activated and remain lit until call has been fulfilled. Fabricate lighted elements of acrylic or other permanent, nonyellowing translucent plastic.

B. Car Control Stations: Manufacturer's standard car control stations mounted in return panel adjacent to car door, unless otherwise indicated.

C. Emergency Communication System: Complying with ASME A17.1 and the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines (ADAAG)." On activation, system dials preprogrammed number of monitoring station and identifies elevator location to monitoring station. System provides two-way voice communication without using a handset and provides visible signals that indicate when system has been activated and when monitoring station has

responded. System is contained in flush-mounted cabinet, with identification, instructions for use, and battery backup power supply.

D. Fire Department Communication System: Flush-mounted cabinet in each car and required conductors in traveling cable for fire department communication system specified in Division 16 Sections.

E. Car Position Indicator: Locate above car door or above car control station and include audible signal to indicate to passengers that car is either stopping at or passing each of the floors served.

1. Include travel direction arrows if not included in car control station.

F. Hall Push-Button Stations: Locate at each landing for each elevator or group of elevators as indicated.

G. Hall Lanterns: Units with illuminated arrows.

1. With each lantern, include audible signals. Signals sound once for up and twice for down.

H. Hall Position Indicators: Locate above each hoistway entrance at ground floor.

I. Corridor Call Station Pictograph Signs: Matching hall push-button stations with text and graphics according to ASME A17.1, Appendix H.

2.5 DOOR REOPENING DEVICES

A. Infrared Array: Uniform array of 36 or more microprocessor-controlled, infrared light beams projecting across car entrance. Interruption of one or more of the light beams causes doors to stop and reopen.

2.6 ELEVATOR CAR ENCLOSURES

A. General: Provide manufacturer's standard enameled-steel car enclosures with removable wall panels, suspended ceiling, trim, accessories, access doors, doors, power door operators, sills (thresholds), lighting, and ventilation.

1. Floor Finish: As indicated by Architect.
2. Plastic-Laminate Wall Panels: Plastic laminate adhesively applied to 1/2-inch fire-retardant-treated particleboard with manufacturer's standard protective edge trim.
3. Fabricate car with recesses and cutouts for signal equipment.
4. Fabricate car door frame integrally with front wall of car.
5. Enameled-Steel Doors: Flush, hollow-metal construction.
6. Sills: Extruded aluminum, with grooved surface, 1/4 inch thick.
7. Luminous Ceiling: Fluorescent light fixtures and ceiling panels of translucent acrylic or other permanent rigid plastic complying with flammability requirements.

8. Handrails: Manufacturer's standard metal handrails.

2.7 HOISTWAY ENTRANCES

A. General: Manufacturer's standard horizontal-sliding, door-and-frame hoistway entrances complete with track systems, hardware, sills, and accessories.

1. Where gypsum board wall construction is indicated, provide self-supporting frames with reinforced head sections.
2. Enameled-Steel Frames: Formed steel sheet.
3. Enameled-Steel Doors: Flush, hollow-metal construction.
4. Sills: Extruded aluminum, with grooved surface, 1/4 inch thick.
5. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107.

2.8 ELEVATORS

A. Elevator No. 1:

1. Type: Under-the-car single cylinder.
2. Number of stops: Four (4).
3. Rated Load: 2500 lb.
4. Rated Speed: 150 fpm.
5. Operation System: Selective collective automatic operation.
6. Car Enclosures:

    a. Front Walls: Enameled steel with integral car door frames.
    b. Side and Rear Wall Panels: Enameled steel.
    c. Door Faces (Interior): Enameled steel.

7. Hoistway Entrances:

    a. Type: Single-speed side sliding.
    b. Frames: Enameled steel.
    c. Doors: Enameled steel.

8. Additional Requirements:

    a. Provide inspection certificate in each car, mounted under acrylic cover with satin stainless-steel frame.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Excavation for Jack: Drill excavation in each elevator pit to accommodate installation of cylinders.

1. Provide well casings as necessary to retain walls of well hole.

B. Install cylinders in protective casings within well holes or casings after removing water and debris and providing a permanent waterproof seal at bottom of well casing.

C. Install cylinders plumb and accurately centered for elevator car position and travel. Anchor securely in place, supported at pit floor. Seal between well casing and pit floor with 4 inches of nonshrink, nonmetallic grout.

D. Leveling Tolerance: 1/4 inch, up or down, regardless of load and direction of travel.

E. Set sills flush with finished floor surface at landing. Fill space under sill solidly with nonshrink, nonmetallic grout.

3.2 FIELD QUALITY CONTROL

A. Acceptance testing: on completion of elevator installation and before permitting use (either temporary or permanent) of elevators, perform acceptance tests as required and recommended by ASME A17.1 and by governing regulations and agencies.

3.3 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain elevators. Review emergency provisions and train Owner's personnel in procedures to follow in identifying sources of operational failures or malfunctions. Refer to Division 1 Section "Closeout Procedures."

3.4 PROTECTION

A. Temporary Use: Do not use elevators for construction purposes unless cars are provided with temporary enclosures, either within finished cars or in place of finished cars, to protect finishes from damage.

1. Provide full maintenance service by skilled, competent employees of elevator Installer for elevators used for construction purposes.

END OF SECTION 14240

SECTION 15500

AUTOMATIC FIRE PROTECTION SYSTEM

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

A. The work covered by this Section of the specifications includes the furnishing of labor, materials, equipment, transportation, permits, inspections and incidentals and the performing of operations required to design, install and test a pressurized, fully supervised, wet pipe fire protection system for full building protection in accordance with NFPA, IBC, and the Owner's insurance underwriter. Areas subject to freezing, such as the attic, shall have a dry pipe system. Exterior overhangs shall have dry pendent or sidewall heads, or glycol-and-water loop per NFPA.

1.2 RELATED DOCUMENTS

A. The drawings and the specifications including SECTION 15000 "SUPPLEMENTAL MECHANICAL GENERAL REQUIREMENTS" are hereby made a part of the work of this section.

1.3 QUALIFICATIONS

A. The Fire Protection Work shall be performed by a qualified Contractor primarily engaged in the design and installation of Fire Protection Systems. The fire protection system design shall be performed under the direction of, and sealed by, a professional engineer registered in the State of Maine.

B. Welding qualifications of individuals installing welded piping shall be certified by the National Certified Welding Bureau for the type(s) of weld(s) proposed for use in piping assembly.

1.4 SUBMITTALS

A. Items for which the submittal requirements of section 15000, Supplemental Mechanical General Requirements, apply are as Follows:

1. Hydrant flow test.
2. System components.
3. Hydraulic calculations.
4. Piping layout, details and control diagram.
5. Flushing and testing records.
6. Certificate of installation.
7. Copy of Fire Protection Contractors License.
8. Welding certificates of individual welding technicians.
9. Zone flow switches and valves.
10. Sprinkler heads.

11. Alarm valve(s).
12. Fire department connection(s).
13. Firestopping materials and methods.

Submit hydrant flow test, equipment descriptive data, hydraulic calculations and system layout for review by the Owner's Insurance Underwriter, State Fire Marshall's office, Portland Fire Department and Architect/Engineer. The Architect's review will be limited to checking for conformance with the design concept of the project and general compliance with the contract documents and will in no way assume liability for review for compliance with codes, standards and laws.

1.5 SPRINKLER COVERAGE

A. Sprinkler head coverage shall conform with NFPA requirements for the use of the building (0.10 GPM/SF density for the hydraulically most remote 1500 S.F.). Coverage shall be increased accordingly where required by the Authority having jurisdiction.

B. If the requirements of the inspection agency or the Owner's insuring agent are more rigorous than those stated herein, then the more rigorous requirements shall govern.

PART 2 PRODUCTS

2.1 SYSTEM COMPONENTS AND HARDWARE

A. Pipe, Fittings, Joints, Hangers, Valves, Fire Department Connections, Alarms: Conform to NFPA-13, Installation of Sprinkler Systems and NFPA 14 Standpipes. Contractor shall obtain up-to-date water flow and pressure data prior to any calculations.

B. Sprinkler Heads:

1. Interior Heated Spaces: Conform to NFPA-13, commercial quick response type. Provide semi-recessed type with white finish for acoustical tile ceilings, center head in tile where possible. Sprinkler heads in GWB ceilings shall be concealed type, white finish. Dry pendent or sidewall heads, where required, may be standard response type, white finish.

2. Provide a spare head cabinet with wrenches and six (6) heads of each orifice size, finish, temperature classification, pattern and length furnished in the project.

3. Sprinkler heads in unheated areas shall be dry pendent or sidewall type, or served by a glycol and water loop or separate dry-pipe system.

4. Temperature ratings for sprinkler heads shall be suitable for the space. Heads in boiler rooms and similar locations with concentrated heat sources shall have heads with the appropriate temperature rating.

C. Fire Department Connection: Provide a 4" Storz or Siamese connection (verify type with the Portland Fire Department) at a location coordinated with the local fire department and the Architect.

D. Post Indicator Valves: Gate valves for uses with indicator post shall conform to UL 262. Indicator posts shall conform to UL 789. Provide indicator post with one coat of primer and two coats of red enamel paint.

E. Valve Boxes: Except where indicator posts are provided, provide each gate valve in buried piping with an adjustable cast-iron valve box of a size suitable for the valve on which it is to be used. Boxes outside of paved areas may be of Acrylonitrile-Butadiene-Styrene (ABS) plastic or of inorganic fiber reinforced black polyolefin plastic. The head shall be round and the lid shall have the word WATER cast on it. The least diameter of the shaft of the box shall be 5.25 inches. Provide each cast-iron box with a heavy coat of bituminous paint.

2.2 WATER SUPPLIES

A. Conform to the requirements of NFPA-13, NFPA 13 - R Installation of Sprinkler Systems.

B. Contractor shall obtain up-to-date water flow and pressure data.

2.3 DEVICES

A. Detection devices and associated wiring both within the fire protection system and to the building Fire Alarm System shall be the responsibility of the Sprinkler Contractor.

2.4 BACKFLOW PREVENTER

A. Provide AMES MODEL 2000.

2.5 PIPING SYSTEM IDENTIFICATION

A. Piping system and valve identification and color coding shall be in accordance with ANSI.

2.6 SPRINKLER SYSTEM ZONING

A. Zoning at a minimum shall be per tenant, but shall be verified by Owner and authority having jurisdiction (AHJ). Each zone alarm shall consist of a flow switch, isolation valve with tamper switch and other components per NFPA and connect to the building fire alarm panel. See Architectural Drawings for additional information.

2.7 CEILING CAVITIES

A. Ceiling cavities above all suspended acoustical tile ceilings in corridor areas and certain other areas contain bundled electrical cables and individual wires and shall be sprinklered. Coordinate sprinkler requirements with the Electrical Contractor.

PART 3 EXECUTION

3.1 PIPING LAYOUT AND DESIGN

A. System requirements, installation requirements, design, plans, and calculations: Conform to NFPA-13, Installation of Sprinkler Systems & NFPA 14 Standpipes.

B. Sprinkler piping shall be run concealed above ceilings in occupied areas. Piping in other areas may be run exposed. Piping shall not be exposed in occupied spaces unless indicated on the drawings.

C. Pipe penetrations through walls and floors shall be in accordance with Section 15000 - Additional General Mechanical Requirements. Traverse points of piping shall be escutcheoned with split chrome (white finish) floor and ceiling plates and spring anchors, where visible to occupancy. All penetrations shall be sleeved and firestopped.

D. Coordinate design and layout with building structure and building systems. The work shown in the contract documents has precedence for space requirements. Work of other trades may be modified or moved only with permission of the trade involved. Costs associated with modifications or relocations shall be the same as for "Substitutions" Section 15000. Sprinkler system piping may need to be located within the structural system in certain locations.

E. Architect shall review proposed system layout and reserve the right to relocate heads, substitute head system and in general review final layout for components visible in occupied spaces.

3.2 SYSTEM ACCEPTANCE

A. Approval, flushing, hydrostatic testing, instructions, and certificates of installation: Conform to NFPA-13, Installation of Sprinkler Systems & NFPA 14 Standpipes.

B. Disinfect the water piping in accordance with AWWA C601. Fill the piping systems with solution containing a minimum of 50 parts per million of available chlorine and allow solution to stand for minimum of 24 hours. Repeat disinfection if chlorine residual is less than 10 parts per million after 24 hours. Flush the solution from the systems with clean water until maximum residual chlorine contents is not greater than 0.2 parts per million.

C. Closing in Work:

1. General: Cover up or enclose work after it has been properly and completely reviewed.

2. No additional cost to the Owner will be allowed for uncovering and recovering, work that is covered or enclosed prior to required review and acceptance.

D. Cleanup and Corrosion Prevention:

1. Upon completion of the work thoroughly clean and flush piping systems to the sewer with water.

2. Piping and equipment shall be thoroughly cleaned. Dirt, dust, and debris shall be removed and the premises left in a clean and neat condition.

3. Before uncovered piping is permitted to be concealed, corrosion and rust shall be wire brushed and cleaned and in the case of iron products, a coat of approved protective paint applied to these surfaces. When corrosion is from the effects of hot solder paste, the areas shall be cleaned and polished and a wash of bicarbonate of soda and water used to neutralize the acid condition.

E. Instructions: On completion of the project, provide a technician familiar with the system to thoroughly instruct the Owner's representative in the care and operation of the system. The total period of instruction shall not exceed four (4) hours. The time of instruction shall be arranged with the Owner.

F. Warranty: For a period of one (1) year after completion of the installation repair or replace any defective materials or workmanship. Upon completion of the installation, the system shall be turned over to the Owner fully inspected and tested, and in operational condition.

3.3 FIRESTOPPING

A. Firestopping shall be performed in accordance with Applicable Codes. All penetrations of fire-rated assemblies including walls and floors by mechanical system components (piping, ductwork, conduits, etc.) shall be firestopped as specified.

* END OF SECTION *

SECTION 15400

PLUMBING

Provide ice maker connection for refrigerator at each unit.

Outside hose bibs with key Woodfords #65 C or equal.

Water heater overflow pan (with drain) IPS # 83200 or equal

Washer overflow pan IPS # 83200 or equal.

Plumbing Fixture Schedule P 1				
All fixtures White				All fixtures listed can be replaced with equal product provide list of fixtures if substituting
Symbol	Fixture	Manuf	Faucet	Description
W 1	Water Closet	American Std		# 2018.212 Champion Elongated Toilet 3121.016 Bowl, 4260.016 tank
L 1	Lavatory	American Std	Moen 4551 Chr	# 0419.444 Cadet Oval Countertop Sink
L 2	Lavatory	American Std	Moen T4560	# 0496.011 Undermount sink
L 3	Lavatory	Toto	Moen T4560	# LPT890 Pedestal Sink
T 1	Bath tub	Aker	Simmons 76-1	# T060 " fiberglass tub with tile surround (see finish schedule)
T 2	Whirlpool tub	Kohler		# 1492 H Greek 48"
T 3	Whirlpool tub	Aker		# SBA 3660 60"
TS 1	Tub / Shower	Aker	Simmons 76-1	# GB60 60" fiberglass tub / shower
SH 1	Shower	Aker	Simmons 76-1	# LS / RS 48 shower with tub
SH 2	Tile Shower	Custom	Simmons 76-1	60" fiberglass shower
SH 3	Tile Shower	Custom	Simmons 76-1	48" tile surround (see finish schedule)
SH 4	Tile Shower	Custom	Simmons 76-1	54" tile surround (see finish schedule)
SH 5	Tile Shower	Custom	Simmons 76-1	60" tile surround (see finish schedule)
KS 1	Kitchen Sink	Elkay	Moen 7430	# PSR 3322
KS 2	Kitchen Sink	Kohler	Moen 7570	# 5931-4U
SC	Sill Cock			Woodfords # 65 C or equal

SECTION 15600

HVAC

Provide a Design Build system as per the instructions by Bennett Engineering to follow.

The 1st and 2nd floor units have the following components:

1. Gas fired boiler for radiant heat and domestic hot water;
2. Provide outlet next to noted "PTAC" units on drawings on a separate 20 A circuit for future unit to be provided by Owner.

The 3rd floor units have the following components:

1. Gas fired furnace with a cooling coil and roof top condenser. The duct chases are from the roof are shown on the TFH plans. The distribution from the furnace to the rooms is design build. Framed soffits are shown on F 1.22 and F 1.23 to carry the ductwork to the outside walls for air distribution.
2. 40 gal electric hot water heater.

The 4th floor units have the following components:

1. Gas fired furnace with a cooling coil and roof top condenser. The duct chases are from the roof are shown on the TFH plans. The distribution from the furnace to the rooms is design build. Framed soffits are shown on F 1.22 and F 1.23 to carry the ductwork to the outside walls for air distribution.
2. 52 gal electric hot water heater.
3. Heat and Glo (or equal) Gas Fireplace with electronic ignition (no pilot light). Vent thru roof with proper flashing at EPDM. Submit shop drawings prior to installation.

January 31, 2007

Mechanical Outline Specification by
Bennett Engineering, Freeport, ME for the

SHERIDAN HEIGHTS CONDOMINIUMS
PORTLAND, ME

HVAC:

1. System design shall be in conformance with all applicable local and national codes.

2. Installation of all equipment and fixtures shall be per manufacturer's recommendations.

3. First and Second Floor Units, HVAC: Heating shall be a hot water system utilizing a * Laars 'Mascot' wall-hung, condensing boiler, fully modulating from 126 MBH down to 32MBH with domestic hot water coil. Provide with condensate pump, route pump discharge to indirect waste standpipe in laundry closet. Fintube Radiation shall be Sterling 'Heatrim Plus' rated for 800Btu per liner foot at 180°F entering water temperature and 2gpm flow. Each kitchen shall be heated by a kickspace heater which shall be Beacon-Morris, Embassy or VRV, 8.0 MBH with 2.0 GPM at 180^0F. EWT. selected to operate on low speed. Provide heating circulator by Taco or Grundfos for each zone. Hot water piping shall be type 'L' copper with fiberglass or flexible unicellular insulation. Space cooling shall be accomplished by one or two Carrier model 52PC packaged terminal air conditioners (PTACs), 230V-1Ph as indicated. One shall be located in the bedroom noted, the other shall be in the living room. Capacities shall be as follows: * OR EQUAL

Unit 1A,	Living Room – 7.0 MBH, Bedroom – 7.0 MBH
Unit 1B,	Living Room – 9.0 MBH
Unit 2A,	Living Room – 12.0 MBH, Bedroom – 7.0 MBH
Unit 2B,	Living Room – 12.0 MBH
Unit 2C,	Living Room – 12.0 MBH
Unit 2E,	Living Room – 12.0 MBH, Bedroom – 7.0 MBH
Unit 2F,	Living Room – 12.0 MBH, Bedroom – 7.0 MBH
Unit 2G,	Living Room – 12.0 MBH

PTAC units shall be provided with wall sleeves, remote thermostat and drain kit with condensate pump. Route condensate pump discharge to indirect waste standpipe in laundry room.

4. Third and Fourth Floor Units, HVAC: Heating and cooling shall be accomplished by a Carrier 'Infinity 96' hot air furnace with a 'Performance' series dx cooling coil and remote condensing unit. Furnace shall be a sealed combustion, direct vent unit utilizing hot surface ignition, a two-stage gas valve, variable speed blower motor and two (2) heat exchangers for increased efficiency. Cooling coil shall include insulated cabinet, TXV expansion valve, low ambient cooling option and drain pan and shall be suitable for upflow installation. Condensing unit shall be housed in a galvanized steel, powder-coated cabinet with louvered coil-guard and shall include high/low pressure switches and filter drier. Condensing unit shall utilize 'Puron' refrigerant and be Energy Star rated

with a SEER rating of 15.0. HVAC controls shall be Carrier 'Infinity' system, capable of controlling the gas heating and dx-cooling, 7-day, 4 period programmable thermostat with automatic changeover and fan speed adjustment. Gas furnace shall be rated for 40.0MBH input, 96% efficient. Cooling coil and condensing unit in Unit 4A shall be rated for 2.5-ton, all others shall be rated for 1.5-ton total cooling capacity. Furnaces shall be located in Units with condensing units located on the roof, as indicated on the drawings. Refrigerant piping and accessories shall be sized, provided and installed per manufacturer's recommendations, refrigerant suction lines shall be insulated with ½" flexible unicellular insulation.

Air distribution ductwork shall be galvanized steel, conforming to SMACNA standards. Supply ductwork shall be sealed to SMACNA seal class A and shall be insulated with 1-½" thick fiberglass duct wrap with "FSK" jacket.

5. Garage, Heating and Ventilating: The heating and ventilating system shall consist of a direct-fired makeup air unit* (Greenheck DG-120-H30, 905MBH input) located in the second floor storage area and supplying 9,000 cfm outside air tempered to the space temperature setpoint. The gas furnace shall be capable of 25:1 turndown. Outside air shall enter the unit through a 60" wide, 72" tall Ruskin ELF6375DX louver (minimum free area 17.5 square ft) with a motor operated damper to prevent cold air migration when the unit is off. Air distribution ductwork shall be galvanized steel, conforming to SMACNA standards. Supply ductwork shall be sealed. A pair of sidewall propeller fans (Greenheck SE2 series) shall exhaust 5000 cfm each. Exhaust fans shall be interlocked with the makeup air unit The ventilation system shall be controlled by a minimum of four carbon monoxide (CO) sensors located throughout the space. Space heating shall be accomplished by four (4) direct-vent, gas-fired unit heaters (Reznor UDAS-60, 60MBH input each). * OR EQUAL

6. Corridor and Common Area, HVAC: The corridors, lobbies, mail room, stair towers and storage room shall be heated, ventilated and cooled by a* Carrier model 48HJ, 5-ton, 13 SEER, packaged rooftop air handler with a heating input/output rating of 60MBH/50MBH on the West end of the building and a Carrier model 48HE, 2-ton, 13SEER, packaged rooftop air handler with a heating input/output of 50MBH/40.5MBH on the East end of the building. Ventilation rates shall be as required to meet ASHRAE 62. Air distribution ductwork shall be galvanized steel, conforming to SMACNA standards. Supply ductwork shall be sealed airtight and shall be insulated with 1½" thick fiberglass duct wrap with "FSK" jacket. * OR EQUAL

   The Stair towers and Entry Vestibule shall have electric wall heaters (10.2 MBH/3kW each) installed as supplemental heat.

   The storage area shall have a direct-vent, gas fired unit heater (Reznor UDAS-45), as supplemental heat.

7. Miscellaneous Spaces, Heating: Electric unit heaters shall be utilized to heat the Utility room (3.4 MBH/1.0 kW).

8. Toilet exhaust fans (EF) shall be* Panasonic Model FV-08VQ2, ceiling type, with solid-state speed control, interlocked with the light switch. Furnish with aluminum wall cap. Toilet exhaust duct shall be 4" diameter, galvanized steel. OR EQUAL

9. Furnish a dryer vent booster fan by Fantech with pressure switch interlocked with the dryer. Dryer exhaust duct shall be 4" diameter galvanized steel.

10. The Trash Room shall be exhausted at a minimum rate of 10 air changes per hour.

11. The Elevator Machine Room shall be vented as required to ensure a maximum space temperature of 80°F.

Plumbing:

1. System design shall be in conformance with all applicable local and national codes.

2. Installation of all equipment and fixtures shall be per manufacturer's recommendations.

3. The water entrance shall conform to Portland Water District requirements and shall include (as a minimum) strainers, isolation valves and a Reduced Pressure Zone (RPZ) type backflow preventer in addition to the water meter.

4. Plumbing fixtures shall be provided as indicated on the Architectural drawings. Fixture type and manufacturer shall be Kohler, Eljer, American-Standard, or equal, with model and color selected by the Architect. Water closets will be floor-mounted tank type. A double bowl stainless steel sink shall be provided in the kitchen as indicated. Lavatories shall be wall hung or vanity type as indicated. Showers shall be Aquarius or Aqua-Bath, molded acrylic, or as selected by the Architect. Tub/Shower units shall be Kohler, Aqua-Bath, molded acrylic, or as selected by the Architect. Units 4A, 4B and 4D shall have Jacuzzis as selected by the Architect. Fixture trim shall be Symmons or Chicago-Faucets., chrome-plated brass. All fixtures shall be water-conserving. Water piping shall be CPVC. Water piping shall be insulated with fiberglass or flexible unicellular insulation to meet energy code. Sanitary piping shall be Schedule 40 PVC with "solvent-cemented" joints. Vent piping shall be Schedule 40 PVC. Shut-off valves shall be Apollo or Watts ball valves. On the third and fourth floors, the domestic water heater shall be a residential grade (40 gallon minimum for one bedroom units and 50 gallon minimum for two bedroom units) electric storage type water heater by State or AO Smith delivering the water at approximately 120°F. The storage tank shall be glass-lined steel with sacrificial anode. The first and second floor domestic hot water production shall be integral to the boiler. * SEE SCHEDULE P1

5. If available water pressure is less than 50psig, a Canariis packaged duplex water pressure booster shall be provided. Water pressure booster shall be rated to supply a minimum of 105gpm at 70psig with a minimum suction pressure 5psig below actual available pressure.

6. Drain pans (minimum 2" deep) shall be provided at all water heaters and washing machines. Drain pan outlets shall be trapped. Drain pan traps shall have trap primers connected to them. Trap primers shall be installed on the nearest lavatory cold water feed.

7. The hot and cold water piping shall be pitched to a conveniently located low point drain to facilitate draining. Hot and cold water branch lines shall have water hammer arrestors installed in each unit.

8. A sump pump with oil detection system shall be installed in the elevator pit. The discharge shall tie in to the sanitary sewer or storm drain as required by the local sewer district.

9. Provide each kitchen sink with a food waste disposer, In-Sink-Erator Model "Evolution", with 1.0 Hp. Motor.

10. Rainwater piping shall be cast iron with ½" flexible unicellular insulation. 4" ϕ

11. Gas piping shall be Schedule 40 carbon steel with threaded joints and malleable iron fittings.

12. Gas pressure booster shall be a packaged, skid mounted system by Etter Engineering* capable of providing full flow to the building with a minimum inlet pressure of 4" w.c., maximum inlet pressure of 14"w.c. and a pressure gain of 10" w.c., system shall include a bypass, radiator and shall be capable of operating down to 40 SCFH system load. System shall include all components required for operation. * OR EQUAL

13. Regulator (Maxitrol 325 series) shall be installed at each piece of gas-fired equipment.

14. Verify gas pressure from Northern Utilities to assure that the gas distribution lines the meters to the individual units are adequately sized.

15. Provide gas feed for standard 30" gas range with oven and 4 burner top at each unit.

END OF OUTLINE SPECIFICATION

SECTION 16000

ELECTRICAL

The location of all 100A sub panels in each unit will be issued in Addendum #1.

SECTION 16000
ELECTRICAL GENERAL REQUIREMENTS
FOR THE INSTALLATION OF THE ELECTRICAL SYSTEMS
FOR SHERIDAN HEIGHTS

PART 1 GENERAL

1.01 SCOPE

A. The electrical system design and installation shall be performed by a electrical design-build contractor, hereinafter referred to as the Contractor.

B. The electrical work shall include but not be limited to the following:

1. New underground service for power including pad mounted transformer and metering. Transformer location and metering location shown on the site plan to be coordinated by Contractor with Architect/CMP/Owner/civil engineer. New, 4" empty PVC conduit for telephone. Two (2) 5" C conduits from riser pole to pad mounted transformer for primary cable by CMP. Secondaries for a 1000A tenant meter stack service and 400A house service from pad mount to exterior meter stack. Conduit exposed on exterior shall be Rigid steel. Contractor responsible for submitting drawing(s) of exterior electrical design for review and approval by Owner/architect prior to installation.

2. Complete power distribution system. Contractor shall provide complete design drawings including all receptacle locations, circuiting, panel locations stamped by a licensed engineer for City permitting.

3. Complete Fire alarm system complying with NFPA and Portland Fire Department requirements. Complete hardwired apartment intercom door release system.

4. Interior lighting system as indicated on Architectural Plans. Complete exit and emergency lighting system throughout the building to comply with NFPA 101.

5. Exterior lighting system. See site plan for layout and fixture type. Contractor responsible for submitting drawing(s) of exterior electrical design for review and approval by the Owner/Architect prior to installation.

6. Electrical feeders and connections for all Mechanical equipment in the building. Mechanical loads by Mechanical Design Build Contractor.

See mechanical drawings included in this set for locations of most equipment including but not limited to gas fired rooftop units (to serve common areas), bathroom exhaust fans, electric water heaters, AC systems for each unit, kitchen hood exhaust fans.

7. Contractor shall provide complete telephone and CATV distribution system in the building including including risers to each floor wiring and jacks to each unit. Testing and labeling for complete operational system.

C. Incoming telephone service cables and interface shall be coordinated with the Telephone Company.

1.02 WORKING DRAWINGS

A. Provide working drawings indicating the location and arrangement of the increments of the systems of this section of work.

B. The drawings shall show sufficient detail to allow coordination between trades, and to provide the Architect/engineer with documents suitable for a quality assurance review. Include with the drawings, manufacturer's data of the electrical devices, fixtures, equipment and systems.

C. Drawings, specifications and calculations shall be prepared, stamped and signed by a Professional Engineer registered in the State of Maine and shall comply with the minimum standards as hereinafter specified.

D. The design shall be in accordance with the current National Electrical Code, BOCA, NEMA, ANSI, NFPA, and other applicable codes and standards.

E. Provide drawings for State Fire Marshall and Portland Fire Department approval.

1.03 STANDARDS

A. Materials, equipment and installation shall comply with the following:

1. 2005 National Electrical Code.
2. Any Federal, State and/or local codes, applicable ordinances and regulations.
3. Latest approved standards of IEEE, ANSI, NEMA, NFPA, OSHA, ADA, UL.
4. Utility company requirements and telephone company requirements.
5. The Portland Fire Department.
6. The Portland Police Department.
7. The monitoring company selected by the Owner.

B. Electrical equipment shall be UL listed.

1.04 MATERIALS AND LABOR

A. Furnish materials and labor necessary to deliver to the Owner a complete and operable system.

B. Materials shall be of the best quality. Workmanship shall be of the highest grade and construction shall be done according to the best practices of the trade.

1.05 CODES, PERMITS, INSPECTIONS

A. The installation shall comply with laws and regulations applying to the electrical installation in effect at the site with regulations of any other governmental body of agency having jurisdiction, and with regulations of the National Electric Code 2006 (NEC).

B. Obtain and pay for permits required by the ordinances at the site. Arrange for all inspections by the local authorities. After completion of the work, furnish the Owner with a certificate of final inspection and approval from the Authority having jurisdiction.

1.06 SHOP DRAWINGS

A. Submit shop drawings, manufacturers' data and certificates for equipment, materials and finish, and pertinent details for each system where specified. Five (5) copies shall be submitted to the Architect. Shop drawings will be returned "No Exceptions Taken", "Make Corrections Noted", "Revise and Resubmit", "Rejected", or "Submit as Specified", less two (2) copies. Work shall progress in accordance with "Reviewed" shop drawings (ONLY).

B. Groups of similar shop drawings shall be submitted as individual bound documents with covers and indexes.

C. Shop drawings must bear the Architect's review stamp. In the event that the Architect rejects shop drawings, the shop drawing must be revised and resubmitted for review.

D. Review will be for type and quality. Quantities and the ability to perform the function intended shall be the responsibility of the Contractor.

1.07 SUBSTITUTIONS

A. Any substitution of a product is subject to review by the Architect. Review of a substitute item is an indication only that the substitute item is compatible with the specified item as a claim of the manufacturer. Insure dimensional propriety, performance, and quality of the substitute item.

B. Reference in the minimum standards to any product, material, fixture, form or type of construction, by proprietary name, manufacturer, make or catalog number, establishes a standard of quality or design and is not meant to limit competition. Use any equivalent substitute provided favorable written review by the Architect is first obtained.

C. Substituted items and systems must meet or exceed the standard of quality and performance inherent in the specified item or system.

1.08 INCIDENTAL WORK IN OTHER DIVISIONS AND BY OTHER CONTRACTORS

A. Excavation, trenching, backfill, transformer pad, cutting, patching and painting shall be as specified in the appropriate section of the specifications.

1.09 TEMPORARY POWER AND LIGHTING SYSTEM

A. Temporary power for all trades will be provided under this section of the specification. The cost of the electrical power shall be as indicated in the General Conditions. Furnish at least a 200 amp single phase service, 120/240 volts with a 200 watt lamp holder for each room minimum. Furnish ground fault duplex outlets as required. Outlets shall be located so that 50' extension cords will reach any point in the building. Power to outlets shall be limited to 1/2 HP motors 120/240 volts. If additional power is required it shall be furnished by the trade requesting the service.

PART 2 EXECUTION

2.01 COORDINATION

A. Coordinate work with the following to insure that the installation is in accordance with applicable requirements.

1. CMP
2. Portland Fire Department
3. Verizon
4. Owner selected monitoring company
5. All trades and Architect/engineer.
6. Owner
7. Elevator installer
8. Time Warner Cable

B. Coordinate final locations of all electrical/telephone/data service drops with the Owner prior to installation.

2.02 RECORD DRAWINGS

A. Submit a neatly marked up set of Electrical Drawings to the Architect for a record of final installation as actually installed. Include an accurate layout of all in-slab, under-slab and buried conduits. This copy will be returned to the Owner after records are made.

2.03 INSTRUCTIONS, OPERATION AND MAINTENANCE DATA

A. At the completion of the work, furnish one (1) set of operating and maintenance instructions of equipment and systems. Submit name and address of nearest available source of repair service and replacement equipment and parts to the Owner. Explain and demonstrate the operation of each system to the Owner representative. The Fire Alarm System and the Security Alarm System manufacturers' field technician shall be present at this demonstration.

B. Data shall include a complete set of shop drawings.

2.04 GUARANTEE - WARRANTY

A. The work executed under this section shall be guaranteed to be free from defects of materials, and workmanship for a period of one (1) year from the date of the final certificate of acceptance. Guarantee shall further state that repair or replacement of any material and work which may become defective during the time of guarantee, together with other work damaged as a consequence of such defects shall be executed at no additional expense to the Owner.

B. Materials furnished shall be new and the work executed shall be in accordance with applicable laws, regulations and codes.

2.05 TESTS

A. After the interior wiring system installation is completed and at such time as the Owner may direct, conduct an operating test. The equipment shall be demonstrated to operate in accordance with the requirements of this specification. The tests shall be performed in the presence of the Owner or their authorized representative. Furnish instruments and personnel required for the tests.

B. Upon completing the installation of the fire alarm system, conduct a complete test of the system in the presence of a representative of the fire alarm equipment manufacturer. During the course of the test, each manual station shall be activated, each smoke detector shall be smoke tested or an equivalent test performed, each rate-of-rise heat detector shall be activated by way of applying heat, each fixed temperature heat detector shall be activated by way of removing the fixed temperature heat fuse. The manufacturer shall supply a minimum of one year guarantee on fire alarm equipment.

C. Each supervised circuit associated with the fire alarm system shall be opened at the most remote point in that circuit causing the trouble indication at the control panel to operate, thereby ascertaining that each circuit is supervised as required. At the completion of the test, submit a letter to the Owner, with a copy to the Engineer, stipulating that the fire alarm system was installed according to these specifications and complies with all applicable codes.

D. The manufacturer shall furnish to the Owner, a one-year contract, effective from the date of acceptance, for maintenance and inspection services of the manufacturer's equipment with a minimum of two inspections during that contract year. Written evidence of such inspections shall be left with the appropriate authorities.

E. Coordinate and comply with local fire department requirements and requirements of the alarm monitoring service.

*** END OF SECTION ***

SECTION 16100
SYSTEMS AND EQUIPMENT
FOR SHERIDAN HEIGHTS

PART 1 GENERAL

1.01 DESCRIPTION: The work covered by this Section of the specifications includes the furnishing of labor, materials, equipment, transportation, permits, inspections and incidentals and the performing of operations required to install the electrical systems.

A. Conductor material, installation and fittings shall meet NEC requirements. Conductors shall be listed for 600 volt AC unless otherwise noted.

D. The electric service shall emanate from a pad mount transformer furnished and installed by Central Maine Power.

1.02 GENERAL REQUIREMENTS: The provisions of Section 16000 "General Electrical" are made a part of this section.

PART 2 PRODUCTS

2.01 RACEWAYS AND FITTINGS

A. Rigid steel conduit, electric metallic tubing, (elbows, couplings and fittings) shall be hot dipped galvanized steel and shall conform to the latest ASA Standards.

B. Flexible metal conduit shall be galvanized steel (NEC-350). Liquid tight flexible conduit shall be UL listed (NEC-351).

C. Fittings for rigid steel conduit shall be cast or malleable iron bodies, cadmium or zinc plated, with taper threads and tapped holes for screw attached cover plates for installation in moist or wet locations, and shall have gaskets of an approved material.

D. Conduit boxes, outlet, switch, junction, pull boxes, extension rings, adapters, and cover plates shall be sherardized galvanized or cadmium plated. Boxes for concealed work shall be stamped steel with stamped steel accessories. Boxes for exposed work shall be cast or malleable iron. UL listed PVC boxes and fittings may be used for concealed construction where permitted by the NEC.

E. Rigid non-metallic conduit shall comply with NEC-347 and shall be schedule 40 or Schedule 80 if required. Approved PVC solvent shall be used for welding PVC conduit and fittings. Furnish listed PVC expansion joints for PVC conduit runs per manufacturer's recommendations.

2.02 CONDUCTORS

A. Panel feeders shall be aluminum. Type MC armored cable shall be used above ceilings and concealed in walls where permitted by the NEC. All branch circuits shall be copper.

B. Grounding conductors shall be copper with green insulation.

C. Copper conductors #2 and larger may be aluminum providing the following items are adhered to:

1. The ampere capacity, voltage drop and conduit fill is in accordance with the NEC and equal to copper conductors specified herein.

2. Prior to making any connection the aluminum wire is to be brushed and an oxide inhibitor applied.

3. Lugs and connectors are to be rated cu/al compression type.

4. Termination of aluminum conductors at heat producing equipment such as motors or heaters is not acceptable.

2.03 COLOR CODING OF CONDUCTORS

A. The building power wiring shall be color coded for insulated 120/208 volt conductors where applicable. The neutral shall be white or gray. Use green for grounding conductors.

2.04 PANELBOARDS AND BOXES

A. Contractor shall provide 1200A, 208V, 3ph, meter stack with 1200A main breaker and 400A house panel feeder. Contractor to provide 400 House paenl to serve house loads including elevator, common area roof top units garage ventilation, common area lighting and exterior lighting. Panels, cabinets, and boxes shall be code gauge steel. Boxes shall comply with NEC requirements. Concealed outlet boxes shall be of code gauge galvanized or sherardized metal not less than #14 gauge. Junction boxes shall be of code gauge steel or cast.

B. Panelboards shall be furnished with active breakers, spare breakers and spaces as required. Panels shall have an equipment ground bus and when

indicated shall also have an insulated and isolated ground bus for computer circuits. Panels shall have main breaker or main lugs as required by the NEC.

1. Each subpanel shall have a hinged door with lock and typed directory.

2. Terminal connectors shall be UL listed al/cu type.

3. Flush and surface mounted panels shall have factory furnished trim. Panel boxes shall be galvanized steel, code gauge, primed and painted manufacturer's standard finish. Flush panels shall be furnished with 6-3/4@ empty conduits stubbed up into hung ceiling space and capped for future use.

4. Panel breakers shall be UL listed quick make, quick break, thermal magnetic type. Breakers shall have interrupting ratings capable of interrupting the available short circuit fault current. HVAC refrigeration loads require HACR rated breakers. Connect panel breakers to insure proper load balance between phases.

C. Fused and unfused switches shall be General Duty or as required. Fuses shall be furnished for fused disconnect switches. Fuses shall be dual-element of required or specified voltage and current rating. Furnish Owner with one set of spare fuses for each type installed.

2.05 GROUNDING SYSTEMS

A. Grounding conductors shall be copper and sized per N.E.C. Article 250 - Tables 250-66 and 250-122. Green grounding conductors shall be run in all raceways and cables shall include a green grounding conductor.

B. Panelboards shall be furnished with equipment ground bus. Panelboards supplying computer receptacles shall also be furnished with insulated/isolated ground bus. Install an isolated grounding conductor back to main ground connection point.

2.06 ELECTRIC SERVICE

A. Tenant meter stack service shall be rated at 1000A, 120/208 volts, 3 phase, 4 wire, 60 Hz. House service shall be 400A, Service size shall include a 25% future growth factor. Main breaker shall be fully rated.

B. Furnish and install the main service ground in compliance with Article 250 in the NEC.

C. Individual feeders shall be installed from the main panel to the respective panels and/or equipment.

D. Provide meter pedestal at pad mounted transformer (exterior rated) ct's in the pad.

2.07 LIGHTING FIXTURES

A. Provide interior lighting as indicated on architectural plans.

B. Lighting fixtures in office area shall be lens troffers 2x4 three T8 lamps and electronic ballasts. 50 FC average. Coordinate locations with the Owner/Architect.

C. Lighting in warehouse, mezzanine and storage areas shall be 20-30 footcandles and have motion sensors. Walk-in coolers shall be provided with lighting do not provide lighting over the coolers in the high bay area.

2.08 TELEPHONE/DATA SYSTEM

A. Complete system including all conduit, wring, jacks, punch downs, terminations and testing.

2.09 FIRE ALARM SYSTEM

A. Design/installation/testing of complete code compliant fire alarm system shall be the responsibility of the contractor.

B. Provide a masterbox to interface with the fire department.

2.10 WIRING DEVICES

A. 20A, Commercial Grade, 120V. grounding type. Color by Owner.

PART 3 EXECUTION

3.01 INSTALLATION OF PANELBOARDS

A. Set panelboards and boxes plumb with the building lines. Mount panelboards so that the top of the panel is not higher than 6'-6" AFF.

B. Panelboards shall have engraved plastic nameplates fastened with screws.

3.02 INSTALLATION OF GROUNDING SYSTEMS

A. Grounding shall be in strict compliance with the National Electrical Code, Article 250.

B. Metallic conduit shall be grounded in accordance with NEC requirements; and equipment grounding conductors shall also be furnished and installed in all branch circuit and feeder raceways. Cables shall include a separate, insulated grounding conductor.

C. Equipment grounding conductors shall be insulated copper with green jacket as covered by the NEC.

D. The green grounding screw on all wiring devices shall be used for grounding connections.

3.03 INSTALLATION OF ELECTRIC SERVICE

A. Determine the maximum available short circuit fault current from CMP and furnish the main panel accordingly.

B. Install empty primary conduits from pad mounted transformer to CMP transition pole. Provide pull wires in conduits. Include one spare primary conduit.

*** END OF SECTION ***

SECTION 16701

TELEPHONE SYSTEM

Provide one CAT – 5 Telephone Jack in each Master Bedroom, Bedroom 2, and Kitchen in each unit. Location of each jack will be issued in Addendum # 1.

Provide one CAT -5 Telephone Jack in the Elevator.

Note that Tel / Data Rooms are provided at the 2nd, 3rd and 4th levels.

SECTION 16702

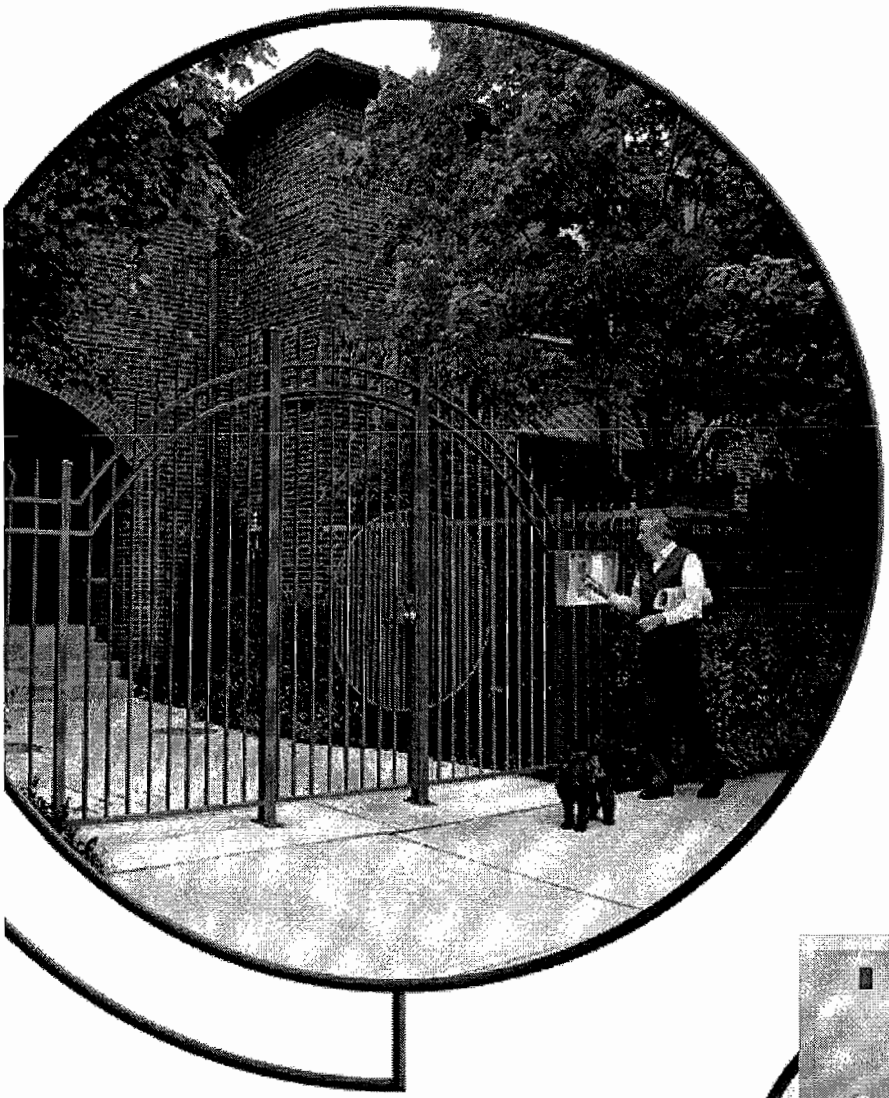
TELEVISION SYSTEM

Provide one Cable TV outlet in each Master Bedroom, Bedroom 2 and Living Room in each unit. Location of each jack will be issued in Addendum # 1.

SECTION 16703

INTERCOM SYSTEM

Provide a Chamberlain Sentex Spectrum Series or equal.



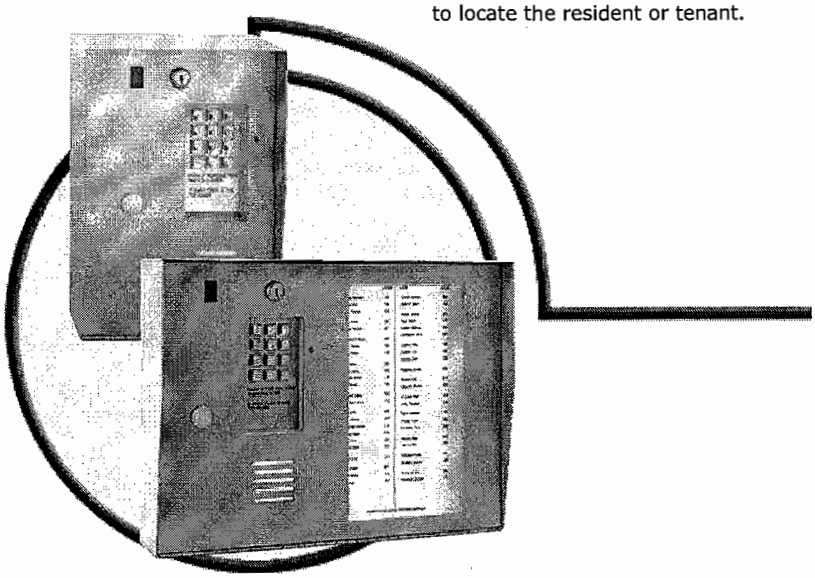
Spectrum Series

cost-effective and attractive telephone entry solution for multi-family buildings and gated communities

The Spectrum Series answers the call for a durable, vandal-resistant telephone entry system used in applications that require a paper directory insert or utilize an external directory. Since Spectrum systems use the existing telephone network, there is no new wiring necessary between the entrance and each office or tenant. As a result you save thousands of dollars over the cost of installing a hard-wired intercom, not to mention the savings on maintenance costs over the life of the system. As with all our telephone entry systems, the Spectrum Series boasts a multitude of features that make the installation quick, operation simple and management effortless.

variable directory code length

The Spectrum Series will accept 1 to 4-digit directory code lengths so apartment or suite numbers can be matched, making it easier to locate the resident or tenant.



CHAMBERLAIN®

16703-2

SENTEX®

full duplex communications
The system boasts audio that is crisp and clear in even the most congested environments by employing echo cancellation technology. This technology prevents cross-talk between the speaker and the microphone and allows for higher volume levels.

entry codes
Each resident or tenant can be assigned a 4-digit access code to unlock the gate or door. Additionally, 10 access codes are provided for vendors or management so the maximum capacity can be utilized for the tenants.

long distance & PBX dialing
Due to the amount of area codes in a single region, many areas are mandating a 10 or 11-digit dialing sequence. The Spectrum supports up to 11-digit dialing on a typical phone system and interfaces seamlessly to a PBX system where extensions are used. Extensions of up to 6 digits will be accepted by the system to connect to the appropriate voice mailbox.

programmable talk time
The time allotted for a visitor and tenant to talk is adjustable from 15 to 250 seconds.

multiple entry
Allows 2 Spectrum units to be connected to a single phone line saving you cost of additional phone line charges.

controllable system relays
Allows the main access and an auxiliary connection (a second gate or door) to be controlled, such as opened to let a visitor enter. The relays can be remotely managed from any remote touch-tone phone. The relays can be latched open or closed.

programmable relay times
The 2 relays can also be programmed to activate for a pre-determined time range of 1 to 63 seconds to allow visitor access.

tone/pulse dialing
Each system can be site-configured to operate on the two types of available phone lines.

programming methods
The Spectrum supports programming via a standard touch-tone phone, the unit's 12-digit keypad and the Windows®-based programming software "SVWin".

internal modem
Provides the ability to program and control the Spectrum via a personal computer from any remote location using a standard phone line and PC modem.

non-volatile memory
In the event power is removed from the unit, the database information will be retained in memory allowing immediate start-up and operation when power is restored.

lightning protection
Physical inputs and telephone line connections contain some protection against typical voltage spikes, such as phone line variances and lightning. However, in an area where lightning is prevalent, external surge suppressors should also be used to minimize damage to the unit.

postal lock provision
Spectrum units support a switch kit that integrates with a U.S. Postal Service Lock. This allows postal carriers entry to a controlled area using a U.S. Postal Service Key. The postal lock is proprietary to the U.S. Postal Service and is acquired through them.

options

enclosure styles
The Spectrum Series comes in 2 styles to match your environment and functionality. Choose between the standard Spectrum enclosure with a stainless steel faceplate or the "DI" directory insert enclosure providing a lighted area that holds a paper insert supporting 125 names.

stainless steel housing
The Spectrum Series systems include a stainless steel faceplate to ensure long-lasting durability. To increase the resistance to vandalism and environmental conditions, these systems can be ordered with stainless steel housings.

handset unit
A handset is recommended for sites requiring more privacy or located in a noisy environment.

SPECIFICATIONS

CAPACITIES
20, 40, 70, 115, 250, 500, 750

DIMENSIONS
Spectrum Surface Mount – 12.5" H x 8.5" W x 4.25" D

Spectrum Flush Mount – 12.5" H x 8.5" W x 3.0" D

Spectrum "DI" Surface Mount – 12.5" H x 16.5" W x 4.25" D

Spectrum "DI" Flush Mount– 12.75" H x 16.5" W x 3.0" D

POWER
12 VAC @ 3.4 amps peak
13.5 VDC @ 1.0 amp

WARRANTY
Two Years
(extended warranties available)

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