

# PROJECT MANUAL - NW ENTRY REMOVALS AND SITE CONSTRUCTION DOCS

Cumberland County Civic Center Renovation

Cumberland County Recreation Center D/B/A

Portland, Maine

Architect Project No. 3757.00



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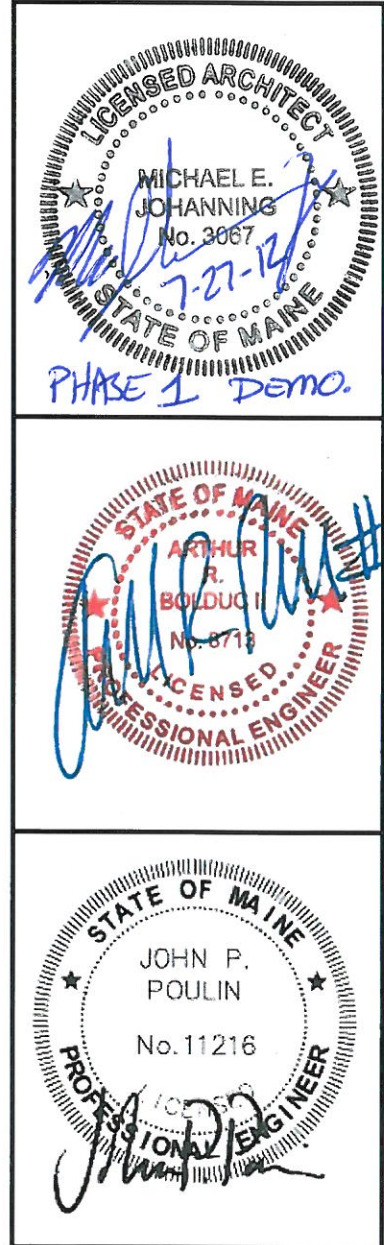
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1.1 DESIGN PROFESSIONALS OF RECORD

ARCHITECT Michael E Johannning, AIA  
License No.: 3067

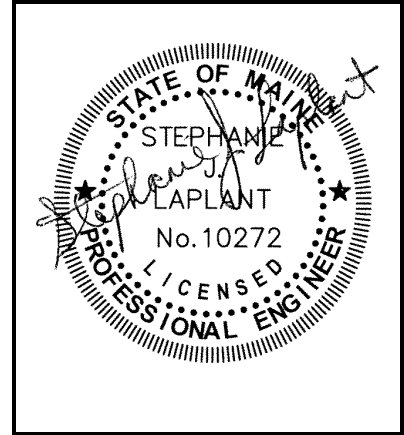
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END OF DOCUMENT 000107

## DOCUMENT 000115 - LIST OF DRAWING SHEETS

## 1.1 LIST OF DRAWINGS

- A. Drawings: Drawings consist of the Contract Drawings and other drawings listed on the Table of Contents page of the separately bound drawing set titled Cumberland County Civic Center Renovation, dated July 27, 2012, as modified by subsequent Addenda and Contract modifications.
- B. List of Drawings: Drawings consist of the following Contract Drawings and other drawings of type indicated:

GENERAL

G0.01 COVER SHEET  
G0.02 DRAWING LIST  
G0.03 SYMBOLS AND ABBREVIATIONS  
LS.01 MECHANICAL LEVEL - LIFE SAFTEY PLAN  
LS.10 EVENT LEVEL - LIFE SAFETY PLAN  
LS.20 CONCOURSE LEVEL - LIFE SAFETY PLAN  
LS.30 MID SUITES LEVEL - LIFE SAFETY PLAN  
LS.40 UPPER SUITE LEVEL - LIFE SAFETY PLAN

CIVIL

GI006 SITE GENERAL NOTES & ABBREVIATIONS  
1 OF 1 TOPOGRAPHY SURVEY  
GR901 CENTER STREET SITE PHOTOS  
GR902 FREE STREET SITE PHOTOS  
GR903 SPRING STREET SITE PHOTOS  
GR904 ELEVATED SITE PHOTOS  
PH100 SITE PHASING PLAN - PHASE I  
PH101 SITE PHASING PLAN - PHASE II  
CD101 SITE REMOVALS PLAN  
CD102 SITE LEDGE REMOVALS PLAN  
CP101 SITE LAYOUT AND MATERIALS PLAN  
CG101 SITE GRADING AND EROSION CONTROL PLAN  
CU101 SITE UTILITY PLAN  
CU301 SITE LARGE SCALE UTILITY PLAN  
CU302 SITE UTILITY PLAN & PROFILE  
CU303 SITE UTILITY PLAN & PROFILE  
LP101 SITE PLANTING PLAN  
C501 SITE DETAILS  
C502 SITE DETAILS  
C503 SITE DETAILS  
C504 SITE DETAILS  
C505 SITE DETAILS  
506 SITE DETAILS  
C601 SITE BORING LOGS  
C602 SITE BORING LOGS

ARCHITECTURAL

AD2.21A CONCOURSE LEVEL REMOVALS PLAN QUAD A  
AD2.31A MID SUITES LEVEL REMOVALS PLAN QUAD A

AD2.41A UPPER SUITES LEVEL REMOVALS PLAN QUAD A  
AD3.01 EXTERIOR REMOVAL ELEVATIONS AND DETAILS  
AD2.00B MECHANICAL LEVEL REMOVALS PLAN - PHASE 2  
AD2.10B EVENT LEVEL REMOVALS PLAN - PHASE 2  
AD2.20B CONCOURSE LEVEL REMOVALS PLAN - PHASE 2  
AD2.30B MID SUITES LEVEL REMOVALS PLAN - PHASE 2  
AD2.40B UPPER SUITES LEVEL REMOVALS PLAN - PHASE 2  
AD2.50B CATWALK REMOVALS PLAN - PHASE 2

PLUMBING

PD2.11A EVENT LEVEL PLUMBING REMOVALS PLAN - QUAD A

MECHANICAL

MD2.03A MECHANICAL LEVEL MECHANICAL DEMO PLAN

ELECTRICAL

E0.01A ELECTRICAL LEGEND, ABBREVIATIONS AND LIGHT FIXTURE SCHEDULE  
ED.03A MECHANICAL LEVEL ELECTRICAL DEMO PLAN  
ED.21A CONCOURSE LEVEL DEMO PLAN - QUAD A

END OF DOCUMENT 000115

DOCUMENT 003000 - INFORMATION AVAILABLE TO CONTRACTOR

The following information is provided for informational purposes only. It is not part of the Contract document.

1. A Geotechnical Report was prepared by S.W. Cole Engineering, Inc., for the Owner on this project. A copy is included in the Appendix of this project manual. Boring logs are also included with the drawing sheets.
2. A Hazardous Materials Identification Report was prepared by Summit Environmental Consultants, Inc., for the Owner on this project. A copy is included in the Appendix of this project manual.
3. A Building Code Report was prepared by FP&C Consultants, Inc., for this project. A copy is included in the Appendix of this project manual.

END OF DOCUMENT 003000



## SECTION 011000 - SUMMARY

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

## 1.2 SUMMARY

- A. This Section includes the following:

- 1. Work covered by the Contract Documents.
- 2. Type of the Contract.
- 3. Work phases.
- 4. Work under other contracts.
- 5. Products ordered in advance.
- 6. Owner-furnished products.
- 7. Use of premises.
- 8. Owner's occupancy requirements.
- 9. Work restrictions.
- 10. Specification formats and conventions.

- B. Related Sections include the following:

- 1. Division 1 Section "Summary of Multiple Contracts" for division of responsibilities for the Work.
- 2. Division 1 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

## 1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project Identification: Cumberland County Civic Center Renovation

- 1. Project Location: One Civic Center Square, Portland, ME 04101

- B. Owner: Cumberland County Recreation Center d/b/a

- 1. Owner's Representative: To Be Determined

- C. Architect: WBRC Architects · Engineers, 30 Danforth Street, Suite 306, Portland, ME 04101

- D. Construction Manager: Cianbro.: One Hunnewell Square Pittsfield, ME 04967

- 1. Construction Manager for this Project is Project's Constructor. In Divisions 1 through 33 Sections, the terms "Construction Manager" and "Contractor" are synonymous.

- E. The Work consists of the following:

1. The work includes phased construction 37,800 +/- SF of additions and 118,400 +/- SF of renovations to the existing Cumberland County Civic Center building to expand its ability to accommodate a range of spectator, assembly, and exhibition events. This includes new accessible entrances, suites, loading and staging area, foodservice, seating, and office space. Work includes but is not limited to, earthwork, site utilities and site improvements, paving, and landscaping. Work also includes demolition and shoring, concrete foundations and slab-on-grade, steel structure, steel joists and decking, roof membrane system over roof insulation, sheet metal, masonry, precast concrete architectural elements, metal stud partitions, insulation, gypsum board walls and ceilings, ceramic tile, acoustical ceilings, resilient flooring, acoustic wall treatment, carpeting, custom cabinets and fixtures, carpentry, glass storefront and curtain wall systems, painting, metal doors, wood doors, metal frames, door hardware, overhead coiling doors and grilles, metal fabrications, toilet partitions and accessories, telescoping seating, elevators, escalators, audio visual equipment, signage, fire protection and detection systems, fireproofing, electrical, including replacement and upgrade of electrical service and generator, heating, ventilating, and air conditioning complete and ready for use.

#### 1.4 TYPE OF CONTRACT

- A. Project will be constructed under a single prime contract.

#### 1.5 OWNER-FURNISHED PRODUCTS

- A. Owner will furnish products indicated. The Work includes providing support systems to receive Owner's equipment and making plumbing, mechanical, and electrical connections.

1. Owner will arrange for and deliver Shop Drawings, Product Data, and Samples to Contractor.
2. Owner will arrange and pay for delivery of Owner-furnished items according to Contractor's Construction Schedule.
3. After delivery, Owner will inspect delivered items for damage. Contractor shall be present for and assist in Owner's inspection.
4. If Owner-furnished items are damaged, defective, or missing, Owner will arrange for replacement.
5. Owner will arrange for manufacturer's field services and for delivery of manufacturer's warranties to Contractor.
6. Owner will furnish Contractor the earliest possible delivery date for Owner-furnished products. Using Owner-furnished earliest possible delivery dates, Contractor shall designate delivery dates of Owner-furnished items in Contractor's Construction Schedule.
7. Contractor shall review Shop Drawings, Product Data, and Samples and return them to Architect noting discrepancies or anticipated problems in use of product.
8. Contractor is responsible for receiving, unloading, and handling Owner-furnished items at Project site.
9. Contractor is responsible for protecting Owner-furnished items from damage during storage and handling, including damage from exposure to the elements.
10. If Owner-furnished items are damaged as a result of Contractor's operations, Contractor shall repair or replace them.
11. Contractor shall install and otherwise incorporate Owner-furnished / Contractor Installed (OS/CI) items into the Work.

- B. Owner-Furnished Products:

1. The following are OS/OI equipment items:

a. Toilet Room Accessories

2. The following are OS/CI equipment items: N/A

#### 1.6 USE OF PREMISES

- A. General: Contractor shall have limited use of premises for construction operations as indicated on Drawings by the Contract limits.
- B. Use of Site: Limit use of premises to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
1. Owner Occupancy: Allow for Owner occupancy of Project site.
  2. Driveways and Entrances: Keep driveways loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
    - a. Schedule deliveries to minimize use of driveways and entrances.
    - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- C. Use of Existing Building: Maintain existing building in a weathertight condition throughout construction period. Repair damage caused by construction operations. Protect building and its occupants during construction period.

#### 1.7 OWNER'S OCCUPANCY REQUIREMENTS

- A. Owner will occupy existing building during the phase one construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits, unless otherwise indicated.
1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
  2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

#### 1.8 WORK RESTRICTIONS

- A. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
1. Notify Architect and Owner not less than (5) five working days in advance of proposed utility interruptions.
  2. Do not proceed with utility interruptions without Owner's written permission.
- B. The start date of construction for the project will be August 27, 2012.

- C. The project is expected to be completed and ready for occupancy by September 20, 2013.

#### 1.9 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the 49-division format and CSI/CSC's "MasterFormat" numbering system.
  - 1. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.
  - 2. Division 01: Sections in Division 01 govern the execution of the Work of all Sections in the Specifications.
- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
  - 1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
  - 2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted..
    - a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
- C. The contract documents are complementary, and what is called for by any one shall be as binding as if called for by all. The intention of the documents is that, unless otherwise specified, the Contractor shall furnish all labor, materials, equipment, items, articles, tools, transportation, insurance, services, necessary supplies, operations or methods and incidentals that may be reasonably required to construct and complete the project, facility or improvement in a manner necessary for the proper execution of the work.

PRODUCTS (Not Used)

PART 2 - EXECUTION (Not Used)

END OF SECTION 011000

## SECTION 012100 - ALLOWANCES

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes 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. Types of allowances include the following:
  - 1. Lump-sum allowances.
  - 2. Unit-cost allowances.
  - 3. Quantity allowances.
- C. Related Sections include the following:
  - 1. Division 01 Section "Contract Modification Procedures" for procedures for submitting and handling Change Orders for allowances.
  - 2. Division 01 Section "Unit Prices" for procedures for using unit prices.
  - 3. Division 01 Section "Quality Requirements" for procedures governing the use of allowances for testing and inspecting.
  - 4. Divisions 02 through 49 Sections for items of Work covered by allowances.

## 1.3 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.

## 1.4 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.
- C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

## 1.5 COORDINATION

- A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

## 1.6 LUMP-SUM UNIT-COST AND QUANTITY ALLOWANCES

- A. Allowance shall include cost to Contractor of specific products and materials selected by Architect under allowance and shall include taxes, freight, and delivery to Project site.
- B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.
- C. Return unused Lump Sum amounts for credit to Owner.

## 1.7 TESTING AND INSPECTING ALLOWANCES

- A. Testing and inspecting allowances include the cost of engaging testing agencies, actual tests and inspections, and reporting results.
- B. The allowance does not include incidental labor required to assist the testing agency or costs for retesting if previous tests and inspections result in failure. The cost for incidental labor to assist the testing agency shall be included in the Contract Sum.
- C. Costs of services not required by the Contract Documents are not included in the allowance.
- D. At Project closeout, credit unused amounts remaining in the testing and inspecting allowance to Owner by Change Order.

## 1.8 ADJUSTMENT OF ALLOWANCES

- A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.

- 1. Include installation costs in purchase amount only where indicated as part of the allowance.

2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
  3. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.
  4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.
- B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.
1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
  2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

## 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 or defective 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.
- B. All allowances will be carried by the General Contractor.

### 3.3 SCHEDULE OF ALLOWANCES

- A. Allowance No. 1: Include \$5,000 to provide ADA compliant interior signage at the NW entry offices.
- B. Allowance No. 2: Include \$500,000 for Electrical Utilities Allowance.
- C. Allowance No. 3: Include \$75,000 to provide Cutting & Patching Allowance not indicated in the Contract Documents.
- D. Allowance No. 4: Include lump-sum allowance of \$50,000 for "excess" rock excavation and disposal offsite (trench and open) not indicated on the Contract Documents. Coordinate quantity allowance adjustment with corresponding unit-price requirements in Section 012200 "Unit Prices."

END OF SECTION 012100

## SECTION 012200 - UNIT PRICES

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for unit prices.
- B. Related Sections include the following:
  - 1. Division 01 Section "Allowances" for procedures for using unit prices to adjust quantity allowances.
  - 2. Division 01 Section "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
  - 3. Division 01 Section "Quality Requirements" for general testing and inspecting requirements.

## 1.3 DEFINITIONS

- A. Unit price is an amount proposed by bidders, stated on the Bid Form, as a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.

## 1.4 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.
- B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.
- C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.
- D. List of Unit Prices: A list of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.



## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION

## 3.1 LIST OF UNIT PRICES

- A. Unit Price No. 1 – Rock Excavation and Removal and replacement with approved materials to subgrade (open):
1. Description: Rock excavation, including removal from site.
  2. Unit of Measurement: Cu. yard of excavated material.
- B. Unit Price No. 2 – Rock Excavation and Removal and replacement with approved materials to subgrade (trench):
1. Description: Rock excavation, including removal from site.
  2. Unit of Measurement: Cu. yard of excavated material.
- C. Unit Price No. 3 – Gravel Base:
1. Description: Gravel base, in place.
  2. Unit of Measurement: Cu. yard of gravel material.
- D. Unit Price No. 4 – Gravel Subbase:
1. Description – Gravel Subbase, in place.
  2. Unit of Measurement Cu.yard of gravel material
- E. Unit Price No. 5 – Bituminous Pavement – HMA 9.5 mm:
1. Description: Bituminous pavement – HMA 9.5 mm, compacted in place.
  2. Unit of Measurement: Per ton.
- F. Unit Price No. 6 – Bituminous Pavement – HMA 19.0 mm:
1. Description: Bituminous pavement – HMA 19.0 mm, compacted in place.
  1. Unit of Measurement: Per ton.
- G. Unit Price No. 7 – Brick sidewalk
1. Description: Brick Sidewalk, in place.
  2. Unit of Measurement: Per square yard
- H. Unit Price No. 8 – Concrete sidewalk/pad
1. Description: Concrete Sidewalk/Pad, in place.
  2. Unit of Measurement: Per square yard
- I. Unit Price No. 9 – ADA Ramp
1. Description: ADA Ramp, in place.

- 2. Unit of Measurement: Each
- J. Unit Price No. 10 – Street Tree (Serviceberry)
  - 1. Description: Street Tree, in place.
  - 2. Unit of Measurement: Each
- K. Unit Price No. 11 – Street Tree (Red Maple)
  - 1. Description: Street Tree, in place.
  - 2. Unit of Measurement: Each
- L. Unit Price No. 12 – Decorative Bollard
  - 1. Description: Decorative Bollard, in place.
  - 2. Unit of Measurement: Each
- M. Unit Price No. 13 – Foundation drain
  - 1. Description: 6" perforated drain, in place
  - 2. Unit of Measurement: Per linear foot
- N. Unit Price No. 14 – Hot mix asphalt pavement milling/grinding
  - 1. Description: Hot mix asphalt pavement milling/grinding, including removal from site
  - 2. Unit of Measurement: Per square yard
- O. Unit Price No. 15 – Provide and Place Flowable Fill:
  - 1. Description: Provide and place flowable fill.
  - 2. Unit of Measurement: Cu. yard of flowable fill material.
- P. Unit Price No. 16 – Cast-in-place Concrete Foundations:
  - 1. Description: 3,500 psi Cast-in Place Concrete, including forming, reinforcing, placing, curing and stripping formwork for footings, foundation walls and piers
  - 2. Unit of Measurement: Per Cu. Yard
- Q. Unit Price No. 17 – Cast-in-place Concrete Flatwork:
  - 1. Description: 3,500 psi Cast-in Place Concrete, including reinforcing, placing and curing for either slabs-on grade or slabs-on-metal deck
  - 2. Unit of Measurement: Per Cu. Yard

END OF SECTION 012200

## SECTION 012500 - SUBSTITUTION PROCEDURES

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements:
  - 1. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

## 1.2 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

## 1.3 ACTION SUBMITTALS

- A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
  - 1. Substitution Request Form: Use CSI Form 13.1A.
  - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
    - a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
    - b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
    - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
    - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
    - e. Samples, where applicable or requested.
    - f. Certificates and qualification data, where applicable or requested.
    - g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
    - h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
    - i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.

- j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
  - k. Cost information, including a proposal of change, if any, in the Contract Sum.
  - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
  - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor through Construction Manager of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
  - b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

#### 1.4 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

### PART 2 - PRODUCTS

#### 2.1 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
  - 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied:
    - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
    - b. Requested substitution will not adversely affect Contractor's construction schedule.
    - c. Requested substitution has received necessary approvals of authorities having jurisdiction.
    - d. Requested substitution is compatible with other portions of the Work.
    - e. Requested substitution has been coordinated with other portions of the Work.
    - f. Requested substitution provides specified warranty.

- g. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- B. Substitutions for Convenience: Not allowed unless otherwise indicated.
- C. Substitutions for Convenience: Architect will consider requests for substitution if received within 60 days after the Notice to Proceed.
  - 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied:
    - a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
    - b. Requested substitution does not require extensive revisions to the Contract Documents.
    - c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
    - d. Requested substitution will not adversely affect Contractor's construction schedule.
    - e. Requested substitution has received necessary approvals of authorities having jurisdiction.
    - f. Requested substitution is compatible with other portions of the Work.
    - g. Requested substitution has been coordinated with other portions of the Work.
    - h. Requested substitution provides specified warranty.
    - i. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

## SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

## 1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions, Special Conditions, and other DIVISION 01 Specification Sections, apply to Work of this section.

## 1.3 MINOR CHANGES IN THE WORK

- A. Architect will issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions."

## 1.4 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
  - 1. Proposal Requests issued by Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
  - 2. Within 10 days after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
    - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    - c. Include costs of labor and supervision directly attributable to the change.
    - d. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

- B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to Architect.
1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
  2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
  3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
  4. Include costs of labor and supervision directly attributable to the change.
  5. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
  6. Comply with requirements in Division 1 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.
- C. Proposal Request Form: Use AIA Document G709 for Proposal Requests.

#### 1.5 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

## SECTION 012900 - PAYMENT PROCEDURES

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

## 1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Sections include the following:
  - 1. Division 1 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
  - 2. Division 1 Section "Construction Progress Documentation" for administrative requirements governing preparation and submittal of Contractor's Construction Schedule and Submittals Schedule.

## 1.3 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

## 1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
  - 1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
    - a. Application for Payment forms with Continuation Sheets.
    - b. Submittals Schedule.
    - c. Contractor's Construction Schedule.
  - 2. Submit the Schedule of Values to Architect at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
  - 3. Subschedules: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values correlated with each phase of payment.
- B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.
  - 1. Identification: Include the following Project identification on the Schedule of Values:



- a. Project name and location.
  - b. Name of Architect.
  - c. Architect's project number.
  - d. Contractor's name and address.
  - e. Date of submittal.
2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
    - a. Related Specification Section or Division.
    - b. Description of the Work.
    - c. Name of subcontractor.
    - d. Name of manufacturer or fabricator.
    - e. Name of supplier.
    - f. Change Orders (numbers) that affect value.
    - g. Dollar value.
      - 1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
  3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.
  4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
  5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
    - a. Differentiate between items stored on-site and items stored off-site. If specified, include evidence of insurance or bonded warehousing.
  6. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
  7. Allowances: Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
  8. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
    - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
  9. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

#### 1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: Progress payments shall be submitted to Architect by the 10<sup>th</sup> day of the month. The period covered by each Application for Payment is one month, ending on the last day of the previous month.
- C. Payment Application Forms: Use forms provided by Owner for Applications for Payment. Sample copies are included in Section 006276 – AIA G702 – 1992 Contractor’s Application and Certification for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
  1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
  2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- E. Transmittal: Submit 3 signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
  1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.
  1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
  2. When an application shows completion of an item, submit final or full waivers.
  3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
  4. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
  5. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner. Refer to Section 006519.160-01 – AIA G706A – 1994 Contractor’s Affidavit of Release of Liens for sample form
- G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
  1. List of subcontractors.
  2. Schedule of Values.
  3. Contractor's Construction Schedule (preliminary if not final).
  4. Products list.
  5. Schedule of unit prices.
  6. Submittals Schedule (preliminary if not final).
  7. List of Contractor's staff assignments.
  8. List of Contractor's principal consultants.

9. Copies of building permits.
  10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
  11. Initial progress report.
  12. Report of preconstruction conference.
  13. Certificates of insurance and insurance policies.
  14. Performance and payment bonds.
- H. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
  2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- I. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
  2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
  3. Updated final statement, accounting for final changes to the Contract Sum.
  4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
  5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
  6. Evidence that claims have been settled.
  7. Final, liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

## SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

## 1.2 SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
  - 1. Project meetings.
  - 2. Administrative and supervisory personnel
- B. Related Sections include the following:
  - 1. Division 1 Section "Construction Progress Documentation" for preparing and submitting Contractor's Construction Schedule.
  - 1. Division 1 Section "Closeout Procedures" for coordinating Contract closeout. Division 1 Section "General Commissioning Requirements" for general requirements that apply to implementation of commissioning.

## 1.3 COORDINATION

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.
  - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
  - 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
  - 3. Make adequate provisions to accommodate items scheduled for later installation.
  - 4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
  - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure

orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's Construction Schedule.
2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Startup and adjustment of systems.
7. Project closeout activities.

#### 1.4 SUBMITTALS

- A. Certificate statement of manufacturer's compliance with ARRA "Buy American" (The American Recovery and Reinvestment Act of 2009). Refer to Section 007301.
- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
  1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.
  2. Submit Construction Waste Management and Construction IAQ Management Plans.

#### 1.5 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
  1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
  2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
  3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.
- B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.
  1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  2. Agenda: Discuss items of significance that could affect progress, including the following:
    - a. Tentative construction schedule.

- b. Phasing.
  - c. Critical work sequencing and long-lead items.
  - d. Designation of key personnel and their duties.
  - e. Procedures for processing field decisions and Change Orders.
  - f. Procedures for requests for interpretations (RFIs).
  - g. Procedures for testing and inspecting.
  - h. Procedures for processing Applications for Payment.
  - i. Distribution of the Contract Documents.
  - j. Submittal procedures.
  - k. Preparation of Record Documents.
  - l. Use of the premises and existing building.
  - m. Work restrictions.
  - n. Owner's occupancy requirements.
  - o. Responsibility for temporary facilities and controls.
  - p. Construction waste management and recycling.
  - q. Parking availability.
  - r. Office, work, and storage areas.
  - s. Equipment deliveries and priorities.
  - t. First aid.
  - u. Security.
  - v. Progress cleaning.
  - w. Working hours.
  - x. Funding source requirements.
  - y. Construction Waste Management
  - z. Construction IAQ
3. Minutes: Contractor will record and distribute meeting minutes to Architect, Owner and all invited attendees.
- C. Progress Meetings: Conduct progress meetings at monthly intervals. Coordinate dates of meetings with preparation of payment requests.
- 1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  - 2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
      - 1) Review schedule for next period.
    - b. Review present and future needs of each entity present, including the following:

- 1) Interface requirements.
  - 2) Sequence of operations.
  - 3) Status of submittals.
  - 4) Deliveries.
  - 5) Off-site fabrication.
  - 6) Hazards and risks.
  - 7) Status of correction of deficient items.
  - 8) Field observations.
  - 9) Requests for interpretations (RFIs).
  - 10) Status of proposal requests.
  - 11) Pending changes.
  - 12) Status of Change Orders.
  - 13) Pending claims and disputes.
  - 14) Documentation of information for payment requests.
3. Minutes: Contractor will record and distribute meeting minutes to Architect, Owner and all invited attendees.
  4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
    - a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

## SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

## 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
  - 1. Contractor's Construction Schedule.
  - 2. Submittals Schedule.
  - 3. Daily construction reports.
  - 4. Field condition reports.
  - 5. Special reports.
- B. Related Sections include the following:
  - 1. Division 1 Section "Payment Procedures" for submitting the Schedule of Values.
  - 2. Division 1 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes.
  - 3. Division 1 Section "Submittal Procedures" for submitting schedules and reports.

## 1.3 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
  - 1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
  - 2. Predecessor Activity: An activity that precedes another activity in the network.
  - 3. Successor Activity: An activity that follows another activity in the network.
- B. Cost Loading: The allocation of the Schedule of Values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum, unless otherwise approved by Architect.
- C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.
- D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- E. Event: The starting or ending point of an activity.



- F. Float: The measure of leeway in starting and completing an activity.
  - 1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
  - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
  - 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- G. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.
- H. Major Area: A story of construction, a separate building, or a similar significant construction element.
- I. Milestone: A key or critical point in time for reference or measurement.
- J. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.
- K. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

#### 1.4 SUBMITTALS

- A. Qualification Data: For scheduling consultant.
- B. Submittals Schedule: Submit three copies of schedule. Arrange the following information in a tabular format:
  - 1. Scheduled date for first submittal.
  - 2. Specification Section number and title.
  - 3. Submittal category (action or informational).
  - 4. Name of subcontractor.
  - 5. Description of the Work covered.
  - 6. Scheduled date for Architect's final release or approval.
- C. Contractor's Construction Schedule: Submit three opaque copies of initial schedule, large enough to show entire schedule for entire construction period.
- D. CPM Reports: Concurrent with CPM schedule, submit three copies of each of the following computer-generated reports. Format for each activity in reports shall contain activity number, activity description, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
  - 1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
  - 2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
- E. Daily Construction Reports: Submit three copies at monthly intervals.
- F. Field Condition Reports: Submit three copies at time of discovery of differing conditions.

- G. Special Reports: Submit three copies at time of unusual event.

## 1.5 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
- B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.
  - 1. Secure time commitments for performing critical elements of the Work from parties involved.
  - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

## PART 2 - PRODUCTS

### 2.1 SUBMITTALS SCHEDULE

- A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.
  - 1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
  - 2. Final Submittal: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

### 2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."
- B. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Final Completion.
  - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- C. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
  - 1. Activity Duration: Define activities so no activity is longer than 20 days, d except for 60 +/- days for heating, mechanical rough-in, electrical rough-in and beam / column fabrication / testing.
    - a.
  - 2. Submittal Review Time: Include review and resubmittal times indicated in Division 1 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
  - 3. Startup and Testing Time: Include not less than 10 working days for startup and testing.

- D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
1. Phasing: Arrange list of activities on schedule by phase.
  2. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Division 1 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
  3. Work Restrictions: Show the effect of the following items on the schedule:
    - a. Coordination with existing construction.
    - b. Limitations of continued occupancies.
    - c. Uninterruptible services.
    - d. Use of premises restrictions.
    - e. Provisions for future construction.
    - f. Environmental control.
  4. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
    - a. Subcontract awards.
    - b. Submittals.
    - c. Purchases.
    - d. Fabrication.
    - e. Deliveries.
    - f. Installation.
    - g. Tests and inspections.
    - h. Adjusting.
    - i. Curing.
    - j. Startup and placement into final use and operation.
- E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion , and the following interim milestones:
1. Completion of Foundations
  2. Completion of weathertight shell
  3. Completion of concrete slabs and curing
  4. time for system start-up and testing
  5. Time for system training
- F. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.

## 2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal Gantt-chart-type, Contractor's Construction Schedule within 10 days of date established for the Notice to Proceed. Base

schedule on the Preliminary Construction Schedule and whatever updating and feedback was received since the start of Project.

- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
  - 1. For construction activities that require 1 month or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

## 2.4 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

- A. General: Prepare network diagrams using AON (activity-on-node) format.
- B. Preliminary Network Diagram: Submit diagram within 10 days of date established for the Notice to Proceed. Outline significant construction activities for the first 30 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.
- C. CPM Schedule: Prepare Contractor's Construction Schedule using a computerized, time-scaled CPM network analysis diagram for the Work.
  - 1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 20 days after date established for the Notice to Proceed.
    - a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.
  - 2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
  - 3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
  - 4. Use "one workday" as the unit of time. Include list of nonworking days and holidays incorporated into the schedule.
- D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the preliminary network diagram, prepare a skeleton network to identify probable critical paths.
  - 1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
    - a. Preparation and processing of submittals.
    - b. Mobilization and demobilization.
    - c. Purchase of materials.
    - d. Delivery.
    - e. Fabrication.
    - f. Utility interruptions.
    - g. Installation.
    - h. Work by Owner that may affect or be affected by Contractor's activities.
    - i. Testing.

2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
  3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
  4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
    - a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.
- E. Initial Issue of Schedule: Prepare initial network diagram from a list of straight "early start-total float" sort. Identify critical activities. Prepare tabulated reports showing the following:
1. Contractor or subcontractor and the Work or activity.
  2. Description of activity.
  3. Principal events of activity.
  4. Immediate preceding and succeeding activities.
  5. Early and late start dates.
  6. Early and late finish dates.
  7. Activity duration in workdays.
  8. Total float or slack time.
- F. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
1. Identification of activities that have changed.
  2. Changes in early and late start dates.
  3. Changes in early and late finish dates.
  4. Changes in activity durations in workdays.
  5. Changes in the critical path.
  6. Changes in total float or slack time.
  7. Changes in the Contract Time.

## 2.5 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
1. List of subcontractors at Project site.
  2. List of separate contractors at Project site.
  3. Approximate count of personnel at Project site.
  4. Equipment at Project site.
  5. Material deliveries.
  6. High and low temperatures and general weather conditions.
  7. Accidents.
  8. Meetings and significant decisions.
  9. Unusual events (refer to special reports).
  10. Stoppages, delays, shortages, and losses.
  11. Meter readings and similar recordings.
  12. Emergency procedures.
  13. Orders and requests of authorities having jurisdiction.
  14. Change Orders received and implemented.
  15. Construction Change Directives received and implemented.

16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial Completions and occupancies.
19. Substantial Completions authorized.

- B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a request for interpretation. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

## 2.6 SPECIAL REPORTS

- A. General: Submit special reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.
- B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

## PART 3 - EXECUTION

### 3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
  2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
  3. As the Work progresses, indicate Actual Completion percentage for each activity.
- B. Distribution: Distribute copies of approved schedule to Architect Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
1. Post copies in Project meeting rooms and temporary field offices.
  2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200

## SECTION 013300 - SUBMITTAL PROCEDURES

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Requirements:
  - 1. Division 01 Section "Payment Procedures" for submitting Applications for Payment and the schedule of values.
  - 2. Division 01 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
  - 3. Division 01 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
  - 4. Division 01 Section "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
  - 5. Division 01 Section "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

## 1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."
- C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.
- D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

#### 1.4 ACTION SUBMITTALS

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and Construction Manager and additional time for handling and reviewing submittals required by those corrections.
1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
  2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
  3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
    - a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
  4. Format: Arrange the following information in a tabular format:
    - a. Scheduled date for first submittal.
    - b. Specification Section number and title.
    - c. Submittal category: Action or Informational
    - d. Name of subcontractor.
    - e. Description of the Work covered.
    - f. Scheduled date for Architect's final release or approval.
    - g. Scheduled date of fabrication.
    - h. Scheduled dates for purchasing.
    - i. Scheduled dates for installation.
    - j. Activity or event number.

#### 1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals.
1. Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.
    - a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
    - b. Digital Drawing Software Program: The Contract Drawings are available in 'Autodesk Revit Architecture 2012'.
    - c. Contractor shall execute a data licensing agreement in the form of AIA Document C106, Digital Data Licensing Agreement.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.



1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
  2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
  3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
  4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
    - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 15 business days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
  2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
  3. Resubmittal Review: Allow 15 business days for review of each resubmittal.
  4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is required, allow 20 business days for initial review of each submittal.

## PART 2 - PRODUCTS

### 2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements for Projects Processed as Electronic Submittals: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
1. Submit electronic submittals as PDF electronic files directly to the NEWFORMA Info Exchange site specifically established for the Project. A brief tutorial handout will be provided at the preconstruction meeting.
    - a. Submit data/drawings/etc for only one (1) Specification Section per submittal.
    - b. Do not combine action and informational items in the same submittal.
    - c. Informational submittals shall be clearly marked with "INFO-" at the beginning of the subject line. Architect will not return informational submittals that are in compliance.
    - d. Each submittal shall be a single PDF file with portrait and/or landscape orientation applied correctly, that includes the following:
      - 1) A GC Transmittal Letter with details of the submittal item, including Specification Section number, type and description of what is being submitted – for example: 061753 Drawings - Wood Trusses.
      - 2) A Separate cover sheet with the GC review stamp leaving sufficient space for the Architect's review stamp.
      - 3) Data, drawings, etc., that relate to the submittal item.

- 4) Black or red marks (arrows, circles, bubbles) to indicate specific product information as applicable.
      - e. Electronic submittals are acceptable for all documents (i.e. large format drawings and samples), unless noted otherwise.
        - 1) If hard copies of large format drawings are required, refer to individual Specification Sections for details and Paragraph 2.1.A.2.
        - 2) Samples: Hard copies are required for all samples, refer to Paragraph 2.1.A.2.e. For electronic copy instructions, refer to Paragraph 2.1.E .
  2. Submit HARD COPY submittals on an as needed basis as follows:
    - a. Submit data/drawings/etc. for only one (1) Specification Section per transmittal.
    - b. Submit the same GC Transmittal Letter with details of the submittal item, including the Specification Section number, type and description of what is being submitted as was sent in the electronic copy.
    - c. Submit the same cover sheet with the GC review stamp as was sent in the electronic copy.
    - d. Submit a hard copy of the same data, drawings, etc., that relate to the submittal item as was sent in the electronic copy, but in the full size intended.
    - e. Submit actual samples with an ID label that has appropriate information attached (Project Number, Specification Section number, GC's submittal number, etc.). Refer to Paragraph 2.1.E.
  3. Submittals received after 2 PM will be processed and logged as being received on the next business day.
  4. Architect, through Construction Manager, will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
- B. General Submittal Procedure Requirements for Projects Processed as Hard Copies: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
1. Submit HARD COPY submittals as follows:
    - a. Submit data/drawings/etc. for only one (1) Specification Section per transmittal.
    - b. Include the GC Transmittal Letter with details of the submittal item(s), including the Specification Section number, type and description.
    - c. Include a cover sheet with the GC review stamp leaving sufficient space for the Architect's review stamp.
    - d. Include 3 hard copies of the data, drawings, etc., that relate to the submittal item in the full size intended.
    - e. Submit actual samples with an ID label that has appropriate information attached (Project Number, Specification Section number, GC's submittal number, etc.).
      - 1) remit one (1) physical sample or color chart with transmittal letter to the Architect's office, unless noted otherwise in individual Specification Sections. Identification: Attach label on unexposed side of Samples that includes the following:
        - a) Name of Project
        - b) Generic description of Sample
        - c) Product name and name of manufacturer
        - d) Sample source
        - e) Number and title of applicable Specification Section
        - f) Specification paragraph number and generic name of each item

2. Submittals received after 2 PM will be processed and logged as being received on the next business day.
  3. Architect, through Construction Manager, will return annotated file. Annotate and retain one copy of file as an electronic Project record document file
- C. 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 published 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 catalog cuts.
    - b. Manufacturer's product specifications.
    - c. Standard color charts.
    - d. Statement of compliance with specified referenced standards.
    - e. Testing by recognized testing agency.
    - f. Application of testing agency labels and seals.
    - g. Notation of coordination requirements.
    - h. Availability and delivery time information.
  4. For equipment, include the following in addition to the above, as applicable:
    - a. Wiring diagrams showing factory-installed wiring.
    - b. Printed performance curves.
    - c. Operational range diagrams.
    - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
  5. Submit Product Data before or concurrent with Samples.
  6. Submit Product Data in the following format:
    - a. PDF electronic file unless otherwise noted.
- D. Shop Drawings: Prepare Project-specific information, drawn accurately to scale (i.e. PDF's shall not be reduced from the scale at which they were drawn). Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    - a. Identification of products.
    - b. Schedules.
    - c. Compliance with specified standards.
    - d. Notation of coordination requirements.
    - e. Notation of dimensions established by field measurement.
    - f. Relationship and attachment to adjoining construction clearly indicated.
    - g. Seal and signature of professional engineer if specified.
  2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.

3. Submit Shop Drawings in the following format:
  - a. PDF electronic file unless drawing size is larger than 11"x17"
    - 1) For drawings larger than 11"x17" inches, determine with the Project Manager whether or not there are specific arrangements for in house printing of large size drawings; otherwise remit one (1) hard copy to the Architect.
    - 2) Refer to individual Specification Sections for additional requirements and provide as necessary.
  
- E. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
  1. Submit a PDF electronic file in color if applicable of samples that contain multiple, related components such as accessories together in one submittal package.
    - a. Also remit one (1) physical sample or color chart with transmittal letter and cover sheet to the Architect's office, unless noted otherwise in individual Specification Sections. Identification: Attach label on unexposed side of Samples that includes the following:
      - 1) Name of Project
      - 2) Generic description of Sample.
      - 3) Product name and name of manufacturer.
      - 4) Sample source.
      - 5) Number and title of applicable Specification Section.
      - 6) Specification paragraph number and generic name of each item.
  2. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
    - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
    - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
  
- F. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
  1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
  2. Manufacturer and product name, and model number if applicable.
  3. Number and name of room or space.
  4. Location within room or space.
  5. Submit product schedule in the following format:
    - a. PDF electronic file.
  
- G. Coordination Drawing Submittals: Comply with requirements specified in Division 01 Section "Project Management and Coordination."
  
- H. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."

- I. Contractor's Submittal Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."
- J. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section "Closeout Procedures", "Operation and Maintenance Data", and "Project Record Documents."
- K. Maintenance Data: Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."
- L. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- M. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- N. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- O. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.
- P. Application for Payment and Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."
- Q. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Division 01 Section "Quality Requirements."
- R. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- S. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
- T. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- U. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- V. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

- W. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- X. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- Y. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- Z. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
  - 1. Name of evaluation organization.
  - 2. Date of evaluation.
  - 3. Time period when report is in effect.
  - 4. Product and manufacturers' names.
  - 5. Description of product.
  - 6. Test procedures and results.
  - 7. Limitations of use.

## 2.2 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
  - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file certificate signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
  - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

## PART 3 - EXECUTION

### 3.1 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

- B. Project Closeout and Maintenance Material Submittals: See requirements in Division 01 Section "Closeout Procedures", "Operation and Maintenance Data", and "Project Record Documents."
- C. 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. Action Submittals: Architect and Construction Manager will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect and Construction Manager will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action, as follows:
  - 1. Reviewed, No Exceptions Taken: Final Unrestricted Release. Work may proceed, provided it complies with the Contract Documents.
  - 2. Reviewed, Revise as Noted: Final But Conditional Release. Work may proceed, provided it complies with the notations and corrections on submittals and with Contract Documents. Architect's comments shall be considered a part of the original submittal. Should Contractor disagree with any such comments, so notify the Architect within fourteen (14) days after receipt of such transmittal and before commencing work on the items in question. Failing this, Contractor shall be deemed to have agreed to such comments by the Architect and to have accepted full responsibility for implementing them at no additional cost to the Owner.
  - 3. Revise and Resubmit: Returned for Resubmittal. Do not proceed with the work at the site or allow submittal at site. Fabrication in shop or factory may proceed on items not affected by the Architect's comments only. Revise submittal in accordance with notations thereon, and resubmit without delay to obtain a different action marking.
  - 4. Rejected: Where submittal is returned for other reasons, with Architect's explanation included.
- B. Informational Submittals: Architect and Construction Manager will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION 013300

## SECTION 014000 - QUALITY REQUIREMENTS

## PART 1 GENERAL

## 1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
  - 1. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
  - 2. Specified tests, inspections, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with the Contract Document requirements.
  - 3. Requirements for Contractor to provide quality-control services required by Architect, Construction Manager, Owner, or authorities having jurisdiction (AHJ) are not limited by provisions of this Section.

## 1.2 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with requirements. Services do not include contract enforcement activities performed by Architect.
- C. Mockups: Full-size, physical example assemblies to illustrate finishes and materials. Mockups are used to verify selections made under Sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples.
- D. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

## 1.3 DELEGATED DESIGN

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
  - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

## 1.4 SUBMITTALS

- A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.



- B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.
  - C. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
    - 1. Specification Section number and title.
    - 2. Description of test and inspection.
    - 3. Identification of applicable standards.
    - 4. Identification of test and inspection methods.
    - 5. Number of tests and inspections required.
    - 6. Time schedule or time span for tests and inspections.
    - 7. Entity responsible for performing tests and inspections.
    - 8. Requirements for obtaining samples.
    - 9. Unique characteristics of each quality-control service.
  - D. Reports: Prepare and submit certified written reports that include the following:
    - 1. Date of issue.
    - 2. Project title and number.
    - 3. Name, address, and telephone number of testing agency.
    - 4. Dates and locations of samples and tests or inspections.
    - 5. Names of individuals making tests and inspections.
    - 6. Description of the Work and test and inspection method.
    - 7. Identification of product and Specification Section.
    - 8. Complete test or inspection data.
    - 9. Test and inspection results and an interpretation of test results.
    - 10. Ambient conditions at time of sample taking and testing and inspecting.
    - 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
    - 12. Name and signature of laboratory inspector.
    - 13. Recommendations on retesting and re-inspecting.
  - E. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.
- 1.5 QUALITY ASSURANCE
- A. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
  - B. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
  - C. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

- D. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.
- F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
  - 1. Requirement for specialists shall not supersede building codes and similar regulations governing the Work, nor interfere with local trade-union jurisdictional settlements and similar conventions.
- G. Testing Agency Qualifications: An agency with the experience and capability to conduct testing and inspecting indicated, as documented by ISO/IEC Standard 17025, and that specializes in types of tests and inspections to be performed.
- H. Preconstruction Testing: Testing agency shall perform preconstruction testing for compliance with specified requirements for performance and test methods.
  - 1. Contractor responsibilities include the following:
    - a. Provide test specimens and assemblies representative of proposed materials and construction. Provide sizes and configurations of assemblies to adequately demonstrate capability of product to comply with performance requirements.
    - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
    - c. Fabricate and install test assemblies using installers who will perform the same tasks for Project.
    - d. When testing is complete, remove assemblies; do not reuse materials on Project.
  - 2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copies to Contractor and Construction Manager. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

#### 1.6 QUALITY CONTROL

- A. Contractor Responsibilities: Unless otherwise indicated, provide quality-control services specified and required by authorities having jurisdiction.
  - 1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
    - a. Contractor shall not employ the same entity engaged by Owner, unless agreed to in writing by Owner.
  - 2. Notify testing agencies at least twenty-four (24) hours in advance of time when Work that requires testing or inspecting will be performed.
  - 3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
  - 4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
  - 5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

- B. Special Tests and Inspections: Owner will engage a testing agency to conduct special tests and inspections required by AHJ as the responsibility of Owner.
  - 1. Testing agency will notify Architect, Construction Manager and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
  - 2. Testing agency will submit a certified written report of each test, inspection, and similar quality-control service to Architect, with copy to Contractor, Construction Manager and to authorities having jurisdiction.
  - 3. Testing agency will submit a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
  - 4. Testing agency will interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
  - 5. Testing agency will retest and re-inspect corrected work.
- C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing.
- D. Retesting/Re-inspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and re-inspecting, for construction that revised or replaced Work that failed to comply with requirements established by the Contract Documents.
- E. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
  - 1. Access to the Work.
  - 2. Incidental labor and facilities necessary to facilitate tests and inspections.
  - 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
  - 4. Facilities for storage and field-curing of test samples.
  - 5. Delivery of samples to testing agencies.
  - 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
  - 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- F. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
  - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- G. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within thirty (30) days of date established for commencement of the Work.
  - 1. Distribution: Distribute schedule to Owner, Construction Manager, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

#### 1.7 QUALITY ASSURANCE AND QUALITY CONTROL SYSTEM

- A. Establish, document and maintain a quality assurance and quality control system capable of verifying to the satisfaction of the Architect that all materials and workmanship, whatever their sources, conform to

the requirements of the Specification.

- B. The quality program shall be defined in a quality control manual or similar document in which the organization systems, inspection and test plan procedures are fully described to ensure that all essential inspection requirements are determined and satisfied throughout all phases of the works.
- C. Construction Manager to establish a tolerance quality control manual to cover all aspects of tolerance compliance relating to the works. A quality control proposal shall be prepared for submission to the Architect for acceptance. This shall describe, in detail, the various types of quality control checks that shall be carried out during each stage of the works; what means and methods shall be used; which personnel shall be employed, together with their qualifications, and how each type of tolerance check shall be recorded and kept for future reference.
- D. Construction Manager's proposals for the quality control manual shall meet the requirements of this section as a minimum and be submitted to the Architect. Provide facilities in the event that the Architect wishes to examine these proposals at the Works. Include details of formal approvals held for the Construction Manager's or sub-contractor's quality system or any evaluations or assessments carried out by independent third parties.
- E. Within 30 days of the written order to proceed, submit a comprehensive quality control manual to the Architect for review, amendment where appropriate, and acceptance.
- F. Include with the quality control manual an inspection and test plan for each major item of work or type of fabrication which shall detail, in sequential order:
  - 1. The principal activities to be carried out.
  - 2. The type, method and frequency of inspections and tests to be carried out.
  - 3. The inspecting authority.
  - 4. The acceptance criteria.
  - 5. The records to be kept.
- G. The inspection and test plan shall contain sufficient space for the Architect to indicate on it the activities he wishes to inspect as either "hold" or "witness" points.
  - 1. A "hold" point is defined as a point on the inspection and test plan beyond which the process may not continue until it has been accepted by the Architect.
  - 2. A "witness" point is defined as a point on the inspection and test plan where the Contractor shall give reasonable notice that a particular part of the process has been reached although the process may continue without acceptance being notified by the Architect.
- H. The inspection and test plan shall provide the basis of inspection for the item of work and shall be accepted prior to commencement of the work.
- I. At all times during the Contract period, make available at the works all necessary resources and facilities and implement any reviews and amendments of the quality control manual deemed necessary or desirable by the Architect.
- J. As a minimum the quality control manual shall include information and procedures as defined below:
  - 1. Organization and Management.
  - 2. Facilities, Measuring and Test Equipment.
  - 3. Personnel Training and Certification.
  - 4. Documentation.
  - 5. Receipts, Storage, Handling and Transportation.

6. Materials.
7. Welding.
8. Fabrication and Erection.
9. Tolerance Control.
10. Prototypes.
11. Painting and Coating.
12. Inspection and Testing of Materials and Workmanship.
13. Non-conforming Items.
14. Design.
15. Control of Purchased Materials and Services.
16. Completed Item, Inspection and Test Results.
17. Records.
18. Review of the Quality System.

K. Means of Auditing

1. The Architect shall review the Contractor's proposals and carry out such tasks as are necessary to ensure that:
  - a. The Contractor's methods of working are likely to produce acceptable work.
  - b. Finished items and assemblies conform to the Specification.
2. Nominate a senior member of the technical organization as Quality Manager who shall be independent of the other functions and be held responsible for all matters relating to the production and implementation of the quality control manual.
3. At any stage during the Contract period, including those times prior to fabrication, make all facilities available to the Architect such that quality audits, according to an established system, may be carried out.
4. Keep and maintain, at an agreed location, a copy of all relevant check certificates for inspection by the Architect upon request.
5. If the Architect detects any deficiencies, either in the work or the Construction Manager's QA/QC system, these matters shall be reported. Each item affected by said deficiencies shall be considered as being of suspect quality and shall be physically quarantined in a separate holding area. No work may be carried out on these items until the Architect instructs to either rework or repair the affected item, or declares it shall be outside the Specification and therefore rejected.

L. Quality Control Methods

1. The appointment of any sub-contractors, or the carrying out of any work at any place other than the Contractor's nominated principal workplace, shall only occur with the acceptance of the Architect and Construction Manager. The work shall be carried out only under equivalent conditions of QA/QC to those at the nominated principal workplace. Demonstrate to the satisfaction of the Architect the methods by which he selects, controls, inspects and verifies that the work carried out by the sub-contractor conforms to the requirements of the Specification.
2. Make available to the Architect copies of each purchase order for any item or service wished to be included within the works. Each purchase order shall fully detail the item or service in terms of quality, grade, type, appropriate Standard applicable, inspection, test and documentation requirements.
3. The organization and management of the Construction Manager's QA/QC program shall be confirmed to be comprehensive and effective for the provision of work to the Specification requirements. All such details shall be fully described in a document, referred to as the quality control manual, which shall be accepted for use by the Architect.
4. All facilities, measuring and test equipment shall be re-calibrated and checked against standards

at whatever frequency is determined appropriate by the equipment manufacturer. Where such items are not considered by the Architect and Construction Manager to give sufficiently accurate readings or results, or are not able to produce consistent results, they shall not be used on this Contract.

5. Personnel training and certification shall be subject to the acceptance of the Construction Manager.
6. Documentation of materials and processes shall only be considered adequate when, having been checked by the Architect, they are deemed by the Architect to verify that the Specification requirements are, in all respects, satisfied.
7. Receipt and storage of incoming materials shall be suitably controlled such that, in the opinion of the Construction Manager, it can be readily confirmed that the correct materials have been employed at the correct locations in the work as described in the Specification.
8. All materials, including part and fully finished components, welding consumables and paints, etc. shall be identified and documented such that the Architect can confirm that all materials used comply with the Specification requirements.
9. All fabrication operations shall use processes, consumables and testing procedures, confirmed by suitable tests, that enable the Architect to confirm that the connections placed during fabrication, and if appropriate during erection, have mechanical properties and freedom from unacceptable defects sufficient to ensure that the Specification requirements are satisfied.
10. Fabrication and erection work shall be monitored by the Construction Manager to ensure that pieces are assembled correctly and when complete are compliant with the correct drawings and the Specification requirements.
11. Make available to the Construction Manager and Architect a detailed program of work so that he may witness significant stages in the fabrication process.
12. Painting and coatings materials and processes checks shall be as stated above and shall be monitored by the Construction Manager at such intervals necessary to confirm that the fabricator is carrying out this work properly and to the required levels of quality.

## 1.8 REFERENCES

### A. Quality Assurance

1. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of standard, except when more rigid requirements are specified or are required by applicable codes. Such standards are made a part of Contract Documents by reference.
2. Conform to reference standard by date of issue current on original date indicated on Contract Documents.
3. Obtain copies of standards when required by Contract Documents.
4. Maintain copy of applicable standards at Project Site during the project, until Final Acceptance.
5. Should specified reference standards conflict with Contract Documents, request clarification from the Architect before proceeding.
6. The contractual relationship, duties, and responsibilities of the parties in the Contract, and the Architect, shall not be altered from Contract Documents by mention or inference otherwise in any reference document.

### B. Reference Standards

1. Conflicting Requirements: Where compliance with two or more standards is specified, and the standards may establish different or conflicting requirements for minimum quantities or quality levels, refer requirements that are different, and uncertainties to Architect for decision before proceeding.
  - a. Minimum Quantity or Quality Levels: Quantity or quality level shown or specified shall be

minimum provided or performed. Actual installation may comply exactly with minimum quantity or quality specified, or it may exceed minimum within reasonable limits. In complying with these requirements, indicated numeric values are minimum or maximum, as appropriate for context of requirements. Refer uncertainties to Architect for decision before proceeding.

2. Copies of Standards: Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to that entity's construction activity. Copies of applicable standards are not bound with Contract Documents.
  - a. Where copies of standards are needed for performance of a required construction activity, Contractor shall obtain copies directly from publication source.

#### 1.9 MOCK-UP, PROTOTYPE, AND BENCHMARK

- A. This Article specifies requirements for preparation of comparative installations the Work for the purpose of establishing visual quality and performance. Refer to individual specification sections for additional requirements.
- B. Provide and coordinate assemblies both on and off the Project site, as scheduled in the technical specification sections, for Construction Manager, Architect's and Owner's review.
- C. The Contractor shall coordinate the requirements for each sample installation with individual Subcontractors and their material suppliers.
- D. Definitions
  1. Mock-ups: Full scale three-dimensional sections utilizing final specified materials and final production techniques, constructed to be fully tested to ensure that the systems meet the performance requirements of the Specification by application of the maximum applied loads, climatic conditions, structural movements, and the like.
    - a. Manufacture of materials/products for inclusion in the Work shall not commence until the Architect's written acceptance of the mockup has been received.
  2. Prototypes: Full scale three-dimensional installations using the final specified materials, constructed to illustrate the general visual intent. Prototypes are not intended to be incorporated into the Work.
  3. Benchmarks: Sample installations using the final specific materials and methods, constructed to illustrate the general visual intent, installation methods, tolerances, and the like; for inspection and approval by the Architect.
    - a. Benchmark installations may be incorporated into the Work if so approved by the Architect.
- E. Submittals
  1. Shop Drawings: Provide large-scale shop drawings for fabrication, installation and erection of all parts of each sample installation. Provide plans, elevations, and details of support, anchorage, connections and accessory items.
  2. Samples: Refer to individual Specification Sections for submittal requirements of components and coordinate accordingly.
- F. Quality Assurance
  1. Design Modifications: Make design modifications to work only as required to meet performance requirements and to coordinate the work. Indicate proposed design modifications on shop

drawings. Maintain original design concept without altering profiles and alignments indicated.

## PART 2 PRODUCTS

### 2.1 MATERIALS AND PRODUCTS - MOCK-UP, PROTOTYPE, AND BENCHMARK

- A. Provide materials, components, and products for exterior wall assembly mock-ups, prototypes, and benchmarks and for specified interior construction components as specified in individual Specification Sections.

## PART 3 EXECUTION

### 3.1 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
  - 1. Provide materials and comply with installation requirements specified in other Sections of these Specifications. Restore patched areas and extend restoration into adjoining areas in a manner that eliminates evidence of patching.
  - 2. Protect construction exposed by or for quality-control service activities.
- B. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000



## SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

## 1.2 SUMMARY

- A. This Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Sections include the following:
  - 1. Division 1 Section "Summary of Work" for limitations on utility interruptions and other work restrictions.
  - 2. Division 1 Section "Submittal Procedures" for procedures for submitting copies of implementation and termination schedule and utility reports.
  - 3. Divisions 2 through 41 Sections for temporary heat, ventilation, and humidity requirements for products in those Sections.
  - 4. Division 31 Section "Dewatering" for disposal of ground water at Project site.

## 1.3 DEFINITIONS

- A. Permanent Enclosure: As determined by Architect, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

## 1.4 USE CHARGES

- A. General: Cost or use charges for temporary facilities shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.
- B. Sewer Service: Sewer service from Owner's existing system is available for use without metering and without payment of use charges, as required for construction operations.
- C. Water Service: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
- D. Electric Power Service: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

## 1.5 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

## 1.6 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities. Permanently installed HVAC units are not to be used prior to owner occupancy.

## PART 2 - PRODUCTS

## 2.1 MATERIALS

- A. Lumber and Plywood: Comply with requirements in Division 6 Section "Rough Carpentry."
- B. Gypsum Board: Minimum 1/2 inch thick by 48 inches wide by maximum available lengths; regular-type panels with tapered edges. Comply with ASTM C 36/C 36M.
- C. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.
- D. Paint: Comply with requirements in Division 9 painting Sections.

## 2.2 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
  - 1. Store combustible materials apart from building.

## 2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. Heating Equipment: Unless Owner authorizes use of permanent heating system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

#### 3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
  1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
  1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.
- C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
- D. Water Service: Use of Owner's existing water service facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
  1. Where installations below an outlet might be damaged by spillage or leakage, provide a drip pan of suitable size to minimize water damage. Drain accumulated water promptly from pans.
- E. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- F. Heating: Provide temporary heating required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. No open flame heaters.
- G. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

- H. Electric Power Service: Use of Owner's existing electric power service will be permitted, as long as equipment is maintained in a condition acceptable to Owner.
- I. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
  - 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
  - 2. Install lighting for Project identification sign.
- J. Telephone Service: Provide temporary telephone service in a common-use facility for use by all construction personnel.
  - 1. At each telephone, post a list of important telephone numbers.
    - a. Police and fire departments.
    - b. Ambulance service.
    - c. Contractor's home office.
    - d. Architect's office.
    - e. Engineers' offices.
    - f. Owner's office.
    - g. Principal subcontractors' field and home offices.
  - 2. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

### 3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
  - 1. Provide incombustible construction for offices, shops, and sheds located within construction area or within 30 feet of building lines. Comply with NFPA 241.
  - 2. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas as indicated on Drawings.
  - 1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.
- C. Parking: Use designated areas of Owner's existing parking areas for construction personnel.
- D. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
  - 1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
  - 2. Remove snow and ice as required to minimize accumulations.

- E. Project Identification and Temporary Signs: Provide Project identification and other signs as indicated on Drawings. Install signs where indicated to inform public and individuals seeking entrance to Project. Unauthorized signs are not permitted.
  - 1. Provide temporary, directional signs for construction personnel and visitors.
  - 2. Maintain and touchup signs so they are legible at all times.
- F. Waste Disposal Facilities: Comply with requirements specified in SECTION 017419, CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.
  - 1. Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction.
  - 2. Comply with Division 1 Section 017000, EXECUTION, for progress cleaning requirements.
- G. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
  - 1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- H. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.
- I. Existing Stair Usage: Use of Owner's existing stairs will not be permitted.

#### 3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
  - 1. Comply with work restrictions specified in Division 1 Section "Summary."
- B. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
  - 1. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
- C. Stormwater Control: Comply with authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- D. Tree and Plant Protection: Comply with requirements specified in Division 2 Section "Tree Protection and Trimming."
- E. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
  - 1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.

- F. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.
  - 1. Prohibit smoking in construction areas.
  - 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
  - 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
  - 4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

### 3.5 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
  - 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.
- C. Operate Project-identification-sign lighting daily from dusk until 12:00 midnight.
- D. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- E. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
  - 1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
  - 2. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. 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 temporary entrances, as required by authorities having jurisdiction.
  - 3. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 1 Section "Closeout Procedures."

END OF SECTION 015000

## SECTION 015639 - TEMPORARY TREE AND PLANT PROTECTION

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section includes general protection and pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction.
- B. Related Sections:
  - 1. Division 01 Section "Temporary Facilities and Controls" for temporary site fencing.
  - 2. Division 31 Section "Site Clearing" for removing existing trees and shrubs.

## 1.3 DEFINITIONS

- A. Caliper: Diameter of a trunk measured by a diameter tape at 6 inches above the ground for trees up to, and including, 4-inch size; and 12 inches above the ground for trees larger than 4-inch size.
- B. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and indicated on Drawings.
- C. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

## 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Verification: For each type of the following:
  - 1. Organic Mulch: 1-pint volume of organic mulch; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch.
  - 2. Protection-Zone Fencing: Assembled Samples of manufacturer's standard size made from full-size components.
  - 3. Protection-Zone Signage: Full-size Samples of each size and text, ready for installation.
- C. Tree Pruning Schedule: Written schedule detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.
  - 1. Species and size of tree.
  - 2. Location on site plan. Include unique identifier for each.
  - 3. Reason for pruning.

4. Description of pruning to be performed.
  5. Description of maintenance following pruning.
- D. Qualification Data: For qualified arborist and tree service firm.
- E. Certification: From arborist, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.
- F. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.
- G. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.
1. Use sufficiently detailed photographs or videotape.
  2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.
- 1.5 QUALITY ASSURANCE
- A. Arborist Qualifications: Licensed arborist in jurisdiction where Project is located.
- B. Tree Service Firm Qualifications: An experienced tree service firm that has successfully completed temporary tree and plant protection work similar to that required for this Project and that will assign an experienced, qualified arborist to Project site during execution of the Work.
- C. Preinstallation Conference: Conduct conference at Project site.
1. Review methods and procedures related to temporary tree and plant protection including, but not limited to, the following:
    - a. Construction schedule. Verify availability of materials, personnel, and equipment needed to make progress and avoid delays.
    - b. Enforcing requirements for protection zones.
    - c. Arborist's responsibilities.
    - d. Field quality control.
- 1.6 PROJECT CONDITIONS
- A. The following practices are prohibited within protection zones:
1. Storage of construction materials, debris, or excavated material.
  2. Parking vehicles or equipment.
  3. Foot traffic.
  4. Erection of sheds or structures.
  5. Impoundment of water.
  6. Excavation or other digging unless otherwise indicated.
  7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.



- B. Do not direct vehicle or equipment exhaust toward protection zones.
- C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Planting Soil: Refer to Section 329200 and 329300.
- B. Protection-Zone Fencing: Fencing fixed in position and meeting the following requirements. Previously used materials may be used when approved by Architect.
  - 1. Chain-Link Protection-Zone Fencing: Galvanized-steel fencing fabricated from minimum 2-inch opening, 0.148-inch- diameter wire chain-link fabric; with pipe posts, minimum 2-3/8-inch- OD line posts, and 2-7/8-inch- OD corner and pull posts ; with 0.177-inch- diameter top tension wire and 0.177-inch- diameter bottom tension wire; with tie wires, hog ring ties, and other accessories for a complete fence system.
    - a. Height: 4 feet.
- C. Protection-Zone Signage: Shop-fabricated, rigid plastic or metal sheet with attachment holes prepunched and reinforced; legibly printed with nonfading lettering and as follows:
  - 1. Size and Text: 8 inch x 12 inch, tree protection

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Erosion and Sedimentation Control: Examine the site to verify that temporary erosion- and sedimentation-control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- B. For the record, prepare written report, endorsed by arborist, listing conditions detrimental to tree and plant protection.

### 3.2 PREPARATION

- A. Locate and clearly identify trees, shrubs, and other vegetation to remain. Tie a 1-inch blue-vinyl tape around each tree trunk at 54 inches above the ground.
- B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.
- C. Tree-Protection Zones: Mulch areas inside tree-protection zones and other areas indicated.

1. Apply 4-inch average thickness of organic mulch. Do not place mulch within 6 inches of tree trunks.

### 3.3 TREE- AND PLANT-PROTECTION ZONES

- A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones before materials or equipment are brought on the site and construction operations begin in a manner that will prevent people from easily entering protected area except by entrance gates. Construct fencing so as not to obstruct safe passage or visibility at vehicle intersections where fencing is located adjacent to pedestrian walkways or in close proximity to street intersections, drives, or other vehicular circulation.
  1. Chain-Link Fencing: Install to comply with ASTM F 567 and with manufacturer's written instructions.
  2. Posts: Set or drive posts into ground one-third the total height of the fence without concrete footings. Where a post is located on existing paving or concrete to remain, provide appropriate means of post support acceptable to Architect.
  3. Access Gates: Install where needed; adjust to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.
- B. Protection-Zone Signage: Install protection-zone signage in visibly prominent locations in a manner approved by Architect. Install one sign spaced approximately every 20 feet on protection-zone fencing, but no fewer than four signs with each facing a different direction.
- C. Maintain protection zones free of weeds and trash.
- D. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.
- E. Maintain protection-zone fencing and signage in good condition as acceptable to Architect and remove when construction operations are complete and equipment has been removed from the site.
  1. Do not remove protection-zone fencing, even temporarily, to allow deliveries or equipment access through the protection zone.
  2. Temporary access is permitted subject to preapproval in writing by arborist if a root buffer effective against soil compaction is constructed as directed by arborist. Maintain root buffer so long as access is permitted.

### 3.4 EXCAVATION

- A. General: Excavate at edge of protection zones and for trenches indicated within protection zones according to requirements in Division 31 Section "Earth Moving."
- B. Trenching near Trees: Where utility trenches are required within protection zones, hand excavate under or around tree roots or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots as required for root pruning.
- C. Redirect roots in backfill areas where possible. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and redirect them without breaking. If encountered

immediately adjacent to location of new construction and redirection is not practical, cut roots approximately 3 inches back from new construction and as required for root pruning.

- D. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

### 3.5 ROOT PRUNING

- A. Prune roots that are affected by temporary and permanent construction. Prune roots as follows:
  - 1. Cut roots manually by digging a trench and cutting exposed roots with sharp pruning instruments; do not break, tear, chop, or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
  - 2. Cut Ends: Do not paint cut root ends.
  - 3. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
  - 4. Cover exposed roots with burlap and water regularly.
  - 5. Backfill as soon as possible according to requirements in Division 31 Section "Earth Moving."
- B. Root Pruning at Edge of Protection Zone: Prune roots 12 inches outside of the protection zone, by cleanly cutting all roots to the depth of the required excavation.
- C. Root Pruning within Protection Zone: Clear and excavate by hand to the depth of the required excavation to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.

### 3.6 CROWN PRUNING

- A. Prune branches that are affected by temporary and permanent construction. Prune branches as follows:
  - 1. Prune trees to remain to compensate for root loss caused by damaging or cutting root system. Provide subsequent maintenance during Contract period as recommended by arborist.
  - 2. Pruning Standards: Prune trees according to ANSI A300 (Part 1).
  - 3. Cut branches with sharp pruning instruments; do not break or chop.
  - 4. Do not apply pruning paint to wounds.
- B. Chip removed branches and dispose of off-site.

### 3.7 REGRADING

- A. Lowering Grade: Where new finish grade is indicated below existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.
- B. Lowering Grade within Protection Zone: Where new finish grade is indicated below existing grade around trees, slope grade away from trees as recommended by arborist unless otherwise indicated.

1. Root Pruning: Prune tree roots exposed by lowering the grade. Do not cut main lateral roots or taproots; cut only smaller roots. Cut roots as required for root pruning.
- C. Raising Grade: Where new finish grade is indicated above existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.
- D. Minor Fill within Protection Zone: Where existing grade is 2 inches or less below elevation of finish grade, fill with topsoil. Place topsoil in a single uncompacted layer and hand grade to required finish elevations.

### 3.8 FIELD QUALITY CONTROL

- A. Inspections: Engage a qualified arborist to direct plant-protection measures in the vicinity of trees, shrubs, and other vegetation indicated to remain and to prepare inspection reports.

### 3.9 REPAIR AND REPLACEMENT

- A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.
  1. Submit details of proposed root cutting and tree and shrub repairs.
  2. Have arborist perform the root cutting, branch pruning, and damage repair of trees and shrubs.
  3. Treat damaged trunks, limbs, and roots according to arborist's written instructions.
  4. Perform repairs within 24 hours.
  5. Replace vegetation that cannot be repaired and restored to full-growth status, as determined by Architect.
- B. Trees: Remove and replace trees indicated to remain that are more than 25 percent dead or in an unhealthy condition before the end of the corrections period or are damaged during construction operations that Architect determines are incapable of restoring to normal growth pattern.
  1. Provide new trees of same size and species as those being replaced for each tree that measures 6 inches or smaller in caliper size.
  2. Provide two new tree(s) of 6-inch caliper size for each tree being replaced that measures more than 6 inches in caliper size.
  3. Plant and maintain new trees as specified in Division 32 Section "Plants."
- C. Soil Aeration: Where directed by Architect, aerate surface soil compacted during construction. Aerate 10 feet beyond drip line and no closer than 36 inches to tree trunk. Drill 2-inch- diameter holes a minimum of 12 inches deep at 24 inches o.c. Backfill holes with an equal mix of augered soil and sand.

### 3.10 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove excess excavated material, displaced trees, trash and debris, and legally dispose of them off Owner's property.

END OF SECTION 015639

## SECTION 017000 - EXECUTION

## PART 1 GENERAL

## 1.1 SUMMARY

- A. Work of this Section consists of execution and closeout requirements, and includes but is not limited to the following:
  - 1. Examination and Preparation
  - 2. Execution
  - 3. Cleaning
  - 4. Starting and Adjusting
  - 5. Protecting Installed Construction
  
- B. Related Sections include the following:
  - 1. Section 017310 Cutting and Patching
  - 2. Section 017419 Construction Waste Management
  - 3. Section 017810 Project Record Documents
  - 4. Section 017820 Operation Maintenance Data
  - 5. Section 018200 Demonstration and Training

## 1.2 EXECUTION

- A. Execution Summary
  - 1. Construction layout.
  - 2. Field engineering and surveying.
  - 3. General installation of products.
  - 4. Coordination of Owner-installed products.
  - 5. Progress cleaning.
  - 6. Starting and adjusting.
  - 7. Protection of installed construction.
  - 8. Correction of the Work.
  
- B. Execution Submittals
  - 1. Submit Certified Surveys
  - 2. Submit Final Property Survey
  - 3. Submit Certificates certifying that location and elevation of improvements comply with requirements.
  - 4. Submit Land Surveyor Qualifications

## PART 2 PRODUCTS

## 2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned, and that meet requirements.
  - 1. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

## PART 3 EXECUTION

## 3.1 EXAMINATION AND PREPARATION

## A. Examination

1. Existing Structures: Research, investigate, explore location of existing above and below-ground structures.
2. Existing Utilities: Research, investigate, explore location of existing above and below-ground utilities.
  - a. Coordinate with "Dig Safe."
3. Examine substrates, areas, and conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

## B. Preparation

1. Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with AHJ.
2. Take field measurements as required to fit the Work properly
3. Verify space requirements and dimensions.
4. Review Contract Documents with field conditions. Request necessary clarifications from Architect.

## C. Construction Layout

1. Verify existing benchmark, control point, and property corner locations.
  - a. Coordinate with Owner.
2. Engage a land surveyor or professional engineer to lay out the Work using accepted surveying practices.
3. Site Improvements: Locate and lay out site improvements, including pavements, grading and fill, utility slopes, and invert elevations
4. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical Work.
5. Record Log: Maintain a log of layout control Work.

## D. Field Engineering

1. Reference Points: Locate and protect existing permanent benchmarks, control points, and similar reference points.
2. Site Benchmarks: Establish and maintain a minimum of two permanent site benchmarks on Project site, referenced to data established by survey control points.
3. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

## E. Installation

1. Locate the Work and components of the Work accurately, in correct alignment and elevation, plumb and level.
2. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
3. Obtain, distribute and use necessary templates.

4. Check, coordinate and ensure installed items correspond to approved Shop Drawings.
  5. Anchors and Fasteners: Provide anchors and fasteners required to anchor each component securely in place, accurately located and with items being fastened aligned with other portions of the Work.
    - a. Allow for building movement, including thermal expansion and contraction.
    - b. Verify finish of exposed anchors and fasteners with Architect.
  6. Joints: Make joints of uniform width.
    - a. Where joint locations in exposed Work are not indicated, arrange joints for the best visual effect.
    - b. Fit exposed connections together to form hairline joints.
  7. Hazardous Materials: Use products, cleaners, and installation materials that are not hazardous.
- F. Owner-Installed Products
1. Site Access: Provide access to Project site for Owner's construction forces.
  2. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction forces.
    - a. Construction Schedule: Coordinate mutually acceptable work schedules.
    - b. Preinstallation Conferences: Both work forces are to attend and participate in pre-installation conferences covering portions of the Work that are to receive Owner's work.

### 3.2 PROJECT CLEANING

#### A. Construction Cleaning:

1. Clean Project site and Work areas broom clean daily.
  - a. Coordinate progress cleaning for joint-use areas where more than one installer has worked.
  - b. Enforce requirements strictly.
  - c. Dispose of materials lawfully.
2. Clean and protect construction in progress and adjoining materials already in place during handling and installation.
  - a. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion
3. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period.
  - a. Adjust and lubricate operable components to ensure operability without damaging effects.
4. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

### 3.3 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust operating components for proper operation without binding. Adjust equipment for proper

operation.

- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in SECTION 014000, QUALITY REQUIREMENTS.

#### 3.4 PROTECTING INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.
- C. Correction Of The Work
  - 1. Repair or remove and replace defective construction.
    - a. Restore damaged substrates and finishes to previous condition.
    - b. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
  - 2. Restore permanent facilities used during construction to their specified condition.
  - 3. Repair components that do not operate properly.
    - a. Remove and replace operating components that cannot be repaired.
  - 4. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017000



## SECTION 017310 - CUTTING AND PATCHING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

## 1.2 SUMMARY

- A. This Section includes procedural requirements for cutting and patching.
- B. Related Sections include the following:
  - 1. Divisions 2 through 33 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
  - 2. Division 7 Section "Through-Penetration Firestop Systems" for patching fire-rated construction.

## 1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.
- B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

## 1.4 QUALITY ASSURANCE

- A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
- B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operating elements include the following:
  - 1. Primary operational systems and equipment.
  - 2. Air or smoke barriers.
  - 3. Fire-suppression systems.
  - 4. Mechanical systems piping and ducts.
  - 5. Control systems.
  - 6. Communication systems.
  - 7. Electrical wiring systems.
  - 8. Operating systems of special construction in Division 13 Sections.
- C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform

as intended, or that results in increased maintenance or decreased operational life or safety. Miscellaneous elements include the following:

1. Water, moisture, or vapor barriers.
2. Membranes and flashings.
3. Equipment supports.
4. Piping, ductwork, vessels, and equipment.
5. Noise- and vibration-control elements and systems.

- D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
  2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

- D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

### 3.3 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
  - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
  - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
  - 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
  - 4. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by cutting and patching operations.
  - 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
  - 6. Proceed with patching after construction operations requiring cutting are complete.
- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.
  - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
  - 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
    - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    - b. Restore damaged pipe covering to its original condition.
  - 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

- a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
  4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
  5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.
- D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 017310

## SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for the following:
  - 1. Recycling nonhazardous construction waste.
  - 2. Disposing of nonhazardous construction waste.
- B. Related Sections include the following:
  - 1. Division 01 Section "Temporary Facilities and Controls" for environmental-protection measures during construction, and location of waste containers at Project site.
  - 2. Division 04 Section "Unit Masonry" for disposal requirements for masonry waste.
  - 3. Division 31 Section "Site Clearing" for disposition of waste resulting from site clearing and removal of above- and below-grade improvements.

## 1.3 DEFINITIONS

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

## 1.4 PERFORMANCE REQUIREMENTS

- A. General: Develop waste management plan that results in end-of-Project rates for salvage/recycling a minimum of 80 percent by weight of total waste generated by the Work.

- B. Salvage/Recycle Requirements: Goal is to salvage and recycle as much nonhazardous construction waste as possible including the following materials:

1. Construction Waste:

- a. Site-clearing waste.
- b. Masonry and CMU.
- c. Lumber.
- d. Wood sheet materials.
- e. Wood trim.
- f. Metals.
- g. Roofing.
- h. Insulation.
- i. Carpet and pad.
- j. Piping.
- k. Electrical conduit.
- l. Packaging: Regardless of salvage/recycle goal indicated above, salvage or recycle 100 percent of the following uncontaminated packaging materials:
  - 1) Paper.
  - 2) Cardboard.
  - 3) Boxes.
  - 4) Plastic sheet and film.
  - 5) Polystyrene packaging.
  - 6) Wood crates.
  - 7) Plastic pails.

1.5 SUBMITTALS

- A. Waste Management Plan: Submit 3 copies of plan within 30 days of date established for commencement of the Work.
- B. Waste Reduction Report: Before request for Substantial Completion, submit the calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work. Include the following information in the report:
1. Material category.
  2. Generation point of waste.
  3. Total quantity of waste in tons.
  4. Quantity of waste recycled, both estimated and actual in tons.
  5. Total quantity of waste recovered (salvaged plus recycled) in tons.
  6. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
- C. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.6 QUALITY ASSURANCE

- A. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

- B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Waste Management Conference: Conduct conference at Project site to review methods and procedures related to waste management including, but not limited to, the following:
  - 1. Review and discuss waste management plan.
  - 2. Review requirements for documenting quantities of each type of waste and its disposition.
  - 3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
  - 4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
  - 5. Review waste management requirements for each trade.

#### 1.7 WASTE MANAGEMENT PLAN

- A. General: Develop plan consisting of waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of site-clearing and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
  - 1. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
  - 2. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
  - 3. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.
- D. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Include the following:
  - 1. Total quantity of waste.
  - 2. Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.
  - 3. Total cost of disposal (with no waste management).
  - 4. Revenue from recycled materials.
  - 5. Savings in hauling and tipping fees that are avoided.
  - 6. Handling and transportation costs. Include cost of collection containers for each type of waste.
  - 7. Net additional cost or net savings from waste management plan.
- E. Forms: Prepare waste management plan on forms similar to those included at end of Part 3.

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION

## 3.1 PLAN IMPLEMENTATION

- A. General: Implement waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
  - 1. Comply with Division 01 Section "Temporary Facilities and Controls" for operation, termination, and removal requirements.
- B. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.
  - 1. Distribute waste management plan to everyone concerned within three days of submittal return.
  - 2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
- C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
  - 1. Designate and label specific areas on Project site necessary for separating materials that are to be recycled, reused, donated, and sold.
  - 2. Comply with Division 01 Section "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

## 3.2 RECYCLING CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Recycling Receivers and Processors: List below is provided for information only; available recycling receivers and processors include, but are not limited to, the following:
  - 1. Almighty Waste (207-782-4000) and division of ERRCO, Epping NH (603-679-2626).
  - 2. Pike Industries in Augusta, ME (207-782-2411) will recycle asphalt paving.
  - 3. Cousineau Bark & Wood, Wilton, ME will chip clean dimensional lumber (without nails or paint).
  - 4. Boralex, Inc., Livermore Falls, ME will recycle OSB, plywood and particleboard (no pressure treated materials)
  - 5. Sandy River Waste, Route 2, Farmington, ME (207-778-3254) will recycle paper, cardboard, cans, bottles, some plastics.
  - 6. Grimm Industries, Topsham, ME (207-729-2191) will recycle metals.
- C. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.
- D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.



1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
  - a. Inspect containers and bins for contamination and remove contaminated materials if found.
2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

### 3.3 RECYCLING CONSTRUCTION WASTE

#### A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

#### B. Site-Clearing Wastes: Chip brush, branches, and trees on-site or at landfill facility.

1. Comply with requirements in Division 32 Section "Plants" for use of chipped organic waste as organic mulch.

#### C. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
  - a. Comply with requirements in Division 32 Section "Plants." for use of clean sawdust as organic mulch.

### 3.4 DISPOSAL OF WASTE

#### A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

#### B. Burning: Do not burn waste materials.

- C. Disposal: Transport waste materials off Owner's property and legally dispose of them.

END OF SECTION 017419

(SAMPLE)

**CONSTRUCTION WASTE MANAGEMENT PLAN**

**Company Name:**

**Contact Person:**

**Address:**

**Telephone #:**

**Project Location:**

**Contractor:**

**Contact Person:**

**Telephone #:**

**Recycling Coordinators:**

**Architect:**

**Contact Person:**

**Telephone #:**

**Designated Recycling Coordinators:****Project Description:****Waste Management Goals:**

- Ø This project will recycle or salvage for reuse a minimum of **80%** by weight of the waste generated on-site.
- Ø Waste reduction will be achieved through building design, and reuse and recycling efforts will be maintained throughout the construction process.

**Waste Prevention Planning:**

- Ø Compliance with \_\_\_\_\_ (name of recycling company) \_\_\_\_\_ recycling requirements for businesses. Recyclables include:
  - o newspaper
  - o corrugated cardboard
  - o white and colored office paper
  - o glass bottles and jars
  - o metal cans
- Ø Compliance with \_\_\_\_\_ (name of recycling company) \_\_\_\_\_ bans, i.e. no disposal of tires, appliances, yard waste, mandatory recyclables, hazardous waste, batteries, fluorescent tubes, and large metal items.
- Ø Project Construction Documents – Requirements for waste management which will be included in all work. The General Contractor will contractually require all subcontractors to comply with the \_\_\_\_\_ (name of recycling company) \_\_\_\_\_ recycling requirements. A copy of this Construction Waste Management Plan will accompany all Subcontractor Agreements and require subcontractor participation.
- Ø The Construction Waste Reduction Plan shall be implemented and executed as follows and as on the chart:
  - o Salvageable materials will be diverted from disposal where feasible.
  - o There will be a designated area on the construction site reserved for a row of dumpsters each specifically labeled for respective materials to be received.
  - o Before proceeding with any removal of construction materials from the construction site, Recycling Coordinators will inspect containers for compliance with \_\_\_\_\_ (name of recycling company) \_\_\_\_\_ requirements.
  - o Wood cutting will occur in centralized locations to maximize reuse and make collection easier.
  - o Hazardous waste will be managed by a licensed hazardous waste vendor.

**Communication & Education Plan:**

- Ø The General Contractor will conduct an on-site pre-construction meeting with subcontractors. Attendance will be required for the subcontractor's key field personnel. The purpose of the meeting is to reinforce to subcontractor's key field employees the commitments made by their companies with regard to the project goals and requirements.
- Ø Waste prevention and recycling activities will be discussed at the beginning of each weekly subcontractor coordination meeting to reinforce project goals and communicate progress to date.
- Ø As each new subcontractor comes on site, the recycling coordinators will present him/her with a copy of the Waste Management Plan and provide a tour of the recycling areas.
- Ø The subcontractor will be expected to make sure all their crews comply with the Waste Management Plan.
- Ø All recycling containers will be clearly labeled. Containers shall be located in close proximity to the building(s) under construction in which recyclables/salvageable materials will be placed.
- Ø Lists of acceptable/unacceptable materials will be posted throughout the site.
- Ø All subcontractors will be informed in writing of the importance of non-contamination with other materials or trash.
- Ø Recycling coordinators shall inspect the containers on a weekly basis to insure that no contamination is occurring and precautions shall also be taken to deter any contamination by the public.

**Motivation Plan:**

- Ø The project team will develop and publish a project mission statement that can be distributed to the subcontractors, attached to subcontracts, and posted at the jobsite.
- Ø The General Contractor will conduct a pre-award meeting for subcontractors. Subcontractors under consideration will be required to attend the meeting to review project goals and requirements with the project team. Attendance will be a prerequisite for award of subcontracts. A sign-off will be required by subcontractors attending the meeting that the project goals are understood. This document will be an attachment to every subcontract. Copies of the attachment will be posted prominently at the jobsite.

**Evaluation Plan:**

- Ø The General Contractor will develop, update, and post at the jobsite a graph indicating the progress to date for achieving the project’s waste recycling goal of XX% by weight of the total project waste stream.

**Expected Project Waste, Disposal, and Handling:**

The following charts identify waste materials expected on this project, their disposal method, and handling procedures:

Material	Quantity	Disposal Method	Handling Procedure
Land clearing debris		Keep separate for reuse and or wood sale	Keep separated in designated areas on site.
Clean dimensional wood and pallet wood		Keep separate for reuse by on-site construction or by site employees for either heating stoves or reuse in home projects. Recycle at: _____	Keep separated in designated areas on site. Place in "Clean Wood" container.
Plywood, OSB, particle board		Reuse, landfill	Keep separated in designated areas on site. Place in "Trash" container.
Painted or treated wood		Reuse, landfill	Keep separated in designated areas on site. Place in "Trash" container.
Concrete		Recycle	
Concrete Masonry Units		Keep separate for re-use by on-site construction or by site employees	Keep separated in designated areas on site
Metals		Recycle at: Williston Drop Off Center	Keep separated in designated areas on site. Place in "Metals" container.
Paint		Reuse or recycle at _____	Keep separated in designated areas on site
Insulation		Reuse, landfill	
Flooring		Reuse, landfill	
Carpet and pad		Reuse or recycle with carpet manufacturer	
Glass		Glass Bottles: Recycle at: _____	Keep separated in designated areas on site. Place in "Glass/Plastic bottles/Metal Cans/Mixed Paper/Cardboard" container

Material	Quantity	Disposal Method	Handling Procedure
Plastics		Plastic Bottles: Recycle at: _____  Plastic bags/scrap: Reuse, landfill	Keep separated in designated areas on site. Place in "Glass/Plastic bottles/Metal Cans/Mixed Paper/Cardboard" container
Beverage		Recycle at: _____	Keep separated in designated areas on site. Place in "Glass/Plastic bottles/Metal Cans/Mixed Paper/Cardboard" container
Cardboard		Recycle at: _____	Keep separated in designated areas on site. Place in "Glass/Plastic bottles/Metal Cans/Mixed Paper/Cardboard" container
Paper and newsprint		Recycle at: _____	Keep separated in designated areas on site. Place in "Glass/Plastic bottles/Metal Cans/Mixed Paper/Cardboard" container
<b>TOTAL</b>			

**Waste Disposal:** Contractor:  
Contact:

- Ø **Name of landfill for disposal of non-recyclable waste:**
  - Transfer Stations:
  - Landfills (ultimate disposal location):
- Ø **Landfill tipping fee:** \$XX / ton
- Ø **Estimate of waste for landfill disposal:**

**Recycling Calculation:**

If all construction waste was disposed in landfill: XX lbs = XX tons x \$XX/ton = \$XX

With recycling: TOTAL = \$XX

**RECYCLING OPERATIONS**

Action ***	Who	When
• Choose bins/collection methods		_____
• Order bins - oversee deliver		_____
• Site bins/collection sites for optimum convenience		_____
• Sort or process wood		_____
• Sort or process metal		_____
Sort or process cardboard		_____
Sort or process _____ (material)		_____
Schedule material pickups/dropoffs		_____
Protect Materials from Contamination		_____
Document material pickups/dropoffs		_____

\*\*\* Depending on the service option chosen, these may be the responsibility of either the field personnel, the hauler, a full-service recycling contractor, or the subcontractors.

**COMMUNICATION PLAN - Except for mandatory items (\*), check other items intended to be used.**

Action	Who	When	Completed
Complete Construction Waste Mgmt. Plan*		_____	
Hold Orientation/Kick-off Meeting*		_____	
Update & Progress in Weekly Job-Site Meetings*		_____	
Encourage Just-In-Time Deliveries		_____	
Post Targeted Materials (Signage)		_____	
Distribute Tip Sheets for Job-Site Personnel		_____	
Post Goals/Progress (Signage)		_____	
_____		_____	

**MOTIVATION PLAN - Except for mandatory items (\*), check other items intended to be used.**

Action	Who	When	Completed
Use formal agreements committing Subs to program		_____	
Require Mis-Sorters to Re-Sort Bin		_____	
Provide Stickers, T-Shirts, or Hats		_____	
Public Recognition of Participating Subs		_____	
Letters of Recognition		_____	
Awards Luncheon		_____	
_____		_____	

**EVALUATION PLAN - Except for mandatory items (\*), check other items intended to be used.**

Action	Who	When	Completed
Perform Short Form Waste Audit		_____	
Perform Full Waste Audit		_____	
Perform Mid-Course Assessment		_____	
Perform Monthly Cost and Materials Tracking*		_____	
Perform Final Evaluation*		_____	
_____		_____	

## SECTION 017700 - CLOSEOUT PROCEDURES

## PART 1 GENERAL

## 1.01 REQUIREMENTS INCLUDED

- A. Administrative provisions for Substantial Completion and for final acceptance.

## 1.02 SUBSTANTIAL COMPLETION

- A. When Contractor considers work, or designated portion of work, is substantially complete, submit written notice with list of items to be completed or corrected.
- B. Should Owner inspection find work is not substantially complete, Owner will promptly notify Contractor in writing, listing observed deficiencies.
- C. Contractor shall remedy deficiencies and send a second written notice of substantial completion.
- D. When Owner finds work is substantially complete, Owner will prepare a Certificate of Substantial Completion in accordance with provisions of the General Conditions.

## 1.03 FINAL COMPLETION

- A. When Contractor considers work is complete, submit written certification that:
  - 1. Contract Documents have been reviewed.
  - 2. Work has been inspected for compliance with Contract Documents.
  - 3. Work has been completed in accordance with Contract Documents and deficiencies listed with Certificate of Substantial Completion have been corrected.
  - 4. Equipment and systems have been tested, adjusted and balanced and are fully operational.
  - 5. Operation of systems has been demonstrated to Owner's personnel.
  - 6. Work is complete and ready for final inspection.
- B. Should Owner inspection find work incomplete, Owner will promptly notify Contractor in writing, listing observed deficiencies.
- C. Contractor shall remedy deficiencies and send a second certification of final completion.
- D. When Owner finds work is complete, Owner will consider closeout submittals.

## 1.04 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.
- B. Warranties and bonds.
- C. Spare parts and maintenance Materials.



- D. Keys and keying schedule.
- E. Evidence of payment and Release of Liens.

1.05 APPLICATION FOR FINAL PAYMENT

- A. Submit application for final payment in accordance with provisions of Conditions of the Contract.

1.06 GUARANTEE

- A. Neither the final requisition for payment nor any provision in the Contract Documents nor partial or entire use or occupancy of the building by the Owner shall constitute an acceptance of work done in accordance with the Contract Documents or relieve the Contractor of liability in respect to express warranties or responsibility for faulty materials or workmanship. The Contractor shall remedy any defects in the work and pay for any damage to other work resulting therefrom which shall appear within one year from the date of final acceptance unless a longer period is specified. The Owner will give notice of observed defects with reasonable promptness.
- B. Although subcontractors shall, throughout these Specifications, be required to provide guarantees for their respective work, the Contractor, in the last analysis, shall be responsible for all work and the guarantee thereof. In the case of disputes between subcontractors as to fault of problems, it is up to the Contractor to resolve these disputes or accept the cost of repair or replacement himself.

PART 2 to 3 – Not Used

END OF SECTION 017700

## SECTION 017810 - PROJECT RECORD DOCUMENTS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

## 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:
  - 1. Record Drawings.
  - 2. Record Specifications.
  - 3. Record Product Data.
- B. Related Sections include the following:
  - 1. Division 1 Section "Closeout Procedures" for general closeout procedures.
  - 2. Division 1 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
  - 3. Divisions 2 through 41 for specific requirements for Project Record Documents of the Work in those Sections.

## 1.3 SUBMITTALS

- A. Record Drawings: Comply with the following:
  - 1. Number of Copies: Submit one set(s) of marked-up Record Prints.
- B. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit one copy of each Product Data submittal.
  - 1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.

## 1.4 RECORD DRAWINGS

- A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.
  - 1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.

- a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
  - b. Accurately record information in an understandable drawing technique.
  - c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
2. Content: Types of items requiring marking include, but are not limited to, the following:
    - a. Dimensional changes to Drawings.
    - b. Revisions to details shown on Drawings.
    - c. Depths of foundations below first floor.
    - d. Locations and depths of underground utilities.
    - e. Revisions to routing of piping and conduits.
    - f. Revisions to electrical circuitry.
    - g. Actual equipment locations.
    - h. Duct size and routing.
    - i. Locations of concealed internal utilities.
    - j. Changes made by Change Order or Construction Change Directive.
    - k. Changes made following Architect's written orders.
    - l. Details not on the original Contract Drawings.
    - m. Field records for variable and concealed conditions.
    - n. Record information on the Work that is shown only schematically.
  3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
  4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
  5. Mark important additional information that was either shown schematically or omitted from original Drawings.
  6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
  2. Identification: As follows:
    - a. Project name.
    - b. Date.
    - c. Designation "PROJECT RECORD DRAWINGS."
    - d. Name of Architect.
    - e. Name of Contractor.
- 1.5 RECORD SPECIFICATIONS
- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
3. Note related Change Orders, Record Product Data, and Record Drawings where applicable.

#### 1.6 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
  3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

#### 1.7 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

### PART 2 - EXECUTION

#### 2.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.
- B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

END OF SECTION 017810

## SECTION 017820 - OPERATION AND MAINTENANCE DATA

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

## 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
  - 1. Operation and maintenance documentation directory.
  - 2. Operation manuals for systems, subsystems, and equipment.
  - 3. Maintenance manuals for the care and maintenance of products, materials, and finishes, and systems and equipment.
- B. Related Sections include the following:
  - 1. Division 1 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
  - 2. Division 1 Section "Closeout Procedures" for submitting operation and maintenance manuals.
  - 3. Division 1 Section "General Commissioning Requirements" for general requirements that apply to implementation of commissioning
  - 4. Division 1 Section "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
  - 5. Divisions 2 through 41 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

## 1.3 SUBMITTALS

- A. Initial Submittal: Submit 2 draft copies of each manual at least 15 days before requesting inspection for Substantial Completion. Include a complete operation and maintenance directory. Architect will return one copy of draft and mark whether general scope and content of manual are acceptable.
- B. Final Submittal: Submit one copy of each manual in final form at least 15 days before final inspection. Architect will return copy with comments within 15 days after final inspection.
  - 1. Correct or modify each manual to comply with Architect's comments. Submit 2 copies of each corrected manual within 15 days of receipt of Architect's comments.

## 1.4 COORDINATION

- A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

## PART 2 - PRODUCTS

## 2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Organization: Include a section in the directory for each of the following:
  - 1. List of documents.
  - 2. List of systems.
  - 3. List of equipment.
  - 4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

## 2.2 MANUALS, GENERAL

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
  - 1. Title page.
  - 2. Table of contents.
  - 3. Manual contents.
- B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:
  - 1. Subject matter included in manual.
  - 2. Name and address of Project.
  - 3. Name and address of Owner.
  - 4. Date of submittal.
  - 5. Name, address, and telephone number of Contractor.
  - 6. Name and address of Architect.
  - 7. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
  - 1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
    - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
    - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
  2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
  3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
  4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
  5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
    - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
    - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

## 2.3 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
1. System, subsystem, and equipment descriptions.
  2. Performance and design criteria if Contractor is delegated design responsibility.
  3. Operating standards.
  4. Operating procedures.
  5. Operating logs.
  6. Wiring diagrams.
  7. Control diagrams.
  8. Piped system diagrams.
  9. Precautions against improper use.
  10. License requirements including inspection and renewal dates.
- B. Descriptions: Include the following:
1. Product name and model number.
  2. Manufacturer's name.

3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

## 2.4 PRODUCT MAINTENANCE MANUAL

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.



- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
  - 1. Include procedures to follow and required notifications for warranty claims.

## 2.5 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
  - 1. Standard printed maintenance instructions and bulletins.
  - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
  - 3. Identification and nomenclature of parts and components.
  - 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
  - 1. Test and inspection instructions.
  - 2. Troubleshooting guide.
  - 3. Precautions against improper maintenance.
  - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  - 5. Aligning, adjusting, and checking instructions.
  - 6. Demonstration and training videotape
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
  - 1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
  - 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
  - 1. Include procedures to follow and required notifications for warranty claims.

## PART 3 - EXECUTION

### 3.1 MANUAL PREPARATION

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to maintenance manuals, operation and maintenance manuals, manufacturer's data, warranties and bonds.
- B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- C. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
  - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
  - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- D. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
  - 1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- E. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.
  - 1. Do not use original Project Record Documents as part of operation and maintenance manuals.
  - 2. Comply with requirements of newly prepared Record Drawings in Division 1 Section "Project Record Documents."
- F. Comply with Division 1 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017820

## SECTION 018200 - DEMONSTRATION AND TRAINING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

## 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
  - 1. Demonstration of operation of systems, subsystems, and equipment.
  - 2. Training in operation and maintenance of systems, subsystems, and equipment.
  - 3. Demonstration and training videotapes.
- B. Related Sections include the following:
  - 1. Divisions 2 through 41 Sections for specific requirements for demonstration and training for products in those Sections.
  - 2. Division 1 Section "General Commissioning Requirements" for general requirements that apply to implementation of commissioning

## 1.3 SUBMITTALS

- A. Instruction Program: Submit 3 copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
  - 1. At completion of training, submit 2 complete training manual(s) for Owner's use.
- B. Attendance Record: For each training module, submit list of participants and length of instruction time.
- C. Demonstration and Training Videotapes: Submit 2 copies within 7 days of end of each training module.
  - 1. Identification: On each copy, provide an applied label with the following information:
    - a. Name of Project.
    - b. Name of Architect.
    - c. Name of Contractor.
    - d. Date videotape was recorded.
  - 2. Transcript: Prepared on 8-1/2-by-11-inch paper, punched and bound in heavy-duty, 3-ring, vinyl-covered binders. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding videotape. Include name of Project and date of videotape on each page.

#### 1.4 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

### PART 2 - PRODUCTS

#### 2.1 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:
  - 1. Fire-protection systems, including fire alarm and fire-extinguishing systems.
  - 2. Refrigeration systems, including condensing units and distribution piping.
  - 3. HVAC systems, including air-handling equipment air distribution systems and terminal equipment and devices.
  - 4. HVAC instrumentation and controls.
  - 5. Electrical service and distribution, including transformers switchboards panelboards and motor controls.
  - 6. Lighting equipment and controls.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:
  - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
    - a. System, subsystem, and equipment descriptions.
    - b. Performance and design criteria.
    - c. Operating standards.
    - d. Regulatory requirements.
    - e. Equipment function.
    - f. Operating characteristics.
    - g. Limiting conditions.
    - h. Performance curves.
  - 2. Documentation: Review the following items in detail:
    - a. Operations manuals.
    - b. Maintenance manuals.
    - c. Project Record Documents.
    - d. Identification systems.
    - e. Warranties and bonds.
    - f. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:
  - a. Instructions on meaning of warnings, trouble indications, and error messages.
  - b. Instructions on stopping.
  - c. Operating instructions for conditions outside of normal operating limits.
  - d. Sequences for electric or electronic systems.
  - e. Special operating instructions and procedures.
  
4. Operations: Include the following, as applicable:
  - a. Startup procedures.
  - b. Equipment or system break-in procedures.
  - c. Routine and normal operating instructions.
  - d. Regulation and control procedures.
  - e. Control sequences.
  - f. Safety procedures.
  - g. Instructions on stopping.
  - h. Normal shutdown instructions.
  - i. Operating procedures for emergencies.
  - j. Operating procedures for system, subsystem, or equipment failure.
  - k. Seasonal and weekend operating instructions.
  - l. Required sequences for electric or electronic systems.
  - m. Special operating instructions and procedures.
  
5. Adjustments: Include the following:
  - a. Alignments.
  - b. Checking adjustments.
  - c. Noise and vibration adjustments.
  - d. Economy and efficiency adjustments.
  
6. Troubleshooting: Include the following:
  - a. Diagnostic instructions.
  - b. Test and inspection procedures.
  
7. Maintenance: Include the following:
  - a. Inspection procedures.
  - b. Types of cleaning agents to be used and methods of cleaning.
  - c. List of cleaning agents and methods of cleaning detrimental to product.
  - d. Procedures for routine cleaning
  - e. Procedures for preventive maintenance.
  - f. Procedures for routine maintenance.
  - g. Instruction on use of special tools.
  
8. Repairs: Include the following:
  - a. Diagnosis instructions.
  - b. Repair instructions.
  - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  - d. Instructions for identifying parts and components.
  - e. Review of spare parts needed for operation and maintenance.

## PART 3 - EXECUTION

## 3.1 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.
- B. Set up instructional equipment at instruction location.

## 3.2 INSTRUCTION

- A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
  - 1. Owner will furnish Contractor with names and positions of participants.
- B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
  - 1. Schedule training with Owner, through Architect, with at least seven days' advance notice.
- C. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of an oral and demonstration performance-based test.
- D. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

## 3.3 DEMONSTRATION AND TRAINING VIDEOTAPES

- A. General: Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.
  - 1. At beginning of each training module, record each chart containing learning objective and lesson outline.
- B. Videotape Format: Provide high-quality VHS color videotape in full-size cassettes.
- C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to show area of demonstration and training. Display continuous running time.
- D. Narration: Describe scenes on videotape by audio narration by microphone while videotape is recorded. Include description of items being viewed. Describe vantage point, indicating location, direction (by compass point), and elevation or story of construction.
- E. Transcript: Provide a typewritten transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.

END OF SECTION 018200

## SECTION 024119 - SELECTIVE STRUCTURE DEMOLITION

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Demolition and removal of selected portions of building or structure.
  - 2. Demolition and removal of selected site elements.
  - 3. Salvage of existing items to be reused or recycled.
- B. Related Sections include the following:
  - 1. Division 01 Section "Summary" for use of premises and Owner-occupancy requirements.
  - 2. Division 01 Section "Temporary Facilities and Controls" for temporary construction and environmental-protection measures for selective demolition operations.
  - 3. Division 01 Section "Cutting and Patching" for cutting and patching procedures.
  - 4. Division 31 Section "Site Clearing" for site clearing and removal of above- and below-grade improvements.

## 1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Detach items from existing construction and deliver them to Owner.
- C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

## 1.4 MATERIALS OWNERSHIP

- A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered during selective demolition remain Owner's property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to Owner.
  - 1. Coordinate with Owner, who will establish special procedures for removal and salvage.

## 1.5 SUBMITTALS

- A. Schedule of Selective Demolition Activities: Indicate the following:
1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
  2. Interruption of utility services. Indicate how long utility services will be interrupted.
  3. Coordination for shutoff, capping, and continuation of utility services.
  4. Use of elevator and stairs.
  5. Locations of proposed dust- and noise-control temporary partitions and means of egress.
  6. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
  7. Means of protection for items to remain and items in path of waste removal from building.
- B. Predemolition Photographs: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by selective demolition operations.

## 1.6 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.
- B. Refrigerant Recovery Technician Qualifications: Certified by a DEP-approved certification program.
- C. Regulatory Requirements: Comply with governing DEP notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- D. Standards: Comply with ANSI A10.6 and NFPA 241.
- E. Predemolition Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to selective demolition including, but not limited to, the following:
1. Inspect and discuss condition of construction to be selectively demolished.
  2. Review structural load limitations of existing structure.
  3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
  4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
  5. Review areas where existing construction is to remain and requires protection.

## 1.7 PROJECT CONDITIONS

- A. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- B. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.



- C. Hazardous Materials: Refer to the appendix for a description of hazardous materials that may be encountered in the Work.
  - 1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Owner will remove hazardous materials under a separate contract.
- D. Storage of removed items or materials on-site is not permitted.
- E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
  - 1. Maintain fire-protection facilities in service during selective demolition operations.

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.
- E. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs.
  - 1. Comply with requirements specified in Division 01 Section "Photographic Documentation."
  - 2. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.
- F. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

### 3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.
  - 1. Comply with requirements for existing services/systems interruptions specified in Division 01 Section "Summary."

- B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
  - 1. Arrange to shut off indicated utilities with utility companies.
  - 2. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
  - 3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.
    - a. Where entire wall is to be removed, existing services/systems may be removed with removal of the wall.

### 3.3 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
  - 1. Comply with requirements for access and protection specified in Division 01 Section "Temporary Facilities and Controls."
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
  - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
  - 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
  - 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
  - 4. Cover and protect furniture, furnishings, and equipment that have not been removed.
  - 5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Division 01 Section "Temporary Facilities and Controls."
- C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
  - 1. Strengthen or add new supports when required during progress of selective demolition.

### 3.4 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Do not overcut. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
9. Dispose of demolished items and materials promptly. Comply with requirements in Division 01 Section "Construction Waste Management and Disposal."

B. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

### 3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in small sections. Cut concrete to a depth of at least 3/4 inch at junctures with construction to remain, using power-driven saw. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete indicated for selective demolition. Neatly trim openings to dimensions indicated.

## SECTION 024119 - SELECTIVE STRUCTURE DEMOLITION

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Demolition and removal of selected portions of building or structure.
  - 2. Demolition and removal of selected site elements.
  - 3. Salvage of existing items to be reused or recycled.
- B. Related Sections include the following:
  - 1. Division 01 Section "Summary" for use of premises and Owner-occupancy requirements.
  - 2. Division 01 Section "Temporary Facilities and Controls" for temporary construction and environmental-protection measures for selective demolition operations.
  - 3. Division 01 Section "Cutting and Patching" for cutting and patching procedures.
  - 4. Division 31 Section "Site Clearing" for site clearing and removal of above- and below-grade improvements.

## 1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Detach items from existing construction and deliver them to Owner.
- C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

## 1.4 MATERIALS OWNERSHIP

- A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered during selective demolition remain Owner's property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to Owner.
  - 1. Coordinate with Owner, who will establish special procedures for removal and salvage.

## SECTION 072100 - THERMAL INSULATION

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:

- 1. Foam-plastic board insulation.

- B. Related Sections:

- 1. Division 04 Section "Unit Masonry" for insulation installed in cavity walls.
  - 2. Division 07 Section "Thermoplastic Polyolefin (TPO) Roofing" for insulation specified as part of roofing construction.
  - 3. Division 09 Section "Gypsum Board Shaft Wall Assemblies" for installation in metal-framed assemblies of insulation specified by referencing this Section.

## 1.3 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 each product.

## 1.4 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to 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.
- B. Protect foam-plastic board insulation as follows:
  - 1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
  - 2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site before installation time.

3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

## PART 2 - PRODUCTS

### 2.1 FOAM-PLASTIC BOARD INSULATION

- A. Extruded-Polystyrene Board Insulation: ASTM C 578, of type and minimum compressive strength indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
  1. Available Products:
    - a. Foamular 250; Owens Corning.
    - b. Styrofoam by Dow Chemical Co. (available from Conn. Plant)
    - c. Amofoam-CM by Tenneco Building Products
  2. 60 PSI strength rating.
  3. R-Value: 5 per inch.
  4. Application:
    - a. Subgrade rigid insulation applications.
    - b. Perimeter foundation insulation.
    - c. Rigid insulation below concrete slab-on-grade.

### 2.2 AUXILIARY INSULATING MATERIALS

- A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation or that interfere with insulation attachment.

### 3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation 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. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

### 3.3 INSTALLATION OF BELOW-GRADE INSULATION

- A. On vertical footing and foundation wall surfaces, set insulation units using manufacturer's recommended adhesive or loosely laid according to manufacturer's written instructions.
  - 1. If not otherwise indicated, extend insulation a minimum of 60 inches below exterior grade line.
- B. On horizontal surfaces under slabs, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

### 3.4 PROTECTION

- A. Protect installed insulation 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 072100

## SECTION 101453 - SITE SIGNS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section includes all traffic and pedestrian signage within limits of work as indicated on the Drawings.

- 1. Traffic Guide Signs.
- 2. Traffic Regulatory, Warning Signs.
- 3. Parking Signs including ADA signs.
- 4. Miscellaneous Informational signs.
- 5. Posts, attachment hardware and accessories.

- B. Related requirements:

- 1. Division 01 Section "Submittal Procedures"
- 2. Section 321216 Section "Hot Mix Asphalt Pavement"

## 1.3 QUALITY ASSURANCE

- A. Quality, grades of materials and installation procedures: In accordance with applicable code and referenced standards including:

- 1. American Society for Testing Materials (ASTM).
- 2. State of Maine, Department of Transportation Standard Specifications (MDOT).
- 3. Manual on Uniform Traffic Control Devices (MUTCD).

## 1.4 SUBMITTALS

- A. Product Data: All materials.
- B. Schedule: Submit schedule of all required signs with drawing of locations.

## PART 2 - PRODUCTS

## 2.1 MATERIALS

- A. Signs: MDOT 645.03 Type I; engineering grade reflective sheeting letters, numerals, symbols and border on engineering grade reflective sheeting background adhered to sheet aluminum sign panel.



- B. Sizes, Colors, Legend Designs: As indicated on drawings and as required by MUTCD and MDOT.
- C. Posts:
  - 1. MDOT 720.08; U-Channel posts; aluminum or galvanized steel; Provide two (2) sections of post with break-away attachment. Shall have 3/8" pre-drilled holes, 1-inch on center.
    - a. Size: 2-1/4" to 3-1/2" wide by 7/8" min. depth u-channel steel
    - b. Color/coating: green enamel coated or painted green on galvanized or zinc oxide primer
  - 2. 1-1/2" O.D. steel pipe, painted green on galvanized or zinc oxide primer. Provide anti-torsion fins at base of buried section.
  - 3. MDOT 720.12 Wood sign posts shall be rectangular, straight and sound timber, cut from live growing native spruce, hemlock, cedar, southern yellow pine, or Douglas Fir trees, free from loose knots or other structurally weakening defects of importance, such as shake or holes and heart rot. They shall be sawn true and planed 4 sides. Posts shall be 4 in by 4 in; with two 1 1/2 in diameter holes drilled perpendicular to direction of traffic, one hole centered 4 in above ground level and one centered 18 in above ground level.
- D. Attachment Hardware: Aluminum or galvanized.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Attach signage to supports with fasteners concealed at face of sign.
- B. Install items firmly in place at prescribed locations, straight, plumb, level, and anchored for long life under hard use.

END OF SECTION 101453

## SECTION 129300 - SITE FURNISHINGS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes the following:

- 1. Bicycle racks.
- 2. Tree Grates
- 3. Decorative Bollards

- B. Related requirements:

- 1. Division 01 Section "Temporary Facilities and Controls" for temporary utilities, temporary construction and support facilities, temporary security and protection facilities procedures.
- 2. Section 312000 "Earth Moving" for excavation for installing concrete footings.
- 3. Section 033000 "Cast-in-place Concrete" for cast in place concrete piers, footings, foundations, and pedestals.
- 4. Section 055000 "Metal Fabrications" for metal secondary supports.

## 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Maintenance Data: For each type of product indicated.

## PART 2 - PRODUCTS

## 2.1 MATERIALS

- A. Anchors, Fasteners, Fittings, and Hardware: Manufacturer's standard, corrosion-resistant-coated or noncorrodible materials; commercial quality.
- B. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107; recommended in writing by manufacturer, for exterior applications.
- C. Erosion-Resistant Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with potable water at Project site to create pourable anchoring, patching, and grouting compound; resistant to erosion from water exposure without needing

protection by a sealer or waterproof coating; recommended in writing by manufacturer, for exterior applications.

D. Galvanizing:

1. Zinc-Coated Tubing: External, zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. of zinc after welding, a chromate conversion coating, and a clear, polymer film. Internal, same as external or consisting of 81 percent zinc pigmented coating, not less than 0.3 mil thick.
2. Hot-Dip Galvanizing: According to ASTM A 123/A 123M, ASTM A 153/A 153M, or ASTM A 924/A 924M.

2.2 BICYCLE RACKS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Stainless Steel Dero Downtown Rack as manufactured by Dero Bike Racks
- B. Style: Double -side parking.  
Capacity: As specified on site plans.
- C. Installation Method: Foot Mount and as detailed
- D. Steel Finish: Satin finish

2.3 TREE GRATES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide R-8810 Tree Grate w/ Frame as manufactured by Neenah Foundry Company
- B. Installation Method: As detailed.
- C. Steel Finish: Cast Gray Iron

2.4 DECORATIVE BOLLARDS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Fairweather model B-1, 8" Dia. Steel bollard,, 36" High, sch 40 pipe.
- B. Installation Method: Embed Mounting and as detailed.
- C. Steel Finish: Color Coated
  1. Color: Black

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated on drawings or within specifications. Complete field assembly of site furnishings where required.
- B. Post Setting: Set cast-in support posts in concrete footing plumb or at correct angle and aligned and at correct height and spacing.

END OF SECTION 129300

## SECTION 221113 – FACILITY WATER DISTRIBUTION PIPING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This section includes all work to distribute water including but not limited to the following:
  - 1. New domestic water service
- B. Related sections:
  - 1. See other related Division 22 sections for additional requirements governing water service connections within the building.
  - 2. Division 31 Section "Earth Moving for Utilities" for soil materials, excavating, backfilling.

## 1.3 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

## AMERICAN NATIONAL STANDARDS INSTITUTE, INC. (ANSI)

ANSI B16.1	2005 Cast Iron Pipe Flanges and Flanged Fittings
ANSI B16.18	2001 Cast Copper Alloy Solder Joint Pressure Fittings
ANSI B16.22	2001 Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
ANSI B16.26	2006 Cast Copper Alloy Fittings for Flared Copper Tubes
ANSI B18.2.2	1987 Square and Hex Nuts
ANSI B18.5	2008 Round Head Bolts (Inch Series)

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A47	1999 Ferritic Malleable Iron Castings
ASTM A48	2008 Gray Iron Castings
ASTM A307	2002 Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength

ASTM A536	1984 (Rev 1999) Ductile Iron Castings
ASTM A563	2007 Carbon and Alloy Steel Nuts
ASTM B32	2008 Solder Metal
ASTM B61	2008 Steam or Valve Bronze Castings
ASTM B62	2002 Composition Bronze or Ounce Metal Castings
ASTM B88	2003 Seamless Copper Water Tube
ASTM C94	2009 Ready-Mixed Concrete
AMERICAN WATER WORKS ASSOCIATION (AWWA)	
AWWA C104/A21.4	2008 Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water (ANSI/AWWA C104/A21.4)
AWWA C105/A21.5	2005 Polyethylene Encasement for Ductile-Iron Pipe Systems
AWWA C110/A21.10	2008 Ductile-Iron and Gray-Iron Fittings, 3 in. Through 48 in.
AWWA C111/A21.11	2006 Rubber Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C115/A21.15	2005 Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
AWWA C151/A21.51	2002 Ductile-Iron Pipe, Centrifugally Cast, for Water
AWWA C153/A21.53	2006 Ductile Iron Compact Fittings for Water Service
AWWA C500	2002 Gate Valves for Water and Sewage Systems
AWWA C502	2005 Dry-Barrel Fire Hydrants
AWWA C503	2005 Wet-Barrel Fire Hydrants
AWWA C509	2001 Resilient-Seated Gate Valves for Water Supply Service
AWWA C600	2005 Installation of Ductile-Iron Water Mains and Their Appurtenances
AWWA C651	2005 Disinfecting Water Mains
AWWA C800	2005 Underground Service Line Valves and Fittings
MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)	
MSS SP-80	2003 Bronze Gate, Globe, Angle and Check Valves
UNDERWRITERS LABORATORIES, INC. (UL)	
UL 246	1993 Hydrants for Fire-Protection Service

UL 262 2004 Gate Valves for Fire Protection Service

#### 1.4 PROJECT CONDITIONS

- A. Water Main Work: Work under Section 221113 shall include the following:
1. Installation of water main starting at the connection to the existing main or other supply main and continuing up to the end location as indicated on the Drawings. Work shall also include all piping, fittings, valves, concrete thrust blocks with restraining rods from elbow, all as indicated. Work also to include all flushing and testing.
  2. Earthwork for the water main work shall follow Section 312100. Where appropriate, provide final grading and loam, seed, and paving as indicated or to match existing features and restore surfaces to original conditions.
- B. Water Service: Work under Section 221113 shall include the following:
1. Installation of water main and water service line starting at the street main or other supply line, continuing up to the end location as indicated otherwise on Drawings. Work shall include all piping, fittings, valves, thrust blocks indicated. Work shall include flushing and testing.
  2. Exterior water line work shall follow Section 312100. Where appropriate provide final grading and loam seed and paving as indicated or to match existing features and restore surfaces to original conditions.
- C. Location: The work covered by this section shall terminate at a point approximately 10 feet from the building, unless otherwise indicated on the drawings.
- D. The General Contractor shall be responsible for all fees and permits related to the connection to the existing municipal water main system.

#### 1.5 DESIGN REQUIREMENTS

- A. Water Distribution Mains: Provide water distribution mains of ductile-iron pipe. Provide gate valves where indicated. Provide water main accessories as indicated.
- B. Water Service Lines: Provide water service lines from water distribution main to building. Water service lines shall be ductile iron pipe. Provide water service line appurtenances where specified and where indicated. All work shall conform to Portland Water District specifications.

#### 1.6 SUBMITTALS

- A. Submit the following in accordance with Section 013300, "Submittals."
- B. Manufacturer's Catalog Data:
1. Pipe and fittings
  2. Joints and couplings
  3. Valves
  4. Corporation stops
  5. Valve boxes
  6. Brass Wedges

- C. Submit manufacturer's standard drawings or catalog cuts for the listed items, except submit both drawings and cuts for push-on joints. Include information concerning gaskets with submittal for joints and couplings
- D. Manufacturer's Instructions
  - 1. Installation procedures for water piping

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Storage: Inspect materials delivered to site for damage. Unload and store with minimum handling. Store materials on site in enclosures or under protective covering. Store jointing materials, and rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes and fittings free of dirt and debris.
- B. Handling: Handle pipe, fittings, valves, hydrants, and other accessories in a manner to ensure delivery to the trench in sound undamaged condition. Take special care to avoid injury to coatings and linings on pipe and fittings; make satisfactory repairs if coatings or linings are damaged. Carry, do not drag pipe to the trench. Store rubber gaskets and jointing materials that are not to be installed immediately, under cover out of direct sunlight.

### PART 2 - PRODUCTS

#### 2.1 WATER DISTRIBUTION MAIN MATERIALS

- A. Piping Materials:
  - 1. Ductile-iron Piping
    - a. Pipe and Fittings: Pipe shall conform to AWWA C151/A21.51 and shall be Thickness Class 52. Flanged pipe shall conform to AWWA C115/A21.15. Fittings shall conform to AWWA C110/A21.10 or AWWA C153/A21.53; fittings with push-on joint ends shall conform to the same requirements as fittings with mechanical-joint ends, except that the bell design shall be modified, as approved, for push-on joint. Fittings shall have pressure rating at least equivalent to that of the pipe. Ends of pipe and fittings shall be suitable for the specified joints. Pipe and fittings shall have cement-mortar lining conforming to AWWA C104/A21.4, double thickness; pipe and fittings to be bituminous coated per AWWA C104/A21.4.
    - b. Joints and Jointing Material
      - 1) Joints: Joints for pipe and fittings shall be push-on joints.
      - 2) Push-on Joints: Shape of pipe ends and fitting ends, gaskets, and lubricant for joint assembly shall conform to AWWA C111/A21.11.
      - 3) Mechanical Joints: Dimensional and material requirements for pipe ends, glands, bolts and nuts, and gaskets shall conform to AWWA C111/A21.11.
      - 4) Flanged Joints: Bolts, nuts, and gaskets for flanged connections shall be as recommended in the Appendix to AWWA C115/A21.15. Flange for setscrewed flanges shall be of ductile iron, ASTM A536, Grade 65-45-12, and shall conform to the applicable requirements of ANSI B16.1, Class 250. Setscrews for setscrewed flanges shall be 190,000 psi tensile strength, heat treated and zinc-coated steel.



Gasket for setscrewed flanges shall conform to the applicable requirements for mechanical-joint gaskets specified in AWWA C111/A21.11. Design of setscrewed gasket shall provide for confinement and compression of gasket when joint to adjoining flange is made.

2. PE PIPE AND FITTINGS

- a. PE, ASTM Pipe: ASTM D 2239, SIDR No. 5.3, 7, or 9; with PE compound number required to give pressure rating not less than 200 psig.
  - 1) Insert Fittings for PE Pipe: ASTM D 2609, made of PA, PP, or PVC with serrated male insert ends matching inside of pipe. Include bands or crimp rings.
  - 2) Molded PE Fittings: ASTM D 3350, PE resin, socket- or butt-fusion type, made to match PE pipe dimensions and class.
- b. PE, AWWA Pipe: AWWA C906, DR No. 7.3, 9, or 9.3; with PE compound number required to give pressure rating not less than 200 psig.
  - 1) PE, AWWA Fittings: AWWA C906, socket- or butt-fusion type, with DR number matching pipe and PE compound number required to give pressure rating not less than 200 psig.
- c. Acceptable products/manufacturers:
  - 1) Ipex Inc.
  - 2) Or approved similar/equal

B. Valves and Other Water Main Accessories

1. Gate Valves on Buried Piping: AWWA C500, to AWWA C509, or to UL 262. Unless otherwise specified, valves conforming to AWWA C500 shall be nonrising stem type with double-disc gates and mechanical-joint ends for the adjoining pipe. Unless specified otherwise, valves conforming to AWWA C509 shall be nonrising stem type with mechanical-joint ends. Unless otherwise specified, valves conforming to UL 262 shall be inside-screw type with operating nut, double-disc or split-wedge type gate, designed for a hydraulic working pressure of 175 psi, and shall have mechanical-joint ends or push-on joint ends as appropriate for the pipe to which it is joined. Materials for UL 262 valves shall conform to the reference standards specified in AWWA C500. Valves shall open by right rotation of the valve stem. Stuffing boxes shall have O-ring stem seals and shall be bolted and constructed so as to permit easy removal of parts for repair. Valves shall be of one manufacturer. Acceptable product/manufacturers are:
  - a. Mueller A2360
  - b. Approved Equal
2. Valve Boxes: Provide a valve box for each gate valve on buried piping. Valve boxes shall be of cast-iron of a size suitable for the valve on which it is to be used and shall be adjustable. Provide a round head. Cast the word "WATER" on the lid. The least diameter of the shaft of the box shall be 5 ¼ inches. Each cast-iron box shall have a heavy coat of bituminous paint.
3. Sleeve-type Mechanical Couplings: Design to couple plain-end piping by compression of a ring gasket at each end of the adjoining pipe sections. The coupling shall consist of one middle ring flared or beveled at each end to provide a gasket seat; two follower rings; two resilient tapered rubber gaskets; and bolts and nuts to draw the follower rings toward each other to compress the gaskets. The middle ring and the follower rings shall be true circular sections free from irregularities, flat spots, and surface defects; the design shall provide for confinement and compression of the gaskets. Middle ring shall be of cast-iron and the follower rings shall be of malleable iron or ductile iron. Cast iron shall conform to ASTM A48 and shall be not less than Class 25. Malleable iron shall conform to ASTM A47. Ductile iron shall conform to ASTM A536. Gaskets shall be designed for resistance to set after installation and shall meet the applicable

requirements specified for gaskets for mechanical joint in AWWA C111/A21.11. Bolts shall be track-head type; bolts and nuts shall be either of the following: bolts conforming to tensile requirements of ASTM A307, Grade A, with nuts conforming to tensile requirements of ASTM A563, Grade A; or round-head square-neck type bolts conforming to ANSI B18.5 with hex nuts conforming to ANSI B18.2.2. Bolts shall be 5/8-inch in diameter; minimum number of bolts for each coupling shall be as required for the application. Bolt holes in follower rings shall be of a shape to hold fast the necks of the bolts used. Do not use mechanically coupled joints using a sleeve-type mechanical coupling as an optional method of jointing except where pipeline is adequately anchored to resist tension pull across the joint

## 2.2 WATER SERVICE LINE MATERIALS

### A. Piping Materials

1. Copper Tubing and Associated Fittings: Tubing shall conform to ASTM B88, Type K. Fittings for solder-type joint shall conform to ANSI B16.18 or ANSI B16.22; fittings for compression-type joint shall conform to ANSI B16.26, flared tube type. All brass fittings to be lead free.
2. PE PIPE AND FITTINGS
  - a. PE, ASTM Pipe: ASTM D 2239, SDR No. 5.3, 7, or 9; with PE compound number required to give pressure rating not less than 200 psig.
    - 1) Insert Fittings for PE Pipe: ASTM D 2609, made of PA, PP, or PVC with serrated male insert ends matching inside of pipe. Include bands or crimp rings.
    - 2) Molded PE Fittings: ASTM D 3350, PE resin, socket- or butt-fusion type, made to match PE pipe dimensions and class.
  - b. PE, AWWA Pipe: AWWA C906, DR No. 7.3, 9, or 9.3; with PE compound number required to give pressure rating not less than 200 psig.
    - 1) PE, AWWA Fittings: AWWA C906, socket- or butt-fusion type, with DR number matching pipe and PE compound number required to give pressure rating not less than 200 psig.

### B. Water Service Line Appurtenances

1. Corporation Stops: Ground key type; made of bronze conforming to ASTM B61 or ASTM B62; and suitable for the working pressure of the system. Ends shall be suitable for solder-joint, or flared tube compression type joint. Threaded ends for inlet and outlet of corporation stops shall conform to AWWA C800; coupling nut for connection to flared copper tubing shall conform to ANSI B16.26.
2. Goosenecks: Type K copper tubing. Joint ends for goosenecks shall be appropriate for connecting to corporation stop and service line. Length of goosenecks shall be in accordance with standard practice.
3. Curb or Service Stops: Ground key, round way, inverted key type; shall be made of bronze conforming to ASTM B61 or ASTM B62; and suitable for the working pressure of the system. Ends shall be as appropriate for connection to the service piping. Arrow shall be cast into body of the curb or service stop indicating direction of flow.
4. Gate Valves Smaller Than 3-inch Size on Buried Piping: MSS SP80, Class 150, solid wedge, nonrising stem. Valves shall have flanged or threaded end connections, with a union on one side of the valve. Provide handwheel operators.
5. Curb Boxes: Provide for each curb or service stop. Curb boxes shall be of cast-iron of a size suitable for the stop on which it is to be used. Provide a round head with the word "WATER" cast on the lid. Each box shall have a heavy coat of bituminous paint.

6. Valve Boxes: Provide for each gate valve on buried piping. Valve boxes shall be of cast-iron of a size suitable for the valve on which it is to be used and shall be adjustable. Provide a round head. Cast the word "WATER" on the lid. The least diameter of the shaft of the box shall be 5 1/4 inches. Each cast-iron box shall have a heavy coat of bituminous paint.
7. All brass components shall be lead-free.

## PART 3 - EXECUTION

### 3.1 INSTALLATION OF PIPELINES

- A. General Requirements for Installation of Pipelines: These requirements shall apply to pipeline installation except where specific exception is made in the "Special Requirements..." paragraphs.
  1. Location of Water Lines: The work covered by this section shall terminate at points as described in Part 1 of this Section and as indicated. Where the location of the water line is not clearly defined by dimensions on the drawings, do not lay water line closer horizontally than 10 feet from any sewer line. Where water lines cross under gravity sewer lines, encase sewer line fully in concrete for a distance of at least 10 feet on each side of the crossing, unless sewer line is made of pressure pipe with rubber-gasketed joints and no joint is located within 3 feet horizontally of the crossing. Lay water lines which cross sewer force mains at least 2 feet above these sewer lines; when joints in the sewer line are closer than 3 feet horizontally from the water line, encase these joints in concrete. Do not lay water lines in the same trench with gas lines, fuel lines or electric wiring.
  2. Earthwork: Perform earthwork operations in accordance with Section 312100.
  3. Pipe Laying and Jointing: Remove fins and burrs from pipe and fittings. Before placing in position, clean pipe, fittings, valves, and accessories and maintain in a clean condition. Provide proper facilities for lowering sections of pipe into trenches. Do not under any circumstances drop or dump pipe, fittings, valves, or other water line material into trenches. Cut pipe accurately to length established at the site and work into place without springing or forcing. Replace by one of the proper length any pipe or fitting that does not allow sufficient space for proper installation of jointing material. Blocking or wedging between bells and spigots will not be permitted. Lay bell-and-spigot pipe with the bell end pointing in the direction of laying. Grade the pipeline in straight lines; avoid the formation of dips and low points. Support pipe at proper elevation and grade, and secure firm, uniform support. Wood support blocking will not be permitted. Lay pipe so that the full length of each section of pipe and each fitting will rest solidly on the pipe bedding; excavate recesses to accommodate bells, joints, and couplings. Provide anchors and supports where indicated and where necessary for fastening work into place. Make proper provision for expansion and contraction of pipelines. Keep trenches free of water until joints have been properly made. At the end of each work day, close open ends of pipe temporarily with wood blocks or bulkheads. Do not lay pipe when conditions of trench or weather prevents installation. Install three (3) brass wedges at each bell prior to backfill.
  4. Installation of Tracer Wire: Install a continuous length of tracer wire for the full length of each run of nonmetallic pipe. Attach wire to top of pipe in such manner that it will not be displaced during construction operations.
  5. Connections to Existing Lines: Contractor shall obtain and pay for fees and permits which may be required to connect to existing lines. After approval is obtained, make connections to existing water lines with a minimum interruption of service on the existing line. Make connections in accordance with the recommended procedures of the manufacturer of pipe of which the line being tapped is made. Contact the local utility company before making connections to the existing line. Follow criteria and regulations of the local utility when making connections to existing line.

## B. Installation of Water Mains:

## 1. Special Requirements for Ductile-iron Piping Installation

- a. Installation, General: Unless otherwise specified in the following subparagraphs, install pipe and fittings in accordance with paragraph entitled, "General Requirements for Installation of Pipelines" and with the requirements of AWWA C600 for pipe installation, joint assembly, valve-and-fitting installation, and thrust restraint.
- b. Jointing:
  - 1) Make push-on joints with the gaskets and lubricant previously specified for this type joint; assemble in accordance with the applicable requirements of AWWA C600 for joint assembly.
  - 2) Make mechanical-joints with the gaskets, glands, bolts, and nuts specified for this type joint; assemble in accordance with the applicable requirements of AWWA C600 for joint assembly and with the recommendations of Appendix A to AWWA C111/A21.11.
  - 3) Make flanged joints with the gaskets, bolts, and nuts previously specified for this type joint. Make flanged joints up tight; avoid undue strain on flanges, fittings, and valves. Align bolt holes for each flanged joint. Use full size bolts for the bolt holes; use of undersized bolts to make up for misalignment of bolt holes or for any other purpose will not be permitted. Do not allow adjoining flange faces to be out of parallel to such degree that the flanged joint cannot be made watertight without overstraining the flange. When any flanged pipe or fitting has dimensions that do not allow the making of a proper flanged joint as specified, replace it by one of proper dimensions. Use setscrewed flanges to make flanged joints where conditions prevent the use of full length flanged pipe; assemble in accordance with the recommendations of the setscrewed flange manufacturer. Setscrews shall be either "Cor-Ten" steel, ductile iron or approved equal. Locking rings and Megalugs are acceptable replacements for retainer glands, but are not a replacement for thrust blocks.
- c. Pipe Anchorage: Provide concrete thrust blocks, reaction backing, for pipe anchorage. Thrust blocks shall be in accordance with the requirements of AWWA C600 for thrust restraint, except that size and positioning of thrust blocks shall be as indicated. Use concrete conforming to ASTM C94 having a minimum compressive strength of 3,000 psi at 28 days; or use concrete of a mix not leaner than one part cement, 2 1/2 parts sand, and 5 parts gravel, having the same minimum compressive strength.

## 2. Installation of Valves and Hydrants:

- a. Installation of Valves: Install gate valves conforming to AWWA C500 and UL 262 in accordance with AWWA C600 for valve-and-fitting installation and with the recommendations of the Appendix (Installation, Operation, and Maintenance of Gate Valves) to AWWA C500. Install gate valves conforming to AWWA C509 in accordance with AWWA C600 for valve-and-fitting installation and with the recommendations of the Appendix (Installation, Operation, and Maintenance of Gate Valves) to AWWA C509. Make and assemble joints to gate valves as specified for making and assembling the same type joints between pipe and fittings.
- b. Installation of Hydrants: Install hydrants in accordance with AWWA C600 for hydrant installation and as indicated. Make and assemble joints as specified for making and assembling the same type joints between pipe and fittings.

## C. Installation of Water Service Piping

1. Location: Connect water service piping to the building as described in Part 1 of this Section and as indicated.
2. Service Line Connections to Water Mains: Connect service lines to the main with a corporation stop and gooseneck and install a gate valve on service line below the frostline. Connections also to be as indicated. Connect service lines to ductile-iron water mains in accordance with AWWA C600 for service taps.
3. Special Requirements for Installation of Metallic Piping: Metallic Piping Installation, General: Install pipe and fittings in accordance with paragraph entitled, "General Requirements for Installation of Pipelines" and with the applicable requirements of AWWA C600 for pipe installation, unless otherwise specified.
  - a. Jointing:
    - 1) Screwed Joints: Make screwed joints up tight with a stiff mixture of graphite and oil, inert filler and oil, or an approved graphite compound; apply to male threads only. Threads shall be full cut; do not leave more than three threads on the pipe exposed after assembling the joint.
    - 2) Joints for Copper Tubing: Cut copper tubing with square ends; remove fins and burrs. Handle tubing carefully; replace dented, gouged, or otherwise damaged tubing with undamaged tubing. Make solder joints using ASTM B32, 95-5 tin-antimony or Grade Sn96 solder. Solder and flux shall contain not more than 0.2 percent lead. Before making joint, clean ends of tubing and inside of fitting or coupling with wire brush or abrasive. Apply a rosin flux to the tubing end and on recess inside of fitting or coupling. Insert tubing end into fitting or coupling for the full depth of the recess and solder. For compression joints on flared tubing, insert tubing through the coupling nut and flare tubing with a flaring tool.

- D. Disinfection: Flush and disinfect new potable water lines and affected portions of existing potable water lines in accordance with AWWA C651. Apply chlorine by the continuous feed method.

## 3.2 FIELD QUALITY CONTROL

- A. Field Tests and Inspections: The Architect and/or its representative will conduct field inspections and witness field tests specified in this section. The Contractor shall perform field tests, and provide labor, equipment, and incidentals required for testing. The Contractor shall produce evidence, when required, that any item of work has been constructed properly in accordance with the drawings and specifications. Do not begin testing on any section of a pipeline where concrete thrust blocks have been provided until at least 5 days after placing of the concrete.
- B. Testing Procedure: Test water mains and water service lines in accordance with the applicable specified standard, except for the special testing requirements given in paragraph entitled "Special Testing Requirements." Test water service lines in accordance with applicable requirements of AWWA C600 for hydrostatic testing. No leakage will be allowed at copper tubing joints (soldered, compression type, brazed and screwed joints).
- C. Special Testing Requirements: For pressure test, use a hydrostatic pressure 50 psi greater than the maximum working pressure of the system, except that for those portions of the system having pipe size larger than 2 inches in diameter, hydrostatic test pressure shall be 1.5 times the working pressure or not less than 125 psi whichever is greater. Hold this pressure for not less than 2 hours. Prior to the pressure test, fill that portion of the pipeline being tested with water for a soaking period of not less

than 24 hours. For leakage test, use a hydrostatic pressure not less than the maximum working pressure of the system. Leakage test may be performed at the same time and at the same test pressure as the pressure test.

- D. Disinfection: Flush and disinfect new potable water lines/associated tanks and affected portions of existing potable water lines in accordance with AWWA C651. Apply chlorine by the continuous feed method.

END OF SECTION 221113

## SECTION 221313 – FACILITY SANITARY SEWERS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This section covers work related to exterior sanitary sewer collection and conveyance systems shown on drawings and specifications.
- B. Related Sections include the following:
  1. Division 01 Section "Temporary Facilities and Controls" for temporary utilities, temporary construction and support facilities, temporary security and protection facilities procedures.
  2. Division 22 Section "Plumbing" for roof drain and sanitary sewer services connections.
  3. Division 32 Section "Turf and Grasses, Plants" for finish grading including preparing and placing planting soil mixes and testing of topsoil material.
  4. Division 31 Section "Earth Moving for Utilities" for soil materials, excavating, backfilling.
  5. Division 31 Section "Dewatering" for requirements and guidelines for dewatering procedures.
  6. Division 31 Section "Excavation Support and Protection" for requirements and guidelines for dewatering procedures.
  7. See other related Division 22 sections for additional requirements governing floor drain and sanitary service piping within the building.

## 1.3 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

## AMERICAN NATIONAL STANDARDS INSTITUTE, INC. (ANSI)

ANSI A14.3                    2008 Ladders-Fixed-Safety Requirements

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C94                    2009 Ready-Mixed Concrete

ASTM C443                    2005 Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets

ASTM C478                    2009 Precast Reinforced Concrete Manhole Sections

ASTM C700                    2007 (Rev. A) Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated

ASTM C923	2008 Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals
ASTM C969	2002 Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines
ASTM D2412	2002 (Rev. 2008) External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading
ASTM D3034	2008 Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D3139	1998 (Rev. 2005) Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM D3212	2007 Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM D4101	2008 Polypropylene Plastic Injection and Extrusion Material
ASTM F405	2005 Corrugated Polyethylene (PE) Tubing and Fittings
ASTM F477	2008 Elastomeric Seals (Gaskets) for Joining Plastic Pipe

## AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C104/A21.4	2008 Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water (ANSI/AWWA C104/A21.4)
AWWA C110/A21.10	2008 Ductile-Iron and Gray-Iron Fittings
AWWA C111/A21.11	2006 Rubber Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C153/A21.53	2006 Ductile-Iron Compact Fittings, 3 in. through 16 in., for Water and Other Liquids
AWWA C600	2005 Installation of Ductile-Iron Water Mains and Their Appurtenances
AWWA C900	2007 Polyvinyl Chloride (PVC) Pressure Pipe, 4 in. through 12 in., for Water Distribution

## FEDERAL SPECIFICATIONS (FS)

FS RR-F-621	1998 (Rev. E) Frames, Covers, Gratings, Steps, Sump and Catch Basin, Manhole
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## UNI-BELL PLASTIC PIPE ASSOCIATION (UNI)

UNI B31992 Installation of Polyvinyl Chloride (PVC) Pressure Pipe

UNI B51989 Installation of Polyvinyl Chloride (PVC) Sewer Pipe

UNI B61990 Low-Pressure Air Testing of Installed Sewer Pipe

## 1.4 SUBMITTALS



## A. Manufacturer's Catalog Data: Submit manufacturer's standard drawings or catalog cuts.

1. Fittings
2. Joints and couplings
3. Piping
4. Riser-wrap

## B. Drawings

1. Precast concrete manholes
2. Metal work

## 1.5 PROJECT CONDITIONS

- A. The General Contractor shall be responsible for all fees, permits and coordination with the local utility company related to the connection to the existing municipal sanitary sewer system.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Piping: Inspect materials delivered to site for damage; store with minimum of handling. Store materials on site in enclosures or under protective coverings. Store plastic piping and jointing materials and rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes and fittings free of dirt and debris.
- B. Metal Items: Check upon arrival; identify and segregate as to types, functions, and sizes. Store off the ground in a manner affording easy accessibility and not causing excessive rusting or coating with grease or other objectionable materials.
- C. Cement, Aggregate, and Reinforcement: As specified in Section 033000.
- D. Handling: Handle pipe, fittings, and other accessories in such manner as to ensure delivery to the trench in sound undamaged condition.

## PART 2 - PRODUCTS

## 2.1 PIPELINE MATERIALS

## A. PVC Plastic Gravity Sewer Piping

1. PVC Plastic Gravity Pipe and Fittings: ASTM D3034, SDR 35, with ends suitable for elastomeric gasket joints. The pipe shall be colored green to identify it for sewer applications.

- B. Sewer Pipe Saddles: Provide pipe saddles in types as indicated on the Drawings. Strap-on sewer saddles are cast iron with a stainless steel saddle strap. Provide manufacturer's standard bolts, nuts, and mastic sealing compound with each saddle. Provide straps in sizes as required by pipe size.

## C. Acceptable products/manufacturers are:

1. EJP, Inc.

2. Ipex Inc.
3. Hancor Pipe
4. ADS Pipe
5. North American Pipe
6. Approved equal.

D. Detection Materials: Provide detectable tape, or detection plates at all buried clean outs.

## 2.2 CONCRETE MATERIALS

A. Concrete materials shall be as specified in Section 033000.

## 2.3 MISCELLANEOUS MATERIALS

A. Precast Concrete and Associated Materials

1. Precast Concrete Manhole Sections: Precast concrete manhole risers, base sections, and tops shall conform to ASTM C478. Base and first riser shall be monolithic. All concrete shall have a minimum ultimate compressive strength of 4000 psi at the end of 28 days. Standard is by American Concrete Co. and Superior Concrete Co.
2. Protective Coating: Plant-applied damp proofing is required for all exterior concrete surfaces for all sanitary structures.
3. Gaskets and Connectors: Gaskets for joints between manhole sections shall conform to ASTM C443. Standard is Kent-Seal. Resilient connectors for making joints between manhole and pipes entering manhole shall conform to ASTM C923.

B. Metal Items

1. Frames and Covers: Unless otherwise indicated on the drawings or specified, frames and covers shall be gray cast iron conforming to ASTM A 48/A 48M -03, Class 30B and suitable for AASHTO H 20-44 and HS 20-44 highway loading. Provide non-skid surface with raised letter "SEWER" designation cast on the cover. Acceptable products/manufacturers shall be:
  - a. Etheridge E24X5 cats iron manhole frame and cover or approved equal;
2. Manhole Steps: Zinc-coated steel conforming to ANSI A14.3. As an option, plastic or rubber coating pressure-molded to the steel may be used. Plastic coating shall conform to ASTM D4101, copolymer polypropylene. Rubber shall conform to ASTM C443, except shore A durometer hardness shall be 70 plus or minus 5. Aluminum steps or rungs will not be permitted. Steps are not required in manholes less than 4 feet deep.

C. Riser-wrap

1. Riser-Wrap is supplied in bulk rolls along with Polyken #1027 liquid adhesive (furnished in 1-gallon cans) and 6" wide joiner- strips.
2. All Riser-Wrap coating material shall be stored, handled, and transported in such a manner as to prevent damage to individual carton or containers. Cartons, sleeve rolls, joiner-strips or individual repair sleeves removed from the storage pallets shall not be dropped, rolled, or thrown in any manner as to damage the coating material. Cartons or sleeve rolls shall not be handled with hooks, ropes, cables, or any other mechanical devices as to damage the coating materials.

3. Factory rolls and/or cartons shall be stacked on end at all times and no higher than seventy-two (72) inches.
4. The coating material shall be stored and/or transported in a dry, ventilated location. Storage temperature shall be a minimum of 4 °F and not to exceed 130 °F.
5. Individual cartons or rolls of coating material shall not contact bare ground or bare warehouse floor. Tools or equipment shall not be stacked on top of the rolls.
6. Riser-Wrap materials that have been damaged or show signs of deterioration shall be inspected by representatives of the owner and at the discretion of the end-user may be rejected.
7. Riser-Wrap sleeves are supplied with a plastic release liner on the adhesive side. This release liner is required to prevent the highly aggressive adhesive from prematurely bonding to itself and protect the adhesive surface from contamination. It should not be removed until time of application.
8. Polyken #1027 liquid adhesive shall be stored in accordance with regulations that govern hazardous material storage. Primer inventory shall rotate on a first in - first out basis. Primer containers shall be marked with receiving date.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION OF PIPELINES AND APPURTENANT CONSTRUCTION

- A. General Requirements for Installation of Pipeline: Apply except where specific exception is made in the following paragraphs entitled, "Special Requirements."
  1. Location: The work covered by this section shall terminate at a point approximately 10 feet from the building, unless otherwise indicated. Where the location of the sewer is not clearly defined by dimensions on the drawings, do not lay sewer line closer horizontally than 10 feet to a water main or service line. Where sanitary sewer lines pass above water lines, encase sewer in concrete for a distance of 10 feet on each side of the crossing, or substitute rubber-gasketed pressure pipe for the pipe being used for the same distance. Where sanitary sewer lines pass below water lines, lay pipe so that no joint in the sewer line will be closer than 3 feet, horizontal distance, to the water line.
  2. Earthwork: Perform earthwork operations in accordance with Section 312100.
  3. Pipe Laying and Jointing: Inspect each pipe and fitting before and after installation; replace those found defective and remove from site. Provide proper facilities for lowering sections of pipe into trenches. Adjust spigots in bells to give a uniform space all around. Blocking or wedging between bells and spigots will not be permitted. Replace by one of the proper dimensions, pipe or fittings that do not allow sufficient space for installation of joint material. At the end of each work day, close open ends of pipe temporarily with wood blocks or bulkheads. Provide batterboards not more than 25 feet apart in trenches for checking and ensuring that pipe invert elevations are as indicated. Laser beam method may be used in lieu of batterboards for the same purpose.
    - a. Lay nonpressure pipe with the bell ends in the upgrade direction.
    - b. Lay pressure pipe with the bell ends in the downgrade direction, or in other words the pressurized flow should hit the bell end of the pipe first.
  4. Connections to Existing Lines: Obtain approval from the Architect before making connection to existing line. Conduct work so that there is minimum interruption of service on existing line. Obtain and pay for any permits needed to connect to existing lines. Contact the local utility company two days before making connection to existing lines. Follow regulations of local utility company related to connecting to their lines. Regrade and repair areas as needed to restore surfaces to existing features.

## B. Special Requirements

1. Installation of PVC Plastic Piping: Install pipe and fittings in accordance with paragraph entitled, "General Requirements for Installation of Pipelines" of this section and with the requirements of UNI B5 for laying and joining pipe and fittings. Make joints with the gaskets specified for joints with this piping and assemble in accordance with the requirements of UNI B5 for assembly of joints. Make joints to other pipe materials in accordance with the recommendations of the plastic pipe manufacturer.
2. Cleanouts: Construct cleanouts of PVC sanitary pipe and fittings with cleanout cover.

## C. Concrete Work: Cast-in-place concrete is included in Section 033000.

## D. Manhole Construction: Use precast concrete base sections. Make inverts in precast concrete bases with a smooth-surfaced semi-circular bottom conforming to the inside contour of the adjacent sewer sections. For changes in direction of the sewer and entering branches into the manhole, make a circular curve in the manhole invert of as large a radius as manhole size will permit. No parging will be permitted on interior manhole walls. For precast concrete construction, make joints between manhole sections with the gaskets specified for this purpose; install in the manner specified for installing joints in concrete piping. Parging will not be required for precast concrete manholes. Make joints between concrete manholes and pipes entering manholes with the resilient connectors specified for this purpose; install in accordance with the recommendations of the connector manufacturer. Where a new manhole is constructed on an existing line, remove existing pipe as necessary to construct the manhole. Cut existing pipe so that pipe ends are approximately flush with the interior face of manhole wall, but not protruding into the manhole. Use resilient connectors as previously specified for pipe connectors to concrete manholes.

## E. Riser-Wrap/Joint Sealing Installation

1. The exterior of the manhole or vault shall be brushed by broom or hand wire tools to remove any loose cement dust or small rock particles from the surface. Sharp edges or points should be also removed or flattened.
2. Preheating is only necessary below when ambient temperatures are below 60 °F and/or moisture is apparent on the surface. The function of preheating is primarily to remove excess moisture and warm the surface where Riser-Wrap is to be installed. In many cases, preheating may not be required.
3. Visible oil and/or grease shall be removed by use of a suitable solvent. Kerosene shall not be used for solvent cleaning.
4. Cleaned surfaces of manhole sections shall not be allowed to sit for extended periods under wet or humid conditions prior to the application of the Riser-Wrap system.
5. Dust and/or other loose materials shall be removed prior to application of primer by dry air blow or broom brushing.
6. The joint sealing system shall always be applied on top of the Polyken #1027 or #1039 liquid adhesive primers.
7. The primer shall be thoroughly mixed prior to application. The primer is applied to the concrete surface with a brush or paint roller to a wet thickness of no less than two (2) mils and no greater than five (5) mils. Primer container shall remain covered when not in use.
8. The primer shall cover the entire exposed concrete surface and manhole cover frame including the indentations caused by the irregular concrete surface where the Riser-Wrap material is to be installed.
9. The primer shall be "dry to touch" prior to the application of the Riser-Wrap. Under no circumstances shall the sleeve be applied over a wet primer surface.
10. The primer shall not be diluted. Primer cans shall remain covered when not in use, to avoid solvent evaporation or contamination and shall be disposed of properly.

11. For street surface enclosures allow approximately 5" of sleeve material to extend upward above the manhole cast iron ring (manhole cover frame). This excess material will fold down over the ring during application. Note that concrete manhole cones have changing circumferences. Always measure the sleeve twice prior to cutting from the longest (largest circumference) place where sleeve is to be installed.
12. Remove 8" of liner from back of sleeve and attach the edge vertically to the manhole section. Hold edge in place and begin to unroll sleeve along marked line; removing liner as you move around the manhole cone section until you have overlapped the starting edge.
13. Using a small amount of flame, heat the adhesive side of the joiner-strip (white textured side) and place the 6" wide joiner-strip vertically across the overlapped sleeve edges (black side out). Hold in-place and apply a small amount of heat to the joiner-strip while gently patting it down with a gloved hand. Adjust torch to medium-high output and begin heating the sleeve (minimum of 6" from joiner-strip) along the bottom edge of Riser-Wrap, moving in one direction and keeping the torch moving in a continuous up and down motion. Continue heating sleeve towards top edge, watching the sleeve closely, so adhesives edges do not touch.
14. Use roller to move adhesive towards outer sleeve edges and to remove wrinkles or bubbles. Do not cut sleeve to remove wrinkles.
15. The Riser-Wrap embossed sleeve outer surface informs the applicator that the sleeve is thoroughly heated when the embossment disappears and also when the adhesive is showing on the outer edges. This is a permanent indicator and provides the inspector information that the heating process has been completed.
16. Do not cut the Riser-Wrap sleeve while applying over cast iron manhole gussets. Gently fold the heated sleeve around them. Cuts can be made later after the Riser-Wrap has cooled to ambient temperature if desired.
17. For complete encapsulation application-begin installation at lowest point, applying sleeves upward in layers that overlap the previous sleeve by 2". Also, the vertical placement of the joiner-strips on each successive wrap should be horizontally staggered to avoid vertical stacking.
18. Filler cord material may be required for step-downs exceeding 1" in variation and/or to repair damaged concrete areas or cover sharp protrusions that cannot be removed by other means.

F. Miscellaneous Construction and Installation

1. Metal Work: Workmanship and Finish: Perform metal work so that workmanship and finish will be equal to the best practice in modern structural shops and foundries. Form iron to shape and size with sharp lines and angles. Do shearing and punching so that clean true lines and surfaces are produced. Make castings sound and free from warp, cold shuts, and blow holes that may impair their strength or appearance. Give exposed surfaces a smooth finish with sharp well-defined lines and arises. Provide necessary rabbets, lugs, and brackets wherever necessary for fitting and support.

3.2 FIELD QUALITY CONTROL (Note: Also perform all testing required by the local utility company)

- A. Field Tests and Inspections: The Architect or representative will conduct field inspections and witness field tests specified in this section.
- B. Leakage Tests: Test lines for leakage by either infiltration tests or exfiltration tests, or by low-pressure air tests. Prior to testing for leakage, backfill trench up to at least lower half of pipe. When necessary to prevent pipeline movement during testing, place additional backfill around pipe sufficient to prevent movement, but leaving joints uncovered to permit inspection. When leakage or pressure drop exceeds the allowable amount specified, make satisfactory correction and retest pipeline section in the same manner. Correct visible leaks regardless of leakage test results.

- C. Low-pressure Air Tests: Perform tests as follows:
  - 1. The contractor shall test the gravity sewer with a low-pressure air test. After completing backfill of a section of wastewater line, the contractor shall at his own expense, conduct a Line Acceptance Test using low pressure air.

The portion of line being tested shall be termed "Acceptable" if the time required in minutes for the pressure to decrease as stated below (greater than the average back pressure of any ground water that may be over the pipe) shall not be less than the time shown for the given diameters in the following table:

- a. PVC Plastic Pipelines: Test all new lines at 4 psi with an allowable pressure drop of one (1) psi at the following durations for a specific pipe diameter size:
  - 15" diameter – 17 minutes
  - 12" diameter – 11.5 minutes
  - 10" diameter – 8 minutes
  - 8" diameter – 5 minutes
  - 6" diameter – 4 minutes
  - 4" diameter – 4 minutes

- D. Internal pressure tests for force mains:
  - 1. All force mains shall be tested per the testing requirements:
    - a. conduct all pressure and leakage testing in accordance with AWWA standards
    - b. Decrease pressure in the main to be tested approximately 20 psi. Observe test gauge to ensure the pressure doesn't rise due to 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
    - c. A pressure test pump shall be connected to the new main at the testing point. The pressure will be slowly increased to 150 psig and allowed to stabilize (+/- 2.5 psig) for a minimum of 15 minutes.
    - d. A reservoir of potable water shall be connected to the test pump and the initial level of water recorded.
    - e. The pump pressure shall be maintained at 150 psig for a minimum of 1 hour with all makeup water withdrawn from the reservoir.
    - f. After one hour, the water level in the reservoir will be measured and the volume of water drawn down from the reservoir calculated and compared with the following allowable leakage:

Allowable leakage (ounces per hour) – (pipe length (feet) X Nominal Diameter (inches) x128)/10,900

- g. If any test discloses leakage greater than that specified above, the contractor, at his own expense, shall locate the leak and make repairs as necessary until the leakage is within the specified allowance. Written certification of leakage and pressure testing shall be submitted to the engineer upon completion.

- E. Deflection Testing: Perform a deflection test on entire length of installed plastic pipeline on completion of work adjacent to and over the pipeline, including leakage tests, backfilling, placement of fill, grading, paving, concreting, and any other superimposed loads determined in accordance with ASTM D2412. Deflection of pipe in the installed pipeline under external loads shall not exceed 4.5 percent of the average inside diameter of pipe. Determine whether the allowable deflection has been exceeded by use of a pull-through device or a deflection-measuring device.

1. Pull-through Device: This device shall be a spherical, spheroidal, or elliptical ball, a cylinder, or circular sections fused to a common shaft. Circular sections shall be so spaced on the shaft that distance from external faces of front and back sections will equal or exceed diameter of the circular section. Pull-through device may also be of a design promulgated by the Uni-Bell Plastic Pipe Association, provided the device meets the applicable requirements specified in this paragraph, including those for diameter of the device, and that the mandrel has a minimum of 9 arms. Ball, cylinder, or circular sections shall conform to the following:
  - a. A diameter, or minor diameter as applicable, of 95 percent of the average inside diameter of the pipe; tolerance of plus 0.5 percent will be permitted.
  - b. Homogeneous material throughout, shall have a density greater than 1.0 as related to water at 39.2 degrees F, and shall have a surface Brinell hardness of not less than 150.
  - c. Center bored and through-bolted with a 1/4-inch minimum diameter steel shaft having a yield strength of not less than 70,000 pounds per square inch, with eyes or loops at each end for attaching pulling cables.
  - d. Each eye or loop shall be suitably backed with a flange or heavy washer such that a pull exerted on opposite end of shaft will produce compression throughout remote end.
2. Deflection Measuring Device: Sensitive to 1.0 percent of the diameter of the pipe being tested and shall be accurate to 1.0 percent of the indicated dimension. Deflection measuring device shall be approved prior to use.
3. Pull-through Device Procedure: Pass the pull-through device through each run of pipe, either by pulling it through or flushing it through with water. If the device fails to pass freely through a pipe run, replace pipe which has the excessive deflection and completely retest in same manner and under same conditions.
4. Deflection Measuring Device Procedure: Measure deflections through each run of installed pipe. If deflection readings in excess of 4.5 percent of average inside diameter of pipe are obtained, retest pipe by a run from the opposite direction. If retest continues to show a deflection in excess of 4.5 percent of average inside diameter of pipe, replace pipe, which has excessive deflection, and completely retest in same manner and under same conditions.

F. Tests for Manholes

1. Vacuum Test: The manhole being tested must not be backfilled. The test is passing if the manhole holds 10 inches of mercury vacuum for 3 minutes with one inch of mercury allowable loss. Contractor shall perform field tests and provide labor, equipment, and incidentals required for testing. Be able to produce evidence, when required, that each item of work has been constructed in accordance with the drawings and specifications.

G. Field Tests for Concrete: Field testing requirements are covered in Section 033000.

END OF SECTION 221313

## SECTION 221323 - SANITARY WASTE INTERCEPTORS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes the following types of interceptors outside the building:
  - 1. Exterior Grease Interceptors.
  - 2. Exterior oil/water separator.
- B. Related Sections include the following:
  - 1. Section 312000 – Earth Moving for Structures and Pavements
  - 2. Section 312100 – Earth Moving for Utilities
  - 3. Section 221313 – Facility Sanitary Sewers
  - 4. Section 221353 – Facility Septic Tanks
  - 5. Section 033000 - Cast-In-Place Concrete
  - 6. Division 22 - Plumbing Systems

## 1.3 DEFINITIONS

- A. FRP: Fiberglass-reinforced plastic.
- B. HDPE: High-density polyethylene plastic.
- C. PE: Polyethylene plastic.
- D. PP: Polypropylene plastic.

## 1.4 SUBMITTALS

- A. Shop Drawings of all items specified herein shall be submitted for approval in accordance with the requirements of Section 013300 - Submittals. Shop Drawings shall show size, arrangement of incoming and outgoing lines, concrete strength, and reinforcing. Approval must be received before fabrication is started.
  - 1. Include materials of construction, dimensions, rated capacities, retention capacities, location and size of each pipe connection, furnished specialties, damp proofing and accessories.
  - 2. Materials for Metal Work (frames and covers)



## 1.5 PROJECT CONDITIONS

- A. Interruption of Existing Sewer Services: Do not interrupt services to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary sewer services according to requirements indicated:
1. Notify Architect no fewer than seven days in advance of proposed interruption of service.
  2. Do not proceed with interruption of sewer services without Architect's written permission.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. 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 by American Concrete Company, Superior Concrete or approved equal.

### 2.2 EXTERIOR GREASE INTERCEPTORS

- A. Grease Interceptors: Precast concrete complying with ASTM C 913. Include rubber-gasketed joints, manholes, compartments or baffles, and piping or openings to retain grease and to permit wastewater flow.
1. Protective Coating: Plant-applied damp proofing to all exterior concrete surfaces for all sanitary structures.
  2. Structural Design Loads:
    - a. Heavy-Traffic Load: Comply with ASTM C 890, A-16 (ASSHTO HS20-44).
  3. Gaskets and Connectors: Gaskets for joints between sections shall conform to ASTM C443. Standard is Kent-Seal. Resilient connectors for making joints between manhole and pipes entering manhole shall conform to ASTM C923.
- B. Grease Interceptor Capacity and Characteristics:
1. Length by Width by Depth: Length and width per manufacturer's recommendations for the size capacity indicated on the drawings.
  2. Number of Compartments: As indicated on the Drawings.
  3. Retention Capacity: 3,000 gallons
  4. Inlet and Outlet Pipe Size and elevations: As indicated on the Drawings.
  5. Installation Position: Underground with manhole riser to grade
  6. Metal Work: Provide frames and covers as indicated in the drawings and specified herein.

### 2.3 PRECAST CONCRETE MANHOLE RISERS

- A. Precast Concrete Manhole Risers: ASTM C 478, with rubber-gasket joints.

1. Structural Design Loads:
    - a. Heavy-Traffic Load: Comply with ASTM C 890, A-16 (ASSHTO HS20-44).
  2. Length: From top of underground concrete structure to grade.
  3. Riser Sections: 3-inch minimum thickness
  4. Top Section: Eccentric cone, unless otherwise indicated. Include top of cone to match grade ring size.
  5. Gaskets: ASTM C 443, rubber.
  6. Steps: Zinc-coated steel conforming to ANSI A14.3. As an option, plastic or rubber coating pressure-molded to the steel may be used. Plastic coating shall conform to ASTM D4101, copolymer polypropylene. Rubber shall conform to ASTM C443, except shore A durometer hardness shall be 70 plus or minus 5. Aluminum steps or rungs will not be permitted. Steps are not required in manholes less than 4 feet deep.
- B. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, to match diameter of manhole frame and cover.
- C. Protective Coating: Plant-applied damp proofing to all exterior concrete surfaces for all sanitary structures.
- D. Manhole Frames and Covers: FS RR-F-621, cast iron; standard is Model R-1733A (solid lid with two lift holes) by Neenah Foundry Co. 8" high, 485 lbs. weight. Manholes in traffic areas to have H20 wheel loading rated covers. The word "SEWER" shall be cast on cover.

### PART 3 - EXECUTION

#### 3.1 EARTHWORK

- A. Excavating, trenching, and backfilling are specified in Division 31 Section "Earth Moving for Utilities."

#### 3.2 INSTALLATION

- A. Install interceptor inlets and outlets at elevations indicated.
- B. Install precast concrete interceptors according to ASTM C891. Set level and plumb.
- C. Install manhole risers from top of underground concrete interceptors to manholes and gratings at finished grade.
- D. Set tops of manhole frames and covers flush with finished surface in pavements.
- E. Set tops of grating frames and grates flush with finished surface.
- F. Clean and prepare concrete surfaces to be field painted. Remove loose efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen surface as required to remove glaze. Paint the following concrete surfaces as recommended by paint manufacturer:
- G. Clean and prepare metal surfaces to be field painted according to SSPC- PA 1. Paint the following metal surfaces according to SSPC-PA 1 and SSPC-Paint 16:

1. Metal Manhole Frames and Covers: All surfaces.
2. Do not paint metal surfaces with factory-applied, corrosion-resistant coating.

H. Repair and restore protective coatings to original condition.

### 3.3 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Make piping connections between interceptors and piping systems.

### 3.4 IDENTIFICATION

- A. Identification materials and installation are specified in Division 31 Section "Earth Moving." Arrange for installation of green warning tapes directly over piping and at outside edges of underground interceptors.
  1. Use warning tapes or detectable warning tape over ferrous piping.
  2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

### 3.5 FIELD QUALITY CONTROL (Note: Also perform all testing required by the local utility company)

- A. Field Tests and Inspections: The Architect or representative will conduct field inspections and witness field tests specified in this section.
- B. Leakage Tests: Test lines for leakage by either infiltration tests or exfiltration tests, or by low-pressure air tests. Prior to testing for leakage, backfill trench up to at least lower half of pipe. When necessary to prevent pipeline movement during testing, place additional backfill around pipe sufficient to prevent movement, but leaving joints uncovered to permit inspection. When leakage or pressure drop exceeds the allowable amount specified, make satisfactory correction and retest pipeline section in the same manner. Correct visible leaks regardless of leakage test results.
- C. Low-pressure Air Tests: Perform tests as follows:
  1. PVC Plastic Pipelines: Test all new lines at 4 psi with an allowable pressure drop of one (1) psi at the following durations for a specific pipe diameter size:
    - 10" diameter – 6 minutes
    - 8" diameter – 4 minutes
    - 6" diameter – 3 minutes
    - 4" diameter – 2 minutes
- D. Deflection Testing: Perform a deflection test on entire length of installed plastic pipeline on completion of work adjacent to and over the pipeline, including leakage tests, backfilling, placement of fill, grading, paving, concreting, and any other superimposed loads determined in accordance with ASTM D2412. Deflection of pipe in the installed pipeline under external loads shall not exceed 4.5 percent of the average inside diameter of pipe. Determine whether the allowable deflection has been exceeded by use of a pull-through device or a deflection-measuring device.

1. Pull-through Device: This device shall be a spherical, spheroidal, or elliptical ball, a cylinder, or circular sections fused to a common shaft. Circular sections shall be so spaced on the shaft that distance from external faces of front and back sections will equal or exceed diameter of the circular section. Pull-through device may also be of a design promulgated by the Uni-Bell Plastic Pipe Association, provided the device meets the applicable requirements specified in this paragraph, including those for diameter of the device, and that the mandrel has a minimum of 9 arms. Ball, cylinder, or circular sections shall conform to the following:
    - a. A diameter, or minor diameter as applicable, of 95 percent of the average inside diameter of the pipe; tolerance of plus 0.5 percent will be permitted.
    - b. Homogeneous material throughout, shall have a density greater than 1.0 as related to water at 39.2 degrees F, and shall have a surface Brinell hardness of not less than 150.
    - c. Center bored and through-bolted with a 1/4-inch minimum diameter steel shaft having a yield strength of not less than 70,000 pounds per square inch, with eyes or loops at each end for attaching pulling cables.
    - d. Each eye or loop shall be suitably backed with a flange or heavy washer such that a pull exerted on opposite end of shaft will produce compression throughout remote end.
  2. Deflection Measuring Device: Sensitive to 1.0 percent of the diameter of the pipe being tested and shall be accurate to 1.0 percent of the indicated dimension. Deflection measuring device shall be approved prior to use.
  3. Pull-through Device Procedure: Pass the pull-through device through each run of pipe, either by pulling it through or flushing it through with water. If the device fails to pass freely through a pipe run, replace pipe which has the excessive deflection and completely retest in same manner and under same conditions.
  4. Deflection Measuring Device Procedure: Measure deflections through each run of installed pipe. If deflection readings in excess of 4.5 percent of average inside diameter of pipe are obtained, retest pipe by a run from the opposite direction. If retest continues to show a deflection in excess of 4.5 percent of average inside diameter of pipe, replace pipe, which has excessive deflection, and completely retest in same manner and under same conditions.
- E. Tests for Manholes
1. Vacuum Test: The manhole being tested must not be backfilled. The test is passing if the manhole holds 10 inches of mercury vacuum for 3 minutes with one inch of mercury allowable loss. Contractor shall perform field tests and provide labor, equipment, and incidentals required for testing. Be able to produce evidence, when required, that each item of work has been constructed in accordance with the drawings and specifications.
- F. Field Tests for Concrete: Field testing requirements are covered in Section 033000.

END OF SECTION 221323

## SECTION 260543 - UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Conduit, ducts, and duct accessories for concrete-encased duct banks, and direct-buried, single duct runs.
  - 2. Manholes.

## 1.3 DEFINITION

- A. RNC: Rigid nonmetallic conduit.

## 1.4 QUALITY ASSURANCE

- A. Comply with IEEE C2.
- B. Comply with NFPA 70.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver ducts to Project site with ends capped. Store nonmetallic ducts with supports to prevent bending, warping, and deforming.
- B. Store precast concrete and other factory-fabricated underground utility structures at Project site as recommended by manufacturer to prevent physical damage. Arrange so identification markings are visible.
- C. Lift and support precast concrete units only at designated lifting or supporting points.

## 1.6 COORDINATION

- A. Coordinate layout and installation of ducts, manholes and handholes with final arrangement of other utilities, site grading, and surface features as determined in the field.

## PART 2 - PRODUCTS

## 2.1 CONDUIT

- A. RNC: NEMA TC 2, Type EPC-40-PVC, UL 651, with matching fittings by same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B.

## 2.2 PRECAST MANHOLES AND TRANSFORMER VAULTS

- A. Comply with ASTM C 858, with structural design loading as specified in "Underground Enclosure Application" Article, and with interlocking mating sections, complete with accessories, hardware, and features.
  - 1. Duct Entrances in Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.
    - a. Type and size shall match fittings to duct or conduit to be terminated.
    - b. Fittings shall align with elevations of approaching ducts and be located near interior corners of manholes to facilitate racking of cable.
- B. Concrete Knockout Panels: 1-1/2 to 2 inches thick, unless noted otherwise, for future conduit entrance and sleeve for ground rod.

## 2.3 UTILITY STRUCTURE ACCESSORIES

- A. Ferrous metal hardware, where indicated, shall be hot-dip galvanized complying with ASTM A 153 and A 123.
- B. Manhole Frames and Covers: Comply with structural design loading specified for manhole.
  - 1. Frame and Cover: Weatherproof, gray cast iron complying with ASTM A 48/A 48M, Class 30B with milled cover-to-frame bearing surfaces; diameter, 29 inches.
    - a. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
  - 2. Cover Legend: Cast in. Retained to suit system.
    - a. Legend: "CMP Co." for duct systems with primary electrical service cables.
    - b. Legend: "CABLE" for cable television service duct systems.
    - c. Legend: "TELEPHONE" for telephone duct systems.
- C. Transformer Vault Access Doors:
  - 1. Frame: ¼" Aluminum channel with recessed anchors and support shelf.
    - a. Type 316 stainless steel hardware.
  - 2. Doors: Aluminum with diamond milled finish.
- D. Pulling Eyes in Concrete Walls: Eyebolt with reinforcing-bar fastening insert, 2-inch-diameter eye, and 1-by-4-inch bolt.
  - 1. Working Load Embedded in 6-Inch, 4000-psi Concrete: 13,000-lbf minimum tension.
- E. Duct-Sealing Compound: Nonhardening, safe for contact with human skin, not deleterious to cable insulation, and workable at temperatures as low as 35 deg F. Capable of withstanding temperature of

300 deg F without slump and adhering to clean surfaces of plastic ducts, metallic conduits, conduit coatings, concrete, masonry, lead, cable sheaths, cable jackets, insulation materials, and common metals.

### PART 3 - EXECUTION

#### 3.1 UNDERGROUND DUCT APPLICATION

- A. Ducts for Electrical Cables over 600 V: RNC, NEMA Type EPC-40-PVC, in concrete-encased duct bank.
- B. Ducts for Electrical Branch Circuits: RNC, NEMA Type EPC-40-PVC, in direct-buried duct bank unless otherwise indicated.
- C. Underground Ducts for Telephone or Cable Television Service Cables: RNC, NEMA Type EPC-40-PVC, in concrete-encased duct bank unless otherwise indicated.

#### 3.2 UNDERGROUND ENCLOSURE APPLICATION

- A. Manholes and Electrical Vaults: Precast concrete.
  - 1. Units Located in Roadways, Sidewalks and Other Deliberate Traffic Paths by Heavy or Medium Vehicles: H-20 structural load rating according to AASHTO HB 17.

#### 3.3 DUCT INSTALLATION

- A. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 12.5 ft., both horizontally and vertically, at other locations unless otherwise indicated.
- B. Joints: Use solvent-cemented joints in ducts and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent ducts do not lie in same plane.
- C. Duct Entrances to Manholes: Use end bells, spaced approximately 10 inches o.c. for 5-inch ducts, and vary proportionately for other duct sizes.
  - 1. Begin change from regular spacing to end-bell spacing 10 ft. from the end bell without reducing duct line slope and without forming a trap in the line.
  - 2. Grout end bells into structure walls from both sides to provide watertight entrances.
- D. Sealing: Provide temporary closure at terminations of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15-psig hydrostatic pressure.
- E. Pulling Cord: Install 100-lbf-test nylon cord in ducts, including spares.
- F. Concrete-Encased Ducts: Support ducts on duct separators.
  - 1. Separator Installation: Space separators close enough to prevent sagging and deforming of ducts, with not less than 4 spacers per 20 ft. of duct. Secure separators to earth and to ducts to prevent floating during concreting. Stagger separators approximately 6 inches between tiers.

Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.

2. Concreting shall be performed by Division 31 Contractor.
3. Reinforcement: Reinforce concrete-encased duct banks where they cross disturbed earth and where indicated. Arrange reinforcing rods and ties without forming conductive or magnetic loops around ducts or duct groups.
4. Minimum Space between Ducts: 3 inches between ducts and exterior envelope wall, 2 inches between ducts for like services.
5. Warning Tape: Bury warning tape approximately 12 inches above all concrete-encased ducts and duct banks. Align tape parallel to and within 3 inches of the centerline of duct bank. Provide an additional warning tape for each 12-inch increment of duct-bank width over a nominal 18 inches. Space additional tapes 12 inches apart, horizontally.

G. Direct-Buried Duct Banks:

1. Install manufactured duct elbows for stub-ups at poles and equipment unless otherwise indicated.
2. Warning Tape Bury warning tape approximately 12 inches above all direct-buried ducts and duct banks. Align tape parallel to and within 3 inches of the centerline of duct bank.

### 3.4 INSTALLATION OF CONCRETE MANHOLES AND ELECTRICAL VAULTS

A. Precast Concrete Structure Installation:

1. Comply with ASTM C 891 unless otherwise indicated.
2. Install units level and plumb and with orientation and depth coordinated with connecting ducts to minimize bends and deflections required for proper entrances.
3. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

B. Elevations:

1. Covers: Set manhole covers flush with finished grade.

C. Manhole Access: Circular opening in manhole roof; sized to match cover size.

D. Waterproofing: Apply waterproofing to exterior surfaces of manholes after concrete has cured at least three days. Waterproofing materials and installation are noted on the Drawings. After ducts have been connected and grouted, and before backfilling, waterproof joints and connections and touch up abrasions and scars. Waterproof exterior of manhole chimneys after mortar has cured at least three days.

E. Hardware: Install removable hardware, including pulling eyes, cable stanchions, and cable arms, and insulators, as required for installation and support of cables and conductors and as indicated.

F. Field-Installed Bolting Anchors: Do not drill deeper than 3-7/8 inches, for anchor bolts installed in the field. Use a minimum of two anchors for each cable stanchion.

G. Warning Sign: Install "Confined Space Hazard" warning sign on the inside surface of each manhole cover.

END OF SECTION 260543



## SECTION 311000 - SITE CLEARING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Removing existing trees, shrubs, groundcovers, plants, and grass.
  - 2. Clearing and grubbing.
  - 3. Stripping and stockpiling topsoil.
- B. Related Sections include the following:
  - 1. Division 01 Section "Sustainable Design Requirements" for additional LEED requirements.
  - 2. Division 01 Section "Temporary Facilities and Controls" for temporary utilities, temporary construction and support facilities, temporary security and protection facilities procedures.
  - 3. Division 01 Section "Temporary Tree and Plant Protection" for protecting trees remaining on-site that are affected by site operations.
  - 4. Division 02 Section "Selective Structure Demolition" for partial demolition of buildings or structures undergoing alterations.
  - 5. Division 32 Section "Turf and Grasses, Plants" for finish grading including preparing and placing planting soil mixes and testing of topsoil material.
  - 6. Division 31 Section "Earth Moving for Structures and Pavement" for soil materials, excavating, backfilling, and site grading.
  - 7. Division 31 Section "Earth Moving for Utilities" for soil materials, excavating and backfilling.

## 1.3 DEFINITIONS

- A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials.
- B. Tree Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.
- C. Selective Clearing: Within the limits designated on the contract drawings (selective clearing should never take place within wetland areas), remove all, dead, dying, or diseased trees. Also trim as needed or remove trees that pose a hazard such as hanging over power lines or are leaning more than 30 degrees from vertical. Avoid/consult with the owner and/or engineer/architect on trees that fit this criteria but are considered specimen trees. (18" or larger caliper)

## 1.4 MATERIAL OWNERSHIP

- A. Except other materials indicated to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

## 1.5 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
  - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
  - 2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
- B. Improvements on Adjoining Property: Performing site clearing on property adjoining Owner's property is prohibited.
- C. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises or adjoining property where indicated.
- D. Utility Locator Service (Dig Safe): Notify Dig Safe (1-888-344-7233) for area where Project is located before site clearing operations has begun. Follow appropriate procedure and regulations as required.
- E. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION

## 3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Locate and clearly flag trees and vegetation to remain or to be relocated.
- C. Protect existing site improvements to remain from damage during construction.
  - 1. Restore damaged improvements to their original condition, as acceptable to Owner and Architect

## 3.2 TREE PROTECTION

- A. Refer to section 015639 Temporary Tree and Plant Protection.

### 3.3 UTILITIES

- A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.
  - 1. Arrange with utility companies to shut off indicated utilities.
- B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
  - 1. Notify Architect not less than two days in advance of proposed utility interruptions.
  - 2. Do not proceed with utility interruptions without Architect's written permission.
- C. Excavate for and remove underground utilities indicated to be removed.

### 3.4 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction.
  - 1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
  - 2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
  - 3. Grind stumps and remove roots, obstructions, and debris extending to a depth of 18 inches below exposed subgrade.
  - 4. Use only hand methods for grubbing within tree protection zone.
  - 5. Chip removed tree branches and utilize for temporary erosion control measures. If can not be used, remove
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
  - 1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

### 3.5 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.
  - 1. Remove subsoil and nonsoil materials from topsoil, including trash, debris, weeds, roots, and other waste materials.

### 3.6 DISPOSAL

- A. Disposal: Remove surplus soil material, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

1. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities.
2. Excess topsoil remains the property of the Owner.

END OF SECTION 311000

## SECTION 312000 – EARTH MOVING FOR STRUCTURES AND PAVEMENTS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section includes performing site preparation, excavation, borrow, filling, backfilling, compaction, compaction testing, and finish grading necessary to construct the finished grades indicated for structures, pavements, and other on-grade slabs or site work. Requirements for excavating and backfilling for utility lines and storm drains are contained in Section 312100, "Earth Moving for Utilities".
- B. Related Sections include the following:
1. Division 01 Section "Temporary Facilities and Controls" for temporary utilities, temporary construction and support facilities, temporary security and protection facilities procedures.
  2. Division 01 Section "Temporary Tree and Plant Protection" for protecting trees remaining on-site that are affected by site operations.
  3. Division 32 Section "Turf and Grasses, Plants" for finish grading including preparing and placing planting soil mixes and testing of topsoil material.
  4. Division 31 Section "Earth Moving for Utilities" for soil materials, excavating, backfilling.
  5. Division 31 Section "Dewatering" for requirements and guidelines for dewatering procedures.
  6. Division 31 Section "Excavation Support and Protection" for requirements and guidelines for temporary excavation support.

## 1.3 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C136	2006 Sieve Analysis of Fine and Coarse Aggregates
ASTM D698	2007 (Rev. 1) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft <sup>3</sup> (600 kN-m/m <sup>3</sup> ))
ASTM D1557	2007 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft <sup>3</sup> (2,700 kN-m/m <sup>3</sup> ))
ASTM D1586	2008 (Rev. A) Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils

ASTM D2487	2006 (Rev. 1) Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D2729	2003 Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D2855	1996 (Rev. 2002) Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings
ASTM D6938	2008 (Rev. A) Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
ASTM D3212	2007 Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM F402	2005 Standard Practice for Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings
ASTM F758	1995 (Rev 2007, E1) Standard Specification for Smooth-Wall Poly(Vinyl Chloride) (PVC) Plastic Underdrain Systems for Highway, Airport, and Similar Drainage

## ARMY CORPS OF ENGINEERS (COE)

COE EM-385-1-1 2008 Safety and Health Requirements Manual

State of Maine, Department of Transportation MDOT Standard Specifications, 12/2002 and amendments

- B. Reference Standard Specifications: Materials and workmanship specified herein with reference to MDOT Maine State Standard shall be in accordance with the referenced articles, sections and paragraphs of the standard except that contractual and payment provisions do not apply.

## 1.4 DEFINITIONS

- A. Coarse Aggregate: A layer of clean, poorly graded crushed rock, stone, or gravel having a high porosity which is placed beneath or adjacent to a building slab or structure with or without a vapor barrier to cut off the capillary flow of pore water to the area immediately below or adjacent a slab or structure.
- B. Compaction: The process of mechanically stabilizing a material by increasing its density at a controlled moisture condition. "Degree of Compaction" is expressed as a percentage of the maximum density obtained by the test procedure described in ASTM D698 or ASTM D1557 for general soil types abbreviated in this specification as " \_\_\_\_\_ percent ASTM D1557 maximum density".
- C. Structural Fill: Granular fill material constructed to attain maximum bearing strength and minimize consolidation or differential settlement under a load.
- D. Excavation: The removal of soil, rock, or hard material to obtain a specified depth or elevation.
- E. Hard Material: Weathered rock, dense consolidated deposits or conglomerate materials, (excluding manmade materials such as concrete) which are not included in the definition of "rock" but which usually require the use heavy excavation equipment with ripper teeth or the use of jack hammers for

removal. Material indicated in the soil boring logs as having a standard penetration resistance as determined by ASTM D1586 between 60 and 120 blows per foot is arbitrarily defined herein as "Hard Material".

- F. Undisturbed Native Soil: Existing in place soil.
  - G. Lift: A layer (or course) of soil placed on top of a previously prepared or placed soil. Lift thickness shall be such that desired density is achieved throughout the lift thickness with 3 to 5 passes of the compaction equipment. Lift thickness shall not exceed 18 inches.
  - H. Rock: Solid, homogeneous, interlocking crystalline material with firmly cemented, laminated, or foliated masses or conglomerate deposits, neither of which can be removed without systematic drilling and blasting, drilling and the use of expansion jacks or feather wedges, or the use of backhoe-mounted pneumatic hole punchers or rock breakers; also large boulders, buried masonry, or concrete other than pavement, exceeding three (3) cubic yard in volume. Material indicated in the soil boring logs as having a standard penetration resistance as determined by ASTM D1586 greater than 120 blows per foot is arbitrarily defined herein as "Rock." Removal of "hard material" will not be considered rock excavation because of intermittent drilling and blasting that is performed merely to increase production.
  - I. Ledge: Where used in this section, the term "Ledge" and "Rock" shall be considered the same and may be used interchangeably. The definition of "Ledge" shall be the same as "Rock" as defined in this section.
  - J. Soil: The unconsolidated surface material of the earth's crust resulting from the chemical and mechanical weathering of rock and organic material.
  - K. Subgrade: The material in excavation (cuts) and fills (embankments) immediately below any subbase, base, pavement, or other improvement. Also, as a secondary definition, the level below which work above is referenced.
  - L. Granular Fill: A dense, well-graded aggregate mixture of sand-gravel or crushed stone with suitable binder soil, placed on a subgrade to provide a suitable foundation for further construction.
  - M. Loam: In natural or undisturbed soil formations, the fine-grained, weathered material on the surface or directly below any loose or partially decomposed organic matter. Loam may be a dark-colored, fine, silty, or sandy material with a high content of well decomposed organic matter, often containing traces of the parent rock material. Gradation and material requirements specified herein apply to all loam references in this contract. The material shall be representative of productive soils in the vicinity.
  - N. Unsatisfactory Material: Existing, in-place soil or other material which can be identified as having insufficient strength characteristics or stability to carry intended loads in fill or embankment without excessive consolidation or loss of stability. Materials classified as PT, OH, or OL by ASTM D2487 are unsatisfactory. Unsatisfactory materials also include poor manmade fills, refuse, frozen material, uncompacted backfills for previous construction, unsound rock or soil lenses, or other deleterious or objectionable material.
  - O. Fine Aggregate: Aggregate passing the 3/8-inch sieve and almost entirely passing the No. 4 sieve and predominantly retained on the No. 200 sieve, as determined by ASTM C125.
- 1.5 SUBMITTALS
- A. Record of Existing Conditions

1. Preblast Survey
- B. Statement
1. Blasting plan (3.3.1.C)
- C. Field Test Reports (Note - Reports shall be as specified herein and as per applicable ASTM Standards).
1. All aggregate, granular fill tests/gradation report. (Produced within the past year)
  2. Subsurface drains, granular fill tests
  3. Structural fill material tests/compaction report.
  4. Compaction tests
  5. General site fill/gradation report.
  6. Stone dust/gradation report
  7. As specified within this section.
- 1.6 DELIVERY AND STORAGE
- A. Deliver and store materials in a manner to prevent contamination or segregation. Store synthetic fiber filter cloth to prevent exposure to direct sunlight in accordance with the manufacturer's written recommendations.
- 1.7 CRITERIA FOR BIDDING
- A. Base bids on the following criteria (field verify existing conditions):
1. Surface elevations as indicated. If not indicated, verify in the field.
  2. Pipes or other man-made obstructions, aside from those indicated on the drawings could be encountered. Field verify existing conditions.
  3. The character of the material to be excavated or used for subgrade is as indicated. If not indicated, field verify. Hard material identified as conglomerate clay, sand, silt, or gravel, volcanic tuff, or consolidated calcareous marine sediments on the borings shall not be considered as rock and removal of such material shall not give cause for a claim for additional compensation regardless of hardness or difficulty in removing.
  4. Removal of rock to the lines and grades indicated and required shall be done at the unit price bid (on the bid form) for "Mass or Trench Excavation". The unit price shall include all of the site contractors' costs associated with rock removals including but not limited to: watchmen; signage and advertising, etc., video/preblast surveys and water quality samples of wells within 500-foot radius of the anticipated blasting areas.
  5. Ground water elevations indicated are based on observations at the time subsurface investigations were made and do not necessarily represent ground water elevation at the time of construction.
  6. Borrow material, Suitable backfill and fill material in the quantities required is not available at the project site.
  7. Blasting will be permitted, obtain Architect/Owner permission. Remove material by drilling and use of expansion jacks for feather wedges, or the use of backhoe-mounted pneumatic hole punchers or rock breakers, or as approved by the Architect/Engineer.
  8. The unit price for mass or trench rock shall include the entire cost to drill, blast, remove and/or dispose of rock material as required.



## 1.8 SITE CONDITIONS

- A. Utilities: Contact the Architect/Engineer 72 hours prior to construction for the location of all existing underground utilities. Movement of construction machinery and equipment over pipes and utilities during construction shall be at the Contractor's risk. Contact the utility companies for locations of their utilities. Perform work adjacent to privately owned utilities in accordance with procedures outlined by the utility company. Excavation made with power-driven equipment is not permitted within two feet of known utilities or subsurface construction. For work immediately adjacent to or for excavations exposing a utility or other buried obstruction, excavate by hand. Start hand excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured. Support uncovered lines or other existing work as affected by the contract excavation until approval for backfill is granted by the Architect/Engineer. Report damage to utility lines or subsurface construction immediately to the utility Owner. Notify the Architect/Engineer immediately.

## 1.9 ADDITIONAL CRITERIA REGARDING ROCK REMOVAL

- A. For concrete slabs and footings for the buildings, the following shall also apply:
1. When ledge is encountered, thoroughly clean off the ledge; contact the Architect for their inspection of such ledge.
  2. Remove any ledge which is fractured or weathered or otherwise unsuitable (as determined by the Architect).
  3. If the Architect determines that the rock is sound, then construct the footings on such sound rock.
  4. Footings shall be installed at the required minimum depth of cover as determined by the Architect/Engineer.

## 1.10 ROCK EXCAVATION

- A. Boulders three (3) cubic yard or smaller shall be considered to be unclassified material regardless of location. Concrete and cut stone encountered in excavation in excess of three (3) cubic yard will be considered as "rock" as herein defined.
- B. The word "trenches" as used herein shall mean excavation for utility lines having vertical sides whose depths exceed their width. Excavations for building foundation walls, retaining walls, and other structures other than utility lines shall not be classified as trench excavation.
- C. When, during the process of excavation, rock is encountered, such material shall be uncovered and exposed and the Architect and/or Engineer shall be notified by the Contractor before proceeding further. The Contractor shall not proceed with the excavation of material claimed as rock until the material has been classified by the Architect or the Engineer. Failure on the part of the Contractor to uncover such material or notify the Architect or Engineer will forfeit the Contractor's right-of-claim for any compensation.
- D. The Contractor shall employ at their expense a registered land surveyor acceptable to the Architect and/or Engineer to take cross sections of rock before removal of same and provide computations of cross sections within the limit of excavation lines. The contractor shall provide this information to the Architect/Engineer for review prior to beginning any blasting.

- E. Rock payment lines for building excavation will permit 6 inches of overblow in all directions from footing. Rock payment lines for trenches will permit 6 inches of overblow in all directions from bedding as shown in the Drawings (min. 36" width for payment).
- F. For the purposes of computing compensation, the payment limits for excavation will be not over 18 inches beyond face of foundation wall in any horizontal direction. Excavations which are made beyond these limits shall be so executed at the Contractor's risk without compensation. Payments will not be made for excess excavations caused by methods of operations used by the Contractor. Unauthorized excess excavations shall be at the Contractor's risk and expense.
- G. All rock excavated shall be removed from the site and disposed of by the Contractor.
- H. All lines and grade work not presently established at the site shall be laid out by the Contractor in accordance with the Contract Documents. Establish permanent bench marks by employment of a registered land surveyor or professional Civil Engineer. Maintain all established bounds and bench marks and replace any which are destroyed or disturbed.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Coarse Aggregate: Provide clean crushed stone or gravel similar to MDOT 703.02 with the following gradation (design size 3/4"):

Sieve	% by Weight Passing
1 inch	100
3/4 inch	90 – 100
1/2 inch	45 – 80
3/8 inch	20 – 55
1/4 inch	5 – 20
No. 4	0 – 10
No. 8	0 – 5
No. 200	1.5 max.

- B. Gas Permeable Coarse Aggregate: Provide clean crushed stone or gravel per ASTM E1465 Type 2 Medium Aggregate with the following gradation:

Sieve	% by Weight Passing
1 inch	100
3/4 inch	90 – 100
1/2 inch	20 – 55
3/8 inch	0 – 15
No. 4	0 – 5

Note: Void space must be at least 40%

- C. Granular Fill: Provide a dense, well-graded aggregate meeting gradation requirements stated in Section 703.06 Type B, MDOT State Standard and as follows:

Sieve	% by Weight Passing
4 inch	100

½ inch	35-75
¼ inch	25-60
No. 40	0-25
No. 200	0-5

- D. Granular Base: Provide a well-graded aggregate of screened or crushed gravel, hard durable and uniform rock and shall consist of clean, angular fragments, free of objectionable matter including but not limited to rounded stone, silt and clay or other deleterious material. It shall be similar to MDOT section 703.06, Type A aggregate and as follows:

Sieve	% by Weight Passing
2-1/2 inch	100
1/2 inch	45-70
1/4 inch	30-55
No. 40	0-20
No. 200	0-5

- E. Granular Subbase: Provide a well-graded aggregate of screened or crushed gravel, hard durable and uniform rock and shall consist of clean, angular fragments, free of objectionable matter including but not limited to rounded stone, silt and clay or other deleterious material. It shall be similar to MDOT section 703.06, Type C Aggregate and as follows:

Sieve	% by Weight Passing
6 inch	100
1/4 inch	25-70
No. 40	0-30
No. 200	0-5

- F. Crushed Aggregate Subbase: Crushed Aggregate subbase to be as follows:

1. As per Maine DOT crushed aggregate subbase 703.06, Type D material and as follows:
  - a. The gradation of the part that passes a 3 inch sieve shall meet the following grading requirements:
 

Sieve	% by Weight Passing
1/4 inch	25-70
No. 40	0-30
No. 200	0-7

Granular subbase to be non-frost susceptible. Granular subbase shall not contain particles of rock that will not pass a 6 inch square mesh sieve.

- G. Fine Aggregate: Fine Aggregate to be as follows:

1. As per MDOT 703.01, Fine Aggregate and as follows: Provide aggregate meeting requirements as described below.

Sieve	% by Weight Passing
3/8 inch	100
No. 4	90-100
No. 8	80-100
No. 16	50-85
No. 30	25-60

No. 60	10-30
No. 100	2-10
No. 200	0-5

- H. Soil Materials: Provide materials free from debris, roots, wood, scrap materials, vegetable matter, refuse or frozen material. Maximum particle size permitted is 6-inches unless otherwise indicated on the drawings. Use excavated material from the site for the work indicated when material falls within the requirements specified herein.
- I. Structural Fill: Provide materials classified as "Granular Fill" where indicated. Structural fill may also include non-frost susceptible "General Site Fill" located a minimum of 18" from foundation walls or adjacent to utilities, or a minimum of 12" away from building slabs, pavements or as indicated on the drawings or specified. System to be as follows:
  - 1. Lifts to be a maximum of 9" thick.
  - 2. Compact each lift to 95% compaction as determined by ASTM D1557.
  - 3. Then add the next lift.

- J. General Site Fill: Provide a soil material from the site or borrow that can be readily compacted to the specified densities and meeting requirements as follows:

Sieve	% by Weight Passing
6 inch	100
3 inch	90-100
1/4 inch	25-90
No. 40	0-50
No. 200	0-20

Materials shall be free of organic material, peat, clay, and other similar soft materials and may include blast ledge material up to 6" in diameter.

- K. Loam: Loam shall be as covered in Section 329200 - "Turf and Grasses."
- L. Stone Dust: Stone dust shall consist of clean, washed concrete sand or stone dust free from vegetable matter lumps or balls of clay and other deleterious substances conforming to the following gradation requirements:

Sieve Size	% Passing
3/8"	100
No. 4	90-96
No. 100	10-30

NOTE: Do not use mason sand or Limestone screenings.

- M. French Drain Stone: Stone for French drains shall be hard durable rock or blasted ledge pieces to be as follows:
  - 1. As per MDOT 703.24, Stone for French Drains and as follows:
    - a. The gradation of the entire sample shall meet the following gradation requirements:

Sieve	% by Weight Passing
6 inch	90-100

1-1/2 inch	0-40
No. 4	0-5

Gradation tests shall conform to AASHTO T27 except that the total sample shall be sieved and the minimum weight of the sample will be 120lbs.

N. Crushed Stone: Crushed Stone shall be obtained from uniform and durable rock and shall consist of clean, angular fragments of quarried rock, free of objectionable matter and to be as follows:

1. As per MDOT 703.31, Crushed Stone and as follows:

a. The stone, which is similar to railroad ballast, shall meet the following gradation requirements in the entire sample taken from the stockpile at the source:

Sieve	% by Weight Passing
2-1/2 inch	100
2 inch	90-100
1 inch	0-30
3/4	0-5

O. No. 2 Stone: No. 2 Stone shall be uniform and durable rock and shall consist of clean, angular fragments of quarried rock, free of objectionable matter including rounded stone and to be as follows:

1. As per ASTM No.2 material and as follows (Nominal size listed as 2- 1/2" to 1- 1/2")::

a. The gradation of the entire sample shall meet the following gradation requirements:

Sieve	% by Weight Passing
3 inch	100
2-1/2 inch	90-100
2 inch	35-70
1-1/2 inch	0-15
3/4	0-5

P. No. 357 Stone: No. 357 is a class 1 aggregate fill consisting of stone that shall be uniform and durable rock and shall consist of clean, angular fragments of quarried rock, free of objectionable matter including but not limited to rounded stone, silt and clay, and to be as follows:

1. As per ASTM No.357 material and as follows (Nominal size listed as 2" to No.4):

a. The gradation of the entire sample shall meet the following gradation requirements:

Sieve	% by Weight Passing
2-1/2 inch	100
2 inch	95-100
1 inch	35-70
1/2 inch	10-30
No. 4	0-5

Q. No. 57 Stone: No. 57 is a class 1 aggregate fill consisting of stone that shall be uniform and durable rock and shall consist of clean, angular fragments of quarried rock, free of objectionable matter including but not limited to rounded stone, silt and clay, and to be as follows:

1. As per ASTM No.57 material and as follows (Nominal size listed as 1" to No.4):

a. The gradation of the entire sample shall meet the following gradation requirements:

Sieve	% by Weight Passing
1-1/2 inch	100
1 inch	95-100
1/2 inch	25-60
No. 4	0-10
No. 8	0-5

R. No. 67 Stone: No. 67 is a class 1 aggregate fill consisting of stone that shall be uniform and durable rock and shall consist of clean, angular fragments of quarried rock, free of objectionable matter including but not limited to rounded stone, silt and clay, and to be as follows:

1. As per ASTM No.67 material and as follows (Nominal size listed as 3/4" to No.4):

a. The gradation of the entire sample shall meet the following gradation requirements:

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

S. No. 7 Stone: No. 7 is a class 3 aggregate fill consisting of stone that shall be uniform and durable rock and shall consist of clean, angular fragments of quarried rock, free of objectionable matter including but not limited to silt and clay, and to be as follows:

1. As per ASTM No.7 material and as follows (Nominal size listed as 1/2" to No.4):

a. The gradation of the entire sample shall meet the following gradation requirements:

Sieve	% by Weight Passing
3/4 inch	100
1/2 inch	90-100
3/8 inch	40-70
No. 4	0-15
No. 8	0-5

(Note: When specified as No.7 pea gravel; the material may be of rounded stone where specified and is intended to be washed material of an open graded design size consisting of mainly 3/8"-1/4" stone particles)

T. River Rock: River rock shall be durable rounded rock and shall be clean and free of objectionable matter and debris and shall be as follows:

1. River Rock shall be a rounded "rip-rap like" material and as follows:

a. Rock: fragments sufficiently durable to ensure permanence in the structure and the environment in which it is to be used. Rock fragments shall be free from cracks, seams, and other defects that would increase the risk of deterioration from natural causes. The size of the fragments shall be such that no individual fragment exceeds a weight of 150

pounds and that no more than 10 percent of the mixture, by weight, consists of fragments weighing 2 pounds or less each. Specific gravity of the rock shall be a minimum of 2.50. The inclusion of more than trace 1% quantities of dirt, sand, clay, and rock fines will not be permitted.

- b. Filter fabric and bedding shall conform as indicated or as described for regular angular rip rap included specification section 312100 "Earth Moving for Utilities".

2.2 GEOTEXTILE FABRICS

- A. As specified on drawings or in Section 313000, "Sedimentation and Erosion Control Measures"

- 1. Fabric: woven polypropylene separation geotextile, possessing the following characteristics:

Mechanical Properties	Test Method	Unit	Minimum Average Roll Value	
			MD	CD
Grab Tensile Strength	ASTM D 4632	N (lbs)	1402 (315)	1402 (315)
Grab Tensile Elongation	ASTM D 4632	%	12	
Trapezoid Tear Strength	ASTM D 4533	N (lbs)	503 (113)	503 (113)
CBR Puncture Strength	ASTM D 6241	N (lbs)	4005 (900)	
Apparent Opening Size (AOS) *	ASTM D 4751	mm (U.S. Sieve)	0.43 (40)	
Permittivity	ASTM D 4491	sec <sup>-1</sup>	0.05	
Flow Rate	ASTM D 4491	l/min/m <sup>2</sup> (gal/min/ft <sup>2</sup> )	163 (4.0)	
UV Resistance (at 500 hours)	ASTM D 4355	% strength retained	70	

\* ASTM D 4751, AOS is a Maximum Opening Diameter Value

Physical Properties	Test Method	Unit	Typical Value	
Weight	ASTM D 5261	g/m <sup>2</sup> (oz/yd <sup>2</sup> )	203 (6.0)	
Thickness	ASTM D 5199	mm (mils)	0.6 (25)	
Roll Dimensions (width x length)	--	m (ft)	3.8 x 110 (12.5 x 360)	5.3 x 78.7 (17.5 x 258)
Roll Area	--	m <sup>2</sup> (yd <sup>2</sup> )	418 (500)	418 (500)
Estimated Roll Weight	--	kg (lb)	109 (240)	109 (240)

- 2. Acceptable products: Mirafi 600X or approved equal.

PART 3 - EXECUTION

3.1 PROTECTION

- A. Shoring and Sheeting: Provide shoring bracing, underpinning and sheeting where required. In addition to Section XXIII A and B of COE EM-385-1-1, and other requirements of this contract meet the following:
  - 1. Prevent undermining of pavements, foundations and slabs.
  - 2. Slope banks where space permits.
  - 3. Where shoring and sheeting materials remain in place in completed work to prevent settlements or damage to adjacent structures or as directed, backfill the excavation to 3-feet below the

finished grade and remove the remaining exposed portion of the shoring before completing the backfill.

- B. Dewatering: Dispose of surface water, which may accumulate in open excavations, unfinished fills, or other low areas. Remove water by trenching where approved, pumping, or other methods to prevent softening of exposed surfaces. Surface dewatering plan shall include rerouting of any storm water runoff or natural drainage if necessary and shall comply with environmental requirements. Collect and dispose of surface and subsurface water encountered in the course of construction.
- C. Water Removal: Remove water by pumping or other methods to prevent the softening of surfaces exposed by excavation. Before excavating below ground water level, place the dewatering system into operation. Lower the water levels at least one foot below the bottom and side slopes of the excavation. Relieve the hydrostatic pressure in pervious zones below the subgrade elevation in layered soils in order to prevent uplift. Use screens and gravel packs as necessary on the dewatering devices to prevent the removal of fines from the soil.
- D. Operation and Performance: Operate the dewatering system continuously, 24-hours per day, 7-days per week until construction work below existing water levels is complete. Measure and record the performance of the dewatering system at the same time each day by use of observation wells and piezometers installed in conjunction with the dewatering system. After placement of initial slabs and backfill, the water level may be allowed to rise but at no time allow it to rise higher than one foot below the prevailing level of excavation or backfill. Have a back-up pump and system available for immediate use.
- E. Protection and Restoration of Surfaces: Protect newly graded areas from traffic, erosion, and settlements. Repair and reestablish damaged or eroded slopes, elevations or grades and restore surface construction prior to acceptance. Protect existing streams, ditches and storm drain inlets from water-borne soil by means of straw bale dikes, filter fabric dams as indicated on the drawings or as required for good construction practices and to meet all environmental regulations.
  - 1. Disposal of Excavated Material: Dispose of excavated material in such a manner that it will not obstruct the flow of runoff, streams, endanger a partly finished structure, impair the efficiency or appearance of facilities, or be detrimental to the completed work.
  - 2. Disposal of Rock. Remove all excess rock off-site.

### 3.2 SURFACE PREPARATION

- A. Erosion Control: Perform as specified in Section 313000, "Erosion and Sedimentation Control Measures".
- B. Stockpiling Loam: Strip approved loam to a depth of 4 to 6-inches from the site where excavation or grading is indicated and stockpile separately from other excavated material. Stockpiled loam shall be the Contractor's property. Locate loam so that the material can be used readily for the finished grading. Protect and store in segregated piles until needed.
- C. Unsatisfactory Material: Remove organic matter, sod, muck, rubbish, and unsuitable soils under embankments, which are less than 3-feet in thickness and under pavements or slabs on grade. Typical depth of removal of such unsuitable material shall be 18 inches unless otherwise indicated.
- D. Subgrade Proof Rolling: Proofrolling of subgrade soils shall be done only as noted on project drawings and with authorization of the Architect/Engineer. Proof rolling shall be done in the presence of the Architect/Engineer. Perform proof rolling only when weather conditions permit. Do not proof roll wet



or saturated subgrades. Wet or saturated materials degraded by unauthorized proof rolling shall be replaced by the Contractor as directed by the Architect/Engineer at no cost to the Owner. Notify the Architect/Engineer 2-days prior to proof rolling.

3.3 EXCAVATION

- A. Excavate to the contours and dimensions indicated. Keep excavations free from water while construction is in progress. Notify the Architect/Engineer immediately in writing in the event that it becomes necessary to remove rock, hard material, or other material defined as unsatisfactory to a depth greater than indicated and an adjustment in contract price will be considered in accordance with the General Conditions. Refill excavations cut below the depths indicated with granular fill and compact as specified herein. Excavate soil disturbed or weakened by the construction operations or soils softened from exposure to weather. Refill with granular fill and compact as specified herein.
- B. Excavations for Structures and Spread Footings: Excavate to depth indicated on the drawings. If excavation is deeper than indicated on the drawings, then backfill with compacted structural fill to top of subgrade elevation prior to form placement. Lean concrete shall be used in place of compacted structural fill if backfill is over excavated sound rock as indicated on drawings.
- C. Rock: Remove rock to the elevations indicated by drilling, blasting, or approved methods in such a manner that will leave foundation rock in an unshattered and solid condition. Roughen level surfaces and cut sloped surfaces into benches for bonding with concrete. Protect shale from conditions causing decomposition along joints or cleavage planes and other types of erosion. Removal of rock beyond the lines and grades indicated unless previously authorized by the Architect/Engineer will not be grounds for a claim for additional payment.
  - 1. Use of Explosives: When explosives are necessary the Contractor shall use the utmost care not to endanger life or property, including new work. The Contractor shall be responsible for all damage and claims resulting from the use of explosives.
    - a. Blasting activities should be done in conformance with the "U.S. Department of Interior Rules 816.61-68" and the Blasting Guidance Manual", Office of Surface Mining, Reclamation and Enforcement, U.S. Department of Interior (OSMRE).
    - b. A blasting plan shall be prepared by the blasting contractor PRIOR to the commencement of the blasting operation. The blasting plan shall include sketches of the proposed drill patterns, delay periods, and decking, and shall indicate the type and amount of explosives to be used, and the location and general description of the structures to be protected.
    - c. Design standards for the blasting plan shall be as follows:
 

SOUND	
Lower Frequency Limit (Hz)	Max Level (dB)
0.1 or Lower	134 Peak
2 or Lower	133 Peak
6 or Lower	129 Peak
SEISMIC	
Distance from Blast (ft)	Max PPV in/sec*
0 to 300	1.25
301-5000	1.00
>5000	0.75

\*at structures not owned by the Owner
    - d. A blasting plan shall be prepared by the blasting contractor and the plan shall be published in a newspaper of general circulation in the locality of the site at least 10 but no more than 30 days prior to commencement of the blasting. Copies of the schedule shall

be disturbed to local governments and public utilities and to each local residence within 1/2 mile of the site and shall include the following:

- 1) \*Name, address and telephone number of blaster
  - 2) \*Identification of the specific areas in which blasting will take place.
  - 3) \*Dates and time of blasts
  - 4) \*Methods to be used to control access to the area in which blasting is anticipated.
- e. The Owner shall provide the Engineer with a photographic/video survey of every structure within 500 feet of the blast zone including but not limited to: building foundations, sign bases, storm and sewer manholes. A survey will be made of each building with the use of a video camera and digital still camera (5 megapixel min.) where applicable. A standard pre-blast form will be utilized and placed on file when the survey is complete.
- f. Prior to initiation of blasting, wells within the 500-foot radius of anticipated blasting areas will be sampled and tested from coliform bacteria, nitrate, fluoride, chloride, hardness, copper, iron, and if iron is detected, pH and manganese. Records of the water test results will be placed on file for future reference. This test shall be provided by the Owner.
- g. Any site where there are electric blasting caps or where explosive charges are being placed or have been placed shall be designated a Blasting Zone. A Blasting Zone shall be marked by approved sign in accordance with MUTCD. The signs shall be conspicuously placed at each end of the Blasting Zone and shall remain in place only while blasting conditions are in effect and shall be removed after the blast and after all caps and explosives have been removed from the area.
- h. All persons and adjacent property within the danger zone of blasting operations shall be warned by the Contractor and no blasting shall be done until the zone is cleared. Sufficient flaggers, furnished by the Contractor, shall be stationed outside the danger zone to stop all approaching traffic during the blasting operations.
- i. Before blasting, the Contractor shall have adequate equipment available to remove debris from the traveled way to restore normal traffic flow with a minimum of delay.
- j. A seismograph shall be set up at buildings which lie within a 300 foot radius of the blasting activities. The seismograph shall have a Seismic Frequency Range of 2 to 150 Hertz and a sound frequency of 2-500 Hz. It shall be capable of recording longitudinal, transverse, vertical and resultant peak particle motion. The following information shall be printed out for each blast:
- 1) Instrument Type
  - 2) Instrument Calibration Date
  - 3) Date and Time of Blast
  - 4) Instrument Location
  - 5) Distance to Blast
  - 6) Resultant Peak Particle Velocity
  - 7) Seismograph Operator
  - 8) Airblast (dB)
- k. The seismograph shall be used to determine the air blast and peak article velocity of each shot in the area where the seismograph is set. Peak particle velocities recorded within the 300-foot radius which exceed 1.25 in/sec. shall be reported to the blaster and the Owner as soon as the record is available.
- l. Watchmen shall be provided by the Contractor during the loading period and until the charges have been exploded.

- D. Shoring and Sheeting: Where required, shore and sheet excavations as described in the submitted plan, with various members sized and arranged to prevent injury to persons and damage to structures. Also arrange shoring and sheeting to preclude injurious caving during removal.

### 3.4 BORROW MATERIALS

- A. Select borrow materials to meet requirements and conditions of the particular fill or backfill materials to be used. Obtain borrow materials from sources off of Owner property.

### 3.5 FILLING AND BACKFILLING

- A. Subgrade Preparation: Step, bench, or break up sloped surfaces steeper than one vertical to 4-horizontal so that the fill material will bond with or be securely keyed to the existing material. Compact with equipment well suited to the soil being compacted. Moisten or aerate material as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used.
- B. Fill and Backfill Beside Structures: Place required backfill material adjacent to structures and compact in a manner that prevents wedging action or eccentric loading upon or against the structures. Step or serrate slopes bounding or within areas to be backfilled to prevent sliding of the fill. Moisten or aerate material as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used. Do not place material on surfaces that are muddy, frozen, or contain frost. Do not use equipment for backfilling operations or for the formation of embankments against structures that will overload the structure. Backfilling against concrete will be done only after the concrete has attained at least 70% of its 28-day compressive strength and approval has been obtained from the Architect/Engineer.
- C. Structural Fill: Place structural fill under spread footing, concrete slabs not pile supported, and pavements in loose lifts of 9-inches maximum. Do not place material on surfaces that are muddy, frozen, or contain frost. Compact with equipment well suited to the soil being compacted. Moisten or aerate material as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used. Compact each lift as specified herein before placing the overlying lift. Compaction shall be accomplished continuously over the entire area. Sufficient passes shall be made to ensure that specified density is obtained.
- D. General Site Fill: Construct site fill, at the locations and to lines and grades indicated on the drawings. Use only approved materials in constructing fill upon the prepared subgrade. Place satisfactory material in horizontal lifts not exceeding 18-inches in loose depth. Do not place material on surfaces that are muddy, frozen, or contain frost. Compact with equipment well suited to the soil being compacted. Moisten or aerate material as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used. Compact each lift as specified before placing the overlying lift.
- E. Final Backfill for Utilities: Construct backfill (final backfill) and general site fill for storm drains, manholes, utility lines, and other utility appurtenances using the material and compaction requirements specified herein for the adjacent or overlying work. Bedding and initial backfill requirements are specified in Section 312100, "Earthwork for Utilities". Backfilling against concrete shall be done only after the concrete has attained at least 70% of its 28-day compressive strength and approval has been obtained from the Architect/Engineer.

- F. Fill for Coarse Aggregate Under Slab: Place material over compacted subgrade. Compact and test the material. Then install the vapor barrier. Then install, compact and test the upper layer of material.
- G. Weather Limitations: Fill and backfill shall not be constructed when weather conditions detrimentally affect the quality of the finished course. Place fill and backfill only if the atmospheric temperature is above freezing in the shade and is rising. Do not construct fill and backfill in the rain or on saturated subgrades. If weather conditions are windy, hot or arid, with high rate of evaporation, schedule the placement in cooler portions of the day and furnish equipment to add moisture to the fill or backfill during and after placement.

### 3.6 SUBGRADE GEOTEXTILE FABRIC (For Sloped/Flat Surfaces)

- A. Place synthetic fiber geotextile fabric as indicated on drawings and as specified directly on prepared subgrade free of vegetation, stumps, and rocks larger than 2-inches diameter and other debris, which may puncture or otherwise damage the fabric. Repair damaged fabric by placing an additional layer of fabric to cover the damaged area a minimum of Two (2)-feet overlap in all directions. Overlap fabric at joints a minimum of two feet. Obtain approval of geotextile fabric installation before placing fill or backfill. Place fill or backfill on fabric in the direction of overlaps and compact as specified herein. Follow manufacturers recommended installation procedures.

### 3.7 COMPACTION

- A. Compact each layer or lift of material specified so that the in-place density tested is not less than the percentage of maximum density specified. General fill below grassed areas shall be compacted to at least 90% of its maximum dry density as determined by ASTM D1557. Fill materials for all other areas shall be compacted to at least 95% of ASTM D1557 unless otherwise noted.

### 3.8 RESTORATION

- A. Site Grading: Grade to finished grades indicated within 0.10-foot. Grade areas to drain water away from structures. Existing grades, which are to remain but are disturbed by the Contractor's operations shall be restored as directed by the Architect.
- B. Finishing Subgrades Under Structures and Pavements: Finish the surface of top lift of fill or top of subgrade to the elevation and cross section indicated on the drawings. Finished surface shall be smooth and of uniform texture. Lightly scarify or blade the finished surface to bring the finished surface to within 0.05-foot of the indicated grade and to eliminate imprints made by compaction and shaping equipment. Surface shall show no deviations in excess of 3/8-inch when tested with a 10-foot straightedge.
- C. Disposition of Surplus Material: Surplus or other soil material not required or suitable for filling, backfilling, or embankment shall be removed from Owner's property. Comply with the requirements of applicable environmental requirements.
- D. Protection of Surfaces: Protect newly graded areas from traffic, erosion, and settlements that may occur in compliance with all applicable environmental regulations and as specified in the paragraph entitled "Protection and Restoration of Surfaces". Repair or reestablish damaged grades, elevations, or slopes prior to acceptance of work.

3.9 FIELD QUALITY CONTROL

- A. All testing shall be performed by a qualified Independent Testing Laboratory acceptable to the Engineer and General Contractor at the Owner's expense unless otherwise indicated (see Section 014000 - Quality Requirements).
- B. In addition to the above tests, the Independent Testing Laboratory will perform additional density tests at locations and times requested by the Engineer.
- C. Additional density testing will be required by the Engineer if the Engineer is not satisfied with the apparent results of the Site Contractor's compaction operation.
  - 1. If the test results fail to meet the requirements of these specifications, the General 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 General Contractor.
  - 2. If the test results pass and meet the requirements of these Specifications, the cost of the initial testing service will be borne by the Owner, but no additional cost will be considered for delays in the performance of the work.
- D. Tests: Test fill, granular base, backfill, granular subbase, granular fill and coarse aggregate as specified herein and as follows:

- 1. For gradation (sieve analysis) fine and course, as per ASTM C136 and D422.
- 2. For moisture density as per ASTM D1557.

Also perform tests as per Table IV.

For areas under slab on grade: First, nuclear density test the granular fill material under the vapor barrier as per ASTM D6938. Then density test the granular fill which is installed between the slab and the vapor barrier.

TABLE IV  
TESTS

Material Type	Location of Material	Minimum Field Density Test Frequency
Fills and Backfills	Structures (adjacent to)	One test per side of structure per lift.
Controlled Fills	Primary roadways and structures (under)	One test per lift per 2,000 sq. ft.
Embankments of Borrow	Any	One test per lift per 10,000 sq. ft.
Borrow	Any	One test per lift per 10,000 sq. ft.

—End of Table IV—

- 3. If the gradation test results fail to meet the requirements of the specifications, or if the sample is noticeably different when delivered to the site, or if the stockpile source changes either before or during construction, or if compaction of the material is unable to meet the compaction requirements, the General Contractor shall undertake whatever action is necessary, at no additional cost to the Owner, to obtain the required gradation. The cost of the retesting will be paid by the General Contractor.

- a. Additionally the contractor reserves the right to test the material for proper gradation in advance of the project's notice to proceed, however the owner reserves the right to request the material be retested once the materials has arrived on site, especially including but not limited to if one of the following has occurred; more than 3 months have passed since the initial material testing had been done, if the material arriving on site for placement appears to not meet spec, if the supplier stockpile has been reworked or if the stockpile supplier has changed, or if mixing of on-site stockpiles has occurred, or other similar occurrences which may affect the products integrity or as noted above. The contractor incurs the cost of this additional testing.
- E. Structural Fill: Method of in-place density tests shall be in accordance with paragraph "Tests". Acceptance of the compacted material shall be determined in each location by the results of a minimum of two consecutive tests. The average of two tests shall equal or exceed the specified density. The location of the tests for each compacted layer will be randomly selected by the Architect/Engineer.
1. Acceptance: The average of field density test results in each fill area shall meet or exceed the specified density requirements and no individual test shall be more than 3% below specified density.

END OF SECTION 312000

SECTION 312100 – EARTH MOVING FOR UTILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes performing site preparation, excavation, borrow, filling, backfilling, compaction, compaction testing, and finish grading necessary to construct to the specified finished grades indicated for utilities. The work covered by this section shall terminate at a point approximately 10 feet from the building, unless otherwise indicated on the drawings.
- B. Related Sections include the following:
  1. Division 01 Section "Temporary Facilities and Controls" for temporary utilities, temporary construction and support facilities, temporary security and protection facilities procedures.
  2. Division 01 Section "Temporary Tree and Plant Protection" for protecting trees remaining on-site that are affected by site operations.
  3. Division 32 Section "Turf and Grasses, Plants" for finish grading including preparing and placing planting soil mixes and testing of topsoil material.
  4. Division 31 Section "Earth Moving for Pavements and Structures" for soil materials, excavating, backfilling, and site grading.
  5. Division 31 Section "Dewatering" for requirements and guidelines for dewatering procedures.
  6. Division 31 Section "Excavation Support and Protection" for requirements and guidelines for dewatering procedures.

1.3 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C33	2008 Standard Specification for Concrete Aggregates
ASTM D698	2007 (Rev. 1) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft <sup>3</sup> (600 kN-m/m <sup>3</sup> ))
ASTM D1556	2007 Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D1557	2007 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft <sup>3</sup> (2,700 kN-m/m <sup>3</sup> ))

ASTM D1586	2008 (Rev. A) Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils
ASTM D6938	2008 Rev. A) Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
ASTM D4253	2000 (Rev. 2006) Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table
ASTM D4254	2000 (Rev. 2006, E1) Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density

## ARMY CORPS OF ENGINEERS (COE) WATERWAYS EXPERIMENT STATION

COE EM-385-1-1 2008 Safety and Health Requirements Manual

## FEDERAL SPECIFICATIONS (FS)

FS UU-P-268 1977 (Rev. G) (Amd. 3) Paper, Kraft, Wrapping

## STATE OF MAINE, DEPARTMENT OF TRANSPORTATION

State of Maine, Department of Transportation MDOT Standard Specifications, 12/2002 and amendments

- B. Materials and workmanship specified herein with reference to MDOT State Standard shall be in accordance with the referenced articles, sections, and paragraphs of the standard except that contractual and payment provisions do not apply.

## 1.4 DEFINITIONS

- A. Backfill: Material used in refilling a cut, trench or other excavation.
- B. Cohesive Materials: Soils classified by ASTM D2487 as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM will be identified as cohesive only when fines have a plasticity index greater than zero.
- C. Cohesionless Materials: Soils classified by ASTM D2487 as GW, GP, SW, and SP. Materials classified as GM and SM will be identified as cohesionless only when the fines have a plasticity index of zero.
- D. Compaction: The process of mechanically stabilizing a material by increasing its density at a controlled moisture condition. "Degree of Compaction" is expressed as a percentage of the maximum density obtained by the test procedure described in ASTM D698 or ASTM D1557 for general soil types or ASTM D4253 or ASTM D4254 (Relative Density) for isolated cohesionless materials, abbreviated in this specification as " \_\_\_\_\_ percent ASTM D1557 maximum density."
- E. Pipe Bedding: A dense, well-graded aggregate mixture of sand, or coarse aggregate, as indicated (mixed individually, in combination with each other, or with suitable binder soil) placed on a subgrade to provide a suitable foundation for pipe.
- F. Hard Material: Weathered rock, dense consolidated deposits, or conglomerate materials (excluding man made materials such as concrete) which are not included in the definition of "rock" but which usually require the use of heavy excavation equipment, ripper teeth, or jack hammers for removal.



Material indicated in the soil boring logs as having a standard penetration resistance as determined by ASTM D1586 between 60 and 120 blows per foot is arbitrarily defined herein as "Hard Material".

- G. In-Situ Soil (Undisturbed Earth): Existing in place soil.
- H. Lift: A layer (or course) of soil placed on top of subgrade or a previously prepared or placed soil in a fill or backfill.
- I. Porous Fill: A granular soil material having a large void ratio when placed and compacted, allowing a free flow of fluid to or from the surrounding soil, with no more than 5% of the material passing the 1/2-inch No. 100 Sieve.
- J. Refill: Material placed in excavation to correct overcut in depth.
- K. Rock: Solid homogeneous interlocking crystalline material with firmly cemented, laminated, or foliated masses or conglomerate deposits, neither of which can be removed without systematic drilling and blasting, drilling and the use of expansion jacks or feather wedges, or the use of backhoe-mounted pneumatic hole punchers or rock breakers; also large boulders, buried masonry, or concrete other than pavement exceeding three (3) cubic yard in volume. Removal of "hard material" will not be considered rock excavation because of intermittent drilling and blasting that is performed merely to increase production. Material identified in the soil boring logs as having a standard penetration resistance as determined by ASTM D1586 greater than 120 blows per foot is arbitrarily defined herein as "Rock."
- L. Loam: In natural or undisturbed soil formations, the fine-grained, weathered material on the surface or directly below any loose or partially decomposed organic matter. Loam may be a dark-colored, fine, silty, or sandy material with a high content of well decomposed organic matter, often containing traces of the parent rock material. Gradation and material requirements specified herein apply to all Loam references in this contract. The material shall be representative of productive soils in the vicinity.
- M. Unyielding Material: Rock rib, ridge, rock protrusion, or soil with cobbles in the trench bottom requiring a covering of finer grain material or special bedding to avoid bridging in the pipe or conduit.
- N. Unsatisfactory Material: In-Situ soil or other material, which can be identified as having insufficient strength characteristics or stability to carry intended loads in the trench without excessive consolidation or loss of stability. Also backfill material, which contains refuse, frozen material, large rocks, debris, soluble particles, and other material, which could damage the pipe or cause the backfill not to compact. Materials classified as PT, OH, or OL by ASTM D2487 are unsatisfactory.
- O. Unstable Material: Material in the trench bottom, which lacks firmness, to maintain alignment and prevent joints from separating in the pipe, conduit, or appurtenance structure during backfilling. This may be material otherwise identified as satisfactory which has been disturbed or saturated.

#### 1.5 SUBMITTALS

- A. Factory Test Reports (produced within the past year)
  - 1. Trench backfill material tests
  - 2. Pipe bedding material tests

#### 1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver and store materials in a manner to prevent contamination, segregation, freezing, and other damage. Store synthetic fiber filter fabric to prevent exposure to direct sunlight.

#### 1.7 CRITERIA FOR BIDDING

- A. Base bids on the following criteria:
  1. Surface elevations are as indicated. If not indicated, verify in the field.
  2. Pipes or other man-made obstructions, other than those indicated, could be encountered. Field verify existing conditions.
  3. The character of the material to be excavated or found in the trench is as indicated. If not indicated, field verify. In addition to rock as indicated and as defined in paragraph entitled "Definitions," hard material in the form of conglomerate clay, sand, silt, gravel, volcanic tuff, or consolidated calcareous marine sediments could be encountered. Remove such hard material to the lines and grades indicated regardless of the hardness or quantity. Such material shall not be considered rock.
  4. Removal of rock to the lines and grades as required shall be done at the unit price on the bid form for "Mass or Trench Excavation". The unit price shall include all of the site contractors' costs associated with rock removals including but not limited to: watchmen; signage; video/preblast surveys; water quality samples.
  5. Ground water elevations indicated are those existing at the time subsurface investigations were made and do not necessarily represent ground water elevation at the time of construction.
  6. Borrow material, Suitable backfill, and bedding material in the quantities required is not available at the project site.
  7. Blasting will be permitted. Obtain /Architect/Owner's prior permission.

#### 1.8 PROTECTION

- A. Utilities: Movement of construction machinery and equipment over pipes and utilities during construction shall be at the contractor's risk. Perform work adjacent to utilities as indicated in accordance with procedures outlined by utility company. Excavation made with power-driven equipment is not permitted within two feet of known utility or subsurface construction. For work immediately adjacent to or for excavations exposing a utility or other buried obstruction, excavate by hand. Start hand excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured. Support uncovered lines or other existing work affected by the contract excavation until approval for backfill is granted by the Architect/Engineer. Report damage to utility lines or subsurface construction immediately to the Architect/Engineer.

#### 1.9 ADDITIONAL REQUIREMENTS

- A. Local Standards: All water line and sewer work shall meet local municipal standards, and local utility company standards; furnish written evidence that such standards have been met.
- B. Road Crossings: Contractor to obtain and pay for all required road crossing permits (including MDOT and local areas when required). Perform all work for street resurfacing which is required for such permits.

### PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. Provide soil materials as specified below free of debris, roots, wood, scrap material, vegetable matter, refuse, soft unsound particles, ice, or other deleterious and objectionable materials.
- B. Backfill: Bring trenches to grade indicated on the drawings using material excavated on the site of this project. When at all possible provide borrow as necessary. Borrow shall be in accordance with backfill requirements of this paragraph and approved for use by the Architect/Engineer prior to placement. This material will be considered unclassified and no testing other than for compaction will be required before use as backfill classified as GW by ASTM D2487 with a maximum particle size of 3-inches conforming to gradation MDOT 703.06.
- C. Special Backfill for Structures and Pavements: Backfill trenches under roads, structures, and paved areas as specified in Section 312000, "Earth Moving For Structures and Pavements" with material conforming to MDOT 703.06.
- D. Sand: Sand shall consist of natural sand or, when approved by the Architect, other inert materials with similar characteristics or combinations thereof, having strong, durable particles. Fine aggregate from different sources of supply shall not be mixed or stored in the same pile nor used alternately in the same class of construction or mix without permission of the Architect. All sand shall be free from injurious amounts of organic impurities. Should the sand, when subjected to the calorimetric test for organic impurities, AASHTO T21 (ASTM C40), produce a color darker than the reference standard color solution (laboratory designation Plate III), it shall be rejected. The sand shall be well graded from coarse to fine and shall meet the following grading requirements when tested according to AASHTO T11 and AASHTO T27.

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves
3/8 inch	100
No. 4	95-100
No. 8	70-95
No. 16	45-80
No. 30	25-55
No. 50	10-30
No. 100	2-10
No. 200	0-5

- E. Backfill for Underdrainage Systems - Refer to Section 334200.
- F. Borrow: Provide materials meeting requirement for general site fill. Obtain borrow materials in excess of those furnished from excavations specified herein from sources off Owner property.
- G. Pipe Bedding: Provide material for pipe bedding as indicated.

2.2 GENERAL SITE FILL, BACKFILL AND EMBANKMENT MATERIAL

- A. Provide a soil material from the site or borrow that can be readily compacted to the specified densities. Materials shall be free of organic material, peat, clay, and other similar soft materials.

2.3 LOAM

- A. Loam shall be as covered in Section 329200 - "Turf and Grasses."

2.4 GRANULAR FILL

- A. Granular fill shall be as covered in Section 312000, "Earth Moving for Structures and Pavements".

2.5 CONCRETE PIPE CRADLES (THRUST BLOCKS) OR ARCHES

- A. Provide concrete pipe, cradles (thrust blocks) where indicated on the drawings and where unstable conditions are encountered conforming to lines and dimensions indicated. Provide concrete in accordance with Section 033000, "Cast-In-Place Concrete." with the concrete having a 28-day compressive strength of 3,000 psi minimum.

2.6 BURIED WARNING AND IDENTIFICATION TAPE

- A. Polyethylene plastic and metallic core or metallic-faced, acid- and alkali-resistant, polyethylene plastic warning tape manufactured specifically for warning and identification of buried utility lines. Provide tape on rolls, 3-inch-minimum width, color coded as specified below for the intended utility with warning and identification imprinted in bold black letters continuously over the entire tape length. Warning and identification to read, "CAUTION, BURIED (intended service) LINE BELOW" or similar wording. Color and printing shall be permanent, unaffected by moisture or soil. Typical Warning Tape Color Codes (Refer to drawings for type needed)

Yellow:	Electric
Yellow:	Gas, Oil, Dangerous Materials
Orange:	Telephone and Other Communications
Blue:	Water Systems
Green:	Sewer Systems
White:	Steam Systems
Gray:	Compressed Air

- B. Warning Tape for Metallic Piping: Acid and alkali-resistant polyethylene plastic tape conforming to the width, color, and printing requirements specified above. Minimum thickness of tape shall be 0.003 inch. Tape shall have a minimum strength of 1500 psi lengthwise, and 1250 psi crosswise, with a maximum 350 percent elongation.
- C. Detectable Warning Tape for Non-Metallic Piping: Polyethylene plastic tape conforming to the width, color, and printing requirements specified above. Minimum thickness of the tape shall be 0.004 inch. Tape shall have a minimum strength of 1500 psi lengthwise and 1250 psi crosswise. Tape shall be manufactured with integral wires, foil backing, or other means of enabling detection by a metal detector when tape is buried up to 3 feet deep. Encase metallic element of the tape in a protective jacket or provide with other means of corrosion protection.

2.7 MATERIAL FOR RIP-RAP

- A. Bedding material, Filter fabric, and rock conforming to these requirements and as indicated.
- B. Bedding Material: Consisting of sand, gravel, or crushed rock, well graded, with a maximum particle size of 2 inches. Material shall be composed of tough, durable particles. Fines passing the No. 200 standard

sieve shall have a plasticity index less than six. Refer to Section 312000, "Earth Moving for Structures and Pavements" for stone materials and bedding materials requirements.

- C. Rock: Rock fragments sufficiently durable to ensure permanence in the structure and the environment in which it is to be used. Rock fragments shall be free from cracks, seams, and other defects that would increase the risk of deterioration from natural causes. The size of the fragments shall be such that no individual fragment exceeds a weight of 150 pounds and that no more than 10 percent of the mixture, by weight, consists of fragments weighing 2 pounds or less each. Specific gravity of the rock shall be a minimum of 2.50. The inclusion of more than trace 1% quantities of dirt, sand, clay, and rock fines will not be permitted. The rock shall be either crushed rock or angular quarried stone. No round or thin, flat stones will be permitted. Rock shall be in its angular state nearly rectangular in cross-section as practicable.
- D. Refer to Section 313000, "Sediment and Erosion Control Measures" for filter fabric requirements.

## 2.8 HEAVY RIP RAP

- A. Shall conform to Maine DOT 703.28 and as follows
  - 1. Stones shall consist of sound, durable rock, resistant to the action of air and water. Either field stone or rough, unhewn quarry stone may be used. The exposed stones shall be angular. Round or thin, flat stones will not be permitted. Stones shall have a minimum weight of 500 pounds each and at least 50% of the stones, by volume, shall exceed 1,000 pounds.
  - 2. Filter fabric and bedding shall conform as indicated or as described for regular rip rap included in this specification section.

## 2.9 FLOWABLE FILL

- A. Description: This section specifies the requirements for flowable fill used for trenches, support for pipe structures, culverts, utility cuts and other works where cavities exist and where firm support is needed for pavements and structural elements. Flowable fill may also be used to fill abandoned water and sewer lines, abandoned fuel tanks, and where any granular compacted fill is needed as is approved by the Engineer or where otherwise shown on the plans or as specified.
- B. Consisting of the placement of a flowable material consisting of portland cement (Type I, II, or III ASTM C150) , fly ash (ASTM C618 ) and/or sand with an expected 28 day unconfined compressive strength of more than 50 pounds per square inch but less than 100 pounds per square inch. Fine aggregate shall be natural sand or sand manufactured from stone, gravel or air-cooled blast furnace slag. The mixture shall consist of: 50 lbs/CY Cement; 250 lbs/CY Fly Ash; 2,910 lbs/CY sand; and 500 lbs/CY water. The sand shall be fine enough to stay in suspension in the mixture to ensure proper flow. These mixtures of materials are expected to yield approximately one cubic yard of material of a flowable consistency. Small adjustments in the amounts of the materials in a mix may be required to achieve the final product. No additional compensation for a change in the material blends shall be allowed. The Contractor shall make one or more one cubic meter (cubic yard) trial batches at different water contents to ensure a flowable material. The mixture is too dry when cracks develop in the fixture as it flows into place.
- C. Adjustments of the proportions shall be based on maintaining the total absolute volume. In order to expedite the settlement of a mixture without entrained air, it may be necessary for bleed water to appear on the surface immediately after the material is struck off. A delay in bleeding indicates there are too many fines in the mixture. The fly ash quantity may be reduced in increments of 50 pounds until

the mixture is bleeding freely. Approximately 60 pounds of sand shall be added to replace each 50 pounds increment of fly ash to maintain the original yield.

- D. Other mixes may be submitted to the Architect/ Engineer for approval. The Contractor shall submit the mix design and test data from an independent test lab 30 days prior to the intended usage for approval. All alternate mixes shall have an unconfined compressive strength between 50 and 100 pounds per square inch at 28 days when tested in accordance with ASTM D 4832. The long term 12 month unconfined compressive strength shall be less than 100 pounds per square inch.
- E. The final mix shall have the required strength, fill the voids of the intended usage and set up within 12 hours. The proportioning, yield, consistency, workability, compressive strength and all other requirements are the sole responsibility of the Contractor.

## PART 3 - EXECUTION

### 3.1 PROTECTION

- A. Shoring and Sheeting: Provide shoring bracing, underpinning and sheeting where indicated or where required to perform work. In addition to Section XXIII A and B of COE EM-385-1-1, include provisions in the shoring and sheeting plan that will accomplish the following:
  - 1. Prevent undermining of pavements, foundations and slabs.
  - 2. Prevent slippage or movement in banks or slopes adjacent to the excavation.
  - 3. When used, allow for the abandonment of shoring and sheeting materials in place in critical areas as the work is completed. In these areas, backfill the excavation to within 3 feet of the finished grade and remove the remaining exposed portion of the shoring before completing the backfill.
- B. Dewatering: Plan for and provide the structures, equipment, and construction for the collection and disposal of surface and subsurface water encountered in the course of construction.
- C. Water Removal: Remove water by pumping or other methods to prevent the softening of surfaces exposed by excavation, prevent hydrostatic uplift, and provide a stable trench condition for installation of the utility. Use screens and gravel packs or other filtering systems on the dewatering devices to prevent the removal of fines from the soil.
- D. Operation and Performance: Operate the dewatering system continuously 24 hours a day, 7 days per week until construction work below existing water levels is complete. Measure and record the performance of the dewatering system at the same time each day with observation wells and piezometers installed in conjunction with the dewatering system. After placement of the pipe or conduit and the initial backfill, the water level may be allowed to rise but at no time allow it to rise higher than one foot below the prevailing level of excavation or backfill. Have a back-up pump and system available for immediate use.
  - 1. Structures and Surfaces: Protect newly backfilled areas and adjacent structures, slopes, or grades from traffic, erosion settlement, or any other damage. Repair and reestablish damaged or eroded grades and slopes and restore surface construction prior to acceptance. Protect existing streams, ditches, and storm drain inlets from water-borne soil by means of straw bale dike as indicated on the contract drawings and as required for good construction practices.

### 3.2 SURFACE PREPARATION

- A. Stockpiling Loam: Strip suitable soil from the site where excavation or grading is indicated and stockpile separately from other excavated material. Material unsuitable for use as loam shall be stockpiled and used for backfilling. Locate loam so that the material can be used readily for the finished grading. Where sufficient existing loam conforming to the material requirements is not available on site, provide borrow materials suitable for use as loam. Protect loam and keep in segregated piles until needed.
- B. Cutting Pavement and Curbs: Saw cut with neat, parallel, straight lines one foot wider than trench width on each side of trenches and one foot beyond each edge of pits. When the saw cut is within three (3) feet of an existing joint, remove pavement to the existing joint.

### 3.3 GENERAL EXCAVATION AND TRENCHING

- A. Keep excavations free from water while construction is in progress. Notify the Architect immediately in writing if it becomes necessary to remove rock or hard, unstable, or otherwise unsatisfactory material to a depth greater than indicated. Make trench sides as nearly vertical as practicable except where sloping of sides is allowed. Sides of trenches shall not be sloped from the bottom of the trench up to the elevation of the top of the pipe, conduit, or duct. Excavate ledge rock, boulders, and other unyielding material to an overdepth at least 6 inches below the bottom of the pipe, conduit, or duct and appurtenances unless otherwise indicated or specified. Overexcavate soft, weak, or wet excavations. Use bedding material placed in 6-inch-maximum layers to refill overdepths to the proper grade. At the Contractor's option, the excavations may be cut to an overdepth of not less than 4 inches and refilled to required grade as specified. Grade bottom of trenches accurately to provide uniform bearing and support for each section of pipe, conduit, duct, structure on undisturbed soil, or bedding material as indicated or specified at every point along its entire length except for portions where it is necessary to excavate for bell holes and for making proper joints. Dig bell holes and depressions for joints after trench has been graded. Dimension of bell holes shall be as required for properly making the particular type of joint to ensure that the bell does not bear on the bottom of the excavation. Trench dimensions shall be as indicated or as required to properly perform the work.
- B. Shoring and Sheet piling: Shore and sheet excavations as described in the plan submitted with various member sizes arranged to prevent injury to persons and damage to structures. Arrange shoring and sheet piling to preclude injurious caving during removal. Obtain approval from the Architect prior to removing shoring, sheet piling, or bracing in excavations adjacent to on-grade slabs, foundations, or other structural elements.

### 3.4 BEDDING

- A. Of materials and depths as indicated or specified for utility lines and utility line structures. Place bedding in 6-inch- maximum loose lifts. Provide uniform and continuous support for each section of structure except at bell holes or depressions necessary for making proper joints.
- B. Concrete Cradles: Specified in lieu of other types of bedding for a particular type of pipe material, shall be as specified.

### 3.5 BURIED WARNING AND IDENTIFICATION TAPE

- A. Install tape in accordance with manufacturer's recommendations except as modified herein. Bury tape 12 inches below finished grade; under pavements and slabs, bury tape 6 inches below top of subgrade.

### 3.6 BACKFILLING

- A. Construct backfill in two operations (initial and final) as indicated and specified in this section. Place initial backfill in 6-inch-maximum loose lifts to one foot above pipe, conduit, or duct unless otherwise specified. Ensure that initially placed material is tamped firmly under pipe haunches. Bring up evenly on each side and along the full length of the pipe, conduit, or duct structure. Ensure that no damage is done to the utility or its protective coating. Place the remainder of the backfill (final backfill) in 9-inch-maximum loose lifts unless otherwise specified. Compact each loose lift as specified in the paragraph entitled "General Compaction" before placing the next lift. Do not backfill in freezing weather or where the material in the trench is already frozen or is muddy, except as authorized. Provide a minimum cover from final grade as indicated. Where settlements greater than the tolerance allowed herein for grading occur in trenches and pits due to improper compaction, excavate to the depth necessary to rectify the problem, then backfill and compact the excavation as specified herein and restore the surface to the required elevation. Coordinate backfilling with testing of utilities. Examples of testing that shall be complete before final backfilling are as follows: water distribution, storm drainage, sanitary sewer, gas distribution systems. Provide buried warning and identification tape installed in accordance with the manufacturer's recommendation.

### 3.7 COMPACTION

- A. Use hand-operated, plate-type, vibratory, or other suitable hand tampers in areas not accessible to larger rollers or compactors. Avoid damaging pipes and protective pipe coatings. Compact material in accordance with the following unless otherwise specified. If necessary, alter, change, or modify selected equipment or compaction methods to meet specified compaction requirements.
- B. Compaction of Material in Subcuts or Overexcavations: In rock, compact to 95 percent of ASTM D1557 maximum density. In soft, weak, or wet soils, tamp refill material to consolidate to density of adjacent material in trench wall. In stable soils, compact to 90 percent of ASTM D1557 maximum density.
- C. Compaction of Pipe and Conduit Bedding: In rock, compact to 95 percent and in soil, compact to 90 percent of ASTM D1557 maximum density.
- D. Compaction of Backfill: Compact initial backfill material surrounding pipes, cables, conduits, or ducts, to 90 percent of ASTM D1557 maximum density except where bedding and backfill are the same material. Where bedding and backfill are the same material, compact initial backfill to the density of the bedding. Under areas to be seeded or sodded, compact succeeding layers of final backfill to 85 percent of ASTM D1557 maximum density. For utilities under highway right-of-way, structures and pavements compact succeeding layers of final backfill as specified under paragraph entitled "Special Earthwork Installation Requirements" or compact succeeding layers of final backfill as specified under section 312000 "Earthwork for Structures and Pavements", whichever is the more stringent.
- E. Flowable Fill Placement: Sufficient mixing capacity and delivery equipment shall be provided for the material to be placed without interruption as much as practical. Flowable fill shall be produced and delivered using standard concrete construction equipment and practices. The mixture shall be discharged within 2.5 hours after the water is added. Placing flowable fill shall be by chute, pumping, or other method approved by the Engineer into the space of the plan intended usage. The fill material shall be brought up uniformly to the fill line shown on the plans or as directed by the Architect/Engineer. Placing of the other fill material over low strength mortar backfill material may commence as soon as the surface water is gone or as directed by the Architect/Engineer. The Architect/Engineer reserves the right to reject the mix if a flowable mixture is not produced.



Before placing the low strength mortar backfill as backfill for conduit or sleeves, the Contractor shall secure the conduit or sleeve to prevent it from floating during placement of the flowable material.

Flowable fill limitation of operation: No flowable fill shall be placed on frozen ground. Mixing and placing of the material is acceptable in freezing temperatures. At the time of placement the flowable fill shall have a temperature of at least 40 degrees F. When flowable fill is placed in freezing temperatures, the material should be covered with blankets overnight. When paving over flowable fill in cold weather, any frozen material on the surface can be scraped off and removed prior to paving.

The flowable fill shall be left undisturbed until the material obtains sufficient strength. Sufficient strength for paving is achieved when the flowable fill can support the weight of foot traffic without apparent deformation. Sufficient strength for supporting vehicular traffic is 2.5 tons per square foot as measured by a pocket penetrometer.

### 3.8 SPECIAL EARTHWORK INSTALLATION REQUIREMENTS

- A. Manholes and Other Appurtenances: Provide at least 12 inches clear from outer surfaces to the embankment or shoring. Remove rock as specified herein. Remove unstable soil that is incapable of supporting the structure to an overdepth of one foot and refill with coarse aggregate to the proper elevation. Stabilize soft, weak, or wet excavations. Refill overdepths with coarse aggregate to the required grade and compact to 95% unless indicated otherwise on drawings.
- B. Compaction for Structures and Pavements: Place final backfill in 6-inch-maximum loose lifts. If a vibratory roller is used for compaction of final backfill, the lift thickness can be increased to 9 inches. Compact all backfill surrounding pipes, ducts, conduits, and other structures to 95 percent of ASTM D1557 maximum density and compact the top 12 inches of subgrade to 95 percent of ASTM D1557 maximum density. Backfill to permit the rolling and compacting of the completed excavation with the adjoining material, providing the specified density necessary to enable paving of the area immediately after backfilling has been completed.

### 3.9 RIP-RAP CONSTRUCTION

- A. Construct rip-rap as indicated and as follows.
  - 1. Preparation: Trim and dress indicated areas to conform to cross sections, lines and grades shown within a tolerance of 0.1 foot.
- B. Bedding Placement: Spread filter fabric and bedding material uniformly to a thickness of at least 3 inches on prepared subgrade or as indicated. Finish bedding to present even surface free from mounds and windows.
- C. Stone Placement: Place rock for rip-rap on prepared bedding material to produce a well graded mass with the minimum practicable percentage of voids in conformance with lines and grades indicated. Distribute larger rock fragments, with dimensions extending the full depth of the rip-rap throughout the entire mass and eliminate "pockets" of small rock fragments. Rearrange individual pieces by mechanical equipment or by hand as necessary to obtain the distribution of fragment sizes specified above.

### 3.10 FINISH OPERATIONS

- A. Grading: Finish to grades indicated within one-tenth of a foot. Provide sod or loam in areas to be seeded or sodded as indicated and in accordance with requirements specified in Section 329200, "Turf and Grasses." Grade areas to drain water away from structures and to provide suitable surfaces for mowing machines. Grade existing grades that are to remain but have been disturbed by the Contractor's operations.
- B. Spreading Loam: Clear areas to receive loam for the finished surface of materials that would interfere with planting and maintenance operations. Scarify subgrade to a depth of 2 inches. Do not place loam when the subgrade is frozen, extremely wet or dry, or in other conditions detrimental to seeding, planting, or grading. Comply with the requirements of Section 329200, "Turf and Grasses." Spread loam to a uniform depth of 4 inches over the designated areas.
- C. Disposition of Surplus Material: Surplus or other soil material not required or suitable for filling, backfilling, or grading shall be removed from Owner's property unless otherwise noted or directed in writing. Comply with all environmental requirements.
- D. Protection of Surfaces: Protect newly graded areas from traffic, erosion, and settlements that may occur. Repair or reestablish damaged grades, elevations, or slopes.
- E. Pavement Repair: Repair pavement, curbs, and gutters as indicated and as required. Do not repair pavement until trench or pit has been backfilled and compacted as specified herein. Provide a temporary road surface of gravel over backfilled portion until permanent pavement is repaired. Remove and dispose of temporary road surface material when permanent pavement is placed. As a minimum, maintain one-way traffic on roads and streets crossed by trenches. Fully open roads and streets to traffic within 1 day.

### 3.11 FIELD QUALITY CONTROL

- A. General Contractor to arrange for and Owner to pay for all soils and field testing. The General Contractor shall pay for any required retesting by the Architect and Owner.
- B. Test sand, bedding, backfill, loam, coarse aggregate, granular fill for conformance to specified requirements. Test backfill to be used under roads and paved areas for conformance to special requirements. Test bedding and backfill for moisture-density relations in accordance with ASTM D698, ASTM D1557 as specified herein. Perform at least one of each of the required tests for each material provided. Perform sufficiently in advance of construction so as not to delay work. Provide additional tests as specified above for each change of source. Perform density and moisture tests in randomly selected locations and in accordance with required ASTM numbers as follows:
  - 1. Bedding and Backfill in Trenches: One test per 50 linear feet in each lift.
  - 2. Appurtenance Structures: One test per 100 square feet or fraction thereof in each lift.

Where ASTM D6938 is used to test field compaction densities, verify test results by performing at least one test per day using ASTM D1556 at a location already tested in accordance with ASTM D6938. Perform at least one additional test using ASTM D1556 for every ten tests performed with a nuclear device, at locations checked in accordance with ASTM D6938.

- C. The contractor reserves the right to test the material for proper gradation in advance of the project's notice to proceed, however the owner reserves the right to request the material be retested once the materials has arrived on site, especially including but not limited to if one of the following has occurred; more than 3 months have passed since the initial material testing had been done, if the material arriving on site for placement appears to not meet spec, if the supplier stockpile has been reworked or if the

stockpile supplier has changed, or if mixing of on-site stockpiles has occurred, or other similar occurrences which may affect the products integrity.

END OF SECTION 312100

## SECTION 312319 - DEWATERING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section includes construction dewatering.
- B. Related Sections:
  - 1. Division 01 Section "Construction Progress Documentation" for recording preexisting conditions and dewatering system progress.
  - 2. Division 31 Section "Earth Moving" for excavating, backfilling, site grading, and for site utilities.
  - 3. Division 31 Section "Excavation Support and Protection" for shoring, bracing, and sheet piling of excavations.
  - 4. Division 33 Section "Subdrainage" for permanent foundation wall, under floor, and footing drainage and site drainage.

## 1.3 PERFORMANCE REQUIREMENTS

- A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.
  - 1. Continuously monitor and maintain dewatering operations to ensure erosion control, stability of excavations and constructed slopes, that excavation does not flood, and that damage to subgrades and permanent structures is prevented.
  - 2. Prevent surface water from entering excavations by grading, dikes, or other means.
  - 3. Accomplish dewatering without damaging existing buildings, structures, and site improvements adjacent to excavation.
  - 4. Remove dewatering system when no longer required for construction.

## 1.4 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning dewatering. Comply with hauling and disposal regulations of authorities having jurisdiction.

## 1.5 PROJECT CONDITIONS

- A. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by geotechnical engineer. Owner will not be responsible for interpretations or conclusions drawn from this data.
  - 1. Make additional test borings and conduct other exploratory operations necessary for dewatering.
  - 2. The geotechnical report is included elsewhere in the Project Manual.
- B. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements, establishing exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.
  - 1. During dewatering, regularly resurvey benchmarks, maintaining an accurate log of surveyed elevations for comparison with original elevations. Promptly notify Architect if changes in elevations occur or if cracks, sags, or other damage is evident in adjacent construction.
- C. Photo Documentation: Digital photo documentation should be made. This includes pre-dewatering, during dewatering, and post-dewatering.

#### 1.6 SUBMITTALS

- A. Shop Drawings: For dewatering system. Show arrangement, locations, and details of wells and well points; locations of risers, headers, filters, pumps, power units, and discharge lines; and means of discharge, discharge splash pads, control of sediment, including location of temporary settling ponds, and disposal of water.
  - 1. Include layouts of piezometers and flow-measuring devices for monitoring performance of dewatering system.
  - 2. Include a written plan, prepared by a state licensed professional engineer registered in the state the dewatering operations will take place, for dewatering operations including control procedures to be adopted if dewatering problems arise.
  - 3. Site photos of showing conditions before dewatering operations begin. Photos should include items and system parts identified in the dewatering plan and shall show any nearby waterways to be used as comparison should erosion and sediment control problems arise. Site photos shall be submitted before, during and upon the conclusion of dewatering operations. These photos should show discharge of water did not create on-site or off-site erosion and sediment control problems. Including the condition of any nearby waterways

#### PART 2 - PRODUCTS (Not Used)

#### PART 3 - EXECUTION

##### 3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by dewatering operations.

1. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding site and surrounding area. Provide upstream surface water diversion berms and subsurface groundwater diversion underdrains.
  2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.
- B. Install dewatering system to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
- C. Provide temporary grading to facilitate dewatering and control of surface water.
- D. Monitor dewatering systems continuously.
- E. Promptly repair damages to adjacent facilities caused by dewatering.
- F. Protect and maintain temporary erosion and sedimentation controls during dewatering operations.
- G. Major problems or deficiencies may require construction operations to shut down until the situation has been corrected. If the architect or owner points out a problem or deficiency and the contractor has not made significant attempts to correct the situation, the owner reserves the right to shut down construction operations until the correction has been made and the contractor will not be compensated for lost time or money due to construction stoppage.

### 3.2 INSTALLATION

- A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.
1. Space well points or wells at intervals required to provide sufficient dewatering.
  2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.
- B. Before excavating below ground-water level, place system into operation to lower water to specified levels. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed or until dewatering is no longer required.
- C. Provide an adequate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Install sufficient dewatering equipment to drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.
1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.
- D. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.
1. Maintain piezometric water level a minimum of 24 inches below surface of excavation.

- E. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction.
- F. Provide standby equipment on site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails. If dewatering requirements are not satisfied due to inadequacy or failure of dewatering system, restore damaged structures and foundation soils at no additional expense to Owner.
  - 1. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches below overlying construction.
- G. Freezing/snow conditions: The contractor should take the proper precautions ensure that none of the dewatering system will be adversely impacted or compromised due to weather such as below freezing temperatures or accumulating snow. The contractor is responsible for removing ice or snow that impacts the dewatering process and their ability to safely discharge the water. This includes checking for snow/ice blockage downstream or off-site of the dewatering discharge point and remedying the situation to ensures the worker and public safety and health.
- H. Damages: Promptly repair damages to adjacent facilities caused by dewatering operations in a timely manner.

END OF SECTION 312319

## SECTION 313000 - SEDIMENTATION AND EROSION CONTROL MEASURES

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This section includes the following:
  - 1. Establishment and maintenance of temporary and permanent drainage areas.
  - 2. Construction, stabilization and maintenance of temporary construction entrances.
  - 3. Construction and maintenance of temporary and permanent outfalls, swales, waterways and embankments.
  - 4. Temporary and permanent vegetative stabilization.
  - 5. Establishment and maintenance of designated stockpile areas.
  - 6. Construction and maintenance of silt fences, stone check dams and hay bale barriers.
  - 7. All erosion and sediment control work required for the safe conduct of the work, whether or not specifically mentioned in these Specifications or indicated on the Drawings.
- B. Related Sections include the following:
  - 1. Division 32 Section "Turf and Grasses, Plants" for finish grading including preparing and placing planting soil mixes and testing of topsoil material.
  - 2. Division 31 Section "Site Clearing" for temporary measures required for site clearing.
  - 3. Division 31 Section "Earth Moving for Pavements and Structures" for soil materials, excavating, backfilling, and site grading.
  - 4. Division 31 Section "Earth Moving for Utilities" for soil materials, excavating, backfilling for utilities.

## 1.3 REFERENCES

- A. Quality, grades of materials and installation procedure: In conformance with applicable code and standards including:
  - 1. American Society for Testing and Materials (ASTM).
  - 2. State of Maine, Department of Transportation, Standard Specifications (MDOT) 12/2002.
  - 3. Maine Erosion and Sedimentation Control Handbook for Construction: Best Management Practices 3/2003.
- B. Land, Air and Water Pollution: Comply with Pollution Control Standards for the State of Maine applicable to the work to ensure that no pollution is caused by work of this Contract.
- C. Soil Erosion and Sediment Control: Implement soil erosion and sediment control in strict accordance with provisions of the Erosion and Sedimentation Control Handbook.



#### 1.4 DEFINITIONS

- A. Sediment: Soil and other debris that have eroded and have been transported by runoff water or wind.
- B. Dust: Earthy material and any substance reduced to fine powder.
- C. Solid Waste: Rubbish, debris, garbage, and other discarded solid materials, except hazardous waste as defined in paragraph entitled "Hazardous Waste," resulting from industrial, commercial, and agricultural operations and from community activities.
- D. Rubbish: Combustible and noncombustible wastes such as paper, boxes, glass, crockery, metal, lumber, cans, and bones.
- E. Debris: Combustible and noncombustible wastes such as ashes and waste materials resulting from construction or maintenance and repair work, leaves, and tree trimmings.
- F. Oily Waste: Petroleum products and bituminous materials.

#### 1.5 SUBMITTALS

- A. Factory Test Reports
  - 1. Erosion Control Mesh.
  - 2. Geotextile fabric.
  - 3. Silt Fence.

#### 1.6 ENVIRONMENTAL PROTECTION REQUIREMENTS

- A. Provide and maintain, during the life of the contract, environmental protection as defined. Plan for and provide environmental protective measures to control pollution that develops during normal construction practice. Plan for and provide environmental protective measures required to correct conditions that develop during the construction of permanent or temporary environmental features associated with the project. Comply with Federal, State, and local regulations pertaining to the environment, including but not limited to water, air, light, and noise pollution.
- B. Environmental Protection Plan: Five days after the award of contract, the Contractor shall meet with the Contracting Officer to discuss the proposed environmental protection plan and to develop mutual understanding relative to the details of environmental protection, including measures for protecting natural resources, required reports, and other measures to be taken.
- C. Environmental Planning: Fourteen days after the meeting, the Contractor shall submit to the Architect/Engineer the proposed environmental plan for further discussion, review, and approval.
- D. Commencement of the Work: As directed by the Contracting Officer, following approval.
- E. Tree Protection: See section 015639 Temporary Tree and Plant Protection.

#### PART 2 - PRODUCTS

2.1 MATERIALS

- A. All Products: As specified by Erosion and Sedimentation Control Handbook.
- B. All Fill Materials: In accordance with requirements of Section 312000, "Earth Moving for Structures and Pavements".
- C. Temporary Vegetative Stabilization: Temporary Seeding for graded or cleared areas, which are subject to erosion for a period of 14 days or more. Vegetation in accordance with Handbook.
- D. Permanent Vegetative Stabilization: Seeding for graded or cleared areas subject to erosion where a permanent, long-lived vegetation cover is needed. Vegetation in accordance with Handbook.
- E. Riprap Waterways and Outfalls:
  - 1. Riprap: Sizes indicated.
  - 2. Drainage Fabric:
    - a. Outfalls: needle-punched nonwoven geotextile composed of polypropylene fibers, possessing the following characteristics:

Mechanical Properties	Test method	Unit	Minimum Average Roll Value	
			MD	CD
Grab Tensile Strength	ASTM D 4632	N (lbs)	912 (205)	912 (205)
Grab Tensile Elongation	ASTM D 4632	%	50	50
Trapezoid Tear Strength	ASTM D 4533	N (lbs)	356 (80)	356 (80)
CBR Puncture Strength	ASTM D 6241	N (lbs)	2225 (500)	
Apparent Opening Size (AOS) *	ASTM D 4751	mm (U.S. Sieve)	0.18 (80)	
Permittivity	ASTM D 4491	sec <sup>-1</sup>	1.1	
Flow Rate	ASTM D 4491	l/min/m <sup>2</sup> (gal/min/ft <sup>2</sup> )	3870 (95)	
UV Resistance (at 500 hours)	ASTM D 4355	% strength retained	70	

\* ASTM D 4751: AOS is a Maximum Opening Diameter Value

Physical Properties	Test Method	Unit	Typical Value	
Weight	ASTM D 5261	g/m <sup>2</sup> (oz/yd <sup>2</sup> )	271 (8.0)	
Thickness	ASTM D 5199	mm (mils)	1.8 (72)	
Roll Dimensions (width x length)	--	m (ft)	3.8 x 110 (12.5 x 360)	4.5 x 91 (15 x 300)
Roll Area	--	m <sup>2</sup> (yd <sup>2</sup> )	418 (500)	
Estimated Roll Weight	--	kg (lb)	120 (265)	

- b. Acceptable products: Mirafi 180N or approved equal.
- c. Waterways: needle-punched nonwoven geotextile composed of polypropylene fibers, possessing the following characteristics:

Mechanical Properties	Test Method	Unit	Minimum Average Roll Value	
			MD	CD
Grab Tensile Strength	ASTM D 4632	N (lbs)	534 (120)	534 (120)

Grab Tensile Elongation	ASTM D 4632	%	50	50
Trapezoid Tear Strength	ASTM D 4533	N (lbs)	223 (50)	223 (50)
CBR Puncture Strength	ASTM D 6241	N (lbs)	1335 (300)	
Apparent Opening Size (AOS) *	ASTM D 4751	mm (U.S. Sieve)	0.212 (70)	
Permittivity	ASTM D 4491	sec <sup>-1</sup>	1.7	
Flow Rate	ASTM D 4491	l/min/m <sup>2</sup> (gal/min/ft <sup>2</sup> )	5500 (135)	
UV Resistance (at 500 hours)	ASTM D 4355	% strength retained	70	

\* ASTM D 4751: AOS is a Maximum Opening Diameter Value

Physical Properties	Test Method	Unit	Typical Value	
Weight	ASTM D 5261	g/m <sup>2</sup> (oz/yd <sup>2</sup> )	163 (4.8)	
Thickness	ASTM D 5199	mm (mils)	1.0 (40)	
Roll Dimensions (width x length)	--	m (ft)	3.8 x 110 (12.5 x 360)	4.5 x 110 (15 x 360)
Roll Area	--	m <sup>2</sup> (yd <sup>2</sup> )	418 (500)	502 (600)
Estimated Roll Weight	--	kg (lb)	74 (164)	89 (197)

d. Acceptable products: Mirafi 140N or approved equal.

F. Grass Waterways & Embankments:

1. Vegetation: In accordance with Handbook; Section 329200, "Turf and Grasses".
2. Erosion Control Mat: for slopes less steep than 2:1, short-term double net erosion control blanket, machine-produced mat of 100% agricultural straw with a functional longevity of up to 12 months.

Property	Test Method	Typical
Thickness	ASTM D6525	0.36 in (9.14 mm)
Resiliency	ECTC Guidelines	80.5%
Water Absorbency	ASTM D1117	514%
Mass/Unit Area	ASTM 6475	10.52 oz/yd <sup>2</sup> (357.7 g/m <sup>2</sup> )
Swell	ECTC Guidelines	15%
Smolder Resistance	ECTC Guidelines	Yes
Stiffness	ASTM D1388	6.06 oz-in
Light Penetration	ECTC Guidelines	9.8%
Tensile Strength –MD	ASTM D6818	169.2 lbs/ft (2.51 kN/m)
Elongation – MD	ASTM D6818	17.2%
Tensile Strength – TD	ASTM D6818	164.4 lbs/ft (2.44 kN/m)
Elongation – TD	ASTM D6818	33.1%

3. Acceptable products: North American Green S150 or approved equal.
4. Erosion Control Mat: for slopes 2:1 or steeper, extended-term double net erosion control blanket, machine-produced mat of 70% agricultural straw and 30% coconut fiber with a functional longevity of up to 24 months.

Property	Test Method	Typical
Thickness	ASTM D6525	0.39 in (9.91 mm)
Resiliency	ECTC Guidelines	75%
Water Absorbency	ASTM D1117	285%

Mass/Unit Area	ASTM 6475	11.44 oz/yd <sup>2</sup> (388 g/m <sup>2</sup> )
Swell	ECTC Guidelines	30%
Smolder Resistance	ECTC Guidelines	Yes
Stiffness	ASTM D1388	1.11 oz-in
Light Penetration	ECTC Guidelines	8.7%
Tensile Strength –MD	ASTM D6818	146.6 lbs/ft (2.17 kN/m)
Elongation – MD	ASTM D6818	26.9%
Tensile Strength – TD	ASTM D6818	147.6 lbs/ft (2.19 kN/m)
Elongation – TD	ASTM D6818	25.2%

5. Acceptable products: North American Green SC150 or approved equal.
6. Turf Reinforcement Mat: permanent composite turf reinforcement mat, machine-produced mat of 70% straw and 30% coconut fiber matrix incorporated into permanent three-dimensional turf reinforcement matting.

Property	Test Method	Typical	Net only
Thickness	ASTM D6525	0.72 in (18.3 mm)	0.48 in
Resiliency	ASTM 6524	95.2%	--
Density	ASTM D792	0.53 oz/in <sup>3</sup>	--
Mass/Unit Area	ASTM 6566	17.88 oz/yd <sup>2</sup> (606 g/m <sup>2</sup> )	--
Porosity	ECTC Guidelines	99%	--
Stiffness	ASTM D1388	222.65 oz-in	--
Light Penetration	ECTC Guidelines	8.9%	--
UV Stability	ASTM D4355 / 1000 hr	100%	100%
Tensile Strength –MD	ASTM D6818	620 lbs/ft (9.05 kN/m)	655 lbs/ft
Elongation – MD	ASTM D6818	35%	25%
Tensile Strength – TD	ASTM D6818	737 lbs/ft (10.75 kN/m)	666 lbs/ft
Elongation – TD	ASTM D6818	16%	16%

7. Acceptable products: North American Green SC250 or approved equal.
8. Pins: U or T type as recommended by fabric manufacturer.

G. Temporary Construction Entrances:

1. Coarse Aggregate in accordance with requirements of Section 312000, "Earth Moving for Structures and Pavements".
2. Culvert: RCP.
3. Fabric: woven polypropylene separation geotextile, possessing the following characteristics:

Mechanical Properties	Test Method	Unit	Minimum Average Roll Value	
			MD	CD
Grab Tensile Strength	ASTM D 4632	N (lbs)	1402 (315)	1402 (315)
Grab Tensile Elongation	ASTM D 4632	%	12	
Trapezoid Tear Strength	ASTM D 4533	N (lbs)	503 (113)	503 (113)
CBR Puncture Strength	ASTM D 6241	N (lbs)	4005 (900)	
Apparent Opening Size (AOS) *	ASTM D 4751	mm (U.S. Sieve)	0.43 (40)	
Permittivity	ASTM D 4491	sec <sup>-1</sup>	0.05	
Flow Rate	ASTM D 4491	l/min/m <sup>2</sup> (gal/min/ft <sup>2</sup> )	163 (4.0)	
UV Resistance (at 500 hours)	ASTM D 4355	% strength retained	70	

\* ASTM D 4751, AOS is a Maximum Opening Diameter Value

Physical Properties	Test Method	Unit	Typical Value	
Weight	ASTM D 5261	g/m <sup>2</sup> (oz/yd <sup>2</sup> )	203 (6.0)	
Thickness	ASTM D 5199	mm (mils)	0.6 (25)	
Roll Dimensions (width x length)	--	m (ft)	3.8 x 110 (12.5 x 360)	5.3 x 78.7 (17.5 x 258)
Roll Area	--	m <sup>2</sup> (yd <sup>2</sup> )	418 (500)	418 (500)
Estimated Roll Weight	--	kg (lb)	109 (240)	109 (240)

4. Acceptable products: Mirafi 600X or approved equal.

H. Hay Bale Barriers, Dams:

1. Barriers: Wire or nylon bound straw or hay bales.
2. Stakes: Steel rebar or 2 x 2 inch wood stakes.

I. Silt Fence:

1. Posts:
  - a. Wood: Minimum 2 inch hardwood stakes.
  - b. Steel: Type T or Type U.
2. Fabric: High strength polypropylene netting treated to ensure protection against sunlight degradation:

Mechanical Properties	Test Method	Unit	Silt Fence Property		Typical Values (English)
			MD	CD	
Grab Tensile Strength	ASTM D 4632	kN	0.55	0.55	125 X125 lbs
Grab Tensile Elongation	ASTM D 4632	%	15	15	15 %
Puncture Strength	ASTM D 4833	kN	266		60 lbs.
Apparent Opening Size (AOS) *	ASTM D 4751	mm	0.60		20 sieve
Permittivity	ASTM D 4491	sec <sup>-1</sup>	0.10		0.10 sec <sup>-1</sup>
Flow Rate	ASTM D 4491	l/min/m <sup>2</sup>	405		8 gal/min/ft <sup>2</sup>
UV Resistance (at 500 hours)	ASTM D 4355	% strength retained	70		70 %

\* ASTM D 4751, AOS is a Maximum Opening Diameter Value

3. Mirafi Silt Fence.
  - a. Propex Geotex woven Silt Fence
  - b. Carthage Mills FX-11 Silt Fence
  - c. Approved equal.

J. Riprap Embankments:

1. Riprap: Sizes indicated.
2. Drainage Fabric: Mirafi 180N or approved equal.

K. Stone Check Dams:

1. Stone: Sizes indicated.
2. Fabric: woven polypropylene separation geotextile, possessing the following characteristics:

Mechanical Properties	Test Method	Unit	Minimum Average Roll Value	
			MD	CD
Grab Tensile Strength	ASTM D 4632	N (lbs)	890 (200)	890 (200)
Grab Tensile Elongation	ASTM D 4632	%	15	10
Trapezoid Tear Strength	ASTM D 4533	N (lbs)	334 (75)	334 (75)
CBR Puncture Strength	ASTM D 6241	N (lbs)	3115 (700)	
Apparent Opening Size (AOS) *	ASTM D 4751	mm (U.S. Sieve)	0.43 (40)	
Permittivity	ASTM D 4491	sec <sup>-1</sup>	0.05	
Flow Rate	ASTM D 4491	l/min/m <sup>2</sup> (gal/min/ft <sup>2</sup> )	204 (5.0)	
UV Resistance (at 500 hours)	ASTM D 4355	% strength retained	70	

\* ASTM D 4751, AOS is a Maximum Opening Diameter Value

Physical Properties	Test Method	Unit	Typical Value	
Weight	ASTM D 5261	g/m <sup>2</sup> (oz/yd <sup>2</sup> )	136 (4.0)	
Thickness	ASTM D 5199	mm (mils)	0.5 (20)	
Roll Dimensions (width x length)	--	m (ft)	3.8 x 132 (12.5 x 432)	5.3 x 94.2 (17.5 x 309)
Roll Area	--	m <sup>2</sup> (yd <sup>2</sup> )	502 (600)	
Estimated Roll Weight	--	kg (lb)	95 (210)	

3. Acceptable products: Mirafi 500X or approved equal.

PART 3 - EXECUTION

3.1 PROTECTION OF NATURAL RESOURCES

- A. Preserve the natural resources within the project boundaries and outside the limits of permanent work. Restore to an equivalent or improved condition upon completion of work. Confine construction activities to within the limits of the work indicated or specified.
- B. Land Resources:
  1. Protection of Vegetation: Except in areas to be cleared, do not remove, cut, deface, injure, or destroy trees or shrubs without the Architect/Engineer permission. Do not fasten or attach ropes, cables, or guys to existing nearby trees for anchorages unless authorized by the Architect/Engineer. Where such use of attach ropes, cables, or guys is authorized, the Contractor shall be responsible for any resultant damage. Protect existing trees, which are to remain, and which may be injured, bruised, defaced, or otherwise damaged by construction operations. Remove displaced rocks from uncleared areas. By approved excavation, remove trees with 30 percent or more of their root systems destroyed.
- C. Grading
  1. Limit initial grading to that required to install required sediment and erosion controls.

2. Extent: Remain just ahead of planned new construction.
  3. Plan to control runoff and contain erosion.
  4. Do not place fill before existing vegetation has been removed.
  5. Do not impair existing surface drainage, create potential hazards, cause hazardous erosion, or cause sediment to collect in drainage systems on adjacent properties, alleys, streets or highways by grading operations.
  6. Riprap Outfalls, Outlets, and Waterways: Construct in accordance with details. Embed riprap in approved fabric.
  7. Grass Waterways: Construct in accordance with details for specific profile. Pin fabric mesh to subgrade with U or T pins in accordance with fabric manufacturer's recommendations.
  8. Hay Bales:
    - a. Place at areas indicated in rows with ends tightly butted.
    - b. Embed each bale a minimum of 4 inches into soil.
    - c. Securely anchor in place with two stakes driven 1-1/2 to 2 feet into ground.
  9. Silt Fence:
    - a. Establish silt fence at areas indicated and as required for control.
    - b. Space posts as required to adequately support wire and cloth against flow and at a maximum of 6 feet oc. Embed posts into ground a minimum of 18 inches.
    - c. Fasten woven wire fence securely to posts with wire ties or staples.
    - d. Fasten filter cloth to wire mesh at top and mid-section with ties spaced every 24 inches; overlap edges minimum 6 inches and fold.
    - e. Embed filter cloth minimum 8 inches into ground.
- D. Borrow Pit Areas: Manage and control borrow pit areas to prevent sediment from entering nearby streams or lakes. Restore areas, including those outside the borrow pit, disturbed by borrow and haul operations. Restoration includes grading, replacement of topsoil, and establishment of a permanent vegetative cover. Uniformly grade side slopes of borrow pit to not more than a slope of 1 part vertical to 2 parts horizontal. Uniformly grade the bottom of the borrow pits to provide a flat bottom and drain by outfall ditches or other suitable means. Stockpile topsoil removed during the borrow pit operation, and use as part of restoring the borrow pit area.
- E. Protection of Erodible Soils: Immediately finish the earthwork brought to a final grade, as indicated or specified. Immediately protect the side slopes and back slopes upon completion of rough grading. Plan and conduct earthwork to minimize the duration of exposure of unprotected soils.
- F. Mechanical Retardation and Control to Runoff: Mechanically retard and control the rate of runoff from the construction site. This includes construction of diversion ditches, benches, and berms to retard and divert runoff to protected drainage courses.
- G. Vegetation and Mulch: Provide temporary protection on sides and back slopes as soon as rough grading is completed or sufficient soil is exposed to require erosion protection. Protect slopes by accelerated growth of permanent vegetation, temporary vegetation, mulching, or netting. Stabilize slopes by hydroseeding, anchoring mulch in place, covering with anchored netting, sodding, or such combination of these and other methods necessary for effective erosion control.
1. Seeding: Provide new seeding where ground is disturbed. Include topsoil or nutriment during the seeding operation necessary to reestablish a suitable stand of grass. The seeding operation shall be as specified in Section 329200, "Turf and Grasses".
- H. Stabilization

1. Stabilize all cleared or graded areas. Stabilize with temporary or permanent vegetation, mulch, or paving as indicated on Drawings within 15 days of obtaining final grade or 30 days after obtaining temporary grade.
  2. For vegetating critical areas where erosion is imminent, place and repeatedly replace adequate mulch, fertilizer, and seed until a vigorous and adequate growth of turf has been established over greater than 80 percent of the area.
- I. Replacement: Remove trees and other landscape features scarred or damaged by equipment operations, and replace with equivalent, undamaged trees and landscape features. Obtain Architect/Engineer's approval before replacement.
  - J. Temporary Construction: Remove traces of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess or waste materials, and other signs of construction. Grade temporary roads, parking areas, and similar temporarily used areas to conform with surrounding contours.
  - K. Burnoff: Burnoff of the ground cover is not permitted.
  - L. Dust Control: Keep dust down at all times, including during nonworking periods. Sprinkle or treat, with dust suppressants, the soil at the site, haul roads, and other areas disturbed by operations. Dry power brooming will not be permitted. Instead, use vacuuming, wet mopping, wet sweeping, or wet power brooming. Air blowing will be permitted only for cleaning nonparticulate debris such as steel reinforcing bars. Only wet cutting will be permitted for cutting concrete blocks, concrete, and bituminous concrete. Do not unnecessarily shaking bags of cement, concrete mortar, or plaster.
- 3.2 MAINTENANCE
- A. Vegetative Stabilization: Irrigate to prevent loss of stand of protective vegetation. Regularly inspect and overseed as necessary. Immediately reestablish damaged stands.
  - B. Hay Bales: Inspect weekly and after every rain; adjust as needed, removing material when bulges develop.
  - C. Silt Fence: Inspect weekly and after every rain; adjust as needed, removing material when bulges develop.
  - D. Construction Entrances: Inspect and repair after every rain. Maintain in a condition to prevent tracking or flowing of sediment onto public right-of-ways. Dress with stone as required.
  - E. Swales, Outfalls: Inspect regularly and after every rain; maintain clear of obstructions and excessive sediment.
  - F. Dikes, Embankments, Landgrading: Inspect weekly and after every rain. Repair as required to maintain integrity or drainage areas.
- 3.3 REPAIRS, REMOVALS
- A. At completion of work, remove designated temporary controls and revise all permanent sediment controls to original condition.



- B. Repair all damages caused by soil erosion and construction activity at or before the end of every working day.
- C. Remove sediment fence when all disturbed areas have been stabilized and a catch of grass greater than 80 percent has been established.

END OF SECTION 313000

## SECTION 315000 - EXCAVATION SUPPORT AND PROTECTION

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section includes temporary excavation support and protection systems.
- B. Related Sections:
  - 1. Division 01 Section "Construction Progress Documentation" for recording preexisting conditions and excavation support and protection system progress.
  - 2. Division 01 Section "Temporary Facilities and Controls" for temporary utilities and support facilities.
  - 3. Division 31 Section "Dewatering" for dewatering system for excavations.
  - 4. Division 31 Section "Earth Moving for Structures and Pavements"
  - 5. Division 31 Section "Earth Moving for Utilities"

## 1.3 PERFORMANCE REQUIREMENTS

- A. Furnish, install, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and of resisting soil and hydrostatic pressure and superimposed and construction loads.
  - 1. Prevent surface water from entering excavations by grading, dikes, or other means.
  - 2. Install excavation support and protection systems without damaging existing buildings, structures, and site improvements adjacent to excavation.
  - 3. Monitor vibrations, settlements, and movements.

## 1.4 PROJECT CONDITIONS

- A. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by geotechnical engineer. Owner will not be responsible for interpretations or conclusions drawn from the data.
  - 1. Make additional test borings and conduct other exploratory operations necessary for excavation support and protection.
  - 2. The geotechnical report is included elsewhere in the Project Manual.

## PART 2 - PRODUCTS

## 2.1 MATERIALS

- A. General: Provide materials that are either new or in serviceable condition.
- B. Structural Steel: ASTM A 36/A 36M, ASTM A 690/A 690M, or ASTM A 992/A 992M.
- C. Cast-in-Place Concrete: ACI 301, of compressive strength required for application.
- D. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

## PART 3 - EXECUTION

## 3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.
  - 1. Shore, support, and protect utilities encountered.
- B. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
  - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
- C. Locate excavation support and protection systems clear of permanent construction so that forming and finishing of concrete surfaces are not impeded.
- D. Monitor excavation support and protection systems daily during excavation progress and for as long as excavation remains open. Promptly correct bulges, breakage, or other evidence of movement to ensure that excavation support and protection systems remain stable.
- E. Promptly repair damages to adjacent facilities caused by installing excavation support and protection systems.

## 3.2 REMOVAL AND REPAIRS

- A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and bear soil and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils or damaging structures, pavements, facilities, and utilities.
  - 1. Remove excavation support and protection systems to a minimum depth of 48 inches below overlying construction and abandon remainder.
  - 2. Fill voids immediately with approved backfill compacted to density specified in Division 31 Section "Earth Moving."
  - 3. Repair or replace, as approved by Architect, adjacent work damaged or displaced by removing excavation support and protection systems.

END OF SECTION 315000

## SECTION 321216 - ASPHALT PAVING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section includes work pertaining to new and recycled bituminous concrete pavings, including sidewalks, gutters, and HMA curbing.
- B. Related Sections:
  - 1. Division 31 Section "Site Clearing" for demolition, removal, and recycling of existing asphalt pavements.
  - 2. Division 31 Section "Earth Moving" for aggregate subbase and base courses and for aggregate pavement shoulders.
  - 3. Division 32 Sections for other paving installed.
  - 4. Division 32 Section "Concrete Paving Joint Sealants" for joint sealants and fillers at paving terminations.
  - 5. A Geotechnical Report has been provided elsewhere in the project manual, please review for additional information and limitations.

## 1.3 PREINSTALLATION CONFERENCE: Conduct conference at Project site.

- A. Review methods and procedures related to providing and placement of asphalt pavement including, but not limited to, the following
  - 1. Construction Schedule
  - 2. Field quality control
  - 3. Traffic control

## 1.4 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

## AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS

AASHTO M156                      1989 (Rev. 1993) Standard Specification for Requirements for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures

AASHTO T84	1995 Standard Specification for Specific Gravity and Absorption of Fine Aggregate
AASHTO T176	1997 (Rev. 1999) Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test
AASHTO T304	1996 Standard Method of Test for Uncompacted Void Content of Fine Aggregate
AASHTO TP-4	1999 Standard Method for Preparing and Determining the Density of Hot Mix Asphalt (HMA) Specimens by Means of the SHRP Gyrotory Compactor
AASHTO TP-58	1999 Standard Test Method for Resistance of Coarse Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus

## AMERICAN NATIONAL STANDARDS INSTITUTE, INC. (ANSI)

ANSI A10.17	2006 Safe Operating Practice for Asphalt Pavement Construction
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## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C128	2007 (Rev. A) Specific Gravity and Absorption of Fine Aggregate
ASTM C142	1997 (Rev. 2004) Test Method for Clay Lumps and Friable Particles in Aggregates
ASTM C295	2008 Petrographic Examination of Aggregate for Concrete
ASTM D979	2006 (Rev. 1) Sampling Bituminous Paving Mixtures
ASTM D2172	2005 Quantitative Extraction of Bitumen from Bituminous Paving Mixtures
ASTM D4791	2005 Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
ASTM D5821	2001 (Rev. 2006) Standard Test Method for Determining the Percentage of Fractured Particles in Coarse Aggregate

## STATE OF MAINE DEPARTMENT OF TRANSPORTATION (MDOT) STANDARD SPECIFICATIONS, 12/2002

MDOT 401	Hot Mix Asphalt Pavement
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## 1.5 GENERAL REQUIREMENTS (MDOT 401.01)

- A. The Contractor shall furnish and place one or more courses of Hot Mix Asphalt Pavement (HMA) on an approved base in accordance with the contract documents and in reasonably close conformity with the lines, grades, thicknesses, and typical cross sections shown on the plans.

## 1.6 SUBMITTALS

- A. Mix Designs (Contractor and Job) (produced within the current paving season)

1. The Contractor shall submit for approval a Job Mix Formula (JMF) to the Owner's independent testing agency for each mixture to be supplied. The Owner's independent testing agency shall then have 15 calendar days in which to process a new design prior to approval. The JMF shall establish a single percentage of aggregate passing each required sieve size within the limits shown in Table 2, and shall not cross the restricted zone. The general composition limits given in Table 2 indicate the control points of mixtures permissible under this specification. The JMF shall state the source, gradation, and percentage to be used of each portion of the aggregate, and mineral filler if required. It shall also state the proposed Performance Graded Asphalt Binder (PGAB) content, the name and location of the refiner and the supplier for the source of PGAB submitted for approval, and the type of PGAB modification if applicable.
2. At the time of JMF submittal, the Contractor shall identify and make available the stockpiles of all proposed aggregates at the plant site. The Owner's independent testing agency shall obtain samples for laboratory testing. The Contractor shall also make available to the Owner's independent testing agency the PGAB proposed for use in the mix in sufficient quantity to test the properties of the asphalt and to produce samples for testing of the mixture. The Contractor shall submit a new JMF for approval each time a change in aggregate source or a change in PGAB is proposed. The same approval process shall be followed. The cold feed percentage of any aggregate may be changed up to 10 percent of the amount listed on the JMF, however no aggregate listed on the JMF shall be eliminated. The target percentage of RAP shall be the percentage listed on the JMF.

B. Certificates of Compliance

1. Submit a certificate of compliance for each shipment of hot mix asphalt material used in the mix.
2. Submit a certificate of compliance for hot mix asphalt curbing material.

C. Drawings

1. Provide details of all proposed curbing sections including length, radius, height, and width.

1.7 DELIVERY AND STORAGE

- A. Inspect materials delivered to the site for damage and store with a minimum of handling. Store aggregates in such a manner as to prevent segregation, contamination, or intermixing of the different aggregate sizes.

1.8 TRAFFIC CONTROL

- A. Vehicular traffic, including heavy equipment, shall not be permitted on the pavement until the surface temperature has cooled to at least 120-degrees F. Surface temperature shall be measured by approved surface thermometers or other satisfactory methods.

1.9 OPERATION SAFETY AND HEALTH GUIDELINES

- A. In addition to the requirements of the General Provisions, conduct mixing and delivery of hot mix asphalt materials and paving operations in accordance with ANSI A10.17.

1.10 WEATHER AND SEASONAL LIMITATIONS

- A. The Contractor may place Hot Mix Asphalt Pavement for use other than a traveled way wearing course provided that the air temperature as determined by an approved thermometer (placed in the shade at the paving location) is 4°C (40°F) or higher and the area to be paved is not frozen. The Contractor may place Hot Mix Asphalt Pavement as traveled way wearing course provided the air temperature determined as above is 10°C (50°F) or higher.
- B. The State is divided into two paving zones as follows:
  - 1. Zone 1 Areas north of US Route 2 from Gilead to Bangor and north of Route 9 from Bangor to Calais.
  - 2. Zone 2 Areas south of Zone 1 including the US Route 2 and Route 9 boundaries.
- C. The Contractor may place Hot Mix Asphalt Pavement for use other than a traveled way wearing course in either Zone between the dates of April 15th and November 15th, provided that the air temperature as determined by an approved thermometer (placed in the shade at the paving location) is 4°C (40°F) or higher and the area to be paved is not frozen. The Contractor may place Hot Mix Asphalt Pavement as traveled way wearing course in Zone 1 between the dates of May 1st and the Saturday following October 1st and in Zone 2 between the dates of April 15th and the Saturday following October 15th, provided the air temperature determined as above is 10°C (50°F) or higher. For the purposes of this Section, the traveled way includes truck lanes, ramps, approach roads and auxiliary lanes. Hot Mix Asphalt Pavement used for curb, driveways, sidewalks, islands, or other incidentals is not subject to seasonal limitations, except that conditions shall be satisfactory for proper handling and finishing of the mixture. Unless otherwise specified, the Contractor shall not place Hot Mix Asphalt Pavement on a wet or frozen surface, and the air temperature shall be 4°C (40°F) or higher.

#### 1.11 EXISTING CONDITIONS

- A. Existing To New Pavements: Where new pavement matches to old care shall be taken to insure proper binding of the two materials. Utilize an asphalt binding paint as required. Both existing and new surfaces shall meet in a smooth continuous plane free from variations in height or smoothness. Clean all areas to meet thoroughly prior to installation.
- B. A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by geotechnical engineer. Owner will not be responsible for interpretations or conclusions drawn from the data.
  - 1. The geotechnical report is included elsewhere in the Project Manual.
  - 2. Please refer to the geotechnical report for possible additional information and guidelines related to the pavement design.

#### 1.12 DEFINITIONS

- A. Deleterious material is defined as those particles of aggregate which may be crumbled in the hand and those which have an absorption greater than 3.0-percent by weight determined in accordance with AASHTO T85 modified for weight of sample. The types which are determined to be deleterious are generally highly absorptive shales, phyllites, sandstones and rotten rock of various kinds.
- B. Fine Aggregate

1. Fine aggregate, from an individual source or stockpile used for blending when tested for absorption as specified in AASHTO T84 (ASTM C128), shall show a percent of absorption of not more than 2.30.
2. Deleterious substances shall not exceed the following limits:

**Maximum permissible limits, percent by weight**

Friable particles, clay lumps, AASHTO T112 (ASTM C142)	1.5
Other deleterious substances such as shale, alkali, mica, coated grains, soft and flaky particles, ASTM C295	1.0

- C. Loose and Broken Pavement: Existing asphalt, bituminous or concrete pavement that is visibly unattached or separated from surrounding pavement. This includes pavement that can be physically removed by hand or depressed when stood upon. Pavement that is "Alligatored" or cracked through to the underlying layer is considered broken. Pavement with seams or longitudinal cracks spaced wider than 3 feet apart is not considered Loose or Broken.

1.13 HOT MIX ASPHALT PLANT (MDOT 401.07)

- A. General Requirements (MDOT 401.071): Mixing plants shall conform to AASHTO M 156. The mixing plant shall include an efficient dust collecting system to prevent loss of fine material. The material collected may be returned to the mixture at a uniform rate and/or be discarded.

1. Performance Graded Asphalt Binder. The Contractor shall provide a valve for sampling the bituminous material, located in a circulating feed line connecting the storage tank with the mixing plant or in a line of the storage circulation system. The valve shall be in a readily accessible location offering protection from damage. The Contractor shall maintain this valve in a workable condition and provide a drainage receptacle.

- B. Automation of Batching (MDOT 401.072): Batch plants shall be automated for weighing, recycling, and monitoring the system.

1. The batch plant shall accurately proportion the various materials in the proper order by weight. The entire batching and mixing cycle shall be continuous and shall not require any manual operations. The batch plant shall use auxiliary interlock circuits to trigger an audible alarm whenever an error exceeding the acceptable tolerance occurs. Along with the alarm, the printer shall print an asterisk on the delivery slip in the same row containing the out-of-tolerance weight. The automatic proportioning system shall be capable of consistently delivering material within the full range of batch sizes. When RAP is being used the plant must be capable of automatically compensating for the moisture content of the RAP.
2. Tolerances are based on the total batch weight of the Hot Mix Asphalt Pavement. The batch plant shall be able to automatically or manually adjust for all desired batch sizes. The first or last bin drawn shall be the sand bin. Allowable tolerances are as follows:

Each aggregate component	± 1.5 percent from the cumulative target, each bin
Last Bin Drawn	± 1.5 percent
Mineral Filler	± 0.5 percent
Performance Graded Asphalt	+0.25 percent, -0.15 percent



Binder	
Zero Return (aggregate)	± 0.5 percent
Zero Return (bituminous material)	0.1 percent

1.14 HAULING EQUIPMENT (MDOT 401.08)

- A. Trucks for hauling Hot Mix Asphalt Pavement shall have tight, clean, smooth metal dump bodies which have been thinly coated with a small amount of lime solution or an approved soap solution or detergent to prevent the mixture from adhering to the bodies.
- B. All truck dump bodies shall have a cover of canvas or other water repellent material capable of heat retention which completely covers the mixture. The cover shall be securely fastened on the loaded truck except when unloading.
- C. All truck bodies shall have an opening on both sides which will accommodate a thermometer stem. The opening shall be located near the midpoint of the body, at least 300 mm (12 inches) above the bed.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. All references for materials contained within this specification are drawn from the State of Maine Department of Transportation (MDOT) 12/2002, Maine State Standard Specifications latest edition.
- B. Hot Mix Asphalt Pavement Mix: The Contractor shall compose the Hot Mix Asphalt Pavement with aggregate, Performance Graded Asphalt Binder (PGAB), and mineral filler if required. HMA shall be designed and tested according to AASHTO TP-4. The Contractor shall size, uniformly grade, and combine the aggregate fractions in proportions that provide a mixture meeting the grading requirements of the Job Mix Formula (JMF). The Contractor may use a maximum of 20 percent reclaimed asphalt pavement (RAP) in any base, binder or shim course, and in any wearing course placed on shoulders (excluding Urban areas). Up to 10 percent RAP will be allowed on mainline surface courses provided that the same JMF is utilized for the full width including shoulders.
- C. Granular Fill: Shall be as specified in Division 31, Section Earth Moving.
  - 1. Granular Base: Shall be as specified in Division 31, Section Earth Moving.
  - 2. Composition of mixtures - (MDOT 401.02 - Supplemental Specification): The coarse and fine aggregate shall meet the requirements of paragraph "Aggregate Schedule." The several aggregate fractions for mixtures shall be sized, graded and combined in such proportions that the resulting composite blends will meet the grading requirements of the following table unless otherwise shown on the drawings.

TABLE 1  
COMPOSITION OF MIXTURES - CONTROL POINTS

SIEVE SIZE	GRADING			
	TYPE 19 mm (3/4 inch)	TYPE 12.5 mm (1/2 inch)	TYPE 9.5 mm (½ inch)	TYPE: 4.75 mm (No. 4)
PERCENT BY WEIGHT PASSING - COMBINED AGGREGATE				
37.5 mm (1 ½ inch)				

25 mm (1 inch)	100			
19 mm (3/4 inch)	90-100	100		
12.5 mm (1/2 inch)	-90	90-100	100	100
9.5 mm (3/8 inch)	-	-90	90-100	95-100
4.75 mm (No. 4)	-	-	-90	80-100
2.36 mm (No. 8)	23-49	28-58	32-67	40-80
1.18 mm (No. 16)	-	-	-	-
0.60 mm (No. 30)	-	-	-	-
0.30 mm (No. 50)	-	-	-	-
0.075 mm (No. 200)	2-8	2-10	2-10	2-10

-- End of Table 1. --

**TABLE 2: VOLUMETRIC DESIGN CRITERIA**

Design ESAL's (Millions)	Required Density (Percent of G <sub>mm</sub> )			Voids in the Mineral Aggregate (VMA)(Minimum Percent)					Voids Filled with Binder (VFB) (Minimum %)	Fines/Eff. Binder Ratio
	N <sub>initial</sub>	N <sub>design</sub>	N <sub>max</sub>	Nominal Maximum Aggregate Size (mm)						
				25 (1 inch)	19 (3/4 inch)	12.5 (1/2 inch)	9.5 (3/8 inch)	4.75 (#4)		
<0.3	≤91.5	96.0	≤98.0	12.0	13.0	14.0	15.0	16.0	70-80	0.6-1.4
0.3 to <3	≤90.5								65-78	
3.0 to <10	≤89.0								65-75*	
10 to <30										
≥30										

\*For 9.5 mm (3/8 inch) nominal maximum aggregate size mixtures, the maximum VFB is 76. For 4.75 (#4) nominal maximum aggregate size mixtures, the maximum VFB is 80.

-- End of Table 2. --

3. Aggregate Schedule: Shall meet the total percentage by weight of aggregate passing the sieve designation as defined in Table 1 of Par. 2.1.C.2 and unless indicated otherwise on contract drawings or in the specifications.
  - a. Base Course: (Roadway) 19.0 mm (as noted on drawings), (walkways) 12.5 mm.
  - b. Finish Course (Roadways and Walkways): 9.5 mm.
  - c. Fine aggregate, that material passing the 2.36 mm sieve, shall not exceed an absorption of 3.0 percent by weight as determined by AASHTO T84. The composite blend shall have a Micro-Deval value of under 18.0 or less as determined by AASHTO TP 58-99. In the event of a failure, the Washington State Degradation test of 1967 shall be run prior to rejection of the material. Material with a value of 30 or more may be accepted. Aggregates shall also meet the following Table 3 consensus properties. The Owner reserves the right to sample and test the composite aggregate for any of the following properties at any time.

**TABLE 3: AGGREGATE CONSENSUS PROPERTIES CRITERIA**

Estimated Traffic, Million 80 kN	ASTM D 5821 Coarse Aggregate	AASHTO T-304 Method A Uncompacted	ASTM D 4791(8.4) Flat and	AASHTO T176 Clay Content/Sand
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(18 kips) ESALs	Angularity (Minimum)	Void Content of Fine Aggregate (Minimum)	Elongated Particles (Maximum)	Equivalent (Minimum)
<0.3	60/60	40	10	45
0.3 to <3.0	75/60			
3.0 to <10	85/80			
10 to <30	95/90	45		50
≥30	100/100			

ASTM D 5821 - "85/80" denotes that 85% of the coarse aggregate has one fractured face and 80% has two fractured faces.

AASHTO TP304 - Criteria are presented as percent air voids in loosely compacted fine aggregate, (U).

ASTM 4791 - Criteria are presented as maximum percent by weight of flat and elongated particles. (5:1 ratio).

-- End of Table 3. --

4. Temperature Requirements (MDOT 401.04): After the JMF is established, the temperatures of the mixture shall conform to the following tolerances:  
 In the truck at the mixing plant     ± 10°C (20°F)  
 At the Paver                             ± 10°C (20°F)  
 The JMF and the mix subsequently produced shall meet the requirements of Tables 2 and 3.
5. Gyration: Mix design shall be 50 gyrations. Substitutions allowed by prior approval of the Architect only.

2.2 CONSTRUCTION EQUIPMENT

- A. Mixing: Provide hot mix asphalt mixture in a mixing plant as specified herein.
- B. Pavers (MDOT 401.09): Dependable and adequate for the purpose intended, properly maintained in satisfactory and safe operating condition at all times. Pavers shall be self-contained, self-propelled units with an activated screed (heated if necessary) capable of placing courses of Hot Mix Asphalt Pavement in full lane widths, shoulder or similar construction.
- C. Rollers (MDOT 401.10): Rollers shall be static steel, pneumatic tire, or approved vibrator type. Rollers shall be in good mechanical condition, capable of starting and stopping smoothly, and be free from backlash when reversing direction. Rollers shall be equipped and operated in such a way as to prevent the picking up of hot mixed material by the roller surface. Use of rollers which result in crushing of the aggregate or displacement of the mixture will not be permitted. Any Hot Mix Asphalt Pavement that becomes loose, broken, contaminated, shows an excess or deficiency of Performance Graded Asphalt Binder, or is in any other way defective shall be removed and replaced at no additional cost with fresh Hot Mix Asphalt Pavement which shall be immediately compacted to conform with the adjacent area. The type of rollers to be used and their relative position in the compaction sequence shall generally be the Contractor's option, provided specification densities are attained and with the following requirements:
  1. At least one roller shall be pneumatic-tired on bridges and variable depth courses as well as the first lift of pavement over gravel or a reclaimed pavement or other irregular surface.
  2. Compaction with a vibratory or steel wheel roller shall precede pneumatic-tired rolling.
  3. Vibratory rollers shall not be operated in the vibratory mode when checking or cracking of the mat occurs, or on bridge decks.

4. Any method which results in cracking or checking of the mat will be discontinued and corrective action taken.
5. The maximum operating speed for a steel wheel roller shall not exceed the manufacturer's recommendations.

## 2.3 CURBING

- A. Hot mix asphalt Curbing: MDOT Type 3 Bituminous Curbing, 712.36. The asphalt cement for bituminous curb shall be of the grade required for the wearing course. The aggregate shall conform to the requirements of Table 3. The coarse aggregate portion retained on the No. 8 sieve may be either crushed rock or crushed gravel. The mineral constituents of the bituminous mixture shall be sized and graded and combined in a composite blend that will produce a stable durable curbing with an acceptable texture.
- B. Concrete curbing: as specified in Section 321313 Site Concrete.
- C. Granite Curbing: as specified in Section 321313 Site Concrete.

## PART 3 - EXECUTION

### 3.1 CONSTRUCTION PROCEDURES

- A. Granular Base and Subbase: The granular base and subbase materials shall be installed in lifts not exceeding 18" and compacted to 95% modified proctor. The granular material shall be brought to the depths and grades as shown on the drawings and specified herein. Care shall be taken to insure no damage to the finish grade prior to the application of the hot mix asphalt concrete paving.
- B. Plant Mix Pavements: Composition of Mixtures: The hot mix asphalt plant admixture shall be composed of aggregate, filler if required and hot mix asphalt material. The several aggregate fractions shall be sized, uniformly graded and combined in proportions that will provide a mixture meeting the grading requirements of the job-mix formula.
- C. Transportation of Hot mix asphalt Mixtures (MDOT 401.08): Trucks for hauling Hot Mix Asphalt Pavement shall have tight, clean, smooth metal dump bodies which have been thinly coated with a small amount of lime solution or an approved soap solution or detergent to prevent the mixture from adhering to the bodies. Petroleum products will not be permitted for coating truck bodies. All truck dump bodies shall have a cover of canvas or other water repellent material capable of heat retention which completely covers the mixture. The cover shall be securely fastened on the loaded truck except when unloading. All truck bodies shall have an opening on both sides which will accommodate a thermometer stem. The opening shall be located near the midpoint of the body, at least 300 mm (12 inches) above the bed.
- D. Make deliveries so that the spreading and rolling of all the mixture prepared for one day's run can be completed during daylight, unless adequate approved artificial lighting is provided. Deliver mixture to the area to be paved in such a manner that the temperature at the time of dumping into the spreader will be higher than that specified herein. Reject any loads that are below minimum temperature, that have crusts of cold unworkable material, or that have been wet excessively by rain. Hauling over freshly laid material is not permitted.
- E. Placing:

1. Surface Preparation of Underlying Course (MDOT 401.11): Prior to the laying of the asphalt (hot mix asphalt) concrete, the Contractor shall thoroughly clean the surface upon which Hot Mix Asphalt Pavement is to be placed of all objectionable material, including loose or broken pavement. Remove or clean matter by power brush or milling machine and finish with power blower or brush. When the surface of the existing base or pavement is irregular, the Contractor shall bring it to uniform grade and cross section. Milled paving shall be finished flat with a straight and square edge, free from irregularities or bulges. Hand brooms or other cleaning methods may be used if approved by Architect/Engineer. Dispose of matter in accordance with applicable Local, State and Federal codes.
  2. Spraying of Contact Surfaces (Tack Coat): Spray contact surfaces of previously constructed pavement (longer than 7 days) with a thin coat of emulsified asphalt material conforming to MDOT specifications for emulsified asphalt tack coat. Paint contact surfaces of structures with a thin coat of emulsified asphalt or other approved material prior to placing the mixture.
  3. General Requirements for Use of Hot mix asphalt Spreaders: The Contractor shall place Hot Mix Asphalt Pavement with a paver using an automatic grade and slope controlled screed. The controls shall automatically adjust the screed and increase or decrease the layer thickness to compensate for irregularities in the preceding course. The controls shall maintain the proper transverse slope and be readily adjustable so that transitions and superelevated curves can be properly paved. The controls shall operate from a fixed or moving reference such as a grade wire or ski type device (floating beam) with a minimum length of 9 m (30 foot).
  4. The Contractor shall operate the paver in such a manner as to produce a visually uniform surface texture and a thickness within the requirements of Subsection 401.101 Surface Tolerances. The paver shall have a receiving hopper with sufficient capacity for a uniform spreading operation and a distribution system to place the mixture uniformly, without segregation in front of the screed. The screed assembly shall produce a finished surface of the required evenness and texture without tearing, shoving, or gouging the mixture. Pavers with extendible screeds shall have auger extensions and tunnel extenders as necessary.
  5. The range of temperatures of the mixtures at the time of spreading shall be between 250-degrees F and 300-degrees F. Hot mix asphalt concrete having temperatures less than minimum spreading temperature when dumped into the spreader will be rejected.
  6. On roads opened to two way traffic, the Contractor shall place each course over the full width of the traveled way section being paved that day.
  7. Hand-spreading in Lieu of Machine-spreading (MDOT 401.15): On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impracticable, the Contractor shall spread, rake, and lute the mixture with hand tools to provide the required compacted thickness. The range of temperatures of the mixtures when dumped onto the area to be paved shall be between 250-degrees F and 300-degrees F. Hot mix asphalt concrete having temperatures less than minimum spreading temperature when dumped onto the area to be paved will be rejected.
- F. Compaction of Mixture (MDOT 401.16): Immediately after the Hot Mix Asphalt Pavement has been spread, struck off, and any surface irregularities adjusted, the Contractor shall thoroughly and uniformly compact the mixture by rolling. The Contractor shall roll the surface when the mixture is in the proper condition and when the rolling does not cause undue displacement, cracking, or shoving. The Contractor shall prevent adhesion of the mixture to the rollers or vibrating compactors without the use of oil.
- G. The Contractor shall immediately correct any displacement occurring as a result of the reversing of the direction of a roller or from other causes. Any operation other than placement of variable depth shim course that results in breakdown of the aggregate shall be discontinued. Any new pavement that shows obvious cracking, checking, or displacement may be removed and replaced for the full lane width as directed by the Architect/ Engineer at no cost to the Owner.

- H. Along forms, curbs, headers, walls, and other places not accessible to the rollers, the Contractor shall thoroughly compact the mixture with mechanical vibrating compactors. The Contractor shall only use hand tamping in areas inaccessible to all other compaction equipment. On depressed areas, the Contractor may use a trench roller or cleated compression strips under a roller to transmit compression to the depressed area.
- I. Joints (MDOT 401.17): The Contractor shall construct wearing course transverse joints in such a manner that minimum tolerances shown in section 401.101 are met when measured with a straightedge. The paver shall always maintain a uniform head of material during the joint construction. The hot asphalt mix shall be free of segregation and meet temperature requirements. Transverse joints of the wearing course shall be straight and neatly trimmed. The Contractor may form a vertical face exposing the full depth of the course by inserting a header, by breaking the bond with the underlying course, or by cutting back with hand tools.
- J. The Contractor shall apply a coating of emulsified asphalt immediately prior to paving all joints, except those formed by pavers operating in echelon. The Contractor shall use an approved spray apparatus designed for covering a narrow surface. The Architect/ Engineer may approve application by a brush for small surfaces, or in the event of a malfunction of the spray apparatus, but for a period of not more than one working day.
- K. Where pavement under this Contract joins an existing pavement, the Contractor shall cut the existing pavement along a smooth line, producing a neat, even, vertical joint. The Architect/ Engineer will not permit broken or raveled edges.
- L. All joints shall present the same texture, density, and smoothness as other portions of the course. Carefully make joints between old and new pavement or within new pavements in a manner as to ensure a thorough and continuous bond between old and new sections of the course. Paint all vertical contact surfaces of previously constructed sections with a thin uniform coat of emulsion or other approved material just before the fresh mixture is placed.
- M. Curbing (MDOT 609.04)
1. Before placing the curb, the foundation course shall be thoroughly cleaned of all foreign and objectionable material. String or chalk lines shall be positioned on the prepared base to provide guide lines. The foundation shall be uniformly painted with tack coat at a rate of 0.2 to 0.7 L/m<sup>2</sup> (0.04 to 0.14 gal/yd<sup>2</sup>).
  2. The curb shall be placed by an approved power operated extruding type machine using the shape mold called for. A tight bond shall be obtained between the base and the curb. The resulting curbing shall conform in all respects to the curbing produced by the machine.
  3. The curb will be sealed with bituminous sealing compound only when directed by the Engineer. Before sealing, the curb shall be clean, dry and shall have reached the ambient temperature.
  4. When required, the curb shall be painted and coated with glass beads in accordance with Section 321219 "Pavement Markings". Curb designated to be painted shall not be sealed with bituminous sealing compound.
  5. Curb may be accepted or rejected based on appearance concerning texture, alignment, or both. All damaged curb shall be removed and replaced at the Contractor's expense.

### 3.2 FIELD SAMPLING AND TESTING

- A. Sampling (MDOT 401.203): One sample will be taken from the paver hopper or the truck body per 250 Mg (275 ton) per pay item. The mix will be tested for gradation and PGAB content. If the mix is within

the USL and LSL tolerances listed in Table 4, the Owner will pay on the basis of the contract price outlined in the bid form and as reflected on the Contractor prepared schedule of values.

TABLE 4: GRADATION, VOLUMETRIC AND PGAB CONTENT VERIFICATION LIMITS

Property	USL and LSL	REJECTION LIMITS
	Method C	
Percent Passing 4.75 mm (No. 4) and larger sieves	Target $\pm$ 7	Target $\pm$ 9
Percent passing 2.36 mm (No. 8) to 1.18 mm (No. 16) sieves	Target $\pm$ 5	Target $\pm$ 7
Percent passing 0.60 (No. 30)	Target $\pm$ 4	Target $\pm$ 6
Percent passing 0.30 mm (No. 50) to 0.075 sieve (No. 200)	Target $\pm$ 3	Target $\pm$ 5
PGAB Content	Target $\pm$ 0.5	Target $\pm$ 0.7
Air Voids	Not applicable	Not applicable
Fines to Effective Binder	Not applicable	Not applicable
Voids in Mineral Aggregate	Not applicable	Not applicable
Voids Filled with Binder	Not applicable	Not applicable
In-place density	92.0 Minimum	-

-End of Table 4-

1. Pavement and Mixture: Owner’s independent testing agency shall cut two 150 mm (6 inch) cores, which shall be tested for percent TMD, thickness and density of the completed pavements. Furnish all tools, labor and material for samples and for satisfactory replacement of pavement. Take samples and test at not less than frequency specified hereinafter and at the beginning of plant operations; for each day’s work as a minimum; each change in the mix or equipment; and as often as directed. Accomplish sampling in accordance with ASTM D979. If the test results for each 250 Mg increment are outside the USL and LSL limits (see Table 4) the following deductions (Table 4b) shall apply. If the test results for each 275 Mg increment are outside the rejection limits presented in Table 4, the 275 ton subplot is subject to removal at the discretion of the Engineer. A second consecutive failing test shall result in cessation of production.

TABLE 4b

PGAB Content	-5%
2.36 mm sieve (No. 8)	-2%
0.30 mm sieve (No. 50)	-1%
0.075 mm sieve (No. 200)	-2%
Density	-10%*

\*Only applies when called for.

-- End of Table 4b --

2. Sample Identification: Furnish each sample in a clean container, securely fastened to prevent loss of material. Tag each sample for identification. The tag shall contain the following information:  
 Contract No. \_\_\_\_\_  
 Sample No. \_\_\_\_\_ Quantity \_\_\_\_\_  
 Date of Sample \_\_\_\_\_  
 Sample \_\_\_\_\_  
 Source \_\_\_\_\_  
 Intended use \_\_\_\_\_  
 For testing \_\_\_\_\_

B. Testing:

1. General Contractor to arrange for and Owner to pay for all required field testing. The General Contractor shall pay for any required retesting by the Architect and Owner.
2. Pavement Courses Tests: Density: If required, determine the representative laboratory density by averaging the density of four laboratory specimens prepared in accordance with ASTM D1559.
3. Thickness: Match thickness as shown on drawing. Variations shall be removed and replaced to the proper thickness at no additional cost to the Owner.
4. Smoothness: Check surface tolerance with a 4.9 m (16 foot) straightedge or string line placed parallel to the centerline of pavement and with a 3 m (10 foot) straightedge or string line placed transverse to the centerline of pavement. Straightedge test the compacted surface of the leveling, binder and wearing courses as the work progresses. Apply straightedge parallel with and at right angles to the centerline after final rolling. Unevenness of the leveling and binder course shall not vary more than plus or minus ¼-inch in 10-feet; variations in the wearing course shall not vary more than plus or minus 1/8-inch in 10-feet. The Contractor shall correct any portion of the pavement showing irregularities greater than that specified by replacing it with new material.
5. Finished Grades: The finish grades of each course placed shall not vary from the finish elevations, profiles and cross sections indicated on the drawings by more than ½-inch.

END OF SECTION 321216



## SECTION 321219 - PAVEMENT MARKINGS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section includes pavement markings with paint, thermoplastic compounds, or reflective media as indicated in the drawings and as specified herein. The work shall include but is not limited to the following:
  1. 4" wide reflectorized white parking stall delineations.
  2. 4" wide reflectorized yellow access road travel lane delineations.
  3. 24" wide reflectorized white "stop" lines, locations as indicated on the drawings.
  4. 8" wide reflectorized white crosswalk striping
- B. Related sections:
  1. Section 013300, Submittal Procedures.
  2. Division 32 Section, "Asphalt Paving"

## 1.3 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY & TRANSPORTATION OFFICIALS  
(AASHTO)

AASHTO M247            1996 Standard Specification for Glass Beads Used in Traffic Paint

FEDERAL SPECIFICATIONS (FS)

FS TT-B-1325            2007 (Rev. D) Beads (Glass Spheres) Retro-Reflective

FS TT-P-115            1999 (Rev. F) Paint, Traffic (Highway, White and Yellow)

MAINE DEPARTMENT OF TRANSPORTATION (MDOT) "Standard Specifications" 12/2002

## 1.4 SUBMITTALS

- A. Manufacturer's Catalog Data

1. Reflective Media
2. Paint
3. Thermoplastic compounds and primer

B. Manufacturer's Instructions

1. Paint
2. Thermoplastic compounds and primer
3. Submit manufacturer's Material Safety Data Sheets.

C. Statements

1. Construction equipment list

D. Factory Test Reports

1. Reflective media
2. Paint
3. Thermoplastic compounds and primer
4. Report from sampling and testing made in accordance with paragraph entitled "Sampling and Testing".

E. Certificates of Compliance: Submit certificates attesting that tests set forth in each applicable referenced publication have been performed, whether specified in that publication to be mandatory or otherwise and that production control tests have been performed at the frequency or intervals specified in the publication. Other tests shall have been performed within 3 years of the date of submittal of certificates on the same type, class, grade, and size of material as is being provided for the project.

1. Reflective media
2. Paint
3. Thermoplastic compounds and primer

1.5 DELIVERY AND STORAGE

- A. Deliver paints, paint materials and thermoplastic compound materials in original sealed containers that plainly show the designated name, specification number, batch number, color, date of manufacture, manufacturer's directions, and name of manufacturer. Provide storage facilities at the job site for maintaining materials at temperatures recommended by the manufacturer.

1.6 SCHEDULES

- A. Submit a written time schedule for traffic line painting. The schedule shall include paving and painting times. Provide the Architect/Engineer with 3-days notice prior to the application of any paint.

1.7 WEATHER LIMITATIONS

- A. Apply paint to clean, dry surfaces, and unless otherwise approved, only when air and pavement temperatures are above 40-degrees F for oil-based materials, 50-degrees F for water-based materials, and less than 95-degrees F. Maintain paint temperature within these same limits.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Provide materials conforming to the requirements specified herein.

1. Paints for Roads and Streets: Paint shall be a cold-applied, alkyd base traffic marking paint in conformance with federal specifications FS TT-P-115, Type 1; FS TT-P-75, Maine State Standard, MDOT 708.03 and the following:

- a. Color: White, Yellow
- b. Finish: Flat
- c. Drying Time: At 70-Degrees F (15 mils-wet)

- 1) To Touch: 12-minutes
- 2) To Recoat: 30-minutes
- 3) For Traffic: 30-minutes

- d. Spread: 100-150-sq. ft. per gal. (15 mils wet) or 300' of a 4" line at 15 mils wet
- e. Flash Point: Under 80-Degrees F.
- f. Viscosity (K.U.): 80-84
- g. % Pigment by weight: 55% min.
- h. Acceptable Products/Manufacturers are:

- 1) "Zonline" Traffic and Zone Marking Paint by PPG Porter Paints of Porter International.
- 2) "Hotline" Fast Dry Latex Traffic Marking Paint by Sherman Williams.
- 3) Approved equal.

NOTE: Paint for temporary pavement marking shall retain the original color, adhere to the glass beads and shall be adequately durable to minimize the need for repainting.

2. Reflective Media for Roads and Streets: Shall be in conformance with FS TT-B-1325, Type I or II, Gradation A, and Maine State Standard MDOT 708.03 where glass beads conform to the requirements of AASHTO M247, Type I.

3. Thermoplastic Compounds: Thermoplastics are applied under heat.

- a. Colors: as specified on the drawings
- b. Thickness: 125mil minimum
- c. Acceptable Products/Manufacturers are:

- 1) "Hottape" Preformed Thermoplastic Pavement Markings by Flint Inc.
- 2) Or similar as approved by the engineer

2.2 EQUIPMENT

A. Machines, tools, and equipment used in the performance of the work shall be approved by the Architect/Engineer and maintained in satisfactory operating condition.

B. Paint Applicator

- 1. Provide self-propelled or mobile-drawn pneumatic spraying machine with suitable arrangements of atomizing nozzles and controls to obtain the specified results. Provide machine having a speed during application capable of applying the stripe widths indicated at the paint coverage rate specified herein and of even uniform thickness with clear-cut edges. Provide equipment used for marking streets and highways capable of placing the prescribed number of lines at a single pass as solid lines, intermittent lines, or a combination of solid and intermittent lines using a maximum of three different colors of paint as specified. Provide paint applicator with paint reservoirs or tanks of sufficient capacity and suitable gages to apply paint in accordance with requirements specified. Equip tanks with suitable air-driven mechanical agitators. Equip spray mechanism with quick-action valves conveniently located, and include necessary pressure regulators and gages in full view and reach of the operator. Install paint strainers in paint supply lines to ensure freedom from residue and foreign matter that may cause malfunction of the spray guns. The paint applicator shall be readily adaptable for attachment of an air-actuated dispenser for the reflective media approved for use. Provide pneumatic spray guns for hand application of paint in areas where the mobile paint applicator cannot be used.
  
- C. Reflective Media Dispenser: Attach dispenser for applying the reflective media to the paint dispenser and operate automatically and simultaneously with the paint applicator through the same control mechanism. Use dispenser capable of adjustment and designed to provide uniform flow of reflective media over the full width of the stripe at the rate of coverage specified herein at all operating speeds of the paint applicator to which it is attached.
  
- D. Thermoplastic:
  - 1. Magnum Torch or approved equivalent propane fueled torch with pressure regulator and 25 ft. of hose with adequate supply of propane
  - 2. Infrared Thermometer
  - 3. Gas powered blower or broom
  - 4. Utility knife

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

- A. Allow new pavement surfaces to cure for a period of not less than 20-days before application of marking materials. Pavement surfaces shall be dry and free of oil, dirt grease, and other contaminants prior to the application of pavement markings. Thoroughly clean surfaces to be marked before application of the paint. Remove dust, dirt, and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water, or a combination of these methods as required. Remove rubber deposits, existing paint markings, residual curing compounds, and other coatings adhering to the pavement by waterblasting. Scrub affected areas, where oil or grease is present on old pavements to be marked, with several applications of trisodium phosphate solution or other approved detergent or degreaser and rinse thoroughly after each application. After cleaning oil-soaked areas, seal with shellac or primer recommended by the manufacturer to prevent bleeding through the new paint. Clean non conforming surfaces to a width of 4 to 6 inches wider than the proposed marking. Do not commence painting in any area until pavement surfaces are dry and clean and have been inspected and approved by the Architect/Engineer.

3.2 APPLICATION

- A. Widths: The traveled way or parking lane width and width of longitudinal lines shall be as specified on the drawings. Lane widths shall be measured from the center of the lane lines once a control line is established for the lane configuration of the roadway. When measurements are taken from existing longitudinal lines, the point of reference shall be the center of the single line or the center of the space between dual lines. The traveled way widths are in compliance when they have an acceptable appearance and are within a 2 inch variation from the proposed lane width.
- B. Alignment: Place markings in a straight and uniform manner. Lane lines are in compliance when they have an acceptable appearance and are visually in alignment, with no more than a 3/8 inch variation in any 40 ft. section. Maintain longitudinal alignment through all intersections and breaks, even though the lines themselves may discontinue. Do not apply pavement line markings over longitudinal joints; offset the markings 2in.
- C. Layout Markings: Remove layout markings that detract from the overall appearance and function of the final markings as determined by the engineer at no additional cost to the owner.
1. Marking Removal: Remove existing pavement markings that conflict with new or altered traffic patterns. Use an approved method and ensure that the pavement surface is not damaged. (Using paint to cover conflicting paint lines is not an acceptable method) If damage occurs, repair or replace damages, to an acceptable manner equal or better than existing conditions, at no additional cost to the owner.
- D. Rate of Application
1. Reflective Markings: Apply paint evenly to the pavement area to be coated at a rate of 105 (plus or minus 5) square feet per gallon at a minimum of 15-mils of wet thickness. Apply glass spheres uniformly to the wet paint on road and street pavement at a rate of 6 (plus or minus 0.5)-pounds of glass spheres per gallon.
  2. Nonreflective Markings: Apply paint evenly to the pavement surface to be coated at a rate of 105 (plus or minus 5) square feet per gallon.
- E. Painting: Apply paint pneumatically with approved equipment at rate of coverage specified herein. Provide guidelines and templates as necessary to control paint application. Take special precautions in marking numbers, letters, and symbols. Manually paint numbers, letters, and symbols. Sharply outline all edges of markings. The maximum drying time requirements of the paint specifications will be strictly enforced, to prevent undue softening of bitumen, and pickup, displacement, or discoloration by tires of traffic. Discontinue painting operations if there is a deficiency in drying of the markings until cause of the slow drying is determined and corrected.
- F. Reflective Media: Application of reflective media shall immediately follow the application of paint. Accomplish drop-on application of the glass spheres to ensure even distribution at the specified rate of coverage. Should there be malfunction of either paint applicator or reflective media dispenser, discontinue operations until deficiency is corrected.
- G. Thermoplastic Compound: Place thermoplastic pavement markings upon dry pavement. At the time of installation the pavement surface temperature shall be a minimum of 40 degrees F and rising Prior to any heating. Rolled tape products shall be unrolled when the temperature is a sustained minimum of 55 degrees F. Thermoplastics, as placed, shall be free from dirt or tint. Heat the targeted surface area to 300 degrees F (or as specified by the manufacturer) immediately place the first piece. Apply all centerline, skipline, edgeline, and other longitudinal type markings with a mobile applicator. Maintain a minimum distance of 6 inches between the torch nozzle and the heat source. Place all special markings, crosswalks, stop bars, legends, arrows, and similar patterns with a portable applicator, using the extrusion method.

### 3.3 FIELD TESTING AND INSPECTION

- A. Inspection: Examine material at the job site to determine that it is the material referenced in the report of test results or certificate of compliance. A certificate of compliance shall be accompanied by test results substantiating conformance to the specified requirements.
1. Surface Preparations and Application Procedures: Surface preparations and application procedures will be examined by the Architect/Engineer to determine conformance with the requirements specified. Approve each separate operation prior to initiation of subsequent operations.
  2. Records: Maintain complete records of quality control inspection results, including actions taken to correct problems. Identify the following for the record
    - a. Ambient Temperature
    - b. Pavement surface temperature
    - c. Material Temperature
    - d. Material Thickness
    - e. Retroreflectivity
    - f. Alignment
    - g. Color
    - h. Product name
  3. Observation Period:
    - a. The contractor shall be responsible for any defects in material and workmanship of the pavement markings for a period of 180 days from the date the pavement is opened to traffic.
    - b. Time charges will not be assessed during the observation period provided all other work on the contract is complete. At the end of the observation period, the engineer can inspect the pavement markings for durability, color, and retroreflectivity, and inform the contractor that the pavement markings have failed and that they require corrective action. Pavement markings will be failed for any of the following conditions:
      - 1) More than 5 percent of the substrate is exposed in any section of longitudinal marking up to a 2,000 ft maximum inspection area.
      - 2) Retroreflectivity values have dropped below the minimum retroreflectivity specified.
      - 3) Marking is discolored when compared visually with the color chips.

Remove and replace all failed markings within 30 days of receiving written notification from Engineer.

### 3.4 TRAFFIC CONTROL AND PROTECTION

- A. Protect the markings until dry. Place warning signs (as per the MUTCD and as approved) near the beginning of the work site and well ahead of the work site for alerting approaching traffic from both directions. Place small markers along newly painted lines to control traffic and prevent damage to newly painted surfaces. Mark painting equipment with large warning signs indicating slow-moving painting equipment in operation. If a vehicle damages uncured markings, reapply the markings and removed the marks left on the pavement by the vehicle at no additional cost to the owner.

END OF SECTION 321226

## SECTION 321313 – SITE CONCRETE

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section includes exterior cement concrete pavement for the following:
  - 1. Walkways
  - 2. Equipment Pads
  - 3. H.C. Ramps
  - 4. Plaza areas
  - 5. Granite Curbing
- B. Related Sections include the following:
  - 1. Division 03 Section "Cast-in-Place Concrete" for general building applications of concrete.
  - 2. Division 31 Section "Earth Moving" for subgrade preparation, grading, and subbase course.

## 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, and ground granulated blast-furnace slag.

## 1.4 SUBMITTALS

- A. Product Data: For each type of manufactured material and product indicated.
- B. Qualification Data: For manufacturer.
- C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:
  - 1. Aggregates.
- D. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
  - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.

- E. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, bent bar diagrams, bar arrangement, splices and laps, and supports for concrete reinforcement.
- F. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:
  - 1. Admixtures.
  - 2. Applied finish materials.
  - 3. Bonding agent or epoxy adhesive.
  - 4. Joint fillers.
  - 5. Saltguard Sealant

#### 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.
  - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- B. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
  - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
- C. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by requirements in the Contract Documents.
- D. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
- E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."
  - 1. Before submitting design mixtures, review concrete pavement mixture design and examine procedures for ensuring quality of concrete materials and concrete pavement construction practices. Require representatives, including the following, of each entity directly concerned with concrete pavement, to attend conference:
    - a. Contractor's superintendent.
    - b. Independent testing agency responsible for concrete design mixtures.
    - c. Ready-mix concrete producer.
    - d. Concrete pavement subcontractor.

#### 1.6 PROJECT CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.



## PART 2 - PRODUCTS

## 2.1 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
  - 1. Use flexible or curved forms for curves with a radius 100 feet or less.
- B. 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.

## 2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete, and as follows:
  - 1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
- C. Recycled Content of Steel Products: Provide products with an average recycled content of steel with postconsumer recycled content not less than 75 percent and preconsumer recycled content not less than 10 percent.

## 2.3 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
  - 1. Portland Cement: ASTM C 150, Type I or II.
  - 2. Include Supplementary Cementitious Materials as a percentage of cementitious materials at 25% by weight:
    - a. Fly Ash: ASTM C 618, Class C or F.
    - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- B. Normal-Weight Aggregates: ASTM C 33, coarse aggregate, uniformly graded. Provide aggregates from a single source.
  - 1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
  - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M.
- D. Air-Entraining Admixture: ASTM C 260.

- E. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

#### 2.4 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.
- B. Water: Potable.

#### 2.5 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Concrete Water Repellent Agent: Clear liquid concrete surface penetrating agent that protects concrete from moisture intrusions and chemical attack of chloride salts. Apply to all exterior concrete surfaces.
  - 1. Available Products: PROSOCO, Inc.; Consolideck Saltguard WB

#### 2.6 CONCRETE MIXTURES

- A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.
  - 1. Use a qualified independent testing agency for preparing and reporting proposed concrete mixture designs for the trial batch method.
- B. General site concrete:
  - 1. Proportion mixtures to provide normal-weight concrete with the following properties:
    - a. Compressive Strength (28 Days): 3,000 psi.
    - b. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.50.
    - c. Slump Limit: 5 inches, plus or minus 1 inch.
  - 2. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:
    - a. Air Content: 6 percent plus or minus 1.5 percent for 1-inch nominal maximum aggregate size.
- C. Higher-strength site concrete:
  - 1. Proportion mixtures to provide normal-weight concrete with the following properties:
    - a. Compressive Strength (28 Days): 4,500 psi.
    - b. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.45.
    - c. Slump Limit: 4 inches, plus or minus 1 inch.

2. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:

a. Air Content: 6 percent plus or minus 1.5 percent for 1-inch nominal maximum aggregate size.

D. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

E. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.

## 2.7 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Furnish batch certificates for each batch discharged and used in the Work.

1. When air temperature is between 85 deg F and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

## 2.8 CURBING

A. Granite Curbing: Stone for curbing and edging shall be approved granite from acceptable sources. The stone shall be hard and durable, predominantly gray in color, free from seams that impair its structural integrity and of smooth splitting character. Natural grain size and color variations characteristic of the source deposit will be permitted. Such natural variations may include bands or clusters of mineral or both of mineral crystallization that do not impair the structural integrity of the curb stone. The dimensions, shape and other details shall be as shown on the plans. Stone for curbing shall be granite in conformance with the following requirements.

1. Minimum depth of 6-inch curbing shall be 18-inches.
2. Curbing will be split faced on the sides with a smooth/rubbed finish on the tops.
3. Provide sound stone uniform in color, texture, and cut free from mineral stains, foreign water, and defects detrimental to appearance and durability.
4. Color range, texture, and finish cut of stone materials shall be within range of existing stone curbing as approved by the Owner.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proceed with concrete pavement operations only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

### 3.2 PREPARATION

- A. Remove loose material from compacted subbase surface immediately before placing concrete.

### 3.3 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

### 3.4 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

### 3.5 JOINTS

- A. General: Form construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.
  - 1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.
  - 1. Continue steel reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
  - 2. Butt Joints: Use epoxy bonding adhesive at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
  - 1. Locate expansion joints at intervals of 50 feet, unless otherwise indicated.
  - 2. Extend joint fillers full width and depth of joint.
  - 3. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
  - 4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
  - 5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.

6. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- D. Control Joints: From weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints by sawcutting for a depth equal to at least one-fourth of the concrete thickness, as follows:
1. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch radius. Repeat grooving of control joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
- E. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

### 3.6 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.
- C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
- D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.
- E. Do not add water to concrete during delivery or at Project site.
- F. Do not add water to fresh concrete after testing.
- G. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- H. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.
1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.
- I. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.
1. Remove and replace concrete that has been placed for more than 15 minutes without being covered by top layer, or use bonding agent if approved by Architect.
- J. Screed pavement surfaces with a straightedge and strike off.

- K. Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.
  - L. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.
  - M. Slip-Form Pavers: When automatic machine placement is used for pavement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce pavement to required thickness, lines, grades, finish, and jointing as required for formed pavement.
    - 1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of paver machine during operations.
  - N. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.
  - O. 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, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
    - 2. Do not use frozen materials or materials containing ice or snow.
    - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mix designs.
  - P. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:
    - 1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
    - 2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
    - 3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.
- 3.7 CURBING
- A. Granite Curbing: Install curbing in conformance with City of Portland Technical Design Standards. Specifications are as follows unless otherwise indicated on the Drawings.
- 3.8 CONCRETE FINISHING
- A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

- B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
  - 1. Apply float finish to surfaces to receive trowel finish.
- C. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
  - 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route or as specified on the construction plans. Coordinate required final finish with Architect before application.

### 3.9 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Comply with ACI 306.1 for cold-weather protection.
- C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
  - 1. Moist Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
    - a. Water.
    - b. Continuous water-fog spray.
    - c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
- E. All exterior concrete surfaces shall be provided with a water repellent product equal to Consolideck Saltguard WB. Apply product per manufacturer's recommendations.

### 3.10 PAVEMENT TOLERANCES

- A. Comply with tolerances of ACI 117 and as follows:
  - 1. Elevation: 1/4 inch.
  - 2. Thickness: Plus 3/8 inch, minus 1/4 inch.
  - 3. Surface: Gap below 10-foot- long, unlevelled straightedge not to exceed 1/4 inch.
  - 4. Joint Spacing: 3 inches.
  - 5. Contraction Joint Depth: Plus 1/4 inch, no minus.
  - 6. Joint Width: Plus 1/8 inch, no minus.

### 3.11 FIELD QUALITY CONTROL

- A. Testing Agency: The Site Contractor shall pay for any required retesting by the Architect and Owner.

- 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 at least 1 composite sample for each 5000 sq. ft. or fraction thereof of each concrete mix placed each day.
    - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
  2. Slump: ASTM C 143/C 143M; 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; 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 and below and when 80 deg F 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 three standard cylinder specimens for each composite sample.
  6. Compressive-Strength Tests: ASTM C 39/C 39M; test 1 specimen at 7 days and 2 specimens at 28 days.
    - a. A compressive-strength test shall be the average compressive strength from 2 specimens obtained from same composite sample and tested at 28 days.
- C. Strength of each concrete mix will be satisfactory if average of any 3 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.
- D. 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 mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- E. 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.
- F. 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.
- G. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.
- H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- 3.12 REPAIRS AND PROTECTION
- A. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.



- B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.
- C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321313

## SECTION 321316.23 - STAMPED CONCRETE PAVING

## PART 1 - GENERAL

## 1.1 SUMMARY

## A. Section includes:

1. Dry-shake colored hardener applied to exterior concrete paving surfaces as indicated on Drawings.
2. Stamping concrete patterns with special imprinting tools.
3. Curing of colored and imprinted concrete.

## B. Related Sections:

1. Section 321313 "Site Concrete" for general concrete applications.
2. Section 321373 "Concrete Paving Joint Sealants" for colored sealant installed in paving joints.

## 1.2 REFERENCES

## A. American Concrete Institute (ACI):

1. ACI 301: Specification for Structural Concrete for Buildings.
2. ACI 302.1R: Recommended Practice for Concrete Floor and Slab Construction.
3. ACI 303.1: Standard Specification for Cast-in-Place Architectural Concrete.
4. ACI 304: Recommended Practice for Measuring, Mixing, Transporting and Placing of Concrete.
5. ACI 305R: Recommended Practice for Hot Weather Concreting.
6. ACI 306R: Recommended Practice for Cold Weather Concreting.

## B. ASTM International (ASTM):

1. ASTM C 260: Standard Specification for Air Entraining Admixtures for Concrete.
2. ASTM C 309: Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
3. ASTM C 979: Standard Specification for Pigments for Integrally Colored Concrete.

## C. Portland Cement Association (PCA):

1. PA124: Finishing Concrete with Color and Texture.

## 1.3 SUBMITTALS

## A. Product Data: For the following products:

1. Dry-shake colored hardener.
2. Liquid release agent.
3. Imprinting/Texturing tools.
4. Curing compound and sealer.

- B. Design Mixes: For each type of concrete.
- C. Samples for Initial Selection: Manufacturer's color charts showing full range of colors available.
- D. Qualification Data: For manufacturer and Installer.

#### 1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Minimum 10 years of documented experience producing the specified products.
- B. Installer Qualifications: Minimum 5 years of documented experience with work of similar scope and complexity required by this Project and acceptable to, or certified by, stamped concrete paving manufacturer.
- C. Publications: Comply with applicable requirements of ACI 301 and PCA PA124.
- D. Material Source: Obtain each specified material from the same source.
- E. Notification: Give a minimum 7 calendar days' notice to manufacturer's authorized field representative before date established for commencement of work.
- F. Stamped Concrete Paving Mockups:
  - 1. Construct a 10 foot by 10 foot mockup at location selected by Architect.
  - 2. Provide individual mockups for each color and pattern required.
  - 3. Construct mockup using materials, processes, and techniques required for the work, including curing procedures. Incorporate representative control, construction, and expansion joints according to Project requirements. Installer for the work to construct mockup.
  - 4. Notify Architect and Owner a minimum of seven calendar days in advance of the date scheduled for each mockup construction.
  - 5. Obtain the Architect's and Owner's acceptance of each mockup prior to commencement of the work.
  - 6. Each mockup to remain until completion of the work to serve as a quality control standard for the work. Provide suitable protections to preclude damage to mockup.
  - 7. Demolish and remove each mockup from site when directed.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products in original factory unopened, undamaged packaging bearing identification of product, manufacturer, batch number, and expiration date as applicable.
- B. Store products in a location protected from damage, construction activity, and adverse environmental conditions according to manufacturer's current recommendations.
  - 1. Imprinting tools must be stored flat, textured face up, with no objects resting on top.
- C. Handle products according to manufacturer's printed instructions.

## 1.6 PROJECT CONDITIONS

- A. Schedule placement to minimize exposure to wind and hot sun before curing materials are applied.
- B. Do not place concrete if rain, frost, or snow is forecast within 24 hours of placement. Protect fresh concrete from moisture and freezing conditions.
- C. Compliance Standards: ACI 305R and ACI 306R.

## 1.7 PREINSTALLATION CONFERENCE

- A. Seven calendar days prior to scheduled date of concrete placement, conduct a meeting at Project site to discuss requirements, including application methods. Attendees to include Architect, Owner, Contractor, Installer, concrete supplier, and manufacturer's authorized field representative.

## PART 2 - PRODUCTS

### 2.1 ACCEPTABLE MANUFACTURERS

- A. Basis of Design: Provide products specified herein manufactured by L. M. Scofield Company (Scofield).

### 2.2 MATERIALS

- A. Dry-Shake Colored Hardener: Cementitious material containing special hard aggregates, formulated as a high opacity color hardening material for the top surface of freshly place concrete substrates. Highly UV-resistant. Factory proportioned, mixed and packaged, ready-to-use. Comply with ASTM C 979.
  - 1. Product: Scofield's "LITHOCHROME Color Hardener."
  - 2. Colors: Brick Red.
  - 3. Imprinting Tools: System of matched tools for imparting textures and patterns into freshly placed concrete surfaces.
  - 4. Product: Scofield's "LITHOTEX Pavecrafters."
  - 5. Patterns: New Brick Running Bond.
- B. Low VOC Liquid Release Agent: Colorless, odorless liquid formulated to break the bond between imprinting tools and surface of color-hardened concrete. Evaporates completely, leaving no residue. VOC content less than 450 g/L (3.75lb/gal).
  - 1. Product: Scofield's "LITHOTEX Liquid Release."
- C. Waterborne Curing Compound and Sealer: Low VOC waterborne modified acrylic formulation. Complies with ASTM C 309.
  - 1. Product: Scofield's "SCOFIELD Cureseal-W."

### 2.3 CONCRETE MIX DESIGN

- A. General: Refer to Section 321313 "Site Concrete" for basic concrete paving requirements, including formwork, reinforcement, concrete materials, and mixing.
- B. Minimum Cement Content: 5-1/2 sacks per cubic yard of concrete.
- C. Mix design must not permit segregation of concrete materials during pumping, placing, or consolidation of concrete. Slump not to exceed 4 inches.
- D. Admixtures:
  - 1. A normal or retarded-set, water-reducing admixture is permissible.
  - 2. An air-entraining admixture complying with ASTM C 260 is acceptable where freeze/thaw durability is required.
  - 3. A nonchloride accelerator is acceptable for cold weather concrete placement.
  - 4. Do not add a high-range water reducing admixture (superplasticizer).
- E. Do not add calcium chloride to concrete mix.
- F. Use of fly ash as a cement replacement may be acceptable, subject to manufacturer's current recommendations.
- G. Do not add water to the mix in the field.

### PART 3 - EXECUTION

#### 3.1 SUBGRADE PREPARATION

- A. Subgrade to receive stamped concrete paving work must be well drained and have adequate, uniform loadbearing characteristics.
  - 1. Verify grading will ensure a uniform concrete thickness during concrete placement.
- B. At the time of concrete placement, subgrade must be moist, completely consolidated, and free from frost. If necessary, subgrade may be dampened with water prior to placement; however, freestanding water or soft, muddy, or frozen ground is not permissible.

#### 3.2 CONCRETE PLACEMENT

- A. General: Place and spread concrete to completely fill all space inside forms. Move concrete into place with square-tipped shovels or concrete rakes.
- B. Consolidate concrete by tamping or vibrating to provide a suitable surface for finishing.
- C. Prior to appearance of excess moisture or bleed water, screed concrete with wood or magnesium straight edge or mechanical vibrating screed.
- D. Continue concrete surface leveling and consolidation with highway magnesium straight edge and (or) magnesium bull float.

- E. Mechanically float concrete surfaces to required flatness and levelness as soon as concrete surface has taken its initial set and will support weight of a power float machine equipped with float shoes or combination blades and operator.
  - 1. Comply with ACI 302.1R for acceptable tolerances.
- F. Completed concrete placement to result in an open surface suitable to receive colored hardener.

### 3.3 STAMPED CONCRETE PAVING INSTALLATION

- A. Apply 2/3 of dry-shake colored hardener at specified application rate to freshly floated concrete surface. Bleed water must not be present during or following application of first and second dry-shake applications.
- B. Do not throw dry-shake colored hardener material; distribute evenly by hand or mechanical spreader designed to apply floor hardeners. Mechanical spreader manufacturer as acceptable to stamped concrete paving manufacturer.
- C. As soon as dry-shake material has absorbed moisture, indicated by uniform darkening of surface, mechanically float concrete surface a second time, just enough to bring moisture from base slab through dry-shake color hardener.
- D. Immediately following second floating, apply remaining 1/3 of dry-shake colored hardener at specified application rate. If applied by hand, broadcast in opposite direction of first application for a more uniform coverage. If a mechanical spreader is used, apply in same manner as previously described.
- E. As soon as dry-shake material has absorbed moisture, mechanically float concrete surface a third time.
- F. Do not add water to the surface.
- G. Begin imprinting operations immediately after applying dry-shake colored hardener, according to manufacturer's written instructions, including application of powder antiquing release agent.

### 3.4 SEALING

- A. Prior to sealing, the following conditions must be present:
  - 1. Release agent has been removed.
  - 2. Moisture content of concrete is low enough that alkali and other salts do not become trapped beneath sealer. This will require a minimum of 28 days subsequent to concrete placement, or longer if required.
  - 3. No evidence of free water on concrete surfaces to receive curing and sealing compound.
- B. Seal imprinted concrete with liquid membrane curing and sealing compounds as recommended by manufacturer.
- C. Apply two coats of specified curing and sealing compound according to manufacturer's written instructions.

## 3.5 PROTECTION OF FINISHED WORK

- A. Prohibit foot or vehicular traffic on the newly imprinted concrete surface.
- B. Protect floor surface from damage throughout remainder of construction period until Final Acceptance of the work. If a covering material is necessary, surfaces must remain uncovered for a minimum of four days after which they may be covered with a new, smooth, nonstaining reinforced kraft curing paper. Plastic sheeting is unacceptable as a covering material.

## 3.6 SCHEDULE

- A. Refer to Drawings for locations of stamped concrete paving applications.

END OF SECTION 321316.23

## SECTION 321373 - CONCRETE PAVING JOINT SEALANTS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Expansion and contraction joints within cement concrete pavement.
  - 2. Joints between cement concrete and asphalt pavement.
- B. Related Sections:
  - 1. Division 07 Section "Joint Sealants" for sealing nontraffic and traffic joints in locations not specified in this Section.
  - 2. Division 32 Section "Asphalt Paving" for constructing joints between concrete and asphalt pavement.
  - 3. Division 32 Section "Concrete Paving" for constructing joints in concrete pavement.

## 1.3 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for joint sealants.

## 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Source Limitations: Obtain each type of joint sealant from single source from single manufacturer.

## 1.5 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
  - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
  - 2. When joint substrates are wet.



3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer based on testing and field experience.
- B. Colors of Exposed Joint Sealants: Match color of finished concrete.

### 2.2 JOINT-SEALANT BACKER MATERIALS

- A. General: Provide joint-sealant backer materials that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint-sealant manufacturer based on field experience and laboratory testing.
- B. Backer Strips for Cold- and Hot-Applied Joint Sealants: ASTM D 5249; Type 2; of thickness and width required to control joint-sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

### 2.3 PRIMERS

- A. Primers: Product 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.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.

- B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

### 3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.
- B. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install joint-sealant backings of kind indicated to support joint 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 joint-sealant backings.
  - 2. Do not stretch, twist, puncture, or tear joint-sealant backings.
  - 3. Remove absorbent joint-sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install joint sealants using proven techniques that comply with the following and at the same time backings are installed:
  - 1. Place joint 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.
- E. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.

### 3.4 CLEANING

- A. Clean off excess joint 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.

### 3.5 PROTECTION

- A. Protect joint sealants, during and after curing period, from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations in repaired areas are indistinguishable from the original work.

END OF SECTION 321373

## SECTION 321400 – UNIT PAVING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Brick pavers set on sand/cement.
  - 2. Bedding and joint sand.
- B. Related Sections:
  - 1. Division 32 Section "Asphalt Paving" for asphalt base under unit pavers.
  - 2. Division 32 Section "Site Concrete" for cast-in-place concrete curbs and gutters serving as edge restraints for unit pavers.

## 1.3 ACTION SUBMITTALS

- A. Shop or product drawings and product data shall be submitted. The layout, pattern, and relationship of paving joints to fixtures and project formed details shall be indicated.
- B. Test results shall be submitted from an independent testing laboratory for compliance of paving unit requirements to ASTM C 936 or other applicable requirements.
- C. Product Data: For the following:
  - 1. Pavers.
  - 2. Sand/Cement setting materials.
- D. Samples for Verification:
  - 1. Full-size units of each type of unit paver indicated.
- E. Sieve Analyses: For setting-bed materials, according to ASTM C 136.

## 1.4 QUALITY ASSURANCE

- A. Installation shall be by a contractor and crew with at least one year of experience in placing clay pavers on projects of similar nature or dollar cost.

- B. Source Limitations: Obtain each type of unit paver, joint material, and setting material from single source with resources to provide materials and products of consistent quality in appearance and physical properties.
- C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. A 9 ft. x 9 ft. paver area shall be installed as described in Article 3.6.
  - 2. This area will be used to determine joint sizes, lines, laying pattern(s), color(s), and texture of the project.
  - 3. This area shall be the standard from which the work will be judged.
  - 4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store pavers on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

#### 1.6 PROJECT CONDITIONS

- A. Cold-Weather Protection: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit paver work damaged by frost or freezing.
- B. Weather Limitations for Bituminous Setting Bed:
  - 1. Install bituminous setting bed only when ambient temperature is above 40 deg F and when base is dry.
  - 2. Apply asphalt adhesive only when ambient temperature is above 50 deg F and when temperature has not been below 35 deg F for 12 hours immediately before application. Do not apply when setting bed is wet or contains excess moisture.

### PART 2 - PRODUCTS

#### 2.1 BRICK PAVERS

- A. Clay Brick Pavers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include:
  - 1. Pine Hall Brick, Pathway Full Range.
  - 2. Thickness: 2-1/4 inches .
  - 3. Face Size: 4 by 8 inches .
  - 4. Color: Pathway Full Range
- B. Efflorescence: Brick shall be rated "not effloresced" when tested according to ASTM C 67.

BEDDING SAND GRADING REQUIREMENTS

ASTM C 33	
Sieve Size	Percent Passing
3/8 in. (9.5 mm)	100
No. 4 (4.75 mm)	95 - 100
No. 8 (2.36 mm)	85 - 100
No. 16 (1.18 mm)	50 - 85
No. 30 (600 μm)	25 - 60
No. 50 (300 μm)	10 - 30
No. 100 (150 μm)	2 - 10

End of Table2 -

2.2 JOINT SAND

- A. Joint sand shall be Unicore Polymeric Sand Max by Unilock or approved equal.
- B. Color: Grey

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas indicated to receive paving, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Verify that subgrade preparation, compacted density and elevations conform to the specifications.
- D. Verify that geotextiles, if applicable, have been placed according to specifications and drawings.
- E. Verify that aggregate subbase materials, thickness, compaction, surface tolerances and elevations conform to the specifications.
- F. Verify that the asphalt base is ready to install the bituminous bedding layer.
- G. Beginning the installing of the sand/cement bedding layer and paver installation shall signify acceptance of the asphalt base.

3.2 INSTALLATION, GENERAL

- A. Do not use unit pavers with chips, cracks, voids, discolorations, or other defects that might be visible or cause staining in finished work.
- B. Mix pavers from several pallets or cubes, as they are placed indicated by manufacturers.
- C. Cut unit pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.
- D. Joint Pattern: As indicated on drawings.
- E. Tolerances: Do not exceed 1/16-inch unit-to-unit offset from flush (lippage) nor 1/8 inch in 24 inches and 1/4 inch in 10 feet from level, or indicated slope, for finished surface of paving.
- F. Provide edge restraints as indicated. Install edge restraints before placing unit pavers.

### 3.3 AGGREGATE SETTING-BED APPLICATIONS

- A. Place leveling course and screed to a thickness of 1 to 1-1/2 inches, taking care that moisture content remains constant and density is loose and uniform until pavers are set and compacted.
- B. Treat leveling course with herbicide to inhibit growth of grass and weeds.
- C. Set pavers with a minimum joint width of 1/16 inch and a maximum of 1/8 inch, being careful not to disturb leveling base. If pavers have spacer bars, place pavers hand tight against spacer bars. Use string lines to keep straight lines. Fill gaps between units that exceed 3/8 inch with pieces cut to fit from full-size unit pavers.
  - 1. When installation is performed with mechanical equipment, use only unit pavers with spacer bars on sides of each unit.
- D. Vibrate pavers into leveling course with a low-amplitude plate vibrator capable of a 3500- to 5000-lbf compaction force at 80 to 90 Hz. Use vibrator with neoprene mat on face of plate or other means as needed to prevent cracking and chipping of pavers. Perform at least three passes across paving with vibrator.
  - 1. Compact pavers when there is sufficient surface to accommodate operation of vibrator, leaving at least 36 inches of uncompacted pavers adjacent to temporary edges.
  - 2. Before ending each day's work, compact installed concrete pavers except for 36-inch width of uncompacted pavers adjacent to temporary edges (laying faces).
  - 3. As work progresses to perimeter of installation, compact installed pavers that are adjacent to permanent edges unless they are within 36 inches of laying face.
  - 4. Before ending each day's work and when rain interrupts work, cover pavers that have not been compacted and cover leveling course on which pavers have not been placed with nonstaining plastic sheets to protect them from rain.
- E. Fill joints immediately after vibrating pavers into leveling course.
- F. Do not allow traffic on installed pavers until sand has been vibrated into joints.

### 3.4 PAVER JOINTS

- A. Install joint sand per manufacturers recommendations.
- B. Repeat joint-filling process 30 days later.

3.5 OTHER CONDITIONS

- A. Place a pre-molded, non-extruded, and resilient expansion joint against all vertical walls with flashing to within one (1) inch of finished grade.

3.6 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace unit pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement.

END OF SECTION 321400

## SECTION 323900 - SITE ACCESSORIES

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section includes site accessories.
- B. Related sections:
  - 1. Section 013300, Submittal Procedures.
  - 2. Section 312000, Earth Moving for Structures and Pavements.
  - 3. Section 312100, Earth Moving for Utilities.
  - 4. Section 321216, Asphalt Paving
  - 5. Section 321313, Site Concrete.
  - 6. Division 26, Electrical Systems
  - 7. Section 323113, Chain Link Fences and Gates.

## 1.3 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred within the text by the basic designation only.

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A123            2008 Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

## 1.4 SUBMITTALS

- 1. Manufacturer's Catalog Data
  - a. Pipe bollard
  - b. Plastic Pipe Bollard Sleeve
  - c. Precast Concrete Light Pole Bases
  - d. Tactile Warning Surface
- 2. Color Selection Samples
  - a. Pipe bollard
  - b. Plastic Pipe Bollard Sleeve
  - c. Tactile Warning Surface



3. Shop Drawings
  - a. Pipe Bollard
  - b. Precast Concrete Light Pole Bases
  
4. Certificates of Compliance: Submit certificates attesting that tests set forth in each applicable referenced publication have been performed, whether specified in that publication to be mandatory or otherwise and that production control tests have been performed at the frequency or intervals specified in the publication. Other tests shall have been performed within 3 years of the date of submittal of certificates on the same type, class, grade, and size of material as is being provided for the project.
  - a. Cast In Place Concrete
  - b. Precast Concrete

#### 1.5 DELIVERY, STORAGE, AND HANDLING

##### A. Storage and Protection

1. Deliver, store, and handle site accessories to prevent damage and deterioration.

#### 1.6 SITE CONDITIONS

- A. General: Do not begin site accessory work before completion of final grading or surfacing.
- B. Existing Conditions: The Contractor shall verify existing site conditions prior to commencing the work. The Contractor shall insure that all prior work required prior to the installation of the work shall be coordinated and completed properly.
- C. Field Measurements: The Contractor shall employ qualified personnel to determine and layout the proper location of new work as indicated on the drawings, as specified herein, or in a manner conforming with industry standards.

#### 1.7 SEQUENCING AND SCHEDULING

- A. The Contractor shall coordinate and sequence all work with other disciplines and with other work shown on the drawings or specified.

#### 1.8 WARRANTY

- A. The Contractor shall provide the Owner with a copy of all manufacturers warranties. The conditions of the warranty approvals shall be completed by the Contractor. The Contractor shall guarantee all work for one year from the date of project completion, determined as the date at which the completion documentation is approved by the Architect/Engineer.

#### 1.9 MAINTENANCE

- A. General: The Contractor shall perform all manufacturer required maintenance work unless specified otherwise within this section. The maintenance period shall terminate at the same time as the one-year warranty period.
- B. Maintenance Service: the Contractor shall pay for the cost of maintenance work provided by suppliers, outside consultants or contractors during the warranty period. A copy of the maintenance contract shall be provided with the operations and maintenance manual.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Pipe Bollards
  - 1. Bollard shall be Schedule 40 galvanized steel pipe 6" O.D.
  - 2. Primer paint and finish paint with exterior oil base paint. Color selected by Architect.
  - 3. Bollard set in concrete footing. See Drawing and refer to Section 321313.
- B. Precast Concrete Light Pole Bases
  - 1. Precast, air-entrained concrete, 4000-psi minimum compressive strength, provide rebar as indicated on the drawings.
  - 2. Size and dimensions as indicated on Drawings. Verify the size with light pole selected. The top of footing shall not be located above frost depth.
  - 3. Provide chamfered edges at top of base.
  - 4. Provide electrical conduit as required.
  - 5. Coordinate bolt size and pattern with light pole selected
  - 6. Acceptable manufacturers are American Concrete or approved equal
- C. Plastic Pipe Bollard Sleeve
  - 1. Plastic sleeve shall be ¼" wall thickness, LDPE with UV inhibitors and anit-static properties sized to slip over the steel pipe bollard
  - 2. Color selected by Architect.
  - 3. Sleeve shall be fastened to steel bollard with galvanized screw two inches up from the base of the sleeve. One on either side of the base.
  - 4. Basis of Design: Dawn Enterprises Model #: BCP6DQ for a 6" bollard. (distributed by bigbollards.com)
- D. Tactile Warning Surface
  - 1. Tactile warning surface shall be composite wet set (replaceable) detectable warning panels manufactured by ADA Solutions or equal approved by the City of Portland Department of Public Services.
  - 2. Must be ADA compliant
  - 3. Color shall be "dark gray" colored (#36118).
  - 4. Surface will be set in concrete with preformed inset. See drawing and refer to Section 321313.
  - 5. Surface will be attached to concrete as recommended by manufacturer and shall be either stainless-steel flat head screw or adhesive recommended by manufacturer.

## PART 3 - EXECUTION

## 3.1 PREPARATION

## A. Coordination of Work

1. The Contractor shall coordinate installation of items outlined in this section with other sections to insure that items are not placed in temporary delivery/travel ways, loading zones, areas subject to disposal of or falling debris or otherwise locate structures in temporary construction zones.

## B. Surface Preparation:

1. Remove loose material and debris from base surface before placing site accessories.
2. Locate and layout all site accessory items. Obtain Architect's acceptance of layout prior to installation.
3. Complete any other preparation as required per the manufacturers specifications.

## 3.2 INSTALLATION

A. Pipe Bollard: Install as shown and detailed on the contract drawing. Pipe bollards shall be set plumb and to the line and grade shown on the drawings.

B. Plastic Pipe Bollard Sleeve: Install per the manufacturers recommendations. Secure the sleeve to the steel bollard with a screw two inches from the base on each side of the sleeve.

## C. Precast Concrete Light Pole Bases

1. Install light pole base on suitable undisturbed native soil or compacted structural fill.
2. Verify that the pole depth below grade exceeds frost depth for that location. Verify that the light pole base reveal above grade is in accordance with the reveal specified on the drawings.
3. Connect electrical conduit as needed.
4. Check that the light pole base is level and plumb.
5. Provide 12" minimum surround of compacted granular fill

D. Tactile Warning Surface: Install per the manufacturers recommendations and City of Portland Technical Specifications.

## E. Tolerances

1. Finish grade shall comply with requirements of Section 312000.
2. Vertical elements shall be set plumb and level.

## 3.3 FIELD QUALITY CONTROL

A. Inspection: Examine subgrades, finished surfaces, and installation conditions. Do not start site accessories work until unsatisfactory conditions are corrected.

## 3.4 ADJUSTING

- A. Adjust all items until accepted by Architect/Engineer.

3.5 CLEANING

- A. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, debris, and equipment. Repair damage resulting from site accessories work.

3.6 PROTECTION

- A. The Contractor shall temporarily barricade or otherwise prevent access to or damage resulting from travel across or near site accessories.

END OF SECTION 323900

## SECTION 329200 - TURF AND GRASSES

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:

1. Seeding.
2. Hydroseeding.
3. Sodding.
4. Turf renovation.
5. Erosion-control material(s).

- B. Related Sections:

1. Section 311000 "Site Clearing" for topsoil stripping and stockpiling.
2. Section 312000 "Earth Moving" for excavation, filling and backfilling, and rough grading.
3. Section 329300 "Plants" for border edgings.
4. Section 334600 "Subdrainage" for subsurface drainage.

## 1.3 DEFINITIONS

- A. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.
- B. Finish Grade: Elevation of finished surface of planting soil.
- C. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- D. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- E. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- F. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture as recommended by testing agency.

- G. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or top surface of a fill or backfill before planting soil is placed.
- H. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
- I. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil, but in disturbed areas such as urban environments, the surface soil can be subsoil.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified landscape Installer.
- B. Product Certificates of Compliance: For soil amendments and fertilizers, from manufacturer.
- C. Material Test Reports: For topsoil.
- D. Seeding Schedule: Provide seeding schedule to Landscape Architect a minimum of 10 days prior to activity.
- E. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of turf during a calendar year. Submit before expiration of required initial maintenance periods.

#### 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful turf establishment.
  - 1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
  - 2. Experience: Five years' experience in turf installation in addition to requirements in Division 01 Section "Quality Requirements."
  - 3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
  - 4. Personnel Certifications: Installer's field supervisor shall have certification in one of the following categories from the Professional Landcare Network:
    - a. Certified Landscape Technician - Exterior, with installation specialty area(s), designated CLT-Exterior.
    - b. Certified Turfgrass Professional, designated CTP.
    - c. Certified Turfgrass Professional of Cool Season Lawns, designated CTP-CSL.
  - 5. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.
  - 6. Pesticide Applicator: State licensed, commercial.

- B. Soil-Testing Laboratory Qualifications: An independent laboratory or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.
- C. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; deleterious material; pH; and mineral and plant-nutrient content of the soil.
  - 1. Testing methods and written recommendations shall comply with USDA's Handbook No. 60.
  - 2. The soil-testing laboratory shall oversee soil sampling, with depth, location, and number of samples to be taken per instructions from Architect. A minimum of three representative samples shall be taken from varied locations for each soil to be used or amended for planting purposes.
  - 3. Report suitability of tested soil for turf growth.
    - a. Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated. State recommendations in weight per 1000 sq. ft. or volume per cu. yd. for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
    - b. Report presence of problem salts, minerals, or heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, provide additional recommendations for corrective action.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws, as applicable.
- B. Sod: Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" in TPI's "Guideline Specifications to Turfgrass Sodding." Deliver sod in time for planting within 24 hours of harvesting. Protect sod from breakage and drying.
- C. Bulk Materials:
  - 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
  - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
  - 3. Accompany each delivery of bulk fertilizers, lime, and soil amendments with appropriate certificates.

#### 1.8 PROJECT CONDITIONS

- A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of Substantial Completion.
  - 1. Spring Planting: April 15<sup>th</sup> – June 15<sup>th</sup>.
  - 2. Fall Planting: August 15<sup>th</sup> – September 30<sup>th</sup>.

- B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

#### 1.9 MAINTENANCE SERVICE

- A. Initial Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until acceptable turf is established but for not less than the following periods:
  - 1. Seeded Turf: 60 days from date of Substantial Completion.
    - a. When initial maintenance period has not elapsed before end of planting season, or if turf is not fully established, continue maintenance during next planting season.
  - 2. Sodded Turf: 30 days from date of Substantial Completion.

#### 1.10 WARRENTY

- A. Provide an 90% catch of grass (turf) by watering, mowing, and maintaining seeded areas until final acceptance. Reseed areas, with specified materials, which fail to provide an 90% catch of grass or where excess flow of water has caused seed to wash away until all affected areas are accepted by the Landscape Architect. Do not remove siltation fences until an approved uniform stand of grass is achieved.

### PART 2 - PRODUCTS

#### 2.1 SEED

- A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.
- B. Seed Species: State-certified seed of grass species as follows:
- C. Seed Species: Seed of grass species as follows, with not less than 95 percent germination, not less than 85 percent pure seed, and not more than 0.5 percent weed seed:
  - a. Lawn Areas – equal mix of 3 dwarf tall fescue

#### 2.2 INORGANIC SOIL AMENDMENTS

- A. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:
  - 1. Class: T, with a minimum of 99 percent passing through No. 8 sieve and a minimum of 75 percent passing through No. 60 sieve.



2. Class: O, with a minimum of 95 percent passing through No. 8 sieve and a minimum of 55 percent passing through No. 60 sieve.
  3. Provide lime in form of ground dolomitic limestone.
- B. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, and with a minimum of 99 percent passing through No. 6 sieve and a maximum of 10 percent passing through No. 40 sieve.
- C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
- D. Aluminum Sulfate: Commercial grade, unadulterated.
- E. Perlite: Horticultural perlite, soil amendment grade.
- F. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through No. 50 sieve.
- G. Sand: Clean, washed, natural or manufactured, and free of toxic materials.
- H. Diatomaceous Earth: Calcined, 90 percent silica, with approximately 140 percent water absorption capacity by weight.
- I. Zeolites: Mineral clinoptilolite with at least 60 percent water absorption by weight.

### 2.3 ORGANIC SOIL AMENDMENTS

- A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 3/4-inch sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
1. Organic Matter Content: 50 to 60 percent of dry weight.
  2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.

### 2.4 FERTILIZERS

- A. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
  2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

### 2.5 TOPSOIL

- A. Provide material free of subsoil, stumps, rocks larger than 3/4-inch diameter (with maximum 3-percent retained on 1/4-inch screen), brush, weeds, toxic substances, and other material or substance detrimental to plant growth. Topsoil shall be a natural, friable soil representative of productive soils in the vicinity. Modify topsoil provided if necessary conform with the requirements specified in Table II.

Provide additional topsoil from approved sources off the site meeting the requirements described in Table II if on-site stockpiled material is not sufficient to complete all indicated work.

PLANTING SOIL

TABLE II

DOA SSIR Soil Survey Investigation Acceptable Report No. 1, Laboratory Test for:	Acceptable Limits
Sand Content	20 to 75-percent by weight
Silt Content	10 to 60-percent by weight
Clay Content	5 to 30-percent by weight
Organic Material (Walkley-Black)	1.5-percent
Ph	5.5 to 7.0
Soluble Salts	600-ppm maximum
Absorption Rate	0.5-inch per hour minimum

2.6 MULCHES

- A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.
- B. Fiber Mulch: Biodegradable, dyed-wood, cellulose-fiber mulch; nontoxic and free of plant-growth or germination inhibitors; with a maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.
- C. Nonasphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application; nontoxic and free of plant-growth or germination inhibitors.
- D. Asphalt Emulsion: ASTM D 977, Grade SS-1; nontoxic and free of plant-growth or germination inhibitors.

2.7 PESTICIDES

- A. General: Pesticide, registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.
- B. Pre-Emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
- C. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.

2.8 EROSION-CONTROL MATERIALS

- A. Erosion-Control Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended steel wire staples, 6 inches long.

- B. Erosion-Control Fiber Mesh: Biodegradable burlap or spun-coir mesh, a minimum of 0.92 lb/sq. yd., with 50 to 65 percent open area. Include manufacturer's recommended steel wire staples, 6 inches long.
- C. Erosion-Control Mats: Cellular, non-biodegradable slope-stabilization mats designed to isolate and contain small areas of soil over steeply sloped surface, of 4-inch nominal mat thickness. Include manufacturer's recommended anchorage system for slope conditions.
  - 1. Products: Subject to compliance with requirements, provide the following:
    - a. Mirafi 700X
    - b. Supergro or equal.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine areas to be planted for compliance with requirements and other conditions affecting performance.
  - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
  - 2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
  - 3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
  - 4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

#### 3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
  - 1. Protect adjacent and adjoining areas from hydroseeding and hydromulching overspray.
  - 2. Protect grade stakes set by others until directed to remove them.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

#### 3.3 TURF AREA PREPARATION

- A. Limit turf subgrade preparation to areas to be planted.

- B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 4 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
  - 1. Apply fertilizer directly to subgrade before loosening.
  - 2. Spread planting soil to a depth of 4 inches but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
    - a. Spread approximately 1/2 the thickness of planting soil over loosened subgrade. Mix thoroughly into top 2 inches of subgrade. Spread remainder of planting soil.
    - b. Reduce elevation of planting soil to allow for soil thickness of sod.
- C. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.
- D. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- E. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

#### 3.4 PREPARATION FOR EROSION-CONTROL MATERIALS

- A. Prepare area as specified in "Turf Area Preparation" Article.
- B. For erosion-control mats, install planting soil in two lifts, with second lift equal to thickness of erosion-control mats. Install erosion-control mat and fasten as recommended by material manufacturer.
- C. Fill cells of erosion-control mat with planting soil and compact before planting.
- D. For erosion-control blanket or mesh, install from top of slope, working downward, and as recommended by material manufacturer for site conditions. Fasten as recommended by material manufacturer.
- E. Moisten prepared area before planting if surface is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

#### 3.5 SEEDING

- A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
  - 1. Do not use wet seed or seed that is moldy or otherwise damaged.
  - 2. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.
- B. Sow seed at manufacturers recommended rate for seed type.

- C. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.
- D. Protect seeded areas with slopes exceeding 1:4 with erosion-control blankets installed and stapled according to manufacturer's written instructions.
- E. Protect seeded areas with erosion-control mats where shown on Drawings; install and anchor according to manufacturer's written instructions.
- F. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1-1/2 inches in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment.
  - 1. Anchor straw mulch by crimping into soil with suitable mechanical equipment.

### 3.6 HYDROSEEDING

- A. Hydroseeding: Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.
  - 1. Mix slurry with fiber-mulch manufacturer's recommended tackifier.
  - 2. Apply slurry uniformly to all areas to be seeded in a one-step process. Apply slurry at a rate so that mulch component is deposited at not less than 1500-lb/acre dry weight, and seed component is deposited at not less than the specified seed-sowing rate.

### 3.7 TURF RENOVATION

- A. Renovate existing turf.
- B. Renovate existing turf damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.
  - 1. Reestablish turf where settlement or washouts occur or where minor regrading is required.
  - 2. Install new planting soil as required.
- C. Remove sod and vegetation from diseased or unsatisfactory turf areas; do not bury in soil.
- D. Remove topsoil containing foreign materials such as oil drippings, fuel spills, stones, gravel, and other construction materials resulting from Contractor's operations, and replace with new planting soil.
- E. Mow, dethatch, core aerate, and rake existing turf.
- F. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.
- G. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Owner's property.
- H. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches (150 mm).

- I. Apply soil amendments and initial fertilizers required for establishing new turf and mix thoroughly into top 4 inches (100 mm) of existing soil. Install new planting soil to fill low spots and meet finish grades.
- J. Apply seed and protect with straw mulch as required for new turf.
- K. Water newly planted areas and keep moist until new turf is established.

### 3.8 TURF MAINTENANCE

- A. Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.
  - 1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
  - 2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
  - 3. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.
- B. Watering: Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 4 inches.
  - 1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
  - 2. Water turf with fine spray at a minimum rate of 1 inch per week unless rainfall precipitation is adequate.
- C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 1/3 of grass height. Remove no more than 1/3 of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:
  - 1. Mow to a height of 3 inches.
- D. Turf Post fertilization: Apply fertilizer after initial mowing and when grass is dry.
  - 1. Use fertilizer that will provide actual nitrogen of at least 1 lb/1000 sq. ft. to turf area.

### 3.9 SATISFACTORY TURF

- A. Turf installations shall meet the following criteria as determined by Architect:
  - 1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches.

- B. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.
- C. If at the end of three weeks a satisfactory of grass has not been produced, the contractor shall renovate and reseed the lawn or unsatisfactory portions thereof immediately or, if after the acceptable planting during the requirements of this specification.

### 3.10 PESTICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents in accordance with requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.
- B. Post-Emergent Herbicides (Selective and Non-Selective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written recommendations.

### 3.11 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.
- C. Remove nondegradable erosion-control measures after grass establishment period.

END OF SECTION 329200

## SECTION 329300 - PLANTS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:

- 1. Plants.
- 2. Planting soils.
- 3. Tree stabilization.

- B. Related Sections:

- 1. Division 01 Section "Temporary Tree and Plant Protection" for protecting, trimming, pruning, repairing, and replacing existing trees to remain that interfere with, or are affected by, execution of the Work.
- 2. Division 31 Section "Site Clearing" for protection of existing trees and plantings, topsoil stripping and stockpiling, and site clearing.
- 3. Division 31 Section "Earth Moving" for excavation, filling, and rough grading and for subsurface aggregate drainage and drainage backfill materials.
- 4. Division 32 Section "Turf and Grasses" for turf (lawn) and meadow planting, hydroseeding, and erosion-control materials.

## 1.3 DEFINITIONS

- A. Backfill: The earth used to replace or the act of replacing earth in an excavation.
- B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required; wrapped with burlap, tied, rigidly supported, and drum laced with twine with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.
- C. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.
- D. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.
- E. Finish Grade: Elevation of finished surface of planting soil.



- F. **Manufactured Topsoil:** Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
  - G. **Pesticide:** A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
  - H. **Pests:** Living organisms that occur where they are not desired, or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
  - I. **Planting Area:** Areas to be planted.
  - J. **Planting Soil:** Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
  - K. **Plant; Plants; Plant Material:** These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.
  - L. **Root Flare:** Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.
  - M. **Stem Girdling Roots:** Roots that encircle the stems (trunks) of trees below the soil surface.
  - N. **Subgrade:** Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.
  - O. **Subsoil:** All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
  - P. **Surface Soil:** Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.
- 1.4 SUBMITTALS
- A. **Product Data:** For each type of product indicated, including soils.
    - 1. **Plant Materials:** Include quantities, sizes, quality, and sources for plant materials.
    - 2. **Pesticides and Herbicides:** Include product label and manufacturer's application instructions specific to the Project.
  - B. **Qualification Data:** For qualified landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.
    - 1. **Manufacturer's certified analysis of standard products.**
  - C. **Material Test Reports:** For imported or manufactured planting and topsoil.

- D. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of plants during a calendar year. Submit before start of required maintenance periods.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful establishment of plants.
  - 1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
  - 2. Experience: Five years' experience in landscape installation in addition to requirements in Division 01 Section "Quality Requirements."
  - 3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
  - 4. Pesticide Applicator: State licensed, commercial.
- B. Soil-Testing Laboratory Qualifications: An independent or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.
- C. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.
- D. Measurements: Measure according to ANSI Z60.1. Do not prune to obtain required sizes.
  - 1. Trees and Shrubs: Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container grown stock. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip to tip. Take caliper measurements 6 inches above the root flare for trees up to 4-inch caliper size, and 12 inches above the root flare for larger sizes.
  - 2. Other Plants: Measure with stems, petioles, and foliage in their normal position.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws if applicable.
- B. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.
- C. Handle planting stock by root ball.
- D. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.
  - 1. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.

2. Do not remove container-grown stock from containers before time of planting.
3. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly-wet condition.

#### 1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.
- B. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.
  1. Spring Planting: April 15<sup>th</sup> - June 15<sup>th</sup>.
  2. Fall Planting: August 15<sup>th</sup> – September 20<sup>th</sup>.
- C. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.
- D. Coordination with Turf Areas (Lawns): Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.
  1. When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

#### 1.8 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.
  1. Failures include, but are not limited to, the following:
    - a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner, or incidents that are beyond Contractor's control.
    - b. Structural failures including plantings falling or blowing over.
    - c. Faulty performance of tree stabilization.
    - d. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
  2. Warranty Periods from Date of Substantial Completion:
    - a. Trees, Shrubs, Vines, and Ornamental Grasses: 12 months.
    - b. Ground Covers, Biennials, Perennials, and Other Plants: 12 months.
  3. Include the following remedial actions as a minimum:
    - a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.

- b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
- c. A limit of one replacement of each plant will be required except for losses or replacements due to failure to comply with requirements.
- d. Provide extended warranty for period equal to original warranty period, for replaced plant material.

## PART 2 - PRODUCTS

### 2.1 PLANT MATERIAL

- A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant Schedule or Plant Legend shown on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
  - 1. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 3/4 inch in diameter; or with stem girdling roots will be rejected.
  - 2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.
- B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.
- C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which shall begin at root flare according to ANSI Z60.1. Root flare shall be visible before planting.

### 2.2 INORGANIC SOIL AMENDMENTS

- A. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:
  - 1. Class: O, with a minimum of 95 percent passing through No. 8 sieve and a minimum of 55 percent passing through No. 60 sieve.
- B. Sulfur: Granular, biodegradable, and containing a minimum of 90 percent sulfur, with a minimum of 99 percent passing through No. 6 sieve and a maximum of 10 percent passing through No. 40 sieve.
- C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
- D. Aluminum Sulfate: Commercial grade, unadulterated.
- E. Perlite: Horticultural perlite, soil amendment grade.
- F. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through No. 50 sieve.

- G. Sand: Clean, washed, natural or manufactured, and free of toxic materials.
- H. Diatomaceous Earth: Calcined, 90 percent silica, with approximately 140 percent water absorption capacity by weight.
- I. Zeolites: Mineral clinoptilolite with at least 60 percent water absorption by weight.

## 2.3 ORGANIC SOIL AMENDMENTS

- A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
- B. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or granular texture, with a pH range of 3.4 to 4.8.
- C. Muck Peat: Partially decomposed moss peat, native peat, or reed-sedge peat, finely divided or of granular texture, with a pH range of 6 to 7.5, and having a water-absorbing capacity of 1100 to 2000 percent.
- D. Wood Derivatives: Decomposed, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture and free of chips, stones, sticks, soil, or toxic materials.

## 2.4 FERTILIZERS

- A. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.
- B. Planting Tablets: Tightly compressed chip type, long-lasting, slow-release, commercial-grade planting fertilizer in tablet form. Tablets shall break down with soil bacteria, converting nutrients into a form that can be absorbed by plant roots.
  - 1. Nutrient Composition: 20 percent nitrogen, 10 percent phosphorous, and 5 percent potassium, by weight plus micronutrients.

## 2.5 PLANTING SOILS

- A. Planting Soil: Amended topsoil meeting requirements of testing. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches deep; do not obtain from bogs, or marshes.

## 2.6 MULCHES

- A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:
  - 1. Type: Dark Bark shredded wood.
  - 2. Color: Dark Brown.

## 2.7 PESTICIDES

- A. General: Pesticide registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.
- B. Pre-Emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
- C. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.

## 2.8 TREE STABILIZATION MATERIALS

- A. Root-Ball Stabilization Materials:
  - 1. Proprietary Root-Ball Stabilization Devices: Proprietary at- or below-grade stabilization systems to secure each new planting by root ball; sized per manufacturer's written recommendations unless otherwise indicated.
    - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      - 1) Border Concepts, Inc.; Tomahawk Tree Stabilizers.
      - 2) Foresight Products, LLC; Duckbill Rootball Fixing System.
      - 3) Tree Staple, Inc.; Tree Staples.

## 2.9 MISCELLANEOUS PRODUCTS

- A. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's written instructions.
- B. Burlap: Non-synthetic, biodegradable.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas to receive plants for compliance with requirements and conditions affecting installation and performance.
  - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
  - 2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
  - 3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.

4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
  - C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

### 3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Architect's acceptance of layout before excavating or planting. Make minor adjustments as required.
- D. Apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks (before wrapping), branches, stems, twigs, and foliage to protect during digging, handling, and transportation.
  1. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.

### 3.3 EXCAVATION FOR TREES AND SHRUBS

- A. Planting Pits and Trenches: Excavate circular planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are not acceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.
  1. Excavate approximately three times as wide as ball diameter for balled and burlapped, container-grown stock.
  2. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
  3. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.
  4. Maintain required angles of repose of adjacent materials as shown on the Drawings. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
  5. Maintain supervision of excavations during working hours.
  6. Keep excavations covered or otherwise protected after working hours.
- B. Subsoil and topsoil removed from excavations must be amended to meet testing agency requirements prior to being used as planting soil.
- C. Obstructions: Notify Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.

1. Hardpan Layer: Drill 6-inch- diameter holes, 24 inches apart, into free-draining strata or to a depth of 10 feet, whichever is less, and backfill with free-draining material.
- D. Drainage: Notify Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.

### 3.4 TREE, SHRUB, AND VINE PLANTING

- A. Before planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.
- B. Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.
- C. Set balled and burlapped stock plumb and in center of planting pit or trench with root flare 1 inch above adjacent finish grades.
1. Use planting soil for backfill.
  2. After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
  3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
  4. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside the root ball about 1 inch from root tips; do not place tablets in bottom of the hole.
  5. Continue backfilling process. Water again after placing and tamping final layer of soil.
- D. Set container-grown stock plumb and in center of planting pit or trench with root flare 1 inch adjacent finish grades.
1. Use planting soil for backfill.
  2. Carefully remove root ball from container without damaging root ball or plant.
  3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
  4. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside the root ball about 1 inch from root tips; do not place tablets in bottom of the hole.
  5. Continue backfilling process. Water again after placing and tamping final layer of soil.
- E. When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.
- F. Trees may be planted with an approved mechanized tree spade at the designated locations. Do not use tree spade to move trees larger than the maximum size allowed for a similar field-grown, balled-and-burlapped root-ball diameter according to ANSI Z60.1, or larger than the manufacturer's maximum size recommendation for the tree spade being used, whichever is smaller.



## 3.5 TREE, SHRUB, AND VINE PRUNING

- A. Remove only dead, dying, or broken branches. Do not prune for shape.
- B. Do not apply pruning paint to wounds.

## 3.6 TREE STABILIZATION

- A. Root-Ball Stabilization: Install at- or below-grade stabilization system to secure each new planting by the root ball unless otherwise indicated.
  - 1. Proprietary Root-Ball Stabilization Device: Install root-ball stabilization system sized and positioned as recommended by manufacturer unless otherwise indicated and according to manufacturer's written instructions.

## 3.7 GROUND COVER AND PLANT PLANTING

- A. Set out and space ground cover and plants other than trees, shrubs, and vines as indicated in even rows with triangular spacing.
- B. Use planting soil for backfill.
- C. Dig holes large enough to allow spreading of roots.
- D. For rooted cutting plants supplied in flats, plant each in a manner that will minimally disturb the root system but to a depth not less than two nodes.
- E. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.
- F. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.
- G. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

## 3.8 PLANTING AREA MULCHING

- A. Mulch backfilled surfaces of planting areas and other areas indicated.

## 3.9 PESTICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents in accordance with authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.
- B. Pre-Emergent Herbicides (Selective and Non-Selective): Apply to tree, shrub, and ground-cover areas in accordance with manufacturer's written recommendations. Do not apply to seeded areas.

- C. Post-Emergent Herbicides (Selective and Non-Selective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written recommendations.

### 3.10 CLEANUP AND PROTECTION

- A. During planting, keep adjacent paving and construction clean and work area in an orderly condition.
- B. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.
- C. After installation and before Substantial Completion, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

### 3.11 DISPOSAL

- A. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.

END OF SECTION 329300

## SECTION 334100 - STORM UTILITY DRAINAGE PIPING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This section covers work related to storm collection and conveyance systems shown on drawings and specifications.
- B. Related Sections include the following:
  1. Division 01 Section "Temporary Facilities and Controls" for temporary utilities, temporary construction and support facilities, temporary security and protection facilities procedures.
  2. Division 22 Section "Plumbing" for roof drain connections.
  3. Division 32 Section "Turf and Grasses, Plants" for finish grading including preparing and placing planting soil mixes and testing of topsoil material.
  4. Division 31 Section "Earth Moving for Utilities" for soil materials, excavating, backfilling.
  5. Division 31 Section "Dewatering" for requirements and guidelines for dewatering procedures.
  6. Division 31 Section "Excavation Support and Protection" for requirements and guidelines for dewatering procedures.

## 1.3 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

## AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO M198            1998 Joints for Circular Concrete Sewer and Culvert Pipe Using Flexible Watertight Gaskets

## AMERICAN CONCRETE PIPE ASSOCIATION (ACPA)

ACPA 01-102            1988 Concrete Pipe Handbook

ACPA 01-103            1978 Concrete Pipe Installation Manual

## AMERICAN NATIONAL STANDARDS INSTITUTE, INC. (ANSI)

ANSI A14.3            2008 Ladders - Fixed – Safety Requirements

## AMERICAN RAILWAY ENGINEERING ASSOCIATION (AREA)

AREA MRE-CHP.1-5	1993 Manual for Railway Engineering (Fixed Properties): Chapter 1, Part 5, Pipelines
AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)	
ASTM A48	2003 (Rev. 2008) Gray Iron Castings
ASTM A525	1987 General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
ASTM A536	1984 (Rev. 2004) Ductile Iron Castings
ASTM A760	2006 Corrugated Steel Pipe, Metallic-Coated for Sewers and Drains
ASTM A762	2008 Corrugated Steel Pipe, Polymer Precoated for Sewers and Drains
ASTM A798	2007 Installing Factory-Made Corrugated Steel Pipe for Sewers and Other Applications
ASTM A819	1984 Steel Sheet, Aluminum-Coated Type 2 for Storm Sewer and Drainage Pipe
ASTM A849	2000 (Rev. 2005) Post-Applied Coatings, Pavings, and Linings for Corrugated Steel Sewer and Drainage Pipe
ASTM B745	1997 (Rev. 2005) Corrugated Aluminum Pipe for Sewers and Drains
ASTM B788	2004 Installing Factory-Made Corrugated Aluminum Culverts and Storm Sewer Pipe
ASTM C14	2007 Nonreinforced Concrete Sewer, Storm Drain, Culvert Pipe
ASTM C76	2008 (Rev. A) Reinforced Concrete Culvert Storm Drain and Sewer Pipe
ASTM C109	2008 Compressive Strength of Hydraulic Cement Mortars (Using 2-in or 50-mm Cube Specimens)
ASTM C150	2007 Portland Cement
ASTM C361	2008 Reinforced Concrete Low Head - Pressure Pipe
ASTM C443	2005 (Rev. A) Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
ASTM C478	2009 Precast Reinforced Concrete Manhole Sections
ASTM C923	2008 Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals
ASTM D1784	2008 Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D2680	2001 (Rev. 2009) Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Composite Sewer Piping

ASTM D2729	2003 Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D3034	2008 Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D3212	2007 Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM D4101	2008 Polypropylene Plastic Injection and Extrusion Material
ASTM F402	2005 Safe Handling of Solvent Cements Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings
ASTM F2648	2007 2 to 60 inch Annular Corrugated Profile Wall Polyethylene (PE) Pipe and Fittings for Land Drainage Applications

## AMERICAN WELDING SOCIETY, INC. (AWS)

AWS D1.1	1992 Structural Welding Code Steel
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## FEDERAL SPECIFICATIONS (FS)

A-A-60005	(Rev. 2) Frames, Covers, Gratings, Steps, Sump and Catch Basin, Manhole
FS TT-C-490	2002 (Rev. E) Cleaning Methods for Ferrous Surfaces and Pretreatments for Organic Coatings

## MILITARY SPECIFICATIONS (MIL)

DOD-P-15328	(Rev. D) (Amd. 1) Primer (Wash), Pretreatment, (Formula No. 117 for Metals) (Metric)
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## UNI-BELL PLASTIC PIPE ASSOCIATION (UNI)

UNI B51989 Installation of Polyvinyl Chloride (PVC) Sewer Pipe (Replaced by ASTM D2321)

## 1.4 SUBMITTALS

## A. Manufacturer's Catalog Data

1. Pipes (each type)
2. Fittings
3. Joints and couplings
4. Cleanouts

## B. Drawings

1. Precast concrete manholes/catch basins
2. Metal work
3. Trench drain components

## C. Certificates of Compliance: Submit certificates attesting that tests set forth in each applicable referenced publication have been performed, whether specified in that publication to be mandatory or otherwise and that production control tests have been performed at the frequency or intervals specified

in the publication. Other tests shall have been performed within 3 years of the date of submittal of certificates on the same type, class, grade, and size of material as is being provided for the project.

1. Pipe and fittings, including factory-applied linings
2. Pipe joint materials
3. Ductile-iron frames, covers, and gratings
4. Precast concrete manhole sections/catch basins
5. Trench drain components

#### 1.5 DELIVERY, STORAGE, AND HANDLING

##### A. Delivery and Storage

1. Piping: Inspect materials delivered to site for damage; store with minimum of handling. Store materials on site in enclosures or under protective coverings. Store plastic piping and jointing materials and rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes and fittings free of dirt and debris.
2. Metal Items: Check upon arrival; identify and segregate as to types, functions, and sizes. Store off the ground in a manner affording easy accessibility and not causing excessive rusting or coating with grease or other objectionable materials.
3. Cement, Aggregates, and Reinforcement: Store as specified in Section 033000, "Cast-In-Place Concrete."

- B. Handling: Handle pipe, fittings, and other accessories in a manner to ensure delivery to the trench in sound undamaged condition. Take special care not to damage coating and paving on pipe and fittings; if damaged, make repairs. Carry, do not drag pipe to trench.

## PART 2 - PRODUCTS

### 2.1 PIPELINE AND CULVERT MATERIALS

#### A. Hdpe Composite Plastic Piping

1. Hdpe Composite Plastic Pipe and Fittings: High Density Polyethylene (Hdpe) composite pipe and fittings.
  - a. Hancor "Hi-Q" or "Titeline".

The prescribed sizes of pipes are nominal inside diameter. Pipes shall be of the size and length shown on the drawings.
2. Corrugated Polyethylene Pipe: The products supplied under this specification shall be high density polyethylene corrugated exterior/smooth interior pipe. 4 through 60 inch shall meet ASTM F2648. Material for pipe production shall be an engineered compound of virgin and recycled high density polyethylene conforming with the minimum requirements of cell classification 424420C (ESCR Test Condition B) for 4- through 10-inch diameters, and 435420C (ESCR Test Condition B) for 12- through 60-inch diameters, as defined and described in the latest version of ASTM D3350, except that carbon black content should not exceed 4%.
3. Joint and Fittings: Pipe joints and fittings shall conform to ASTM F2306, AASHTO M252 or AASHTO M294, or be approved by the Engineer.

## B. Composite Plastic Piping

1. ABS Composite Plastic Pipe and Fittings: Acrylonitrile-Butadiene Styrene (ABS) or Poly(Vinyl Chloride) (PVC) composite pipe and fittings, ASTM D2680.
2. Jointing Materials for ABS Composite Plastic Piping: ASTM D2680 solvent cement and primer or ASTM D3212 elastomeric gasket joints. Ends of pipe and fittings shall be suitable for either Type SC or Type OR joints.

## C. Polyvinyl Chloride (PVC) Plastic Piping

1. PVC Plastic Pipe and Fittings: Provide bell and spigot type PVC pipe in sizes, locations, and at grades as indicated on the Drawings. Pipe shall conform to ASTM D3034 for SDR 35 pipe; PVC resin compound shall conform to ASTM D1784; lock in rubber sealing rings shall conform to ASTM D3212 and ASTM D477. Standard laying lengths shall be 12.5-feet. All joints shall be flexible providing for linear expansion and contraction. Provide manufacturer's standard lubricant. Acceptable products/manufacturers are:
  - a. Ipex Inc
  - b. North American Pipe
  - c. Hancor
  - d. Or approved similar or equal.

- D. Detection Materials: Provide detectable tape, or detection plates at all buried clean outs.

## 2.2 CONCRETE MATERIALS

## A. Precast Concrete and Associated Materials

1. Precast Concrete Manhole Sections: Precast concrete manhole risers, base sections, and tops shall conform to ASTM C478. Base and first riser shall be monolithic. All concrete shall have a minimum compressive strength of 4,000 - psi at 28-days. Components shall be designed for a H-20 wheel loading and reinforced to 0.12-in. sq./ft. Honched concentric cones shall be designed for use with square frames and grates unless otherwise indicated on the Drawings. Base shall be monolithic construction. Provide precast setting sections "Doughnuts," for frames as shown on the Drawings. Set frames with mortar as covered in paragraph - "Joint Mortar." Acceptable products/manufacturers are:
  - a. American Concrete Industries.
  - b. Superior Concrete Co., Inc.
  - c. Approved equal.
2. Type "F" Catch Basin: Provide Type "F" catch basins where located on the drawings. Catch basin shall be a precast square catch basin in sizes as shown on the drawings designed for an H-20 wheel loading. Provide outlet in location and elevation as indicated on the drawings. Concrete for catch basins shall have a minimum compressive strength of 4,000 psi at 28-days, and shall be reinforced with welded wire mesh acceptable products/manufacturers are:
  - a. "Type 'F' CB" by American Concrete Industries.
  - b. Superior Concrete Co., Inc.
  - c. Approved equal.

3. Gaskets and Connectors: Gaskets for joints between manhole sections shall conform to ASTM C443. Resilient connectors for making joints between manhole and pipes entering manhole shall conform to ASTM C923.

B. Metal Items

1. Frames, Covers, and Gratings: Unless otherwise indicated on the drawings or specified, frames, covers and gratings shall be gray cast iron conforming to ASTM A 48/A 48M -03, Class 30B and suitable for AASHTO H 20-44 and HS 20-44 highway loading.
2. Catch Basins: Unless otherwise indicated on drawings, standard frames and grates shall be provided. Acceptable products/manufacturers shall be:
  - a. STANDARD: General Foundries 22484-SQH-USA (24" square grate with 8" deep frame) or approved equal;
  - b. CASCADE: General Foundries 22484-CAS-USA (24" square grate with 8" deep frame) or approved equal;
  - c. BEEHIVE: Neenah R-2560-E5 (25.75" diameter with 8" deep frame) or approved equal;
  - d. Or as otherwise specified on drawings.
3. Manholes: Provide non-skid surface with raised letter "DRAIN" designation cast on the cover. Acceptable products/manufacturers shall be:
  - a. Etheridge E24X5 cast iron manhole frame and cover or approved equal
4. Drainage Structure Steps: Zinc-coated steel conforming to ANSI A14.3. As an option, plastic or rubber coating pressure-molded to the steel may be used. Plastic coating shall conform to ASTM D4101, copolymer polypropylene. Rubber shall conform to ASTM C443, except shore A durometer hardness shall be 70 plus or minus 5. Aluminum steps or rungs will not be permitted. Provide steps in manholes or catch basins greater than 4 feet deep.

- C. Patching Mortar: Provide a hydraulic cement-base, quick-set, mortar at repairable damage sections and pipe openings in catch basins. Provide mortar in conformance with the following:

TEST	RESULT
Compressive Strength (ASTM C109)	20 minutes = 2142-psi
	1-day = 4383-psi
	7-days = 5334-psi
	28-days = 5833-psi
Tensile (ASTM C190)	20-minutes = 210-psi
	1-day = 270-psi
	7-days = 320-psi
	28-days = 370-psi
Flexural (ASTM C348)	7-days = 650-psi
	28-days = 370-psi
Push Out Load	Greater than 6000 psi

1. "Water Plug" by Thoro System Products
2. Approved equal.

- D. Joint Mortar: The cement for mortar shall conform to the requirements of Portland cement AASHTO M85, Type II or IIA. Joint mortar shall consist of 1-part Portland cement, 2 parts sand and sufficient water to obtain the required consistency. Mortar shall be used within 30-minutes after its preparation.



- E. Cast-in-place concrete applications: refer to section 321313 Site Concrete.

## 2.3 TRENCH DRAIN COMPONENTS

### A. Trench drain units

1. Trench drain units shall be modular HDPE channels with tongue and groove connections encased in concrete..
2. Grates shall be galvanized ductile iron with inlet slots perpendicular to direction of flow.
3. Acceptable products/manufacturers are:
  - a. Zurn Z874 wide throat trench drain system
  - b. Approved equal.

- B. Catch basins for trench drain system shall be of HDPE encased in concrete, designed to accommodate trench drain channels. Catch basins shall contain a stainless steel trash basket. Grates shall be of galvanized ductile iron with same inlet slot pattern as trench drain units.

1. Acceptable products/manufacturers are:
  - a. Zurn Z874 trench drain system
  - b. Approved equal.

## PART 3 - EXECUTION

### 3.1 INSTALLATION OF PIPELINES AND APPURTENANT CONSTRUCTION

- A. General Requirements for Installation of Pipelines: These requirements shall apply to pipeline installation except where specific exception is made under paragraph entitled "Special Requirements."

1. Location: The work covered by this section shall terminate at a point approximately 10 feet from the building, unless otherwise indicated on the drawings.
2. Earthwork: Perform earthwork operations in accordance with Section 312100, "Earth work for Utilities."
3. Pipe Laying and Jointing: Inspect each pipe and fitting before and after installation; remove those found defective from site and replace with new. Provide proper facilities for lowering sections of pipe into trenches. Lay pipe with the bell ends in the upgrade direction. Adjust spigots in bells to produce a uniform space. Blocking or wedging between bells and spigots will not be permitted. Replace by one of the proper dimensions any pipe or fitting that does not allow sufficient space for proper calking or installation of joint material. At the end of each workday, close open ends of pipe temporarily with wood blocks or bulkheads. Provide batterboards not more than 25 feet apart in trenches for checking and ensuring that pipe invert elevations are as indicated. Laser beam method may be used in lieu of batterboards for the same purpose.
4. Connections to Existing Lines: Notify Architect/Engineer in writing at least 10 days prior to date that connections are to be made. Obtain approval of the Architect/Engineer before interrupting service. Conduct work so that there is minimum interruption of service on existing line.

- B. Special Requirements

1. Installation of ABS or PVC Composite Plastic Piping: Install pipe and fittings in accordance with the "General Requirements for Installation of Pipelines" and with the recommendations of the plastic pipe manufacturer. Make joints with the primer and solvent cement specified for this joint; assemble in accordance with the recommendations of the pipe manufacturer. Handle solvent cement in accordance with ASTM F402.
  2. Installation of PVC Plastic Piping: Install pipe and fittings in accordance with the "General Requirements for Installation of Pipelines" and with the requirements of UNI B5 for laying and joining pipe and fittings. Make joints with the gaskets specified for joints with this piping; assemble in accordance with the requirements of UNI B5 for assembly of joints. Make joints to other pipe materials in accordance with the recommendations of the plastic pipe manufacturer.
  3. Installation of PVC Plastic Piping, Fittings, and Saddles: Install pipe and fittings in accordance with the "General Requirements for Installation of Pipelines" and with the requirements of UNI B5 for laying and jointing pipe and fittings. Make joints to other pipe materials in accordance with the recommendations of the plastic pipe manufacturer. Make joints with the gaskets specified for joints with this piping; assemble in accordance with the requirements of UNI B5 for assembly of joints and as follows:
    - a. Clean all foreign material from bell and rubber ring.
    - b. Clean pipe spigot end from all foreign material.
    - c. Lubricate spigot end of pipe using pipe manufacturers recommended lubricant. Cover entire spigot end circumference. Coating should be equivalent to one coat of enamel paint. (Keep out of dirt).
    - d. Insert spigot end into the bell so that it is in contact with the rubber ring. Keep the pipe lengths in proper alignment.
    - e. Follow manufacturer's written installation instructions in strict accordance.
- C. Concrete Work: Perform cast-in-place concrete work in accordance with Section 033000, "Cast-In-Place Concrete", and the following:
1. Concrete Cradles (Thrust Blocks): Provide in locations and configurations as indicated on the drawings. Minimum compressive strength of concrete shall be 3000 psi, protect concrete from freezing conditions. Install thrust block from undisturbed soil to mid diameter of the pipes.
  2. Manhole and Catch Basin Construction: Use precast concrete base sections. Make inverts in precast concrete bases with a smooth-surfaced semi-circular bottom conforming to the inside contour of the adjacent drainage sections. For precast concrete construction, make joints between sections with the gaskets specified for this purpose; install in the manner specified for installing joints in concrete piping. Give a smooth finish to inside joints of precast concrete manholes and catch basins. Parging will not be required for precast concrete manholes. Make joints between concrete manholes and pipes entering manholes with the resilient connectors specified for this purpose; install in accordance with the recommendations of the connector manufacturer. Where a new manhole is constructed on an existing line, remove existing pipe as required to construct the manhole. Cut existing pipe so that pipe ends are approximately flush with the interior face of manhole wall, but not protruding beyond into the manhole. Use resilient connectors as specified for pipe connectors to concrete manholes.
- D. Metal Work
1. Rims, Frames, Grates, and Covers: Set grating frames in a bed of mortar to grades as indicated on the Drawings. Set all units in strict accordance with the manufacturer's written installation instructions. For additional rim and frame raising conditions set frame on precast risers or "doughnuts."
  2. Workmanship and Finish: Perform metal work so that workmanship and finish will be equal to the best practice in modern structural shops and foundries. Form iron and steel to shape and

size with sharp lines and angles. Do shearing and punching so that clean true lines and surfaces are produced. Make castings sound and free from warp, cold shuts, and blow holes that may impair their strength or appearance. Give exposed surfaces a smooth finish with sharp well-defined lines and arises. Provide rabbets, lugs, and brackets wherever necessary for fitting and support.

3. Field Painting: After installation, clean steel covers and steel or concrete frames not buried in masonry or concrete to bare metal of mortar, dirt, grease, and other deleterious materials. Apply a coat of primer, zinc oxide to a minimum dry film thickness of .5-mil; and apply a topcoat, epoxy to a minimum dry film thickness of .5-mils, color optional. Do not paint surfaces subject to abrasion.

#### E. Trench Drain installation

1. The sub-base must be excavated sufficiently to ensure a minimum of 6" of concrete cover underneath and on both sides of the finished drain system. Slope the edges of the excavation to provide a smooth transition to the slab subgrade. Slope the bottom of the excavation to approximately follow the slope of the channels. The excavation should be made along the center lines of all the proposed drainage runs. Prepare a deeper excavation for all appropriate catch basins to ensure a minimum of 6" of bedding concrete underneath. Once the excavations are complete, place all of the required components (in the correct order) next to the excavation. It is often helpful at this point to set an alignment "string line" over the proposed trench run to indicate the finished grade elevation.
2. The catch basin should be located near the discharge piping stub-in. Carefully drill out the cutouts which correspond to the desired pipe size to be used. Make the appropriate discharge pipe connections. Place the catch basin into the excavation and support it with bricks. Place the bedding concrete into the catch basin and level it to the correct surface elevation. NOTE: Remove the appropriate catch basin channel and end cap cutouts at this time.
3. Begin the installation of the channels at the discharge end of the trench run with the deepest (highest number) channel. If a catch basin is being used at the discharge point, connect this channel to the catch basin (arrows always point downstream). If a catch basin is not being used, attach the proper end cap to the discharge end of the channel. If a channel "bottom cutout" is being used, remove the appropriate size and install the channel over the outlet drain stub-in. The succeeding channels should be installed with the installation chair under the channel at the channel joints being connected. Tighten the chair alignment bolts into channel dimples. Place the pre-cut rebar (minimum 1/2" diameter #4) through rebar connecting clamps. Drive the rebar into the subgrade enough to provide stability and prevent floating during concreting. Adjust the chair, raising the channel to the string line height, and secure the rebar clamps. NOTE: The top of the rebar should be a minimum of 2" below the finished grade. If Extender Panels are to be used, refer to Drawing Details.
4. The proper grate must be secured in the channels prior to concreting to prevent the channels from flexing inward from the pressure of the wet concrete. Grates should be wrapped in plastic prior to installation (2 wraps of 6 mil. visqueen is recommended) to facilitate cleanup after concreting and to provide adequate spacing for grate removal. Care must be taken not to spread the channel walls. NOTE 1: Set the grates (and frames, if applicable) into the channel and install the locking devices. After the placement of the system at the proper grade has been completed, check to ensure that the channels will not "float" when the concrete is placed. When installed properly the installation chair will prevent "floating" by its positive engagement into the sides of the channels. When placing the concrete, be sure it is placed under the channels and is properly consolidated. The concrete that is placed under and around the channels may be placed as part of a monolithic slab pour. NOTE: DO NOT tool finish or radius the edge of the concrete along the drain channels. Finish-trowel only to the top edge of the drain channels.
5. After the concrete slab is hard enough to walk on, remove the wrapping from the grates. Remove the appropriate catch basin channel and end cap cutouts at this time.

## 3.2 FIELD QUALITY CONTROL

- A. Field Tests and Inspections: The Architect/Engineer or representative will conduct field inspections and witness field tests specified in this section. The Contractor shall perform field tests and provide labor, equipment, and incidentals required for testing, except that the Contractor will furnish water and electric power needed for field tests. Be able to produce evidence, when required, that each item of work has been constructed properly in accordance with the drawings and specifications.
- B. Pipeline Testing: Check each straight run of pipeline for gross deficiencies by holding a light in a manhole; it shall show a practically full circle of light through the pipeline when viewed from the adjoining end of line.
- C. Field Tests for Concrete: Field testing requirements are covered in Section 033000, "Cast-in-Place Concrete"

END OF SECTION 334100

## SECTION 334200 – UNDERDRAINS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section includes Type "B" and Type "C" underdrain systems, including furnishing, excavating, laying, backfilling and finish grading underdrain piping, bedding and backfill materials prior to the placement of granular base and subbase material for use in road foundation soils.
- B. Related sections
  - 1. 312000 – Earth Moving for Structures and Pavements
  - 2. 312100 – Earth Moving for Utilities
  - 3. 334100 - Storm Drainage System

## 1.3 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

## STATE OF MAINE DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS (MDOT)

As referenced

## 1.4 SUBMITTALS

- A. Manufacturer's product data
  - 1. Submit manufacturer's product data for each type of drainage pipe required. Show types and sizes of fittings and accessories proposed for this work.
    - a. All product data.
- B. Field Test Reports
  - 1. Submit gradation test for all bedding and backfill material.

## PART 2 - PRODUCTS

2.1 UNDERDRAIN PIPE

A. Perforated Underdrain Pipe:

- 1. (Type B) MDOT 605.03 shall consist of a 6 inch diameter corrugated or smooth walled interior pipe consisting of the following type:
  - a. Corrugated polyethylene drainage tubing, slotted for underdrain
  - b. Polyvinyl Chloride (PVC) perforated pipe.
- 2. (Type C) MDOT 605.03 shall consist of a 12 to 30 inch diameter smooth wall interior pipe consisting of the following type:
  - a. Corrugated polyethylene drainage tubing, slotted for underdrain
  - b. Polyvinyl Chloride (PVC) perforated pipe.
- 3. Shall meet the requirements of ASTM F758 and AASHTO M252.
- 4. Acceptable Products/Manufacturers:
  - a. Hancor
  - b. ADS pipe
  - c. Sewer and Drain pipe (S&D) by EJP, Inc.
  - d. Perf by Scepter
  - e. Or approved similar or equal
  - f. Substitutions - In accordance with Section 013300.

2.2 UNDERDRAIN BACKFILL MATERIAL (MDOT 703.22)

A. Granular material for underdrain Type "B" shall be free from organic matter and shall conform to the following table.

Sieve Designation	Percent Finer by Weight
1 inch	95-100
1/2 inch	75-100
No. 4	50-100
No. 20	15-80
No. 50	0-15
No. 200	0-5

B. Crushed or uncrushed material for underdrain type C shall conform to the following table.

Sieve Designation	Percent Finer by Weight
1 inch	100
3/4 inch	90-100
3/8 inch	0-75
No. 4	0-25
No. 10	0-5

C. Angular material for a French drain underdrain shall conform to the following table. (per MDOT 703.24)

Sieve Designation	Percent Finer by Weight
6 inch	100
1-1/2 inch	0-40
No. 4	0-5

### 2.3 COMPACTED CLAY BEDDING MATERIAL

- A. Shall be a dense, poorly graded material free from friables and organic material. Shall be capable of providing an impervious barrier and of supporting the Type "C" underdrain piping and expected loads.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Coordination installation of the underdrain system with excavating and backfilling work performed under Sections 312000 and 312100.
1. After the road subgrade has been established, excavate the underdrain trench in accordance with sections and locations shown on the drawings.
  2. Do not lay damaged or defective pipe.
  3. Pipe shall not be laid in water or when the trench conditions or weather is unsuitable for such work. Remove water from trenches by pumping or other approved methods.
  4. Lay pipe with the bell ends upstream.
- B. Type "B" Underdrain Construction (MDOT 605.04)
1. The trench shall be excavated to the required width and depth and a bed of the specified granular underdrain material, 6 inches in depth, shall be prepared in the trench. Six inch perforated pipe shall be laid and firmly bed with the perforations down as shown on the section drawings. The pipe shall bear on the bedding material along its entire length.
  2. After the pipe has been firmly bedded and joints securely connected, it must be inspected by the Architect/Engineer, Town appointed Engineer and the Contracting Officer before any backfill is placed. An additional 6" of granular free-draining French drain material shall be placed over the top of the pipe. The remaining backfill shall be granular fill material meeting the requirements of Section 312100.
  3. For underdrain placed under areas of proposed pavement, the backfill material shall be placed in 8 inch layers, loose measure and thoroughly compacted except that the initial layer of backfill around the pipe may be placed in a layer not exceeding 12 inches.
  4. For underdrains placed under areas not proposed to be paved, the initial layer of backfill shall not exceed 12 inches and the remaining material may be placed in 1 lift to the elevation of the subgrade and compacted with heavy rubber tired or vibratory compaction equipment to an 85% modified proctor density.
  5. The upstream end of all completed underdrain pipe that is to be buried shall be sealed with cement mortar or a plastic end cap or other acceptable material. Temporary end caps shall be used in areas which will be constructed at a later date. Care shall be taken that soil does not enter the pipe. Pipe so contaminated before backfilling shall be removed, cleaned and relaid.
- C. Type "C" Underdrain Construction (605.04)

1. The trench shall be excavated to the required width and depth and a bed of the specified granular underdrain material, 6 inches in depth, shall be prepared in the trench. The required perforated pipe shall be laid and firmly bed with the perforations up as shown on the section drawings. The pipe shall bear on the bedding material along its entire length.
  2. After the pipe has been firmly bedded and joints securely connected, it must be inspected by the Architect/Engineer, Town appointed Engineer and the Contracting Officer before any backfill is placed. Additional granular free-draining underdrain material shall be rammed below the haunches and placed over the top of the pipe with power pneumatic hand tampers (MDOT 603.08) as shown on the section drawings. Six inches of shaped coarse aggregate underdrain material shall be placed over the top invert of the piping as shown on the section drawings. The remaining backfill shall be granular fill material meeting the requirements of Section 312100.
  3. The backfill material shall be placed in 8 inch layers, loose measure and thoroughly compacted with power pneumatic hand tampers or vibratory equipment to 95% modified proctor, except that the initial layer of backfill around the pipe may be placed in a layer not exceeding 12 inches.
  4. When construction equipment is used or traffic is maintained the Contractor shall maintain a minimum cover of three feet (3') over all pipes. Whenever this cover extends above the subgrade the Contractor shall temporarily place granular fill which shall be removed when necessary to complete the work in accordance with the plans and specifications.
  5. Coupling bands shall be used on all pipe as required by the individual pipe manufacturer.
  6. The upstream end of all completed underdrain pipe that is to be buried shall be sealed with cement mortar or a plastic end cap or other acceptable material. Temporary end caps shall be used in areas which will be constructed at a later date. Care shall be taken that soil does not enter the pipe. Pipe so contaminated before backfilling shall be removed, cleaned and relaid.
- D. Underdrain Construction in Embankment: When underdrain is to be constructed in embankment fill, the excavation for the trench shall be done after the embankment has been completed to the subgrade elevation unless directed otherwise by the Architect/Engineer.

### 3.2 TOLERANCES

- A. Lay with minimum uniform pitch of 6 inches in 100 feet unless shown otherwise on drawings. Use a laser alignment or similar method to achieve straight, uniform grades.
- B. Pipes shall be inspected between manholes by shining a bright light and upon inspection, a uniform circle of light shall appear at the opposite end.
- C. In the event that a trench is overexcavated, the grade shall be brought back with compacted granular fill material compacted to 95% modified proctor.

### 3.3 FIELD QUALITY CONTROL

- A. Test system as required by Architect/Engineer. In general, this will require observing the system during a rainfall event. In dry weather conditions, water shall be discharged in an amount as required by the Architect/Engineer who shall observe the systems characteristics.
- B. Test material for conformance to specified requirements. General Contractor to arrange for and Owner to pay for all soils and field testing. The General Contractor shall pay for any required retesting by the Architect and Owner.
- C. The contractor reserves the right to test the material for proper gradation in advance of the project's notice to proceed, however the owner reserves the right to request the material be retested once the



materials has arrived on site, especially including but not limited to if one of the following has occurred; more than 3 months have passed since the initial material testing had been done, if the material arriving on site for placement appears to not meet spec, if the supplier stockpile has been reworked or if the stockpile supplier has changed, or if mixing of on-site stockpiles has occurred, or other similar occurrences which may affect the products integrity. The contractor incurs the cost of this additional testing.

- D. Additional field quality control testing as specified in section 312100.

#### 3.4 ENVIRONMENTAL PROTECTION

- A. When working adjacent to a protected resource or other sensitive area, or in areas where erosion and sediment could enter the system, protect as shown on the drawings with temporary inlet devices and as specified in Section 313000.

END OF SECTION 334200

# REPORT

July 12, 2012  
12-0034 S

## Geotechnical Engineering Services

Proposed Additions and Renovations  
Cumberland County Civic Center  
Free Street, Center Street and Spring Street  
Portland, Maine

**PREPARED FOR:**

Cumberland County Recreation Center  
d/b/a Cumberland County Civic Center  
Attn: Joe Bruno  
One Civic Center  
Portland, Maine 04101

**PREPARED BY:**

S.W.COLE ENGINEERING, INC.  
286 Portland Road  
Gray, Maine 04039  
207-657-2866



- *Geotechnical Engineering*
- *Construction Materials Testing*
- *GeoEnvironmental Services*
- *Ecological Services*

[www.swcole.com](http://www.swcole.com)

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Attachment A	Limitations
Sheet 1	Exploration Location Plan
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Sheet 13	Underdrain Detail

12-0034 S

July 12, 2012

Cumberland County Recreation Center  
d/b/a Cumberland County Civic Center  
Attn: Joe Bruno  
One Civic Center  
Portland, Maine 04101

Subject: Geotechnical Engineering Services  
Proposed Additions and Renovations  
Cumberland County Civic Center  
Free Street, Center Street and Spring Street  
Portland, Maine

Dear Joe:

In accordance with our Proposal dated March 30, 2012, we have performed subsurface explorations for the proposed additions and renovations to the Cumberland County Civic Center (CCCC) in Portland, Maine. This report presents our findings and geotechnical recommendations and its contents are subject to the limitations set forth in Attachment A.

## **1.0 INTRODUCTION**

### **1.1 Scope and Purpose**

The purpose of our work was to obtain subsurface information at the site of the proposed additions in order to develop geotechnical recommendations relative to foundations and earthwork associated with the proposed construction. Our scope of work included review of prior exploration data, the making of eight test borings, soils laboratory testing, a geotechnical analysis of the subsurface findings and preparation of this report.

## **1.2 Proposed Construction**

We understand proposed renovations and additions to the CCCC include in-fill additions to the northwest and southwest entries, extension of the southeast entry and reconfiguration of the loading dock. Specifically, we understand:

- Northwest Entry: the existing plaza will be reconfigured and enclosed to add restrooms at the concourse level.
- Loading Docks: the existing loading dock will be skewed and reconfigured to 4 bays. The new configuration will take some of the footprint of the existing northeast arena level and southeast mechanical level.
- Southeast Entry: the existing exterior stairs and plaza will be demolished and the building extended to the corner of Spring and Center Streets to create a new enclosed street level entry about 4 feet above the mechanical level and new restrooms and concession space on the course level.
- Southwest Entry: the existing plaza will be reconfigured and in-filled to improve concourse level circulation and create new club and locker room space.

Existing site features are shown on the “Exploration Location Plan” attached as Sheet 1.

## **2.0 EXPLORATION AND TESTING**

### **2.1 Explorations**

Eight test borings (B-101 through B-108) were made at the site in June 2012. The test borings were made by Great Works Test Boring, Inc. of Rollinsford, New Hampshire working under subcontract to S.W. COLE ENGINEERING, INC. These exploration locations were selected and established in the field by S.W. COLE ENGINEERING, INC. based upon measurements from existing site features and utility constraints. The approximate exploration locations are shown on the “Exploration Location Plan” attached as Sheet 1. The approximate locations of fifteen prior test borings (B-1 through B-15) made in October 1973 are also shown on Sheet 1 based upon historical survey information in the facilities records.

Logs of the explorations are attached as Sheets 2 through 9. A log of rock cores obtained at B-103 and B-107 is attached as Sheet 10. The ground surface elevations shown on the logs were estimated based on topographic information shown on Sheet 1. Logs of the prior explorations made in October 1973 for the original design of the facility are shown on Sheet 1. A log of October 1973 rock cores viewed at the facility in June 2012 is attached as Sheet 11. A key to the notes and symbols used on the logs is attached as Sheet 12.

## **2.2 Testing**

The test borings were made using solid-stem auger drilling techniques. The soils were sampled at 2 to 5-foot intervals using a split spoon sampler and Standard Penetration Test (SPT) methods at the test borings. SPT blow counts are shown on the logs. Soil samples obtained from the test borings were returned to our laboratory for classification. The site soils are not considered reactive, corrosive nor expansive.

## **3.0 SITE AND SUBSURFACE CONDITIONS**

### **3.1 Site Conditions**

The site is located on the Portland peninsula bounded by Free, Center and Spring Streets. Based on facility records, we understand:

- The existing building was built on a relatively flat site that sloped gently downward from a high elevation of about 89 feet (project datum) in the northwest corner along Free Street to a low elevation of about 54 feet in the southeast corner near the corner of Spring and Center Streets.
- The facility was cut into the site with finished floor elevations of 76.0 feet for the Concourse Level, 67.3 feet for the Arena Level and 64.3 feet for the Skating Lobby. The southeast portion of the Skating Lobby floor slabs are anticipated to be on compacted fill. A Mechanical Level basement was constructed in the southeast corner of the site with the lowest level finished floor elevation of 50.8 feet.

- The original design documents specified that all footings bear on relatively shallow bedrock present beneath the site and that the foundation bearing surfaces be inspected by a licensed P.E. prior to casting foundation concrete.
- Excavation and blasting records to remove bedrock are not available.

Existing site conditions and approximate topography around the site boundary are shown on the “Exploration Location Plan” attached as Sheet 1.

### **3.2 Subsurface Conditions**

The subsurface conditions encountered in the test borings at each of the proposed addition or renovation areas are summarized below. Refer to the attached logs for more detailed descriptions of the subsurface findings at the exploration locations.

Northwest Entry (B-101 and B-102): These test borings encountered a surficial layer of mulch over fill to depths of ½ to 4 feet before encountering refusal surfaces interpreted to be bedrock (B-102) and a relic slab (B-101).

Free water was not encountered in these test borings; however groundwater likely becomes perched on the shallow refusal surfaces.

Loading Dock (B-103): This test boring encountered a surficial layer of asphalt overlying sand and gravel fill to a depth of 11 feet before encountering bedrock where a 5-foot rock core was taken to a depth of 16.3 feet. It should be noted this boring was completed on the existing truck ramp that slopes steeply upward from Center Street (approximate elevation 60 feet) to the Arena Level of the building (approximate elevation 67.3 feet), thus the thickness of fill is anticipated to increase with elevation gain.

Free water was not encountered in these test borings; however groundwater likely becomes perched on the shallow refusal surfaces.

Southeast Entry (B-104 and B-105): Below a concrete sidewalk, B-104 encountered silty sand fill to a depth of about 3 feet overlying native glacial till to a depth of about 10 feet overlying a refusal surface interpreted to be bedrock. Below a concrete sidewalk, boring B-105 encountered sand and gravel fill to a depth of about 10 feet overlying a thin veneer of glacial till before encountering a refusal surface interpreted to be bedrock at a depth of

about 10.5 feet. The fill encountered in B-105 is interpreted to be backfill for the existing mechanical level basement.

Groundwater was observed at depths of 6 to 6.5 feet in these test borings, which approximately corresponds to the basement floor elevation.

Southwest Entry (B-106, B-107 and B-108): Below a layer of topsoil, B-106 encountered sand and gravel fill to a depth of 4.5 feet overlying glacial till mantling bedrock at a depth of about 12 feet. Boring B-107 was made in the southwest plaza and encountered concrete pavement overlying sandy fill to a depth of about 7 feet overlying bedrock where a 5-foot core was taken to a depth of 12.1 feet. Boring B-108 was made along the sidewalk of the southwest entry and encountered fill mantling a refusal surface, interpreted to be bedrock, at a depth of about 3 feet.

Free water was not encountered in these test borings; however groundwater likely becomes perched on the shallow refusal surfaces.

### **3.3 Seismic and Frost Considerations**

The 25-year Air Freezing Index for the Portland, Maine area is about 1,250-Fahrenheit degree-days, which corresponds to a frost penetration depth on the order of 4.5 feet. Based on the findings at the test borings and existing and new foundations being founded on bedrock, we interpret the site soils to correspond to Seismic Site Class B according to 2009 IBC N-value method.

## **4.0 EVALUATION AND RECOMMENDATIONS**

### **4.1 General Findings**

Based on the subsurface findings, the proposed construction appears feasible from a geotechnical standpoint. The principle geotechnical considerations are:

- Spread footing foundations and on-grade floor slabs bearing on properly prepared subgrades are appropriate for the proposed construction. All footings must be excavated and founded on sound, intact bedrock. On-grade floor slabs may be founded on a layer of new base gravel overlying bedrock, native glacial till or densified existing sandy fills.



- Perimeter foundation underdrains should be provided for the proposed building additions.
- The native soils are unsuitable for reuse as backfill for proposed building foundations. The existing sand and gravel fills may be suitable for reuse as Granular Borrow in building areas not exposed to freezing. Imported Structural Fill, Crushed Stone and Crushed Gravel will be needed for construction.

#### **4.2 Site and Subgrade Preparation**

We recommend that site preparation begin with the construction of an erosion control system to protect adjacent drainage ways and areas outside the construction limits.

Fill and Slab Areas: Organics and existing pavements, sidewalks must be completely removed beneath the proposed building addition footprints and fill areas. Following removal of surface cover, the existing fills should be densified and compacted prior to placing new fills. Areas that become soft or yield after densification, should be removed and replaced with compacted Structural Fill.

Footing Subgrades: All footings should be excavated to and founded on sound, intact bedrock. Bedrock surfaces should be cleaned of loose debris prior to casting foundations. Bearing surfaces must be observed by the Geotechnical Engineer of Record prior to casting foundations.

#### **4.3 Excavation and Dewatering**

Excavation work will generally encounter topsoil, existing pavements and sidewalk, sandy fills, native glacial till and bedrock. Care must be exercised during construction to minimize disturbance of the sensitive slab and pavement bearing soils. Final cuts to subgrade in native glacial till for slabs and pavement should be performed with a smooth-edged bucket to help minimize soil disturbance. Bedrock removal will require blasting or hoe-ramming. If blasting is employed, care must be taken not to overblast below foundation bearing surfaces.

Sumping and pumping dewatering techniques should be adequate to control groundwater in excavations. A layer of Crushed Stone may be added over the bottom of excavations to

provide a drainage media from which to sump and pump. Controlling the water levels to at least one foot below planned excavation depths will help stabilize subgrades during construction.

Excavations must be properly shored and/or sloped according to OSHA Regulations to prevent sloughing and caving of the sidewalls during construction.

#### **4.4 Foundations**

We recommend the proposed building be supported on spread footing foundations bearing on sound intact bedrock. We recommend the following geotechnical parameters for design consideration:

- Design Frost Depth = 4.5 feet (2.5 feet if on bedrock)
- Net Allowable Soil Bearing Pressure = 25 ksf or less (sound, intact bedrock)
- Base Friction Factor = 0.7 (Concrete to Bedrock)
- Passive Lateral Earth Pressure Coefficient = 3.0
- At-Rest Lateral Earth Pressure Coefficient = 0.5
- Total Unit Weight of Backfill = 130 pcf (Structural Fill)
- Internal Friction Angle of Backfill = 30 degrees
- Seismic Soil Site Class = B (2009 IBC, N-value method)

Post-construction settlement is anticipated to be less than ¼ inch between foundations founded on bedrock.

#### **4.5 Foundation Drainage**

We recommend an underdrain system be installed near footing grade around the perimeter footings. The underdrain pipe should consist of 4-inch diameter, perforated SDR-35 foundation drain pipe enveloped in 12-inches of Crushed Stone wrapped in filter fabric, such as Mirafi 160N. The underdrain pipe must be connected to a positive gravity outlet protected from freezing, clogging and backflow.

Exterior foundation backfill should be sealed with a surficial layer of clayey or loamy soil in areas that are not paved or occupied by entrance slabs. This is to reduce direct surface water infiltration into the backfill. Surface grades should be sloped away from the building for positive surface water drainage. General underdrain details are shown on Sheet 13.

#### **4.6 Slab-On-Grade Floors**

We recommend on-grade concrete floors be supported on a minimum of 12 inches of compacted Structural Fill. On-grade floor slabs founded on properly prepared subgrades may be designed considering a modulus of subgrade reaction of 170 pci. The structural engineer or concrete consultant must design steel reinforcing and joint spacing appropriate to slab thickness and function.

We recommend a sub-slab vapor retarder particularly in areas of the building where the concrete slab will be covered with an impermeable surface treatment or floor covering that may be sensitive to moisture vapors. The vapor retarder must have a permeance that is less than the floor cover or surface treatment that is applied to the slab. The vapor retarder must have sufficient durability to withstand direct contact with the sub-slab base material and construction activity. The vapor retarder material shall be placed according to the manufacturer's recommended method, including the taping and lapping of all joints and wall connections. The architect and/or flooring consultant should select the vapor retarder products compatible with flooring and adhesive materials.

The floor slab should be appropriately cured using moisture retention methods after casting. Typical floor slab curing methods should be used for at least 7 days. The architect or flooring consultant should assign curing methods consistent with current applicable American Concrete Institute (ACI) procedures with consideration of curing method compatibility to proposed surface treatments, flooring and adhesive materials.

#### **4.7 Entrance Slabs and Sidewalks**

Entrance slabs and sidewalks adjacent to buildings must be designed to reduce the effects of differential frost action between adjacent pavement, doorways, and entrances. We recommend that clean, non-frost susceptible sand and gravel meeting the requirements of Structural Fill be provided to a depth of at least 4.5 feet below the top of entrance slabs. This thickness of Structural Fill should extend the full width of the entrance slabs and outward at least 4.5 feet, thereafter transitioning up to the bottom of the adjacent sidewalk or pavement subbase gravel at a 3H:1V or flatter slope. General details of this frost transition zone are attached as Sheet 13.

Entrance slabs serving as pavements, such as loading docks, may be designed using a modulus of subgrade reaction of 170 pci provided they are underlain by at least 12 inches of Structural Fill with a frost transition zone as discussed above.

#### **4.8 Backfill and Compaction**

Based on the subsurface findings, the native glacial till soils are unsuitable for reuse as fill within the building. Existing sandy fills may be reused as Granular Borrow within areas not exposed to freezing. We recommend the following fill and backfill materials.

Granular Borrow: Compacted fill to raise site grades in building and paved areas should be sand, silty sand or sand and gravel meeting the requirements of MDOT Standard Specification 703.19 “Granular Borrow” as given below.

<b>MDOT 703.19 Granular Borrow</b>	
<b>Sieve Size</b>	<b>Percent Finer by Weight</b>
6 inch	100
#40	0 to 70
200	0 to 10

Structural Fill: Fill to raise site grades over wet subgrades, backfill for foundations and base gravel below floor slabs should be clean, non-frost susceptible sand and gravel meeting the gradation requirements for Structural Fill as given below.

<b>Structural Fill</b>	
<b>Sieve Size</b>	<b>Percent Finer by Weight</b>
4 inch	100
3 inch	90 to 100
¼ inch	25 to 90
#40	0 to 30
#200	0 to 5

Crushed Stone: Crushed Stone, used as foundation drainage and underdrain aggregate, should meet the gradation requirements of MDOT Standard Specifications 703.22 “Underdrain Backfill Type C”.

<b>MDOT 703.22 Underdrain Backfill Type C – Crushed Stone</b>	
<b>Sieve Size</b>	<b>Percent Finer by Weight</b>
1 inch	100
¾ inch	90-100
⅜ inch	0-75
#4	0-25
#10	0-5

Placement and Compaction: Fill should be placed in horizontal lifts and compacted such that the desired density is achieved throughout the lift thickness with 3 to 5 passes of the compaction equipment. Loose lift thicknesses for grading, fill and backfill activities should not exceed 12 inches. We recommend that fill and backfill in building and paved areas be compacted to at least 95 percent of its maximum dry density as determined by ASTM D-1557. Crushed Stone should be compacted in loose lifts not exceeding 12 inches.

#### **4.9 Weather Considerations**

The native glacial till soils are easily disturbed especially when wet. Earthwork and foundation construction activities should be limited during wet and freezing weather. The contractor should anticipate the need to moisture condition fills in order to facilitate compaction. If construction takes place during cold weather, subgrades, foundations and floor slabs must be protected during freezing conditions. Concrete and fill must not be placed on frozen soil; and once placed, the concrete and soil beneath the structure must be protected from freezing.

#### **4.10 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 and foundation 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 subgrade observations for foundations as well as testing services for soils, concrete, asphalt, steel and spray-applied fireproofing construction materials.

**5.0 CLOSURE**

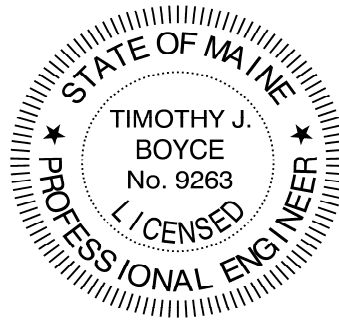
It has been a pleasure to be of assistance to you with this phase of your project. We look forward to working with you during the construction phase of the project.

Sincerely,

**S.W. COLE ENGINEERING, INC.**



Timothy J. Boyce, P.E.  
Senior Geotechnical Engineer



TJB:rec

## **Attachment A Limitations**

This report has been prepared for the exclusive use of Cumberland County Recreation Center for specific application to the proposed Cumberland Country Civic Center Renovations and Additions 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.

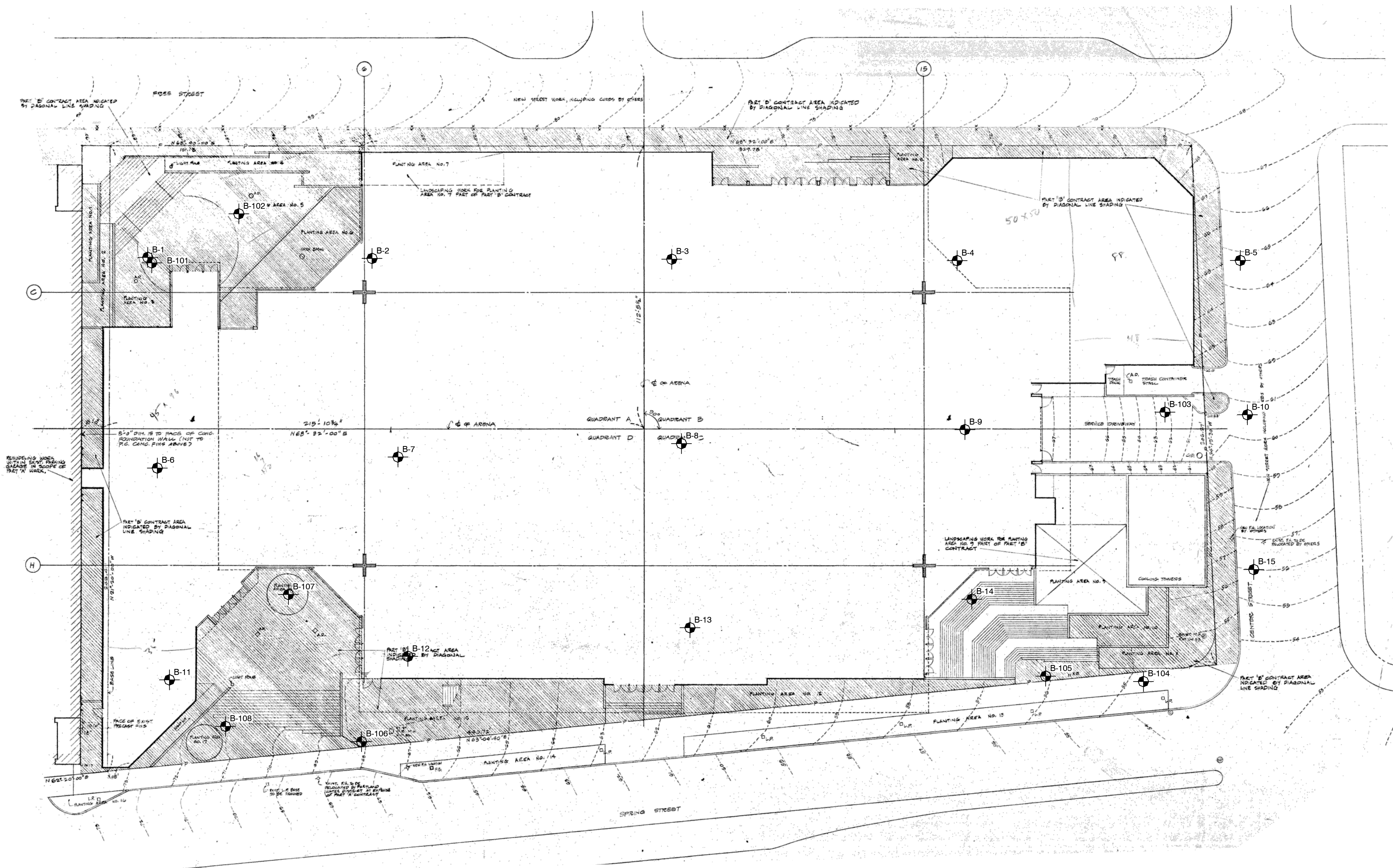
The soil profiles described in the report are intended to convey general trends in subsurface conditions. The boundaries between strata are approximate and are based upon interpretation of exploration data and samples.


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.



**LEGEND:**  
 APPROXIMATE BORING LOCATION

- NOTES:**
- EXPLORATION LOCATION PLAN WAS PREPARED FROM A 1/16" = 1'-0" SCALE PLAN OF THE SITE ENTITLED "SITE PLAN" PREPARED BY EDUARDO CATALANO, ARCHITECT, DATED SEPTEMBER 18, 1974 AND PROVIDED AS A PORTABLE DOCUMENT FORMAT (PDF)
  - BORINGS B-1 THROUGH B-15 WERE PERFORMED BY D.L. JONES, ON OCTOBER 1973 AND PROVIDED ON THIS PLAN BASED ON LOCATIONS SHOWN ON A 1/16" = 1'-0" PLAN OF THE SITE ENTITLED "SURVEY PLAN" PREPARED BY EDUARDO CATALANO, ARCHITECT AND PROVIDED AS A PORTABLE DOCUMENT FORMAT (PDF).
  - BORINGS B-101 THROUGH B-108 WERE PERFORMED BY S.W. COLE ENGINEERING, INC., JUNE 2012 AND WERE LOCATED IN THE FIELD BY TAPED MEASUREMENTS FROM EXISTING SITE FEATURES.
  - THIS PLAN SHOULD BE USED IN CONJUNCTION WITH THE ASSOCIATED S.W. COLE ENGINEERING, INC. GEOTECHNICAL REPORT.
  - THE PURPOSE OF THIS PLAN IS ONLY TO DEPICT THE LOCATION OF THE EXPLORATIONS IN RELATION TO THE EXISTING CONDITIONS AND PROPOSED CONSTRUCTION AND IS NOT TO BE USED FOR CONSTRUCTION.

**BORING DATA - FOR INFORMATION ONLY**  
 BORINGS PERFORMED BY D.L. JONES - OCTOBER, 1973  
 ROCK RECOVERY BASED ON 1 7/8" BARREL 5' DEPTH OF CORE  
 FULL REPORT AVAILABLE IN ARCHITECT'S OFFICE

B-1	B-2	B-3	B-4	B-5	B-6	B-7	B-8	B-9	B-10	B-11	B-12	B-13	B-14	B-15
EL. 82.4'	EL. 78.3'	EL. 73.0'	EL. 66.3'	EL. 61.2'	EL. 77.6'	EL. 72.9'	EL. 69.3'	EL. 62.2'	EL. 57.7'	EL. 71.2'	EL. 64.8'	EL. 60.0'	EL. 55.9'	EL. 53.4'
SAND & GRAVEL ROCK 100% RECOVERY	REFUSAL	FILL BOULDERS SAND & GRAVEL ROCK 80% RECOVERY	SAND & GRAVEL REFUSAL	SAND & GRAVEL REFUSAL	SAND & GRAVEL REFUSAL	SAND & GRAVEL REFUSAL	SAND & GRAVEL REFUSAL	FILL SILT SAND & GRAVEL SAND GRAVEL & WETLAND ROCK REFUSAL	BASINENT FILL SAND & GRAVEL REFUSAL	FILL SAND & GRAVEL ROCK 90% RECOVERY	SILT SAND REFUSAL	FILL SAND & GRAVEL ROCK 90% RECOVERY	FILL SILT SAND & GRAVEL REFUSAL	SAND & GRAVEL ROCK 90% RECOVERY



NO.	DATE	DESCRIPTION	BY
2	07/12/2012	FINAL REPORT SUBMISSION	CEM
1	06/21/2012	REPORT SUBMISSION	CEM
-	06/14/2012	DRAFT SUBMISSION	CEM

**S.W. COLE ENGINEERING, INC.**  
 CUMBERLAND COUNTY RECREATION CENTER  
**EXPLORATION LOCATION PLAN**  
 PROPOSED ADDITIONS AND RENOVATIONS  
 CUMBERLAND COUNTY CIVIC CENTER  
 FREE STREET, CENTER STREET AND SPRING STREET  
 PORTLAND, MAINE

Job No.: 12-0034      Scale: 1" = 20'  
 Date: 06/14/2012      Sheet: 1

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# BORING LOG

BORING NO.: **B-101**  
 SHEET: 1 OF 1  
 PROJECT NO.: 12-0034  
 DATE START: 6/6/2012  
 DATE FINISH: 6/6/2012  
 ELEVATION: 76' ±  
 SWC REP.: PJO

PROJECT / CLIENT: CUMBERLAND COUNTY CIVIC CENTER RENOVATIONS  
 LOCATION: SPRING, CENTER & FREE STREETS, PORTLAND, MAINE  
 DRILLING CO.: S.W. COLE ENGINEERING, INC. DRILLER:

WATER LEVEL INFORMATION  
 SOILS MOIST AT 0.3' ±

CASING: TYPE SIZE I.D. HAMMER WT. HAMMER FALL  
 SSA 6" POWER HEAD  
 SAMPLER:  
 CORE BARREL:

CASING BLOWS PER FOOT	SAMPLE				SAMPLER BLOWS PER 6"				DEPTH	STRATA & TEST DATA
	NO.	PEN.	REC.	DEPTH @ BOT	0-6	6-12	12-18	18-24		
									0.2'	TOPSOIL / MULCH
									0.5'	BROWN SILTY GRAVELLY SAND WITH BRICK (FILL)
										REFUSAL AT 0.5' (CONCRETE SLAB)

SAMPLES: SOIL CLASSIFIED BY: REMARKS:

D = SPLIT SPOON  
 C = 2" SHELBY TUBE  
 S = 3" SHELBY TUBE  
 U = 3.5" SHELBY TUBE

X

DRILLER - VISUALLY  
 SOIL TECH. - VISUALLY  
 LABORATORY TEST

STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL.

2

BORING NO.: **B-101**



# BORING LOG

BORING NO.: **B-102**

SHEET: 1 OF 1

PROJECT NO.: 12-0034

DATE START: 6/6/2012

DATE FINISH: 6/6/2012

ELEVATION: 76' ±

SWC REP.: PJO

WATER LEVEL INFORMATION

SOILS MOIST AT 0.3'±

PROJECT / CLIENT: CUMBERLAND COUNTY CIVIC CENTER RENOVATIONS

LOCATION: SPRING, CENTER &amp; FREE STREETS, PORTLAND, MAINE

DRILLING CO.: S.W. COLE ENGINEERING, INC.

DRILLER: \_\_\_\_\_

CASING: TYPE \_\_\_\_\_ SIZE I.D. \_\_\_\_\_ HAMMER WT. \_\_\_\_\_ HAMMER FALL \_\_\_\_\_  
SSA 6" POWER HEAD

SAMPLER: \_\_\_\_\_

CORE BARREL: \_\_\_\_\_

CASING BLOWS PER FOOT	SAMPLE				SAMPLER BLOWS PER 6"				DEPTH	STRATA & TEST DATA
	NO.	PEN.	REC.	DEPTH @ BOT	0-6	6-12	12-18	18-24		
									0.3'	TOPSOIL / MULCH
									4.0'	BROWN GRAVELLY SAND SOME SILT (FILL)
										REFUSAL AT 4.0' (PROBABLE BEDROCK)

SAMPLES:  
 D = SPLIT SPOON  
 C = 2" SHELBY TUBE  
 S = 3" SHELBY TUBE  
 U = 3.5" SHELBY TUBE

SOIL CLASSIFIED BY:

X
---

DRILLER - VISUALLY  
 SOIL TECH. - VISUALLY  
 LABORATORY TEST

REMARKS:

STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL.

3



# BORING LOG

BORING NO.: **B-103**  
 SHEET: 1 OF 1  
 PROJECT NO.: 12-0034  
 DATE START: 6/6/2012  
 DATE FINISH: 6/6/2012  
 ELEVATION: 62' ±  
 SWC REP.: PJO

PROJECT / CLIENT: CUMBERLAND COUNTY CIVIC CENTER RENOVATIONS  
 LOCATION: SPRING, CENTER & FREE STREETS, PORTLAND, MAINE  
 DRILLING CO.: GREAT WORKS TEST BORINGS, INC. DRILLER: JEFF LEE

CASING: TYPE SSA SIZE I.D. 4 1/2" HAMMER WT. 30" HAMMER FALL  
 SAMPLER: SS 2" 140 lbs 30"  
 CORE BARREL: NQ2 2"

WATER LEVEL INFORMATION  
 SOILS MOIST AT 5.0'

CASING BLOWS PER FOOT	SAMPLE				SAMPLER BLOWS PER 6"				DEPTH	STRATA & TEST DATA
	NO.	PEN.	REC.	DEPTH @ BOT	0-6	6-12	12-18	18-24		
HW									0.4'	ASPHALT
	1D	24"	18"	2.5'	9	9	8	8		BROWN SAND AND GRAVEL SOME SILT (FILL)  ~MEDIUM DENSE BECOMING...  ...VERY DENSE~
	2D	24"	14"	4.5'	7	9	15	17		
	3D	24"	18"	7.0'	10	21	28	40		
	4D	6"	6"	7.5'	50					
	5D	14"	13"	11.2'	9	21	50/2"		11.0'	RQD = 76% BEDROCK-SEE ROCK CORE LOG
	6D	5.0'	4.9'	16.3'					16.3'	BOTTOM OF EXPLORATION AT 16.3'

SAMPLES:  
 D = SPLIT SPOON  
 C = 2" SHELBY TUBE  
 S = 3" SHELBY TUBE  
 U = 3.5" SHELBY TUBE

SOIL CLASSIFIED BY:  
 DRILLER - VISUALLY  
 SOIL TECH. - VISUALLY  
 LABORATORY TEST

REMARKS:  
 STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL.



# BORING LOG

BORING NO.: **B-104**  
 SHEET: 1 OF 1  
 PROJECT NO.: 12-0034  
 DATE START: 6/6/2012  
 DATE FINISH: 6/6/2012  
 ELEVATION: 55' ±  
 SWC REP.: PJO

PROJECT / CLIENT: CUMBERLAND COUNTY CIVIC CENTER RENOVATIONS  
 LOCATION: SPRING, CENTER & FREE STREETS, PORTLAND, MAINE  
 DRILLING CO.: GREAT WORKS TEST BORINGS, INC. DRILLER: JEFF LEE

CASING: TYPE SSA SIZE I.D. 4 1/2" HAMMER WT. HAMMER FALL  
 SAMPLER: SS 2" 140 lbs 30"  
 CORE BARREL:

WATER LEVEL INFORMATION  
 FREE WATER AT 6.0' IN OPEN BORE HOLE

CASING BLOWS PER FOOT	SAMPLE				SAMPLER BLOWS PER 6"				DEPTH	STRATA & TEST DATA
	NO.	PEN.	REC.	DEPTH @ BOT	0-6	6-12	12-18	18-24		
									0.4'	CONCRETE SIDEWALK
	1D	24"	18"	3.0'	4	5	6	5	3.0'	BROWN SILTY SAND (FILL) ~MEDIUM DENSE~
	2D	24"	20"	5.0'	6	10	14	14	7.0'	MOTTLED RUST BROWN SILTY GRAVELLY SAND (GLACIAL TILL) ~MEDIUM DENSE~ (POSSIBLY RE-WORKED)
	3D	24"	24"	7.0'	7	9	19	23		
	4D	24"	24"	9.0'	20	10	10	10		
	5D	24"	12"	11.0'	18	50			10.1'	LIGHT GRAY GRAVELLY SILTY SAND (GLACIAL TILL) ~MEDIUM DENSE~
									12.5'	WEATHERED BEDOCK
										REFUSAL AT 12.5' (BEDROCK)

SAMPLES: D = SPLIT SPOON  
 C = 2" SHELBY TUBE  
 S = 3" SHELBY TUBE  
 U = 3.5" SHELBY TUBE

SOIL CLASSIFIED BY:  
 DRILLER - VISUALLY  
 SOIL TECH. - VISUALLY  
 LABORATORY TEST

REMARKS: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL.

5

BORING NO.: **B-104**



# BORING LOG

BORING NO.: **B-105**  
 SHEET: 1 OF 1  
 PROJECT NO.: 12-0034  
 DATE START: 6/6/2012  
 DATE FINISH: 6/6/2012  
 ELEVATION: 56' ±  
 SWC REP.: PJO

PROJECT / CLIENT: CUMBERLAND COUNTY CIVIC CENTER RENOVATIONS  
 LOCATION: SPRING, CENTER & FREE STREETS, PORTLAND, MAINE  
 DRILLING CO.: GREAT WORKS TEST BORINGS, INC. DRILLER: JEFF LEE

CASING: TYPE SSA SIZE I.D. 4 1/2" HAMMER WT. HAMMER FALL  
 SAMPLER: SS 2" 140 lbs 30"  
 CORE BARREL:

WATER LEVEL INFORMATION  
 FREE WATER AT 6.5' IN OPEN BORE HOLE

CASING BLOWS PER FOOT	SAMPLE				SAMPLER BLOWS PER 6"				DEPTH	STRATA & TEST DATA
	NO.	PEN.	REC.	DEPTH @ BOT	0-6	6-12	12-18	18-24		
									0.5'	CONCRETE SIDEWALK
	1D	24"	15"	3.0'	8	11	20	22		BROWN SILTY SAND AND GRAVEL (FILL)  ~VERY DENSE~
	2D	24"	18"	5.0'	25	34	30	25		
	3D	24"	18"	7.0'	11	24	33	27		
	4D	24"	17"	9.0'	21	23	13	12		
	5D	6"	3"	10.5'	3	50/0"			10.0'	
									10.5'	BROWN SILTY GRAVELLY SAND (GLACIAL TILL) ~LOOSE~
									11.5'	BEDROCK
										REFUSAL AT 11.5' (BEDROCK)

SAMPLES:  
 D = SPLIT SPOON  
 C = 2" SHELBY TUBE  
 S = 3" SHELBY TUBE  
 U = 3.5" SHELBY TUBE

SOIL CLASSIFIED BY:  
 DRILLER - VISUALLY  
 SOIL TECH. - VISUALLY  
 LABORATORY TEST

REMARKS:  
 STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL.



# BORING LOG

BORING NO.: **B-106**  
 SHEET: 1 OF 1  
 PROJECT NO.: 12-0034  
 DATE START: 6/6/2012  
 DATE FINISH: 6/6/2012  
 ELEVATION: 68' ±  
 SWC REP.: PJO

PROJECT / CLIENT: CUMBERLAND COUNTY CIVIC CENTER RENOVATIONS  
 LOCATION: SPRING, CENTER & FREE STREETS, PORTLAND, MAINE  
 DRILLING CO. : GREAT WORKS TEST BORINGS, INC. DRILLER: JEFF LEE  
 CASING: TYPE SSA SIZE I.D. 4 1/2" HAMMER WT. HAMMER FALL  
 SAMPLER: SS 2" 140 lbs 30"  
 CORE BARREL:

WATER LEVEL INFORMATION  
 SOILS SATURATED AT 3.0'

CASING BLOWS PER FOOT	SAMPLE				SAMPLER BLOWS PER 6"				DEPTH	STRATA & TEST DATA
	NO.	PEN.	REC.	DEPTH @ BOT	0-6	6-12	12-18	18-24		
									0.5'	BLACK/BROWN SAND AND SILT WITH ORGANICS (TOPSOIL)
	1D	24"	18"	2.0'	7	15	12	11		BROWN SILTY SAND AND GRAVEL (FILL) ~MEDIUM DENSE~
	2D	24"	18"	4.0'	11	16	12	12	4.5'	
	3D	24"	18"	7.0'	10	24	21	15		MOTTLED RUST BROWN GRAVELLY SILTY SAND WITH WEATHERED BEDROCK FRAGMENTS (GLACIAL TILL) ~VERY DENSE~ (POSSIBLY RE-WORKED)
	4D	24"	20"	9.0'	29	30	30	27	9.5'	
	5D	21"	17"	11.8'	9	5	7	50/3"	11.8'	LIGHT GRAY SILTY SAND SOME GRAVEL (GLACIAL TILL) ~MEDIUM DENSE~
									12.2'	BEDROCK
										REFUSAL AT 12.2' (BEDROCK)

SAMPLES:  
 D = SPLIT SPOON  
 C = 2" SHELBY TUBE  
 S = 3" SHELBY TUBE  
 U = 3.5" SHELBY TUBE

SOIL CLASSIFIED BY:  
 DRILLER - VISUALLY  
 SOIL TECH. - VISUALLY  
 LABORATORY TEST

REMARKS:  
 STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL.



# BORING LOG

BORING NO.: **B-107**  
 SHEET: 1 OF 1  
 PROJECT NO.: 12-0034  
 DATE START: 6/6/2012  
 DATE FINISH: 6/6/2012  
 ELEVATION: 76' ±  
 SWC REP.: PJO  
 WATER LEVEL INFORMATION  
 SOILS MOIST AT 4.5'

PROJECT / CLIENT: CUMBERLAND COUNTY CIVIC CENTER RENOVATIONS  
 LOCATION: SPRING, CENTER & FREE STREETS, PORTLAND, MAINE  
 DRILLING CO.: GREAT WORKS TEST BORINGS, INC. DRILLER: JEFF LEE

CASING: TYPE SSA SIZE I.D. 4 1/2" HAMMER WT. 140 lbs HAMMER FALL 30"  
 SAMPLER: SS 2" 140 lbs 30"  
 CORE BARREL: NQ2 2"

CASING BLOWS PER FOOT	SAMPLE				SAMPLER BLOWS PER 6"				DEPTH	STRATA & TEST DATA
	NO.	PEN.	REC.	DEPTH @ BOT	0-6	6-12	12-18	18-24		
HW									0.4'	CONCRETE SIDEWALK
	1D	24"	10"	2.5'	2	2	1	1		BROWN SAND AND SILT WITH ORGANICS (FILL) ~LOOSE~
	2D	24"	18"	4.5'	2	2	2	5	4.4'	
	3D	24"	12"	7.0'	7	11	9	7	7.0'	BROWN GRAVELLY SILTY SAND (FILL) ~MEDIUM DENSE~
	4D	1"	0"	7.1'	25/1"					RQD = 61% BEDROCK-SEE ROCK CORE LOG
	R1	5.0'	4.6'	12.1'					12.1'	BOTTOM OF EXPLORATION AT 12.1'

SAMPLES:  
 D = SPLIT SPOON  
 C = 2" SHELBY TUBE  
 S = 3" SHELBY TUBE  
 U = 3.5" SHELBY TUBE

SOIL CLASSIFIED BY:  
 DRILLER - VISUALLY  
 SOIL TECH. - VISUALLY  
 LABORATORY TEST

REMARKS:  
 STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL.



# BORING LOG

BORING NO.: **B-108**

SHEET: **1 OF 1**

PROJECT NO.: **12-0034**

DATE START: **6/6/2012**

DATE FINISH: **6/6/2012**

ELEVATION: **71' ±**

SWC REP.: **PJO**

PROJECT / CLIENT: **CUMBERLAND COUNTY CIVIC CENTER RENOVATIONS**

LOCATION: **SPRING, CENTER & FREE STREETS, PORTLAND, MAINE**

DRILLING CO. : **GREAT WORKS TEST BORINGS, INC.** DRILLER: **JEFF LEE**

WATER LEVEL INFORMATION

SOILS MOIST AT 1.0'

	TYPE	SIZE I.D.	HAMMER WT.	HAMMER FALL
CASING:	SSA	4 1/2"		
SAMPLER:	SS	2"	140 lbs	30"
CORE BARREL:				

CASING BLOWS PER FOOT	SAMPLE				SAMPLER BLOWS PER 6"				DEPTH	STRATA & TEST DATA
	NO.	PEN.	REC.	DEPTH @ BOT	0-6	6-12	12-18	18-24		
									1.0'	BLACK/BROWN SAND AND SILT WITH ORGANICS, BRICK (FILL) ~LOOSE~
	1D	24"	16"	2.0'	4	5	10	10		BROWN SAND AND GRAVEL SOME SILT (FILL)
	2D	11"	5"	2.9'	10	50/4"			2.9'	~MEDIUM DENSE~
									3.5'	BEDROCK
										REFUSAL AT 3.5' (BEDROCK)

SAMPLES: D = SPLIT SPOON C = 2" SHELBY TUBE S = 3" SHELBY TUBE U = 3.5" SHELBY TUBE	SOIL CLASSIFIED BY: <input type="checkbox"/> DRILLER - VISUALLY <input checked="" type="checkbox"/> SOIL TECH. - VISUALLY <input type="checkbox"/> LABORATORY TEST	REMARKS:  STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL.	<div style="border: 1px solid black; border-radius: 50%; width: 30px; height: 30px; display: flex; align-items: center; justify-content: center; margin: 0 auto;">9</div>
BORING NO.: <b>B-108</b>			



**CORE BOX SUMMARY SHEET 1 OF 2**
**BORING(S) NO:** B-107 AND B-103

**PROJECT NO & LOCATION:**

12-0034 / PORTLAND, ME

**LOGGED BY** PJO

**DATE:** 6/7/2012

**CHECKED BY** GWB

**DATE:** 6/7/2012

**PHOTO: B-107 R1 (7.1'-12.1'), B-103 (11.3'-16.3')**

BORING	RUN NO.	CORE SIZE	DEPTH & CORE INTERVAL (FT)	RECOVERY (FT)	RQD (%)	ROCK QUALITY	LITHOLOGIC DESCRIPTION
B-107	R1	NQ2	7.1-12.1 (5.0)	4.6'	61	Fair	Gray Schist (Spring Point Formation); moderately hard; fine grained; slightly weathered, quartz veins pitted and iron oxide stained; closely spaced shallow to steeply dipping fractures at 15-75° from horizontal.
B-103	R1	NQ2	11.3-16.3 (5.0)	4.9'	76	Good	Gray Schist (Spring Point Formation) contains quartz veins and weathered garnets; moderately hard; fine grained; slightly weathered; weakly foliated, closely spaced moderate to steeply dipping fractures at 15-60° from horizontal.

CORE BOX SUMMARY SHEET 2 OF 2

**BORING(S) NO:** B-1, B-11, B-3 & B-13

**PROJECT NO & LOCATION:** 12-0034 / PORTLAND, ME

**LOGGED BY** PJO **DATE:** 6/7/2012

**CHECKED BY** GWB **DATE:** 6/7/2012



**PHOTO:** B-1 (3'-8'), B-11 (5.8'-10.8'), B-3 (1.5'-5'), B-3 (7'-12'), B-13 (11'-16')

BORING	RUN NO.	CORE SIZE	DEPTH & CORE INTERVAL (FT)	RECOVERY (FT)	RQD (%)	ROCK QUALITY	LITHOLOGIC DESCRIPTION
B-1	R1	AQ	3'-8' (5.0)	3.8'	38%	Poor	Gray Schist (Spring Point Formation); moderately hard; fine grained, weakly foliated; slightly weathered, fracture surfaces stained with iron oxide; closely spaced shallow to steeply dipping mechanical and natural fractures at 15-85° from horizontal.
B-11	R1	AQ	5.8'-10.8' (5.0)	4.0'	70%	Fair	Gray Schist (Spring Point Formation); moderately hard; fine grained; very slightly weathered, fracture surfaces stained with iron oxide; closely spaced shallow to moderately dipping fractures at 15-50° from horizontal.
B-3	R1	AQ	1.5'-5.0' (3.5)	1.5'	0%	Very Poor	Cored a boulder
B-3	R1	AQ	7'-12' (5.0)	3.2'	0%	Very Poor	Gray Schist (Spring Point Formation); moderately hard; fine grained; slightly weathered, highly fractured, surfaces stained with iron oxide. Quartz veins pitted and iron oxide stained.
B-13	R1	AQ	11'-16' (5.0)	4.5'	25%	Very Poor / Poor	Gray Schist (Spring Point Formation); moderately hard; fine grained, weakly foliated; slightly weathered, highly fractured, surfaces stained with iron oxide. Shallow to steep fracture angles and quartz veins.



## **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 <sub>u</sub>	-	unconfined compressive strength, kips/sq. ft. - based on laboratory unconfined compressive test
S <sub>v</sub>	-	field vane shear strength, kips/sq. ft.
L <sub>v</sub>	-	lab vane shear strength, kips/sq. ft.
q <sub>p</sub>	-	unconfined compressive strength, kips/sq. ft. based on pocket penetrometer test
O	-	organic content, percent (dry weight basis)
W <sub>L</sub>	-	liquid limit - Atterberg test
W <sub>P</sub>	-	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 <sub>T</sub>	-	total soil weight
γ <sub>B</sub>	-	buoyant soil weight

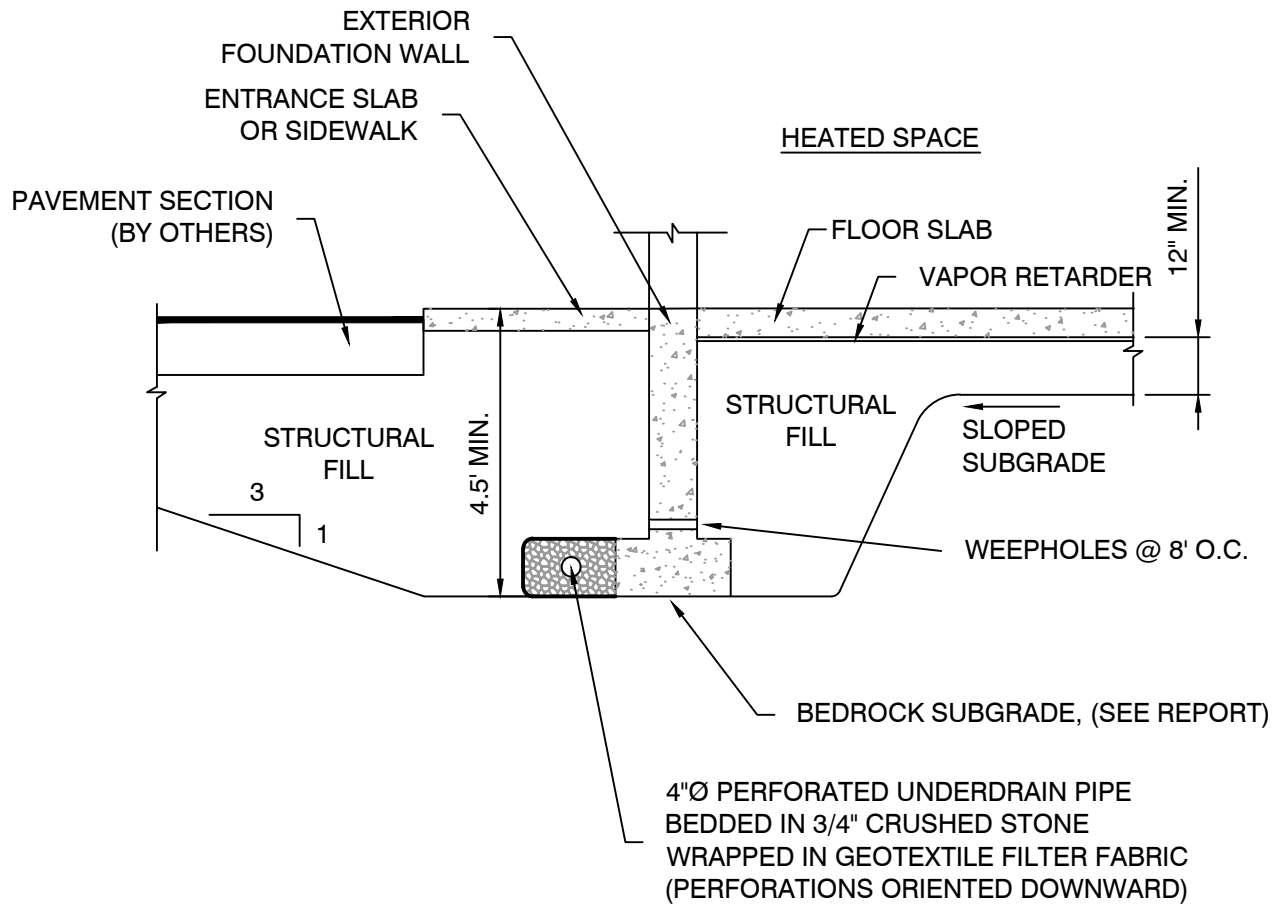
### **Description of Proportions:**

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.



**NOTE:**

1. UNDERDRAIN INSTALLATION AND MATERIAL GRADATION RECOMMENDATIONS ARE CONTAINED WITHIN THIS REPORT.
2. DETAIL IS PROVIDED FOR ILLUSTRATIVE PURPOSES ONLY, NOT FOR CONSTRUCTION.



CUMBERLAND COUNTY RECREATION CENTER

**UNDERDRAIN DETAIL**

PROPOSED ADDITIONS AND RENOVATIONS  
 CUMBERLAND COUNTY CIVIC CENTER  
 FREE STREET, CENTER STREET AND SPRING STREET  
 PORTLAND, MAINE

Job No.:	12-0034	Scale:	Not to Scale
Date :	07/12/2012	Sheet:	13



**HAZARDOUS MATERIALS IDENTIFICATION REPORT**  
**CUMBERLAND COUNTY CIVIC CENTER**  
**ONE CIVIC CENTER SQUARE**  
**PORTLAND, MAINE**



***Prepared for:***

---

Cumberland County Recreation Center  
One Civic Center Square  
Portland, Maine 04101

***Prepared by:***

---

Summit Environmental Consultants, Inc.  
8 Harlow Street, Suite 4A  
Bangor, ME 04401

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- Table 1 – Summary of Asbestos Containing Materials
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**APPENDICES**

- Appendix A – Asbestos Laboratory Analytical Results
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- Appendix C – Asbestos Analytical Laboratory Certifications
- Appendix D – LBP Determination Report
- Appendix E – PCB Laboratory Analytical Results
- Appendix F – Maine Department of Environmental Protection forms X and Y

## EXECUTIVE SUMMARY

Summit Environmental Consultants, Inc., (Summit) conducted a Hazardous Materials Identification Survey (HMIS) of the Cumberland County Civic Center (CCCC) located at One Civic Center Square in Portland, Maine. The subject property is utilized as a recreation center and is currently scheduled for renovation. The CCCC is a 99,400-square foot, steel and masonry structure with rubber roofing. The building consists of a stadium and associated infrastructure including administrative offices, ticket sales, vendor areas, restaurant, restrooms, locker rooms, storage areas and maintenance areas. The investigation focused on identifying Asbestos-Containing Materials (ACM), Lead-Based Paint (LBP) and hazardous materials present on the interior and exterior of the building that would require special handling and disposal or would be regulated prior to/during renovation of the facility. Inspection of the CCCC was conducted on March 15, 2012.

The investigation revealed the following relevant information:

1. Eighty-three (83) bulk samples of suspect ACM were collected for asbestos analysis from interior and exterior building materials.

Identified ACM included

- Floor tile with non-ACM adhesive present in the sound booths and press boxes;
- Floor tile and associated ACM adhesive present along the east end of the ice rink;
- Floor tile and associated ACM adhesive present in the entry hall outside the restaurant kitchen: and

Large diameter cementitious transite conduit used as utility conduit in the ticket booth and in the mechanical tunnel on the northern side of the arena. It appears that the transite conduit was used to house ventilation ducts running under the concrete floor within the building. This could not be confirmed, however it should be assumed that the transite conduit is present under the floor.

2. Potential Universal Wastes including fluorescent lights and light ballasts were identified during the survey. Those ballasts not labeled as “no-PCB” should be segregated and handled as hazardous waste. Additional materials (sodium vapor lamps and mercury thermostats) requiring special handling were identified.

A LBP determination was conducted using a portable X-Ray Fluorescence (XRF) Lead Paint Analyzer to determine the presence of LBP on identified painted interior and exterior surfaces. LBP was identified on surfaces throughout the interior

3. Ten bulk samples of the window/door caulking were collected from the interior and exterior of the building and analyzed for the presence of Polychlorinated Biphenyl (PCB). Laboratory analytical results were “non-detect” for the caulking samples.
4. An unregistered underground storage tank (UST) is located within a HVAC impoundment on the eastern end of the building below cooling equipment. The UST is reportedly is a 500-gallon diesel fuel tank installed between 1975 and 1976 and is associated with the facility’s emergency generator. The UST has reportedly not been

serviced or refilled after the initial filling (1975-76). The condition of the UST and surrounding soils is unknown.

5. Electrical transformers are present beneath the stadium seating. Electrical transformers may contain PCB oil, which if present must be handled as hazardous waste.

Based on Summit's survey/assessment of the property; ACM, LBP and hazardous materials are present at the CCCC. Should these materials be impacted by planned renovations, Summit recommends, at a minimum, removal of those impacted ACM and hazardous materials prior to commencement of renovation activities, as required by applicable State of Maine and federal rules and regulations. The unregistered UST located on the eastern end of the building must be registered with the MEDEP, additionally a notice of intent to remove or abandon the UST should be filed with the registration forms to comply with current UST regulations.



## 1.0 INTRODUCTION

Summit Environmental Consultants, Inc., (Summit) conducted a Hazardous Materials Identification Survey (HMIS) of the Cumberland County Civic Center (CCCC) located at One Civic Center Square in Portland, Maine. The subject property is utilized as a recreation center and is currently scheduled for renovation. The CCCC is a 99,400-square foot, steel and masonry structure with rubber roofing. The building consists of a stadium and associated infrastructure including administrative offices, ticket sales, vendor areas, locker rooms, storage areas, restaurant, restrooms and maintenance areas. The investigation focused on identifying Asbestos-Containing Materials (ACM), Lead-Based Paint (LBP) and hazardous materials present on the interior and exterior of the building.

## 2.0 ASBESTOS SURVEY

This Asbestos Identification Survey was conducted in accordance with the Maine Department of Environmental Protection (MEDEP) Chapter 425 Asbestos Management Regulations (April 3, 2011 revision) and was completed to provide Cumberland County Recreation Center (CCRC) with information regarding the presence of interior and exterior ACM associated with the building. Mr. Dennis Kingman and Mr. Brett Deyling (both of Summit), asbestos inspectors licensed in the State of Maine, performed the field survey on March 15, 2012. Copies of the Summit investigator's Asbestos Inspector certifications are included in Appendix B.

Completion of the Asbestos Identification Survey included:

- Visual identification of suspect ACM on the interior and exterior of the building;
- Collection of Eighty Three (83) bulk samples of suspect ACM from the interior and exterior of the building in accordance with MEDEP regulations; and
- Quantification of ACM identified by laboratory analysis.

As with any scientific study, an asbestos identification survey is subject to a variety of limitations. Limitations to be considered in interpreting the results of the survey performed on this building include the following:

- Variations in building materials used during construction and subsequent renovations.
- Inaccessible areas within walls and floors.
- Areas not accessible at the time of the site inspection including:
  - The portion of the mechanical tunnel beneath the stadium seating on the southeast quarter of the stadium; and
  - The kitchen associated with the restaurant on the southwestern portion of the building.
- Roofing systems associated with the structure are rubber membrane type roofs and were identified as having been recently installed. As directed by the client, the rubber membrane roofs were not sampled.

Bulk samples of suspect ACM collected during the survey were submitted to EMSL Analytical, Inc. (EMSL) of Cinnaminson, New Jersey for analysis. Bulk samples collected during this survey were analyzed using the MEDEP required analytical methods: “PLM-EPA 600/R-93/116” (for surfacing, thermal system insulation and cementitious materials) and “PLM NOB-EPA 600/R-93/116” (for non-friable organically bound materials (NOBs)) (i.e.; floor tile, adhesives, and roofing) with “gravimetric reduction”. Samples were analyzed at the EMSL laboratory, which is certified to perform asbestos analysis by both the National Voluntary Laboratory Accreditation Program (NVLAP) and the American Industrial Hygiene Association (AIHA). EMSL is a MEDEP licensed Asbestos Analytical Laboratory (A copy of EMSL’s laboratory certifications is included in Appendix C). Laboratory analytical results and chain of custodies are included as Appendix A.

During the inspection, Eighty-three (83) bulk samples were collected from suspect ACM including:

- Eight types of mudded insulation on pipe fittings;
- Six types of floor tile and associated mastic;
- Two types of window caulking;
- Acoustic wall covering;
- Generator exhaust insulation;
- Boiler room tank insulation;
- Boiler refractory cement and rope sectional gasketing;
- Sheetrock wall board; and
- Seven types of ceiling tile.

Large diameter, cementitious transite conduit present in the mechanical tunnels and ticket office were not sampled and assumed to be ACM.

The number of samples collected was determined by the number of homogeneous sampling areas identified by the inspector. A homogeneous area is an area that, based on the inspector’s judgment, contains materials that are uniform in color and texture and are present on similar building or utility components. Asbestos sample locations are shown on Figures 1 through 4.

## **2.1 Asbestos Sampling Results**

Locations and occurrences of materials that tested positive and are homogenous (similar in color and texture) in nature are considered as ACM. A material is defined by the MEDEP as an asbestos-containing material if it contains greater than or equal to one percent (1%) asbestos based on laboratory analysis. A material can only be considered negative for asbestos if analytical results from all bulk samples in a group of samples representing that material indicate an asbestos content of less than 1%.

### **Interior:**

ACM identified by laboratory analysis consisted of:

- Floor tile with non-ACM adhesive present in the sound booths and press boxes;
- Floor tile and associated ACM adhesive present along the east end of the ice rink;

- Floor tile and associated ACM adhesive present in the entry hall outside the restaurant kitchen: and
- Large diameter cementitious transite conduit used as utility conduit in the ticket booth and in the mechanical tunnel on the northern side of the arena. It appears that the transite conduit was used to house ventilation ducts running under the concrete floor within the building. This could not be confirmed, however it should be assumed that the transite conduit is present under the floor;

**Exterior:**

ACM was not identified on the exterior of the building.

An inventory of identified ACM is included in Table 1. Locations of identified ACM are presented on Figures 1 through 4.

Cost estimates (as presented in Table 1) have been prepared to provide a budget for removal of ACM identified during the survey. These estimates do not include material replacement costs, regulatory agency notification fees or a contingency. Estimates assume the Contractor will be responsible to prepare the asbestos abatement design(s). Regulatory agency notification fees associated with this project will range from \$100.00 to \$300.00 depending phasing and project schedule. Actual abatement costs may vary depending upon the amount of ACM abated and abatement methods utilized.

### **3.0 HAZARDOUS MATERIALS ASSESSMENT**

Summit conducted a Hazardous Materials Assessment on March 15, 2012. The intent of this assessment was to identify materials used or stored at the CCCC that would require removal and proper disposal prior to impact by renovation and/or demolition activities. To assess current conditions, Summit conducted a walkthrough of accessible interior areas, as well as the building exterior.

In addition to hazardous materials observed during this assessment, an unregistered underground storage tank (UST) is located within a HVAC impoundment on the eastern end of the building below cooling equipment. The UST is reportedly is a 500-gallon diesel fuel tank installed between 1975 and 1976 and is associated with the facility's emergency generator. The UST has reportedly not been serviced or refilled after the initial filling (1975-76). The condition of the UST and surrounding soils is unknown.

A summary of identified hazardous materials and associated estimate for removal and disposal of these materials is included in Table 2.

### **4.0 LEAD-BASED PAINT DETERMINATION**

A LBP determination of the CCCC was conducted by Atlantic Environmental Services (AES) a Summit sub-consultant, on March 15, 2012. Deborah A. Kasik, a MEDEP certified Lead Risk Assessor, performed the determination. The purpose of the determination was to identify materials with LBP. The lead-based paint testing was performed in accordance with the *established protocols* outlined in the *State of Maine Department of Environmental Protection's*

Lead Management Regulations, Chapter 424, Section 7, as they apply to this project. The testing provides information on the LBP content and assessment of condition for the surfaces tested.

The LBP testing was conducted utilizing a portable X-ray Fluorescence Lead Paint Analyzer (RMD LPA-1), which non-destructively tests for the presence of lead-based paint. This equipment is licensed with the Department of Human Services Radiation Control Program and operated in accordance with all applicable regulations and conditions of licensure.

LBP was identified on the following surfaces:

<u>Location</u>	<u>LBP Materials</u>
Ladies Rooms	Entry walls only (previously marked with an arrow). Each wall is approximately 4 feet square;
Arena Area	Large "ROW" lettering on cinderblock walls around the perimeter of the arena painted in either black or in orange;
Utility Closets	Glazing on utility sinks; and
Administrative Offices	Vinyl baseboards.

LBP was not identified on the exterior surfaces.

A copy of the LBP determination report including a sketch showing LBP locations and field forms is included as Appendix D.

## **5.0 PCB-CONTAINING CAULK ASSESSMENT**

PCBs were used as a plasticizer in caulking and in elastic sealant materials, primarily from 1950 through 1978. The caulk/sealants were used in windows and associated window systems, door frames, stairways, masonry columns and other masonry building materials. PCBs were not used in these materials after 1978. Consistent with USEPA guidelines, PCB-containing caulking has a PCB content of equal to or greater than 50 parts per million ( $\geq 50$  ppm). At this level, the caulk containing PCBs is not an authorized use under the current PCB regulations and must be removed. When removed, these materials are considered a controlled hazardous waste material under the Toxic Substance Control Act (TSCA).

Summit conducted a limited PCB-caulking field screening on March 15, 2012. During the screening, homogeneous caulking/glazing types present on window and door systems affected by the planned renovation project were noted and classified by system or use (e.g.; caulking associated with the junction of window frames and the surrounding substrate; or caulking associated with the wall junctions, etc.). Ten representative samples of window and door caulking were collected from the following systems impacted by the planned renovation:

- Large panel windows located on the northeast, northwest, southeast and southwest corners of the building; and
- Entry doors.

The suspect PCB samples were placed in laboratory provided containers and shipped to Analytics Environmental Laboratory LLC (Analytics) of Portsmouth, New Hampshire for analysis using USEPA Method SW-846-8082 and sample preparation Method SW-846 3540C (Soxhlet extraction). Laboratory analytical results were “non-detect” for all caulking samples. Laboratory analysis reports are included in Appendix E.

## 6.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the Asbestos Identification Survey and observations made during the Hazardous Materials Assessment this investigation revealed the following relevant information:

1. Eighty-three (83) bulk samples of suspect ACM were collected for asbestos analysis from interior and exterior building materials.

ACM identified by laboratory analysis consisted of:

- Floor tile with non-ACM adhesive present in the sound booths and press boxes;
  - Floor tile and associated ACM adhesive present along the east end of the ice rink;
  - Floor tile and associated ACM adhesive present in the entry hall outside the restaurant kitchen; and
  - Large diameter cementitious transite conduit used as utility conduit in the ticket booth and in the mechanical tunnel on the northern side of the arena. It appears that the transite conduit was used to house ventilation ducts running under the concrete floor within the building. This could not be confirmed, however it should be assumed that the transite conduit is present under the floor;
2. Potential Universal Wastes including fluorescent lights and light ballasts were identified during the survey. Those ballasts not labeled as “no-PCB” should be segregated and handled as hazardous waste. Additional materials (sodium vapor lamps and mercury thermostats) requiring special handling were identified. Additional materials (a mercury thermostat) requiring special handling were identified.
  3. A LBP determination was conducted using a portable X-Ray Fluorescence (XRF) Lead Paint Analyzer to determine the presence of LBP on identified painted interior and exterior surfaces. LBP was identified on surfaces throughout the interior
  4. Ten bulk samples of the window/door caulking were collected from the interior and exterior of the building and analyzed for the presence of Polychlorinated Biphenyl (PCB). Laboratory analytical results were “non-detect” for the caulking samples.
  5. An unregistered underground storage tank (UST) is located within a HVAC impoundment on the eastern end of the building below cooling equipment. The UST is reportedly is a 500-gallon diesel fuel tank installed between 1975 and 1976 and is associated with the facility’s emergency generator. The UST has reportedly not been serviced or refilled after the initial filling (1975-76). The condition of the UST and

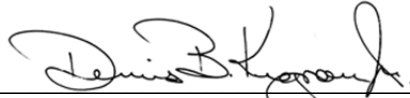
surrounding soils is unknown. The unregistered UST located on the eastern end of the building must be registered with the MEDEP, additionally a notice of intent to remove or abandon the UST should be filed with the registration forms to comply with current UST regulations.

6. Electrical transformers are present beneath the stadium seating. Electrical transformers may contain PCB oil, which if present must be handled as hazardous waste.

## 7.0 REPORT CERTIFICATION

This report was prepared and reviewed by Summit Environmental Consultants, Inc. for the sole use of the Cumberland County Recreation Center and its constituents and should not be reproduced without their full, written authorization.

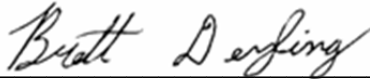
*Inspectors:*



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Dennis B. Kingman, Jr. CHMM

Maine DEP License No AI-0034



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Brett Deyling

Staff Engineer

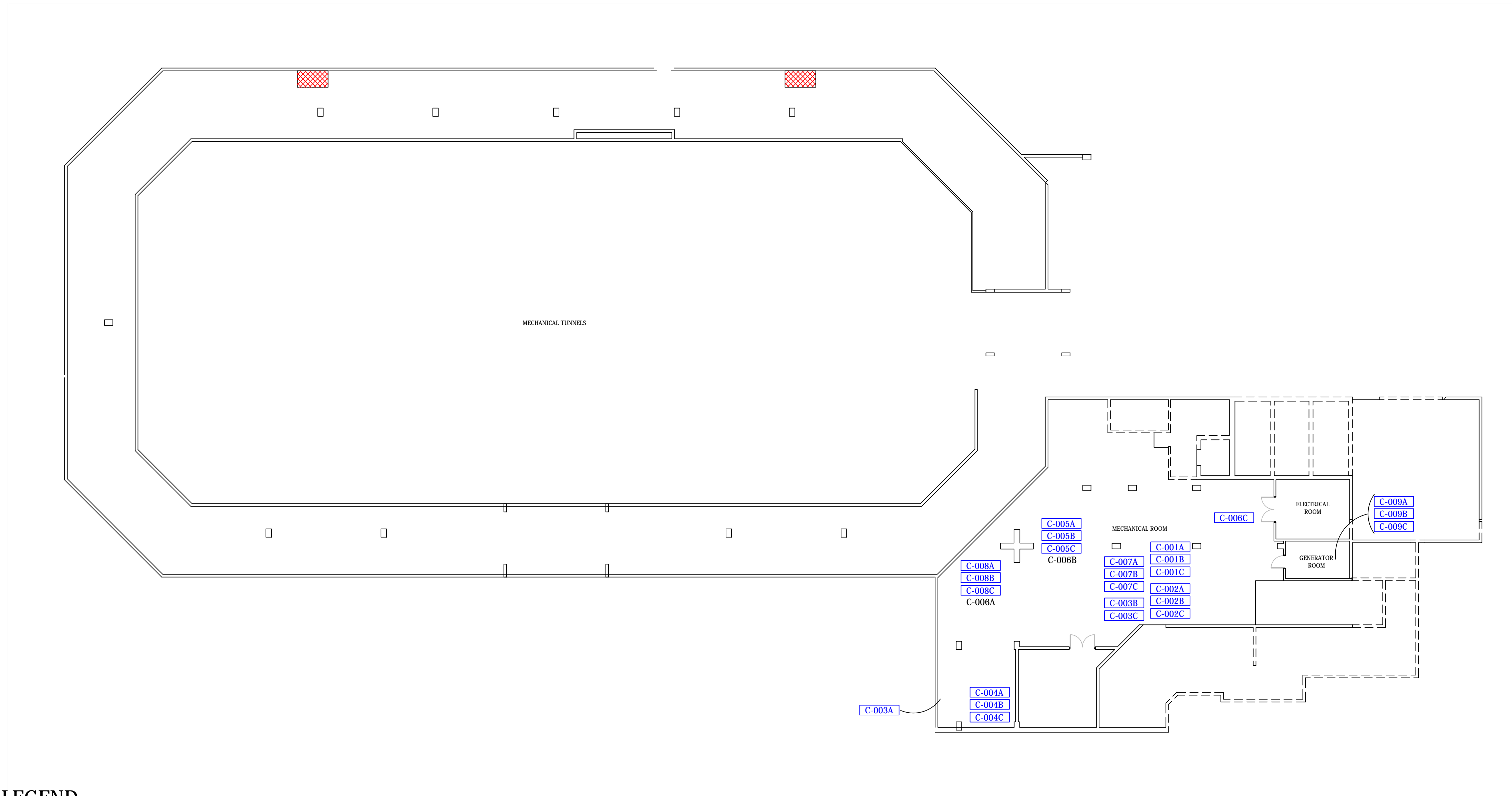
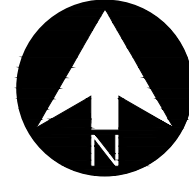
Maine DEP License No AI-0605

## *Figures*

*Figure 1*

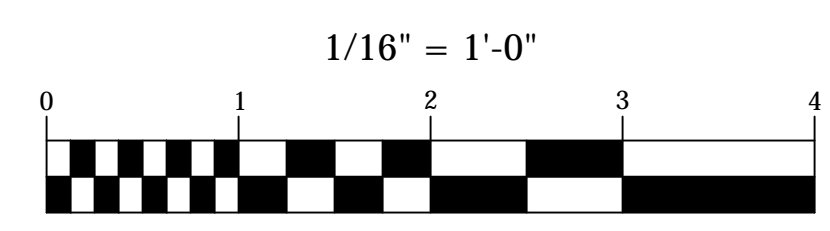
**Mechanical Level**





LEGEND

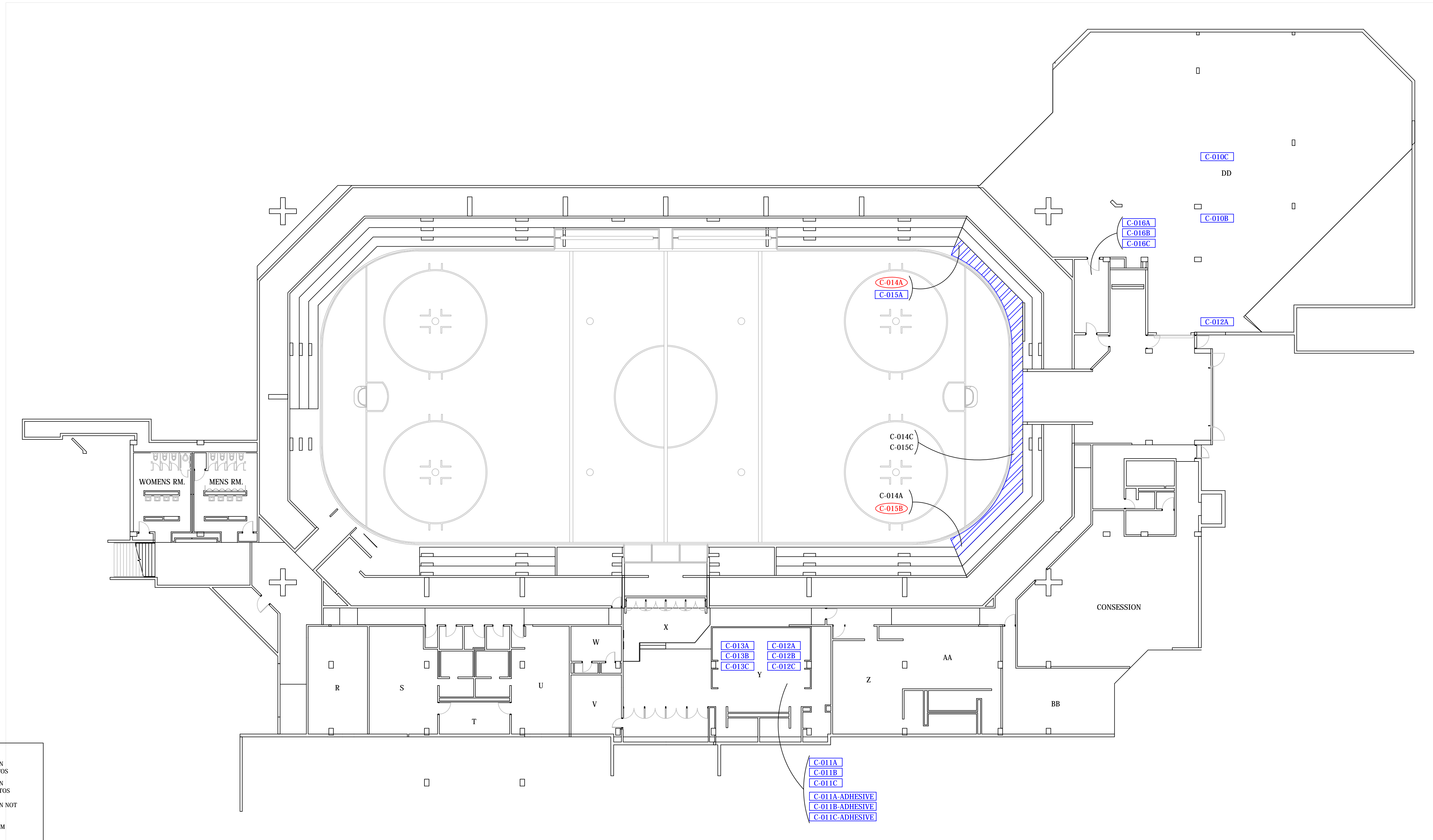
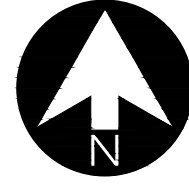
- C-001A = SAMPLE NUMBER AND LOCATION TESTING POSITIVE FOR ASBESTOS
- C-002A = SAMPLE NUMBER AND LOCATION TESTING NEGATIVE FOR ASBESTOS
- C-001B = SAMPLE NUMBER AND LOCATION NOT ANALYZED (POSITIVE STOP)
- = ACM FLOOR TILE WITH NON-ACM ADHESIVE
- = ACM FLOOR TILE WITH ACM ADHESIVE
- = NON-ACM FLOOR TILE WITH ACM ADHESIVE
- = TRANSITE CONDUIT (1.5' DIAMETER)



Source: FLOOR PLAN DERIVED FROM DRAWINGS BY OTHERS PROVIDED TO SUMMIT AND ARE NOT WARRANTED AS TO ACCURACY.

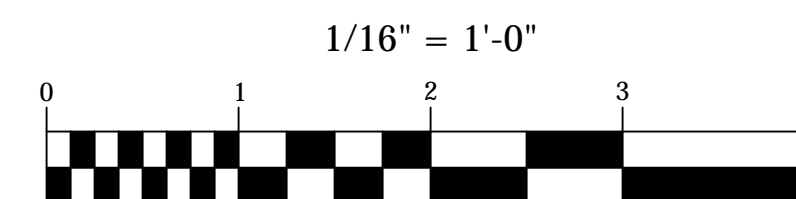
*Figure 2*

Event Level



LEGEND

- C-001A - SAMPLE NUMBER AND LOCATION TESTING POSITIVE FOR ASBESTOS
- C-002A - SAMPLE NUMBER AND LOCATION TESTING NEGATIVE FOR ASBESTOS
- C-001B - SAMPLE NUMBER AND LOCATION NOT ANALYZED (POSITIVE STOP)
- ACM FLOOR TILE WITH NON-ACM ADHESIVE
- ACM FLOOR TILE WITH ACM ADHESIVE
- NON-ACM FLOOR TILE WITH ACM ADHESIVE
- TRANSITE CONDUIT (1.5" DIAMETER)



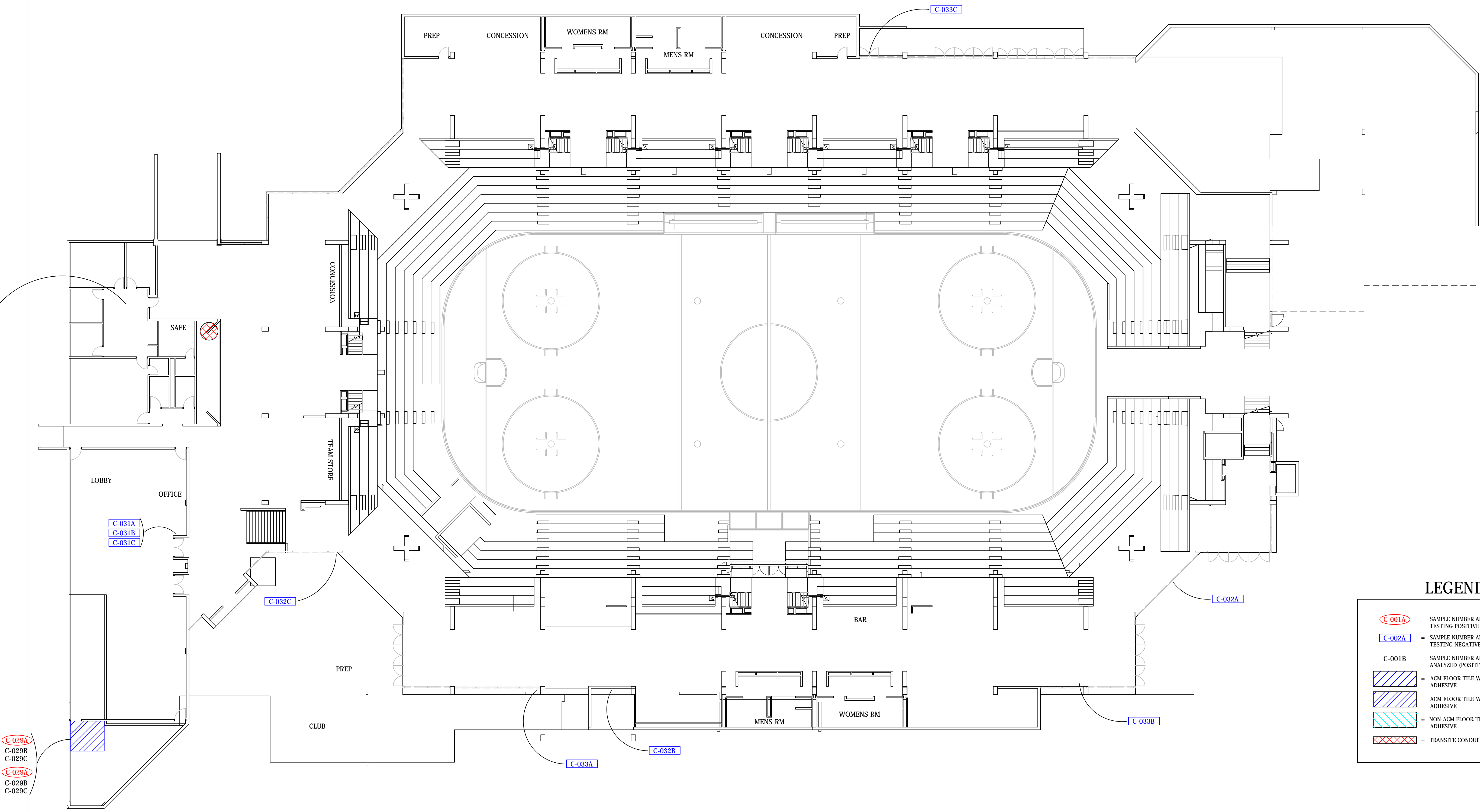
Source:  
FLOOR PLAN DERIVED FROM DRAWINGS BY OTHERS PROVIDED TO SUMMIT AND ARE NOT WARRANTED AS TO ACCURACY.

*Figure 3*

Concourse Level

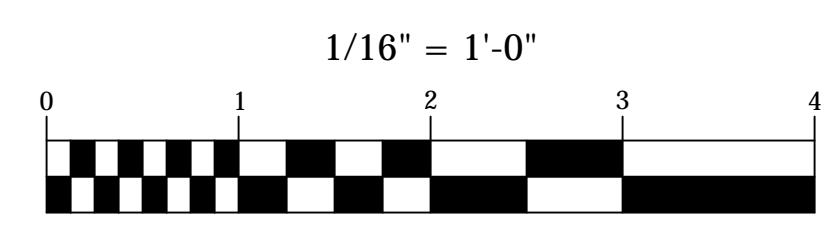


- C-020A
- C-020B
- C-020C
- C-021A
- C-021B
- C-021C
- C-022A
- C-022B
- C-022C
- C-023A
- C-023B
- C-023C
- C-024A
- C-024B
- C-024C
- C-025A
- C-025B
- C-025C
- C-026A
- C-026B
- C-026C
- C-027A
- C-027B
- C-027C
- C-028A
- C-028B
- C-028C



LEGEND

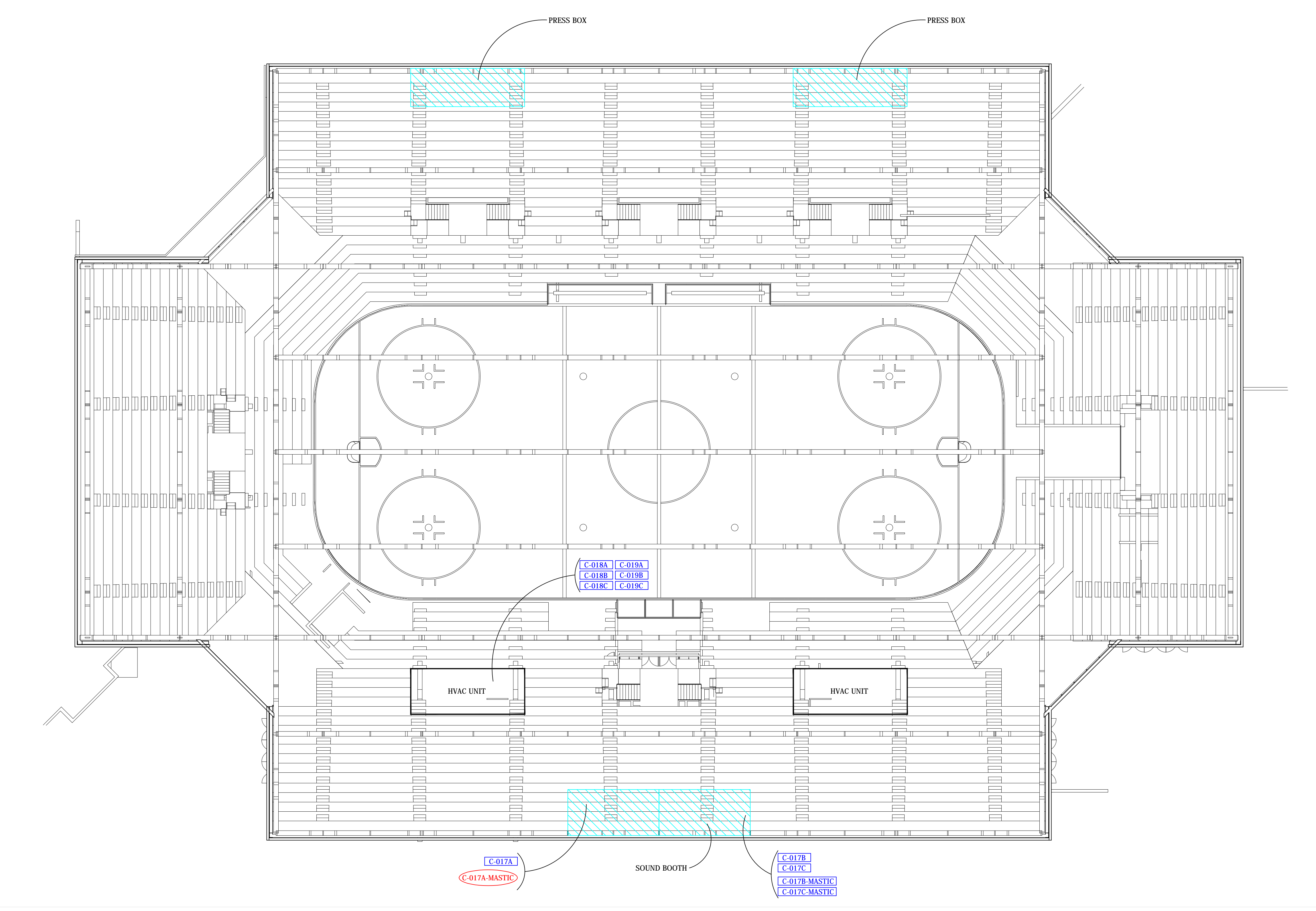
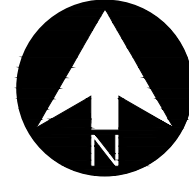
- C-001A - SAMPLE NUMBER AND LOCATION TESTING POSITIVE FOR ASBESTOS
- C-002A - SAMPLE NUMBER AND LOCATION TESTING NEGATIVE FOR ASBESTOS
- C-001B - SAMPLE NUMBER AND LOCATION NOT ANALYZED (POSITIVE STOP)
- ACM FLOOR TILE WITH NON-ACM ADHESIVE
- ACM FLOOR TILE WITH ACM ADHESIVE
- NON-ACM FLOOR TILE WITH ACM ADHESIVE
- TRANSITE CONDUIT (1.5" DIAMETER)



Source:  
 FLOOR PLAN DERIVED FROM DRAWINGS BY OTHERS PROVIDED TO SUMMIT AND ARE NOT WARRANTED AS TO ACCURACY.

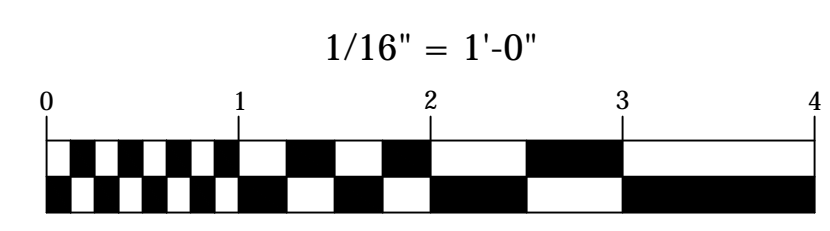
*Figure 4*

Catwalk Level



**LEGEND**

- C-001A = SAMPLE NUMBER AND LOCATION TESTING POSITIVE FOR ASBESTOS
- C-002A = SAMPLE NUMBER AND LOCATION TESTING NEGATIVE FOR ASBESTOS
- C-001B = SAMPLE NUMBER AND LOCATION NOT ANALYZED (POSITIVE STOP)
- = ACM FLOOR TILE WITH NON-ACM ADHESIVE
- = ACM FLOOR TILE WITH ACM ADHESIVE
- = NON-ACM FLOOR TILE WITH ACM ADHESIVE
- = TRANSITE CONDUIT (1.5" DIAMETER)



Source:  
FLOOR PLAN DERIVED FROM DRAWINGS BY OTHERS PROVIDED TO SUMMIT AND ARE NOT WARRANTED AS TO ACCURACY.

## *Tables*



*Table 1*

**SUMMARY OF ASBESTOS CONTAINING MATERIALS**

**TABLE 1**

<b>Identified ACM</b>	<b>Sample Number</b>	<b>Total Estimated Quantity</b>	<b>Unit</b>	<b>Unit Cost</b>	<b>Estimated Removal Cost</b>
North end by ice rink - 12x12 inch gray floor tile and associated mastic	C-014A	240	SF	\$6/SF	\$1,440
Sound Booth and Press Boxes - 12x12 inch beige floor tile	C-017A	240	SF	\$5/SF	\$1,200
Kitchen Exit - 12x12 brown speck floor tile and associated mastic	C-029A	80	SF	\$6/SF	\$480
Ticket Booth and north tunnel - Transite Piping	Assumed ACM and not sampled	100	LF	\$25/LF	\$2,500
<b>TOTAL</b>					<b>\$5,620.00</b>

*Table 2*

**HAZARDOUS MATERIALS INVENTORY**

**TABLE 2**

<b>Materials</b>	<b>Estimated Quantity</b>	<b>Unit</b>	<b>Unit Cost</b>	<b>Remediation Cost</b>
Fluorescent Light Tubes	5218	Linear Foot of Light Tube	\$0.20	\$1,044
Suspect PCB-Containing Light Ballasts	640	Each	\$0.50	\$320
Electric Transformers	2	Each	\$100	\$200
Sodium Vapor Lamps	100	Pounds	\$0.50	\$50
Mercury Thermostat	1	Each	\$8	\$8
UST	1	Lump Sum	\$40,000	\$40,000
Transportation	10	Per Pickup	\$100	\$1,000
Labor to Consolidate & Pack for Shipment	10	Manday	\$500	\$5,000
<b>ESTIMATED TOTAL COST</b>				<b>50,000</b>

## *Appendices*

*Appendix A*

**ASBESTOS LABORATORY ANALYTICAL RESULTS**



# EMSL Analytical, Inc.

200 Route 130 North Cinnaminson, NJ 08077  
Phone/Fax: (800) 220-3675 / (856) 786-5974  
<http://www.emsl.com> / [cinnaslab@EMSL.com](mailto:cinnaslab@EMSL.com)

EMSL Order ID: 041206868  
Customer ID: SUMM78  
Customer PO:  
Project ID:

**Attn:** Dennis Kingman  
Summit Environmental Consultants, Inc.  
8 Harlow Street  
Suite 4A  
Bangor, ME 04401

Phone: (207) 262-9040  
Fax: (207) 262-9080  
Collected: 3/16/2012  
Received: 3/19/2012  
Analyzed: 3/23/2012

**Proj:** 12-/Cumberland County Civic Center/Portland

## Summary Test Report for Asbestos Analysis via EPA 600/R-93/116 and/or EPA 600/M4-82-020

**Client Sample ID:** C-001A

**Lab Sample ID:** 041206868-0001

**Sample Description:** Boiler A/Refractory cement

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	0%	100%	None Detected	

**Client Sample ID:** C-001B

**Lab Sample ID:** 041206868-0002

**Sample Description:** Boiler A/Refractory cement

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	0%	100%	None Detected	

**Client Sample ID:** C-001C

**Lab Sample ID:** 041206868-0003

**Sample Description:** Boiler A/Refractory cement

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	0%	100%	None Detected	

**Client Sample ID:** C-002A

**Lab Sample ID:** 041206868-0004

**Sample Description:** Boiler A/Rope Gasket

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	White	95%	5%	None Detected	

**Client Sample ID:** C-002B

**Lab Sample ID:** 041206868-0005

**Sample Description:** Boiler A/Rope Gasket

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	White	95%	5%	None Detected	

**Client Sample ID:** C-002C

**Lab Sample ID:** 041206868-0006

**Sample Description:** Boiler A/Rope Gasket

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Tan/White	95%	5%	None Detected	

**Client Sample ID:** C-003A

**Lab Sample ID:** 041206868-0007

**Sample Description:** By water boiler/Small diameter fittings

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	25%	75%	None Detected	



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200 Route 130 North Cinnaminson, NJ 08077  
Phone/Fax: (800) 220-3675 / (856) 786-5974  
<http://www.emsl.com> / [cinnasblab@EMSL.com](mailto:cinnasblab@EMSL.com)

EMSL Order ID: 041206868  
Customer ID: SUMM78  
Customer PO:  
Project ID:

## Summary Test Report for Asbestos Analysis via EPA 600/R-93/116 and/or EPA 600/M4-82-020

**Client Sample ID:** C-003B

**Lab Sample ID:** 041206868-0008

**Sample Description:** By X-tank #1/Small diameter fittings

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	40%	60%	None Detected	

**Client Sample ID:** C-003C

**Lab Sample ID:** 041206868-0009

**Sample Description:** By X-tank #1/Small diameter fittings

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	30%	70%	None Detected	

**Client Sample ID:** C-004A

**Lab Sample ID:** 041206868-0010

**Sample Description:** Water main/Large diameter water line fittings

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	30%	70%	None Detected	

**Client Sample ID:** C-004B

**Lab Sample ID:** 041206868-0011

**Sample Description:** Water main/Large diameter water line fittings

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	30%	70%	None Detected	

**Client Sample ID:** C-004C

**Lab Sample ID:** 041206868-0012

**Sample Description:** Water main/Large diameter water line fittings

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	30%	70%	None Detected	

**Client Sample ID:** C-005A

**Lab Sample ID:** 041206868-0013

**Sample Description:** Chiller B/Brine pump fitting

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	30%	70%	None Detected	

**Client Sample ID:** C-005B

**Lab Sample ID:** 041206868-0014

**Sample Description:** Chiller B/Brine pump fitting

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	30%	70%	None Detected	

**Client Sample ID:** C-005C

**Lab Sample ID:** 041206868-0015

**Sample Description:** Chiller B/Brine pump fitting

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	White	65%	35%	None Detected	The sample group is not homogeneous





# EMSL Analytical, Inc.

200 Route 130 North Cinnaminson, NJ 08077  
Phone/Fax: (800) 220-3675 / (856) 786-5974  
<http://www.emsl.com> / [cinnasblab@EMSL.com](mailto:cinnasblab@EMSL.com)

EMSL Order ID: 041206868  
Customer ID: SUMM78  
Customer PO:  
Project ID:

## Summary Test Report for Asbestos Analysis via EPA 600/R-93/116 and/or EPA 600/M4-82-020

**Client Sample ID:** C-006A

**Lab Sample ID:** 041206868-0016

**Sample Description:** Large diameter fittings

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	30%	70%	None Detected	

**Client Sample ID:** C-006B

**Lab Sample ID:** 041206868-0017

**Sample Description:** Large diameter fittings

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	30%	70%	None Detected	

**Client Sample ID:** C-006C

**Lab Sample ID:** 041206868-0018

**Sample Description:** Large diameter fittings

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	30%	70%	None Detected	

**Client Sample ID:** C-007A

**Lab Sample ID:** 041206868-0019

**Sample Description:** Top/X-tank #1 end cap

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	30%	70%	None Detected	

**Client Sample ID:** C-007B

**Lab Sample ID:** 041206868-0020

**Sample Description:** Top/X-tank #1 end cap

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	30%	70%	None Detected	

**Client Sample ID:** C-007C

**Lab Sample ID:** 041206868-0021

**Sample Description:** Bottom/X-tank #1 end cap

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	30%	70%	None Detected	

**Client Sample ID:** C-008A

**Lab Sample ID:** 041206868-0022

**Sample Description:** Medium diameter pipe fittings

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	30%	70%	None Detected	

**Client Sample ID:** C-008B

**Lab Sample ID:** 041206868-0023

**Sample Description:** Medium diameter pipe fittings

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	30%	70%	None Detected	



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## Summary Test Report for Asbestos Analysis via EPA 600/R-93/116 and/or EPA 600/M4-82-020

**Client Sample ID:** C-008C

**Lab Sample ID:** 041206868-0024

**Sample Description:** Medium diameter pipe fittings

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	30%	70%	None Detected	

**Client Sample ID:** C-009A

**Lab Sample ID:** 041206868-0025

**Sample Description:** Generator/Exhaust insulation

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	White	20%	80%	None Detected	

**Client Sample ID:** C-009B

**Lab Sample ID:** 041206868-0026

**Sample Description:** Generator/Exhaust insulation

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	40%	60%	None Detected	

**Client Sample ID:** C-009C

**Lab Sample ID:** 041206868-0027

**Sample Description:** Generator/Exhaust insulation

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Beige	18%	82%	None Detected	

**Client Sample ID:** C-010A

**Lab Sample ID:** 041206868-0028

**Sample Description:** Maintenance area/Roof drain fittings

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	30%	70%	None Detected	

**Client Sample ID:** C-010B

**Lab Sample ID:** 041206868-0029

**Sample Description:** Maintenance area/Roof drain fittings

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	30%	70%	None Detected	

**Client Sample ID:** C-010C

**Lab Sample ID:** 041206868-0030

**Sample Description:** Maintenance area/Roof drain fittings

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	30%	70%	None Detected	

**Client Sample ID:** C-011A

**Lab Sample ID:** 041206868-0031

**Sample Description:** Room Y/Acoustic wall cover

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	White	25%	75%	None Detected	



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## Summary Test Report for Asbestos Analysis via EPA 600/R-93/116 and/or EPA 600/M4-82-020

**Client Sample ID:** C-011B

**Lab Sample ID:** 041206868-0032

**Sample Description:** Room Y/Acoustic wall cover

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	White	25%	75%	None Detected	

**Client Sample ID:** C-011C-Wallpaper

**Lab Sample ID:** 041206868-0033

**Sample Description:** Room Y/Acoustic wall cover

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	White	25%	75%	None Detected	

**Client Sample ID:** C-011C-Adhesive

**Lab Sample ID:** 041206868-0033A

**Sample Description:** Room Y/Acoustic wall cover

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	White	0%	100%	None Detected	

**Client Sample ID:** C-012A

**Lab Sample ID:** 041206868-0034

**Sample Description:** Room Y/T1 Ceiling tile (small pattern)

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Brown	90%	10%	None Detected	

**Client Sample ID:** C-012B

**Lab Sample ID:** 041206868-0035

**Sample Description:** Room Y/T1 Ceiling tile (small pattern)

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	90%	10%	None Detected	

**Client Sample ID:** C-012C

**Lab Sample ID:** 041206868-0036

**Sample Description:** Room Y/T1 Ceiling tile (small pattern)

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	90%	10%	None Detected	

**Client Sample ID:** C-013A

**Lab Sample ID:** 041206868-0037

**Sample Description:** Room Y/T2 Ceiling tile (large pattern)

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	90%	10%	None Detected	

**Client Sample ID:** C-013B

**Lab Sample ID:** 041206868-0038

**Sample Description:** Room Y/T2 Ceiling tile (large pattern)

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	90%	10%	None Detected	



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## Summary Test Report for Asbestos Analysis via EPA 600/R-93/116 and/or EPA 600/M4-82-020

Client Sample ID: C-013C

Lab Sample ID: 041206868-0039

Sample Description: Room Y/T2 Ceiling tile (large pattern)

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	90%	10%	None Detected	

Client Sample ID: C-014A

Lab Sample ID: 041206868-0040

Sample Description: N end by ice rink/12x12 gray floor tile

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	3/23/2012	Gray	0.0%	93.0%	7.0% Chrysotile	

Client Sample ID: C-014B

Lab Sample ID: 041206868-0041

Sample Description: N end by ice rink/12x12 gray floor tile

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	3/23/2012					Positive Stop (Not Analyzed)

Client Sample ID: C-014C

Lab Sample ID: 041206868-0042

Sample Description: N end by ice rink/12x12 gray floor tile

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	3/23/2012					Positive Stop (Not Analyzed)

Client Sample ID: C-015A

Lab Sample ID: 041206868-0043

Sample Description: N end by ice rink/Floor tile adhesive assoc. w/ 014A

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	3/23/2012	Black	0.0%	100%	<0.30% Chrysotile	

Client Sample ID: C-015B

Lab Sample ID: 041206868-0044

Sample Description: N end by ice rink/Floor tile adhesive assoc. w/ 014B

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	3/23/2012	Gray	0.0%	99.0%	1.0% Chrysotile	

Client Sample ID: C-015C

Lab Sample ID: 041206868-0045

Sample Description: N end by ice rink/Floor tile adhesive assoc. w/ 014C

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	3/23/2012	Black	0.0%	100%	<0.36% Chrysotile	

Client Sample ID: C-016A

Lab Sample ID: 041206868-0046

Sample Description: LEO office/2x4 ceiling tile

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	90%	10%	None Detected	



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## Summary Test Report for Asbestos Analysis via EPA 600/R-93/116 and/or EPA 600/M4-82-020

**Client Sample ID:** C-016B

**Lab Sample ID:** 041206868-0047

**Sample Description:** LEO office/2x4 ceiling tile

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	90%	10%	None Detected	

**Client Sample ID:** C-016C

**Lab Sample ID:** 041206868-0048

**Sample Description:** LEO office/2x4 ceiling tile

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	90%	10%	None Detected	

**Client Sample ID:** C-017A-Floor Tile

**Lab Sample ID:** 041206868-0049

**Sample Description:** Sound Booth/12x12 beige floor tile

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	3/23/2012	Tan	0.0%	98.3%	1.7% Chrysotile	

**Client Sample ID:** C-017A-Mastic

**Lab Sample ID:** 041206868-0049A

**Sample Description:** Sound Booth/12x12 beige floor tile

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	3/23/2012	Brown	0.0%	100%	None Detected	

**Client Sample ID:** C-017B-Floor Tile

**Lab Sample ID:** 041206868-0050

**Sample Description:** Sound Booth/12x12 beige floor tile

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	3/23/2012					Positive Stop (Not Analyzed)

**Client Sample ID:** C-017B-Mastic

**Lab Sample ID:** 041206868-0050A

**Sample Description:** Sound Booth/12x12 beige floor tile

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	3/23/2012	Brown	0.0%	100%	None Detected	

**Client Sample ID:** C-017C

**Lab Sample ID:** 041206868-0051

**Sample Description:** Sound Booth/12x12 beige floor tile

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	3/23/2012					Positive Stop (Not Analyzed)

**Client Sample ID:** C-018A

**Lab Sample ID:** 041206868-0052

**Sample Description:** SE HVAC Room/Small diameter fittings

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	40%	60%	None Detected	



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**Client Sample ID:** C-018B

**Lab Sample ID:** 041206868-0053

**Sample Description:** SE HVAC Room/Small diameter fittings

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	30%	70%	None Detected	

**Client Sample ID:** C-018C

**Lab Sample ID:** 041206868-0054

**Sample Description:** SE HVAC Room/Small diameter fittings

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	25%	75%	None Detected	

**Client Sample ID:** C-019A

**Lab Sample ID:** 041206868-0055

**Sample Description:** SE HVAC Room/Large diameter fittings

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	30%	70%	None Detected	

**Client Sample ID:** C-019B

**Lab Sample ID:** 041206868-0056

**Sample Description:** SE HVAC Room/Large diameter fittings

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray/Yellow	50%	50%	None Detected	

**Client Sample ID:** C-019C

**Lab Sample ID:** 041206868-0057

**Sample Description:** SE HVAC Room/Large diameter fittings

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	25%	75%	None Detected	

**Client Sample ID:** C-020A

**Lab Sample ID:** 041206868-0058

**Sample Description:** Front Director Office/12x12 white pink floor tile

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	3/23/2012	Gray	0.0%	100%	None Detected	

**Client Sample ID:** C-020B

**Lab Sample ID:** 041206868-0059

**Sample Description:** Front Director Office/12x12 white pink floor tile

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	3/23/2012	Gray	0.0%	100%	None Detected	

**Client Sample ID:** C-020C

**Lab Sample ID:** 041206868-0060

**Sample Description:** Front Director Office/12x12 white pink floor tile

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	3/23/2012	Gray	0.0%	100%	None Detected	



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## Summary Test Report for Asbestos Analysis via EPA 600/R-93/116 and/or EPA 600/M4-82-020

**Client Sample ID:** C-021A

**Lab Sample ID:** 041206868-0061

**Sample Description:** Front Director Office/Adhesive assoc w/ 020A

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	3/23/2012	Yellow	0.0%	100%	None Detected	

**Client Sample ID:** C-021B

**Lab Sample ID:** 041206868-0062

**Sample Description:** Front Director Office/Adhesive assoc w/ 020B

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	3/23/2012	Yellow	0.0%	100%	None Detected	

**Client Sample ID:** C-021C

**Lab Sample ID:** 041206868-0063

**Sample Description:** Front Director Office/Adhesive assoc w/ 020C

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	3/23/2012	Yellow	0.0%	100%	None Detected	

**Client Sample ID:** C-022A

**Lab Sample ID:** 041206868-0064

**Sample Description:** Front Director Office/Ceiling tile (TB)

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Tan	95%	5%	None Detected	

**Client Sample ID:** C-022B

**Lab Sample ID:** 041206868-0065

**Sample Description:** Front Director Office/Ceiling tile (TB)

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Tan	90%	10%	None Detected	

**Client Sample ID:** C-022C

**Lab Sample ID:** 041206868-0066

**Sample Description:** Front Director Office/Ceiling tile (TB)

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Tan	90%	10%	None Detected	

**Client Sample ID:** C-023A

**Lab Sample ID:** 041206868-0067

**Sample Description:** Director-Bathroom/Pattern floor tile

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	3/23/2012	Tan /Black	0.0%	100%	None Detected	

**Client Sample ID:** C-023B

**Lab Sample ID:** 041206868-0068

**Sample Description:** Director-Bathroom/Pattern floor tile

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	3/23/2012	Tan /Black	0.0%	100%	None Detected	



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## Summary Test Report for Asbestos Analysis via EPA 600/R-93/116 and/or EPA 600/M4-82-020

**Client Sample ID:** C-023C

**Lab Sample ID:** 041206868-0069

**Sample Description:** Director-Bathroom/Pattern floor tile

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	3/23/2012	Tan /Black	0.0%	100%	None Detected	

**Client Sample ID:** C-025A

**Lab Sample ID:** 041206868-0070

**Sample Description:** Director Office/Sheetrock walls

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	White	10%	90%	None Detected	

**Client Sample ID:** C-025B-Drywall

**Lab Sample ID:** 041206868-0071

**Sample Description:** Director Office/Sheetrock walls

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	White	10%	90%	None Detected	

**Client Sample ID:** C-025B-Joint Compound

**Lab Sample ID:** 041206868-0071A

**Sample Description:** Director Office/Sheetrock walls

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	White	0%	100%	None Detected	

**Client Sample ID:** C-025C-Drywall

**Lab Sample ID:** 041206868-0072

**Sample Description:** Director Office/Sheetrock walls

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	15%	85%	None Detected	

**Client Sample ID:** C-025C-Joint Compound

**Lab Sample ID:** 041206868-0072A

**Sample Description:** Director Office/Sheetrock walls

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	White	0%	100%	None Detected	

**Client Sample ID:** C-026A

**Lab Sample ID:** 041206868-0073

**Sample Description:** Reception/12x12 beige floor tile

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	3/23/2012	Tan	0.0%	100%	None Detected	

**Client Sample ID:** C-026B

**Lab Sample ID:** 041206868-0074

**Sample Description:** Reception/12x12 beige floor tile

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	3/23/2012	Tan	0.0%	100%	None Detected	





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**Client Sample ID:** C-026C-Floor Tile **Lab Sample ID:** 041206868-0075

**Sample Description:** Reception/12x12 beige floor tile

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	3/23/2012	Tan	0.0%	100%	None Detected	

**Client Sample ID:** C-026C-Mastic **Lab Sample ID:** 041206868-0075A

**Sample Description:** Reception/12x12 beige floor tile

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	3/23/2012				Insufficient Material	

**Client Sample ID:** C-027A **Lab Sample ID:** 041206868-0076

**Sample Description:** Reception/2X4 ceiling tile -TA

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	90%	10%	None Detected	

**Client Sample ID:** C-027B **Lab Sample ID:** 041206868-0077

**Sample Description:** Reception/2X4 ceiling tile -TA

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	90%	10%	None Detected	

**Client Sample ID:** C-027C **Lab Sample ID:** 041206868-0078

**Sample Description:** Reception/2X4 ceiling tile -TA

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	80%	20%	None Detected	

**Client Sample ID:** C-028A **Lab Sample ID:** 041206868-0079

**Sample Description:** Office Hallway "TC"/2X2 pinhole ceiling

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	90%	10%	None Detected	

**Client Sample ID:** C-028B **Lab Sample ID:** 041206868-0080

**Sample Description:** Office Hallway "TC"/2X2 pinhole ceiling

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	90%	10%	None Detected	

**Client Sample ID:** C-028C **Lab Sample ID:** 041206868-0081

**Sample Description:** Office Hallway "TC"/2X2 pinhole ceiling

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	85%	15%	None Detected	



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## Summary Test Report for Asbestos Analysis via EPA 600/R-93/116 and/or EPA 600/M4-82-020

**Client Sample ID:** C-029A

**Lab Sample ID:** 041206868-0082

**Sample Description:** Kitchen Exit/12x12 brown speck FT

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	3/23/2012	Tan	0.0%	98.6%	1.4% Chrysotile	

**Client Sample ID:** C-029B

**Lab Sample ID:** 041206868-0083

**Sample Description:** Kitchen Exit/12x12 brown speck FT

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	3/23/2012				Positive Stop (Not Analyzed)	

**Client Sample ID:** C-029C

**Lab Sample ID:** 041206868-0084

**Sample Description:** Kitchen Exit/12x12 brown speck FT

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	3/23/2012				Positive Stop (Not Analyzed)	

**Client Sample ID:** C-030A

**Lab Sample ID:** 041206868-0085

**Sample Description:** Kitchen Exit/Adhesive assoc. w/ 029A

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	3/23/2012	Black	0.0%	95.6%	4.4% Chrysotile	

**Client Sample ID:** C-030B

**Lab Sample ID:** 041206868-0086

**Sample Description:** Kitchen Exit/Adhesive assoc. w/ 029B

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	3/23/2012				Positive Stop (Not Analyzed)	

**Client Sample ID:** C-030C

**Lab Sample ID:** 041206868-0087

**Sample Description:** Kitchen Exit/Adhesive assoc. w/ 029C

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	3/23/2012				Positive Stop (Not Analyzed)	

**Client Sample ID:** C-031A

**Lab Sample ID:** 041206868-0088

**Sample Description:** Lounges/2x4 ceiling tile TD

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	90%	10%	None Detected	

**Client Sample ID:** C-031B

**Lab Sample ID:** 041206868-0089

**Sample Description:** Lounges/2x4 ceiling tile TD

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	90%	10%	None Detected	



# EMSL Analytical, Inc.

200 Route 130 North Cinnaminson, NJ 08077  
Phone/Fax: (800) 220-3675 / (856) 786-5974  
<http://www.emsl.com> / [cinnaslab@EMSL.com](mailto:cinnaslab@EMSL.com)

EMSL Order ID: 041206868  
Customer ID: SUMM78  
Customer PO:  
Project ID:

## Summary Test Report for Asbestos Analysis via EPA 600/R-93/116 and/or EPA 600/M4-82-020

**Client Sample ID:** C-031C

**Lab Sample ID:** 041206868-0090

**Sample Description:** Lounges/2x4 ceiling tile TD

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/23/2012	Gray	90%	10%	None Detected	

**Client Sample ID:** C-032A

**Lab Sample ID:** 041206868-0091

**Sample Description:** Exterior/Window caulk

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	3/23/2012	Black	0.0%	100%	None Detected	

**Client Sample ID:** C-032B

**Lab Sample ID:** 041206868-0092

**Sample Description:** Exterior/Window caulk

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	3/23/2012	Black	0.0%	100%	None Detected	Sample is not homogeneous. Recommend TEM

**Client Sample ID:** C-032C

**Lab Sample ID:** 041206868-0093

**Sample Description:** Exterior/Window caulk

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	3/23/2012	Black	0.0%	100%	None Detected	

**Client Sample ID:** C-033A

**Lab Sample ID:** 041206868-0094

**Sample Description:** Interior/Window caulk

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	3/23/2012	Black	0.0%	100%	None Detected	

**Client Sample ID:** C-033B

**Lab Sample ID:** 041206868-0095

**Sample Description:** Interior/Window caulk

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	3/23/2012	Black	0.0%	100%	None Detected	

**Client Sample ID:** C-033C

**Lab Sample ID:** 041206868-0096

**Sample Description:** Interior/Window caulk

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	3/23/2012	Black	0.0%	100%	None Detected	



# EMSL Analytical, Inc.

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<http://www.emsl.com> / [cinnasblab@EMSL.com](mailto:cinnasblab@EMSL.com)

EMSL Order ID: 041206868  
Customer ID: SUMM78  
Customer PO:  
Project ID:

## Summary Test Report for Asbestos Analysis via EPA 600/R-93/116 and/or EPA 600/M4-82-020

PLM: ME Cert #BA-0137 (JY) #BA-0134

PLM EPA NOB: ME Cert #BA-0134

### Analyst(s)

Frank Dicrescenzo	PLM	(41)
	PLM Grav. Reduction	(7)
Johnny Yu	PLM	(25)
	PLM Grav. Reduction	(20)

Stephen Siegel, CIH, Laboratory Manager  
or other Approved Signatory

Any questions please contact Steve Siegel.

EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. This test report must not be used to claim product endorsement by NVLAP or any agency of the U.S. Government. EMSL bears no responsibility for sample collection activities or analytical method limitations. The laboratory is not responsible for the accuracy of results when requested to physically separate and analyze layered samples. PLM alone is not consistently reliable in detecting asbestos in floor coverings and similar NOBs

Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ NVLAP Lab Code 101048-0, AIHA-LAP, LLC-IHLAP Lab 100194, NYS ELAP 10872, NJ DEP 03036

Initial report from: 03/23/2012 11:14:35



<b>EMSL – MA</b> 7 Constitution Way, Ste 107 Woburn, MA 01801 (781) 933-8411 (781) 933-8412 Fax	<b>EMSL – CT</b> 4 Fairfield Blvd. Wallingford, CT 06492 (203) 284-5948 (203) 284-5978 Fax	<b>EMSL – NY</b> 307 West 38 <sup>th</sup> Street New York, NY 10018 (866) 448-3675 (212) 290-0058 Fax	<b>EMSL – NJ</b> 107 Haddon Avenue Westmont, NJ 08108 (800) 220-3675 (856) 858-4960 Fax
---	--	--	---

**Your Name:** Dennis Kingman **Project Manager:** DBK

**Company:** Summit Environmental Consultants, Inc.

**Street:** 8 HARLOW STREET, SUITE 4A

**City/State/Zip:** Bangor, Maine 04401

**Phone:** 207-262-9040 **Fax:** 207-262-9080 **Email:** dkingman@summitenv.com

**Project Name:** Cumberland County Civic Center Project #: 12

**Project Location:** PORTLAND **Project State (US):** ME

TURNAROUND TIME

3 Hours
  6 Hours
  12 Hours
  24 Hours
  48 Hours
  72 Hours
  4 Days
  5 Days
  6-10 Days

SAMPLE MATRIX

Air
  Bulk
  Soil
  Wipe
  Micro-Vac
  Drinking Water
  Wastewater
  Chips
  Other

ASBESTOS ANALYSIS

**PCM - Air**

NIOSH 7400 (A) Issue 2: August 1994

OSHA w/TWA

**TEM AIR**

AHERA 40 CFR, Part 763 Subpart E

NIOSH 7402 Issue 2

EPA Level II

**PLM - Bulk**

EPA 600/R-93/116 *\* see comments*

NY Stratified Point Count

California Air Resource Board (CARB) 435

NIOSH 9002

PLM NOB (Gravimetric) NYS 198.1

EPA Point Count (400 Points)

EPA Point Count (1,000 Points)

Standard Addition Point Count

**SOILS**

EPA Protocol Qualitative

EPA Protocol Quantitative

EMSL MSD 9000 Method fibers/gram

Superfund EPA 540-R097-028 (dust generation)

**TEM BULK**

Drop Mount (Qualitative)

Chatfield SOP-1988-02

TEM NOB (Gravimetric) NY 198.4

**TEM MICROVAC**

ASTM D 5755-95 (Quantitative)

**TEM WIPE**

ASTM D-6480-99

Qualitative

**TEM WATER**

EPA 100.1

EPA 100.2

NYS 198.2

Other:

LEAD ANALYSIS

**Flame Atomic Absorption**

Wipe, SW846-7420  ASTM  non ASTM

Soil, SW846-7420

Air, NIOSH 7082

Chips, SW846-7420 or AOAC 5.009 (974.02)

Wastewater, SW 846-7420

TCLP LEAD SW846-1311/7420

**Graphite Furnace Atomic Absorption**

Air, NIOSH 7105

Wastewater, SW846-7421

Soil, SW846-7421

Drinking Water, EPA 239.2

**ICP - Inductively Coupled Plasma**

Wipe, SW846-6010  ASTM  non ASTM

Soil, SW846-6010

Air, NIOSH 7300

MICROBIAL ANALYSIS

**Air Samples**

Mold & Fungi by Air O Cell

Mold & Fungi by Agar Plate count & id

Bacterial Count and Gram Stain

Bacterial Count and Identification

**Water Samples**

Total Coliforms, Fecal Coliforms

Escherichia Coli, Fecal Streptococcus

Legionella

Salmonella

Giardia and Cryptosporidium

**Wipe and Bulk Samples**

Mold & Fungi - Direct Examination

Mold & Fungi - (Culture follow up to direct examination if necessary)

Mold & Fungi - Culture (Count & ID)

Mold & Fungi - Culture (Count only)

Bacterial Count & Gram Stain

Bacterial Count & Identification (3 most prominent types)

Other:

MATERIALS ANALYSIS

Full Particle Identification

Optical Particle Identification

Dust Mites and Insect Fragments

Particle Size & Distribution

Product Comparison

Paint Characterization

Failure Analysis

Corrosion Analysis

Glove Box Containment Study

Petrographic Examination of Concrete

Portland Cement in Workplace Atmospheres (OSHA ID-143)

Man Made Vitrous Fibers - MMVF's

Synthetic Fiber Identification

Other:

Additional Information/Comments/Instructions: *Positive Step - NOB per Maine DEP Regs*  
*NO SAMPLE # 24 TAKEN*

**Client Sample # (S)** C-001A **TOTAL SAMPLE #**

**Relinquished:** *[Signature]* **Date:** 3/16/2012 **Time:** 0830

**Received:** *[Signature]* **Date:** *[Signature]* **Time:**

**Relinquished:** **Date:** 3-19-2012 **Time:** 8:45 AM

**Received:** **Date:** **Time:**

041206868



www.emsl.com

EMSL - MA  
7 Constitution Way, Ste 107  
Woburn, MA 01801  
(781) 933-8411  
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(203) 284-5948  
(203) 284-5978 Fax

EMSL - NY  
307 West 38<sup>th</sup> Street  
New York, NY 10018  
(866) 448-3675  
(212) 290-0058 Fax

EMSL - NJ  
107 Haddon Avenue  
Westmont, NJ 08108  
(800) 220-3675  
(856) 858-4960 Fax

SAMPLE NUMBER	SAMPLE DESCRIPTION/LOCATION	VOLUME Air (L)	Area (Inches sq.)
C-001A	Refractory cement - Border A		
B	" "		
C	" "		
002A	Rope Gasket - Border A		
B	" "		
C	" "		
003A	Small diameter Filtrags - <sup>by</sup> Water Border		
B	" " by X-TANK #1		
C	" " by X-TANK #1		
004A	LARGE <sup>WATER MAIN</sup> Diameter Water hoses Filtrags		
B	" "		
C	" "		
005A	Brine Pump filter - chiller B		
B	" "		
C	" "		
006A	LARGE Diameter Filtrags		
B			
C			
007A	X-TANK #1 End Cap - top		
B	" " - top		
C	" " - Ballon		
008A	Medium Diameter Pipe Filtrags		
B	" "		
C	" "		

SAMPLES ACCEPTED FOR ANALYSIS BY ASI ANALYTICAL INC.

F  
N  
F  
F  
F  
F  
F  
F  
F

Relinquished:

*[Signature]*

Date:

3/16

Time:

0820

Received:

Date:

Time:

Relinquished:

Date:

Time:

Received:

Date:

Time:



www.emsl.com

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7 Constitution Way, Ste 107  
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107 Haddon Avenue  
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(856) 858-4960 Fax

SAMPLE NUMBER	SAMPLE DESCRIPTION/LOCATION	VOLUME Air (L)	Area (Inches sq.)
C-009A	Generator exhaust insulation		
B	"		
C	"		
C-010A	Roof Drain flaps. Maintenance Area		
B	"		
C	"		
C-011A	Acoustic wall cover Room		
B	"		
C	"		
012A	T1 curly tile (small pattern) Room		
B	"		
C	"		
013A	T2 curly tile (large pattern) Room		
B	"		
C	"		
014A	12x12 Gray floor tile - Nemo by ice rink		
B	"		
C	"		
015A	floor tile same as 014A		
B	"	014B	
C	"	014C	
016A	2x4 Curly tile - LEO office		
B	"		
C	"		

EMSL ANALYTICAL

017 MAR 19 A 10:16

Relinquished:

*[Signature]*

Received:

Relinquished:

Received:

Date:

3/16

Date:

Date:

Date:

Time:

0830

Time:

Time:

Time:

041206888



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Woburn, MA 01801  
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(781) 933-8412 Fax

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4 Fairfield Blvd.  
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EMSL - NY  
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EMSL - NJ  
107 Haddon Avenue  
Westmont, NJ 08108  
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SAMPLE NUMBER	SAMPLE DESCRIPTION/LOCATION	VOLUME Air (L)	Area (Inches sq.)
C-017A	12x12 Beige floor tile - Sewer Booth		
B	"		
C	"		
018A	Small diameter Filings - SE HVAC Room		
B	"		
C	"		
019A	Large diameter Filings - SE HVAC Room		
B	"		
C	"		
020A	12x12 white pink floor tile - Front Director office		
B	"		
C	"		
021A	Adhesive Assoc w/ 020A		
B	" " 020B		
C	" " 020C		
022A	Carly tile [T.B.] - Front Director office		
B	"		
C	"		
023A	PATTERN Floor tile - Director - Bathroom 305F		
B			
C			
024A	2x4 Carly tile - Reception - TA		
B	"		
C	"		

NOT SUBMITTED

Relinquished:  
Received:  
Relinquished:  
Received:

*Ben Joffe*  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Date: 3/16 Time: 0830  
Date: \_\_\_\_\_ Time: \_\_\_\_\_  
Date: \_\_\_\_\_ Time: \_\_\_\_\_  
Date: \_\_\_\_\_ Time: \_\_\_\_\_

SAMPLE ACCEPTED FOR ANALYSIS BY MSU ANALYTICAL INC

MAR 19 10:16 AM '16  
CINNAMISON, NJ





EMSL - MA  
7 Constitution Way, Ste 107  
Woburn, MA 01801  
(781) 933-8411  
(781) 933-8412 Fax

EMSL - CT  
4 Fairfield Blvd.  
Wallingford, CT 06492  
(203) 284-5948  
(203) 284-5978 Fax

EMSL - NY  
307 West 38<sup>th</sup> Street  
New York, NY 10018  
(866) 448-3675  
(212) 290-0058 Fax

EMSL - NJ  
107 Haddon Avenue  
Westmont, NJ 08108  
(800) 220-3675  
(856) 858-4960 Fax

F  
N  
F  
F  
N  
N  
F  
N

SAMPLE NUMBER	SAMPLE DESCRIPTION/LOCATION	VOLUME Air (L)	Area (Inches sq.)
C-025A	Sheet rock walls - <del>Dressed</del> office		
B	"		
C	"		
026 A	12x12 <del>white</del> <sup>Brown</sup> BRIDGE Porcelain - Reception		
B	"		
C	"		
027 A	2x4 ceiling tile - TA - Reception		
B	"		
C	"		
028 A	2x2 punch hole ceiling - office hallway		
B	"		
C	"		
029 A	12x12 Brown speck Ft - Kitchen grout		
B	"		
C	"		
030 A	Asbestos w/ 029 A		
B	" / 029 B		
C	" / 029 C		
031 A	2x4 ceiling tile TD Breakdown		
B	"		
C	"		
032 A	Window Caulk - exterior		
B	"		
C	"		

02 MAR 2016 9:46:10  
CINCINNATI, N.J.

Relinquished:  
Received:  
Relinquished:  
Received:

*[Signature]*

Date: 3/16 Time: 0830  
Date: Time:  
Date: Time:  
Date: Time:

SAMPLES ACCEPTED FOR ANALYSIS BY EMSL ANALYTICAL



*Appendix B*

**ASBESTOS INSPECTOR CERTIFICATIONS**

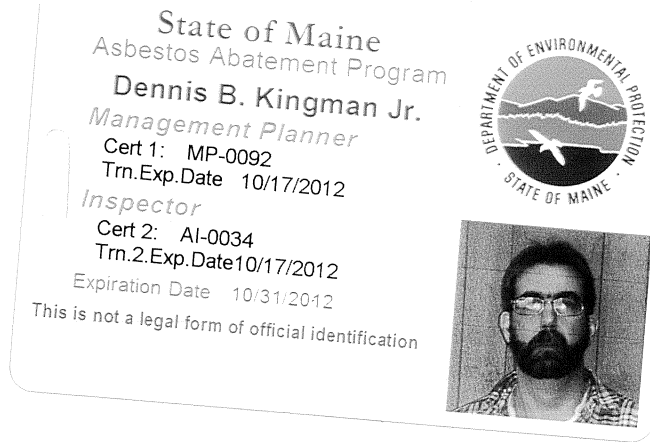


STATE OF MAINE  
DEPARTMENT OF ENVIRONMENTAL PROTECTION

PAUL R. LEPAGE  
GOVERNOR

November 28, 2011

**Summit Environmental Consultants, Inc.**  
640 Main Street  
Lewiston, Maine 04240



CIA W. AHO  
COMMISSIONER

Dear Licensee:

Asbestos application(s) for individual certification of the **two** employee(s) listed below have been received and **approved**. Individual certification numbers are listed below and wallet card(s) are enclosed. Card(s) are property of the individual to whom each is issued. Your responsibility as a licensee is to ensure delivery of the cards to persons in your employment. This letter should be retained for your company files as record of certification.


**Remember**, in Maine all **certified employees** working on an asbestos abatement project, whether conducting removal/repair, air monitoring, design, inspection, or analysis functions, **must work for a State of Maine licensed asbestos firm** and carry his/her wallet card(s) on the job site.

As a reminder, prior to renewing your asbestos certification, the State of Maine **requires** an annual refresher course to be taken before submitting a renewal application. A certificate shall expire one year from the last day of the month from the date of issuance, **or on the last day of the month that the training certificate expires**, whichever is sooner. A listing of training providers is attached and it is your responsibility to ensure you have completed a renewal training course prior to your training expiration date.

All our asbestos forms can be found at <http://www.maine.gov/dep/rwm/asbestos/newupdatedformsasb.htm>. Thank you for your cooperation and your completed application(s).

<u>Name</u>	<u>Category</u>	<u>Certification #</u>	<u>Exp. Date</u>
Dennis B. Kingman Jr.	Management Planner	MP-0092	10/31/2012
Dennis B. Kingman Jr.	Inspector	AI-0034	10/31/2012

Sincerely,

  
Sandra J. Moody, Environmental Technician  
Division of Solid Waste Management  
Bureau of Remediation and Waste Management

AUGUSTA  
17 STATE HOUSE STATION  
AUGUSTA, MAINE 04333-0017  
(207) 287-7688 FAX: (207) 287-7826  
RAY BLDG., HOSPITAL ST.

BANGOR  
106 HOGAN ROAD, SUITE 6  
BANGOR, MAINE 04401  
(207) 941-4570 FAX: (207) 941-4584

PORTLAND  
312 CANCO ROAD  
PORTLAND, MAINE 04103  
(207) 822-6300 FAX: (207) 822-6303

PRESQUE ISLE  
1235 CENTRAL DRIVE, SKYWAY PARK  
PRESQUE ISLE, MAINE 04679-2094  
(207) 764-0477 FAX: (207) 760-3143



"Take a step in the right direction" <sup>SM</sup>

491 Norridgewock Road  
Fairfield, Maine 04937  
(207) 453-KEITH (5348)  
Fax (207) 453-5226  
jonathan@trainerman.com  
www.trainerman.com

Date: 10/12/11

Name: Dennis Kingman, Jr.

Course abbreviation: AIR (also circle) Asbestos or Lead Initial or Refresher

Asbestos: Air Monitor, Inspector, Management Planner, Supervisor/OSHA CP, Worker, Designer, O&M/OSHA Class 3, OSHA Class 2 (Material: \_\_\_\_\_), Designated Person, Awareness, Other: \_\_\_\_\_

Lead: Renovator, Sampling Tech, Inspector, Risk Assessor, Supervisor/OSHA CP, Worker, Designer, Essential Maintenance, OSHA Worker, Awareness, Other: \_\_\_\_\_

Dear Dennis:

Congratulations on your successful completion of the above specified course. Your examination score was 96.

Your certificate is enclosed and the original should be kept in a safe place. You will need to give your employer a copy for their records which must be maintained for at least one year beyond your employment.

This training certification expires one year from the date of the exam (except for Lead Renovator is 5 years and Asbestos Designated Person has none), and you will need to take a Refresher course by then. We may (or may not) send you a reminder notice as a courtesy (but you need to keep track of this for yourself). Thank you for participating in the course and we hope to see you at future courses.

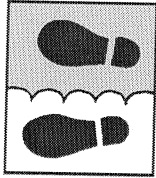
Sincerely,

**Klane's Education Information Training Hub, LLC** <sup>SM</sup>

Jonathan Klane, M.S.Ed., CIH, CHMM, CET

Enclosure

491 Norridgewock Road \* Fairfield, Maine 04937 \* (207) 453-KEITH (5348) \* jonathan@trainerman.com \* www.trainerman.com



SM

*"Take a step in the right direction" SM*

*Certifies that*

**Dennis B. Kingman, Jr., CHMM**

DOB or SSN: 10/09/1961

has attended and successfully completed the required classroom and written examination under TSCA Title II and DEP Chapter 425 on October 17, 2011 for the

**Asbestos Inspector 4-Hour  
Annual Refresher Training Course**

\* Refresher course is not valid without the corresponding initial and any required refresher training courses.

October 17, 2011

Exam Date

October 17, 2012

Expiration Date

KAIR-348

Certificate Number

  
Jonathan Klane, M.S.Ed., CIH, CHMM, CET



"Take a step in the right direction" <sup>SM</sup>

491 Norridgewock Road  
Fairfield, Maine 04937  
(207) 453-KEITH (5348)  
Fax (207) 453-5226  
jonathan@trainerman.com  
www.trainerman.com

Date: 10/17/11

Name: Dennis Kingman

Course abbreviation: AMPR (also circle) Asbestos or Lead Initial or Refresher

Asbestos: Air Monitor, Inspector, Management Planner, Supervisor/OSHA CP, Worker, Designer, O&M/OSHA Class 3, OSHA Class 2 (Material: \_\_\_\_\_), Designated Person, Awareness, Other: \_\_\_\_\_

Lead: Renovator, Sampling Tech, Inspector, Risk Assessor, Supervisor/OSHA CP, Worker, Designer, Essential Maintenance, OSHA Worker, Awareness, Other: \_\_\_\_\_

Dear Dennis:

Congratulations on your successful completion of the above specified course. Your examination score was 100.

Your certificate is enclosed and the original should be kept in a safe place. You will need to give your employer a copy for their records which must be maintained for at least one year beyond your employment.

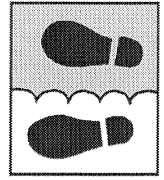
This training certification expires one year from the date of the exam (except for Lead Renovator is 5 years and Asbestos Designated Person has none), and you will need to take a Refresher course by then. We may (or may not) send you a reminder notice as a courtesy (but you need to keep track of this for yourself). Thank you for participating in the course and we hope to see you at future courses.

Sincerely,  
**Klane's Education Information Training Hub, LLC** <sup>SM</sup>

Jonathan Klane, M.S.Ed., CIH, CHMM, CET

Enclosure

491 Norridgewock Road \* Fairfield, Maine 04937 \* (207) 453-KEITH (5348) \* jonathan@trainerman.com \* www.trainerman.com



"Take a step in the right direction" <sup>SM</sup>

*Certifies that*

**Dennis Kingman, Jr., CHMM**  
DOB or SSN: 10/09/1961

has attended and successfully completed the required classroom and written examination under TSCA Title II and DEP Chapter 425 on October 17, 2011 for the

**Asbestos Management Planner 4-Hour Annual Refresher Training Course**

\* Refresher course is not valid without the corresponding initial and any required refresher training courses.

October 17, 2011

Exam Date

October 17, 2012

Expiration Date

*Jonathan Klane*

Jonathan Klane, M.S.Ed., CIH, CHMM, CET

KAMPR-149

Certificate Number





State of Maine  
Asbestos Abatement Program

**Brett M. Deyling**

*Inspector*

Cert No. AI-0605

Trn.Exp.Date 04/22/2012

Expiration Date 04 30 2012



This is not a legal form of official identification



STATE OF MAINE  
DEPARTMENT OF ENVIRONMENTAL PROTECTION

PAUL R. LEPAGE  
GOVERNOR

DARRYL N. BROWN  
COMMISSIONER

May 10, 2011

**Summit Environmental Consultants, Inc.**  
640 Main Street  
Lewiston, Maine 04240

Dear Licensee:

Asbestos application(s) for individual certification of the **one** employee(s) listed below have been received and **approved**. Individual certification numbers are listed below and wallet card(s) are enclosed. Card(s) are property of the individual to whom each is issued. Your responsibility as a licensee is to ensure delivery of the cards to persons in your employment. This letter should be retained for your company files as record of certification.

**Remember**, in Maine all **certified employees** working on an asbestos abatement project, whether conducting removal/repair, air monitoring, design, inspection, or analysis functions, **must work for a State of Maine licensed asbestos firm** and carry his/her wallet card(s) on the job site.

As a reminder, prior to renewing your asbestos certification, the State of Maine **requires** an annual refresher course to be taken before submitting a renewal application. A certificate shall expire one year from the last day of the month from the date of issuance, **or on the last day of the month that the training certificate expires**, whichever is sooner. A listing of training providers is attached and it is your responsibility to ensure you have completed a renewal training course prior to your training expiration date.

All our asbestos forms can be found at <http://www.maine.gov/dep/rwm/asbestos/newupdatedformsasb.htm>. Thank you for your cooperation and your completed application(s).

<u>Name</u>	<u>Category</u>	<u>Certification #</u>	<u>Exp. Date</u>
Brett M. Deyling	Inspector	AI-0605	04/30/2012

Sincerely,

Sandra J. Moody, Environmental Technician  
Division of Solid Waste Management  
Bureau of Remediation and Waste Management

AUGUSTA  
17 STATE HOUSE STATION  
AUGUSTA, MAINE 04333-0017  
(207) 287-7688 FAX: (207) 287-7826  
RAY BLDG., HOSPITAL ST.

BANGOR  
106 HOGAN ROAD, SUITE 6  
BANGOR, MAINE 04401  
(207) 941-4570 FAX: (207) 941-4584

PORTLAND  
312 CANCO ROAD  
PORTLAND, MAINE 04103  
(207) 822-6300 FAX: (207) 822-6303

PRESQUE ISLE  
1235 CENTRAL DRIVE, SKYWAY PARK  
PRESQUE ISLE, MAINE 04679-2094  
(207) 764-0477 FAX: (207) 760-3143

# Environmental Management Inc.

51 River Road Brunswick, Maine 04011  
(207) 729-7549

*This is to certify that:*  
**Brett Deyling**

*Has completed the requisite 4-hour refresher training, and has passed an examination for reaccreditation as an:*

**Asbestos Inspector**

pursuant to Title II of the Toxic Substance Control Act, 15 U.S.C. 2646  
and Maine State Regulations 06-096 CMR 425.5 (E)

**January 27, 2012**

1/27/2012

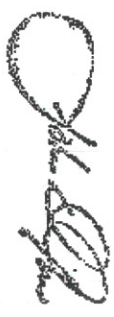
84

*Examination Date*

*Test Score*

1/26/2013

*Expiration Date*



*President / Director of Training*

AI-R-TP0018-12-0293  
*Certificate Number*

*Appendix C*

**ASBESTOS ANALYTICAL LABORATORY CERTIFICATIONS**



State of Maine

Department of Environmental Protection

LICENSE

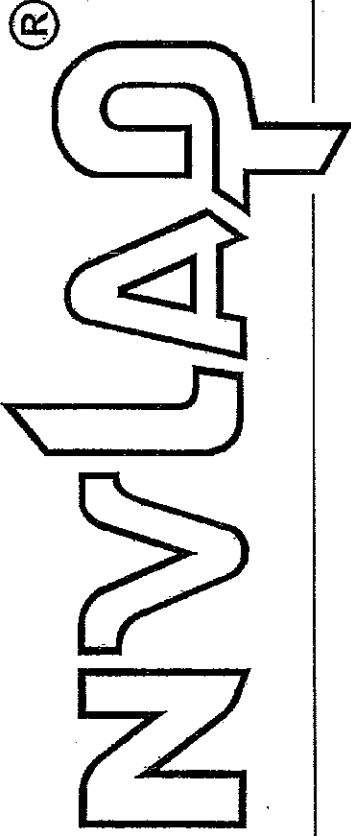
EMSL Analytical, Inc.

Asbestos Analytical Laboratory  
(Bulk)

License Number: LB-0039

Expiration Date: 10/31/2012

United States Department of Commerce  
National Institute of Standards and Technology



---

**Certificate of Accreditation to ISO/IEC 17025:2005**

---

NVLAP LAB CODE: 101048-0

**EMSL Analytical, Inc.**  
Cinnaminson, NJ

*is accredited by the National Voluntary Laboratory Accreditation Program for specific services,  
listed on the Scope of Accreditation, for.*

**AIRBORNE ASBESTOS FIBER ANALYSIS**

*This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005.  
This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality  
management system (refer to joint ISO-ILAC-IAF Communiqué dated January 2009).*

2011-07-01 through 2012-06-30

Effective dates

---



*Jolly S. Bruce*

For the National Institute of Standards and Technology



**National Voluntary  
Laboratory Accreditation Program**



**SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005**

**EMSL Analytical, Inc.**  
200 Route 130 North  
Cinnaminson, NJ 08077  
Mr. Stephen Siegel, CIH  
Phone: 800-220-3675 Fax: 856-786-5973  
E-Mail: [ssiegel@emsl.com](mailto:ssiegel@emsl.com)  
URL: <http://www.emsl.com>

**AIRBORNE ASBESTOS FIBER ANALYSIS (TEM)**

**NVLAP LAB CODE 101048-0**

***NVLAP Code    Designation / Description***

18/A02            U.S. EPA's "Interim Transmission Electron Microscopy Analytical Methods-Mandatory and Nonmandatory-and Mandatory Section to Determine Completion of Response Actions" as found in 40 CFR, Part 763, Subpart E, Appendix A.

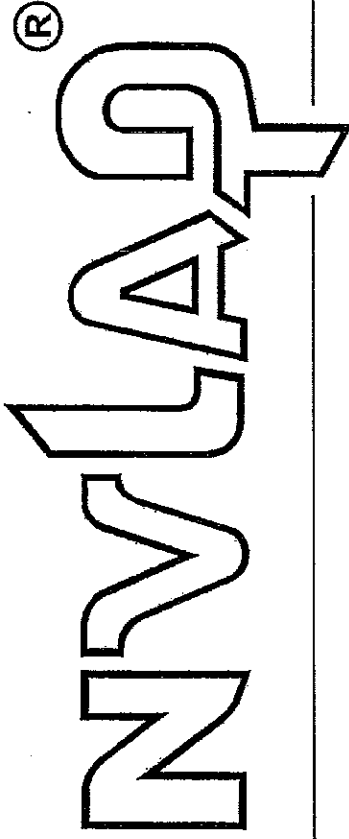
2011-07-01 through 2012-06-30

*Effective dates*

*Sally S. Bruce*

*For the National Institute of Standards and Technology*

United States Department of Commerce  
National Institute of Standards and Technology



---

## Certificate of Accreditation to ISO/IEC 17025:2005

---

NVLAP LAB CODE: 101048-0

**EMSL Analytical, Inc.**  
Cinnaminson, NJ

is accredited by the National Voluntary Laboratory Accreditation Program for specific services,  
listed on the Scope of Accreditation, for:

### **BULK ASBESTOS FIBER ANALYSIS**

*This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005.  
This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality  
management system (refer to joint ISO-ILAC-IAF Communiqué dated January 2009).*

2011-07-01 through 2012-06-30

Effective dates



*Jolly A. Bruce*  
For the National Institute of Standards and Technology





**National Voluntary  
Laboratory Accreditation Program**



**SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005**

**EMSL Analytical, Inc.**  
 200 Route 130 North  
 Cinnaminson, NJ 08077  
 Mr. Stephen Siegel, CIH  
 Phone: 800-220-3675 Fax: 856-786-5973  
 E-Mail: [ssiegel@emsl.com](mailto:ssiegel@emsl.com)  
 URL: <http://www.emsl.com>

**BULK ASBESTOS FIBER ANALYSIS (PLM)**

**NVLAP LAB CODE 101048-0**

***NVLAP Code    Designation / Description***

18/A01            EPA-600/M4-82-020: Interim Method for the Determination of Asbestos in Bulk Insulation Samples

2011-07-01 through 2012-06-30

*Effective dates*

*Sally S. Bruce*

*For the National Institute of Standards and Technology*

**AIHA**

Laboratory Accreditation  
Programs, LLC

**AIHA Laboratory Accreditation Programs, LLC**

*acknowledges that*

**EMSL Analytical Inc.**

200 Route 130 North, Cinnaminson, NJ 08077

Laboratory ID: 100194

has fulfilled the requirements of the AIHA Laboratory Accreditation Programs (AIHA-LAP), LLC thereby conforming to the ISO/IEC 17025:2005 international standard, *General Requirements for the Competence of Testing and Calibration Laboratories*. The above named laboratory, along with all premises from which key activities are performed, as listed above, have been accredited by AIHA-LAP, LLC in the following:

**LABORATORY ACCREDITATION PROGRAMS**

- ✓ INDUSTRIAL HYGIENE      Accreditation Expires: July 01, 2012
- ✓ ENVIRONMENTAL LEAD      Accreditation Expires: July 01, 2012
- ✓ ENVIRONMENTAL MICROBIOLOGY      Accreditation Expires: July 01, 2012
- FOOD      Accreditation Expires:

Specific Field(s) of Testing (FoT)/Method(s) within each Accreditation Program for which the above named laboratory maintains accreditation is outlined on the attached Scope of Accreditation. Continued accreditation is contingent upon successful on-going compliance with AIHA-LAP, LLC requirements. This certificate is not valid without the attached **Scope of Accreditation**. Please review the AIHA-LAP, LLC website ([www.aihaaccreditedlabs.org](http://www.aihaaccreditedlabs.org)) for the most current scope of accreditation.



*Dave Sandusky, CIH*  
Chairperson, Analytical Accreditation Board

Date Issued: 07/01/2010



## AIHA Laboratory Accreditation Programs, LLC SCOPE OF ACCREDITATION

EMSL Analytical, Inc.  
107 Haddon Avenue, Westmont, NJ 08108

Laboratory ID: 100194  
Issue Date: 07/01/2010

The laboratory is approved for those specific field(s) of testing/methods listed in the table below. Clients are urged to verify the laboratory's current accreditation status for the particular field(s) of testing/Methods, since these can change due to proficiency status, suspension and/or revocation. A complete listing of currently accredited Industrial Hygiene laboratories is available on the AIHA-LAP, LLC website at: <http://www.aihaaccreditedlabs.org>

### Industrial Hygiene Laboratory Accreditation Program (IHLAP)

Initial Accreditation Date: 02/01/1989

IHLAP Category	Field of Testing (FoT)	Method	Method Description <i>(for internal methods only)</i>
Core Program Testing	Gas Chromatography	NIOSH 1003	
		NIOSH 1005	
		NIOSH 1400	
		NIOSH 1500	
		NIOSH 1550	
		NIOSH 1603	
		NIOSH 2000	
		NIOSH 2551	
		NIOSH 5502	
		NIOSH 5503	
		NIOSH 5510	
		OSHA 1010	
		GC (Diffusive Samplers)	NIOSH 1003
	NIOSH 1005		
	NIOSH 1501		
	GC/MS	EPA TO-15	
	HPLC	NIOSH 2016	
		NIOSH 5506	
		OSHA 47	
		OSHA 58	
	AA	NIOSH 6009	
		NIOSH 7105	
		OSHA ID-140	
		OSHA ID-145	
	ICP	NIOSH 7300	
	XRD	NIOSH 7500	
	Ion Chromatography	NIOSH 6004	
		NIOSH 6011	
NIOSH 7903			



IHLAP Category	Field of Testing (FoT)	Method	Method Description <i>(for internal methods only)</i>
Core Program Testing	Ion Chromatography	OSHA ID-214	
		OSHA ID-215	
	Gravimetric	NIOSH 0500	
		NIOSH 0600	
	UV/VIS (Colorimetric)	NIOSH 6010	
	Thermal Optical Analyzer	NIOSH 5040	
	Polarized Light Microscopy (PLM)	EPA 600/R-93/116	
	Phase Contrast Microscopy (PCM)	NIOSH 7400	
	Transmission Electron Microscopy (TEM)	EPA AHERA - 40 CFR Part 763	
		NIOSH 7402	

The laboratory participates in the following AIHA-LAP, LLC-approved proficiency testing programs:

<input checked="" type="checkbox"/> Metals*	<input checked="" type="checkbox"/> Organic Solvents*
<input checked="" type="checkbox"/> Silica*	<input checked="" type="checkbox"/> Diffusive Sampler (3M)*
<input checked="" type="checkbox"/> Asbestos*	<input type="checkbox"/> Diffusive Sampler (SKC)*
<input type="checkbox"/> Bulk Asbestos*	<input type="checkbox"/> Diffusive Sampler (AT)
<input checked="" type="checkbox"/> Beryllium	<input checked="" type="checkbox"/> WASP <sup>1</sup> (Formaldehyde)
<input type="checkbox"/> WASP <sup>1</sup> (Thermal Desorption Tubes)	
<input type="checkbox"/> Pharmaceutical Round Robin	
<input type="checkbox"/> Compressed/Breathing Air Round Robin	
<input type="checkbox"/> NVLAP (determined at the time of site assessment)	

<sup>1</sup> Workplace Analytical Scheme for Proficiency

*Appendix D*

**LEAD-BASED PAINT  
DETERMINATION REPORT**

# AES

Atlantic Environmental Services

PO Box 615

West Kennebunk, Maine 04094

Phone: (207) 604-2581

Email: deb.atlanticenvironmental@gmail.com

Lead-Based Paint XRF TESTING

## *Cumberland County Civic Center Portland, Maine*



Prepared For:

Mr. Dennis Kingman  
Summit Environmental Consultants, Inc.  
8 Harlow Street, Suite 4A  
Bangor, Maine 04401

April 4, 2012

Dennis Kingman  
Summit Environmental Consultants, Inc.  
8 Harlow Street, Suite 4A  
Bangor, Maine 04401

RE: Lead-Based Paint XRF Testing  
Cumberland County Civic Center, Portland, Maine  
AES Job #: 12-133

Dear Mr. Kingman:

*Atlantic Environmental Services* has completed the environmental lead-based paint testing at the Cumberland County Civic Center located in Portland, Maine.

**Purpose**

The purpose of this testing was to determine the presence of lead-based paint on components throughout the facility. The lead-based paint testing was performed utilizing a portable X-ray Fluorescence Analyzer (XRF) that non-destructively tests for the presence of lead on building components. Once lead-containing components were identified, a visual assessment as to the current condition of the paint was also performed.

**Lead Testing Procedures**

On March 15, 2012, I, Deborah A. Kasik, *ME DEP* certified Lead Risk Assessor, License #LR-0003, performed the Lead-Based Paint Testing.

The lead-based paint testing was performed in accordance with the established protocols outlined in the *State of Maine Department of Environmental Protection's* Lead Management Regulations, Chapter 424, Section 7, as they apply to this project. The testing provides information on the lead-based paint content and assessment of condition for the surfaces tested. All results have been included on the field forms for your review. *Important note: The room numbers/names correspond to those on the drawing produced by AES.*

The lead-based paint testing was conducted utilizing a portable X-ray Fluorescence Lead Paint Analyzer (RMD LPA-1), which non-destructively tests for the presence of lead-based paint. This equipment is licensed with the Department of Human Services Radiation Control Program and operated in accordance with all applicable regulations and conditions of licensure.

**Explanation of Analysis Methods**

The X-ray Fluorescence Lead Paint Analyzer is a complete lead paint analysis system that quickly, accurately, and non-destructively measures the concentration of lead-based paint on surfaces. X-ray Fluorescence is a common technique utilizing gamma rays to bombard the surface, causing the atoms in the paint to emit characteristic X-rays. These characteristic X-rays are detected and analyzed to provide the apparent lead concentration information.

The RMD LPA-1 has the ability to read concentrations of lead in paint up to 9.9 milligrams per square centimeter; if the content of lead in the paint is greater than 9.9, the reading for that component will be listed as >9.9 mg/cm<sup>2</sup>. The minimum detection limit of this particular equipment is 0.3 milligrams per square centimeter.

Calibration of the equipment is required by regulation and, as indicated on the Field Sheets, the readings were within the limits established by the manufacturer.

### Limitations

In certain circumstances, leaded components may be covered by other building components, such as sheetrock over old painted walls and ceilings. It should be understood that the lead testing process is non-destructive, unless authorization has been received by the Owner to access otherwise inaccessible components. Those areas where access was achievable, the surfaces were tested and the results included on the field forms. In cases where the components were inaccessible, the Owner can either assume that these inaccessible components contain lead-based paint or have them tested when renovation work may disturb them. The XRF readings obtained on the accessible surface are therefore for that surface only (i.e. XRF reading on paneling) and do not apply to the surface beneath it.

### Observations/Results

Cumberland County Civic Center is a multi-level, multi-purpose concrete building located in Portland, Maine. A limited amount of lead was identified in the building, as outlined below:

#### Interior:

- Ladies Rooms – Entry walls only (previously marked with ‘arrows’ or insignia)  
Each wall area is approximately 4’x4’ in size
- Arena Area – Large ‘Row’ lettering on the cinderblock walls around the perimeter of the arena  
Painted either in black or in orange
- Utility Closets – Glazing on utility sinks only
- Admin/Office Areas – vinyl baseboards

#### Exterior:

No lead-based paint identified

The condition of the paint both interior and exterior ranges from good to poor as indicated on the field forms (good – fair=highlighted in blue; poor=highlighted in yellow. **Similar components to the ones tested should be presumed to yield the same results.**

### Explanation of Results

Components found to contain lead-based paint have also been assessed in terms of the condition of the paint. This assessment is based on the definitions outlined in the DEP regulations and utilized as an industry standard. There are three different classifications for paint condition - good, fair, and poor, which are ‘generally’ defined as follows:

- GOOD: paint which is entirely intact.
- FAIR: paint is intact, but worn; minor chips are evident as a result of normal wear and tear; no adhesion or substrate problems, e.g. no broken wallboard is present.
- POOR: paint is severely worn, weathered, or no longer adhering, i.e. peeling, cracking, flaking, chalking; or the substrate is broken, exposed, or otherwise deteriorated.

### Recommendations

The objective of this testing was to determine the presence of lead-based paint and assess the condition of the paint as it currently exists. All scraping, sanding, cutting, welding, grinding, or demolition of any painted surface should not be performed under dry conditions in which airborne dust can be generated. Similarly, renovation/demolition activities that may impact lead-containing components are a concern with respect to the



generation of airborne lead dust; therefore, safety measures such as the use of engineering controls are essential in order to protect human health and the environment. Contractors performing renovation/demolition activities in which excessive amounts of lead dust may be generated shall be trained in the hazards of lead-containing materials and the subsequent removal, cleaning, packaging, and handling of these materials as well as wearing NIOSH approved respirators, disposable clothing, and other requirements of the standard. All work operations shall be performed in accordance with the following:

- *OSHA 29 CFR Part 1926.62, Lead Standard.*

The lead dust generated from any renovation work must be contained so that exposure is minimal, for both the workers and any occupants. After any renovation work is completed the dust should immediately be cleaned in order to prevent migration to other areas of the structure or waterway.

Monitoring lead-containing components that remain for condition changes is important; any changes should be addressed immediately. Any work, whether it is on the interior or exterior of the structure should be performed in a safe manner so as to minimize the amount of dust that is generated.

Additional recommendation: when ordering building materials for renovation/rehabilitation projects, order should state 'Lead-Free'.

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If you should have any questions at all concerning the information contained herein, or in general, please do not hesitate to contact me at (207) 604-2581 or via email at [deb.atlanticenvironmental@gmail.com](mailto:deb.atlanticenvironmental@gmail.com).

Sincerely,

*Deborah A. Kasik*

Deborah A. Kasik  
Lead Risk Assessor (LR#0003)

Enclosures

# ENVIRONMENTAL LEAD-BASED XRF RESULTS

**CLIENT:** Summit Environmental Consultants, Inc.  
**SITE:** Cumberland County Civic Center, Portland, Maine  
**BLDG:** J LPA-1 #3305; ME Rad Lic #31223  
**DATE:** 3/15/2012  
**AES #:** 12-133  
**Page:** 1 of 10  
**CALIBRATION:** 1.0 / 1.0 mg/cm<sup>2</sup>  
**Inspector Signature:** Deborah A. Kasik/LR#0003

FIELD ID #	SAMPLE LOCATION	SIDE	COMPONENT(S)	COLOR	SUBSTRATE TYPE:	RESULTS mg/cm <sup>2</sup>	CONDITION	NOTES:
L-1	SECTION K LOBBY	A	STRUCTURAL I-BEAMS	WHITE	METAL	<0.3		
L-2	SECTION K LOBBY	A	WALL	WHITE	CONCRETE	<0.3		
L-3	SECTION K LOBBY	D	ENTRY DOORS	FACTORY	METAL	<0.3		
L-4	SECTION K LOBBY	C	WINDOWS	BROWN	METAL	<0.3		
L-5	SECTION K LOBBY	C	RAIL ALONG WINDOW	STAIN	WOOD	<0.3		
L-6	SECTION K LOBBY	A	ENTRY DOORS	BLUE	METAL	<0.3		
L-7	SECTION K LOBBY	A	ENTRY DOOR FRAMES	BLUE	METAL	<0.3		
L-8	SECTION K LOBBY	A	FIRE EXTINGUISHER SUPPORT	RED	METAL	<0.3		
L-9	SECTION K LOBBY	B	ARROW TO MEN'S	GREEN	CONCRETE	<0.3		
L-10	SECTION D,E,F MEN'S	C	MEN'S ROOM WALL	BLUE	CONCRETE	<0.3		
L-11	SECTION D,E,F MEN'S	C	MEN'S ROOM FLOOR	GRAY	CONCRETE	<0.3		
L-12	SECTION D,E,F MEN'S	C	CEILING BEAM	WHITE	CONCRETE	<0.3		
L-13	SECTION D,E,F MEN'S	C	CEILING BEAM	WHITE	CONCRETE	<0.3		
L-14	SECTION D,E,F MEN'S	C	STALLS		METAL	<0.3		
L-15	SECTION D,E,F MEN'S	C	CLOSET WALLS	WHITE	CONCRETE	<0.3		
L-16	SECTION D,E,F MEN'S	C	CLOSET CEILING	WHITE	CONCRETE	<0.3		
L-17	SECTION D,E,F MEN'S	C	CLOSET FLOOR	RED & GRAY	CONCRETE	<0.3		
L-18	SECTION D,E,F MEN'S	C	CLOSET DOOR / FRAME	BROWN	METAL	<0.3		
L-19	SECTION D,E,F MEN'S	C	JANITOR'S SINK	GLAZE	CERAMIC	>9.9		
L-20	SECTION D,E,F MEN'S	C	REGULAR SINKS	GLAZE	CERAMIC	<0.3		

*D = Drywall; P = Plaster; W = Wood; M = Metal; C = Concrete; B = Brick; V = Vinyl. MG/CM<sup>2</sup> = Milligrams per square centimeter*

# ENVIRONMENTAL LEAD-BASED XRF RESULTS

**CLIENT:** Summit Environmental Consultants, Inc. **DATE:** 3/15/2012  
**SITE:** Cumberland County Civic Center, Portland, Maine **AES #:** 12-133  
**BLDG:** **Page:** 2 of 10  
**XRF #** 12-133-0003 **ME Rad Lic #** 31223 **CALIBRATION:** 1.0 / 1.0 mg/cm2 **Inspector Signature:** Deborah A. Kasik/LR#0003

FIELD ID #	SAMPLE LOCATION	SIDE	COMPONENT(S)	COLOR	SUBSTRATE TYPE:	RESULTS mg/cm <sup>2</sup>	CONDITION	NOTES:
L-21	SECTION D,E,F LADIES	C	ARROW TO LADIES	BLUE	CONCRETE	<0.3		
L-22	SECTION D,E,F LADIES	C	WALLS AT ENTRY	PINK	CONCRETE	0.8/0.9/1.3 / 1.4 / 2.9	G	
L-23	SECTION D,E,F LADIES	C	WALLS	PINK	CONCRETE	<0.3		
L-24	SECTION D,E,F LADIES	C	CEILING	WHITE	CONCRETE	<0.3		
L-25	SECTION D,E,F LADIES	C	CEILING BEAM	WHITE	CONCRETE	<0.3		
L-26	SECTION D,E,F LADIES	C	FLOOR	GRAY	CONCRETE	<0.3		
L-27	B,C,D LOBBY AREA	C	SPRINKLER PIPING	FACTORY	METAL	<0.3		
L-28	B,C,D LOBBY AREA	C	WALLS	WHITE	CONCRETE	<0.3		
L-29	B,C,D LOBBY AREA	C	DOOR / FRAME	BROWN	METAL	<0.3 / <0.3		
L-30	B,C,D LOBBY AREA	A	STRUCTURAL I-BEAM	WHITE	METAL	<0.3		
L-31	'B' STAIRS TO CENTER	B,C	DOOR / FRAMES	BROWN	METAL	<0.3 / <0.3		
L-32	'B' STAIRS TO CENTER		STRUCTURAL I-BEAM*	BROWN	METAL	<0.3		* ABOVE DOOR
L-33	'B' STAIRS TO CENTER		STRUCTURAL I-BEAM	WHITE	METAL	<0.3		
L-34	'B' STAIRS TO CENTER		DOOR / FRAME TO PRIVATE OFFICE	BROWN	METAL	<0.3		
L-35	'B' STAIRS TO CENTER	B	ELEVATOR DOORS	GREEN	METAL	<0.3		
L-36	'B' STAIRS TO CENTER		HANDRAIL TO UPPER LEVELS	BROWN	METAL	<0.3		
L-37	'B' STAIRS TO CENTER	D	DOORS / FRAME	BLUE	METAL	<0.3		
L-38	'B' STAIRS TO CENTER	C	ACCESS DOOR	BROWN	METAL	<0.3		
L-39	W,X,Y LOBBY AREA	A	STRUCTURAL I-BEAMS	BROWN / WHITE	METAL	<0.3 / <0.3		
L-40	W,X,Y LOBBY AREA	C	WALLS	WHITE	CONCRETE	<0.3		

D = Drywall; P = Plaster; W = Wood; M = Metal; C = Concrete; B = Brick; Y = Vinyl. MG/CM<sup>2</sup> = Milligrams per square centimeter

# ENVIRONMENTAL LEAD-BASED XRF RESULTS

**CLIENT:** Summit Environmental Consultants, Inc. **DATE:** 3/15/2012  
**SITE:** Cumberland County Civic Center, Portland, Maine **AES #:** 12-133  
**BLDG:** **Page:** 3 of 10  
**XRF #** 0 LPA-1 #3305; ME Rad Lic #31223 **CALIBRATION:** 1.0 / 1.0 mg/cm2 **Inspector Signature:** Deborah A. Kasik/LR#0003

FIELD ID #	SAMPLE LOCATION	SIDE	COMPONENT(S)	COLOR	SUBSTRATE TYPE:	RESULTS mg/cm <sup>2</sup>	CONDITION	NOTES:
L-41	W,X,Y LOBBY AREA	C	DOORS / FRAME	BLUE	METAL	<0.3		
L-42	SECTION WXY MEN'S	A	WALLS	BLUE	CONCRETE	<0.3 / <0.3		
L-43	SECTION WXY MEN'S	A	FLOOR	GRAY	CONCRETE	<0.3		
L-44	SECTION WXY MEN'S	A	CEILING & CEILING BEAM	WHITE	CONCRETE	< 0.3 / <0.3		
L-45	SECTION WXY MEN'S	A	HEATER	BROWN	METAL	<0.3		
L-46	SECTION WXY MEN'S	A	UTILITY CLOSET	BROWN	METAL	<0.3		
L-47	SECTION WXY LADIES	A	WALLS AT ENTRY	PINK	CONCRETE	0.7 / 0.8 / 0.6 / 0.7 / 1.0	G	
L-48	SECTION WXY LADIES	A	FLOOR	GRAY	CONCRETE	<0.3		
L-49	SECTION WXY LADIES	A	CEILING & CEILING BEAM	WHITE	CONCRETE	<0.3 / <0.3		
L-50	S,T,U LOBBY AREA	C	GRATE	FACTORY	METAL	<0.3		
L-51	S,T,U LOBBY AREA	C	WALLS	WHITE	CONCRETE	<0.3		
L-52	S,T,U LOBBY AREA	A	DOOR / FRAME	BROWN	METAL	<0.3		
L-53	S,T,U LOBBY AREA	C	STRUCTURAL I-BEAM		METAL	<0.3		
L-54	ARENA AREA		PIPING	ORANGE	METAL	<0.3		
L-55	L,M,N,O LOBBY AREA		PIPING	BLUE	METAL	<0.3		
L-56	L,M,N,O LOBBY AREA		WALLS	BLUE	WOOD	<0.3		
L-57	L,M,N,O LOBBY AREA		SAFETY MARKINGS	YELLOW	CONCRETE	<0.3 / <0.3		ALONG STAIRS
L-58	L,M,N,O LOBBY AREA		SEATS	GREEN	METAL	<0.3		
L-59	L,M,N,O LOBBY AREA		SEATS	BLUE	METAL	<0.3		
L-60	L,M,N,O LOBBY AREA		SEATS	BLACK	METAL	<0.3		

D = Drywall; P = Plaster; W = Wood; M = Metal; C = Concrete; B = Brick; V = Vinyl. MG/CM<sup>2</sup> = Milligrams per square centimeter

# ENVIRONMENTAL LEAD-BASED XRF RESULTS

**CLIENT:** Summit Environmental Consultants, Inc.  
**SITE:** Cumberland County Civic Center, Portland, Maine  
**BLDG:** D LPA-1 #3305; ME Rad Lic #31223  
**DATE:** 3/15/2012  
**AES #:** 12-133  
**Page:** 4 of 10  
**Inspector Signature:** Deborah A. Kasik/LR#0003

**CALIBRATION:** 1.0 / 1.0 mg/cm<sup>2</sup>

FIELD ID #	SAMPLE LOCATION	SIDE	COMPONENT(S)	COLOR	SUBSTRATE TYPE:	RESULTS mg/cm <sup>2</sup>	CONDITION	NOTES:
L-61	L,M,N,O LOBBY AREA		LADDER TO CATWALK	YELLOW	METAL	<0.3		
L-62	L,M,N,O LOBBY AREA		STRUCTURAL STEEL	CREAM	METAL	<0.3 / <0.3 / <0.3		
L-63	L,M,N,O LOBBY AREA		WALLS	CREAM	WOOD	<0.3		
L-64	L,M,N,O LOBBY AREA		LMNO LETTERS * (INCLUDES ALL LETTERS)	BLACK	PAINT ON CONCRETE	6.2 / 6.5	G	* ON BARE CINDERBLOCK WALLS AROUND ARENA
L-65	B,C,D,E,F,G,H AREA		PIPING	YELLOW	METAL	<0.3		
L-66	B,C,D,E,F,G,H AREA		PIPING	GREEN	METAL	<0.3		
L-67	B,C,D,E,F,G,H AREA		PIPING	BLUE	METAL	<0.3		
L-68	B,C,D,E,F,G,H AREA		WALLS	BLUE	WOOD	<0.3		
L-69	B,C,D,E,F,G,H AREA		ROW NUMBERS SUPPORTS ON STAIRS	BLACK	CONCRETE	<0.3		ROW NUMBERS ON STAIRS
L-70	B,C,D,E,F,G,H AREA			WHITE	METAL	<0.3		
L-71	B,C,D,E,F,G,H AREA		LADDER TO CATWALK	YELLOW	METAL	<0.3		
L-72	B,C,D,E,F,G,H AREA		BCDEFGH LETTERS*	YELLOW	PAINT ON CONCRETE	>9.9	G	* ON BARE CONCRETE
L-73	B,C,D,E,F,G,H AREA		STRUCTURAL STEEL	WHITE	WOOD	<0.3		
L-74	B,C,D,E,F,G,H AREA		WALLS	MULTI	WOOD	<0.3		
L-75	B,C,D,E,F,G,H AREA		CATWALK FRAME BOOTH DOOR / FRAME	CREAM	METAL	<0.3		
L-76	B,C,D,E,F,G,H AREA			BLACK	METAL	<0.3		
L-77	B,C,D,E,F,G,H AREA		PIPING	GREEN	METAL	<0.3		
L-78	B,C,D,E,F,G,H AREA		PIPING	YELLOW	METAL	<0.3		
L-79	B,C,D,E,F,G,H AREA		PIPING	BLUE	METAL	<0.3		
L-80	B,C,D,E,F,G,H AREA		PIPING	ORANGE	METAL	<0.3		

D = Drywall; P = Plaster; W = Wood; M = Metal; C = Concrete; B = Brick; V = Vinyl. MG/CM<sup>2</sup> = Milligrams per square centimeter

# ENVIRONMENTAL LEAD-BASED XRF RESULTS

**CLIENT:** Summit Environmental Consultants, Inc. **DATE:** 3/15/2012  
**SITE:** Cumberland County Civic Center, Portland, Maine **AES #:** 12-133  
**BLDG:** **Page:** 5 of 10  
**XRF #** 12-133-0003 **CALIBRATION:** 1.0 / 1.0 mg/cm<sup>2</sup> **Inspector Signature:** Deborah A. Kasik/LR#0003

FIELD ID #	SAMPLE LOCATION	SIDE	COMPONENT(S)	COLOR	SUBSTRATE TYPE:	RESULTS mg/cm <sup>2</sup>	CONDITION	NOTES:
L-81	B, C, D, E, F, G, H AREA		SAFETY PRINT	YELLOW	CONCRETE	<0.3		
L-82	B, C, D, E, F, G, H AREA		LETTERS IF	ORANGE	CONCRETE	8.8		
L-83	B, C, D, E, F, G, H AREA		WALL AROUND IT	BLUE	CONCRETE	<0.3		
L-84	B, C, D, E, F, G, H AREA		STRUCTURAL STEEL	CREAM	METAL	<0.3		X ALL
L-85	B, C, D, E, F, G, H LOWER		BOX AREA	WHITE	CONCRETE	<0.3		
L-86	B, C, D, E, F, G, H LOWER		RAIL	BROWN	METAL	<0.3		
L-87	B, C, D, E, F, G, H LOWER		RAIL SUPPORT	BLACK	METAL	<0.3		
L-88	B, C, D, E, F, G, H LOWER		WALLS	BLACK	CONCRETE	<0.3		
L-89	R, S, T, U, V, W, X, Y, Z AREA		SAFETY	YELLOW	CONCRETE	<0.3		
L-90	R, S, T, U, V, W, X, Y, Z AREA		KNEE WALL	BLACK / WHITE	FIBERGLASS	<0.3		
L-91	R, S, T, U, V, W, X, Y, Z AREA		BASEBOARD	YELLOW	FIBERGLASS	<0.3		
L-92	MAIN LOBBY		WALLS	WHITE	CONCRETE	<0.3 / <0.3		
L-93	TICKET AREA		STRUCTURAL SUPPORTS	WHITE	METAL	<0.3		
L-94	TICKET AREA		CEILING	WHITE	CONCRETE	<0.3		
L-95	TICKET AREA		SUPPORT COLUMNS	WHITE	CONCRETE	<0.3		
L-96	TICKET AREA		STRUCTURAL SUPPORTS	BROWN	METAL	<0.3		
L-97	TICKET AREA		ROLL UP DOORS / FRAME	BROWN	METAL	<0.3 / <0.3		
L-98	LOBBY PUB & GRILL		HANDRAIL	BROWN	METAL	<0.3		
L-99	LOBBY PUB & GRILL		UPPER WALL	WHITE	DRYWALL	<0.3		
L-100	LOBBY PUB & GRILL		CHAIR RAIL	N/A	PLASTIC	<0.3		

*D = Drywall; P = Plaster; W = Wood; M = Metal; C = Concrete; B = Brick; V = Vinyl. MG/CM<sup>2</sup> = Milligrams per square centimeter*

# ENVIRONMENTAL LEAD-BASED XRF RESULTS

**CLIENT:** Summit Environmental Consultants, Inc. **DATE:** 3/15/2012  
**SITE:** Cumberland County Civic Center, Portland, Maine **AES #:** 12-133  
**BLDG:** **Page:** 6 of 10  
**XRF #** 12-133-0003 **ME Rad Lic #** 31223 **CALIBRATION:** 1.0 / 1.0 mg/cm2 **Inspector Signature:** Deborah A. Kasik/LR#0003

FIELD ID #	SAMPLE LOCATION	SIDE	COMPONENT(S)	COLOR	SUBSTRATE TYPE:	RESULTS mg/cm <sup>2</sup>	CONDITION	NOTES:
L-101	LOBBY PUB & GRILL		LOWER WALL	N/A	DRYWALL	<0.3		
L-102	LOBBY PUB & GRILL		BASEBOARD	GRAY	VINYL	<0.3		
L-103	LOBBY PUB & GRILL		ENTRY DOORS & FRAMES	BLUE	METAL	<0.3 / <0.3		
L-104	ENTRY TO KITCHEN / EXTERIOR		WALLS	WHITE	CONCRETE	<0.3		
L-105	ENTRY TO KITCHEN / EXTERIOR		BASEBOARD	GRAY	CONCRETE	<0.3		
L-106	ADMIN TICKET AREA		WALLS	CREAM	CONCRETE	<0.3		
L-107	ADMIN TICKET AREA		BASEBOARD	GRAY	VINYL	3.4	G	
L-108	ADMIN TICKET AREA		WALLS	PINK	WOOD	<0.3		
L-109	ADMIN TICKET AREA		WALLS	CREAM	WOOD	<0.3		
L-110	OFFICE		WALLS	CREAM	DRYWALL	<0.3		
L-111	OFFICE		BASEBOARD	CREAM	VINYL	2.3	G	
L-112	OFFICE		VAULT DOOR & FRAME	CREAM	METAL	<0.3 / <0.3		
L-113	BATHROOM		CEILING	WHITE	DRYWALL	<0.3		
L-114	BATHROOM		WALLS	N/A	CONCRETE	<0.3		
L-115	BATHROOM		HEATER	N/A	METAL	<0.3		
L-116	BATHROOM		BASEBOARD	GRAY	VINYL	<0.3		
L-117	OFFICE TO OFFICE		DOOR TRIM	CREAM	WOOD	<0.3		
L-118	OFFICE TO OFFICE		DOOR THRESHOLD	STAIN	WOOD	<0.3		
L-119	OFFICE		WALLS	BLUE	DRYWALL	<0.3		
L-120	OFFICE BEHIND RECEPTION		WALLS	WALLPAPER	DRYWALL	<0.3		

D = Drywall; P = Plaster; W = Wood; M = Metal; C = Concrete; B = Brick; V = Vinyl. MG/CM<sup>2</sup> = Milligrams per square centimeter

# ENVIRONMENTAL LEAD-BASED XRF RESULTS

**CLIENT:** Summit Environmental Consultants, Inc.  
**SITE:** Cumberland County Civic Center, Portland, Maine  
**BLDG:** LPA-1 #3305; ME Rad Lic #31223  
**DATE:** 3/15/2012  
**AES #:** 12-133  
**Page:** 7 of 10  
**CALIBRATION:** 1.0 / 1.0 mg/cm<sup>2</sup>  
**Inspector Signature:** Deborah A. Kasik/LR#0003

FIELD ID #	SAMPLE LOCATION	SIDE	COMPONENT(S)	COLOR	SUBSTRATE TYPE:	RESULTS mg/cm <sup>2</sup>	CONDITION	NOTES:
L-121	OFFICE BEHIND RECEPTION		BASEBOARD		VINYL	<0.3		
L-122	OFFICE BEHIND RECEPTION		DOOR / TRIM		METAL	<0.3		
L-123	GENERAL GM'S		WALLS	WALLPAPER	DRYWALL	<0.3		
L-124	OFFICE GM'S		CEILING	WHITE	CONCRETE	0.4		
L-125	LOWER LEVEL OFFICE CORNER		UPPER WALLS	WHITE	CONCRETE	<0.3		
L-126	LOWER LEVEL OFFICE CORNER		LOWER WALLS	GRAY	CONCRETE	<0.3		
L-127	LOWER LEVEL OFFICE CORNER		SHELF RACK	BLACK / WHITE / GRAY	WOOD	<0.3		
L-128	LOWER LEVEL OFFICE CORNER		SUPPORTS	GRAY	METAL	<0.3		
L-129	LOWER LEVEL OFFICE CORNER		BRICK ABOVE DOOR	WHITE	BRICK	<0.3		
L-130	LOWER LEVEL OFFICE CORNER		DOOR / FRAME	BLACK	METAL	<0.3		
L-131	LOWER LEVEL OFFICE CORNER		CEILING & CEILING BEAM	WHITE	CONCRETE	<0.3		
L-132	STAGE HANDS ONLY OFFICE		WALLS	WHITE	CONCRETE	<0.3		
L-133	STAGE HANDS ONLY OFFICE		DOOR / FRAME	BLACK	METAL	<0.3		
L-134	UTILITY ROOM		FLOOR	RED	CONCRETE	<0.3		
L-135	UTILITY ROOM		WALLS	GRAY & WHITE	CONCRETE	<0.3 / <0.3		
L-136	UTILITY ROOM		DOOR / FRAME	BROWN	METAL	<0.3		
L-137	SHOP		SUPPORT COLUMN	WHITE	CONCRETE	<0.3		
L-138	SHOP		CEILING & CEILING BEAM	WHITE	CONCRETE	<0.3 / <0.3		
L-139	SHOP		CORNER	N/A	METAL	<0.3		
L-140	ANNEX	C	UPPER & LOWER WALLS	WHITE / GRAY	CONCRETE	<0.3 / <0.3		

D = Drywall; P = Plaster; W = Wood; M = Metal; C = Concrete; B = Brick; V = Vinyl. MG/CM<sup>2</sup> = Milligrams per square centimeter



# ENVIRONMENTAL LEAD-BASED XRF RESULTS

**CLIENT:** Summit Environmental Consultants, Inc. **DATE:** 3/15/2012  
**SITE:** Cumberland County Civic Center, Portland, Maine **AES #:** 12-133  
**BLDG:** **Page:** 8 of 10  
**XRF #** 12-133-0003 **ME Rad Lic #**31223 **CALIBRATION:** 1.0 / 1.0 mg/cm2 **Inspector Signature:** Deborah A. Kasik/LR#0003

FIELD ID #	SAMPLE LOCATION	SIDE	COMPONENT(S)	COLOR	SUBSTRATE TYPE:	RESULTS mg/cm <sup>2</sup>	CONDITION	NOTES:
L-141	ANNEX		CORNER	N/A	METAL	<0.3		
L-142	ANNEX		ROLLING DOOR FRAME	BLACK	METAL	<0.3 / <0.3		
L-143	OPERATIONS DEPARTMENT		UPPER & LOWER WALLS	WHITE /GRAY	CONCRETE	<0.3 / <0.3		
L-144	OPERATIONS DEPARTMENT		DOOR / FRAME	N/A	METAL	<0.3		
L-145	OPERATIONS DEPARTMENT		WINDOW FRAME	N/A	METAL	<0.3		
L-146	OPERATIONS OFFICE SMALL		WALL	LIGHT GREEN	DRYWALL	<0.3		
L-147	OPERATIONS OFFICE SMALL		WALL	LIGHT GREEN	CONCRETE	<0.3		
L-148	OPERATIONS OFFICE SMALL		FLOOR	TILE	CERAMIC	<0.3		
L-149	OPERATIONS OFFICE LARGE		WALLS	GREEN	DRYWALL & WOOD	<0.3 / <0.3		
L-150	OPERATIONS OFFICE LARGE		DOOR TRIM	GREEN	WOOD	<0.3		
L-151	EMPLOYEE AREA BATHROOM		CEILING	WHITE	CONCRETE	<0.3		
L-152	EMPLOYEE AREA BATHROOM		WALLS	CREAM	CONCRETE	<0.3		
L-153	EMPLOYEE AREA BATHROOM		DOORS & FRAME	BROWN	METAL	<0.3		
L-154	EMPLOYEE AREA BATHROOM		THRESHOLD	GRAY	CONCRETE	<0.3		
L-155	BREAK ROOM		WALLS	WHITE	CONCRETE	<0.3		
L-156	BREAK ROOM		WINDOW TRIM	GREEN	METAL	<0.3		
L-157	BREAK ROOM		WALLS	WHITE	DRYWALL	<0.3		
L-158	BREAK ROOM		SUPPORT COLUMN	GREEN	CONCRETE	<0.3		
L-159	BREAK ROOM		CEILING	WHITE	CONCRETE	<0.3		
L-160	BREAK ROOM		DOOR	GREEN	WOOD	<0.3		

*D = Drywall; P = Plaster; W = Wood; M = Metal; C = Concrete; B = Brick; V = Vinyl. MG/CM<sup>2</sup> = Milligrams per square centimeter*

# ENVIRONMENTAL LEAD-BASED XRF RESULTS

**CLIENT:** Summit Environmental Consultants, Inc. **DATE:** 3/15/2012  
**SITE:** Cumberland County Civic Center, Portland, Maine **AES #:** 12-133  
**BLDG:** **Page:** 9 of 10  
**XRF #** 1 LPA-1 #3305; ME Rad Lic #31223 **CALIBRATION:** 1.0 / 1.0 mg/cm2 **Inspector Signature:** Deborah A. Kasik/LR#0003

FIELD ID #	SAMPLE LOCATION	SIDE	COMPONENT(S)	COLOR	SUBSTRATE TYPE:	RESULTS mg/cm <sup>2</sup>	CONDITION	NOTES:
L-161	HALLWAY TO UTILITY		WALLS	WHITE	CONCRETE	<0.3		
L-162	HALLWAY TO UTILITY		FLOOR	GRAY	CONCRETE	<0.3		
L-163	HALLWAY TO UTILITY		BASEBOARD	GRAY	CONCRETE	<0.3		
L-164	HALLWAY TO UTILITY		DOOR / FRAME	GREEN	METAL	<0.3 / <0.3		
L-165	HALLWAY TO UTILITY		UTILITY SINK	GLAZE	CERAMIC	>9.9		
L-166	HALLWAY TO UTILITY		SHELF / SHELF SUPPORTS	WHITE	WOOD	<0.3 / <0.3		
L-167	HALLWAY TO UTILITY		CEILING & CEILING BEAM	WHITE	CONCRETE	<0.3		
L-168	OFFICES		WALLS	CREAM	CONCRETE	<0.3 / <0.3		
L-169	OFFICES		DOORS / TRIM	GREEN	METAL	<0.3 / <0.3		
L-170	HALL TO PIRATES LOCKER ROOMS		CEILING	WHITE	CONCRETE	<0.3		
L-171	HALL TO PIRATES LOCKER ROOMS		WALLS	*	CONCRETE	<0.3		* WHITE, BLUE, RED, GRAY
L-172	RM. #1		CEILING	WHITE	CONCRETE	<0.3		
L-173	RM. #1		WALLS	WHITE	CONCRETE	<0.3		
L-174	RM. #1		VENT SYSTEM	WHITE	METAL	<0.3		
L-175	RM. #1		SUPPORT	WHITE	WOOD	<0.3		
L-176	SHOWER		TILE IN SHOWER	N/A	CERAMIC	<0.3		
L-177	SHOWER		BASEBOARD	& RED	VINYL	<0.3		
L-178	RM. #2		BASEBOARD	RED	METAL	<0.3		
L-179	RM. #3		WALLS	WHITE	CONCRETE	<0.3		
L-180	RM. #3		SHOWER ROOM FLOOR	GRAY	CONCRETE	<0.3		

D = Drywall; P = Plaster; W = Wood; M = Metal; C = Concrete; B = Brick; V = Vinyl. MG/CM<sup>2</sup> = Milligrams per square centimeter

# ENVIRONMENTAL LEAD-BASED XRF RESULTS

<b>CLIENT:</b> Summit Environmental Consultants, Inc.	<b>DATE:</b> 3/15/2012	
<b>SITE:</b> Cumberland County Civic Center, Portland, Maine	<b>AES #:</b> 12-133	
<b>BLDG:</b> D LPA-1 #3305; ME Rad Lic #31223	<b>Page:</b> 10 of 10	
<b>XRF #</b>	<b>CALIBRATION:</b> 1.0 / 1.0 mg/cm2	<b>Inspector Signature:</b> Deborah A. Kasik/LR#0003

FIELD ID #	SAMPLE LOCATION	SIDE	COMPONENT(S)	COLOR	SUBSTRATE TYPE:	RESULTS mg/cm <sup>2</sup>	CONDITION	NOTES:
L-181	RM. #3		CEILING & CEILING BEAM	WHITE	CONCRETE	<0.3 / <0.3		
L-182	RM. #3		WALLS	WHITE	WOOD	<0.3		
L-183	RM. #3		WINDOW TRIM	N/A	WOOD	<0.3 / <0.3		
L-184	RM. #3		TREADS & RISERS TO UPPER LEVEL	N/A	WOOD	<0.3 / <0.3		
L-185	RM. #3		BASEBOARD	BLACK	VINYL	<0.3		
L-186	SPRING STREET LOBBY		WALLS	*	CONCRETE	<0.3		* BLACK, WHITE, RED, BLUE, GRAY
L-187	SPRING STREET LOBBY		WOOD TRIM	WHITE	WOOD	<0.3		
L-188	BOILER ROOM		UTILITY SINK	GLAZE	CERAMIC	>9.9		
L-189	BOILER ROOM		SPRINKLER PIPING	WHITE	METAL	<0.3		
L-190	BOILER ROOM		SPRINKLER PIPING	RED	METAL	<0.3		

D = Drywall; P = Plaster; W = Wood; M = Metal; C = Concrete; B = Brick; V = Vinyl. MG/CM<sup>2</sup> = Milligrams per square centimeter

*Appendix E*

PCB LABORATORY ANALYTICAL RESULTS

April 3, 2012

Mr. Dennis Kingman  
Summitt Environmental  
8 Harlow St. Suite 4A  
Bangor, ME 04401

**RE: Analytical Results Case Narrative  
Analytics # 72374  
Cumberland County Civic Center  
Project No: 12-3051**

Dear Mr. Kingman;

Enclosed please find the analytical results for samples submitted for the above-mentioned project. The attached Cover Page lists the sample IDs, Lab tracking numbers and collection dates for the samples included in this deliverable.

Samples were analyzed for Polychlorinated Biphenyls (PCBs) by EPA Method 8082.

Unless otherwise noted in the Non-conformance Summary listed below, all of the quality control (QC) criteria including initial calibration, calibration verification, surrogate recovery, holding time and method accuracy/precision for these analyses were within acceptable limits.

This Level II data package has been assembled in the following order:

- Case Narrative/Non-Conformance Summary
- Sample Log Sheet - Cover Page
- PCB Form 1 Data Sheet for Samples and Blanks
- Chromatograms
- PCB Form 10 Confirmation Results
- PCB Form 3 MS/MSD (LCS) Recoveries
- Chain of Custody (COC) Forms

## QC NON CONFORMANCE SUMMARY

**Sample Receipt:**

No exceptions.

**PCBs by EPA Method 8082:**

No results were reported below the quantitation limit.

All samples were analyzed at increased quantitation limits due to sample matrix.

Samples 72374-3, 72374-7, 72374-9 and 72374-10 MS and MSD had interferences that prevented the determination of surrogate Decachlorobiphenyl on one or both columns. For samples where the interference was present on both columns results were reported with a comment to that effect.

The MS/MSD analyzed on sample 72374-10 had high RPDs. The laboratory control samples (L032012PSOX/LD032012PSOX) were in control for all analytes. Results were reported without qualification.

The closing continuing calibration standard (file#L29155SC &L29156SC) had low recovery for surrogate Decachlorobiphenyl. The analytical window was re-analyzed with similar results. Results were reported without qualification.

If you have any questions on this data submittal, please do not hesitate to contact me.

Sincerely,  
ANALYTICS Environmental Laboratory, LLC



Stephen Knollmeyer  
Laboratory Director

Mr. Dennis Kingman  
Summit Environmental  
8 Harlow St. Suite 4A  
Bangor ME 04401

**Report Number: 72374**

**Revision: Rev. 0**

**Re: Cumberland County Civic Center (Project No: 12-3051)**


Enclosed are the results of the analyses on your sample(s). Samples were received on 20 March 2012 and analyzed for the tests listed. Samples were received in acceptable condition, with the exceptions noted below or on the chain of custody. These results pertain to samples as received by the laboratory and for the analytical tests requested on the chain of custody. The results reported herein conform to the most current NELAC standards, where applicable, unless otherwise narrated in the body of the report. Please see individual reports for specific methodologies and references.

**Sample Analysis:** The attached pages detail the Client Sample IDs, Lab Sample IDs, and Analyses requested

**Sample Receipt Exceptions:** None

Analytics Environmental Laboratory is certified by the states of New Hampshire, Maine, Massachusetts, Connecticut, Rhode Island, Virginia, Maryland, North Carolina, and is accredited by the Department of Defense (DOD) ELAP program. A list of actual certified parameters is available upon request.

If you have any questions on these results, please do not hesitate to contact us.

Authorized signature   
Stephen L. Knollmeyer Lab. Director

Date 4/3/2012

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**CLIENT: Summit Environmental**

**REPORT NUMBER: 72374**

**REV: Rev. 0**

**PROJECT: Cumberland County Civic Center (Project No: 12-3051)**

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<u>Lab Number</u>	<u>Sample Date</u>	<u>Station Location</u>	<u>Analysis</u>	<u>Comments</u>
72374-1	03/15/12	NW3-1	EPA 8082 (PCBs only)	
72374-2	03/15/12	NW3-2	EPA 8082 (PCBs only)	
72374-3	03/15/12	NW3-3	EPA 8082 (PCBs only)	
72374-4	03/15/12	SW3-4	EPA 8082 (PCBs only)	
72374-5	03/15/12	SW3-5	EPA 8082 (PCBs only)	
72374-6	03/15/12	ND-1	EPA 8082 (PCBs only)	
72374-7	03/15/12	ND-2	EPA 8082 (PCBs only)	
72374-8	03/15/12	ED-3	EPA 8082 (PCBs only)	
72374-9	03/15/12	SD-4	EPA 8082 (PCBs only)	
72374-10	03/15/12	SD-5	EPA 8082 (PCBs only)	



**Surrogate Compound Limits**

Matrix:	Aqueous	Solid	Method
Units:	% Recovery	% Recovery	
<b>Volatile Organic Compounds - Drinking Water</b>			
1,4-Difluorobenzene	70-130		EPA 524.2
Bromofluorobenzene	70-130		
1,2-Dichlorobenzene-d4	70-130		
<b>Volatile Organic Compounds</b>			
1,2-Dichloroethane-d4	70-120	70-120	EPA 624/8260B
Toluene-d8	85-120	85-120	
Bromofluorobenzene	75-120	75-120	
<b>Semi-Volatile Organic Compounds</b>			
2-Fluorophenol	20-110	35-105	EPA 625/8270C
d5-Phenol	15-110	40-100	
d5-nitrobenzene	40-110	35-100	
2-Fluorobiphenyl	50-110	45-105	
2,4,6-Tribromophenol	40-110	40-125	
d14-p-terphenyl	50-130	30-125	
<b>PAH's by SIM</b>			
d5-nitrobenzene	21-110	35-110	EPA 8270C
2-Fluorobiphenyl	36-121	45-105	
d14-p-terphenyl	33-141	30-125	
<b>Pesticides and PCBs</b>			
2,4,5,6-Tetrachloro-m-xylene (TCX)	46-122	40-130	EPA 608/8082
Decachlorobiphenyl (DCB)	40-135	40-130	
<b>Herbicides</b>			
Dichloroacetic acid (DCAA)	30-150	30-150	
<b>Gasoline Range Organics/TPH Gasoline</b>			
Trifluorotoluene TFT (FID)	60-140	60-140	MEDEP 4217/EPA 8015
Bromofluorobenzene (BFB) (FID)	60-140	60-140	
Trifluorotoluene TFT (PID)	60-140	60-140	
Bromofluorobenzene (BFB) (PID)	60-140	60-140	
<b>Diesel Range Organics/TPH Diesel</b>			
m-terphenyl	60-140	60-140	MEDEP 4125/EPA 8015/CT ETPH
<b>Volatile Petroleum Hydrocarbons</b>			
2,5-Dibromotoluene (PID)	70-130	70-130	MADEP VPH May 2004 Rev1.1
2,5-Dibromotoluene (FID)	70-130	70-130	
<b>Extracatable Petroleum Hydrocarbons</b>			
1-chloro-octadecane (aliphatic)	40-140	40-140	MADEP EPH May 2004 Rev1.1
o-Terphenyl (aromatic)	40-140	40-140	
2-Fluorobiphenyl (Fractionation)	40-140	40-140	
2-Bromonaphthalene (fractionation)	40-140	40-140	

PCB  
DATA SUMMARIES

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April 2, 2012

**SAMPLE DATA**

**CLIENT SAMPLE ID**

**Project Name:** Cumberland County Civic Center  
**Project Number:** 12-3051  
**Field Sample ID:** Lab QC

**Lab Sample ID:** B032012PSOX RR  
**Matrix:** Soil  
**Percent Solid:** 100  
**Dilution Factor:** 1.0  
**Collection Date:**  
**Lab Receipt Date:**  
**Extraction Date:** 03/20/12  
**Analysis Date:** 03/22/12

PCB ANALYTICAL RESULTS		
COMPOUND	Quantitation Limit $\mu\text{g}/\text{kg}$	Results $\mu\text{g}/\text{kg}$
PCB-1016	33	U
PCB-1221	33	U
PCB-1232	33	U
PCB-1242	33	U
PCB-1248	33	U
PCB-1254	33	U
PCB-1260	33	U
Surrogate Standard Recovery		
2,4,5,6-Tetrachloro-m-xylene	75	%
Decachlorobiphenyl	100	%
U=Undetected J=Estimated E=Exceeds Calibration Range B=Detected in Blank		

**METHODOLOGY:** Sample analysis conducted according to Test Methods for Evaluating Solid Waste, SW-846 Method 8082.  
 Sample preparation conducted according to Test Methods for Evaluating Solid Waste, SW-846 Method 3540C.  
 Sample cleanup was conducted according to SW-846 Method 3665A.

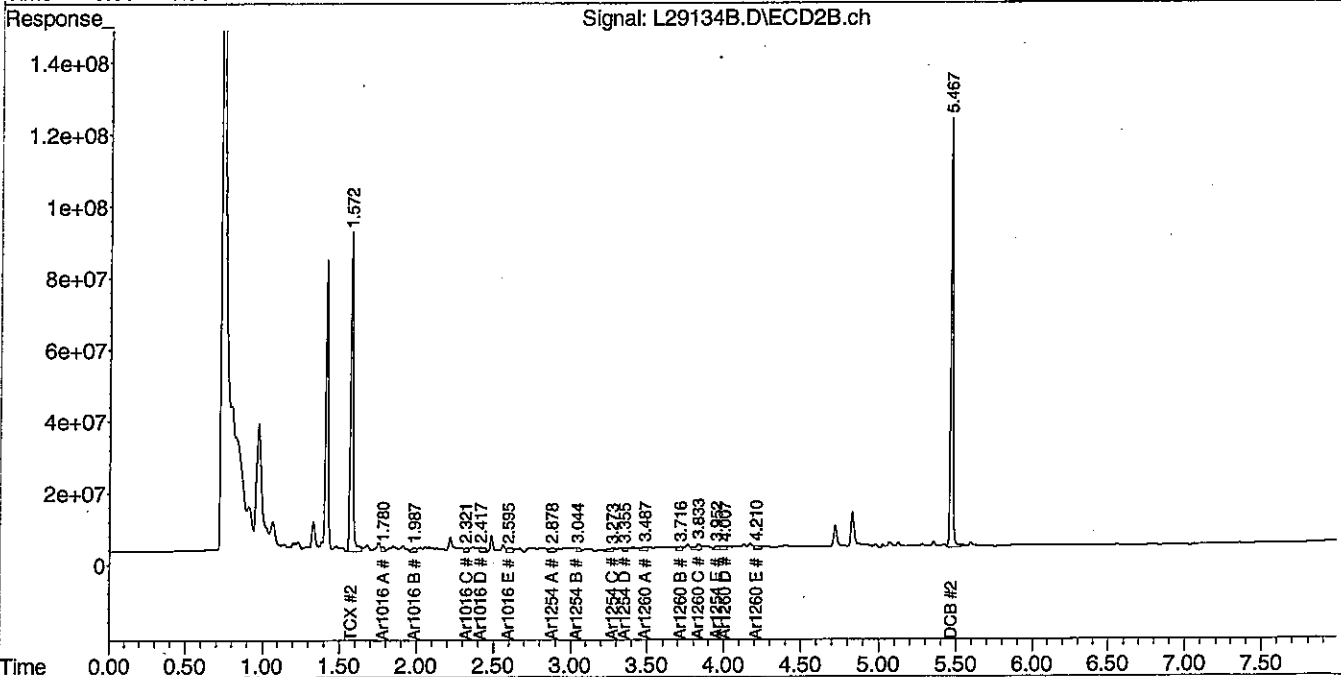
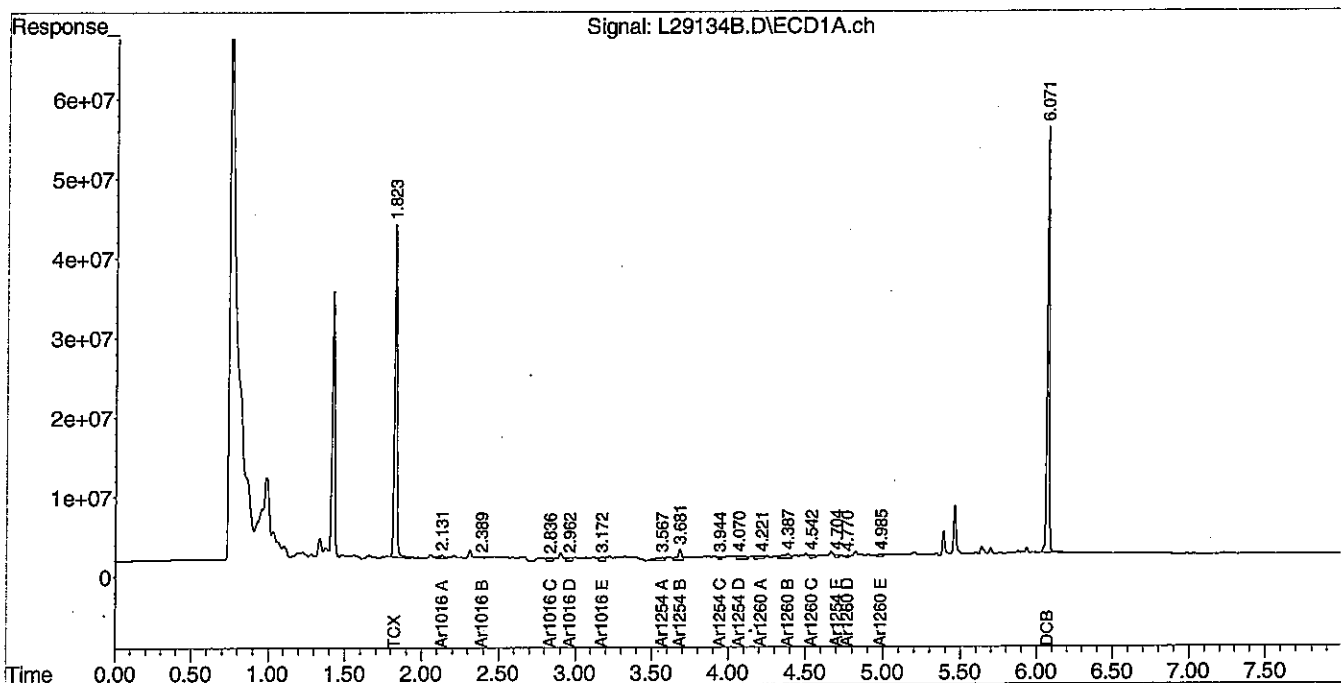
**COMMENTS:** Results are expressed on a dry weight basis.



Data Path : C:\msdchem\1\DATA\032112-L\  
 Data File : L29134B.D  
 Signal(s) : Signal #1: ECD1A.ch Signal #2: ECD2B.ch  
 Acq On : 22 Mar 2012 5:22 pm  
 Operator : JK  
 Sample : B032012PSOX,RR,,A/C  
 Misc : SOIL  
 ALS Vial : 6 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
 Integration File signal 2: autoint2.e  
 Quant Time: Mar 26 14:08:40 2012  
 Quant Method : C:\msdchem\1\METHODS\PCB032112.M  
 Quant Title : SW-846 METHOD 8082 Aroclor 1016/1260/1254  
 QLast Update : Thu Mar 22 10:38:07 2012  
 Response via : Initial Calibration  
 Integrator: ChemStation

Volume Inj. : 2 uL  
 Signal #1 Phase : STX-CLPPesticides Signal #2 Phase: STX-CLPPesticides  
 Signal #1 Info : 30 m x 0.25mm x 0 Signal #2 Info : 30 m x 0.25mm x 0.25 um



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**SAMPLE DATA**

**CLIENT SAMPLE ID**

**Project Name:** Cumberland County Civic Center

**Project Number:** 12-3051

**Field Sample ID:** NW3-1

**Lab Sample ID:** 72374-1

**Matrix:** Solid

**Percent Solid:** 100

**Dilution Factor:** 10

**Collection Date:** 03/15/12

**Lab Receipt Date:** 03/20/12

**Extraction Date:** 03/20/12

**Analysis Date:** 03/22/12

PCB ANALYTICAL RESULTS		
COMPOUND	Quantitation Limit $\mu\text{g}/\text{kg}$	Results $\mu\text{g}/\text{kg}$
PCB-1016	330	U
PCB-1221	330	U
PCB-1232	330	U
PCB-1242	330	U
PCB-1248	330	U
PCB-1254	330	U
PCB-1260	330	U
Surrogate Standard Recovery		
2,4,5,6-Tetrachloro-m-xylene	79	%
Decachlorobiphenyl	60	%
U=Undetected J=Estimated E=Exceeds Calibration Range B=Detected in Blank		

**METHODOLOGY:** Sample analysis conducted according to Test Methods for Evaluating Solid Waste, SW-846 Method 8082.  
 Sample preparation conducted according to Test Methods for Evaluating Solid Waste, SW-846 Method 3540C.  
 Sample cleanup was conducted according to SW-846 Method 3665A.

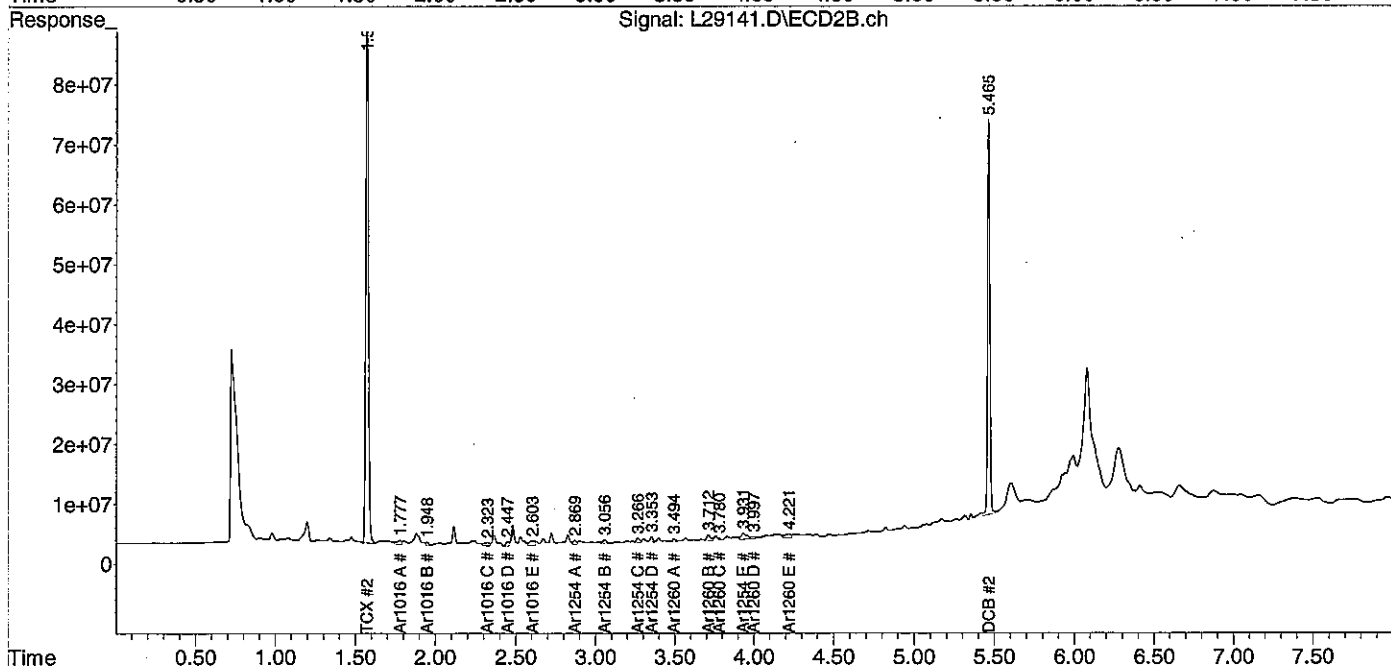
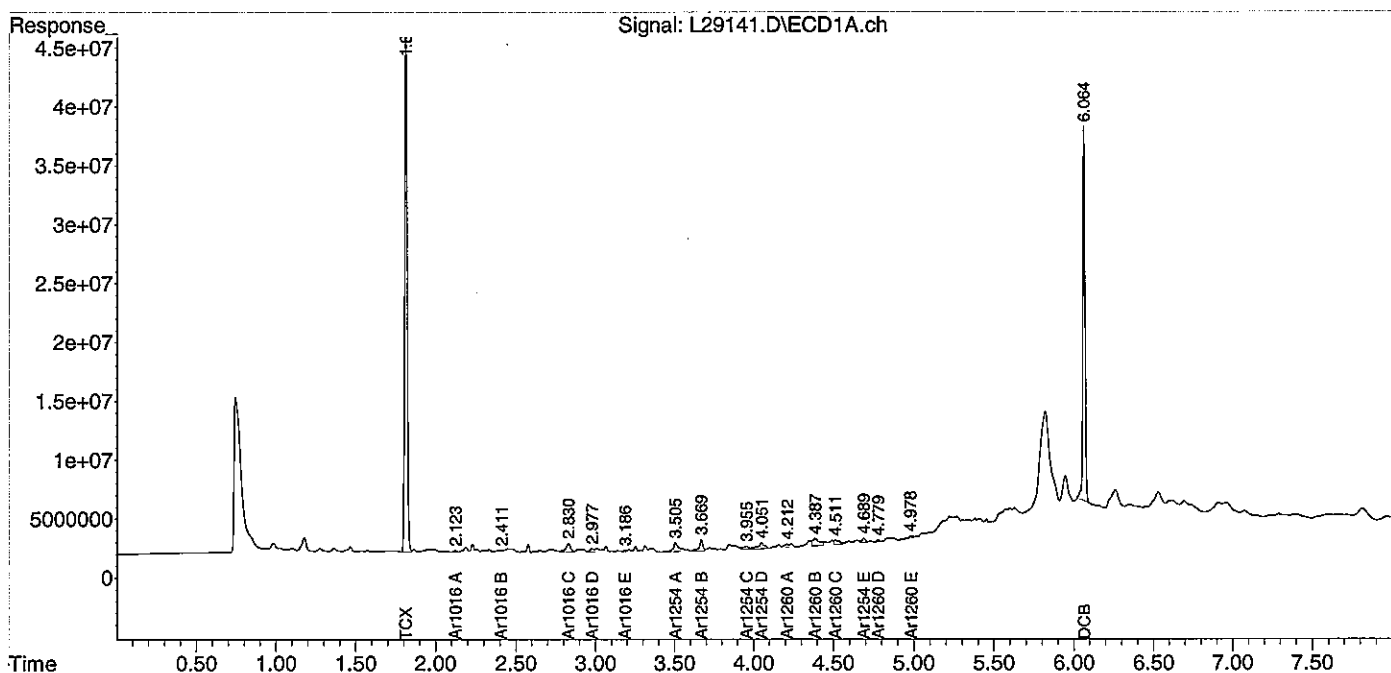
**COMMENTS:** Results are expressed on a dry weight basis.



Data Path : C:\msdchem\1\DATA\032112-L\  
 Data File : L29141.D  
 Signal(s) : Signal #1: ECD1A.ch Signal #2: ECD2B.ch  
 Acq On : 22 Mar 2012 6:34 pm  
 Operator : JK  
 Sample : 72374-1,,A/C  
 Misc : SOIL  
 ALS Vial : 13 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
 Integration File signal 2: autoint2.e  
 Quant Time: Mar 27 11:43:55 2012  
 Quant Method : C:\msdchem\1\METHODS\PCB032112.M  
 Quant Title : SW-846 METHOD 8082 Aroclor 1016/1260/1254  
 QLast Update : Thu Mar 22 10:38:07 2012  
 Response via : Initial Calibration  
 Integrator: ChemStation

Volume Inj. : 2 uL  
 Signal #1 Phase : STX-CLPPesticides Signal #2 Phase: STX-CLPPesticides  
 Signal #1 Info : 30 m x 0.25mm x 0 Signal #2 Info : 30 m x 0.25mm x 0.25 um



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**SAMPLE DATA**

**CLIENT SAMPLE ID**

**Project Name:** Cumberland County Civic Center

**Project Number:** 12-3051

**Field Sample ID:** NW3-2

**Lab Sample ID:** 72374-2

**Matrix:** Solid

**Percent Solid:** 98

**Dilution Factor:** 7

**Collection Date:** 03/15/12

**Lab Receipt Date:** 03/20/12

**Extraction Date:** 03/20/12

**Analysis Date:** 03/22/12

PCB ANALYTICAL RESULTS		
COMPOUND	Quantitation Limit $\mu\text{g}/\text{kg}$	Results $\mu\text{g}/\text{kg}$
PCB-1016	231	U
PCB-1221	231	U
PCB-1232	231	U
PCB-1242	231	U
PCB-1248	231	U
PCB-1254	231	U
PCB-1260	231	U
Surrogate Standard Recovery		
2,4,5,6-Tetrachloro-m-xylene	63	%
Decachlorobiphenyl	58	%
U=Undetected J=Estimated E=Exceeds Calibration Range B=Detected in Blank		

**METHODOLOGY:** Sample analysis conducted according to Test Methods for Evaluating Solid Waste, SW-846 Method 8082.  
Sample preparation conducted according to Test Methods for Evaluating Solid Waste, SW-846 Method 3540C.  
Sample cleanup was conducted according to SW-846 Method 3665A.

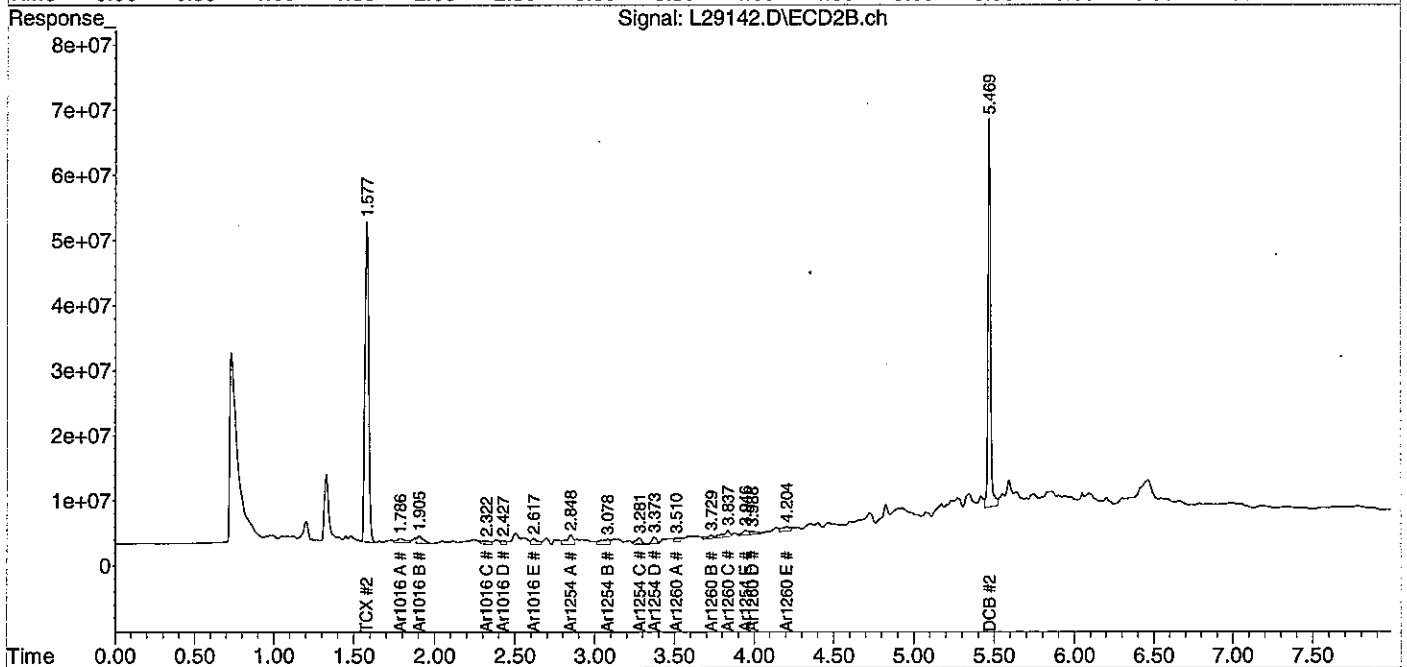
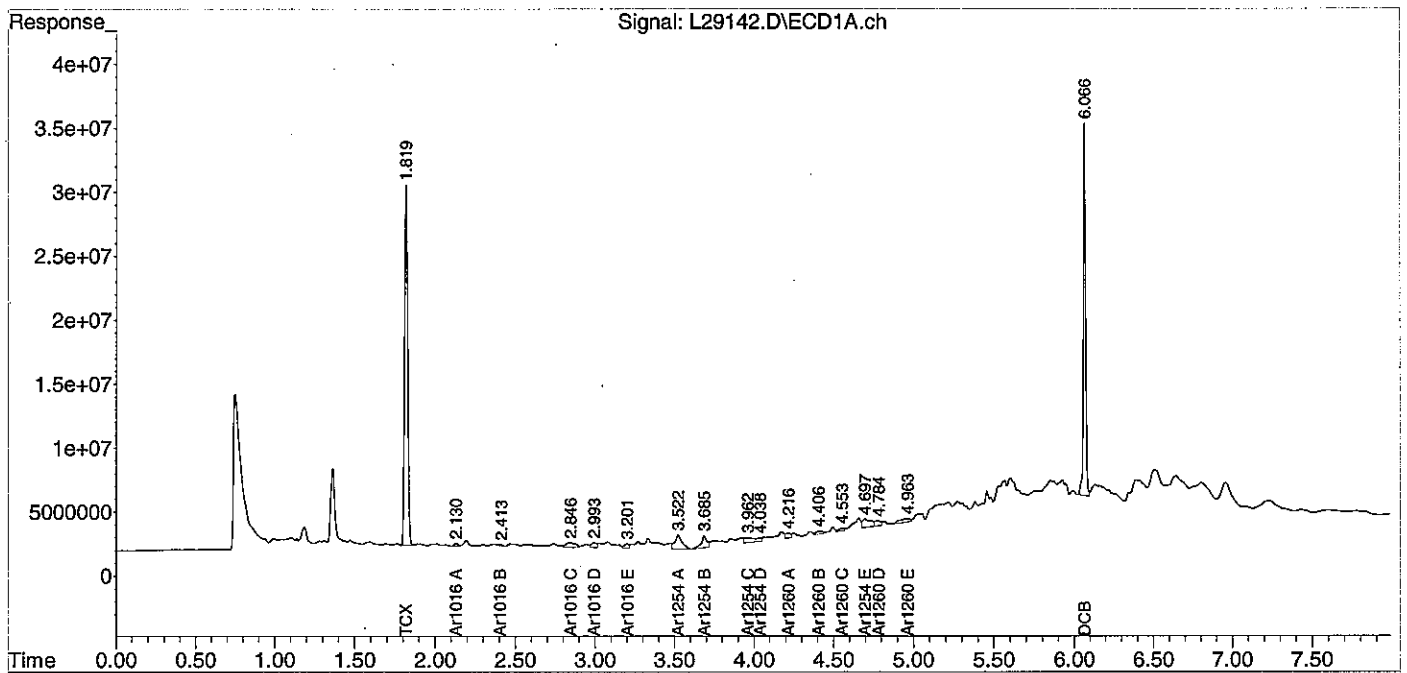
**COMMENTS:** Results are expressed on a dry weight basis.



Data Path : C:\msdchem\1\DATA\032112-L\  
 Data File : L29142.D  
 Signal(s) : Signal #1: ECD1A.ch Signal #2: ECD2B.ch  
 Acq On : 22 Mar 2012 6:45 pm  
 Operator : JK  
 Sample : 72374-2,,A/C  
 Misc : SOIL  
 ALS Vial : 14 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
 Integration File signal 2: autoint2.e  
 Quant Time: Mar 27 11:43:57 2012  
 Quant Method : C:\msdchem\1\METHODS\PCB032112.M  
 Quant Title : SW-846 METHOD 8082 Aroclor 1016/1260/1254  
 QLast Update : Thu Mar 22 10:38:07 2012  
 Response via : Initial Calibration  
 Integrator: ChemStation

Volume Inj. : 2 uL  
 Signal #1 Phase : STX-CLPPesticides Signal #2 Phase: STX-CLPPesticides  
 Signal #1 Info : 30 m x 0.25mm x 0 Signal #2 Info : 30 m x 0.25mm x 0.25 um





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April 2, 2012

**SAMPLE DATA**

**CLIENT SAMPLE ID**

**Project Name:** Cumberland County Civic Center

**Project Number:** 12-3051

**Field Sample ID:** NW3-3

**Lab Sample ID:** 72374-3

**Matrix:** Solid

**Percent Solid:** 99

**Dilution Factor:** 7

**Collection Date:** 03/15/12

**Lab Receipt Date:** 03/20/12

**Extraction Date:** 03/20/12

**Analysis Date:** 03/22/12

PCB ANALYTICAL RESULTS		
COMPOUND	Quantitation Limit µg/kg	Results µg/kg
PCB-1016	231	U
PCB-1221	231	U
PCB-1232	231	U
PCB-1242	231	U
PCB-1248	231	U
PCB-1254	231	U
PCB-1260	231	U
<b>Surrogate Standard Recovery</b>		
2,4,5,6-Tetrachloro-m-xylene	78	%
Decachlorobiphenyl	I	%
U=Undetected J=Estimated E=Exceeds Calibration Range B=Detected in Blank		

**METHODOLOGY:** Sample analysis conducted according to Test Methods for Evaluating Solid Waste, SW-846 Method 8082.  
Sample preparation conducted according to Test Methods for Evaluating Solid Waste, SW-846 Method 3540C.  
Sample cleanup was conducted according to SW-846 Method 3665A.

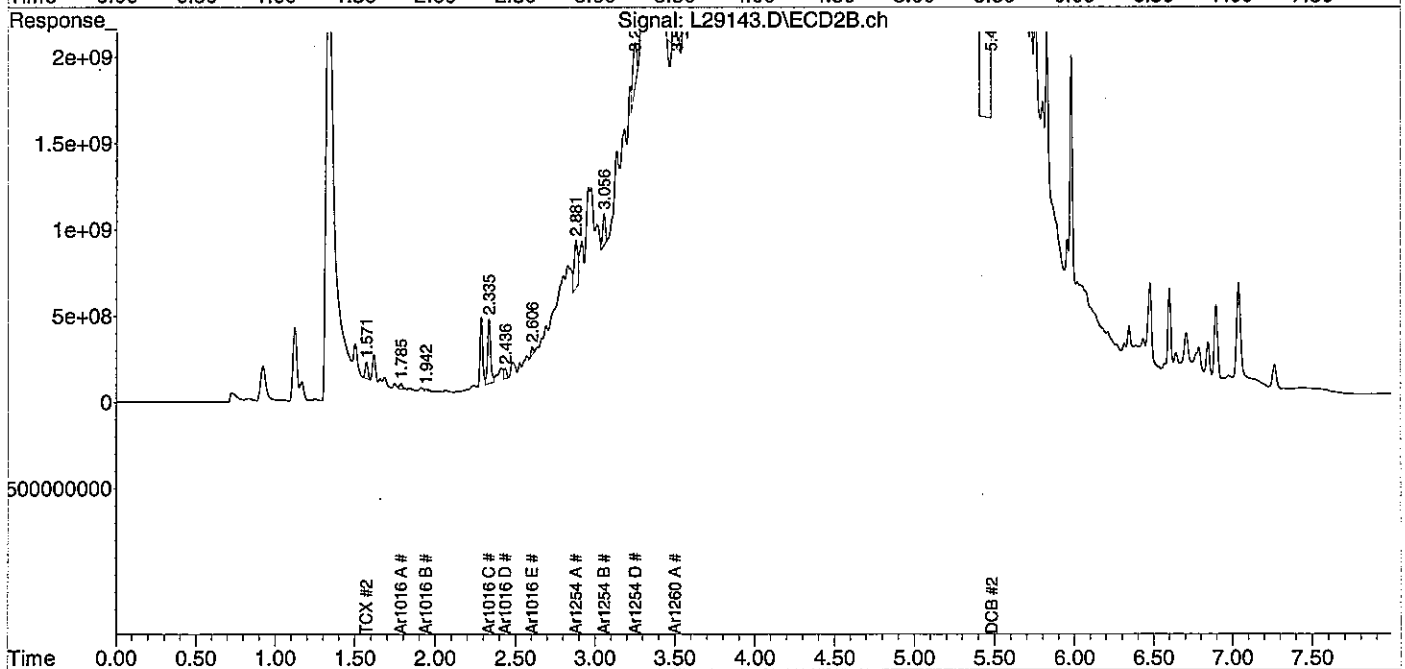
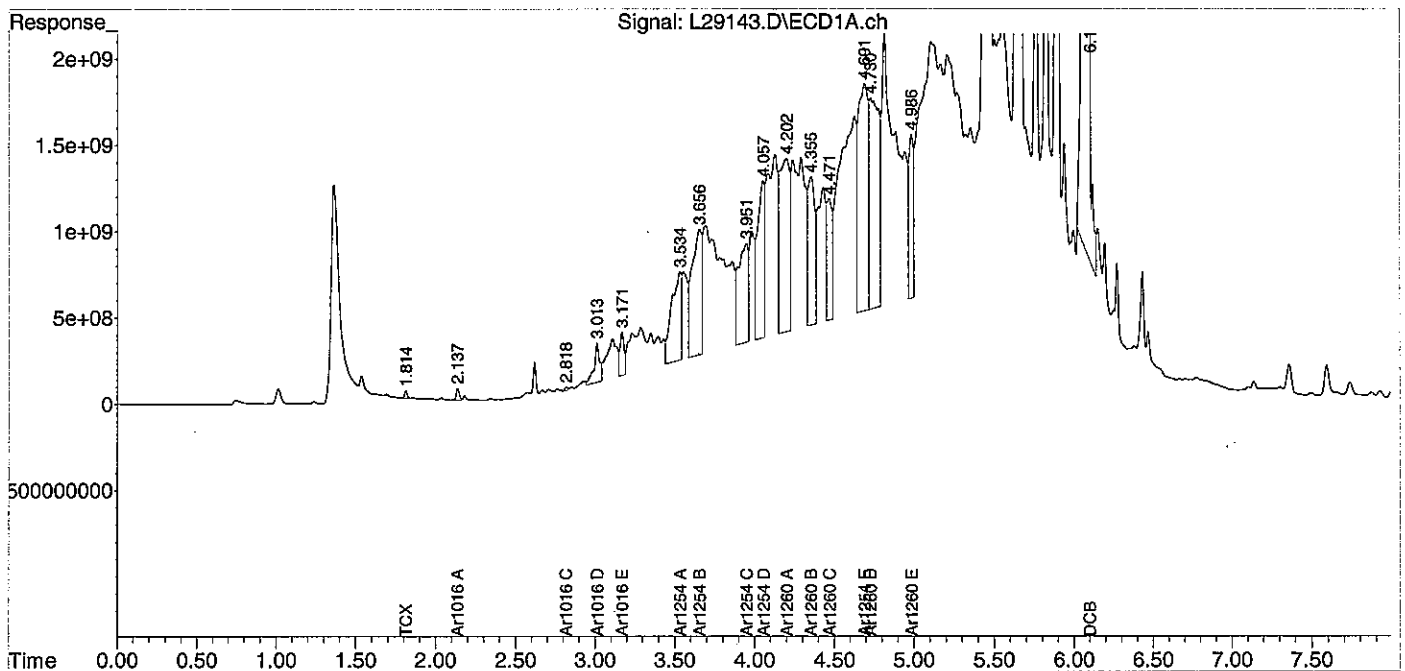
**COMMENTS:** Results are expressed on a dry weight basis.  
I=Unable to read surrogate results due to interference.

Authorized signature 

Data Path : C:\msdchem\1\DATA\032112-L\  
 Data File : L29143.D  
 Signal(s) : Signal #1: ECD1A.ch Signal #2: ECD2B.ch  
 Acq On : 22 Mar 2012 6:55 pm  
 Operator : JK  
 Sample : 72374-3,,A/C  
 Misc : SOIL  
 ALS Vial : 15 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
 Integration File signal 2: autoint2.e  
 Quant Time: Apr 02 15:42:55 2012  
 Quant Method : C:\msdchem\1\METHODS\PCB032112.M  
 Quant Title : SW-846 METHOD 8082 Aroclor 1016/1260/1254  
 QLast Update : Thu Mar 22 10:38:07 2012  
 Response via : Initial Calibration  
 Integrator: ChemStation

Volume Inj. : 2 uL  
 Signal #1 Phase : STX-CLPPesticides Signal #2 Phase: STX-CLPPesticides  
 Signal #1 Info : 30 m x 0.25mm x 0 Signal #2 Info : 30 m x 0.25mm x 0.25 um



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**SAMPLE DATA**

**CLIENT SAMPLE ID**

**Project Name:** Cumberland County Civic Center

**Project Number:** 12-3051

**Field Sample ID:** SW3-4

**Lab Sample ID:** 72374-4

**Matrix:** Solid

**Percent Solid:** 97

**Dilution Factor:** 8

**Collection Date:** 03/15/12

**Lab Receipt Date:** 03/20/12

**Extraction Date:** 03/20/12

**Analysis Date:** 03/22/12

PCB ANALYTICAL RESULTS		
COMPOUND	Quantitation Limit µg/kg	Results µg/kg
PCB-1016	264	U
PCB-1221	264	U
PCB-1232	264	U
PCB-1242	264	U
PCB-1248	264	U
PCB-1254	264	U
PCB-1260	264	U
<b>Surrogate Standard Recovery</b>		
	2,4,5,6-Tetrachloro-m-xylene	67 %
	Decachlorobiphenyl	83 %
U=Undetected J=Estimated E=Exceeds Calibration Range B=Detected in Blank		

**METHODOLOGY:** Sample analysis conducted according to Test Methods for Evaluating Solid Waste, SW-846 Method 8082.  
 Sample preparation conducted according to Test Methods for Evaluating Solid Waste, SW-846 Method 3540C.  
 Sample cleanup was conducted according to SW-846 Method 3665A.

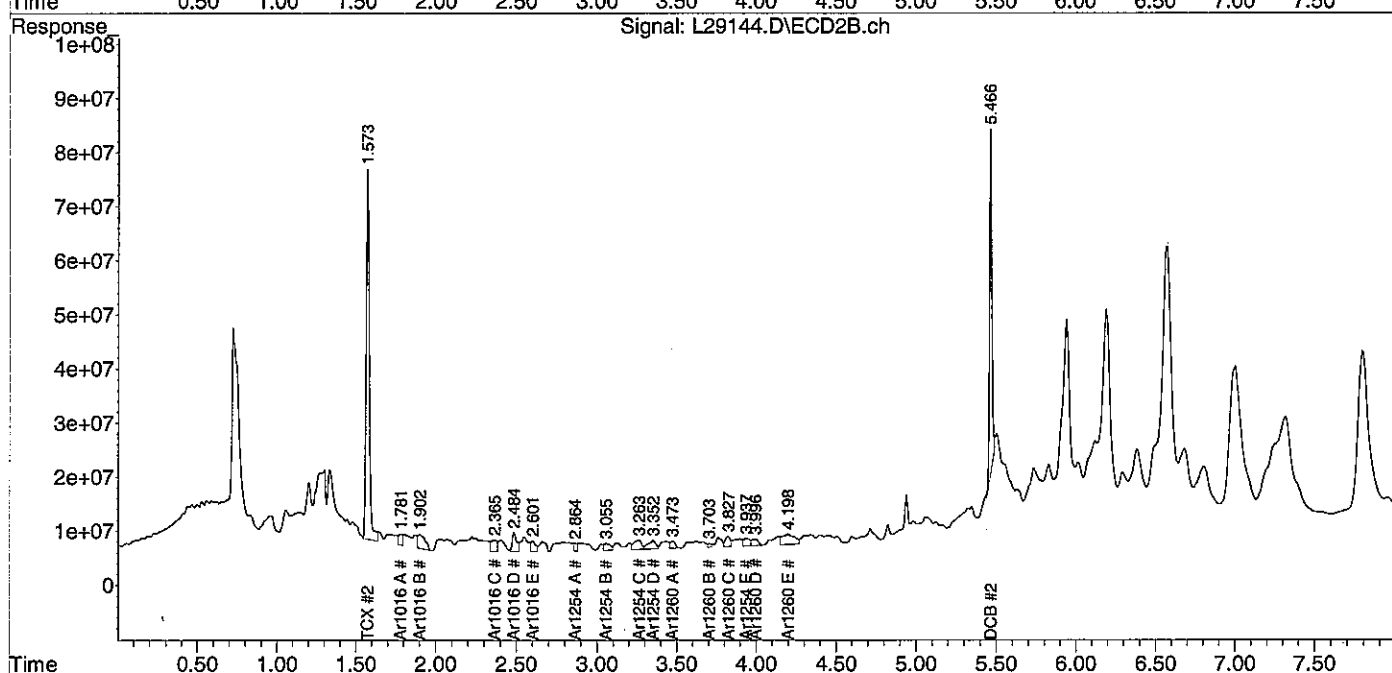
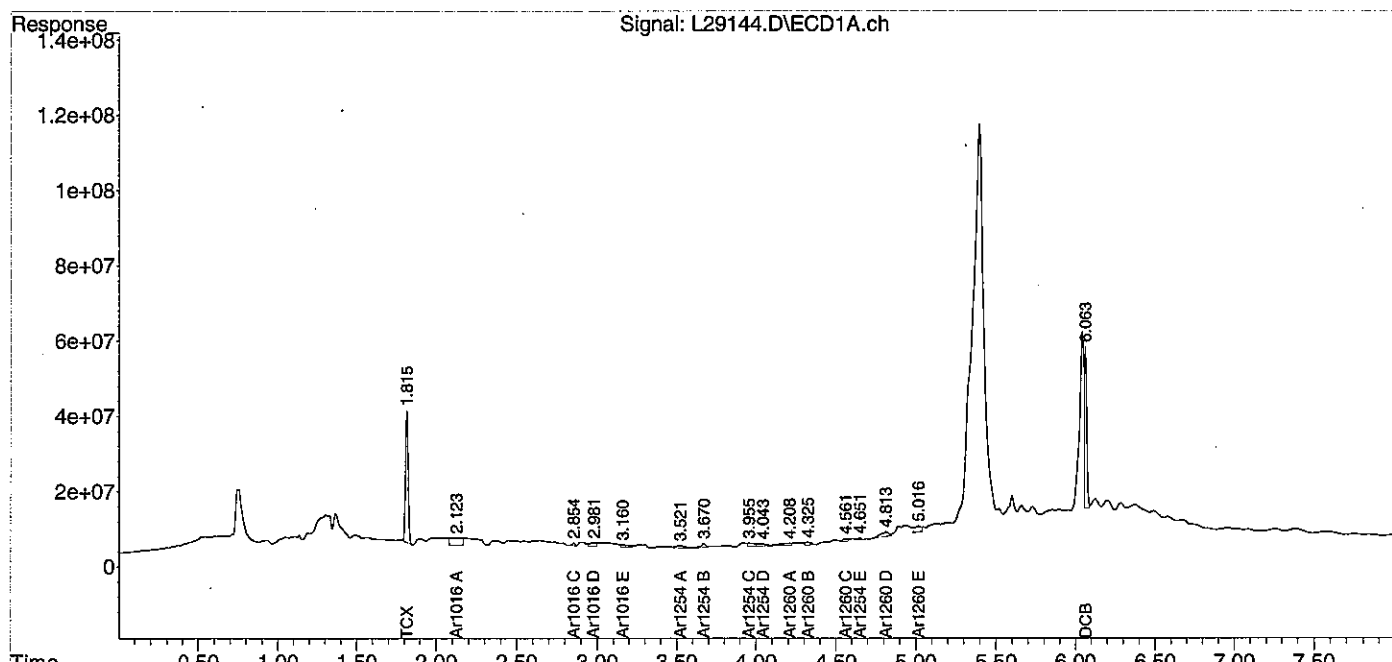
**COMMENTS:** Results are expressed on a dry weight basis.



Data Path : C:\msdchem\1\DATA\032112-L\  
 Data File : L29144.D  
 Signal(s) : Signal #1: ECD1A.ch Signal #2: ECD2B.ch  
 Acq On : 22 Mar 2012 7:05 pm  
 Operator : JK  
 Sample : 72374-4,,A/C  
 Misc : SOIL  
 ALS Vial : 16 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
 Integration File signal 2: autoint2.e  
 Quant Time: Apr 02 15:43:26 2012  
 Quant Method : C:\msdchem\1\METHODS\PCB032112.M  
 Quant Title : SW-846 METHOD 8082 Aroclor 1016/1260/1254  
 QLast Update : Thu Mar 22 10:38:07 2012  
 Response via : Initial Calibration  
 Integrator: ChemStation

Volume Inj. : 2 uL  
 Signal #1 Phase : STX-CLPPesticides Signal #2 Phase: STX-CLPPesticides  
 Signal #1 Info : 30 m x 0.25mm x 0 Signal #2 Info : 30 m x 0.25mm x 0.25 um



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April 2, 2012

**SAMPLE DATA**

**CLIENT SAMPLE ID**

**Project Name:** Cumberland County Civic Center  
**Project Number:** 12-3051  
**Field Sample ID:** SW3-5

**Lab Sample ID:** 72374-5  
**Matrix:** Solid  
**Percent Solid:** 100  
**Dilution Factor:** 6  
**Collection Date:** 03/15/12  
**Lab Receipt Date:** 03/20/12  
**Extraction Date:** 03/20/12  
**Analysis Date:** 03/22/12

**PCB ANALYTICAL RESULTS**

COMPOUND	Quantitation Limit $\mu\text{g}/\text{kg}$	Results $\mu\text{g}/\text{kg}$
PCB-1016	198	U
PCB-1221	198	U
PCB-1232	198	U
PCB-1242	198	U
PCB-1248	198	U
PCB-1254	198	U
PCB-1260	198	U
<b>Surrogate Standard Recovery</b>		
2,4,5,6-Tetrachloro-m-xylene	70	%
Decachlorobiphenyl	59	%
U=Undetected J=Estimated E=Exceeds Calibration Range B=Detected in Blank		

**METHODOLOGY:** Sample analysis conducted according to Test Methods for Evaluating Solid Waste, SW-846 Method 8082.  
 Sample preparation conducted according to Test Methods for Evaluating Solid Waste, SW-846 Method 3540C.  
 Sample cleanup was conducted according to SW-846 Method 3665A.

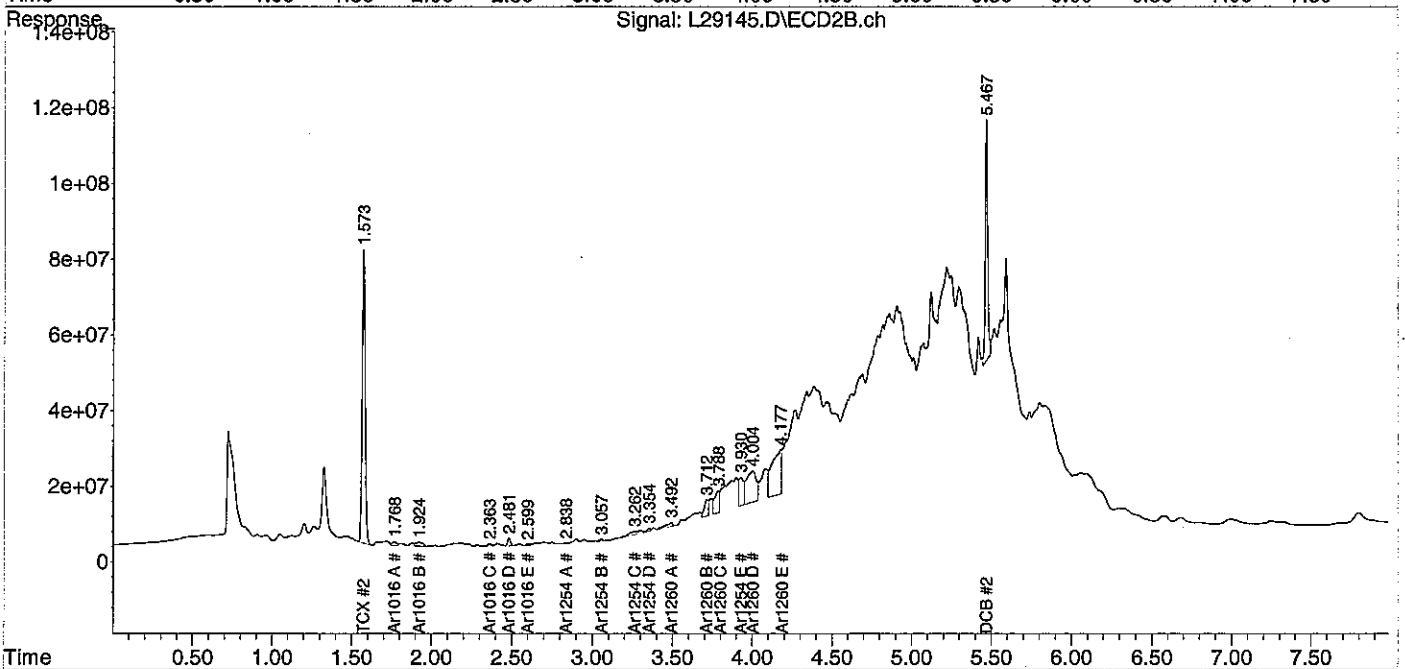
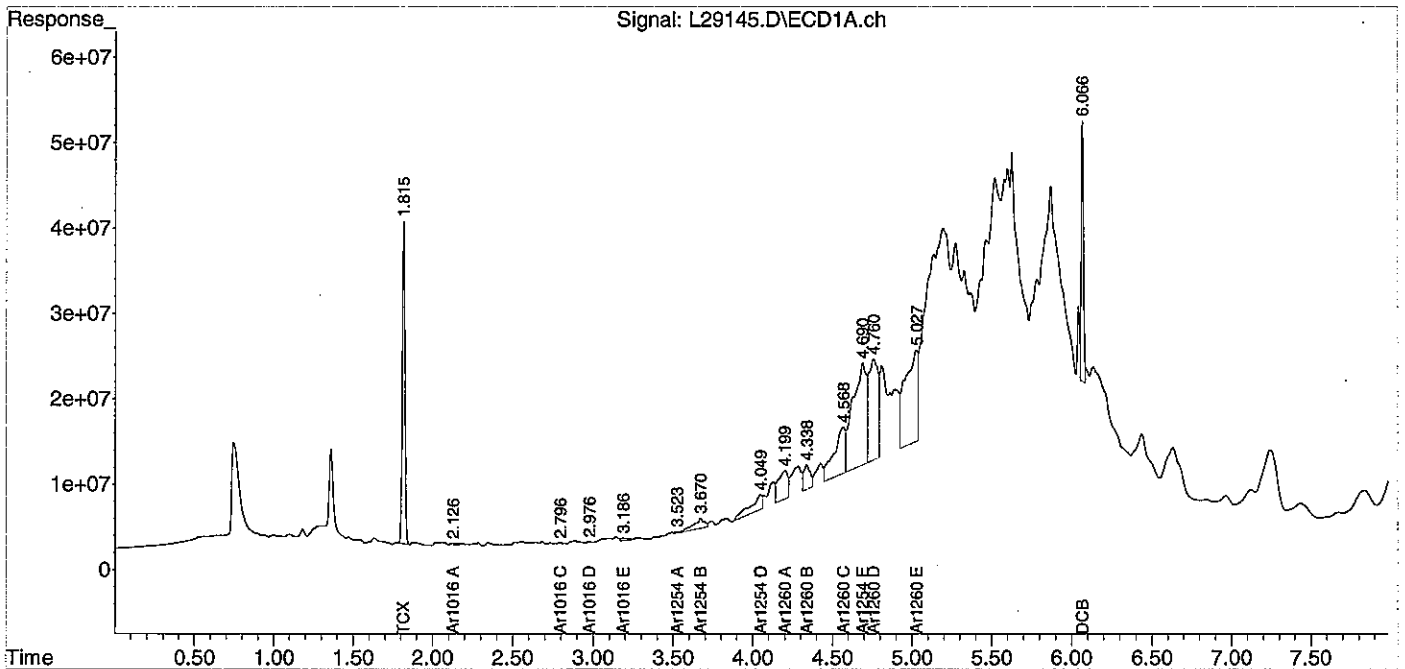
**COMMENTS:** Results are expressed on a dry weight basis.

Authorized signature 

Data Path : C:\msdchem\1\DATA\032112-L\  
 Data File : L29145.D  
 Signal(s) : Signal #1: ECD1A.ch Signal #2: ECD2B.ch  
 Acq On : 22 Mar 2012 7:16 pm  
 Operator : JK  
 Sample : 72374-5,,A/C  
 Misc : SOIL  
 ALS Vial : 17 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
 Integration File signal 2: autoint2.e  
 Quant Time: Apr 02 15:43:53 2012  
 Quant Method : C:\msdchem\1\METHODS\PCB032112.M  
 Quant Title : SW-846 METHOD 8082 Aroclor 1016/1260/1254  
 QLast Update : Thu Mar 22 10:38:07 2012  
 Response via : Initial Calibration  
 Integrator: ChemStation

Volume Inj. : 2 uL  
 Signal #1 Phase : STX-CLPPesticides Signal #2 Phase: STX-CLPPesticides  
 Signal #1 Info : 30 m x 0.25mm x 0 Signal #2 Info : 30 m x 0.25mm x 0.25 um



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April 2, 2012  
**SAMPLE DATA**

**CLIENT SAMPLE ID**  
**Project Name:** Cumberland County Civic Center  
**Project Number:** 12-3051  
**Field Sample ID:** ND-1

**Lab Sample ID:** 72374-6  
**Matrix:** Solid  
**Percent Solid:** 99  
**Dilution Factor:** 7  
**Collection Date:** 03/15/12  
**Lab Receipt Date:** 03/20/12  
**Extraction Date:** 03/20/12  
**Analysis Date:** 03/22/12

PCB ANALYTICAL RESULTS		
COMPOUND	Quantitation Limit $\mu\text{g}/\text{kg}$	Results $\mu\text{g}/\text{kg}$
PCB-1016	231	U
PCB-1221	231	U
PCB-1232	231	U
PCB-1242	231	U
PCB-1248	231	U
PCB-1254	231	U
PCB-1260	231	U
Surrogate Standard Recovery		
2,4,5,6-Tetrachloro-m-xylene	61	%
Decachlorobiphenyl	49	%
U=Undetected J=Estimated E=Exceeds Calibration Range B=Detected in Blank		

**METHODOLOGY:** Sample analysis conducted according to Test Methods for Evaluating Solid Waste, SW-846 Method 8082.  
 Sample preparation conducted according to Test Methods for Evaluating Solid Waste, SW-846 Method 3540C.  
 Sample cleanup was conducted according to SW-846 Method 3665A.

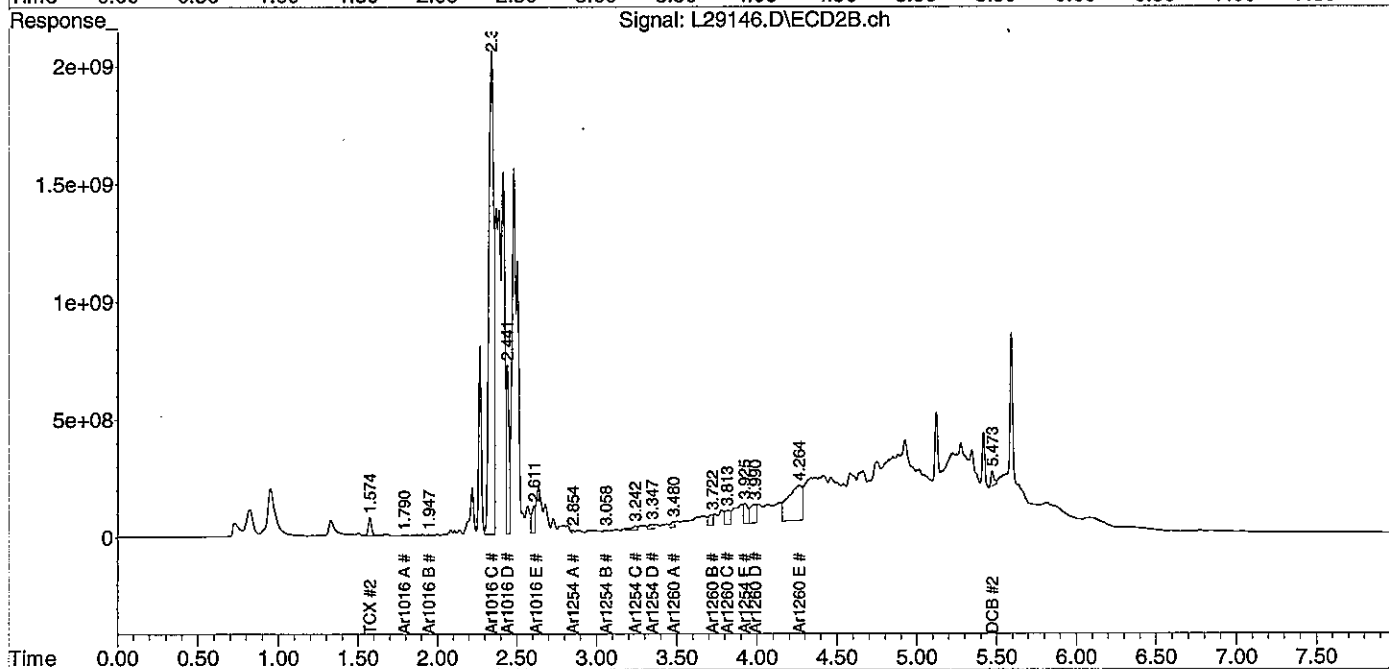
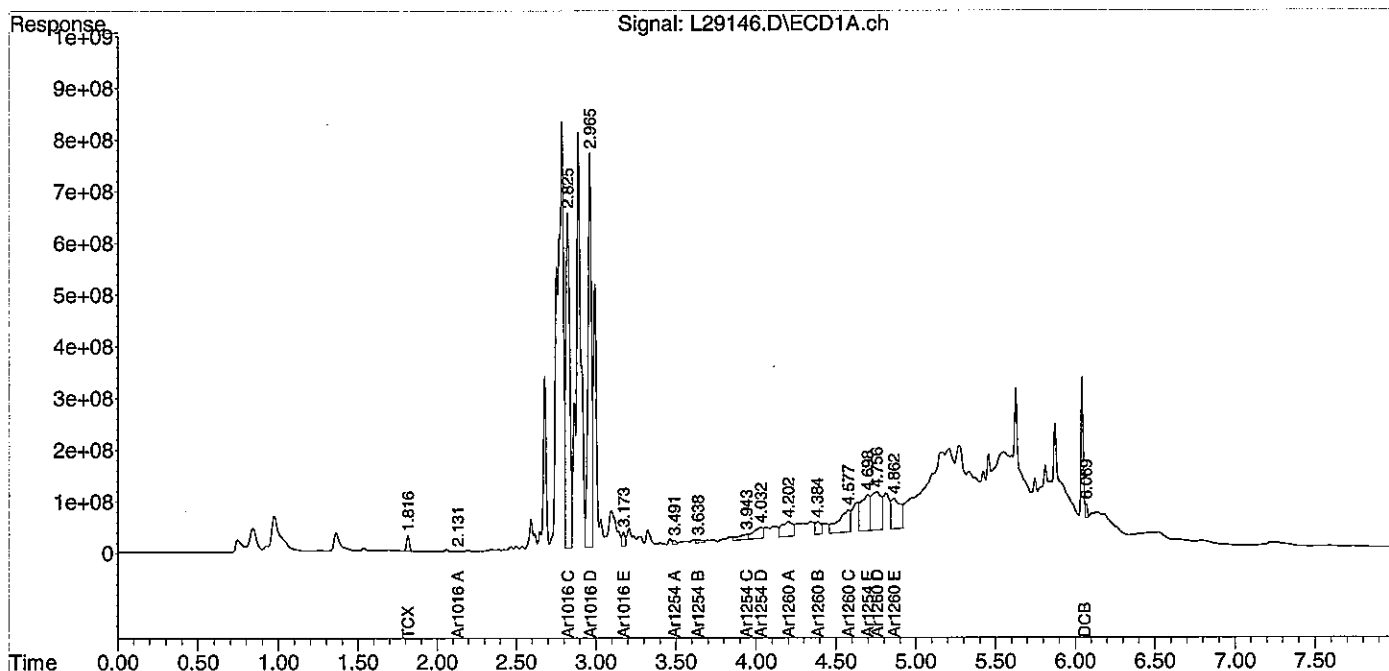
**COMMENTS:** Results are expressed on a dry weight basis.



Data Path : C:\msdchem\1\DATA\032112-L\  
 Data File : L29146.D  
 Signal(s) : Signal #1: ECD1A.ch Signal #2: ECD2B.ch  
 Acq On : 22 Mar 2012 7:26 pm  
 Operator : JK  
 Sample : 72374-6,,A/C  
 Misc : SOIL  
 ALS Vial : 18 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
 Integration File signal 2: autoint2.e  
 Quant Time: Apr 02 15:44:33 2012  
 Quant Method : C:\msdchem\1\METHODS\PCB032112.M  
 Quant Title : SW-846 METHOD 8082 Aroclor 1016/1260/1254  
 QLast Update : Thu Mar 22 10:38:07 2012  
 Response via : Initial Calibration  
 Integrator: ChemStation

Volume Inj. : 2 uL  
 Signal #1 Phase : STX-CLPPesticides Signal #2 Phase: STX-CLPPesticides  
 Signal #1 Info : 30 m x 0.25mm x 0 Signal #2 Info : 30 m x 0.25mm x 0.25 um





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April 2, 2012

**SAMPLE DATA**

**CLIENT SAMPLE ID**

**Project Name:** Cumberland County Civic Center

**Project Number:** 12-3051

**Field Sample ID:** ND-2

**Lab Sample ID:** 72374-7

**Matrix:** Solid

**Percent Solid:** 99

**Dilution Factor:** 7

**Collection Date:** 03/15/12

**Lab Receipt Date:** 03/20/12

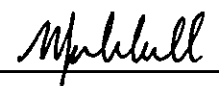
**Extraction Date:** 03/20/12

**Analysis Date:** 03/22/12

PCB ANALYTICAL RESULTS		
COMPOUND	Quantitation Limit µg/kg	Results µg/kg
PCB-1016	231	U
PCB-1221	231	U
PCB-1232	231	U
PCB-1242	231	U
PCB-1248	231	U
PCB-1254	231	U
PCB-1260	231	U
<b>Surrogate Standard Recovery</b>		
2,4,5,6-Tetrachloro-m-xylene	73	%
Decachlorobiphenyl	85	%
U=Undetected J=Estimated E=Exceeds Calibration Range B=Detected in Blank		

**METHODOLOGY:** Sample analysis conducted according to Test Methods for Evaluating Solid Waste, SW-846 Method 8082.  
Sample preparation conducted according to Test Methods for Evaluating Solid Waste, SW-846 Method 3540C.  
Sample cleanup was conducted according to SW-846 Method 3665A.

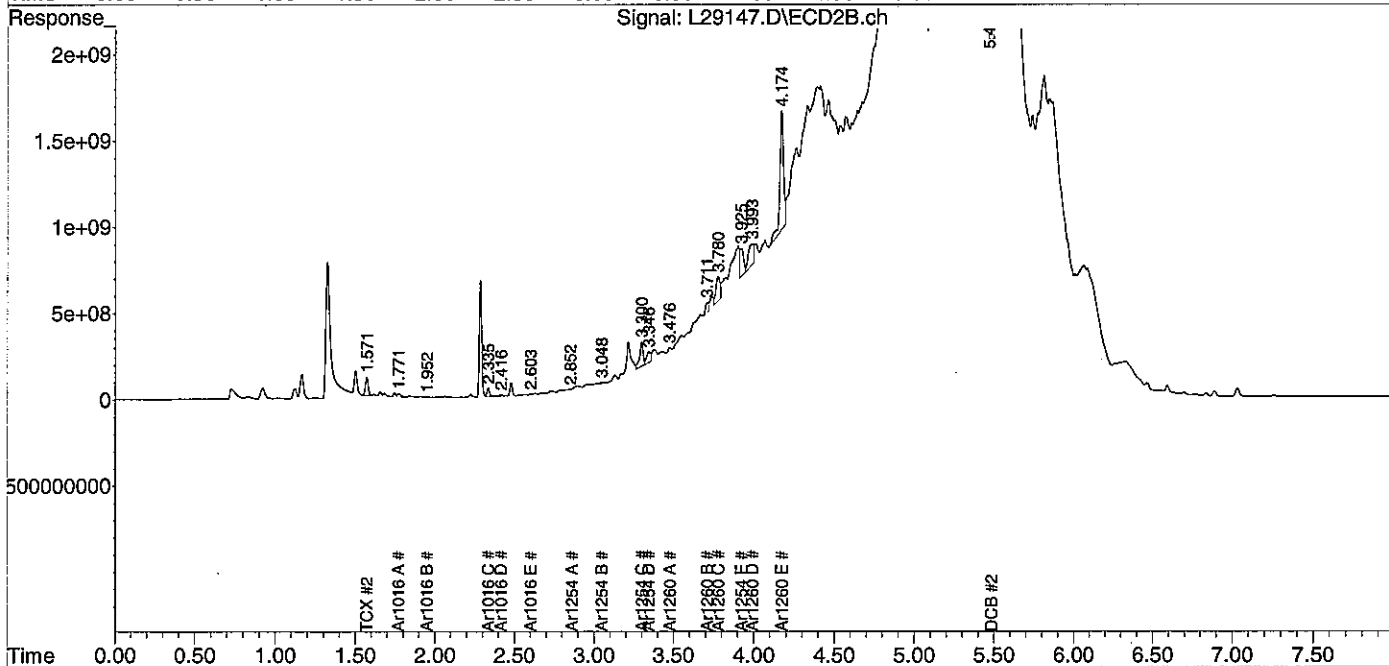
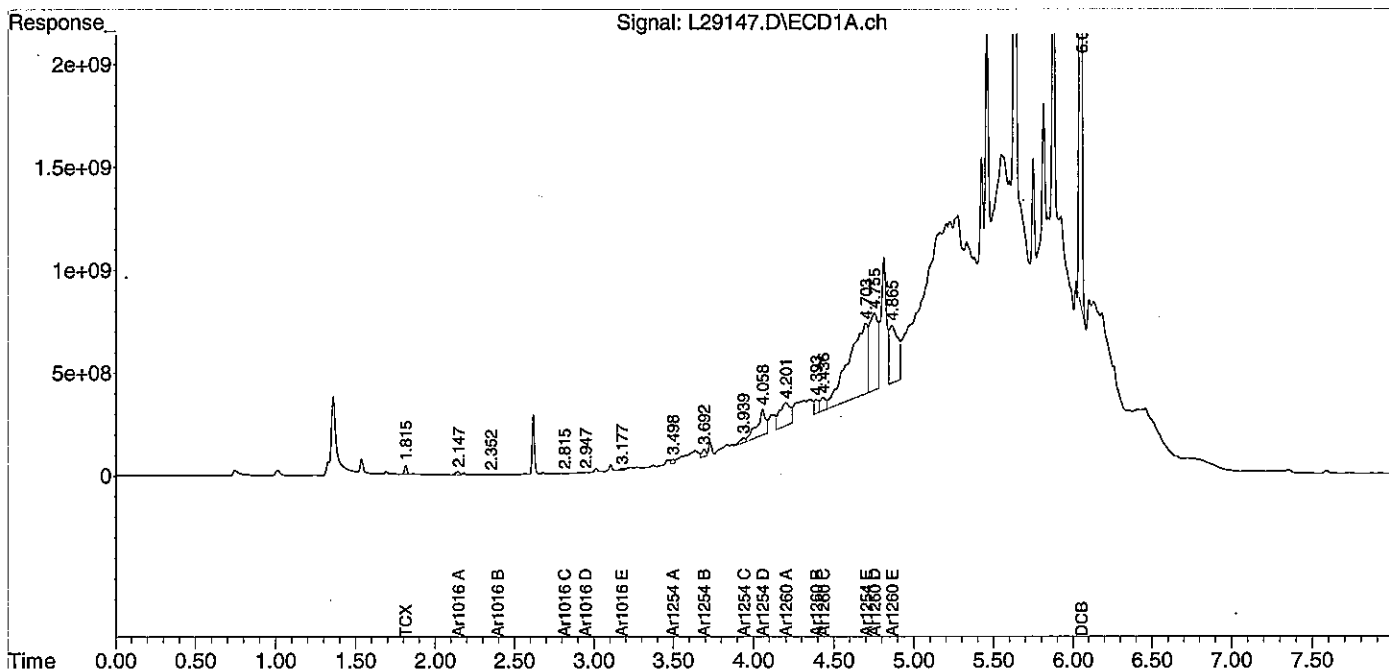
**COMMENTS:** Results are expressed on a dry weight basis.



Data Path : C:\msdchem\1\DATA\032112-L\  
 Data File : L29147.D  
 Signal(s) : Signal #1: ECD1A.ch Signal #2: ECD2B.ch  
 Acq On : 22 Mar 2012 7:36 pm  
 Operator : JK  
 Sample : 72374-7,,A/C  
 Misc : SOIL  
 ALS Vial : 19 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
 Integration File signal 2: autoint2.e  
 Quant Time: Apr 02 15:45:18 2012  
 Quant Method : C:\msdchem\1\METHODS\PCB032112.M  
 Quant Title : SW-846 METHOD 8082 Aroclor 1016/1260/1254  
 QLast Update : Thu Mar 22 10:38:07 2012  
 Response via : Initial Calibration  
 Integrator: ChemStation

Volume Inj. : 2 uL  
 Signal #1 Phase : STX-CLPPesticides Signal #2 Phase: STX-CLPPesticides  
 Signal #1 Info : 30 m x 0.25mm x 0 Signal #2 Info : 30 m x 0.25mm x 0.25 um



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April 2, 2012

**SAMPLE DATA**

**CLIENT SAMPLE ID**

**Project Name:** Cumberland County Civic Center

**Project Number:** 12-3051

**Field Sample ID:** ED-3

**Lab Sample ID:** 72374-8

**Matrix:** Solid

**Percent Solid:** 100

**Dilution Factor:** 6

**Collection Date:** 03/15/12

**Lab Receipt Date:** 03/20/12

**Extraction Date:** 03/20/12

**Analysis Date:** 03/22/12

PCB ANALYTICAL RESULTS		
COMPOUND	Quantitation Limit $\mu\text{g}/\text{kg}$	Results $\mu\text{g}/\text{kg}$
PCB-1016	198	U
PCB-1221	198	U
PCB-1232	198	U
PCB-1242	198	U
PCB-1248	198	U
PCB-1254	198	U
PCB-1260	198	U
<b>Surrogate Standard Recovery</b>		
2,4,5,6-Tetrachloro-m-xylene	74	%
Decachlorobiphenyl	72	%
U=Undetected J=Estimated E=Exceeds Calibration Range B=Detected in Blank		

**METHODOLOGY:** Sample analysis conducted according to Test Methods for Evaluating Solid Waste, SW-846 Method 8082.  
Sample preparation conducted according to Test Methods for Evaluating Solid Waste, SW-846 Method 3540C.  
Sample cleanup was conducted according to SW-846 Method 3665A.

**COMMENTS:** Results are expressed on a dry weight basis.

PCB Report

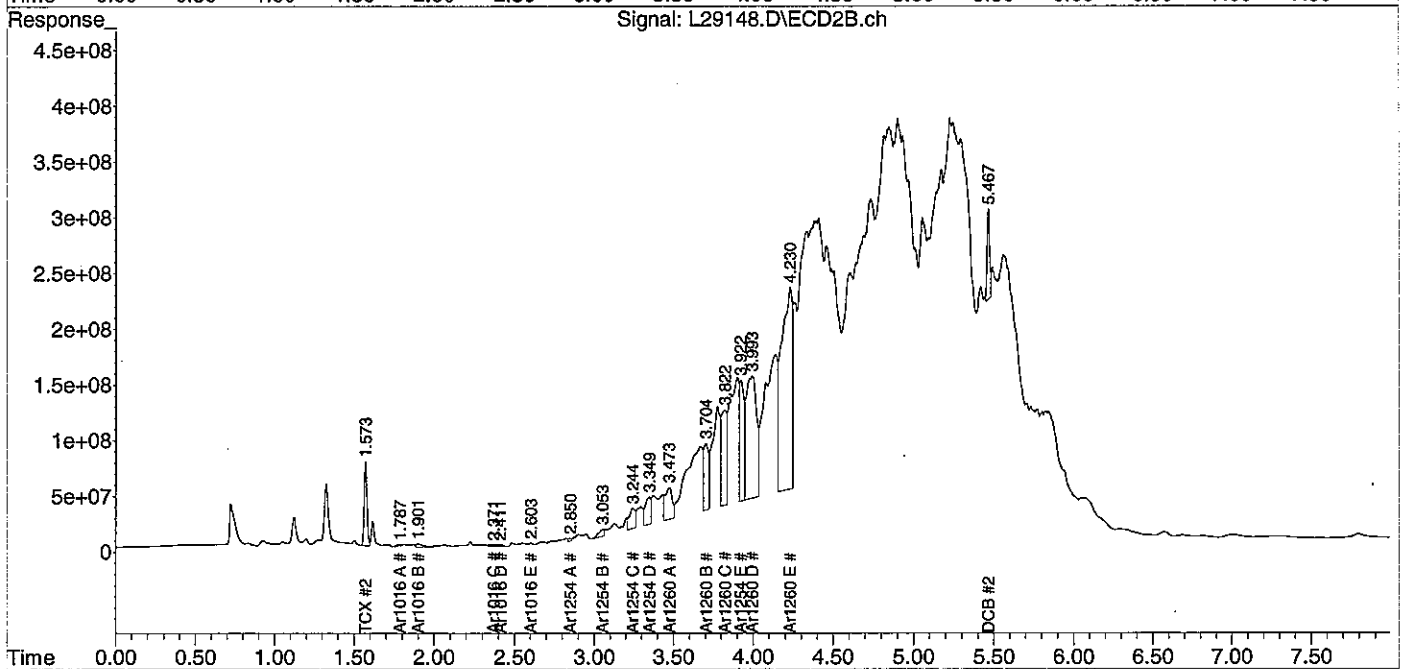
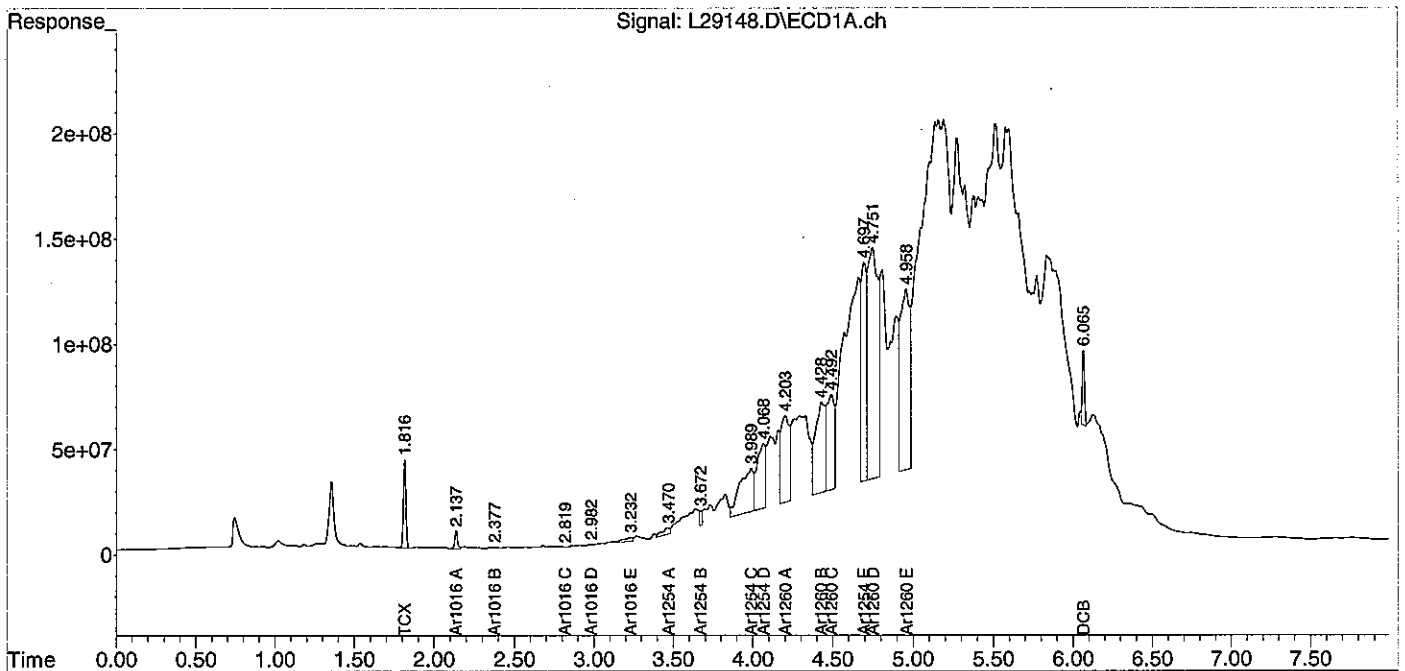
Authorized signature



Data Path : C:\msdchem\1\DATA\032112-L\  
 Data File : L29148.D  
 Signal(s) : Signal #1: ECD1A.ch Signal #2: ECD2B.ch  
 Acq On : 22 Mar 2012 7:46 pm  
 Operator : JK  
 Sample : 72374-8,,A/C  
 Misc : SOIL  
 ALS Vial : 20 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
 Integration File signal 2: autoint2.e  
 Quant Time: Apr 02 15:45:42 2012  
 Quant Method : C:\msdchem\1\METHODS\PCB032112.M  
 Quant Title : SW-846 METHOD 8082 Aroclor 1016/1260/1254  
 QLast Update : Thu Mar 22 10:38:07 2012  
 Response via : Initial Calibration  
 Integrator: ChemStation

Volume Inj. : 2 uL  
 Signal #1 Phase : STX-CLPPesticides Signal #2 Phase: STX-CLPPesticides  
 Signal #1 Info : 30 m x 0.25mm x 0 Signal #2 Info : 30 m x 0.25mm x 0.25 um



Mr. Dennis Kingman  
Summit Environmental  
8 Harlow St. Suite 4A  
Bangor ME 04401

April 2, 2012

**SAMPLE DATA**

**CLIENT SAMPLE ID**

**Project Name:** Cumberland County Civic Center  
**Project Number:** 12-3051  
**Field Sample ID:** SD-4

**Lab Sample ID:** 72374-9  
**Matrix:** Solid  
**Percent Solid:** 99  
**Dilution Factor:** 5  
**Collection Date:** 03/15/12  
**Lab Receipt Date:** 03/20/12  
**Extraction Date:** 03/20/12  
**Analysis Date:** 03/22/12

**PCB ANALYTICAL RESULTS**

COMPOUND	Quantitation Limit $\mu\text{g}/\text{kg}$	Results $\mu\text{g}/\text{kg}$
PCB-1016	165	U
PCB-1221	165	U
PCB-1232	165	U
PCB-1242	165	U
PCB-1248	165	U
PCB-1254	165	U
PCB-1260	165	U
<b>Surrogate Standard Recovery</b>		
2,4,5,6-Tetrachloro-m-xylene	84	%
Decachlorobiphenyl	I	%
U=Undetected J=Estimated E=Exceeds Calibration Range B=Detected in Blank		

**METHODOLOGY:** Sample analysis conducted according to Test Methods for Evaluating Solid Waste, SW-846 Method 8082.  
Sample preparation conducted according to Test Methods for Evaluating Solid Waste, SW-846 Method 3540C.  
Sample cleanup was conducted according to SW-846 Method 3665A.

**COMMENTS:** Results are expressed on a dry weight basis.  
I=Unable to read surrogate results due to interference.

PCB Report

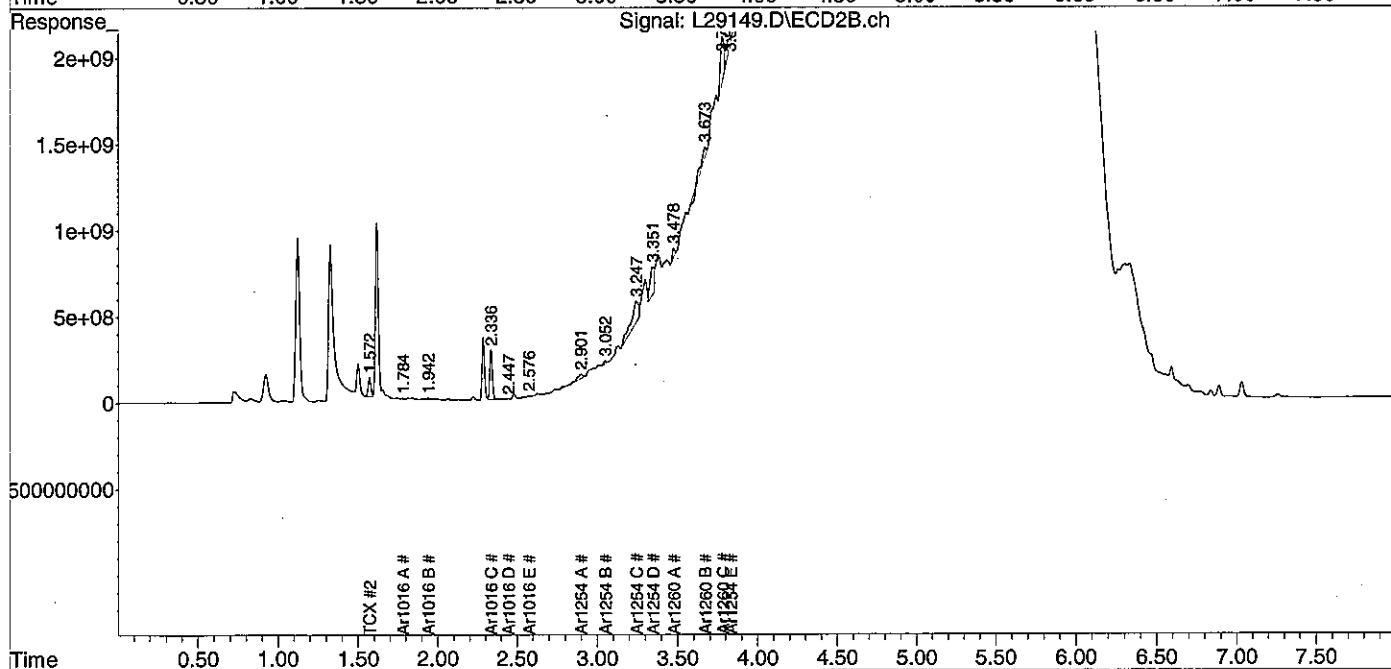
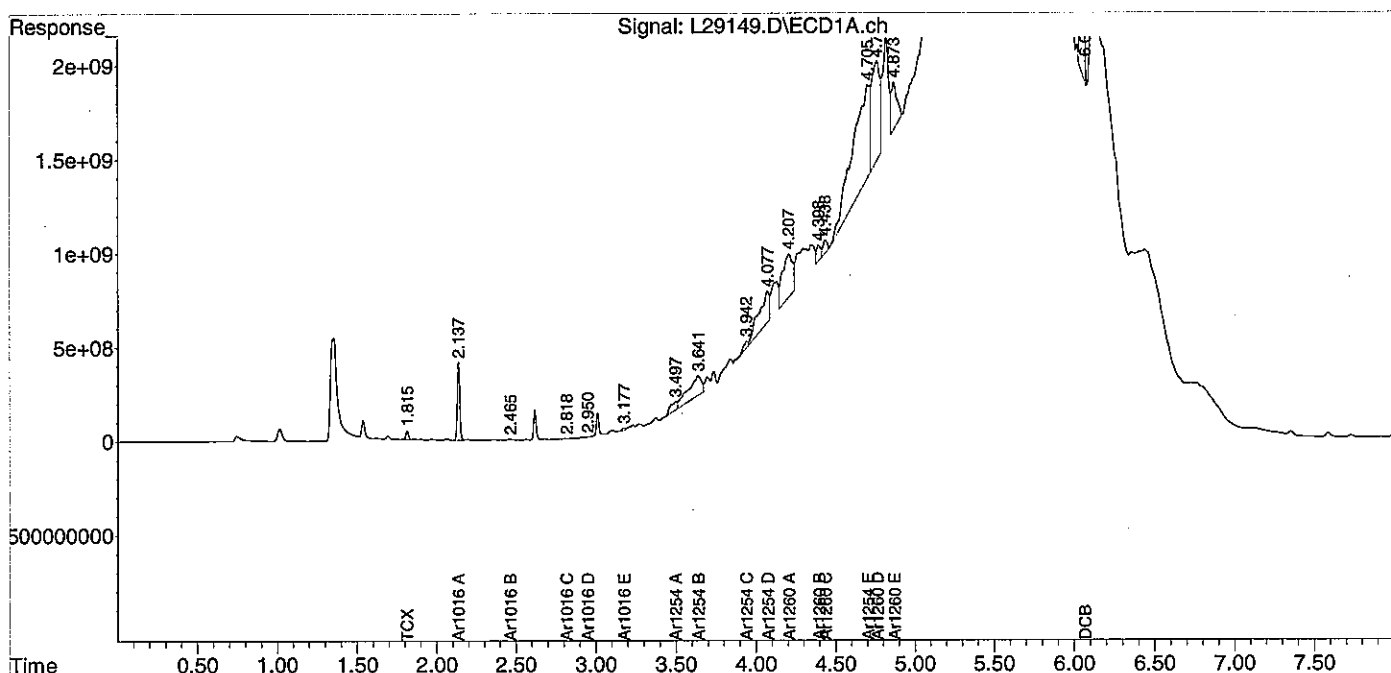
Authorized signature



Data Path : C:\msdchem\1\DATA\032112-L\  
 Data File : L29149.D  
 Signal(s) : Signal #1: ECD1A.ch Signal #2: ECD2B.ch  
 Acq On : 22 Mar 2012 7:57 pm  
 Operator : JK  
 Sample : 72374-9,,A/C  
 Misc : SOIL  
 ALS Vial : 21 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
 Integration File signal 2: autoint2.e  
 Quant Time: Apr 02 15:46:30 2012  
 Quant Method : C:\msdchem\1\METHODS\PCB032112.M  
 Quant Title : SW-846 METHOD 8082 Aroclor 1016/1260/1254  
 QLast Update : Thu Mar 22 10:38:07 2012  
 Response via : Initial Calibration  
 Integrator: ChemStation

Volume Inj. : 2 uL  
 Signal #1 Phase : STX-CLPPesticides Signal #2 Phase: STX-CLPPesticides  
 Signal #1 Info : 30 m x 0.25mm x 0 Signal #2 Info : 30 m x 0.25mm x 0.25 um



Mr. Dennis Kingman  
 Summit Environmental  
 8 Harlow St. Suite 4A  
 Bangor ME 04401

April 2, 2012

**SAMPLE DATA**

**CLIENT SAMPLE ID**

**Project Name:** Cumberland County Civic Center  
**Project Number:** 12-3051  
**Field Sample ID:** SD-5

**Lab Sample ID:** 72374-10  
**Matrix:** Solid  
**Percent Solid:** 98  
**Dilution Factor:** 10  
**Collection Date:** 03/15/12  
**Lab Receipt Date:** 03/20/12  
**Extraction Date:** 03/20/12  
**Analysis Date:** 03/22/12

**PCB ANALYTICAL RESULTS**

COMPOUND	Quantitation Limit $\mu\text{g}/\text{kg}$	Results $\mu\text{g}/\text{kg}$
PCB-1016	330	U
PCB-1221	330	U
PCB-1232	330	U
PCB-1242	330	U
PCB-1248	330	U
PCB-1254	330	U
PCB-1260	330	U
<b>Surrogate Standard Recovery</b>		
2,4,5,6-Tetrachloro-m-xylene	86	%
Decachlorobiphenyl	60	%
U=Undetected J=Estimated E=Exceeds Calibration Range B=Detected in Blank		

**METHODOLOGY:** Sample analysis conducted according to Test Methods for Evaluating Solid Waste, SW-846 Method 8082.  
 Sample preparation conducted according to Test Methods for Evaluating Solid Waste, SW-846 Method 3540C.  
 Sample cleanup was conducted according to SW-846 Method 3665A.

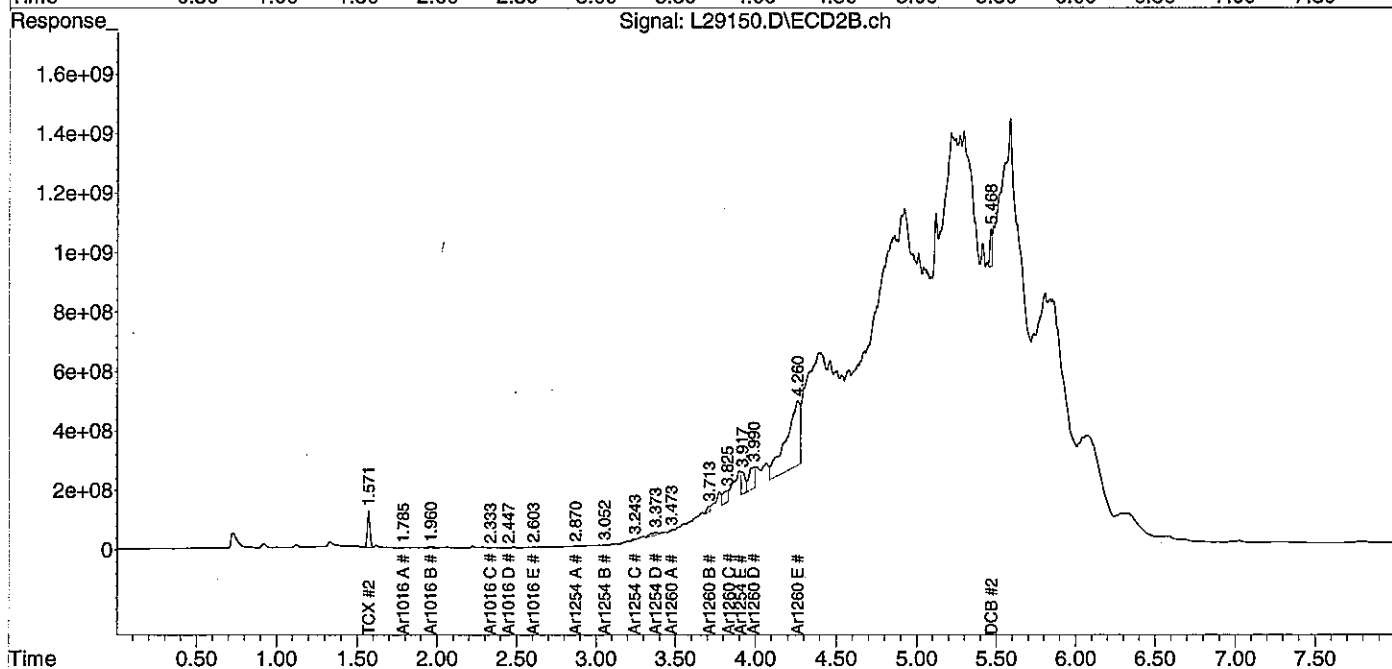
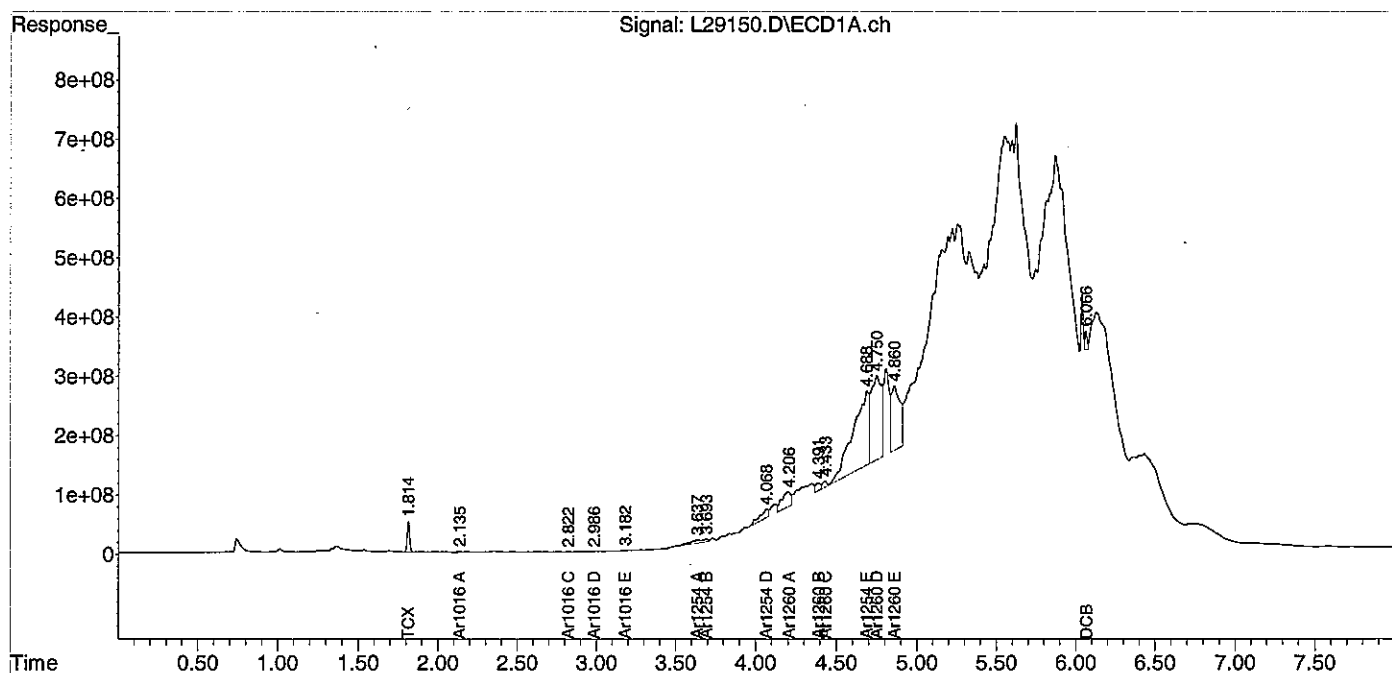
**COMMENTS:** Results are expressed on a dry weight basis.



Data Path : C:\msdchem\1\DATA\032112-L\  
 Data File : L29150.D  
 Signal(s) : Signal #1: ECD1A.ch Signal #2: ECD2B.ch  
 Acq On : 22 Mar 2012 8:07 pm  
 Operator : JK  
 Sample : 72374-10,,A/C  
 Misc : SOIL  
 ALS Vial : 22 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
 Integration File signal 2: autoint2.e  
 Quant Time: Apr 02 15:47:07 2012  
 Quant Method : C:\msdchem\1\METHODS\PCB032112.M  
 Quant Title : SW-846 METHOD 8082 Aroclor 1016/1260/1254  
 QLast Update : Thu Mar 22 10:38:07 2012  
 Response via : Initial Calibration  
 Integrator: ChemStation

Volume Inj. : 2 uL  
 Signal #1 Phase : STX-CLPPesticides Signal #2 Phase: STX-CLPPesticides  
 Signal #1 Info : 30 m x 0.25mm x 0.2 Signal #2 Info : 30 m x 0.25mm x 0.25 um





PCB  
QC FORMS



PCB SOIL  
LABORATORY CONTROL SAMPLE/DUPLICATE  
PERCENT RECOVERY

Instrument ID: L

GC Column #1: STX-CLPesticides I

Column ID: 0.25 mm

GC Column #2: STX-CLPesticides II

Column ID: 0.25 mm

SDG: 72374

Non-spiked sample: B032012PSOX,RR,,A/C

Spike: L032012PSOX,RR,,A/C

Spike duplicate: LD032012PSOX,RR,,A/C

COMPOUND	LCS SPIKE	LCSD SPIKE	LOWER	UPPER	RPD	NON-SPIKE	SPIKE	SPIKE		SPIKE DUP		SPIKE DUP		RPD	
	ADDED (ug/kg)	ADDED (ug/kg)	LIMIT	LIMIT	LIMIT	RESULT (ug/kg)	RESULT (ug/kg)	% REC	#	RESULT (ug/kg)	% REC	#	RPD	#	
PCB 1016	200	200	65	140	30	0	170	85		170	85		0.0		
PCB 1260	200	200	60	130	30	0	173	86		181	91		4.6		
PCB 1016 #2	200	200	65	140	30	0	163	82		184	92		11.9		
PCB 1260 #2	200	200	60	130	30	0	183	91		192	96		5.1		

# Column to be used to flag recovery and RPD values outside of QC limits

\* Values outside QC limits

LCS/LCSD spike added values have been weight adjusted.

Non-spike result of "0" used in place of "U" to allow calculation of spike recovery.

Comments: \_\_\_\_\_  
\_\_\_\_\_

PCB SOIL  
MATRIX SPIKE/DUPLICATE  
PERCENT RECOVERY

Instrument ID: L

GC Column #1: STX-CLPesticides I

Column ID: 0.25 mm

GC Column #2: STX-CLPesticides II

Column ID: 0.25 mm

SDG: 72374

Non-spiked sample: 72374-10,,A/C

Spike: 72374-10,MS,,A/C

Spike duplicate: 72374-10,MSD,,A/C

COMPOUND	MS SPIKE	MSD SPIKE	LOWER	UPPER	RPD	NON-SPIKE	SPIKE	SPIKE		SPIKE DUP		SPIKE DUP		RPD	#
	ADDED (ug/kg)	ADDED (ug/kg)	LIMIT	LIMIT	LIMIT	RESULT (ug/kg)	RESULT (ug/kg)	% REC	#	RESULT (ug/kg)	% REC	#	#		
PCB 1016	1725	1100	65	145	30	0	1437	83		936	85		42.2	*	
PCB 1260	1725	1100	65	145	30	0	2420	140		1367	124		55.6	*	
PCB 1016 #2	1725	1100	65	145	30	0	2431	141		1002	91		83.3	*	
PCB 1260 #2	1725	1100	65	145	30	0	1756	102		1364	124		25.1		

# Column to be used to flag recovery and RPD values outside of QC limits

\* Values outside QC limits

MS/MSD spike added values have been weight adjusted.

Non-spike result of "0" used in place of "U" to allow calculation of spike recovery.

Comments: \_\_\_\_\_  
\_\_\_\_\_

## CHAIN OF CUSTODIES

# Chain Of Custody Form

environmental laboratory LLC		195 Commerce Way, Suite E Portsmouth, NH 03801 (800) 929-9906		(603) 436-5111 (603) 430-2151 Fax		For Analytics Use Only	
Project Name: <b>Cumberland County Civic Center</b>		Circle and/or Write Required Analysis Followed by Preservation Code		Samples were: <b>10 Shipped or hand-delivered</b>		2) Temperature (°C): <b>5.5</b>	
Project#: <b>12-3051</b>		Please list in preservation code here		3) Received in good condition: <b>Y</b> or <b>N</b>		4) pH checked by: <b>NH</b>	
Company: <b>SUMMIT ENVIRONMENTAL</b>		Metals: RCRA8 PP13 TAL23 Other**		5) Labels checked by: <b>DV slzdlz</b>		Matrix Key: C = Concrete WP = Wipe WW = Wastewater SW = Surface Water E = Extract	
Report to: <b>DENNIS KINGMAN</b>		VPH: Full or Ranges only TETPH		Matrix No. of Containers checked pH checked Analytics Sample #		State Standard: (eg. S-1 or GW-1) EDD Required: Y* N Type:	
Address: <b>8 NARLOW ST SUITE 41A</b>		EPH: Full or Ranges only TETPH		X 1 ← 72374-1		Report Type: <input type="checkbox"/> MCP* <input type="checkbox"/> CTRCP* <input type="checkbox"/> DOD* <input type="checkbox"/> Standard	
Phone: <b>207-263-9040</b>		TPH: 8015 (Gas Range) ME4217 TPH: 8015 (Diesel Range) 8100M ME4125		2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9 10 10		Project Requirements: *Fee may apply	
Quote #:		PCB: 8082 608 Soxhlet Y or N		VOC: 8260 524.2 624		State: <input type="checkbox"/> NH <input type="checkbox"/> MA <input checked="" type="checkbox"/> ME <input type="checkbox"/> CT <input type="checkbox"/> RI	
PO# (if required):		Pesticides: 8081 608		SVOC: 8270 625 PAH only SIM		Other:	
Sample Identification		Field Filtered? Y or N		VOC: 8260 524.2 624		Turnaround Time (TAT) <input type="checkbox"/> 24 Hours* <input type="checkbox"/> 48 Hours* <input type="checkbox"/> 72 Hours* <input type="checkbox"/> 5 Days* <input checked="" type="checkbox"/> 10 Days	
Sample Date		Sample Time		SVOC: 8270 625 PAH only SIM		Sampler Name (Print): <b>DENNIS KINGMAN</b>	
NW 3-1 NW 3-2 NW 3-3 SW 3-4 SW 3-5 ND-1 ND-2 ED-3 SD-4 SD-5		3/5/12 1415 1420 1440 1510 1535 1445 1445 1510 1525 1540		VOC: 8260 524.2 624		Relinquished By Sampler: <b>[Signature]</b>	
Comments, Additional Analyses, or Special Instructions: <b>PCB BULK CAULK Soxhlet extraction</b>		** List requested metals here		Relinquished By: <b>[Signature]</b>		Relinquished By: <b>[Signature]</b>	
Email Results to: <b>DKINGMAN@SUMMITENV.COM</b>		Please note: For volatile analyses, a trip blank has been provided in the cooler. If you want the trip blank run and reported please write the trip blank on the COC. Trip Blank analyses will be charged unless other arrangements have been made.		Relinquished By: <b>[Signature]</b>		Relinquished By: <b>[Signature]</b>	
Turnaround Time (TAT)		Date: <b>3-19-12</b> Time: <b>1800</b>		Relinquished By: <b>[Signature]</b>		Relinquished By: <b>[Signature]</b>	
Relinquished By:		Date: <b>3/20/12</b> Time: <b>930</b>		Relinquished By: <b>[Signature]</b>		Relinquished By: <b>[Signature]</b>	
Relinquished By:		Date:		Relinquished By:		Relinquished By:	

ANALYTICS SAMPLE RECEIPT CHECKLIST



AEL LAB#: 72374 COOLER NUMBER: 264  
 CLIENT: Summit NUMBER OF COOLERS: 1  
 PROJECT: Cumberland County Civic Center

**A: PRELIMINARY EXAMINATION:**

1. Cooler received by (initials): CP DATE COOLER RECEIVED/OPENED: 3/20/12
2. Circle one:  Shipped  Hand delivered (If so, skip 3)
3. Did cooler come with a shipping slip?  Y  N  
 3a. Enter carrier name and airbill number here: FedEx 7981 8392 9722
4. Were custody seals on the outside of cooler?  Y  N  
 How many & where: \_\_\_\_\_ Seal Date: \_\_\_\_\_ Seal Name: \_\_\_\_\_
5. Did the custody seals arrive unbroken and intact upon arrival?  Y  N
6. COC#: ✓
7. Were Custody papers filled out properly (ink, signed, legible, project information etc)?  Y  N
8. Were custody papers sealed in a plastic bag?  Y  N
9. Did you sign the COC in the appropriate place?  Y  N
10. Was enough ice used to chill the cooler?  Y  N Temp. of cooler: 5.5 on ice

**B. Log-In:** Date samples were logged in: 3/20/12 By: CP

11. Were all bottles sealed in separate plastic bags?  Y  N
12. Did all bottles arrive unbroken and were labels in good condition?  Y  N
13. Were all bottle labels complete (ID, Date, time, etc.)?  Y  N
14. Did all bottle labels agree with custody papers?  Y  N
15. Were the correct containers used for the tests indicated?  Y  N
16. Were samples received at the correct pH?  Y  N/A
17. Was sufficient amount of sample sent for the tests indicated?  Y  N
18. Were all samples submitted within holding time?  Y  N
19. Were VOA samples absent of greater than pea-sized bubbles?  Y  N/A  
 (Note: Pea-sized bubbles or smaller are acceptable and are not considered to adversely affect volatiles data.)

If NO, List Sample ID's, Lab #s: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

\*When bubbles are present in VOA samples they are labelled from smallest (or no bubbles) to largest. Lab to analyze VOA samples with no bubbles or smallest bubbles first.

20. Laboratory labeling verified by (initials): DW Date: 3/20/12

From: (207) 262-9040  
Dennis Kingman  
SUMMIT ENVIRONMENTAL CONSULT  
8 HARLOW STREET  
SUITE 4A  
BANGOR, ME 04401

Origin ID: BGRA



J12101112190225

Ship Date: 19MAR12  
ActWgt: 20.0 LB  
CAD: 1957951/INET3250

Delivery Address Bar Code



SHIP TO: (603) 436-5111

BILL SENDER

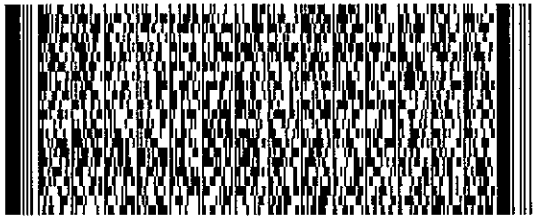
**Steve Knollmeyer**  
**Analytics Environmental Laboratory**  
**195 COMMERCE WAY UNIT E**

**PORTSMOUTH, NH 03801**

Ref # 12-3051  
Invoice #  
PO #  
Dept #

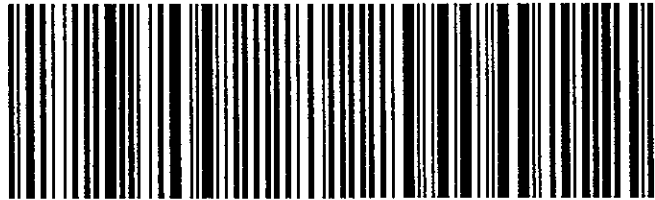
**TUE - 20 MAR A2**  
**STANDARD OVERNIGHT**

TRK# 7981 8392 9722  
0201



**03 IGGA**

**03801**  
NH-US  
**MHT**



512G1/81D5/A278

**After printing this label:**

1. Use the 'Print' button on this page to print your label to your laser or inkjet printer.
2. Fold the printed page along the horizontal line.
3. Place label in shipping pouch and affix it to your shipment so that the barcode portion of the label can be read and scanned.

**Warning:** Use only the printed original label for shipping. Using a photocopy of this label for shipping purposes is fraudulent and could result in additional billing charges, along with the cancellation of your FedEx account number.

Use of this system constitutes your agreement to the service conditions in the current FedEx Service Guide, available on fedex.com. FedEx will not be responsible for any claim in excess of \$100 per package, whether the result of loss, damage, delay, non-delivery, misdelivery, or misinformation, unless you declare a higher value, pay an additional charge, document your actual loss and file a timely claim. Limitations found in the current FedEx Service Guide apply. Your right to recover from FedEx for any loss, including intrinsic value of the package, loss of sales, income interest, profit, attorney's fees, costs, and other forms of damage whether direct, incidental, consequential, or special is limited to the greater of \$100 or the authorized declared value. Recovery cannot exceed actual documented loss. Maximum for items of extraordinary value is \$500, e.g. jewelry, precious metals, negotiable instruments and other items listed in our Service Guide. Written claims must be filed within strict time limits, see current FedEx Service Guide.



## *Appendix F*

MEDEP Forms X and Y

**Asbestos Bulk Sampling Protocols and Disclosure**

State of Maine  
Department of Environmental Protection  
Lead & Asbestos Hazard Prevention Program  
17 State House Station, Augusta, ME 04333  
TEL (207) 287-2651 FAX (207) 287-6220

**FORM**

**X**

Page 1 of 1  
2011

**Asbestos Bulk Sampling**

Bulk samples must be collected by a Department-certified Inspector in a random manner such that they are representative of each homogenous area. Bulk samples shall be collected and analyzed for all asbestos abatement activities unless an approved disclosure is received by the owner or owner's agent from the operator prior to the start of the project.

An asbestos consultant may implement an alternative sampling protocol that collects more but not less than the number of samples per homogeneous area, provided the asbestos consultant has informed the building owner or owner's agent of the standard sampling protocol set forth below prior to the sampling event. The asbestos consultant must document that the building owner or owner's agent received information regarding the standard sampling protocol set forth in this section by obtaining the building owner's or owner's agent's signature on a statement acknowledging receipt of the information before the sampling event begins.

**Standard Sampling Protocol**

- **Surfacing Material:** 3 bulk samples from each homogenous area and/or material that is 1,000 square feet or less. 5 bulk samples from each homogenous area that is greater than 1,000 square feet but less than or equal to 5000 square feet. 7 bulk samples from each homogenous area that is greater than 5,000 square feet.
- **Thermal System Insulation:** 3 bulk samples from each homogenous area. 1 bulk sample from each homogenous area of patched thermal system insulation if the patched section is less than 6 linear or square feet. Samples sufficient to determine whether the material is ACM from each insulated mechanical system where cement is utilized on tees, elbows, or valves.
- **Miscellaneous ACM:** 3 samples from each miscellaneous material. 1 sample if the amount of miscellaneous material is less than 6 square or linear feet.

**Asbestos Bulk Sampling Disclosure**

I have reviewed and understand the Standard Sampling Protocol and any benefits and associated costs of an Alternative Sampling Protocol with Summit Environmental Consultants, Inc., a Maine licensed Asbestos Consultant. I also understand that a copy of this completed form must be available upon request by the MDEP.

Neil Pratt - CC Board Chair  
Signature (Building Owner/Agent)

Neal Pratt  
Print Name

Date 3/7/12

**Facility Location(where bulk sampling is to take place)**

BLDG Name Cumberland County Civic Center

Physical Address One Civic Center Square City Portland

Floor and/or Rm.# Entire Building

**Asbestos Bulk  
Sample Analysis  
Protocols and  
Disclosure**

State of Maine  
Department of Environmental Protection  
Lead & Asbestos Hazard Prevention Program  
17 State House Station, Augusta, ME 04333  
TEL (207) 287-2651 FAX (207) 287-6220

**FORM  
Y**

Page 1 of 2  
2011

**Bulk Sample Analysis**

Bulk samples collected must be analyzed by a Department-licensed Asbestos Analytical Laboratory. Bulk samples shall be analyzed until a positive result is obtained or all samples have been analyzed. Reanalysis is not required if the sample result is less than 1%. Wherever there is a suspect asbestos-containing material and a mastic/adhesive affixed to that material, the mastic/adhesive shall be analyzed and reported separately from the suspect asbestos-containing material.

**Standard Analytical Methods**

- Surfacing Materials, Thermal System Insulation and Cementitious Materials: PLM-EPA 600/R-93/116 visual estimation method (1993).
- Non-friable Organically Bound Materials (NOB): PLM NOB-EPA 600/R-93/116 with gravimetric preparation method. (including but not limited to floor tiles, asphalt shingles, caulking, glazing, mastics, coatings, sealants, adhesives and glues)

**Alternative Analytical Methods**

- Surfacing Materials and Thermal System Insulation: PLM EPA/600/R-93/116 (200 Point Count); PLM EPA/600/R-93/116 (400 Point Count); or PLM EPA/600/R-93/116 (1000 Point Count). May be used whenever the asbestos analytical laboratory has reported friable bulk samples with an asbestos content of less than 10% using the standard visual estimation.
- Surfacing Materials, Thermal System Insulation and Cementitious Materials: EPA 600/R-93/116 section 2.5.5.2 (TEM % by Mass). May be used whenever the asbestos analytical laboratory has determined is it not feasible or appropriate to have bulk sample(s) analyzed using the standard visual estimation.
- Non-friable Organically Bound Materials (NOB): PLM EPA/600/R-93/116 (200 Point Count); PLM EPA/600/R-93/116 (400 Point Count); or PLM EPA/600/R-93/116 (1000 Point Count). May be used whenever the asbestos analytical laboratory has reported an NOB sample with an asbestos content of less than 10% using the standard visual estimation.
- Non-friable Organically Bound Materials (NOB): TEM EPA NOB EPA/600/R-93/116b section 2.5, and TEM Chatfield method. May be used whenever the asbestos analytical laboratory has determined is it not feasible or appropriate to have bulk sample(s) analyzed using the standard visual estimation.

**Important Notice**

An analytical laboratory may use TEM, or other Department-approved analytical method, for bulk sample rather than the standard PLM analytical method. The Asbestos Consultant that collected the bulk samples for the building owner must document that the building owner or owner's agent received information regarding the standard analytical protocol set forth in the rule by obtaining the building owner's or owner's agent's signature on a statement acknowledging receipt of the information before the alternative analytical methods are employed.

**Asbestos Bulk  
Sample Analysis  
Protocols and  
Disclosure**

State of Maine  
Department of Environmental Protection  
Lead & Asbestos Hazard Prevention Program  
17 State House Station, Augusta, ME 04333  
TEL (207) 287-2651 FAX (207) 287-6220

**FORM  
Y**

Page 2 of 2  
2011

**Asbestos Bulk Sample Analysis Disclosure**

**Asbestos Design Consultant**

I have reviewed the Standard Analytical Protocols with the building owner/agent. I have also advised the building owner or the building owner's agent that whenever the asbestos analytical laboratory has determined it is not feasible or appropriate to have bulk sample(s) of suspect asbestos-containing surfacing materials analyzed using the standard method, the building owner or the building owner's agent may then either elect to treat the suspect bulk material(s) as asbestos-containing with no further analysis required, or may consent to the use of an alternative analytical method to determine whether the suspect bulk sample(s) is asbestos-containing. I also understand that a copy of this completed form must be available upon request at the asbestos project site.



Dennis B. Kingman, Jr. CHMM

Signature (Asbestos Design Consultant)

Print Name

Date March 1, 2012

**Building Owner/Agent**

I have reviewed the Asbestos Bulk Sample Analysis Protocols with the above Asbestos Design Consultant. I further understand that whenever the asbestos analytical laboratory has determined it is not feasible or appropriate to have bulk sample(s) of suspect asbestos-containing surfacing materials analyzed using the standard method, I may then either elect to treat the suspect bulk material(s) as asbestos-containing with no further analysis required, or may consent to the use of an alternative analytical method to determine whether the suspect bulk sample(s) is asbestos-containing.



Signature (Building Owner/Agent)

Print Name

Date 3/7/12

**Facility Location(where bulk samples were collected)**

BLDG Name Cumberland County Civic Center

Physical Address One Civic Center Square City Portland

Floor and/or Rm.# Entire building



# Building Code Report

Project No. 7657.00

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## CUMBERLAND COUNTY CIVIC CENTER

PORTLAND, MAINE



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## 1.0 **INTRODUCTION**

This Report presents the Building Code Approach for the Cumberland County Civic Center in Portland, Maine. This Building Code Report has been developed to establish and document approaches to major fire and life safety concerns.

This Report addresses the major fire protection aspects of Cumberland County Civic Center including:

- Fire-resistive Construction
- Exiting Systems
- Smoke Control System for Atrium
- Fire Suppression Systems
- Fire Alarm System
- Emergency Alarm and Communications Systems
- Emergency and Standby Power

The approaches contained within the Building Code Approach are intended to meet the requirements of the applicable codes.



## 2.0 **SCOPE**

This Report outlines major fire and life safety code criteria affecting the design of the Cumberland County Civic Center. Criteria are summarized primarily from the Maine Uniform Building and Energy Code (an Amended 2009 International Building Code (IBC)) and the 2009 NFPA 101 *Life Safety Code* (NFPA 101), as well as the City of Portland Fire Prevention and Protection code, which incorporates amended 2009 Editions of NFPA 1 Fire Code and NFPA 101 *Life Safety Code*, the City of Portland Technical Standard, and the City of Portland Fire Department Rules and Regulations. Major life safety design approaches have been summarized in Section 5.0, *Fire Protection Approach*.





### 3.0 **BUILDING DESCRIPTION**

The Cumberland County Civic Center is an existing Arena with a maximum occupant load of 8,700 based on a concert seating arrangement. Circulation levels and amenities are as follows:

- **Mechanical Level**  
(@ 50 feet – 10 inches) This level includes a mechanical room, electrical switch gear room, emergency generator, fire pump, and lobby circulation space. This level and the Event Floor are considered as one story.
- **Event Floor**  
(@ 67 feet – 2 ½ inches) This level includes offices, ticketing, a meeting room, commissary, loading/staging area, locker rooms, a star dressing room, ice suites, toilet rooms, storage, and other back-of-house spaces.
- **Concourse Level**  
(@ 76 feet – 0 inches) This level includes a circulation concourse, ticketing, team store, two suites, toilets, concessions, and other back-of-house spaces.
- **Northwest Entry Level**  
(@ 89 feet – 6 ½ inches) This level includes a lobby, two suites, offices, toilet rooms, and other back-of-house spaces and is considered a mezzanine to the Concourse Level.
- **Suite Level**  
(@ 103 feet – 7 ½ inches) This level includes two suites and is considered a mezzanine to the Concourse Level.



#### **4.0 CODES AND STANDARDS**

The City of Portland, Maine is currently enforcing the Maine Uniform Building & Energy Code (an Amended 2009 International Building Code (IBC)) and the 2009 Life Safety Code (NFPA 101). The following additional codes are enforced:

- 2009 NFPA 54 National Fuel Gas Code
- 2009 NFPA 1 National Fire Code
- 2008 National Electrical Code (NFPA 70, NEC)
- 2010 Maine State Plumbing Code (2009 Uniform Plumbing Code)
- 2010 Americans with Disabilities Act (ADA)
- 2009 International Existing Building Code (IEBC)
- 2009 International Energy Conservation Code (IECC)
- ASHRAE 62.1 – 2007
- ASHRAE 62.2 – 2007
- ASHRAE 90.1 – 2007
- ASTM E1465-06
- City of Portland Technical Manual – Section 3
- 2010 NFPA 72 National Fire Alarm and Signaling Code
- City of Portland Fire Department Rules and Regulations



## **5.0 FIRE PROTECTION APPROACH**

This Report describes the Building Code Approach for the Cumberland County Civic Center.

This Report addresses the following major issues:

- Occupancy
- Fire-resistive Construction
- Exiting Systems
- Smoke Control System for Atrium
- Fire Suppression Systems
- Fire Detection Systems
- Emergency Alarm and Communications Systems
- Standby Power
- Firefighting Access and Facilities

### **5.1 OCCUPANCY**

The building is a three-story building with a height of approximately 77 feet (measured to the roof line), and contains use groups A-4, B, S-1, and S-2 (IBC) and Assembly >300, Business, and Storage (NFPA 101) occupancies.

The Northwest Entry Level and Suite Level are considered mezzanines to the Concourse Level. Per Section 8.6.9.2.1 of the 2009 Edition of NFPA 101, the aggregate area of mezzanines within a room is limited to 1/3 the area of the room in which the mezzanines are located. This is more restrictive than the 2009 IBC which allows up to 1/2 of the floor area when the building is non-combustible construction, fully sprinklered, and provided with an emergency voice/alarm communication system. The aggregate area of the mezzanines is 7,569 square feet and the area of the Seating Bowl is 62,687 square feet. This 12%, which is less than 33%. Portions of the mezzanines are enclosed. Per Section 8.6.9.3 of the 2009 Edition of NFPA 101, enclosed mezzanines are permitted if the occupancy load of the enclosed space is less than 10 or if a mezzanine has two or more means of egress and if not less than one means of egress provides direct access from the enclosed area to an exit at the mezzanine level. This is more restrictive than the 2009 IBC which provides leniency for mezzanines in buildings which are fully sprinklered.

The office area is enclosed and the Suites are open to below. Since the occupant load of the enclosed portion of the office is 10 or less, the Northwest Entry Level and Suite Level meet the mezzanine requirements of the 2009 Edition of NFPA 101 and the 2009 IBC.

The IBC and NFPA 101 recognize two approaches to address mixed uses. Occupancy separations may or may not be required between any two occupancies in a building of mixed occupancy depending on the separation approach taken. In addition, some specific use areas are required to be separated regardless of the approach chosen to address a mixed occupancy building.

The Cumberland County Civic Center will use the un-separated mixed use approach. The un-separated mixed use approach, found in Section 508.3.2 of the IBC and Section 6.1.14 of the NFPA 101, requires that the building construction and fire protection comply with the most restrictive, un-separated occupancy classification.



The following areas are also separated using this approach:

OCCUPANCY/SPECIFIC HAZARD	IBC REQUIRED FIRE RESISTANCE RATING	NFPA 101
Electrical Transformer Room (Containing >112.5 kVA Dry-Type Transformer)	1-hour (NEC Section 450-21)	1-hour (NEC Section 450-21)
Fire Department Command Center (Room & Access to)	1-hour (Section 911.1)	1-hour NFPA 1 Section 11.9.2
Boiler Rooms	>15 psi and 10 hp Smoke Tight Construction (Section 508.2.5)	>200,000 Btu aggregate in room Smoke Partition Section 12.3.2
Generator Room	1-hour (Section 909.11)	2-hour NFPA 110 Section 7.2.1.1
Fire Pump Room	2-hour (Section 508.2.5)	2-hour with access approved by Fire Department NFPA 20 Section 5.12.1.1



## 5.2 FIRE-RESISTIVE CONSTRUCTION

The construction classification of the Cumberland County Civic Center is assumed to meet Type I-B (IBC) and Type II-222 (NFPA 101), per Table 602 of the IBC and Section 12.1.6 of the NFPA 101. New construction for the building will be required to meet the following parameters:

BUILDING ELEMENT	FIRE-RESISTANCE RATING
Exterior load-bearing walls	2-hour
Interior bearing structural members (columns, partitions, walls, etc.)	2-hour
	2-hour, if supporting roof only
Floors	2-hour
Roofs	1-hour; 0-hour where the lowest portion of the roof structure is 20 feet or more above the floor
Exit access corridors & Concourse	0-hour
Enclosed vertical shafts (including Type I grease duct enclosure) & exit enclosures	2-hour

Fire rated doors, frames, and hardware will be provided on openings in rated separations and vertical shafts. Doors will be self-closing or automatic closing.

- ¾-hour doors in 1-hour walls which are not shafts or exits
- 1½-hour doors in 2-hour enclosures and fire wall; doors at stair enclosures do not need to meet the additional temperature transmission criteria of a maximum of 450° F at the end of a 30-minute fire exposure in sprinklered buildings



### 5.2.3 Interior Finish

LOCATION	INTERIOR FINISH RATING IBC CHAPTER 8	INTERIOR FINISH RATING NFPA 101 SECTION 12.3.3
Stair enclosures	Class A or B	Class A or B
Corridors & lobbies	Class A or B	Class A or B
Assembly areas greater than 300 occupants	Class A or B	Class A or B
Other areas including offices & assembly less than 300 occupants	Class A, B, or C	Class A, B, or C



### 5.3 EXITING SYSTEMS

The building will be evaluated using both smoke protected assembly seating and traditional exiting philosophies. The building is fully sprinklered. Exits will be sized accordingly.

All areas will employ traditional exit factors until they enter a smoke protected area. At that point, the smoke protected provisions will be applied to the population. If smoke protected areas exit through areas where traditional exiting factors apply, the traditional exiting factors will apply to the entire population exiting through that area.

#### Traditional Exit Width Factors:

- Stairs, aisles 0.3 inches/person  
(40 people/foot)
- Doors, ramps, Concourses 0.2 inches/person  
(60 people/foot)

The Seating Bowl and Main Concourse will be evaluated using smoke protected assembly seating philosophies. Exits will be sized based on the smoke protected assembly seating provisions as allowed per Section 1028 of the IBC and Section 12.4.2.3 of the NFPA 101. The use of smoke protected assembly seating concepts allows the following exit width factors:

#### Smoke Protected Exit Width Factors:

- Stairs, Aisles 0.144 inches/person  
(83 people/foot)
- Doors, Ramps, Concourses 0.11 inches/person  
(109 people/foot)

#### 5.3.1 Main Exit

For assembly occupancies, if a main entrance is provided, it is required to serve 50% of the population.

### 5.4 SMOKE MANAGEMENT SYSTEM

A mechanical smoke control system will be provided to allow the use of smoke-protected assembly seating provisions. When activated, the smoke control system will exhaust smoke from the seating bowl or concourse at a rate which maintains the smoke layer six feet above the floor.



## **5.5 FIRE SUPPRESSION SYSTEMS**

### **5.5.1 Automatic Sprinklers and Standpipes**

#### **5.5.1.1 Sprinklers**

- Sprinklers are required throughout all enclosed spaces per NFPA 13, 2010 Edition.

#### **5.5.1.2 Standpipe Risers**

- Required per IBC Section 905.3.19 and NFPA 1 Section 13.2.2
- Provide wet automatic Class I standpipes with 2½ inch outlets in all exit stairways per the IBC Section 905.3.2.

In exterior areas or non-conditioned interior areas subject to freezing, provide dry standpipes per IBC Section 905.3.2.

#### **5.5.1.3 Water Supply**

- Connection to the public water supply.

### **5.5.2 Provide Portable Fire Extinguishers**

- Portable fire extinguishers are required per NFPA 1 Section 13.6.2.
- Drawings are required to show type and mounting locations.

### **5.5.3 Automatic Extinguishing Systems Serve All Grease Laden Cooking Hoods**

- Required to comply with Section 12.7.2 of the NFPA 101, Chapter 50 of NFPA 1 and NFPA 96





## 5.6 FIRE DETECTION SYSTEMS

### 5.6.1 Automatic fire alarm systems required to monitor:

- a. Automatic sprinkler waterflow alarms.
- b. Smoke detectors in elevator lobbies, top of freight elevator shafts, and elevator machine rooms to initiate elevator recall.
- c. Smoke detectors within HVAC supply air ducts with fan capacities in excess of 2,000 cfm and return air ducts with fan capacities in excess of 15,000 cfm. Smoke detection within these ducts shall initiate automatic fan shutoff.
- d. Smoke detectors at locations that have fire alarm system control equipment. These areas include, but are not limited to, transponders, power supply panels, and control panels.
- e. Beam detectors which activate the smoke control system.

### 5.6.2 Manual

- One manual pull station is required.

### 5.6.3 Fire Alarm Equipment required to comply with NFPA 101, NFPA 1, and City of Portland Fire Department Rules and Regulations.

## 5.7 EMERGENCY ALARM AND COMMUNICATIONS SYSTEMS

Provide combination audio/visual devices throughout all areas of the building. A voice alarm and strobes are required. Occupant notification will be by voice announcements and visual appliances per Section 907.2.1.1 of the IBC and Section 12.3.4.3 of the NFPA 101. Use of the PA system for audible notification in accordance with Section 12.3.4.3.6 of the NFPA 101 is allowed.

Supervision per City of Portland Fire Department Rules and Regulations, NFPA 72, and other applicable codes:

- a. Fire detection and alarm system provided with trouble alarm signals.
- b. Sprinkler and standpipe systems including:
  - Valve tamper switches on all water supply control valves.
  - Waterflow switches for each system.
- c. Fire alarm annunciation panel provided at Spring Street and Free Street entrances.

Upon alarm activation, all performance sound equipment circuits will initiate shunt trip and lighting will be restored to normal levels.



## 5.8 SECONDARY POWER

### 5.8.1 Emergency power (as defined by NFPA 70) is required for the following connected loads simultaneously:

- Fire Detection and Alarm Systems
- Exit and Emergency Lighting
- Voice/Alarm Communication System
- In-Building Public Safety Radio Enhancement System if required

### 5.8.2 Standby power (as defined by NFPA 70) is provided for the following connected loads simultaneously by an emergency generator:

- Elevators that connect four stories or are listed for accessible means of egress
- Smoke Control System
- Fire Pump (if provided)

## 5.9 FIRE FIGHTING ACCESS AND FACILITIES

### 5.9.1 Alarms automatically relayed via central alarm station to fire department. AES Master Box Connect will be provided per City of Portland Fire Department Rules and Regulations.

### 5.9.2 Sprinkler systems provided throughout the building.

- Fire department connection provided per NFPA 13 and 14 in an accessible location approved by the Fire Department, near the front entry point of the building. Recommended locations are on the Spring Street and Free Street sides of the building.

### 5.9.3 Fire apparatus access roads are required to be within 150 feet of all exterior portions of the First Level.

### 5.9.4 Emergency Responder Radio Coverage

Emergency responder radio coverage is required per IBC Section 915. In addition, a central control system consolidated in a fire command center is required to be provided for the Fire Department which contains fire alarm panels, controls for the voice alarm system, two-way communication systems (if required), elevator status panels, emergency generator status panels, fire pump status panels and a public telephone. An RF Engineer will determine compliance with NFPA 1 Annex O for performance of the public safety radio system within the building.



### 5.9.5 Fire Command Center

The following are required in a Fire Command Center, per IBC Section 911 and NFPA 1 Section 11.9:

1. The emergency voice/alarm communication system control unit.
2. The fire department communications system.
3. Fire detection and alarm system annunciator.
4. Annunciator unit visually indicating the location of the elevators and whether they are operational.
5. Status indicators and controls for air distribution systems.
6. The fire-fighter's control panel required by IBC Section 909.16 for smoke control systems installed in the building.
7. Controls for unlocking stairway doors simultaneously.
8. Sprinkler valve and waterflow detector display panels.
9. Emergency and standby power status indicators.
10. A telephone for fire department use with controlled access to the public telephone system.
11. Fire pump status indicators.
12. Schematic building plans indicating the typical floor plan and detailing the building core, means of egress, fire protection systems, fire-fighting equipment and fire department access and the location of fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions.
13. Work table.
14. Generator supervision devices, manual start and transfer features.
15. Public address system, where specifically required by other sections of this code.
16. Elevator fire recall switch in accordance with ASME A17.1.
17. Elevator emergency or standby power selector switch(es), where emergency or standby power is provided.

### 5.9.6 Shaftway Markings

- Exterior access – Outside openings accessible to the fire department that open directly on a hoistway or a shaftway communicating between two or more floors are to be marked “shaftway” in red letters at least six inches high on a white background.
- Interior Access – Interior door or window openings to a hoistway are to be plainly marked “shaftway” in red letters at least six inches high on a white background.
  - Exception: Markings are not required if the opening to the shaft is readily discernable as an opening by the construction or arrangement.
- Per IBC Section 914.1 and NFPA 1 Section 10.12.2



### 5.9.7 Equipment Room Identification

- Rooms containing controls for air conditioning systems.
- Rooms with sprinkler riser valves or other fire detection, suppression, or control elements.
- Per IBC Section 914.2, NFPA 101, NFPA 1, and City of Portland Fire Department Rules and Regulations.

