

## TABLE OF CONTENTS

<u>Division</u>		<u>Section Number</u>
<b>0</b>	<b>BIDDING AND CONTRACT REQUIREMENTS</b>	
	Subsurface Data	00320
	Attachment-Subsurface Data	
	Permits	00890
	Attachment- Order of Conditions	
<b>1</b>	<b>GENERAL REQUIREMENTS</b>	
	Control of Work and Materials	01110
	Measurement and Payment	01270
	Health & Safety Plan	01380
	Signage (Traffic Control)	01550
	Dust Control	01562
	Environmental Protection	01570
	Cleaning Up	01740
	Project As-Built Record Drawings	01765
	Project Closeout	01770
<b>2</b>	<b>SITE WORK</b>	
	Common Borrow	02055
	Geotextile Fabrics	02071
	Excavation and Stockpiling of Contaminated Material	02113
	Transportation and Disposal of Contaminated Material	02130
	Selective Site Demolition	02223
	Clearing and Grubbing	02230
	Selective Clearing, Invasive Species	02232
	Dewatering	02240
	Support of Excavation	02252
	Earthwork	02300
	Excavation, Borrow and Backfill	02315
	Loam Borrow	02329
	Turf Reinforcing Mat	02376
	Tracer Tape	02518
	Paving (Massachusetts)	02745
	Curbing (Massachusetts)	02771
	Sidewalk Construction and Replacement (Massachusetts)	02775
	Steel Barrier Gate	02829
	Seeding	02920

<u>Division</u>		<u>Section Number</u>
<b>3</b>	<b>CONCRETE</b>	
	Concrete Reinforcement	03200
	Cast-In-Place Concrete	03300
<b>7</b>	<b>THERMAL AND MOISTURE PROTECTION</b>	
	Joint Protection	07920
<b>9</b>	<b>FINISHES</b>	
	Painting	09900
<b>16</b>	<b>ELECTRICAL</b>	
	General Conditions	16010
	Basic Electrical Materials and Methods	16050
	Building Conductors and Cables	16123
	Raceway and Boxes	16130
	<b>END OF SECTION</b>	

P:\MA\Worcester MA\Coes Park\Parking Lot Expansion\Specs\\_Table of Contents.docx

SECTION 00320

SUBSURFACE DATA

PART I - GENERAL

1.01 SCOPE:

- A. Subsurface environmental sampling consisting of surface soil samples, borings, test pits, and monitoring wells has been performed by several parties including the Engineer. In 2020, the Engineer collected soil samples and the analytical results are appended hereto and are a part of the Contract Documents. The 2020 soil samples were collected to pre-characterize excavated materials that will require off-site transport and disposal as part of this project. Several compounds were detected in soil including arsenic and lead detected above RCS-1 standards as summarized in the attached Table 1. At the request of the Contractor, analytical laboratory reports will be provided for review.

If Contractors deem the subsurface information insufficient, they may, after obtaining Owner and Engineer's permission, perform additional subsurface explorations, at no expense to the Owner in coordination and with the observation of the Engineer. The Contractor shall not rely on the interpretations, opinions, conclusions or recommendations included in the report, only the factual data relative to the specific times, locations, and depths referenced in the report.

- B. Environmental reports for the property are publicly available to the Contractor at the MassDEP's website: <http://public.dep.state.ma.us/SearchableSites2/Search.aspx>

The Contractor shall review documents for detailed Site information listed under Site Release Tracking Numbers (RTN) 2-0906 and 2-14384. An Activity and Use Limitation (AUL) is present for the Limits of Work and is filed with the MassDEP under RTN 2-0906. A copy of the AUL is attached and is filed with the Worcester Registry of Deeds under Book 51992, Page 73. **All work must be performed in accordance with the AUL requirements.**

- C. Subsurface information provided in the Contract Documents is limited by the methods used for obtaining and expressing such data, and is subject to various interpretations. The terms used to describe soils, rock, groundwater and such other conditions are subject to local usage and individual interpretation.
- D. Historical reports include groundwater level measurements made in the field at the particular location and at the time measurements were made, and do not necessarily represent permanent groundwater elevations. Groundwater elevations may be affected by temperature, rainfall, tidal fluctuation, and other factors that may not have been present

at the time the measurements were made. The Contractors should be aware that groundwater level fluctuations may affect methods of construction.

- E. Subsurface exploration and data are for the general information of the Contractors. The Contractors are obligated to examine the site, review boring and test pit logs, all available information and records of explorations, investigations and other pertinent data for the site, and then based upon their own interpretations and investigations decide the character of material to be encountered and excavated, the suitability of the materials to be used for backfilling and such other purposes, the groundwater conditions, difficulties or obstacles likely to be encountered, and other conditions affecting the work. The subsurface data is accurate only at the particular locations and times the subsurface explorations were made. No other warranty either expressed or implied by the Owner, Engineer or their agents is made as to the accuracy of the subsurface information and data shown on the drawings or presented in the Contract Documents.

## PART 2 – PRODUCTS

Not used.

## PART 3 – EXECUTION

Not used.

END OF SECTION

\\Wse03.local\WSE\Projects\MA\Worcester MA\Coes Park\Parking Lot Expansion\Specs\00320 Subsurface Data.docx



2014 00008329

Bk: 51992 Pg: 73

Form 1075

Page: 1 of 18 01/30/2014 01:52 PM WD

NOTICE OF ACTIVITY AND USE LIMITATION

M.G.L. c. 21E, §6 and 310 CMR 40.0000

Disposal Site Name: CK Company Inc., 72 Coes Street, Worcester, Massachusetts, 01603  
DEP Release Tracking Number: 2-0906

This Notice of Activity and Use Limitation ("Notice") is made as of this 30<sup>th</sup> day of January, 2014, by the CITY OF WORCESTER, a Massachusetts municipal corporation with an address of 455 Main Street, Worcester, Massachusetts 01608, together with its successors and assigns (collectively "Owner").

WITNESSETH:

WHEREAS, the City of Worcester is the owner in fee simple of a certain parcel of vacant land located in Worcester, Worcester County, Massachusetts, pursuant to a decree of the Massachusetts Land Court dated February 2, 1999, recorded with the Worcester District Registry of Deeds in Book 21136, Page 288.

WHEREAS, said parcel of land, which is more particularly bounded and described in Exhibit A, attached hereto and made a part hereof ("Property") is subject to this Notice of Activity and Use Limitation. The Property is shown as Worcester Assessor's Map 08, Block 51, Lot 1, on a plan of land entitled "Plan of Land in the City of Worcester, County of Worcester, Massachusetts," prepared for the City of Worcester, by Chappell Engineering Associates, LLC, dated October 2, 2013, and recorded in the Worcester District Registry of Deeds as Plan No. 13537, in Plan Book 903 Plan 44.

WHEREAS, the Property comprises all of a disposal site as the result of a release of oil and/or hazardous material. Exhibit B is a sketch plan showing the relationship of the Property subject to this Notice of Activity and Use Limitation to the boundaries of said disposal site existing within the limits of the Property and to the extent such boundaries have been established. Exhibit B is attached hereto and made a part hereof; and

WHEREAS, one or more response actions have been selected for the Disposal Site in accordance with M.G.L. c. 21E ("Chapter 21E") and the Massachusetts Contingency Plan, 310 CMR 40.0000 ("MCP"). Said response actions are based upon (a) the restriction of human access to and contact with oil and/or hazardous material in soil and/or (b) the restriction of certain activities occurring in, on, through, over or under the Property. The basis for such restrictions is set forth in an Activity and Use Limitation Opinion ("AUL Opinion"), dated 1/28/2014, 2014, (which is attached hereto as Exhibit C and made a part hereof);

NOW, THEREFORE, notice is hereby given that the activity and use limitations set forth in said AUL Opinion are as follows:

1. Activities and Uses Consistent with the AUL Opinion. The AUL Opinion provides that a condition of No Significant Risk to health, safety, public welfare or the environment exists for any foreseeable period of time (pursuant to 310 CMR 40.0000) so long as any of the following activities and uses occur on the Property:

*Ham*  
18

- (i) Use and maintenance of the Property as a parking area and public park, provided that direct contact with contaminated soil located within the Environmental Cap Area as described in Exhibit A and depicted in Exhibit B remains restricted through the use and maintenance of a cap, as described in Paragraph 3(i);
- (ii) Short term (i.e., less than six months) construction excavation, grading, and/or other subsurface activities at the Property, provided that the activities be conducted in accordance with the Obligations and Conditions set forth in Paragraph 3 below;
- (iii) Such other activities and uses which, in the Opinion of a Licensed Site Professional (LSP), shall present no greater risk of harm to health, safety, public welfare, or the environment than the activities and uses set forth in this Paragraph; and
- (iv) Such other activities and uses not identified in Paragraph 2 as being Activities and Uses Inconsistent with the AUL.

**2. Activities and Uses Inconsistent with the AUL Opinion.** Activities and uses which are inconsistent with the objectives of this Notice of Activity and Use Limitation, and which, if implemented at the Property, may result in a significant risk of harm to health, safety, public welfare or the environment or in a substantial hazard, are as follows:

- (i) Use of the Property as a residence, school, or day care center;
- (ii) Growth of fruits and vegetables or any other agricultural product for human consumption;
- (iii) Industrial or commercial uses;
- (iv) Use as a parking area or park in absence of the cap identified in Obligations and Conditions Paragraph 3(i);
- (v) Any activity and use that may damage the cap;
- (vi) Any activity that involves the removal, disturbance and/or relocation of contaminated soil located a depth of 0 to 8 feet below grade surface at the Property that is not supervised by an LSP and performed in accordance with the MCP and the obligations and conditions set forth in Paragraph 3 (i), (ii), and (iii);
- (vii) Any long term (more than 6 months) activity involving removal, disturbance and/or relocation of contaminated soil at the Property unless such activity is evaluated by an LSP who renders an Opinion that states that such disturbance is consistent with maintaining a condition of No Significant Risk, and all activities are performed in accordance with the obligations and conditions set for in Paragraph 3 (i), (ii) and (iii); and,
- (viii) Alteration of the cap installed at the Property as identified in Obligations and Conditions Paragraph 3 (i), unless an LSP Opinion is rendered which states that such alteration is consistent with maintaining a condition of No Significant Risk.

**3. Obligations and Conditions Set Forth in the AUL Opinion.** If applicable, obligations and/or conditions to be undertaken and/or maintained at the Property to maintain a condition of No Significant Risk as set forth in the AUL Opinion shall include the following:

- (i) The constructed cap at the Property, its as-built location as described in Exhibit A and shown on Exhibit B, consisting of a 30 mil Polyvinyl Chloride (“PVC”) liner and 6-inch thick asphalt cap meeting the requirements of the Toxic Substance Control Act (“TSCA”) 761.61(a)(7), must be permanently maintained, repaired or replaced as necessary with a comparable barrier, to prevent exposures to Polychlorinated Biphenyl (“PCB”) impacted soil

located beneath the cap and to ensure that the PCB impacted soil remains inaccessible, unless an LSP Opinion is rendered which states that removal or alteration of the cap is consistent with maintaining a condition of No Significant Risk. The cap may be temporarily removed or disturbed for subsurface activity authorized in accordance with this AUL under the oversight of an LSP, provided that the cap is repaired or replaced with a comparable barrier to prevent future exposures to underlying contaminated soil within ten (10) days following the completion of the project;

(ii) The cap must be inspected on a bi-annual basis to confirm its ability to effectively prevent exposure to underlying PCB impacted soils through direct contact, ingestion and/or inhalation;

(iii) Prior to the performance of any subsurface activity or excavation which may result in direct contact with and/or disturbance of contaminated soil at the Property, a written Health & Safety Plan (“HSP”) and a Soil Management Plan (“SMP”) must be developed and implemented in accordance with the guidelines set forth below:

a) The HSP must be prepared by a Certified Industrial Hygienist or other qualified individual sufficiently trained in worker health and safety requirements. The HSP should specify the type of personal protection (i.e., clothing, respirators), engineering controls, and environmental monitoring necessary to prevent worker exposure to contaminated soil through dermal contact, ingestion, and/or inhalation. On-site workers who may come in contact with the contaminated soil should be appropriately trained on the requirements of the HSP, and the plan must be available on-site throughout the course of a project.

b) The SMP must be prepared by an LSP and the SMP should describe appropriate soil excavation, soil characterization, handling, storage, transportation, and disposal procedures. The SMP should include a description of the engineering controls and monitoring procedures necessary to ensure that the workers and nearby receptors are not affected by fugitive dust or particulates. On-site workers who may come in contact with the contaminated soil should be appropriately trained on the requirements of the SMP, and the plan must be available on-site throughout the course of a project.

4. Proposed Changes in Activities and Uses. Any proposed changes in activities and uses at the Property which may result in higher levels of exposure to oil and/or hazardous material than currently exist shall be evaluated by an LSP who shall render an Opinion, in accordance with 310 CMR 40.1080 *et seq.*, as to whether the proposed changes will present a significant risk of harm to health, safety, public welfare or the environment. Any and all requirements set forth in the Opinion to meet the objective of this Notice shall be satisfied before any such activity or use is commenced.

5. Violation of a Response Action Outcome. The activities, uses and/or exposures upon which this Notice is based shall not change at any time to cause a significant risk of harm to health, safety, public welfare, or the environment or to create substantial hazards due to exposure to oil and/or hazardous material without the prior evaluation by an LSP in accordance with 310 CMR 40.1080 *et seq.*, and without additional response actions, if necessary, to achieve or maintain a condition of No Significant Risk or to eliminate substantial hazards.

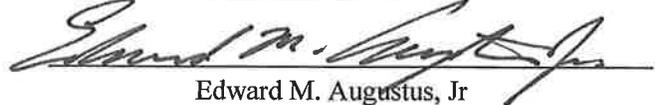
If the activities, uses, and/or exposures upon which this Notice is based change without the prior evaluation and additional response actions determined to be necessary by an LSP in accordance with 310 CMR 40.1080 *et seq.*, the owner or operator of the Property subject to this Notice at the time that the activities, uses and/or exposures change, shall comply with the requirements set forth in 310 CMR 40.0020.

6. Incorporation Into Deeds, Mortgages, Leases, and Instruments of Transfer. This Notice shall be

incorporated either in full or by reference into all future deeds, easements, mortgages, leases, licenses, occupancy agreements or any other instrument of transfer, whereby an interest in and/or a right to use the Property or a portion thereof is conveyed.

Owner hereby authorizes and consents to the filing and recordation and/or registration of this Notice, said Notice to become effective when executed under seal by the undersigned LSP, and recorded and/or registered with the appropriate Registry of Deeds and/or Land Registration Office.

WITNESS the execution hereof under seal this 15 day of Jan., 2014.



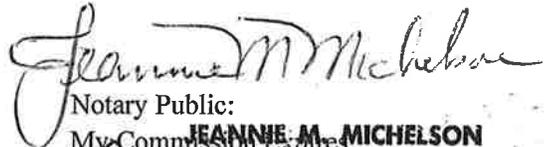
Edward M. Augustus, Jr  
City Manager

COMMONWEALTH OF MASSACHUSETTS

Worcester, ss

\_\_\_\_, 2014

On this 15<sup>th</sup> day of January, 2014, before me, the undersigned notary public, personally appeared Edward Augustus, Jr. who proved to me through satisfactory evidence of identification, which was personal knowledge, to be the person whose name is signed on the preceding or attached document, and acknowledged to me that he signed it voluntarily for its stated purpose on behalf of the City of Worcester.



Notary Public:

My Commission Expires **JEANNE M. MICHELSON**

**Notary Public**



**Commonwealth of Massachusetts**

**My Commission Expires**

**July 24, 2030**

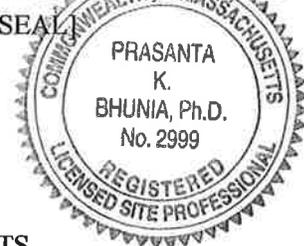
The undersigned LSP hereby certifies that he executed the aforesaid Activity and Use Limitation Opinion attached hereto as Exhibit C and made a part hereof and that in his Opinion this Notice of Activity and Use Limitation is consistent with the terms set forth in said Activity and Use Limitation Opinion.

Date: January 28, 2014



Prasanta K. Bhunia, Ph.D., LSP

[LSP SEAL]



COMMONWEALTH OF MASSACHUSETTS

Worcester, ss

\_\_\_\_, 2014

On this 29 day of January, 2014, before me, the undersigned notary public, personally appeared Prasanta K. Bhunia, Ph.D., LSP #2999, who proved to me through satisfactory evidence of identification, which were Drivers License, to be the person whose name is signed on the preceding or attached document, and acknowledged to me that he signed it voluntarily for its stated purpose.

As LSP for THE CITY OF WORCESTER, a municipality

Notary Public: *Sally Smith*  
My Commission Expires: August 25, 2017

Upon recording, return to:

City of Worcester  
455 Main Street  
Worcester, MA 01600



## **Exhibit A**

### **Written Legal Description of the Property**

Starting at a point on the northwest corner of Mill Street and Coes Street,

Thence turning and running N86° 09' 25"W, 227.63' along the northerly layout line of Mill Street to a point,

Thence turning and running S78° 50' 35"W, 252.23' along the northerly layout line of Mill Street to a point,

Thence turning and running N11° 09' 25", 10' (+/-) to a point,

Thence turning and running along the high water line of the Coes Reservoir, 658' (+/-) to a point,

Thence turning and running S80° 20' 40"E, 131' (+/-) to a point,

Thence turning and running S27° 51' 32"E, 8' (+/-) to a point,

Thence turning and running along the high water line of Coes Pond, 418' (+/-) to a point,

Thence turning and running S16° 36' 35"W, 200' (+/-) to a point,

Thence turning and running N73° 23' 25"W, 221.33' along the northerly layout line of Coes Street to a point,

Thence turning and running counter clockwise through a curve of radius 80.00' a length of 139.16' along the northeasterly layout line of Coes Street to a point,

Thence turning and running S06° 56' 35"W, 118.73' along the westerly layout line of Coes Street to the point of beginning.

Lot being 113,256 Square Feet (+/-) as described on a plan titled "Plan of Land in the City of Worcester, County of Worcester, Massachusetts, Prepared for the City of Worcester, October 2, 2013" by Chapell Engineering Associates, LLC.

### **Description of Environmental Cap Area**

Starting at a point on the southerly end of the curve of radius 80.00' and a length of 139.16' along the northeasterly layout line of Coes Street,

Thence turning and running N18° 34' 18"W, 37.96' to the point of beginning of the Environmental Cap,

Thence turning and running N35° 40' 27"W, 72.00' to a point,

Thence turning and running N54° 19' 33"E, 81.00' to a point,

Thence turning and running S35° 40' 27"E, 72.00' to a point,

Thence turning and running S54° 19' 33"W, 81.00' to the point of beginning.

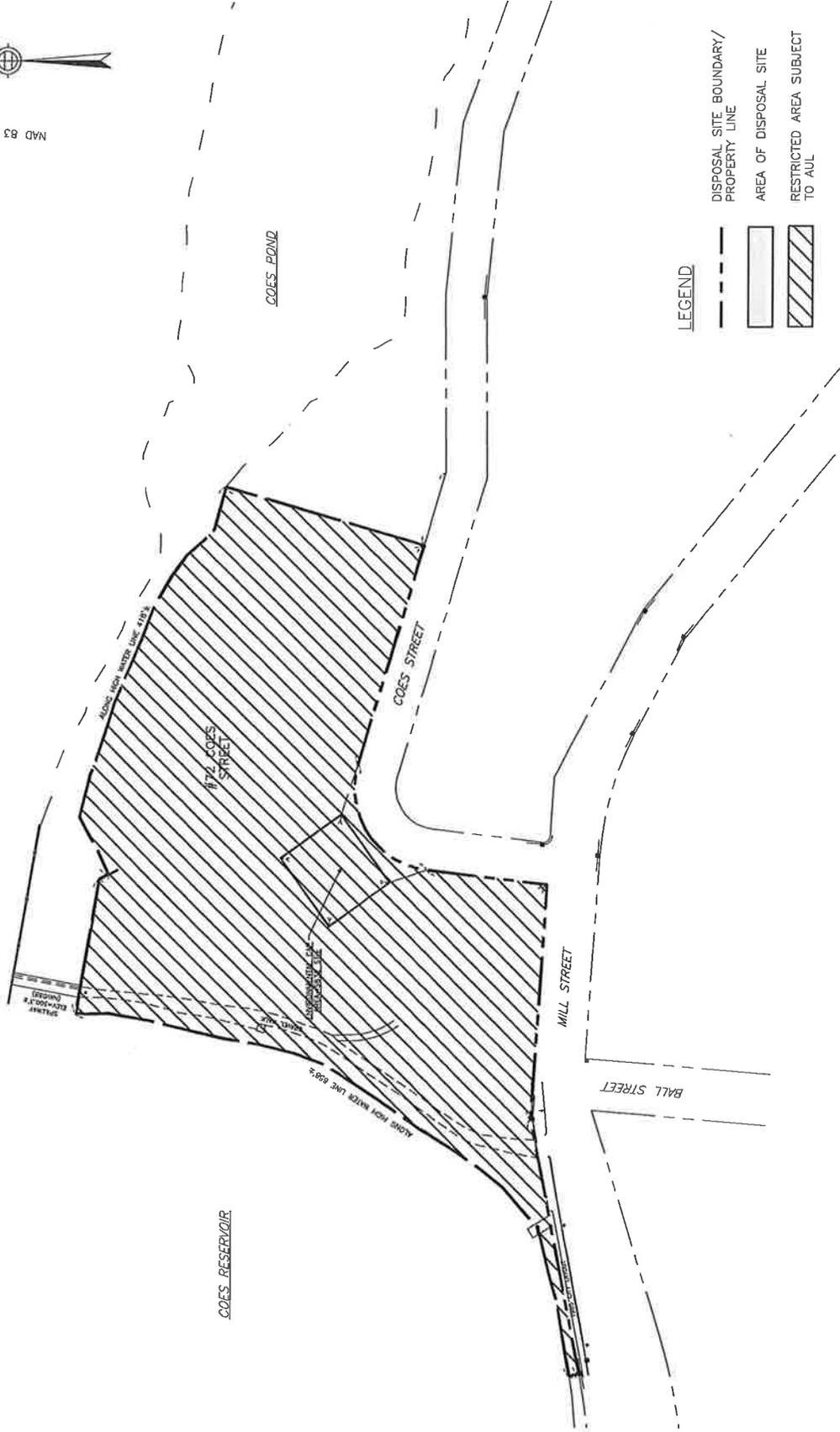
The Area being 5,832 Square Feet (+/-) as described on a plan titled "Plan of Land in the City of Worcester, County of Worcester, Massachusetts Prepared for the City of Worcester, October 2, 2013" by Chapell Engineering Associates, LLC.

**Exhibit B**

**Sketch Plan with As-Built Location of Cap**



MAD 83



**LEGEND**

- DISPOSAL SITE BOUNDARY/  
PROPERTY LINE
- AREA OF DISPOSAL SITE
- RESTRICTED AREA SUBJECT  
TO AUL

EXHIBIT B

72 COES STREET  
WORCESTER, MA.

SKETCH PLAN

DESIGNED BY: AKP	CHECKED BY: SFH	DATE: OCTOBER, 2013
------------------	-----------------	---------------------



SCALE 1" = 150'



**Exhibit C**

**Activity and Use Limitation Opinion**

**EXHIBIT C**  
**AUL LSP OPINION NARRATIVE**

Site Name: CK Company  
72 Coes Street  
Worcester, Massachusetts  
DEP Release Tracking Number: 2-0906

In accordance with the requirements of the Massachusetts Contingency Plan (MCP), 310 CMR 40.1074, this Licensed Site Professional (LSP) Opinion was prepared in support of a Notice of Activity and Use Limitation (AUL) for the Disposal Site located at 72 Coes Street in Worcester, Massachusetts, (the "Site").

Site History

The Site is located on approximately 2.6 acres of undeveloped land at 72 Coes Street in Worcester, Massachusetts. The Site is zoned for manufacturing, but surrounding properties are zoned for residential use. Coes Reservoir is located to the west, Coes Pond to the north and northeast, Mill Street to the south, and Coes Street to the southeast. A raceway connecting Coes Reservoir to Coes Pond runs along the northern border of the Site.

The Coes Knife Company began manufacturing knives and metal tools at the Site in 1866, immediately after construction of the Coes Reservoir Dam. Manufacturing operations included grinding, welding and twisting processes, and waste streams generated by the facility included scrap metal, oil, and process cooling water. The facility was demolished in 1903 and replaced with a wrench factory. The facility continued to manufacture tools and knives until 1991. The property was foreclosed in 1997, and the City of Worcester took ownership of the land-based parcel only through non-payment of taxes. In 2001, the City demolished existing buildings and associated structures.

In 1991, EnviroCorp conducted a preliminary environmental assessment of the Site that included the collection of soil, groundwater and surface water samples. VOCs and total petroleum hydrocarbons (TPH) were detected in one groundwater well in the middle of the Site, and TPH and metals were detected in soil at several locations above MCP reportable concentrations. Potential sources of contamination were identified as historic waste disposal practices and accidental spills of heating oil from on-site ASTs.

On September 28, 1992, the Massachusetts Department of Environmental Protection (DEP) assigned Release Tracking Number (RTN) 2-0906 to the Site based on the findings of a preliminary environmental assessment performed by EnviroCorp. Subsequently, during a Brownfields Site assessment in 2002, chromium and polychlorinated biphenyls (PCBs) exceeding Imminent Hazard thresholds were detected on the northern dam portion of the property. The DEP was notified of this new condition and assigned a second RTN 2-14384 to the Site. Since this notification, several Site investigations and remedial response actions were completed under RTN 2-14384. In January 2008, RTN 2-14384 was linked to RTN 2-0906.

During Phase I – Initial Site Investigation for RTN 2-0906, a total PCB concentration of 2.96 mg/kg was detected at one location. Subsequently, Site assessment was completed in accordance with the Toxic Substances Control Act (TSCA) and the Massachusetts Contingency Plan (MCP) indicated the presence of several metals in soil including elevated concentration of lead in one area and moderate concentrations of PCBs in another area. Based on the data, a Phase II – Comprehensive Site Investigation report including a Method 3 risk characterization was completed and submitted to DEP and the Environmental Protection Agency (EPA). The EPA reviewed the risk characterization report and approved the Site cleanup approach under the risk-based cleanup provision of the TSCA regulations.

The Site cleanup was performed Phase IV – Remedy Implementation Plan (Phase IV RIP) of the MCP and in accordance with EPA’s PCB cleanup and disposal approval dated October 13, 2010 and included excavation and off-Site disposal of lead-impacted soil from a localized area, the placement of a cap over an area of PCB-impacts, and the placement of an AUL over entire the Site. No Significant Risk (NSR) exists for the use of the Site as a park, but an implementation of an AUL was selected to further reduce exposure to impacted soil and to restrict the future uses of the Site.

Reason for Activity and Use Limitation

As described above, implementation of an AUL was selected to further reduce exposure to impacted soil and to restrict the future uses of the Site other than a parking area or park. An AUL is required to provide notice of the restrictions regarding future Site activities and uses. This AUL Opinion applies to the entire Disposal Site, RTN 2-0906.

The AUL boundaries subject to this Notice of AUL are equivalent to the legal (metes and bounds) description of the property attached as Exhibit A, and boundaries shown in Exhibit B.

Permitted Uses and Activities

- i) Use and maintenance of the Property as a parking area and public park, provided that direct contact with contaminated soil located within a the Environmental Cap Area as described in Exhibit A and depicted in Exhibit B remains restricted through the use and maintenance of a cap, as described in Obligations and Conditions 3(i);
- ii) Short term (i.e., less than six months) construction excavation, grading, and/or other subsurface activities, provided that the activities be conducted in accordance with the Obligations and Conditions set forth in Paragraph 3 below;
- iii) Such other activities and uses which, in the Opinion of a Licensed Site Professional (LSP), shall present no greater risk of harm to health, safety, public welfare, or the environment than the activities and uses set forth in as Permitted Uses and Activities; and
- iv) Such other activities and uses not identified in Restricted Uses and Activities below as being Activities and Uses Inconsistent with the AUL.

Restricted Uses and Activities

- (i) Use of the Property as a residence, school, or day care center;
- (ii) Growth of fruits and vegetables or any other agricultural product for human consumption;
- (iii) Industrial or commercial uses;
- (iv) Use as a parking area or park in absence of the cap identified in Obligations and Conditions 3(i), below;
- (v) Any activity and use that may damage the cap;
- (vi) Any activity that involves the removal, disturbance and/or relocation of contaminated soil located a depth of 0 to 8 below grade surface at the Property that is not supervised by an LSP and performed in accordance with the MCP and the obligations and conditions set forth in Obligations and Conditions (i), (ii), and (iii) below;

- v) Any long term (more than 6 months) activity involving removal, disturbance and/or relocation of contaminated soil at the Property unless such activity is evaluated by a LSP who renders an Opinion that states that such disturbance is consistent with maintaining a condition of No Significant Risk, and all activities are performed in accordance with the Obligations and Conditions (i), (ii) and (iii) below; and,
- vi) The alteration of the cap installed at the Property as identified in Obligations and Conditions (i) below unless an LSP Opinion is rendered which states that such alteration is consistent with maintaining a condition of No Significant Risk.

#### Obligations and Conditions

- i) The constructed cap at the Property (as-built location as described in Exhibit A and shown on Exhibit B) consisting of a 30 mil Polyvinyl Chloride (“PVC”) liner and 6 inch asphalt cap meeting the requirements of the Toxic Substance Control Act (“TSCA”) 761.61(a)(7) must be permanently maintained, repaired or replaced as necessary with a comparable barrier, to prevent exposures to PCB impacted soil located beneath the cap and to ensure that the PCB impacted soil remains inaccessible, unless an LSP Opinion is rendered which states that removal or alteration of the cap is consistent with maintaining a condition of No Significant Risk. The cap may be temporarily removed or disturbed for subsurface activity authorized in accordance with this AUL under the oversight of an LSP, provided that the cap is repaired or replaced with a comparable barrier to prevent future exposures to underlying contaminated soil within ten (10) days following the completion of the project.
- ii) The cap must be inspected on a bi-annual basis to confirm its ability to effectively prevent exposure(s) to underlying PCB impacted soils through direct contact, ingestion and/or inhalation.
- iii) Prior to the performance of any subsurface activity or excavation which may result in direct contact with and/or disturbance of contaminated soil at the Property, a written Health & Safety Plan (“HSP”) and a Soil Management Plan (“SMP”) must be developed and implemented in accordance with the guidelines set forth below:

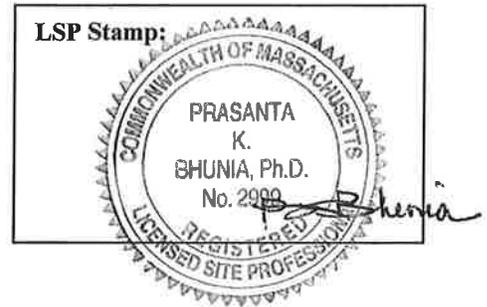
A HSP must be prepared by a Certified Industrial Hygienist or other qualified individual sufficiently trained in worker health and safety requirements. The HSP should specify the type of personal protection (i.e., clothing, respirators), engineering controls, and environmental monitoring necessary to prevent worker exposures to contaminated soil through dermal contact, ingestion, and/or inhalation. On-site workers who may come in contact with the contaminated soil should be appropriately trained on the requirements of the HSP, and the plan must be available on-site throughout the course of a project.

A SMP must be prepared by an LSP and the SMP should describe appropriate soil excavation, soil characterization, handling, storage, transport, and disposal procedures. The SMP should include a description of the engineering controls and monitoring procedures necessary to ensure that workers and receptors in the vicinity are not affected by fugitive dust or particulates. On-Site workers who may come in contact with the contaminated soil should be appropriately trained on the requirements of the SMP, and the plan must be available on-Site throughout the course of a project.

This AUL Opinion is based upon information presented in:

- *The Massachusetts Contingency Plan* 310 CMR 40.0000, revised February 14, 2008.
- Massachusetts Department of Environmental Protection, *Guidance on Implementing Activity and Use Limitations*. May 1999.
- DRAFT Class A-3 Response Action Outcome Statement (2-0906), Weston & Sampson, 2014

LSP Signature:   
LSP Name: Prasanta K. Bhunia, Ph.D., LSP #2999  
Date: January 28, 2014



**Exhibit D**

**Bureau of Waste Site Cleanup Form 113A**



Massachusetts Department of Environmental Protection  
Bureau of Waste Site Cleanup

BWSC113A

ACTIVITY & USE LIMITATION (AUL) OPINION FORM

Release Tracking Number

Pursuant to 310 CMR 40.1056 & 40.1070 - 40.1084 (Subpart J)

2 - 906

A. DISPOSAL SITE LOCATION:

1. Disposal Site Name: CK Company Inc.

2. Street Address: 72 Coes Street

3. City/Town: Worcester

4. ZIP Code: 01603-0000

B. THIS FORM IS BEING USED TO: (check one)

1. Provide the LSP Opinion for a **Notice of Activity and Use Limitation**, pursuant to 310 CMR 40.1074.
2. Provide the LSP Opinion for an **Evaluation of Changes in Land Uses/Activities and/or Site Conditions after a Response Action Outcome Statement**, pursuant to 310 CMR 40.1080. Include BWSC113A as an attachment to BWSC113. Section A and C do not need to be completed.
3. Provide the LSP Opinion for an **Amended Notice of Activity and Use Limitation**, pursuant to 310 CMR 40.1081(4).
4. Provide the LSP Opinion for a **Partial Termination of a Notice of Activity and Use Limitation**, pursuant to 310 CMR 40.1083(3).
5. Provide the LSP Opinion for a **Termination of a Notice of Activity and Use Limitation**, pursuant to 310 CMR 40.1083(1)(d).
6. Provide the LSP Opinion for a **Grant of Environmental Restriction**, pursuant to 310 CMR 40.1071.
7. Provide the LSP Opinion for an **Amendment of a Grant of Environmental Restriction**, pursuant to 310 CMR 40.1081(3).
8. Provide the LSP Opinion for a **Partial Release of a Grant of Environmental Restriction**, pursuant to 310 CMR 40.1083(2).
9. Provide the LSP Opinion for a **Release of a Grant of Environmental Restriction**, pursuant to 310 CMR 40.1083(1)(c).
10. Provide the LSP Opinion for a **Confirmatory Activity and Use Limitation**, pursuant to 310 CMR 40.1085(4).

(Unless otherwise noted above, all sections of this form (BWSC113A) must be completely filled out, printed, stamped, signed with black ink and attached as an exhibit to the AUL Document to be recorded and/or registered with the Registry of Deeds and/or Land Registration Office.)

C. AUL INFORMATION:

1. Is the address of the property subject to AUL different from the disposal site address listed above?

a. No  b. Yes If yes, then fill out address section below.

2. Street Address: \_\_\_\_\_

3. City/Town: \_\_\_\_\_

4. ZIP Code: \_\_\_\_\_



**Massachusetts Department of Environmental Protection**  
 Bureau of Waste Site Cleanup

**BWSC113A**

**ACTIVITY & USE LIMITATION (AUL) OPINION FORM**

Release Tracking Number

Pursuant to 310 CMR 40.1056 & 40.1070 - 40.1084 (Subpart J)

2 - 906

**D. LSP SIGNATURE AND STAMP:**

I attest under the pains and penalties of perjury that I have personally examined and am familiar with this transmittal form, including any and all documents accompanying this submittal. In my professional opinion and judgment based upon application of (i) the standard of care in 309 CMR 4.02(1), (ii) the applicable provisions of 309 CMR 4.02(2) and (3), and 309 CMR 4.03(2), and (iii) the provisions of 309 CMR 4.03(3), to the best of my knowledge, information and belief,

> if Section B indicates that a **Notice of Activity and Use Limitation** is being registered and/or recorded, the Activity and Use Limitation that is the subject of this submittal (i) is being provided in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000 and (ii) complies with 310 CMR 40.1074;

> if Section B indicates that an **Evaluation of Changes in Land Uses/Activities and/or Site Conditions after a Response Action Outcome Statement** is being submitted, this evaluation was developed in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000 and (ii) complies with 310 CMR 40.1080;

> if Section B indicates that an **Amended Notice of Activity and Use Limitation or Amendment to a Grant of Environmental Restriction** is being registered and/or recorded, the Activity and Use Limitation that is the subject of this submittal (i) is being provided in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000 and (ii) complies with 40.1081;

> if Section B indicates that a **Termination or a Partial Termination of a Notice of Activity and Use Limitation, or a Release or Partial Release of a Grant of Environmental Restriction** is being registered and/or recorded, the Activity and Use Limitation that is the subject of this submittal (i) is being provided in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000 and (ii) complies with 310 CMR 40.1083;

> if Section B indicates that a **Grant of Environmental Restriction** is being registered and/or recorded, the Activity and Use Limitation that is the subject of this submittal (i) is being provided in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000 and (ii) complies with 310 CMR 40.1071;

> if Section B indicates that a **Confirmatory Activity and Use Limitation** is being registered and/or recorded, the Activity and Use Limitation that is the subject of this submittal (i) is being provided in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000 and (ii) complies with 310 CMR 40.1085(4);

I am aware that significant penalties may result, including, but not limited to, possible fines and imprisonment, if I submit information which I know to be false, inaccurate or materially incomplete.

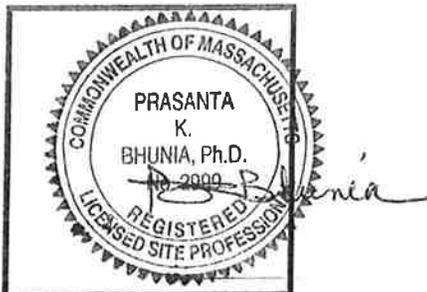
1. LSP #: 2999

2. First Name: Prasanta 3. Last Name: Bhunia

4. Telephone: (978) 532-1900 5. Ext.: 2287 6. FAX: (978) 573-4080

7. Signature: *Prasanta Bhunia* 8. Date: 01/28/2014  
 mm/dd/yyyy

9. LSP Stamp:



**Exhibit E**  
**Signatory Authority, 310 CMR 40.1074(2)(c)**



CITY OF WORCESTER  
LAW DEPARTMENT  
CITY HALL, ROOM 301  
WORCESTER, MASSACHUSETTS 01608

TELEPHONE  
(508) 799-1161  
FACSIMILE NUMBER  
(508) 799-1163

DAVID M. MOORE  
CITY SOLICITOR

January 14, 2014

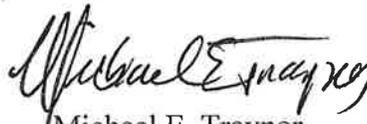
To Whom It May Concern:

This letter is provided in my capacity as deputy city solicitor of the city of Worcester.

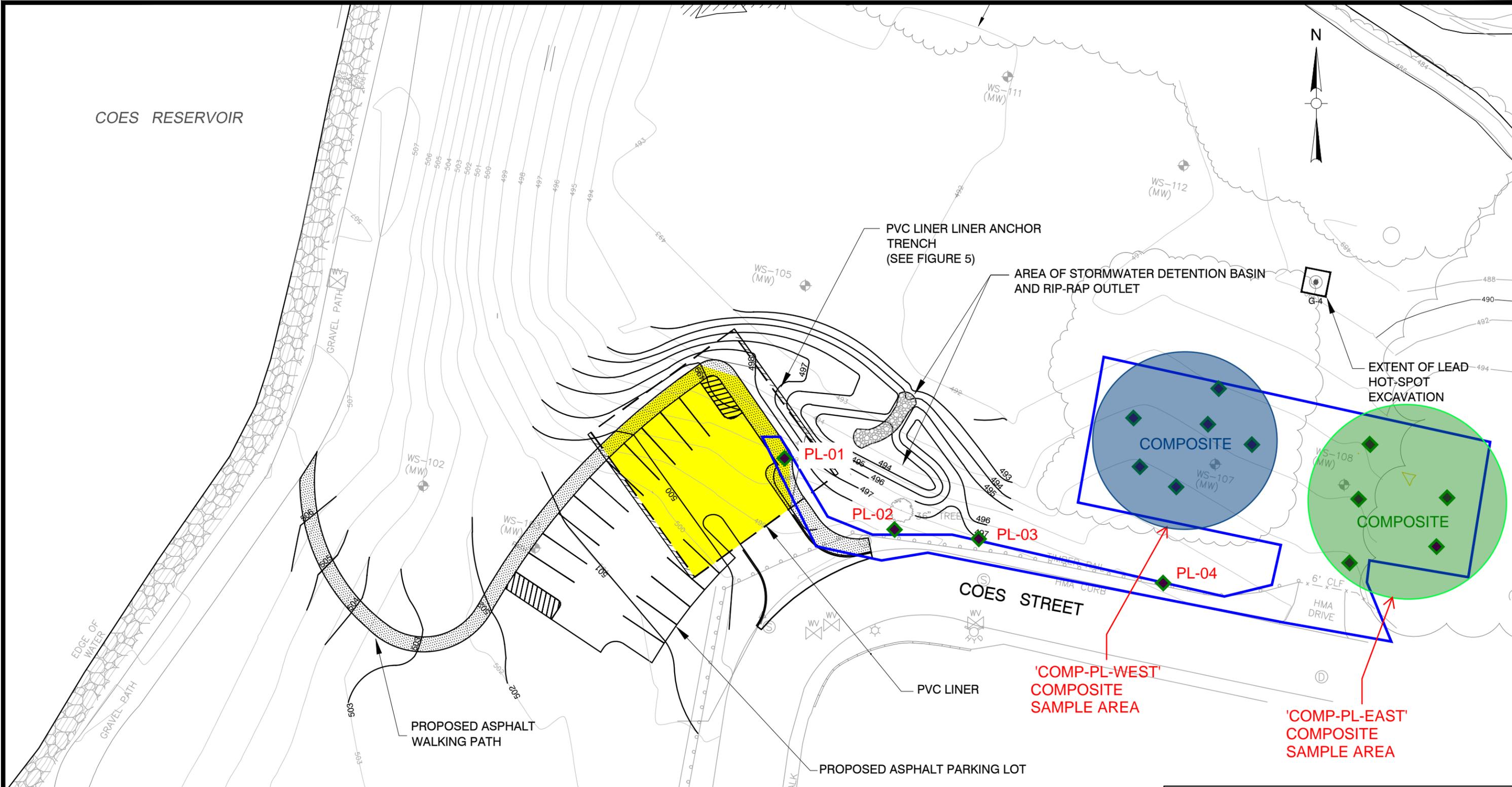
I certify that the city of Worcester is a municipal corporation organized under a home rule charter adopted by the voters on November 5, 1985. The city charter (§3-1a) provides that the city manager is the chief administrative officer and executive officer of the city. In such capacity the city manager has, possesses and exercises all the power, rights and duties, other than legislative, commonly associated with municipal chief executive or administrative officers. (§3-2).

I certify that Edward M. Augustus, Jr., was appointed to the office of city manager by the City Council by an order adopted on December 3, 2013 and that said order remains in full force and effect.

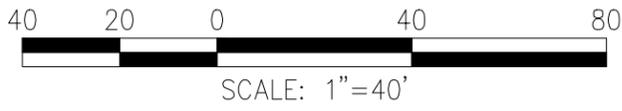
Very truly yours,

  
Michael E. Traynor  
Deputy City Solicitor

O:\Worcester MA\Coes MCP\RAO and Phase IV Comp\Figures\Figure 4 - PCB Cap and Grading Plan.dwg



- LEGEND:**
- APPROXIMATE EXTENT OF PCB-IMPACTED SOIL
  - EXTENT OF 30-MIL PVC LINER
  - EXISTING ELEVATION CONTOURS (1 FT)
  - PROPOSED ELEVATION CONTOURS (1 FT)
  - GRAB SOIL SAMPLE LOCATION - IN SHADED AREA GRAB SAMPLES USED AS COMPOSITE, OUTSIDE SHADED AREA SUBMITTED INDIVIDUALLY FOR ANALYSIS



**NOTES:**  
ALL SAMPLE LOCATIONS ARE APPROXIMATE AND FOR GRAPHICAL PURPOSES ONLY.

**NOT FOR CONSTRUCTION**

SKETCH		
COES KNIFE REMEDIATION PROJECT WORCESTER, MASSACHUSETTS		
DISPOSAL CHARACTERIZATION SOIL SAMPLE LOCATIONS		
DESIGNED BY: TMB	CHECKED BY: PKB	DATE: 2020
<b>Weston &amp; Sampson</b>		

Table 1  
Summary of Soil Analytical Results  
Coes Parking Lot  
Worcester, Massachusetts

Parameter	Units	Reportable Concentrations (RCs) <sup>1</sup>	Comm 97 Contaminant Levels for Soil Reuse <sup>2</sup>		SAMPLING LOCATION								
			RCS-1	Lined Landfill	Unlined Landfill	COMP-PL-EAST	COMP-PL-WEST	NM-NORTH	NM-SOUTH	PL-01 (0-12")	PL-02 (0-12")	PL-03 (0-12")	PL-04 (0-12")
						1/14/2020	1/14/2020	1/14/2020	1/14/2020	1/14/2020	1/14/2020	1/14/2020	1/14/2020
<b>VOCs</b>													
ACETONE	mg/kg	6	~	~	< 0.12	< 0.12	< 0.11	< 0.11	NT	NT	NT	NT	
TERT-AMYL METHYL ETHER	mg/kg	~	~	~	< 0.0012	< 0.0012	< 0.0011	< 0.0011	NT	NT	NT	NT	
BENZENE	mg/kg	2	~	~	< 0.0023	< 0.0024	< 0.0023	< 0.0021	NT	NT	NT	NT	
BROMOBENZENE	mg/kg	100	~	~	< 0.0023	< 0.0024	< 0.0023	< 0.0021	NT	NT	NT	NT	
BROMOCHLOROMETHANE	mg/kg	~	~	~	< 0.0023	< 0.0024	< 0.0023	< 0.0021	NT	NT	NT	NT	
BROMODICHLOROMETHANE	mg/kg	0.1	~	~	< 0.0023	< 0.0024	< 0.0023	< 0.0021	NT	NT	NT	NT	
BROMOFORM	mg/kg	0.1	~	~	< 0.0023	< 0.0024	< 0.0023	< 0.0021	NT	NT	NT	NT	
BROMOMETHANE	mg/kg	0.5	~	~	< 0.012	< 0.012	< 0.011	< 0.011	NT	NT	NT	NT	
2-BUTANONE (MEK)	mg/kg	4	~	~	< 0.047	< 0.047	< 0.045	< 0.043	NT	NT	NT	NT	
N-BUTYLBENZENE	mg/kg	~	~	~	< 0.0023	< 0.0024	< 0.0023	< 0.0021	NT	NT	NT	NT	
SEC-BUTYLBENZENE	mg/kg	~	~	~	< 0.0023	< 0.0024	< 0.0023	< 0.0021	NT	NT	NT	NT	
TERT-BUTYLBENZENE	mg/kg	100	~	~	< 0.0023	< 0.0024	< 0.0023	< 0.0021	NT	NT	NT	NT	
TERT-BUTYLETHYL ETHER	mg/kg	~	~	~	< 0.0012	< 0.0012	< 0.0011	< 0.0011	NT	NT	NT	NT	
CARBON DISULFIDE	mg/kg	100	~	~	< 0.0070	< 0.0071	< 0.0068	< 0.0064	NT	NT	NT	NT	
CARBON TETRACHLORIDE	mg/kg	5	~	~	< 0.0023	< 0.0024	< 0.0023	< 0.0021	NT	NT	NT	NT	
CHLOROBENZENE	mg/kg	1	~	~	< 0.0023	< 0.0024	< 0.0023	< 0.0021	NT	NT	NT	NT	
CHLORODIBROMOMETHANE	mg/kg	0.005	~	~	< 0.0012	< 0.0012	< 0.0011	< 0.0011	NT	NT	NT	NT	
CHLOROETHANE	mg/kg	100	~	~	< 0.012	< 0.012	< 0.011	< 0.011	NT	NT	NT	NT	
CHLOROFORM	mg/kg	0.2	~	~	< 0.0047	< 0.0047	< 0.0045	< 0.0043	NT	NT	NT	NT	
CHLOROMETHANE	mg/kg	100	~	~	< 0.012	< 0.012	< 0.011	< 0.011	NT	NT	NT	NT	
2-CHLOROTOLUENE	mg/kg	100	~	~	< 0.0023	< 0.0024	< 0.0023	< 0.0021	NT	NT	NT	NT	
4-CHLOROTOLUENE	mg/kg	~	~	~	< 0.0023	< 0.0024	< 0.0023	< 0.0021	NT	NT	NT	NT	
1,2-DIBROMO-3-CHLOROPROPANE	mg/kg	10	~	~	< 0.0023	< 0.0024	< 0.0023	< 0.0021	NT	NT	NT	NT	
1,2-DIBROMOETHANE (EDB)	mg/kg	0.1	~	~	< 0.0012	< 0.0012	< 0.0011	< 0.0011	NT	NT	NT	NT	
DIBROMOMETHANE	mg/kg	500	~	~	< 0.0023	< 0.0024	< 0.0023	< 0.0021	NT	NT	NT	NT	
1,2-DICHLOROBENZENE	mg/kg	9	~	~	< 0.0023	< 0.0024	< 0.0023	< 0.0021	NT	NT	NT	NT	
1,3-DICHLOROBENZENE	mg/kg	3	~	~	< 0.0023	< 0.0024	< 0.0023	< 0.0021	NT	NT	NT	NT	
1,4-DICHLOROBENZENE	mg/kg	0.7	~	~	< 0.0023	< 0.0024	< 0.0023	< 0.0021	NT	NT	NT	NT	
DICHLORODIFLUOROMETHANE	mg/kg	1000	~	~	< 0.012	< 0.012	< 0.011	< 0.011	NT	NT	NT	NT	
1,1-DICHLOROETHANE	mg/kg	0.4	~	~	< 0.0023	< 0.0024	< 0.0023	< 0.0021	NT	NT	NT	NT	
1,2-DICHLOROETHANE	mg/kg	0.1	~	~	< 0.0023	< 0.0024	< 0.0023	< 0.0021	NT	NT	NT	NT	
1,1-DICHLOROETHYLENE	mg/kg	3	~	~	< 0.0047	< 0.0047	< 0.0045	< 0.0043	NT	NT	NT	NT	
CIS-1,2-DICHLOROETHYLENE	mg/kg	0.1	~	~	< 0.0023	< 0.0024	< 0.0023	< 0.0021	NT	NT	NT	NT	
TRANS-1,2-DICHLOROETHYLENE	mg/kg	1	~	~	< 0.0023	< 0.0024	< 0.0023	< 0.0021	NT	NT	NT	NT	
1,2-DICHLOROPROPANE	mg/kg	0.1	~	~	< 0.0023	< 0.0024	< 0.0023	< 0.0021	NT	NT	NT	NT	
1,3-DICHLOROPROPANE	mg/kg	500	~	~	< 0.0012	< 0.0012	< 0.0011	< 0.0011	NT	NT	NT	NT	
2,2-DICHLOROPROPANE	mg/kg	~	~	~	< 0.0023	< 0.0024	< 0.0023	< 0.0021	NT	NT	NT	NT	
1,1-DICHLOROPROPENE	mg/kg	~	~	~	< 0.0023	< 0.0024	< 0.0023	< 0.0021	NT	NT	NT	NT	
CIS-1,3-DICHLOROPROPENE	mg/kg	~	~	~	< 0.0012	< 0.0012	< 0.0011	< 0.0011	NT	NT	NT	NT	
TRANS-1,3-DICHLOROPROPENE	mg/kg	~	~	~	< 0.0012	< 0.0012	< 0.0011	< 0.0011	NT	NT	NT	NT	
DIETHYL ETHER	mg/kg	100	~	~	< 0.012	< 0.012	< 0.011	< 0.011	NT	NT	NT	NT	
DIISOPROPYL ETHER	mg/kg	100	~	~	< 0.0012	< 0.0012	< 0.0011	< 0.0011	NT	NT	NT	NT	
1,4-DIOXANE	mg/kg	0.2	~	~	< 0.12	< 0.12	< 0.11	< 0.11	NT	NT	NT	NT	
ETHYLBENZENE	mg/kg	40	~	~	< 0.0023	< 0.0024	< 0.0023	< 0.0021	NT	NT	NT	NT	
HEXACHLOROBUTADIENE	mg/kg	30	~	~	< 0.0023	< 0.0024	< 0.0023	< 0.0021	NT	NT	NT	NT	
2-HEXANONE	mg/kg	100	~	~	< 0.023	< 0.024	< 0.023	< 0.021	NT	NT	NT	NT	
ISOPROPYLBENZENE	mg/kg	1000	~	~	< 0.0023	< 0.0024	< 0.0023	< 0.0021	NT	NT	NT	NT	
P-ISOPROPYLTOLUENE	mg/kg	100	~	~	< 0.0023	< 0.0024	< 0.0023	< 0.0021	NT	NT	NT	NT	
METHYL TERT-BUTYL ETHER (MTBE)	mg/kg	0.1	~	~	< 0.0047	< 0.0047	< 0.0045	< 0.0043	NT	NT	NT	NT	
METHYLENE CHLORIDE	mg/kg	0.1	~	~	< 0.012	< 0.012	< 0.011	< 0.011	NT	NT	NT	NT	
4-METHYL-2-PENTANONE (MIBK)	mg/kg	0.4	~	~	< 0.023	< 0.024	< 0.023	< 0.021	NT	NT	NT	NT	
NAPHTHALENE	mg/kg	4	~	~	< 0.0047	< 0.0047	< 0.0045	< 0.0043	NT	NT	NT	NT	
N-PROPYLBENZENE	mg/kg	100	~	~	< 0.0023	< 0.0024	< 0.0023	< 0.0021	NT	NT	NT	NT	
STYRENE	mg/kg	3	~	~	< 0.0023	< 0.0024	< 0.0023	< 0.0021	NT	NT	NT	NT	
1,1,1,2-TETRACHLOROETHANE	mg/kg	0.1	~	~	< 0.0023	< 0.0024	< 0.0023	< 0.0021	NT	NT	NT	NT	
1,1,1,2,2-TETRACHLOROETHANE	mg/kg	0.005	~	~	< 0.0012	< 0.0012	< 0.0011	< 0.0011	NT	NT	NT	NT	
TETRACHLOROETHYLENE	mg/kg	1	~	~	< 0.0023	< 0.0024	< 0.0023	< 0.0021	NT	NT	NT	NT	
TETRAHYDROFURAN	mg/kg	500	~	~	< 0.012	< 0.012	< 0.011	< 0.011	NT	NT	NT	NT	
TOLUENE	mg/kg	30	~	~	< 0.0023	< 0.0024	< 0.0023	< 0.0021	NT	NT	NT	NT	
1,2,3-TRICHLOROBENZENE	mg/kg	~	~	~	< 0.0023	< 0.0024	< 0.0023	< 0.0021	NT	NT	NT	NT	
1,2,4-TRICHLOROBENZENE	mg/kg	2	~	~	< 0.0023	< 0.0024	< 0.0023	< 0.0021	NT	NT	NT	NT	
1,1,1-TRICHLOROETHANE	mg/kg	30	~	~	< 0.0023	< 0.0024	< 0.0023	< 0.0021	NT	NT	NT	NT	
1,1,2-TRICHLOROETHANE	mg/kg	0.1	~	~	< 0.0023	< 0.0024	< 0.0023	< 0.0021	NT	NT	NT	NT	
TRICHLOROETHYLENE	mg/kg	0.3	~	~	< 0.0023	< 0.0024	< 0.0023	< 0.0021	NT	NT	NT	NT	
TRICHLOROFLUOROMETHANE	mg/kg	1000	~	~	< 0.012	< 0.012	< 0.011	< 0.011	NT	NT	NT	NT	
1,2,3-TRICHLOROPROPANE	mg/kg	100	~	~	< 0.0023	< 0.0024	< 0.0023	< 0.0021	NT	NT	NT	NT	
1,2,4-TRIMETHYLBENZENE	mg/kg	1000	~	~	< 0.0023	< 0.0024	< 0.0023	< 0.0021	NT	NT	NT	NT	
1,3,5-TRIMETHYLBENZENE	mg/kg	10	~	~	< 0.0023	< 0.0024	< 0.0023	< 0.0021	NT	NT	NT	NT	
VINYL CHLORIDE	mg/kg	0.7	~	~	< 0.012	< 0.012	< 0.011	< 0.011	NT	NT	NT	NT	
M/P-XYLENE	mg/kg	100	~	~	< 0.0047	< 0.0047	< 0.0045	< 0.0043	NT	NT	NT	NT	
O-XYLENE	mg/kg	100	~	~	< 0.0023	< 0.0024	< 0.0023	< 0.0021	NT	NT	NT	NT	
TOTAL VOCs	mg/kg	~	10	4	ND	ND	ND	ND	NT	NT	NT	NT	

Table 1  
Summary of Soil Analytical Results  
Coes Parking Lot  
Worcester, Massachusetts

Parameter	Units	Reportable Concentrations (RCs) <sup>1</sup>	Comm 97 Contaminant Levels for Soil Reuse <sup>2</sup>		SAMPLING LOCATION								
			RCS-1	Lined Landfill	Unlined Landfill	COMP-PL-EAST	COMP-PL-WEST	NM-NORTH	NM-SOUTH	PL-01 (0-12")	PL-02 (0-12")	PL-03 (0-12")	PL-04 (0-12")
						1/14/2020	1/14/2020	1/14/2020	1/14/2020	1/14/2020	1/14/2020	1/14/2020	1/14/2020
<b>SVOCs</b>													
ACENAPHTHENE	mg/kg	4	~	~	< 0.21	< 0.22	<b>0.25</b>	< 0.19	NT	NT	NT	NT	NT
ACENAPHTHYLENE	mg/kg	1	~	~	< 0.21	< 0.22	< 0.20	< 0.19	NT	NT	NT	NT	NT
ACETOPHENONE	mg/kg	1000	~	~	< 0.42	< 0.43	< 0.39	< 0.39	NT	NT	NT	NT	NT
ANILINE	mg/kg	1000	~	~	< 0.42	< 0.43	< 0.39	< 0.39	NT	NT	NT	NT	NT
ANTHRACENE	mg/kg	1000	~	~	< 0.21	< 0.22	<b>0.66</b>	<b>0.24</b>	NT	NT	NT	NT	NT
BENZO(A)ANTHRACENE	mg/kg	7	~	~	<b>0.50</b>	<b>0.49</b>	<b>1.9</b>	<b>0.83</b>	NT	NT	NT	NT	NT
BENZO(A)PYRENE	mg/kg	2	~	~	<b>0.48</b>	<b>0.50</b>	<b>1.8</b>	<b>0.85</b>	NT	NT	NT	NT	NT
BENZO(B)FLUORANTHENE	mg/kg	7	~	~	<b>0.62</b>	<b>0.62</b>	<b>2.3</b>	<b>0.99</b>	NT	NT	NT	NT	NT
BENZO(G,H,I)PERYLENE	mg/kg	1000	~	~	<b>0.29</b>	<b>0.33</b>	<b>0.97</b>	<b>0.57</b>	NT	NT	NT	NT	NT
BENZO(K)FLUORANTHENE	mg/kg	70	~	~	<b>0.23</b>	<b>0.25</b>	<b>0.80</b>	<b>0.42</b>	NT	NT	NT	NT	NT
BIS(2-CHLOROETHOXY)METHANE	mg/kg	500	~	~	< 0.42	< 0.43	< 0.39	< 0.39	NT	NT	NT	NT	NT
BIS(2-CHLOROETHYL)ETHER	mg/kg	0.7	~	~	< 0.42	< 0.43	< 0.39	< 0.39	NT	NT	NT	NT	NT
BIS(2-CHLOROISOPROPYL)ETHER	mg/kg	0.7	~	~	< 0.42	< 0.43	< 0.39	< 0.39	NT	NT	NT	NT	NT
BIS(2-ETHYLHEXYL)PHTHALATE	mg/kg	90	~	~	< 0.42	< 0.43	< 0.39	< 0.39	NT	NT	NT	NT	NT
4-BROMOPHENYL PHENYL ETHER	mg/kg	100	~	~	< 0.42	< 0.43	< 0.39	< 0.39	NT	NT	NT	NT	NT
BUTYLBENZYLPHTHALATE	mg/kg	100	~	~	< 0.42	< 0.43	< 0.39	< 0.39	NT	NT	NT	NT	NT
4-CHLOROANILINE	mg/kg	1	~	~	< 0.82	< 0.84	< 0.76	< 0.75	NT	NT	NT	NT	NT
2-CHLORONAPHTHALENE	mg/kg	1000	~	~	< 0.42	< 0.43	< 0.39	< 0.39	NT	NT	NT	NT	NT
2-CHLOROPHENOL	mg/kg	0.7	~	~	< 0.42	< 0.43	< 0.39	< 0.39	NT	NT	NT	NT	NT
CHRYSENE	mg/kg	70	~	~	<b>0.54</b>	<b>0.53</b>	<b>1.7</b>	<b>0.74</b>	NT	NT	NT	NT	NT
DIBENZ(A,H)ANTHRACENE	mg/kg	0.7	~	~	< 0.21	< 0.22	<b>0.29</b>	< 0.19	NT	NT	NT	NT	NT
DIBENZOFURAN	mg/kg	100	~	~	< 0.42	< 0.43	< 0.39	< 0.39	NT	NT	NT	NT	NT
DI-N-BUTYLPHTHALATE	mg/kg	50	~	~	< 0.42	< 0.43	< 0.39	< 0.39	NT	NT	NT	NT	NT
1,2-DICHLOROBENZENE	mg/kg	9	~	~	< 0.42	< 0.43	< 0.39	< 0.39	NT	NT	NT	NT	NT
1,3-DICHLOROBENZENE	mg/kg	3	~	~	< 0.42	< 0.43	< 0.39	< 0.39	NT	NT	NT	NT	NT
1,4-DICHLOROBENZENE	mg/kg	0.7	~	~	< 0.42	< 0.43	< 0.39	< 0.39	NT	NT	NT	NT	NT
3,3'-DICHLOROBENZIDINE	mg/kg	3	~	~	< 0.21	< 0.22	< 0.20	< 0.19	NT	NT	NT	NT	NT
2,4-DICHLOROPHENOL	mg/kg	0.7	~	~	< 0.42	< 0.43	< 0.39	< 0.39	NT	NT	NT	NT	NT
DIETHYLPHTHALATE	mg/kg	10	~	~	< 0.42	< 0.43	< 0.39	< 0.39	NT	NT	NT	NT	NT
2,4-DIMETHYLPHENOL	mg/kg	0.7	~	~	< 0.42	< 0.43	< 0.39	< 0.39	NT	NT	NT	NT	NT
DIMETHYLPHTHALATE	mg/kg	0.7	~	~	< 0.42	< 0.43	< 0.39	< 0.39	NT	NT	NT	NT	NT
2,4-DINITROPHENOL	mg/kg	3	~	~	< 0.82	< 0.84	< 0.76	< 0.75	NT	NT	NT	NT	NT
2,4-DINITROTOLUENE	mg/kg	0.7	~	~	< 0.42	< 0.43	< 0.39	< 0.39	NT	NT	NT	NT	NT
2,6-DINITROTOLUENE	mg/kg	100	~	~	< 0.42	< 0.43	< 0.39	< 0.39	NT	NT	NT	NT	NT
DI-N-OCTYLPHTHALATE	mg/kg	1000	~	~	< 0.42	< 0.43	< 0.39	< 0.39	NT	NT	NT	NT	NT
1,2-DIPHENYLHYDRAZINE (AZOBENZENE)	mg/kg	50	~	~	< 0.42	< 0.43	< 0.39	< 0.39	NT	NT	NT	NT	NT
FLUORANTHENE	mg/kg	1000	~	~	<b>1.1</b>	<b>1.1</b>	<b>4.3</b>	<b>1.7</b>	NT	NT	NT	NT	NT
FLUORENE	mg/kg	1000	~	~	< 0.21	< 0.22	<b>0.35</b>	< 0.19	NT	NT	NT	NT	NT
HEXACHLOROBENZENE	mg/kg	0.7	~	~	< 0.42	< 0.43	< 0.39	< 0.39	NT	NT	NT	NT	NT
HEXACHLOROBUTADIENE	mg/kg	30	~	~	< 0.42	< 0.43	< 0.39	< 0.39	NT	NT	NT	NT	NT
HEXACHLOROETHANE	mg/kg	0.7	~	~	< 0.42	< 0.43	< 0.39	< 0.39	NT	NT	NT	NT	NT
INDENO(1,2,3-CD)PYRENE	mg/kg	7	~	~	<b>0.33</b>	<b>0.37</b>	<b>1.1</b>	<b>0.60</b>	NT	NT	NT	NT	NT
ISOPHORONE	mg/kg	100	~	~	< 0.42	< 0.43	< 0.39	< 0.39	NT	NT	NT	NT	NT
2-METHYLNAPHTHALENE	mg/kg	0.7	~	~	< 0.21	< 0.22	< 0.20	< 0.19	NT	NT	NT	NT	NT
O-CRESOL	mg/kg	500	~	~	< 0.42	< 0.43	< 0.39	< 0.39	NT	NT	NT	NT	NT
M/P-CRESOL	mg/kg	500	~	~	< 0.42	< 0.43	< 0.39	< 0.39	NT	NT	NT	NT	NT
NAPHTHALENE	mg/kg	4	~	~	< 0.21	< 0.22	<b>0.29</b>	< 0.19	NT	NT	NT	NT	NT
NITROBENZENE	mg/kg	500	~	~	< 0.42	< 0.43	< 0.39	< 0.39	NT	NT	NT	NT	NT
2-NITROPHENOL	mg/kg	100	~	~	< 0.42	< 0.43	< 0.39	< 0.39	NT	NT	NT	NT	NT
4-NITROPHENOL	mg/kg	100	~	~	< 0.82	< 0.84	< 0.76	< 0.75	NT	NT	NT	NT	NT
PENTACHLOROPHENOL	mg/kg	3	~	~	< 0.42	< 0.43	< 0.39	< 0.39	NT	NT	NT	NT	NT
PHENANTHRENE	mg/kg	10	~	~	<b>0.88</b>	<b>0.69</b>	<b>3.0</b>	<b>1.0</b>	NT	NT	NT	NT	NT
PHENOL	mg/kg	1	~	~	< 0.42	< 0.43	< 0.39	< 0.39	NT	NT	NT	NT	NT
PYRENE	mg/kg	1000	~	~	<b>0.94</b>	<b>0.97</b>	<b>3.2</b>	<b>1.5</b>	NT	NT	NT	NT	NT
1,2,4-TRICHLOROBENZENE	mg/kg	2	~	~	< 0.42	< 0.43	< 0.39	< 0.39	NT	NT	NT	NT	NT
2,4,5-TRICHLOROPHENOL	mg/kg	4	~	~	< 0.42	< 0.43	< 0.39	< 0.39	NT	NT	NT	NT	NT
2,4,6-TRICHLOROPHENOL	mg/kg	0.7	~	~	< 0.42	< 0.43	< 0.39	< 0.39	NT	NT	NT	NT	NT
TOTAL SVOCs	mg/kg	~	100	100	<b>5.91</b>	<b>5.85</b>	<b>22.91</b>	<b>9.44</b>	NT	NT	NT	NT	NT

Table 1  
Summary of Soil Analytical Results  
Coes Parking Lot  
Worcester, Massachusetts

Parameter	Units	Reportable Concentrations (RCs) <sup>1</sup>	Comm 97 Contaminant Levels for Soil Reuse <sup>2</sup>		SAMPLING LOCATION								
			RCS-1	Lined Landfill	Unlined Landfill	COMP-PL-EAST	COMP-PL-WEST	NM-NORTH	NM-SOUTH	PL-01 (0-12")	PL-02 (0-12")	PL-03 (0-12")	PL-04 (0-12")
						1/14/2020	1/14/2020	1/14/2020	1/14/2020	1/14/2020	1/14/2020	1/14/2020	1/14/2020
<b>Metals</b>													
ANTIMONY	mg/kg	20	~	~	< 2.0	< 2.1	< 1.9	< 1.9	< 1.9	< 1.9	< 1.8	< 1.8	
ARSENIC	mg/kg	20	40	40	<b>35</b>	<b>30</b>	<b>22</b>	<b>24</b>	<b>29</b>	<b>25</b>	<b>14</b>	<b>33</b>	
BARIUM	mg/kg	1000	~	~	<b>97</b>	<b>81</b>	<b>62</b>	<b>55</b>	<b>37</b>	<b>39</b>	<b>80</b>	<b>92</b>	
BERYLLIUM	mg/kg	90	~	~	<b>0.44</b>	<b>0.43</b>	<b>0.47</b>	<b>0.39</b>	<b>0.42</b>	<b>0.36</b>	<b>0.32</b>	<b>0.37</b>	
CADMIUM	mg/kg	70	80	30	<b>1.2</b>	<b>0.95</b>	<b>0.84</b>	<b>0.81</b>	<b>0.95</b>	<b>0.90</b>	<b>4.7</b>	<b>1.3</b>	
CHROMIUM	mg/kg	100	1000	1000	<b>27</b>	<b>30</b>	<b>29</b>	<b>26</b>	<b>28</b>	<b>21</b>	<b>26</b>	<b>43</b>	
LEAD	mg/kg	200	2000	1000	<b>170</b>	<b>190</b>	<b>56</b>	<b>52</b>	<b>46</b>	<b>30</b>	<b>4400</b>	<b>21</b>	
MERCURY	mg/kg	20	10	10	<b>0.089</b>	<b>0.15</b>	<b>0.067</b>	<b>0.072</b>	<b>0.048</b>	<b>0.039</b>	< 0.028	< 0.027	
NICKEL	mg/kg	600	~	~	<b>22</b>	<b>20</b>	<b>24</b>	<b>21</b>	<b>23</b>	<b>19</b>	<b>21</b>	<b>28</b>	
SELENIUM	mg/kg	400	~	~	< 4.1	< 4.2	< 3.8	< 3.8	< 3.9	< 3.7	< 3.7	< 3.7	
SILVER	mg/kg	100	~	~	< 0.41	< 0.42	< 0.38	< 0.38	< 0.39	< 0.37	<b>11</b>	< 0.37	
THALLIUM	mg/kg	8	~	~	< 2.0	< 2.1	< 1.9	< 1.9	< 1.9	< 1.9	< 1.8	< 1.8	
VANADIUM	mg/kg	400	~	~	<b>22</b>	<b>22</b>	<b>23</b>	<b>22</b>	<b>23</b>	<b>19</b>	<b>30</b>	<b>38</b>	
ZINC	mg/kg	1000	~	~	<b>83</b>	<b>71</b>	<b>61</b>	<b>59</b>	<b>78</b>	<b>56</b>	<b>50</b>	<b>56</b>	
TCLP LEAD	mg/L	~	5	5	< 0.10	< 0.10	NT	NT	NT	NT	NT	NT	
<b>PCBs</b>													
PCB 1016	mg/kg	1	~	~	< 0.094	< 0.095	< 0.091	< 0.086	< 0.094	< 0.088	< 0.084	< 0.084	
PCB 1221	mg/kg	1	~	~	< 0.094	< 0.095	< 0.091	< 0.086	< 0.094	< 0.088	< 0.084	< 0.084	
PCB 1232	mg/kg	1	~	~	< 0.094	< 0.095	< 0.091	< 0.086	< 0.094	< 0.088	< 0.084	< 0.084	
PCB 1242	mg/kg	1	~	~	< 0.094	< 0.095	< 0.091	< 0.086	< 0.094	< 0.088	< 0.084	< 0.084	
PCB 1248	mg/kg	1	~	~	< 0.094	< 0.095	< 0.091	< 0.086	< 0.094	< 0.088	< 0.084	< 0.084	
PCB 1254	mg/kg	1	~	~	< 0.094	< 0.095	< 0.091	<b>0.090</b>	< 0.094	< 0.088	< 0.084	< 0.084	
PCB 1260	mg/kg	1	~	~	< 0.094	< 0.095	< 0.091	< 0.086	< 0.094	< 0.088	< 0.084	< 0.084	
PCB 1262	mg/kg	1	~	~	< 0.094	< 0.095	< 0.091	< 0.086	< 0.094	< 0.088	< 0.084	< 0.084	
PCB 1268	mg/kg	1	~	~	< 0.094	< 0.095	< 0.091	< 0.086	< 0.094	< 0.088	< 0.084	< 0.084	
TOTAL PCBs	mg/kg	1	2	2	< 0.094	< 0.095	< 0.091	<b>0.09</b>	< 0.094	< 0.088	< 0.084	< 0.084	
<b>TPH</b>													
TPH	mg/kg	1000	5000	2500	<b>280</b>	<b>300</b>	<b>360</b>	<b>330</b>	NT	NT	NT	NT	
<b>General Chemistry</b>													
% Solids	% Wt	~	~	~	<b>80.2</b>	<b>78.3</b>	<b>86.3</b>	<b>87.4</b>	<b>84.5</b>	<b>87.5</b>	<b>90.3</b>	<b>89.6</b>	
SPECIFIC CONDUCTANCE	µmhos/cm	~	8000	4000	<b>6.5</b>	<b>2.9</b>	<b>6.5</b>	<b>6.7</b>	NT	NT	NT	NT	
IGNITABILITY	present/absent	~	~	~	Absent	Absent	Absent	Absent	NT	NT	NT	NT	
REACTIVE CYANIDE	mg/kg	~	~	~	< 4.0	< 3.9	< 4.0	< 3.8	NT	NT	NT	NT	
REACTIVE SULFIDE	mg/kg	~	~	~	< 20	< 20	< 20	< 19	NT	NT	NT	NT	
pH	pH Units	~	~	~	<b>5</b>	<b>5.6</b>	<b>6.4</b>	<b>6.6</b>	NT	NT	NT	NT	

QC'd by

**Notes:**

- BOLD** Parameter is greater than or equal to laboratory detection limit.
- BOLD** Parameter is greater than or equal to Reportable Concentrations Standards.
- BOLD** Parameter is greater than or equal to Comm 97 Contaminant Levels for Soil Reuse.

< = indicates parameter not detected above laboratory method reporting limit, shown

1 = Standards are from 310 CMR 40.0000: Massachusetts Contingency Plan.

2 = Standards are from MassDEP Policy # Comm-97-001.

**Abbreviations:**

- mg/kg = milligrams per kilogram
- mg/L = milligrams per liter
- ~ = No Standard
- NT = Not Tested
- ND = Not Detected
- TCLP = Toxicity Characteristic Leaching Procedure
- PCBs = Polychlorinated Biphenyls
- TPH = Total Petroleum Hydrocarbons
- VOCs = Volatile Organic Compounds
- SVOCs = Semivolatile Organic Compounds
- µmhos/cm = microhm per centimeter

C:\Users\kirkjand\AppData\Roaming\Microsoft\Excel\Table 1 - Soil Analytical Results 01.14 (version 1).xls\soil\_results

## SECTION 00890

### PERMITS

#### PART 1 – GENERAL

##### 1.01 DESCRIPTION:

This Section provides specific information and defines specific requirements of the Contractor regarding the preparation and acquisition of permits required to perform the work of this project.

##### 1.02 RELATED WORK:

- A. Section 01110, CONTROL OF WORK AND MATERIALS
- B. Section 01562, DUST CONTROL
- C. Section 01570, ENVIRONMENTAL PROTECTION
- D. Section 02113, EXCAVATION AND STOCKPILING OF IMPACTED MATERIAL
- E. Section 02130, TRANSPORTATION AND DISPOSAL OF IMPACTED MATERIAL
- F. Section 02240, DEWATERING
- G. Section 02300, EARTHWORK

##### 1.03 GENERAL REQUIREMENTS:

- A. The Owner has obtained or will obtain and pay for the permits listed below, which are required for this project. The Contractor shall assist in obtaining certain permits, as indicated. The Contractor shall obtain and pay for all other permits required, as defined under the Permits subsection of Section 00700, GENERAL CONDITIONS.

---

<u>Permits by Owner</u>	<u>Status</u>
Conservation Commission Order of Conditions (Ch. 131, s. 40)	(Attached)
Chapter 253 Dam Safety Permit	In Process

Permits by Contractor

\*City of Worcester Permits (various)

\*Contractor shall prepare permit application and obtain the permit after contract is awarded, bearing all expenses. Owner will pay for and/or waive the permit application fee if applicable

1.04 CONSERVATION COMMISSION ORDERS:

The Conservation Commission has under the authority of Massachusetts General Laws Chapter 131, Section 40, issued an Order of Conditions on the work under this contract. This Order is to become a part of the Contract Documents and the Contractor shall perform all work in strict conformance with said Order. A copy of this Order is attached to this section.

PART 2 - PRODUCTS

Not Used.

PART 3 – EXECUTION

3.01 PERFORM WORK IN ACCORDANCE WITH REQUIREMENTS:

- A. The Contractor shall perform the work in accordance with the Contract Documents, including the attached permits/order of conditions, and any applicable municipal requirements.
- B. Prior to commencing any construction activities, the Contractor shall demonstrate to the Owner and the Engineer, through on-site inspection and submitting copies of permits or approvals, that it is in full compliance with the terms and conditions of all permits specified herein. The Contractor shall maintain full compliance with all permits throughout the performance of the work, and upon request, grant access to permitting

authorities to inspect the site for the purpose of verifying such compliance.

END OF SECTION

\\wse03.local\WSE\Projects\MA\Worcester MA\Coes Park\Parking Lot Expansion\Specs\Division 0\00890 -  
Permits.docx



**Massachusetts Department of Environmental Protection**  
Bureau of Resource Protection - Wetlands  
**WPA Form 5 – Order of Conditions**  
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:  
349-1267  
MassDEP File #  
eDEP Transaction #  
Worcester  
City/Town

**A. General Information**

**Please note:**  
this form has  
been modified  
with added  
space to  
accommodate  
the Registry  
of Deeds  
Requirements

1. From: City of Worcester  
Conservation Commission
2. This issuance is for  
(check one): a.  Order of Conditions b.  Amended Order of Conditions
3. To: Applicant:

**Important:**  
When filling  
out forms on  
the  
computer,  
use only the  
tab key to  
move your  
cursor - do  
not use the  
return key.



a. First Name \_\_\_\_\_ b. Last Name \_\_\_\_\_  
City of Worcester Department of Public Works and Parks  
c. Organization \_\_\_\_\_  
50 Skyline Drive  
d. Mailing Address \_\_\_\_\_  
Worcester MA 01605  
e. City/Town \_\_\_\_\_ f. State \_\_\_\_\_ g. Zip Code \_\_\_\_\_

4. Property Owner (if different from applicant):

a. First Name \_\_\_\_\_ b. Last Name \_\_\_\_\_  
c. Organization \_\_\_\_\_  
d. Mailing Address \_\_\_\_\_  
e. City/Town \_\_\_\_\_ f. State \_\_\_\_\_ g. Zip Code \_\_\_\_\_

5. Project Location:

140 Mill Street & 30 Coes Street Worcester  
a. Street Address \_\_\_\_\_ b. City/Town \_\_\_\_\_  
08-051 -00001, -00002  
c. Assessors Map/Plat Number \_\_\_\_\_ d. Parcel/Lot Number \_\_\_\_\_

Latitude and Longitude, if known:     d    m    s         d    m    s      
d. Latitude \_\_\_\_\_ e. Longitude \_\_\_\_\_



**Massachusetts Department of Environmental Protection**  
Bureau of Resource Protection - Wetlands  
**WPA Form 5 – Order of Conditions**

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:  
349-1267  
MassDEP File #

eDEP Transaction #  
Worcester  
City/Town

**A. General Information (cont.)**

6. Property recorded at the Registry of Deeds for (attach additional information if more than one parcel):

Worcester

a. County

21136

c. Book

b. Certificate Number (if registered land)

288

d. Page

7. Dates: 1/24/20 4/13/20 4/21/20  
a. Date Notice of Intent Filed b. Date Public Hearing Closed c. Date of Issuance

8. Final Approved Plans and Other Documents (attach additional plan or document references as needed):

Coes Park, Parking Lot Expansion

a. Plan Title

Weston & Sampson

b. Prepared By

1/24/20

d. Final Revision Date

James I. Pearson, P.E.

c. Signed and Stamped by

1:20

e. Scale

NOI Application Materials, including Stormwater Report

f. Additional Plan or Document Title

January 2020

g. Date

**B. Findings**

1. Findings pursuant to the Massachusetts Wetlands Protection Act:

Following the review of the above-referenced Notice of Intent and based on the information provided in this application and presented at the public hearing, this Commission finds that the areas in which work is proposed is significant to the following interests of the Wetlands Protection Act (the Act). Check all that apply:

- a.  Public Water Supply
- b.  Land Containing Shellfish
- c.  Prevention of Pollution
- d.  Private Water Supply
- e.  Fisheries
- f.  Protection of Wildlife Habitat
- g.  Groundwater Supply
- h.  Storm Damage Prevention
- i.  Flood Control

2. This Commission hereby finds the project, as proposed, is: (check one of the following boxes)

**Approved** subject to:

- a.  the following conditions which are necessary in accordance with the performance standards set forth in the wetlands regulations. This Commission orders that all work shall be performed in accordance with the Notice of Intent referenced above, the following General Conditions, and any other special conditions attached to this Order. To the extent that the following conditions modify or differ from the plans, specifications, or other proposals submitted with the Notice of Intent, these conditions shall control.



**Massachusetts Department of Environmental Protection**  
Bureau of Resource Protection - Wetlands

**WPA Form 5 – Order of Conditions**

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:  
349-1267  
MassDEP File #

eDEP Transaction #  
Worcester  
City/Town

**B. Findings (cont.)**

Denied because:

- b.  the proposed work cannot be conditioned to meet the performance standards set forth in the wetland regulations. Therefore, work on this project may not go forward unless and until a new Notice of Intent is submitted which provides measures which are adequate to protect the interests of the Act, and a final Order of Conditions is issued. **A description of the performance standards which the proposed work cannot meet is attached to this Order.**
- c.  the information submitted by the applicant is not sufficient to describe the site, the work, or the effect of the work on the interests identified in the Wetlands Protection Act. Therefore, work on this project may not go forward unless and until a revised Notice of Intent is submitted which provides sufficient information and includes measures which are adequate to protect the Act's interests, and a final Order of Conditions is issued. **A description of the specific information which is lacking and why it is necessary is attached to this Order as per 310 CMR 10.05(6)(c).**
- 3.  Buffer Zone Impacts: Shortest distance between limit of project disturbance and the wetland resource area specified in 310 CMR 10.02(1)(a) \_\_\_\_\_ a. linear feet

**Inland Resource Area Impacts:** Check all that apply below. (For Approvals Only)

Resource Area	Proposed Alteration	Permitted Alteration	Proposed Replacement	Permitted Replacement
4. <input type="checkbox"/> Bank	_____ a. linear feet	_____ b. linear feet	_____ c. linear feet	_____ d. linear feet
5. <input type="checkbox"/> Bordering Vegetated Wetland	_____ a. square feet	_____ b. square feet	_____ c. square feet	_____ d. square feet
6. <input type="checkbox"/> Land Under Waterbodies and Waterways	_____ a. square feet	_____ b. square feet	_____ c. square feet	_____ d. square feet
	_____ e. c/y dredged	_____ f. c/y dredged		
7. <input checked="" type="checkbox"/> Bordering Land Subject to Flooding	21,002 _____ a. square feet	21,002 _____ b. square feet	21,002 (in place) _____ c. square feet	21,002 _____ d. square feet
Cubic Feet Flood Storage	0 _____ e. cubic feet	0 _____ f. cubic feet	+16.2 _____ g. cubic feet	+16.2 _____ h. cubic feet
8. <input type="checkbox"/> Isolated Land Subject to Flooding	_____ a. square feet	_____ b. square feet		
Cubic Feet Flood Storage	_____ c. cubic feet	_____ d. cubic feet	_____ e. cubic feet	_____ f. cubic feet
9. <input type="checkbox"/> Riverfront Area	_____ a. total sq. feet	_____ b. total sq. feet		
Sq ft within 100 ft	_____ c. square feet	_____ d. square feet	_____ e. square feet	_____ f. square feet
Sq ft between 100-200 ft	_____ g. square feet	_____ h. square feet	_____ i. square feet	_____ j. square feet



**Massachusetts Department of Environmental Protection**  
Bureau of Resource Protection - Wetlands

**WPA Form 5 – Order of Conditions**

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

349-1267

MassDEP File #

eDEP Transaction #

Worcester

City/Town

**B. Findings (cont.)**

**Coastal Resource Area Impacts:** Check all that apply below. (For Approvals Only)

	Proposed Alteration	Permitted Alteration	Proposed Replacement	Permitted Replacement
10. <input type="checkbox"/> Designated Port Areas	Indicate size under Land Under the Ocean, below			
11. <input type="checkbox"/> Land Under the Ocean	_____	_____		
	a. square feet	b. square feet		
	_____	_____		
	c. c/y dredged	d. c/y dredged		
12. <input type="checkbox"/> Barrier Beaches	Indicate size under Coastal Beaches and/or Coastal Dunes below			
13. <input type="checkbox"/> Coastal Beaches	_____	_____	_____ cu yd	_____ cu yd
	a. square feet	b. square feet	c. nourishment	d. nourishment
14. <input type="checkbox"/> Coastal Dunes	_____	_____	_____ cu yd	_____ cu yd
	a. square feet	b. square feet	c. nourishment	d. nourishment
15. <input type="checkbox"/> Coastal Banks	_____	_____		
	a. linear feet	b. linear feet		
16. <input type="checkbox"/> Rocky Intertidal Shores	_____	_____		
	a. square feet	b. square feet		
17. <input type="checkbox"/> Salt Marshes	_____	_____	_____	_____
	a. square feet	b. square feet	c. square feet	d. square feet
18. <input type="checkbox"/> Land Under Salt Ponds	_____	_____		
	a. square feet	b. square feet		
	_____	_____		
	c. c/y dredged	d. c/y dredged		
19. <input type="checkbox"/> Land Containing Shellfish	_____	_____	_____	_____
	a. square feet	b. square feet	c. square feet	d. square feet
20. <input type="checkbox"/> Fish Runs	Indicate size under Coastal Banks, Inland Bank, Land Under the Ocean, and/or inland Land Under Waterbodies and Waterways, above			
	_____	_____		
	a. c/y dredged	b. c/y dredged		
21. <input type="checkbox"/> Land Subject to Coastal Storm Flowage	_____	_____		
	a. square feet	b. square feet		
22. <input type="checkbox"/> Riverfront Area	_____	_____		
	a. total sq. feet	b. total sq. feet		
Sq ft within 100 ft	_____	_____	_____	_____
	c. square feet	d. square feet	e. square feet	f. square feet
Sq ft between 100-200 ft	_____	_____	_____	_____
	g. square feet	h. square feet	i. square feet	j. square feet



**Massachusetts Department of Environmental Protection**  
Bureau of Resource Protection - Wetlands  
**WPA Form 5 – Order of Conditions**

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:  
349-1267  
MassDEP File #

eDEP Transaction #  
Worcester  
City/Town

**B. Findings (cont.)**

\* #23. If the project is for the purpose of restoring or enhancing a wetland resource area in addition to the square footage that has been entered in Section B.5.c (BVW) or B.17.c (Salt Marsh) above, please enter the additional amount here.

23.  Restoration/Enhancement \*:

\_\_\_\_\_ a. square feet of BVW

\_\_\_\_\_ b. square feet of salt marsh

24.  Stream Crossing(s):

\_\_\_\_\_ a. number of new stream crossings

\_\_\_\_\_ b. number of replacement stream crossings

**C. General Conditions Under Massachusetts Wetlands Protection Act**

**The following conditions are only applicable to Approved projects.**

1. Failure to comply with all conditions stated herein, and with all related statutes and other regulatory measures, shall be deemed cause to revoke or modify this Order.
2. The Order does not grant any property rights or any exclusive privileges; it does not authorize any injury to private property or invasion of private rights.
3. This Order does not relieve the permittee or any other person of the necessity of complying with all other applicable federal, state, or local statutes, ordinances, bylaws, or regulations.
4. The work authorized hereunder shall be completed within three years from the date of this Order unless either of the following apply:
  - a. The work is a maintenance dredging project as provided for in the Act; or
  - b. The time for completion has been extended to a specified date more than three years, but less than five years, from the date of issuance. If this Order is intended to be valid for more than three years, the extension date and the special circumstances warranting the extended time period are set forth as a special condition in this Order.
  - c. If the work is for a Test Project, this Order of Conditions shall be valid for no more than one year.
5. This Order may be extended by the issuing authority for one or more periods of up to three years each upon application to the issuing authority at least 30 days prior to the expiration date of the Order. An Order of Conditions for a Test Project may be extended for one additional year only upon written application by the applicant, subject to the provisions of 310 CMR 10.05(11)(f).
6. If this Order constitutes an Amended Order of Conditions, this Amended Order of Conditions does not extend the issuance date of the original Final Order of Conditions and the Order will expire on \_\_\_\_\_ unless extended in writing by the Department.
7. Any fill used in connection with this project shall be clean fill. Any fill shall contain no trash, refuse, rubbish, or debris, including but not limited to lumber, bricks, plaster, wire, lath, paper, cardboard, pipe, tires, ashes, refrigerators, motor vehicles, or parts of any of the foregoing.



**Massachusetts Department of Environmental Protection**  
Bureau of Resource Protection - Wetlands

**WPA Form 5 – Order of Conditions**

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

349-1267

MassDEP File #

eDEP Transaction #

Worcester

City/Town

**C. General Conditions Under Massachusetts Wetlands Protection Act**

8. This Order is not final until all administrative appeal periods from this Order have elapsed, or if such an appeal has been taken, until all proceedings before the Department have been completed.
9. No work shall be undertaken until the Order has become final and then has been recorded in the Registry of Deeds or the Land Court for the district in which the land is located, within the chain of title of the affected property. In the case of recorded land, the Final Order shall also be noted in the Registry's Grantor Index under the name of the owner of the land upon which the proposed work is to be done. In the case of the registered land, the Final Order shall also be noted on the Land Court Certificate of Title of the owner of the land upon which the proposed work is done. The recording information shall be submitted to the Conservation Commission on the form at the end of this Order, which form must be stamped by the Registry of Deeds, prior to the commencement of work.
10. A sign shall be displayed at the site not less than two square feet or more than three square feet in size bearing the words,
 

"Massachusetts Department of Environmental Protection" [or, "MassDEP"]  
"File Number            349-1267 "
11. Where the Department of Environmental Protection is requested to issue a Superseding Order, the Conservation Commission shall be a party to all agency proceedings and hearings before MassDEP.
12. Upon completion of the work described herein, the applicant shall submit a Request for Certificate of Compliance (WPA Form 8A) to the Conservation Commission.
13. The work shall conform to the plans and special conditions referenced in this order.
14. Any change to the plans identified in Condition #13 above shall require the applicant to inquire of the Conservation Commission in writing whether the change is significant enough to require the filing of a new Notice of Intent.
15. The Agent or members of the Conservation Commission and the Department of Environmental Protection shall have the right to enter and inspect the area subject to this Order at reasonable hours to evaluate compliance with the conditions stated in this Order, and may require the submittal of any data deemed necessary by the Conservation Commission or Department for that evaluation.
16. This Order of Conditions shall apply to any successor in interest or successor in control of the property subject to this Order and to any contractor or other person performing work conditioned by this Order.



**Massachusetts Department of Environmental Protection**  
Bureau of Resource Protection - Wetlands

**WPA Form 5 – Order of Conditions**

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

349-1267

MassDEP File #

eDEP Transaction #

Worcester

City/Town

**C. General Conditions Under Massachusetts Wetlands Protection Act (cont.)**

17. Prior to the start of work, and if the project involves work adjacent to a Bordering Vegetated Wetland, the boundary of the wetland in the vicinity of the proposed work area shall be marked by wooden stakes or flagging. Once in place, the wetland boundary markers shall be maintained until a Certificate of Compliance has been issued by the Conservation Commission.
18. All sedimentation barriers shall be maintained in good repair until all disturbed areas have been fully stabilized with vegetation or other means. At no time shall sediments be deposited in a wetland or water body. During construction, the applicant or his/her designee shall inspect the erosion controls on a daily basis and shall remove accumulated sediments as needed. The applicant shall immediately control any erosion problems that occur at the site and shall also immediately notify the Conservation Commission, which reserves the right to require additional erosion and/or damage prevention controls it may deem necessary. Sedimentation barriers shall serve as the limit of work unless another limit of work line has been approved by this Order.
19. The work associated with this Order (the "Project")
- (1)  is subject to the Massachusetts Stormwater Standards
- (2)  is NOT subject to the Massachusetts Stormwater Standards

**If the work is subject to the Stormwater Standards, then the project is subject to the following conditions:**

- a) All work, including site preparation, land disturbance, construction and redevelopment, shall be implemented in accordance with the construction period pollution prevention and erosion and sedimentation control plan and, if applicable, the Stormwater Pollution Prevention Plan required by the National Pollution Discharge Elimination System Construction General Permit as required by Stormwater Condition 8. Construction period erosion, sedimentation and pollution control measures and best management practices (BMPs) shall remain in place until the site is fully stabilized.
- b) No stormwater runoff may be discharged to the post-construction stormwater BMPs unless and until a Registered Professional Engineer provides a Certification that:
- i.* all construction period BMPs have been removed or will be removed by a date certain specified in the Certification. For any construction period BMPs intended to be converted to post construction operation for stormwater attenuation, recharge, and/or treatment, the conversion is allowed by the MassDEP Stormwater Handbook BMP specifications and that the BMP has been properly cleaned or prepared for post construction operation, including removal of all construction period sediment trapped in inlet and outlet control structures;
- ii.* as-built final construction BMP plans are included, signed and stamped by a Registered Professional Engineer, certifying the site is fully stabilized;
- iii.* any illicit discharges to the stormwater management system have been removed, as per the requirements of Stormwater Standard 10;



**Massachusetts Department of Environmental Protection**  
Bureau of Resource Protection - Wetlands

**WPA Form 5 – Order of Conditions**

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

349-1267

MassDEP File #

eDEP Transaction #

Worcester

City/Town

**C. General Conditions Under Massachusetts Wetlands Protection Act (cont.)**

iv. all post-construction stormwater BMPs are installed in accordance with the plans (including all planting plans) approved by the issuing authority, and have been inspected to ensure that they are not damaged and that they are in proper working condition;

v. any vegetation associated with post-construction BMPs is suitably established to withstand erosion.

c) The landowner is responsible for BMP maintenance until the issuing authority is notified that another party has legally assumed responsibility for BMP maintenance. Prior to requesting a Certificate of Compliance, or Partial Certificate of Compliance, the responsible party (defined in General Condition 18(e)) shall execute and submit to the issuing authority an Operation and Maintenance Compliance Statement (“O&M Statement”) for the Stormwater BMPs identifying the party responsible for implementing the stormwater BMP Operation and Maintenance Plan (“O&M Plan”) and certifying the following:

i.) the O&M Plan is complete and will be implemented upon receipt of the Certificate of Compliance, and

ii.) the future responsible parties shall be notified in writing of their ongoing legal responsibility to operate and maintain the stormwater management BMPs and implement the Stormwater Pollution Prevention Plan.

d) Post-construction pollution prevention and source control shall be implemented in accordance with the long-term pollution prevention plan section of the approved Stormwater Report and, if applicable, the Stormwater Pollution Prevention Plan required by the National Pollution Discharge Elimination System Multi-Sector General Permit.

e) Unless and until another party accepts responsibility, the landowner, or owner of any drainage easement, assumes responsibility for maintaining each BMP. To overcome this presumption, the landowner of the property must submit to the issuing authority a legally binding agreement of record, acceptable to the issuing authority, evidencing that another entity has accepted responsibility for maintaining the BMP, and that the proposed responsible party shall be treated as a permittee for purposes of implementing the requirements of Conditions 18(f) through 18(k) with respect to that BMP. Any failure of the proposed responsible party to implement the requirements of Conditions 18(f) through 18(k) with respect to that BMP shall be a violation of the Order of Conditions or Certificate of Compliance. In the case of stormwater BMPs that are serving more than one lot, the legally binding agreement shall also identify the lots that will be serviced by the stormwater BMPs. A plan and easement deed that grants the responsible party access to perform the required operation and maintenance must be submitted along with the legally binding agreement.

f) The responsible party shall operate and maintain all stormwater BMPs in accordance with the design plans, the O&M Plan, and the requirements of the Massachusetts Stormwater Handbook.



**Massachusetts Department of Environmental Protection**  
Bureau of Resource Protection - Wetlands

**WPA Form 5 – Order of Conditions**

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

349-1267

MassDEP File #

eDEP Transaction #

Worcester

City/Town

**C. General Conditions Under Massachusetts Wetlands Protection Act (cont.)**

- g) The responsible party shall:
  1. Maintain an operation and maintenance log for the last three (3) consecutive calendar years of inspections, repairs, maintenance and/or replacement of the stormwater management system or any part thereof, and disposal (for disposal the log shall indicate the type of material and the disposal location);
  2. Make the maintenance log available to MassDEP and the Conservation Commission (“Commission”) upon request; and
  3. Allow members and agents of the MassDEP and the Commission to enter and inspect the site to evaluate and ensure that the responsible party is in compliance with the requirements for each BMP established in the O&M Plan approved by the issuing authority.
  
- h) All sediment or other contaminants removed from stormwater BMPs shall be disposed of in accordance with all applicable federal, state, and local laws and regulations.
  
- i) Illicit discharges to the stormwater management system as defined in 310 CMR 10.04 are prohibited.
  
- j) The stormwater management system approved in the Order of Conditions shall not be changed without the prior written approval of the issuing authority.
  
- k) Areas designated as qualifying pervious areas for the purpose of the Low Impact Site Design Credit (as defined in the MassDEP Stormwater Handbook, Volume 3, Chapter 1, Low Impact Development Site Design Credits) shall not be altered without the prior written approval of the issuing authority.
  
- l) Access for maintenance, repair, and/or replacement of BMPs shall not be withheld. Any fencing constructed around stormwater BMPs shall include access gates and shall be at least six inches above grade to allow for wildlife passage.

Special Conditions (if you need more space for additional conditions, please attach a text document):

**See Attachment A.**

- 20. For Test Projects subject to 310 CMR 10.05(11), the applicant shall also implement the monitoring plan and the restoration plan submitted with the Notice of Intent. If the conservation commission or Department determines that the Test Project threatens the public health, safety or the environment, the applicant shall implement the removal plan submitted with the Notice of Intent or modify the project as directed by the conservation commission or the Department.



**Massachusetts Department of Environmental Protection**  
Bureau of Resource Protection - Wetlands

**WPA Form 5 – Order of Conditions**

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

349-1267

MassDEP File #

eDEP Transaction #

Worcester

City/Town

**D. Findings Under Municipal Wetlands Bylaw or Ordinance**

1. Is a municipal wetlands bylaw or ordinance applicable?  Yes  No

2. The City of Worcester hereby finds (check one that applies):  
Conservation Commission

a.  that the proposed work cannot be conditioned to meet the standards set forth in a municipal ordinance or bylaw, specifically:

City of Worcester Wetlands Protection Ordinance & Regulations

COW GRO

1. Municipal Ordinance or Bylaw

Part 1. Ch. 6.

2. Citation

Therefore, work on this project may not go forward unless and until a revised Notice of Intent is submitted which provides measures which are adequate to meet these standards, and a final Order of Conditions is issued.

b.  that the following additional conditions are necessary to comply with a municipal ordinance or bylaw:

City of Worcester Wetlands Protection Ordinance & Regulations

COW GRO

1. Municipal Ordinance or Bylaw

Part 1. Ch. 6.

2. Citation

3. The Commission orders that all work shall be performed in accordance with the following conditions and with the Notice of Intent referenced above. To the extent that the following conditions modify or differ from the plans, specifications, or other proposals submitted with the Notice of Intent, the conditions shall control.

The special conditions relating to municipal ordinance or bylaw are as follows (if you need more space for additional conditions, attach a text document):

**See Attachment A.**

---

---

---

---

**ATTACHMENT A**

**Worcester Conservation Commission  
Special Order of Conditions**

City of Worcester Wetlands Protection Ordinance & City of Worcester Wetlands Protection Regulations  
(City of Worcester Revised Ordinance Part I, Chapter 6)

And

Massachusetts General Laws, Chapter 131, §40 - Massachusetts Wetlands Protection Act

**140 Mill Street and 30 Coes Street (CC-2020-008)**

**Project Description:** To construct a parking area, sidewalk, and stormwater system, removal of an earthen mound, and associated site work. To occur within Bordering Land Subject to Flooding with no fill to occur and within 100' buffer to bank and Bordering Vegetated Wetland.

**Waivers Granted:** N/A

**Table of Contents:**

I. Conditions to Meet Prior to and During Construction .....	2
II. Conditions to Meet Before the Start of Any Activity .....	2
III. Stormwater Management System.....	3
IV. Conditions to Meet During Construction .....	3
V. Conditions to Meet at Completion of Project.....	5
VI. General Conditions.....	6

**Notes:**

- **Office of the Commission** is located at the Division of Planning and Regulatory Services (455 Main Street 4<sup>th</sup> floor, Worcester, MA), which can be contacted by e-mailing [planning@worcesterma.gov](mailto:planning@worcesterma.gov) or calling 508-799-1400 ext. 31440.
- **Asterisked (\*) conditions** are standard conditions of approval for all projects.
- **Wetland or Bank Flagging** – Prior to construction, wetland and/or bank flags shall be installed and left in place for entirety of project.
- **Pre-Construction Conference** is required.
- **Fill and Flood Storage** – No additional fill shall be added on site. If filling is required, the applicant shall return to the Conservation Commission for approval of changes and provide Compensatory Storage as required under 310 CMR 10.57.
- **Deeded Conditions** – Conditions 35, 47, and 51 shall extend beyond the Certificate of Compliance, in perpetuity, and shall be referred to in all future deeds to this property.

## **I. Conditions to Meet Prior to and During Construction**

21. Person Responsible for Compliance with the Order of Conditions\* – A person shall be designated to be responsible to monitor compliance with the Order of Conditions. Their name and contact information (24/7) shall be provided to the Office of the Commission prior to start of any activity. This person shall conduct:
  - a) periodic inspections to assure the adequacy and continued effectiveness of erosion and sediment controls;
  - b) inspections of said controls following 0.5-inch or greater rain events, or after a heavy snow melt.
22. Contract\* - This Order of Conditions and all approved plans shall be included as part of any contract and subcontract and shall be posted in a prominently displayed location in the supervisory office on site during all phases of construction.
23. Notification\* - The applicant shall notify the Office of the Commission a minimum of 48 hours prior to the start of any activity.
24. Wetland or Bank Flagging – Prior to construction, wetland and/or bank flags shall be installed along the resource area boundary, and shall remain in place during and after construction until approved for removal through the issuance of Certificate of Compliance for the entire project.

## **II. Conditions to Meet Before the Start of Any Activity**

25. Stormwater Management System Maintenance – Prior to the start of any activity, the applicant must submit in writing the name, address and telephone number of the party responsible for ongoing maintenance of the stormwater management system components.
26. Stormwater Pollution Prevention Plan (SWPPP)\* – That one (1) copy of the SWPPP submitted to the EPA in compliance with the NPDES permit requirements, if applicable, shall be provided to the Office of the Commission prior to commencement of work.
27. Tree Cutting\* – Tree cutting is allowed following installation of erosion and sediment controls; otherwise, it may be allowed, prior to such installation, with the explicit permission of the Commission or its Agents.
28. Trees To Remain\* – All trees to remain post construction shall be marked on site as shown on the approved plan so that the Commission or its representative can verify them before any clearing takes place.
29. Pre-Construction Conference\* -
  - a) The Conservation Commission or its Agents shall conduct a pre-construction conference prior to commencement of activities in each phase of the project. Phasing, if any, shall conform to the approved plans.
  - b) The property owner / applicant and any person performing work that is subject to this Order are responsible for understanding and complying with the requirements of this Order, the Wetlands Protection Act, 310 CMR 10.00 and City of Worcester Wetlands Protection Ordinance and Regulations. Said persons shall acknowledge such in writing prior to commencement of activities.
30. Inspections Prior to Site Preparation and Site Work\* - Erosion and sediment controls shall be installed and verified, in compliance with final approved plans, by the Commission or its Agents prior to the commencement of any excavation, grubbing and/or stumping of vegetation, grading, construction, or other site preparation.
31. Construction Schedule - Submit a Construction Schedule consistent with Work Sequencing plans provided to the Office of the Commission prior to the start of any activities.

32. Demarcation of Limit of Work – For areas of work within the 100 foot buffer to a bordering vegetated wetland/bank, prior to construction, the contractor shall stake out the 15 foot Worcester Wetlands Protection Ordinance no-disturb buffer or limit of work, whichever is further from the bordering vegetated wetlands, using an orange snow/construction fence to demarcate the no-disturbance zone during construction in order to prevent encroachments beyond the approved limit of work and prevent resource area impacts.

### III. Stormwater Management System

33. Catch Basins\* –

- a) The paved roadways and parking lots shall be bermed and shall be installed with standard City of Worcester catch basins.
- b) Prior to start of activity on site that causes soil erosion and sedimentation, catch basin filter traps shall be installed in the existing and new catch basins.
- c) Catch basins shall be cleaned as warranted during construction to keep them clear of sediment, and minimum twice a year thereafter.

34. Construction Timing – The stormwater management detention basin and all associated drainage piping, inverts, and outlets as proposed in the project plans shall be constructed and be operating as designed prior to any other construction related activity on the site.

35. Stormwater Management System Maintenance\* – The stormwater management system shall be maintained in accordance with the approved design plans and Operation and Maintenance Plan on file with the Office of the Commission. The system shall be maintained in good hydraulic condition (e.g. any accumulated silt/sediment shall be removed; the system shall be kept free of any litter, refuse, or other extraneous matter, etc.). This condition shall extend in perpetuity beyond the issuance of the Certificate of Compliance.

36. Retention Basin Vegetation -

- a) The stormwater retention basin shall be vegetated as shown in the approved plans to ensure optimal removal of pollutants associated with stormwater runoff.
- b) The system shall be maintained in good hydraulic condition (e.g. any accumulated silt/sediment shall be removed; the system shall be kept free of any litter, refuse, or other extraneous matter, etc.). If system maintenance disturbs any wetland plant species, the basin shall be revegetated as soon as possible with the same species.
- c) The system shall be monitored for the presence of invasive species during regular inspections, and shall be removed, if found.

### IV. Conditions to Meet During Construction

37. Limit of Work\* – No removal, filling, dredging or altering of jurisdictional areas shall take place outside the approved work under this Order of Condition.

38. Work Sequencing\* – Activities shall take place in accordance with all phasing and sequencing shown on the plan and/or provided in the application materials on file with the Office of the Commission and shall follow any lot opening restrictions otherwise provided herein.

39. Erosion Stabilization -

- a) Erosion and Sediment Controls\* - All erosion and sediment controls shall be monitored, maintained, and adjusted for the duration of the project to prevent adverse impacts to jurisdictional areas. Additional erosion and sediment controls may be utilized on site as needed.

- b) Off Site Impacts\* - There shall be no off-site erosion, flooding, ponding, or flood-related damage from runoff caused by the project activities.
- c) Unanticipated Drainage or Erosion\* - The applicant shall control any unanticipated drainage and/or erosion conditions that may cause damage to jurisdictional areas and/or abutting or downstream properties. Said control measures shall be implemented immediately upon need. The Office of the Conservation Commission shall be notified if such conditions arise and of the measures utilized.
- d) Soil Stabilization due to Delay in Work\* - If there is an interruption of more than 10, but less than 60 days between completion of grading and revegetation, the applicant shall sow all disturbed areas with annual rye grass to prevent erosion. If soils are to be exposed for longer than 60 days, a temporary cover of rye or other grass should be established following US Soil Conservation Services procedures, as recently amended, to prevent erosion and sedimentation. Once final grading is complete, loaming and seeding of final cover should be completed promptly.
- e) Grading of Slopes\*-
  - i. >40% Slope – Slopes shall not exceed those specified in the plans approved by the Conservation Commission. Any slope equal to or greater than 40% (1 vertical to 2 1/2 horizontal) shall be stabilized with erosion control matting.
  - ii. <40% Slope – Final grades of vegetated areas shall not exceed a slope of 1 vertical to 2 1/2 horizontal (40%) and shall be stabilized to prevent erosion, particularly during the construction period.
- f) Stockpiling – No stockpiling shall occur on site within Bordering Land Subject to Flooding.
- g) Site Stabilization Prior to Winter\* - Prior to winter, exposed soils shall be stabilized (e.g. with demonstrated vegetative growth, impermeable barriers, erosion control blankets, etc.).

40. Invasive Insects\* -

- a) Plantings – No trees to be planted shall be species susceptible to the Asian Longhorned Beetle or Emerald Ash Borer.
- b) Wood Removal – All tree, brush & wood removal shall adhere to the most recently amended requirements set forth by the Massachusetts Department of Conservation & Recreation for any project located in the Asian Longhorned Beetle Quarantine Zone.

41. Dust Control\* - Provisions for dust control shall be provided during all construction and demolition activities. Such provisions shall be conducted in compliance with all City of Worcester Water Use Restrictions, if in effect, during such activities.

42. Dewatering\* – If dewatering is required,

- a) Notice of such activities shall be given to the Office of the Commission within 24 hours of commencement;
- b) There shall be no discharge of untreated dewatered stormwater or groundwater to jurisdictional areas either by direct or indirect discharge to existing drainage systems;
- c) Any discharge to surface waters or drainage structures must be visibly free of sediment;
- d) To the maximum extent practicable, proposed dewatering activities should be located outside of the 100' buffer. If such activities must be located within the 100' buffer, they shall be monitored at all times when the pumps are running;
- e) Dewatering activities shall be confined within an area of secondary containment at all times.

43. Cement Truck Washing - Cement trucks shall not discharge washout effluent directly to any resource area, the 30' buffer thereto, or into any drainage system. Designated washout areas shall be located out of the 100 buffer zone to any wetland.
44. Equipment/Material Placement - No equipment or materials are to enter or be placed in the wetland, bank, or land under water at any time.
45. Fill and Flood Storage – No additional fill shall be added on site. If filling is required, the applicant shall return to the Conservation Commission for approval of changes and provide Compensatory Storage as required under 310 CMR 10.57.
46. Spill Prevention\* -
  - a) No fuel, oil, or other pollutants shall be stored in any resource area or the buffer zone thereto, unless specified in this Order;
  - b) No refueling shall take place within resource areas or 100-ft to a resource area;
  - c) The applicant shall take all necessary precautions to prevent discharge or spillage of fuel, oil or other pollutants onto any part of the site;
  - d) A spill kit shall be present on site at all times.
47. Fertilizers – For any portion of the lot located in the buffer zone, the Commission will allow the use of fertilizers only during the construction phase in order to establish vegetation in order to stabilize slopes as quickly as possible.

#### **V. Conditions to Meet at Completion of Project**

48. Site Stabilization\* - All disturbed areas shall be properly stabilized with well-established perennial vegetation or other approved methods before the project is considered complete.
49. Erosion and Sediment Controls\* - Erosion and sediment controls shall not be removed from the site until all disturbed areas have been stabilized with final vegetative cover and approval has been received from the Commission or its Agents to do so. The controls must then be removed within two weeks of receipt of that certification.
50. Certificate of Compliance\* - Upon completion of the project, the applicant shall request in writing a Certificate of Compliance from the Commission. If the project has been completed in accordance with plans stamped by a registered professional engineer, architect, landscape architect, or land surveyor, certification must include a written statement by such professional certifying the same.
  - a) A certified as-built plan-of-land shall be provided showing final grades with one 1' contours, all resource areas, and all constructed improvements;
51. Snow Storage – At no time shall snow be stored or stockpiled within 30' of a bordering vegetated wetland or bank, a stormwater basin, or compensatory storage area.
52. Deed Condition – Conditions numbered 35, 47, and 51 shall extend beyond the Certificate of Compliance, in perpetuity, and shall be referred to in all future deeds to this property.

## VI. General Conditions

53. Change in Ownership\* - If a change in ownership takes place while this Order is still in effect, it is the responsibility of the new owner to notify the Commission of the change and to provide the name of the person responsible for compliance with the Order.
54. Conservation Agent's Power to Act\* - With respect to all conditions, except \_\_\_\_\_, the Conservation Commission designates the Conservation Agent, as its Agent with full powers to act on its behalf in administering and enforcing this Order, unless the Agent determines approval from the Commission is appropriate.
55. Right to Inspect\* - A member of the Conservation Commission or its Agent may enter and inspect the property and the activity that are the subjects of this Order at all reasonable times, with or without probable cause or prior notice, and until a Certificate of Compliance is issued, for the purpose of evaluating compliance with this Order (and other applicable laws and regulations).
56. Changes to the Plan or Errors & Omissions\* -
- (a) If any plan, calculation, or other data presented to the Office of the Commission is in error or have omissions, and are deemed significant by the Commissioners or their Agents, all work will stop at the discretion of the Commission, until the discrepancies have been rectified to the Commission's satisfaction.
  - (b) The applicant must notify the Commission in writing of any changes in the plans or implementation of the proposed activity where mandated by any local, state, or federal agencies having jurisdiction over the proposed activity. If, in the opinion of the Commission, any changes in the plans or implementation of the proposed activity so require, then the Commission may modify, amend or rescind this Order in a way consistent with:
    - M.G.L. Chapter 131, Section 40,
    - 310 CMR 10.00, *Wetlands Protection*,
    - the City of Worcester's *Wetlands Protection Ordinance*, and
    - the Commission's *Wetlands Protection Regulations*
- If any provisions of any conditions, or application thereof is held to be invalid, such invalidity shall not affect any other provisions of this Order. If the Commission deems that a proposed change is major or substantial, a new hearing may be required.
57. Liability\* - The applicant shall indemnify and save harmless the Commonwealth, the City of Worcester, the Conservation Commission, and its Agents against all sites, claims or liabilities of every name and nature arising at any time out of or in consequence of the acts of the Commission or its Agents in the performance of the work covered by this Order and/or failure to comply with the terms and conditions of this Order whether by itself or its employees or subcontractors.



**Massachusetts Department of Environmental Protection**  
Bureau of Resource Protection - Wetlands

**WPA Form 5 – Order of Conditions**

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

349-1267

MassDEP File #

eDEP Transaction #

Worcester

City/Town

**E. Signatures**

This Order is valid for three years, unless otherwise specified as a special condition pursuant to General Conditions #4, from the date of issuance.

1. Date of Issuance

Please indicate the number of members who will sign this form.

This Order must be signed by a majority of the Conservation Commission.

2. Number of Signers

The Order must be mailed by certified mail (return receipt requested) or hand delivered to the applicant. A copy also must be mailed or hand delivered at the same time to the appropriate Department of Environmental Protection Regional Office, if not filing electronically, and the property owner, if different from applicant.

The names typed below represent the intent to sign the foregoing document in accordance with MGL Chapter 110G §9. In addition, Pursuant to DEP's Guidance to Conservation Commissions for Submissions During Mass DEP Office Closure (issued March 28, 2020), this Order will be emailed to the appropriate MassDEP Regional Office using the format indicated in DEP's Guidance Document.

Signatures:

/Joseph Charpentier/

/Devin Canton/

/Christian Escobar/

/Azal Khaled/

/Amanda Amory/

/Sarah French/

by hand delivery on

by certified mail, return receipt requested, on

4/21/20

Date

Date

**F. Appeals**

The applicant, the owner, any person aggrieved by this Order, any owner of land abutting the land subject to this Order, or any ten residents of the city or town in which such land is located, are hereby notified of their right to request the appropriate MassDEP Regional Office to issue a Superseding Order of Conditions. The request must be made by certified mail or hand delivery to the Department, with the appropriate filing fee and a completed Request for Departmental Action Fee Transmittal Form, as provided in 310 CMR 10.03(7) within ten business days from the date of issuance of this Order. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant, if he/she is not the appellant.

Any appellants seeking to appeal the Department's Superseding Order associated with this appeal will be required to demonstrate prior participation in the review of this project. Previous participation in the permit proceeding means the submission of written information to the Conservation Commission prior to the close of the public hearing, requesting a Superseding Order, or providing written information to the Department prior to issuance of a Superseding Order.

The request shall state clearly and concisely the objections to the Order which is being appealed and how the Order does not contribute to the protection of the interests identified in the Massachusetts Wetlands Protection Act (M.G.L. c. 131, § 40), and is inconsistent with the wetlands regulations (310 CMR 10.00). To the extent that the Order is based on a municipal ordinance or bylaw, and not on the Massachusetts Wetlands Protection Act or regulations, the Department has no appellate jurisdiction.



**Massachusetts Department of Environmental Protection**  
Bureau of Resource Protection - Wetlands

**WPA Form 5 – Order of Conditions**

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

349-1267

MassDEP File #

eDEP Transaction #

Worcester

City/Town

**G. Recording Information**

Prior to commencement of work, this Order of Conditions must be recorded in the Registry of Deeds or the Land Court for the district in which the land is located, within the chain of title of the affected property. In the case of recorded land, the Final Order shall also be noted in the Registry's Grantor Index under the name of the owner of the land subject to the Order. In the case of registered land, this Order shall also be noted on the Land Court Certificate of Title of the owner of the land subject to the Order of Conditions. The recording information on this page shall be submitted to the Conservation Commission listed below.

Conservation Commission

Detach on dotted line, have stamped by the Registry of Deeds and submit to the Conservation Commission.

To:

Conservation Commission

Please be advised that the Order of Conditions for the Project at:

Project Location

MassDEP File Number

Has been recorded at the Registry of Deeds of:

County

Book

Page

for:

Property Owner

and has been noted in the chain of title of the affected property in:

Book

Page

In accordance with the Order of Conditions issued on:

Date

If recorded land, the instrument number identifying this transaction is:

Instrument Number

If registered land, the document number identifying this transaction is:

Document Number

Signature of Applicant



**Massachusetts Department of Environmental Protection**  
Bureau of Resource Protection - Wetlands  
**Request for Departmental Action Fee**  
**Transmittal Form**

DEP File Number:

\_\_\_\_\_  
Provided by DEP

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

**A. Request Information**

1. Location of Project

\_\_\_\_\_  
a. Street Address

\_\_\_\_\_  
b. City/Town, Zip

\_\_\_\_\_  
c. Check number

\_\_\_\_\_  
d. Fee amount

2. Person or party making request (if appropriate, name the citizen group's representative):

\_\_\_\_\_  
Name

\_\_\_\_\_  
Mailing Address

\_\_\_\_\_  
City/Town

\_\_\_\_\_  
State

\_\_\_\_\_  
Zip Code

\_\_\_\_\_  
Phone Number

\_\_\_\_\_  
Fax Number (if applicable)

3. Applicant (as shown on Determination of Applicability (Form 2), Order of Resource Area Delineation (Form 4B), Order of Conditions (Form 5), Restoration Order of Conditions (Form 5A), or Notice of Non-Significance (Form 6)):

\_\_\_\_\_  
Name

\_\_\_\_\_  
Mailing Address

\_\_\_\_\_  
City/Town

\_\_\_\_\_  
State

\_\_\_\_\_  
Zip Code

\_\_\_\_\_  
Phone Number

\_\_\_\_\_  
Fax Number (if applicable)

4. DEP File Number:

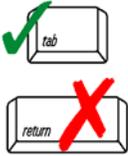
\_\_\_\_\_

**B. Instructions**

1. When the Departmental action request is for (check one):

- Superseding Order of Conditions – Fee: \$120.00 (single family house projects) or \$245 (all other projects)
- Superseding Determination of Applicability – Fee: \$120
- Superseding Order of Resource Area Delineation – Fee: \$120

**Important:**  
When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.





Massachusetts Department of Environmental Protection  
Bureau of Resource Protection - Wetlands  
**Request for Departmental Action Fee  
Transmittal Form**

DEP File Number:

---

Provided by DEP

---

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

---

**B. Instructions (cont.)**

Send this form and check or money order, payable to the *Commonwealth of Massachusetts*, to:

Department of Environmental Protection  
Box 4062  
Boston, MA 02211

2. On a separate sheet attached to this form, state clearly and concisely the objections to the Determination or Order which is being appealed. To the extent that the Determination or Order is based on a municipal bylaw, and not on the Massachusetts Wetlands Protection Act or regulations, the Department has no appellate jurisdiction.
3. Send a **copy** of this form and a **copy** of the check or money order with the Request for a Superseding Determination or Order by certified mail or hand delivery to the appropriate DEP Regional Office (see <http://www.mass.gov/eea/agencies/massdep/about/contacts/>).
4. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant, if he/she is not the appellant.

## SECTION 01110

### CONTROL OF WORK AND MATERIALS

#### PART 1 – GENERAL

Not Used.

#### PART 2 – PRODUCTS

Not Used

#### PART 3 - EXECUTION

##### 3.01 HAULING, HANDLING AND STORAGE OF MATERIALS:

- A. The Contractor shall, at its own expense, handle and haul all materials furnished by it and shall remove any of its surplus materials at the completion of the work.
- B. The Contractor shall provide suitable and adequate storage for equipment and materials furnished by it that are liable to injury and shall be responsible for any loss of or damage to any equipment or materials by theft, breakage, or otherwise.
- C. All excavated materials and equipment to be incorporated in the Work shall be placed so as not to injure any part of the Work or existing facilities and so that free access can be had at all times to all parts of the Work and to all public utility installations in the vicinity of the work. Materials and equipment shall be kept neatly piled and compactly stored in such location as will cause a minimum of inconvenience to public travel and adjoining owners, tenants and occupants.
- D. The Contractor shall be responsible for all damages to the work under construction during its progress and until final completion and acceptance even though partial payments have been made under the Contract.

##### 3.02 OPEN EXCAVATIONS:

- A. All open excavations shall be adequately safeguarded by providing temporary barricades, caution signs, lights and other means to prevent accidents to persons, and damage to property. The Contractor shall, at its own expense, provide suitable and safe means for completely covering all open excavations and for accommodating travel when work is not in progress.
- B. Bridges provided for access to private property during construction shall be removed when no longer required.

- C. The length of open trench will be controlled by the particular surrounding conditions but shall always be confined to the limits prescribed by the Engineer.
- D. If the excavation becomes a hazard, or if it excessively restricts traffic at any point, then special construction procedures shall be taken, such as limiting the length of trench and prohibiting stocking excavated material in the street.
- E. All street excavations shall be completely closed at the end of each work day. Backfilling or use of steel plates of adequate strength to carry traffic shall be used.

### 3.03 MAINTENANCE OF TRAFFIC:

- A. Unless permission to close the street is received in writing from the proper authority, all excavated materials and equipment shall be placed so that vehicular and pedestrian traffic may be safely maintained at all times.
- B. Should the Chief of Police deem it necessary, uniformed officers will be assigned to direct traffic. The Contractor shall make all arrangements in obtaining uniformed officers required.
- C. The Contractor shall at its own expense, as directed by the Police Traffic Control/Safety Officer, provide and erect acceptable barricades, barrier fences, traffic signs, and all other traffic devices not specifically covered in a bid item, to protect the work from traffic, pedestrians, and animals. The Contractor shall provide sufficient temporary lighting such as lanterns/flashers (electric battery operated) or other approved illuminated traffic signs and devices to afford adequate protection to the traveling public, at no additional cost to the Owner.
- D. The Contractor shall furnish all construction signs that are deemed necessary by and in accordance with Part VI of the Manual on Uniform Traffic Control Devices as published by the U.S. Department of Transportation. In addition, the Contractor may be required to furnish up to 128 square feet of additional special construction warning signs. Size and exact wording of signs shall be determined by the Engineer during construction.
- E. The intent of policing is to ensure public safety by direction of traffic. Police officers are not to serve as watchmen to protect the Contractor's equipment and materials.
- F. Nothing contained herein shall be construed as relieving the Contractor of any of its responsibilities for protection of persons and property under the terms of the Contract.

### 3.04 CARE AND PROTECTION OF PROPERTY:

The Contractor shall be responsible for the preservation of all public and private property, and shall use every precaution necessary to prevent damage thereto. If any direct or indirect damage is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work on the part of the Contractor, such property shall be promptly restored by the Contractor, at its expense, to

a condition similar or equal to that existing before the damage was done, to the satisfaction of the Engineer.

3.05 PROTECTION AND RELOCATION OF EXISTING STRUCTURES AND UTILITIES:

- A. All existing buildings, utilities, pipes, poles, wires fences, curbing, property line markers and other structures which the Engineer decides must be preserved in place without being temporarily or permanently relocated, shall be carefully supported and protected from damage by the contractor. Should such property be damaged, it shall be restored by the Contractor, at no additional cost to the Owner.
- B. The Contractor shall determine the location of all underground structures and utilities (including existing water services, drain lines, electrical lines, and sewers). Services to buildings shall be maintained, and all costs or charges resulting from damage thereto shall be paid by Contractor.
- C. When fences interfere with the Contractor's operations, it shall remove and (unless otherwise specified) promptly restore them in accordance with Section 01564 EXISTING FENCES.
- D. On paved surfaces the Contractor shall not use or operate tractors, bulldozers, or other power-operated equipment with treads or wheels which are shaped to cut or otherwise damage such surfaces.
- E. All property damaged by the Contractor's operations shall be restored to a condition at least equal to that in which it was found immediately before work was begun. Suitable materials and methods shall be used for such restoration.
- F. Restoration of existing property and structures shall be carried out as promptly as practicable and shall not be left until the end of the construction period.

3.06 MAINTENANCE OF FLOW:

- A. The Contractor shall at its own cost, provide for the flow of sewers and drains interrupted during the progress of the work, and shall immediately cart away and dispose of all offensive matter. The entire procedure of maintaining existing flow shall be fully discussed with the Engineer well in advance of the interruption of any flow.
- B. All existing drainage facilities including, but not limited to; brooks, streams, canals, channels, ditches, culverts, catch basins and drainage piping shall be adequately safeguarded so as not to impede drainage or to cause siltation of downstream areas in any manner whatsoever. If the Contractor damages or impairs any of the aforesaid drainage facilities, it shall repair the same within the same day.
- C. At the conclusion of the work, the Contractor shall remove all silt in drainage structures caused by its operations as described in Section 01740, CLEANING UP.

### 3.07 REJECTED MATERIALS AND DEFECTIVE WORK:

- A. Materials furnished by the Contractor and condemned by the Engineer as unsuitable or not in conformity with the specifications shall forthwith be removed from the work by the Contractor and shall not be made use of elsewhere in the work.
- B. Any errors, defects or omissions in the execution of the work or in the materials furnished by the Contractor, even though they may have been passed or overlooked or have appeared after the completion of the work, discovered at any time before the final payment is made hereunder, shall be forthwith rectified and made good by and at the expense of the Contractor and in a manner satisfactory to the Engineer.
- C. The Contractor shall reimburse the Owner for any expense, losses or damages incurred in consequence of any defect, error, omission or act of the Contractor or its employees, as determined by the Engineer, occurring previous to the final payment.

### 3.08 SANITARY REGULATIONS:

Sanitary conveniences for the use of all persons employed on the work, properly screened from public observation, shall be provided in sufficient numbers in such manner and at such locations as may be approved. The contents shall be removed and disposed of in a satisfactory manner as the occasion requires. The Contractor shall rigorously prohibit the committing of nuisances within, on or about the work. Any employees found violating these provisions shall be discharged and not again employed on the work without the written consent of the Engineer. The sanitary conveniences specified above shall be the obligation and responsibility of the Contractor.

### 3.09 SAFETY AND HEALTH REGULATIONS:

This project is subject to the Safety and Health regulations of the U.S. Department of Labor set forth in 29 CFR, Part 1926, and to the Massachusetts Department of Labor and Industries, Division of Industrial Safety "Rules and Regulations for the Prevention of Accidents in Construction Operations (454 CMR 10.0 et. seq.)." The Contractor shall be familiar with the requirements of these regulations.

### 3.10 SITE INVESTIGATION:

The Contractor acknowledges that it has satisfied itself as to the conditions existing at the site of the work, the type of equipment required to perform this work, the quality and quantity of the materials furnished insofar as this information is reasonably ascertainable from an inspection of the site, as well as from information presented by the drawings and specifications made a part of this contract. Any failure of the Contractor to acquaint itself with available information will not relieve it from the responsibility for estimating properly the difficulty or cost of successfully performing the work. The Owner assumes no responsibility for any conclusion or interpretation made by the Contractor on the basis of the information made available by the Owner.

3.11 ELECTRIC SERVICE:

- A. The Contractor shall make all necessary applications and arrangements and pay for all fees and charges for electrical energy for power and light necessary for the proper completion of this contract during its entire progress. The Contractor shall provide and pay for all temporary wiring, switches, connections, and meters.
- B. There shall be sufficient electric lighting so that all work may be done in a workmanlike manner where there is not sufficient daylight.

END OF SECTION

## SECTION 01270

### MEASUREMENT AND PAYMENT

#### 1. GENERAL

- A. The following sections describe the measurement and payment for the work to be done under the respective items listed in the FORM OF GENERAL BID.
- B. The lump sum price stated in the FORM OF GENERAL BID shall constitute full compensation as herein specified, for all of the work completed in accordance with the drawings and specifications. All other activities required in connection with performance of the work, including all work required under Division 1, GENERAL REQUIREMENTS, whether described in the contract documents or mandated by applicable codes, permits and laws, will not be separately paid for unless specifically provided for in the form of general bid, but will be considered to be incidental to performance of the overall project.
- C. Base bid includes all impacted material handling, transport and disposal for 500 tons of impacted material. Impacted materials that are generated based on Contractor over-excavation beyond the limits of work or limits of excavation shall be at no additional cost to the Owner and shall be excluded from the total tonnage.
- D. Base bid includes all Granite boulder/block removal along Coes reservoir dam as indicated in the drawings and relocation to a site of the Owners choosing within the city of Worcester.
- E. Base bid shall include an allowance of \_\_\_\_\_ Dollars for the purchase of 2 Security cameras and all necessary equipment, hardware, Manufacturer and model as required by the City of Worcester to fully integrate into the existing city-wide system.

END OF SECTION

\\wse03.local\WSE\Projects\MA\Worcester MA\Coes Park\Parking Lot Expansion\Specs\Division 0\01270 - Measurement and Payment.docx

## SECTION 01380

### HEALTH AND SAFETY PLAN

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

- A. Prior to the start of work on the site, Contractor shall prepare and submit a site-specific health and safety plan that includes consideration of all known and potential hazards at the site. Work may not proceed at the project site until the Contractor's health and safety plan has been received and reviewed by the Engineer. **This plan shall include all local, state, and federally required COVID-19 protection requirements.**

##### 1.02 REFERENCES:

- A. OSHA 29 CFR 1910.120

##### 1.03 RELATED WORK:

- A. Section 00320 - SUBSURFACE DATA
- B. Section 01562 - DUST CONTROL
- C. Section 02113 - EXCAVATION AND STOCKPILING OF IMPACTED MATERIAL
- D. Section 02130 - TRANSPORTATION AND DISPOSAL OF IMPACTED MATERIAL
- E. Section 02240 - DEWATERING
- F. Section 02300 - EARTHWORK

#### PART 2 – PRODUCTS

##### 2.01 HEALTH AND SAFETY PLAN:

- A. The health and safety plan shall include, but not necessarily be limited to the following:
  - 1. Identification of Contractor's Site Safety Officer.
  - 2. Identification of Hazards and Risks Associated with Project.
  - 3. Contractor's Standard Operating Procedures, Including Personnel Training and Field Orientation.
  - 4. Respiratory Protection Training Requirements.

5. Levels of Protection and Selection of Equipment Procedures.
6. Type of Medical Surveillance Program.
7. Personal Hygiene Requirements and Guidelines.
8. Zone Delineation of the Project Site.
9. Site Security and Entry Control Procedures.
10. Field Monitoring of Site Contaminants.
11. Contingency and Emergency Procedures.
12. Listing of Emergency Contacts.

The Contractor Health & Safety Plan shall include requirements to comply with federal, state and municipal COVID-19 guidance and policies. These include but are not limited to Owner-specific requirements for reporting.

### PART 3 - EXECUTION

#### 3.01 PERSONAL PROTECTIVE EQUIPMENT:

- A. The personal protective equipment required to provide the appropriate level of dermal and respiratory protection shall be determined based on the concentrations of residual contamination at the Site and the results of air monitoring performed by the Contractor and the standards set forth in the Contractor's health and safety plan. The Engineer may conduct duplicate air monitoring for quality control purposes. Modified Level D protection shall be the minimum requirement for all on-site personnel.

END OF SECTION

\\wse03.local\WSE\Projects\MA\Worcester MA\Coes Park\Parking Lot Expansion\Specs\01380 - Health and Safety Plan.docx

## SECTION 01550

### SIGNAGE (TRAFFIC CONTROL)

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

This Section covers furnishing and installing traffic control signs and other devices.

##### 1.02 SYSTEM DESCRIPTION:

The Contractor shall furnish and install all construction signs deemed necessary by and in accordance with the latest edition of Part VI of the Manual on Uniform Traffic Control Devices(MUTCD) as published by the U.S. Department of Transportation.

#### PART 2 - PRODUCTS

##### 2.01 TRAFFIC WARNING AND REGULATING DEVICES:

Contractor shall provide warning signs, barricades and other devices in accordance with the specifications provided in the MUTCD. Size of signs, lettering, colors, method of support and other factors prescribed in the MUTCD shall be adhered to.

#### PART 3 - EXECUTION

##### 3.01 INSTALLATION:

- A. Contractor shall erect barricades, barrier fences, traffic signs, and other traffic control devices as required by the MUTCD, or as required by the Engineer, to protect the work area from traffic, pedestrians, and animals.
- B. Contractor shall relocate barricades, signs and other devices as necessary as the work progresses.
- C. Unless extended protection is required for specific areas, when the work has been completed, all temporary warning and regulatory devices used by the Contractor shall be removed so that traffic can move unimpeded through the area.

END OF SECTION

## SECTION 01562

### DUST CONTROL

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION:

This section of the specification covers the control of dust via calcium chloride and water, complete. The Contractor shall stockpile excavated materials as specified in Section 02113, EXCAVATION AND STOCKPILING OF IMPACTED MATERIAL. The excavated materials shall be stockpiled on and covered with secured polyethylene sheeting. The Contractor shall secure the stockpiles to restrict any dust and migration.

#### PART 2 - PRODUCTS

##### 2.01 CALCIUM CHLORIDE:

- A. Calcium chloride shall conform to the requirements of AASHTO-M 144, Type I or Type II and Specification for Calcium Chloride, ASTM D98. The calcium chloride shall be packaged in moisture proof bags or in airtight drums with the manufacturer, name of product, net weight, and percentage of calcium chloride guaranteed by the manufacturer legibly marked on each container.
- B. Calcium chloride failing to meet the requirements of the aforementioned specifications or that which has become caked or sticky in shipment, may be rejected by the Engineer.

##### 2.02 WATER:

- A. Water shall not be brackish and shall be free from oil, acid, and injurious alkali or vegetable matter.

#### PART 3 - EXECUTION

##### 3.01 APPLICATION:

- A. Calcium chloride shall be applied when ordered by the Engineer and only in areas which will not be adversely affected by the application. See Section 01570, ENVIRONMENTAL PROTECTION.
- B. Calcium chloride shall be uniformly applied at the rate of 1-1/2 pounds per square yard or at any other rate as required by the Engineer. Application shall be by means of a mechanical spreader, or other approved methods. The number and frequency of applications shall be determined by the Engineer.

- C. Water may be sprinkler applied with equipment including a tank with gauge-equipped pressure pump and a nozzle-equipped spray bar.
- D. Water shall be dispersed through the nozzle under a minimum pressure of 20 pounds per square inch, gauge pressure.
- E. The Contractor shall place excavated materials on polyethylene sheeting and cover stockpiles daily with secured polyethylene sheeting. Any deficiencies identified by the Owner or Engineer in securing of stockpiles shall be immediately corrected at no additional cost to the Owner.
- F. The Contractor shall be aware of the proximity of the project to an active playground with children present. Dust controls shall fully contain excavated materials within the limits of work. Any erosion and migration of excavated materials shall be cleaned and corrected to the Owner and Engineer's satisfaction at no additional cost to the Owner.

END OF SECTION

\\wse03.local\WSE\Projects\MA\Worcester MA\Coes Park\Parking Lot Expansion\Specs\01562 - Dust Control.docx

## SECTION 01570

### ENVIRONMENTAL PROTECTION

#### PART 1 – GENERAL

##### 1.01 DESCRIPTION:

- A. The work covered by this section of the specifications consists of furnishing all labor, materials, tools and equipment and performing all work required for the prevention of environmental pollution during and as a result of construction operations under this contract.
- B. The requirements set forth in this section of the specifications apply to work in and adjacent to wetlands, unless otherwise specifically stated.
- C. All work under this Contract shall be in accordance with the Conservation Commissions' Orders of Conditions as well as any conditional requirements applied, all of which are attached to Section 00890, PERMITS.
- D. Prior to commencement of work, the Contractor shall meet with representatives of the Engineer to develop mutual understandings relative to compliance of the environmental protection program.

##### 1.02 RELATED WORK:

- A. Section 00890 – PERMITS
- B. Section 01562 – DUST CONTROL
- C. Section 02071 – GEOTEXTILE FABRIC
- D. Section 02230 – CLEARING AND GRUBBING
- E. Section 02240 – DEWATERING
- F. Section 02252 – SUPPORT OF EXCAVATION
- G. Section 02300 – EARTHWORK

##### 1.03 SUBMITTALS:

- A. The Contractor shall submit for approval six sets of details and literature fully describing environmental protection methods to be employed in carrying out construction activities within 100 feet of wetlands or across areas designated as wetlands.

#### PART 2 - PRODUCTS

##### 2.01 SILT FENCE:

- A. The silt fence shall consist of a 3-foot wide continuous length sediment control fabric, stitched to a mesh backing, and stapled to preweathered oak posts installed as shown on the drawings. The oak posts shall be 1-1/4-inches by 1-1/4-inches (Minimum Dimension) by 48-inches and shall be tapered. The bottom edge of the silt fence shall be buried as shown on the drawings.
- B. The silt fence shall be DOT Silt Fence PPDM3611, as manufactured by U.S. Silt & Site Supply/Getsco, Concord, NH, or approved equal.
- C. Silt fence properties:

<b>Physical Properties</b>	<b>Test Method</b>	<b>Minimum Value</b>
Grab Strength, lbs.	ASTM-D-4632	124
Grab Elongation, %	ASTM-D-4632	15
Mullen burst, psi	ASTM-D-3786	300
Puncture, lbs.	ASTM-D-4833	65
Trapezoidal Tear, lbs.	ASTM-D-4833	65
UV Resistance <sup>2</sup> , % <sup>3</sup>	ASTM-D-4355	80@500 hrs.
AOS, US Sieve No.	ASTM-D-4751	30
Flow Rate, gal/min/sq ft	ASTM-D-4491	10
Permittivity, (1/sec) gal/min/sq ft	ASTM-D-4491	0.05 sec <sup>-1</sup>

2.02 STRAW BALES:

- A. Straw bales shall consist of certified seed free stems of agricultural grain and cereal crops and shall be free of grasses and legumes. Standard bales shall be 14-inches high, 18- inches wide and 36- to 40-inches long tied with polypropylene twine and weigh within 5 percent of 7 lbs. per cubic ft.

2.03 STRAW WATTLES:

- A. Straw Wattles shall consist of a 100% biodegradable exterior jute or coir netting with 100% wheat straw interior filling as manufactured by Granite Environmental, Inc., Sebastian, Florida (Phone: 888-703-9889; website: [www.GraniteEnvironmental.com](http://www.GraniteEnvironmental.com)), or approved equal.

2.04 COMPOST BARRIERS:

- B. Compost Barriers (filter tubes) shall be Filtrexx Siltsoxx 100% compost interior filling as manufactured by Filtrexx Northeast Systems, 84 Daniel Plummer Rd | Goffstown, NH (Phone: 603-621-9800; website: <https://www.filtrexxns.com/palletized-soxx/siltsoxx/>), or approved equal.

**MATERIALS:**

Material for the filter tubes shall be compost meeting M1.06.0, except that no manure or biosolids shall be used. In addition, no kiln-dried wood or construction debris shall

be allowed. Particle size analysis: 98% shall pass through a 3 inch (75mm) sieve; 30-50% shall pass 3/8 inches (10mm) sieve.

Tubes for compost filters shall be a minimum of 12 inches (300 mm), a maximum of 18" (450mm) in diameter. Tube material shall be a knitted mesh with 1/8" - 3/8" (3-10 mm) openings, and made of biodegradable (cotton or jute) materials. Photodegradable (HDPE or polypropylene) fabric may be used; however, photodegradable fabric must be removed and disposed of by the contractor, at his expense, at the end of the contract. Additional tubes shall be used at the direction of the Engineer.

As shown in the detail, the 1 foot (0.2 meters) wide by 2 inch (50 mm) deep wedge of compost spread along the top of the filter tube shall be incidental to the installation.

Stakes for anchors, if required, shall be nominal 2 x 2 stakes.

#### METHODS:

Tubes of compost may be filled on site or shipped. Tubes shall be placed, filled and staked in place as required to ensure stability against water flows. All tubes shall be tamped to ensure good contact with soil. The Contractor shall ensure that the filter tubes function as intended at all times. Tubes shall be inspected after each rainfall and at least daily during prolonged rainfall.

The Contractor shall immediately correct all deficiencies, including, but not limited, to washout, overtopping, clogging due to sediment, and erosion. The contractor shall review location of tubes in areas where construction activity causes drainage runoff to ensure that the tubes are properly located for effectiveness. Where deficiencies exist, such as overtopping or wash-out, additional staking or compost material shall be installed as directed by the Engineer. Contractor shall remove sediment deposits as necessary to maintain the filters in working condition. The functional integrity of filter tubes shall be maintained in sound condition at all times. Filter tubes that are decomposing, cut, or otherwise compromised shall be repaired or replaced as directed by the Engineer and be incidental to this item. Filter tube fabric and stakes shall be removed by the Contractor when site conditions are sufficiently stable to prevent surface erosion, and after receiving permission to do so from the Engineer. All biodegradable tube fabric shall be cut and laid flat in place to decompose onsite at the direction of the Engineer. Tube fabric that is not decomposing satisfactorily shall be removed and disposed off-site by the Contractor. At the direction of the Engineer, the

Contractor may rake out and seed compost so that it is no greater than 2 inches (50 mm) in depth on soil substrate.

2.05 CATCH BASIN PROTECTION:

- A. To trap sediment and to prevent sediment from clogging drainage systems, catch basin protection in the form of a siltation sack (Silsack as manufactured by ACF Environmental, Inc. or approved equal) shall be provided as approved by the Engineer.

2.06 SILT SOCKS:

- A. Silt socks shall be a tubular filter sock of mesh fabric. The fabric will have openings of between 1/8" to 1/4" diameter. The mesh material will either photo degrade within one year or be made of nylon with a life expectancy of 24 months. The sock shall be filled with a mix of composted leaf mulch, bark mulch and wood chips that have been composted for at least one year. The sock will have a minimum diameter of 12-inches.

PART 3- EXECUTION

3.01 NOTIFICATION AND STOPPAGE OF WORK:

- A. The Engineer will notify the Contractor in writing of any non-compliance with the provisions of the Order of Conditions. The Contractor shall, after receipt of such notice, immediately take corrective action. Such notice, when delivered to the Contractor or his authorized representative at the site of the work, shall be deemed sufficient for the purpose. If the Contractor fails to act promptly, the Owner may order stoppage of all or part of the work through the Engineer until satisfactory corrective action has been taken. No claim for an extension of time or for excess costs or damage incurred by the Contractor as a result of time lost due to any stop work orders shall be made unless it was later determined that the Contractor was in compliance.

3.02 AREA OF CONSTRUCTION ACTIVITY:

- A. Insofar as possible, the Contractor shall confine his construction activities to those areas defined by the plans and specifications. All land resources within the project boundaries and outside the limits of permanent work performed under this contract shall be preserved in their present condition or be restored to a condition after completion of construction at least equal to that which existed prior to work under this contract.

3.03 PROTECTION OF WATER RESOURCES:

- A. The Contractor shall not pollute streams, lakes or reservoirs with fuels, oils, bitumens, calcium chloride, acids or other harmful materials. It is the Contractor's responsibility to comply with

all applicable Federal, State, County and Municipal laws regarding pollution of rivers and streams.

- B. Special measures should be taken to insure against spillage of any pollutants into public waters.

#### 3.04 CONSTRUCTION IN AREAS DESIGNATED AS WETLANDS ON THE DRAWINGS:

- A. Insofar as possible, the Contractor shall make every effort to minimize disturbance within areas designated as wetlands or within 100-feet of wetland resource areas. Total easement widths shall be limited to the widths shown.
- B. The Contractor shall perform his/her work in such a way that these areas are left in the condition existing prior to construction.
- C. The elevations of areas designated as wetlands shall not be unduly disturbed by the Contractor's operations outside of the trench limits. If such disturbance does occur, the Contractor shall take all measures necessary to return these areas to the elevations which existed prior to construction.
- D. In areas designated as wetlands, the Contractor shall carefully remove and stockpile the top 24 inches of soil. This topsoil material shall be used as backfill for the trench excavation top layer. The elevation of the trench shall be restored to the preconstruction elevations wherever disturbed by the Contractor's operation.
- E. Excavated materials shall not be permanently placed or temporarily stored in areas designated as wetlands. Temporary storage areas for excavated material shall be as required by the Engineer.

#### 3.05 PROTECTING AND MINIMIZING EXPOSED AREAS:

- A. The Contractor shall limit the area of land which is exposed and free from vegetation during construction. In areas where the period of exposure will be greater than two (2) months, temporary vegetation, mulching or other protective measures shall be provided as specified.
- B. The Contractor shall take account of the conditions of the soil where temporary cover crop will be used to ensure that materials used for temporary vegetation are adaptive to the sediment control. Materials to be used for temporary vegetation shall be approved by the Engineer.

#### 3.06 LOCATION OF STORAGE AREAS:

- A. The location of the Contractor's storage areas for equipment and/or materials shall be upon cleared portions of the job site or areas to be cleared as a part of this project, and shall require written approval of the Engineer. Plans showing storage facilities for equipment and materials shall be submitted for approval of the Engineer.
- B. No excavated materials or materials used in backfill operations shall be deposited within a minimum distance of one hundred (100) feet of any watercourse or any drainage facility. Adequate measures for erosion and sediment control such as the placement of baled hay around

the downstream perimeter of stockpiles shall be employed to protect any downstream areas from siltation.

- C. There shall be no storage of equipment or materials in areas designated as wetlands.
- D. The Engineer may designate a particular area or areas where the Contractor may store materials used in his operations.

### 3.07 PROTECTION OF LANDSCAPE:

- A. The Contractor shall not deface, injure, or destroy trees or shrubs nor remove or cut them without written authority from the Owner. No ropes, cables, or guys shall be fastened to or attached to any existing nearby trees for anchorages unless specifically authorized by the Engineer. Excavating machinery and cranes shall be of suitable type and be operated with care to prevent injury to trees which are not to be removed, particularly overhanging branches and limbs. The Contractor shall, in any event, be responsible for any damage resulting from such use.
- B. Branches, limbs, and roots shall not be cut except by permission of the Engineer. All cutting shall be smoothly and neatly done without splitting or crushing. When there is unavoidable injury to branches, limbs and trunks of trees, the injured portions shall be neatly trimmed and covered with an application of grafting wax or tree healing paint as directed.
- C. Where, in the opinion of the Engineer, trees may possibly be defaced, bruised, injured, or otherwise damaged by the Contractor's equipment or by other operations, the Engineer may require the Contractor to adequately protect such trees by placing boards, planks, poles or fencing around them. Any trees or landscape feature scarred or damaged by the Contractor's equipment or operations shall be restored as nearly as possible to its original condition at the expense of the Contractor. The Engineer will decide what method of restoration shall be used, and whether damaged trees shall be treated and healed or removed and disposed of under the provisions of Section 02230, CLEARING AND GRUBBING.
- D. Cultivated hedges, shrubs, and plants which could be injured by the Contractor's operations shall be protected by suitable means or shall be dug up, balled and temporarily replanted and maintained. After construction operations have been substantially completed, they shall be replanted in their original positions and cared for until growth is re-established. If cultivated hedges, shrubs, and plants are injured to such a degree as to affect their growth or diminish

their beauty or usefulness, they shall be replaced by items of a kind and quality at least equal to that existing at the start of the work.

### 3.08 CLEARING AND GRUBBING:

- A. The Contractor shall clear and grub only on the Owner's land or the Owner's easements, and only the area required for construction operations, as approved by the Engineer. Removal of mature trees (4 inches or greater DBH) will not be allowed on temporary easements.

### 3.09 DISCHARGE OF DEWATERING OPERATIONS:

- A. Any water that is pumped and discharged from excavation as part of the Contractor's water handling shall be filtered by an approved method prior to its discharge into a receiving water or drainage system.
- B. Under no circumstances shall the Contractor discharge water to the areas designated as wetlands. When constructing in a wetlands area, the Contractor shall discharge water from dewatering operations directly to the nearest drainage system, stream, or waterway after filtering by an approved method.
- C. The pumped water shall be filtered through filter fabric and baled straw, a vegetative filter strip or a vegetated channel to trap sediment occurring as a result of the construction operations. The vegetated channel shall be constructed such that the discharge flow rate shall not exceed a velocity of more than 1 foot per second. Accumulated sediment shall be cleared from the channel periodically.

### 3.10 DUST CONTROL:

- A. During the progress of the work, the Contractor shall conduct his operations and maintain the area of his activities, including sweeping and sprinkling of streets as necessary, to minimize creation and dispersion of dust. If the Engineer decides it is necessary to use calcium chloride for more effective dust control, the Contractor shall furnish and spread the material, as directed. Calcium chloride shall be as specified under Section 01562, DUST CONTROL.
- B. Calcium Chloride shall not be used for dust control within a drainage basin or in the vicinity of any source of potable water.

### 3.11 SEPARATION AND REPLACEMENT OF TOPSOIL:

- A. Topsoil shall be carefully removed from areas where excavations are to be made, and separately stored to be used again as directed. The topsoil shall be stored in an area acceptable to the Engineer and adequate measures shall be employed to prevent erosion of said material.

### 3.12 BALED STRAW:

- A. To trap sediment and to prevent sediment from clogging drainage systems, baled straw shall be used where shown on the drawings. Care shall be taken to keep the bales from breaking apart. The bales should be securely staked to prevent overturning, flotation, or displacement.

All deposited sediment shall be removed periodically. Straw bales shall not be placed within a waterway during construction.

3.13 ERECTION AND MAINTENANCE OF SILT FENCE:

- A. Where indicated on the drawings or where required by the Engineer, the Contractor shall erect and maintain a temporary silt fence. In areas designated as wetlands, the Contractor shall line the limits of the construction easement with a silt fence. The silt fence shall be used specifically to contain sediment from runoff water and to minimize environmental damage caused by construction.

3.14 CATCH BASIN PROTECTION:

- A. Catch basin protection shall be used for every catch basin, shown on the plans or as required by the Engineer, to trap sediment and prevent it from clogging drainage systems and entering wetlands. Siltation sacks shall be securely installed under the catch basin grate. Care shall be taken to keep the siltation sacks from breaking apart or clogging. All deposited sediment shall be removed periodically and at times prior to predicted precipitation to allow free drainage flow. Prior to working in areas where catch basins are to be protected, each catch basin sump shall be cleaned of all debris and protected. The contractor shall properly dispose of all debris at no additional cost to the Owner.

3.16 STRAW WATTLES:

- A. The wattles will be placed in a shallow trench (2-3 inches deep) and staked in the ground using wooden stakes driven at 4-foot intervals. The wooden stakes will be placed at a minimum depth of 24-inches into the ground.

3.16 SILT SOCKS:

- A. The silt socks will be staked in the ground using wooden stakes driven at 4-foot intervals. The wooden stakes will be placed at a minimum depth of 24-inches into the ground.

END OF SECTION

\\wse03.local\WSE\Projects\MA\Worcester MA\Coes Park\Parking Lot Expansion\Specs\01570 - Environmental protection (confirm matches permits).docx

## SECTION 01740

### CLEANING UP

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION:

The Contractor must employ at all times during the progress of its work adequate cleanup measures and safety precautions to prevent injuries to persons or damage to property. The Contractor shall immediately, upon request by the Engineer provide adequate material, equipment and labor to cleanup and make safe any and all areas deemed necessary by the Engineer.

##### 1.02 RELATED WORK:

- A. Section 00700 GENERAL CONDITIONS
- B. Section 01110 CONTROL OF WORK AND MATERIALS
- C. Section 01140 SPECIAL PROVISIONS
- D. Section 01570 ENVIRONMENTAL PROTECTION

#### PART 2 - PRODUCTS

Not applicable

#### PART 3 - EXECUTION

##### 3.01 DAILY CLEANUP:

- A. The Contractor shall clean up, at least daily, all refuse, rubbish, scrap and surplus material, debris and unneeded construction equipment resulting from the construction operations and sweep the area. The site of the work and the adjacent areas affected thereby shall at all times present a neat, orderly and workmanlike appearance.
- B. Upon written notification by the Engineer, the Contractor shall within 24 hours clean up those areas, which in the Engineer's opinion are in violation of this section and the above referenced sections of the specifications.
- C. If in the opinion of the Engineer, the referenced areas are not satisfactorily cleaned up, all other work on the project shall stop until the cleanup is satisfactory.

##### 3.02 MATERIAL OR DEBRIS IN DRAINAGE FACILITIES:

- A. Where material or debris has washed or flowed into or has been placed in existing watercourses, ditches, gutters, drains, pipes, structures, such material or debris shall be entirely removed and satisfactorily disposed of during progress of the work, and the ditches, channels, drains, pipes, structures, and work shall, upon completion of the work, be left in a clean and neat condition.

3.03 REMOVAL OF TEMPORARY BUILDINGS, STRUCTURES AND EQUIPMENT:

- A. On or before completion of the work, the Contractor shall, unless otherwise specifically required or permitted in writing, tear down and remove all temporary buildings and structures it built; shall remove all temporary works, tools and machinery or other construction equipment it furnished; shall remove all rubbish from any grounds which it has occupied; shall remove silt fences and hay bales used for trapping sediment; and shall leave the roads and all parts of the property and adjacent property affected by its operations in a neat and satisfactory condition.

3.04 RESTORATION OF DAMAGED PROPERTY:

- A. The Contractor shall restore or replace, when and as required, any property damaged by its work, equipment or employees, to a condition at least equal to that existing immediately prior to the beginning of operations. To this end the Contractor shall do as required all necessary highway or driveway, walk and landscaping work. Materials, equipment, and methods for such restoration shall be as approved by the Engineer.

3.05 FINAL CLEANUP:

- A. Before acceptance by the Owner, the Contractor shall perform a final cleanup to bring the construction site to its original or specified condition. This cleanup shall include removing all trash and debris off of the premises. Before acceptance, the Engineer shall approve the condition of the site.

END OF SECTION

## SECTION 01765

### PROJECT AS-BUILT RECORD DRAWINGS

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

This Section covers the Contractors As-Built Record drawings for the project. The As-Built Record drawings for the project shall include, but are not limited to:

A. The Contractors construction coordination drawings for all the project disciplines. The Contractors construction coordination drawings for the project disciplines shall be submitted to the Engineer prior to Construction of the said discipline. The Contractors construction coordination drawings for the project disciplines shall include but are not limited to the following:

1. Architectural
2. Civil
3. Structural
4. Electrical
5. Mechanical
6. Plumbing
7. Process
8. Instrumentation

B. Draft Record Documents Review

Upon completion of the project construction the Contractor shall submit a complete copy of 24- by 36-inch Record Drawings to the Owner and the Engineer for review. The Owner and the Engineer shall jointly review the Record Drawings and provide comments to the Contractor. The Contractor shall modify the Record Drawings as necessary based on the comments provided by the Owner and the Engineer.

C. Final Record Documents

Upon incorporation and acceptance of the Draft Record Drawings comments from the Owner and the Engineer, the Contractor shall submit the Final Record Drawings and documentation. The Contractor shall submit two sets of 24- by 36-inch Record Drawings to the Owner and an additional two sets of 24- by 36-inch Record Drawings to the Engineer for their records. The Contractor shall also submit to the Engineer a minimum 20 gigabyte flash drive with the electronic Record Drawing files. The electronic Record Drawing files shall be obtained from the Owner (the Engineer shall provide on behalf of the Owner if the Engineer was the project designer) and developed in AutoCAD 2010/Revit 2017 (or later) and

the submittal shall include the Final AutoCAD DWG/Revit RVT file documents, drawing line types, blocks, etc. The actual version of AutoCAD/Revit shall be coordinated with the Engineer.

D. Pre- and Post-Construction Survey

The Contractor shall perform a pre- and post-construction survey of the entire project area. The topographic survey shall be performed by or under the supervision of and certified by a Registered Land Surveyor in the State of **Massachusetts**. The Contractor shall also submit to the Engineer a minimum 20 gigabyte flash drive with the electronic pre- and post-construction survey files. The Contractor shall send the electronic pre- and post-construction survey files to the Engineer which shall be developed in AutoCAD 2010/ Revit 2017 (or later) and the submittal shall include the Final AutoCAD DWG / Revit RVT file documents, drawing line types, blocks, etc. The actual version of AutoCAD / Revit shall be coordinated with the Engineer. The Contractor shall notify the Owner and Engineer at least 48-hours in advance of each survey.

1.02 RELATED WORK:

- A. General Requirements in their entirety.
- B. Division 2 through Division 16.

1.03 AS-BUILT DOCUMENTS:

- A. Contractor shall maintain on site, separate from the documents used for construction, one complete set of the documents listed below, and as construction progresses, shall legibly record on these documents all changes made during construction.
  - 1. Contract Drawings.
  - 2. Specifications.
  - 3. Addenda.
  - 4. Change Orders and other Modifications to the Contract.
  - 5. Reviewed shop drawings, product data, and samples.
  - 6. Written interpretations and clarifications.
  - 7. Field Orders.
  - 8. Field test reports properly verified.
- B. The completed set of documents shall include but are not limited to:
  - 1. Significant deviations of any nature made during construction.
- C. The completed set of as-built documents shall be submitted to the Engineer with the final Application for Payment.

PART 2 - MATERIALS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

Document5

## SECTION 01770

### PROJECT CLOSEOUT

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

- A. This Section covers administrative and procedural requirements for closing out the project, including, but not limited to:
  - 1. Project as-built documents
  - 2. Final Cleaning
  - 3. Substantial Completion
  - 4. Final Completion
  - 5. Correction/Warranty Period
- B. Closeout checklist to be completed by the Engineer.

##### 1.02 RELATED WORK:

- A. General Requirements in their entirety.
- B. Section 01740, CLEANING UP
- C. Division 2 through Division 16.

##### 1.03 AS-BUILT DOCUMENTS:

- A. Contractor shall maintain on site, separate from the documents used for construction, one set of the documents listed below, and as construction progresses, shall legibly record on these documents all changes made during construction.
  - 1. Contract Drawings.
  - 2. Specifications.
  - 3. Addenda.
  - 4. Change Orders and other Modifications to the Contract.
  - 5. Reviewed shop drawings, product data, and samples.

6. Written interpretations and clarifications.

7. Field Orders.

8. Field test reports properly verified.

B. The completed set of as-built documents shall be submitted to the Engineer with the final Application for Payment.

#### 1.04 CHECKOUT AND CERTIFICATIONS:

A. Prior to checkout and certifications the following tasks shall be completed:

1. Construction shall be complete. For this purpose, completion of construction is defined as follows:

a. The Contractor has completed construction and erection of the work in conformance with the Contract Drawings and Specifications.

b. The Contractor has installed and adjusted operating equipment, systems, or facilities, as applicable, as defined by the manufacturers' erection, installation, operation and maintenance instructions.

2. All shop drawings shall have final approval.

3. All shop tests shall be complete and approved test results submitted to the Engineer.

B. Refer to Section 01750 for requirements regarding equipment checkout and certification.

#### 1.05 START-UP AND TESTING:

A. Prior to start-up the following tasks shall be complete:

1. All checkout and certifications shall be satisfactorily completed,

2. All operations and maintenance manuals shall be approved,

3. All preliminary training by the manufacturer's representative shall be completed,

5. An approved start-up procedure shall be in place.

#### 1.06 FINAL CLEANING:

A. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion.

1. Clean the site, including landscape development areas of rubbish, litter and other foreign substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to smooth, even textured surfaces.
2. Remove waste and surplus materials, rubbish, fencing equipment, temporary utilities and construction facilities from the site, unless otherwise required by the Engineer.
3. Comply with requirements of Section 01740 CLEANING UP.

1.07 SUBSTANTIAL COMPLETION:

- A. Substantial Completion is officially defined in the General and Supplementary Conditions. The date of substantial completion will be certified by the Engineer. This date will not be certified until the following requirements have been satisfied by the Contractor:
  1. All Contract requirements are coordinated into a fully operational system. All individual units of equipment and treatment are fully operative and performing at specified efficiencies. Where efficiencies are not specified, performance shall meet acceptable standards for the particular unit.
  2. All field tests have been satisfactorily completed and reports forwarded to the Engineer.
  3. All final training has been completed by the manufacturers' representatives.
  4. All spare parts and lubricants have been satisfactorily delivered to the Owner. Spare parts are for the exclusive use of the Owner when the facility has been turned over. Contractor is responsible for all maintenance and repair materials required until the facility is accepted by the Owner.

1.08 CLOSEOUT PROCEDURES:

- A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and is complete in accordance with Contract Documents and ready for Engineer's and Owner's inspection.
- B. Accompany Engineer and Owner on inspection to verify conformance with the Contract Documents. Prepare a punch list of work items that have been determined by inspection to not conform to Contract Documents. Punch list items shall include work items that are missing, incomplete, damaged, incorrect items, or improperly installed or constructed. The Contractor shall correct the punch list deficiencies by re-work, modifications, or replacement, as appropriate, until the items conform to the Contract Documents. The initial punch list shall be produced by the Contractor, with copies to the Engineer and

Owner. When the Contractor has reduced the number of deficient items to a reasonable level, the Engineer will develop a definitive punch list for the use of the Contractor.

- C. Provide submittals to Engineer that are required by governing or other authorities.

1.09 FINAL COMPLETION:

- A. Prior to final completion, the following tasks shall be completed:
  - 1. All items in the punch list shall be completed.
  - 2. All Contract closeout documentation shall be submitted to and accepted by the Engineer.
- B. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due. The Contractor shall submit the following documents with or prior to Final Application for Payment: Set of as-built documents, Contract Completion and Acceptance Certificate, Consent of Surety to Final Payment, Release and Waiver of Liens and Claims (SECTION 01770 ATT. A), Affidavit of Payment of Debts and Claims, and remaining releases, waivers, warranties/guarantees, and all other data required by the Contract Documents.

1.10 CORRECTION/WARRANTY PERIOD:

- A. During the correction period, the Contractor shall correct all deficiencies in equipment and materials.
- B. During the warranty period, the Contractor shall perform all corrective work on warranty deficiencies.
- C. Corrective work will be identified by the Engineer or Owner, as appropriate. The Contractor will be notified of the item(s) requiring corrective work.
- D. The Contractor shall begin work on all corrective work within ten days of being notified of the deficiency by the Engineer and shall then work continuously until the deficiency is

corrected. Upon completion of the corrective work, the Contractor shall submit a letter report to the Engineer describing the deficiency and the corrective action that was taken.

- E. The Contractor shall coordinate all corrective work with the Engineer and/or the Owner.

1.11 COMPLETION CHECKLIST:

- A. **The Project Completion Checklist, which follows, shall be modified as required for the specific project and shall be completed as the project nears completion.** When the project has been fully completed, Final Payment can be approved.

Document2

**PROJECT COMPLETION CHECKLIST**

Owner \_\_\_\_\_ Job No.

Project

As part of the project closeout, all items listed below must be checked off as being complete or otherwise accounted for. The person verifying completion of the item shall list the completion date and his/her initials.

<b>Project Closeout Checklist (SAMPLE)</b>		
	Date Completion Verified	Verified by
<b>AS-BUILT DOCUMENTS HANDED OVER</b>		
1. Contract Drawings		
2. Specifications		
3. Addenda		
4. Change Orders/Contract Modifications		
5. Reviewed Shop Drawings, Product Data and Samples		
6. Written Interpretations/Clarifications		
7. Field Orders		
8. Field Test Reports		
<b>EQUIPMENT CHECKOUT AND CERTIFICATIONS</b>		
1. Construction Complete per Drawings/Specifications		
2. Equipment Installed and Adjusted		
3. All Shop Drawings have Final Approval		
4. All Shop Tests Complete and Results Submitted		

<b>Project Closeout Checklist (SAMPLE)</b>		
	Date Completion Verified	Verified By
<b>FINAL CLEANING</b>		
1. All Construction Facilities Removed		
2. All Construction Debris Removed		
3. All Areas Swept/Cleared		
<b>SUBSTANTIAL COMPLETION</b>		
1. All Items Coordinated Into a Fully Operational System		
2. All Equipment Units Operational at Specified Efficiencies		
3. All Field Tests Completed and Reports Submitted		
4. All Final Training by Manufacturer's Rep. Completed		
5. All Spare Parts and Lubricants Provided		
<b>CLOSEOUT PROCEDURES</b>		
1. Written Certification Submitted that Work is Ready for Owner & Engineer Inspector		
2. Inspection by Owner, Engineer, Contractor completed		
3. Punch List of Nonconforming Items Prepared		
4. Documents Required by Governing or Other Authorities Submitted		
5. Final Application for Payment Received		
6. Contract Completion and Acceptance Certificate Submittal		
7. Consent of Surety to Final Payment Submittal		
8. Release and Waiver of Liens and Claims Submitted		
9. Affidavit of Payment of Debts and Claims Submitted		
10. Warranties/Guarantees Submitted		
11. Other Required Releases and Waivers Submitted (List Them)		
12. Permits Submitted (List Them)		
13. Weekly Payrolls Submitted as Required by Law		
<b>FINAL COMPLETION</b>		
1. All Items in Punch List Completed		

**Project Closeout Checklist (SAMPLE)**

	Date Completion Verified	Verified By
2. All Other Required Documentation Submitted (List It)		
<b>CORRECTION/WARRANTY PERIOD</b>		
1. Correction Period Start Date: _____  End Date: _____		
2. Specific Warranties Provided  <u>Item</u> <u>Warranty Duration</u>		

Full name of persons signing their initials on this checklist:

---

---

---

---

---

END OF SECTION

Document2

SECTION 02055  
COMMON BORROW

PART 1 - GENERAL

1.01 WORK INCLUDED:

This specification covers the furnishing of all labor, material and equipment necessary to place and compact a layer of common borrow as indicated on the drawings and as described herein.

PART 2 - PRODUCT

2.01 MATERIAL:

Common Borrow shall be as specified in Section 02300, EARTHWORK.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. After approval of the underlying surface, common borrow shall be placed on top and when compacted shall be a minimum of 6-inches thick.
- B. The common borrow shall be compacted to at least 95 percent of maximum dry density as specified in ASTM D1557, Method C.
- C. Common borrow shall be placed on the intermediate cover, as required, using rubber tired or track vehicles. Vehicles shall not drive directly on the intermediate cover, but may operate on previously placed gravel. The Contractor will be responsible for repairing any damage to the intermediate cover layer resulting from this covering operations.
- D. The Engineer reserves the right to perform the ASTM D1557, Method C density test on any compacted common borrow area.

END OF SECTION

## SECTION 02071

### GEOTEXTILE FABRICS

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

This Section covers furnishing of all labor, materials, and equipment necessary to install specified geotextile fabrics in locations shown on the drawings and as required by the Engineer.

##### 1.02 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

Shop drawings or working drawings and material specifications shall be submitted to the Engineer for review for each type of geotextile fabric furnished. General installation practices and installation schedule shall be included in the submittal.

#### PART 2 - PRODUCTS

##### 2.01 EROSION CONTROL FABRIC

- A. Erosion Control Fabric shall be of the best quality proven design and construction and shall be entirely suitable in every respect for the intended service.
- B. Erosion Control fabric shall be Miramat Erosion Control/Revegetation MAT (ECRM) as manufactured by Tencate Geosynthetics, Pendergrass, GA; Enkamat Soil Erosion Matting as manufactured by BASF Corporation Fibers Division, Enka, N.C.; Tenax Erosion Control Netting as manufactured by ATP Corporation, Ashtabula; Ohio or approved equal.

##### 2.02 FILTER/DRAINAGE FABRIC:

- A. The filter/drainage fabric shall be composed of continuous-filament fibers bonded together to form a sheet. The fabric shall be an average of 20 mils thick and possess the characteristics of Tencate Mirafi 140N.
- B. The filter/drainage fabric shall be Tencate Mirafi 140N as manufactured by Tencate Geosynthetics, Pendergrass, GA; Foss-65 by Foss Manufacturing Co., Hampton, NH; US 120NW, as manufactured by US Fabrics, Cincinnati, OH, or approved equal.

##### 2.03 DEMARCATION LAYER GEOTEXTILE:

- A. The demarcation layer shall be an orange, non-woven geotextile composed of polypropylene filament fibers which are formed into a stable network. The fabric shall be an average of 35 mils thick and possess the characteristics of Tencate Mirafi

140NL/O or approved equal. If the condition of existing demarcation fabric at the mound is acceptable to the Engineer the Contractor may re-use the orange demarcation fabric. The Contractor shall furnish and install new orange demarcation fabric at no cost to the Owner if the existing material is not acceptable to the Engineer.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION:

##### A. GENERAL:

Installation of geotextile fabrics shall be strictly in accordance with manufacturer's instructions and specific layout plans and details reviewed by the Engineer.

##### B. EROSION CONTROL FABRIC:

Erosion control fabric shall be placed over the prepared surface in drainage swales and other locations as required by the Engineer. The fabric shall be unrolled, placed in the direction of water flow, overlapped, pinned down with wood stakes, and seeded. All installation work shall be in accordance with manufacturer's recommendations or as required by the Engineer.

##### C. FILTER/DRAINAGE FABRIC:

The filter/drainage fabric shall be installed in the final graded trench bottom prior to placement of the crushed stone bedding and at other locations shown on the drawings or designated by the Engineer. The drainage fabric in place shall cover the entire trench bottom and trench sides as shown on the drawings. Each width of drainage fabric shall be overlapped in accordance with manufacturer's recommendations, but not less than 2 feet, to prevent intrusion of soil fines into the bedding.

##### D. DEMARCATION LAYER GEOTEXTILE:

The orange demarcation layer shall be installed in the final subgrade of landscaped areas that will not be completed with either asphalt, or concrete. In areas of tree planting, the Contractor shall remove the fabric to allow the planting; in the tree areas a minimum of 36 inches of imported fill shall be placed between the final grade and subgrade. Each width of demarcation fabric shall be overlapped in accordance with manufacturer's recommendations, but not less than 2 feet. All installation work shall be in accordance with manufacturer's recommendations or as required by the Engineer.

The Contractor shall follow the manufacturer's instructions for all geotextile and fabric placement and installation.

#### 3.02 FINAL INSPECTION AND ACCEPTANCE:

A. The Engineer, at the Contractor's expense, reserves the right to have a manufacturer's

representative inspect the installation process at any time during construction. Any work found to be unsatisfactory shall be corrected at the Contractor's expense.

END OF SECTION

## SECTION 02113

### EXCAVATION AND STOCKPILING OF IMPACTED MATERIAL

#### PART 1 – GENERAL

##### 1.01 DESCRIPTION:

- A. Furnish all labor, materials, equipment, and incidentals necessary to properly excavate, remove, and/or segregate impacted materials. The Contractor shall be responsible for all analytical testing of soils for disposal and confirmatory purposes, as required by the disposal/recycling facility and the Engineer.
- B. The Contractor shall excavate impacted materials within the limit of work, as required by the Engineer. All excavated soil shall be stockpiled on and securely covered with 10 mil polyethylene while awaiting disposal characterization results.
- C. Impacted materials may include soil, sediment, vegetation, sand, or debris removed from below grade.

##### 1.02 RELATED WORK:

- A. Section 00320 – SUBSURFACE DATA
- B. Section 00890 – PERMITS
- C. Section 01380 – HEALTH AND SAFETY PLAN
- D. Section 01562 – DUST CONTROL
- E. Section 01570 – ENVIRONMENTAL PROTECTION
- F. Section 02130 – TRANSPORTATION AND DISPOSAL OF IMPACTED MATERIAL
- G. Section 02240 – DEWATERING
- H. Section 02300 – EARTHWORK

##### 1.03 SUBMITTALS:

- A. Laboratory results for all samples collected and/or analyzed by the Contractor shall be submitted to the Engineer within 2 days of receipt. The results shall include all Chain-of-Custody forms and all documentation provided by the laboratory.
- B. Excavation Materials Management Plan (EMMP) for Construction in Contaminated Areas. The Contractor shall submit an EMMP to the Engineer for review as defined in Section 02130 – TRANSPORTATION AND DISPOSAL OF IMPACTED MATERIAL.

#### 1.04 REFERENCES:

##### A. Massachusetts Department of Environmental Protection (DEP) Policy Number:

1. WSC-13-500, Similar Soils Provision Guidance.
2. WSC-94-400, Interim Remediation Waste Management Policy for Petroleum Contaminated Soils.
3. COMM-97-001, Reuse and Disposal of Contaminated Soils at Massachusetts Landfills.

##### B. Massachusetts Contingency Plan (MCP), 310 CMR 40.0000.

##### C. Toxic Substances Control Act (TSCA), 40 CFR 761.00.

##### D. 310 CMR 30.0000 and the Resource Conservation and Recovery Act (RCRA), 40 CFR 148 and 268.

##### E. All other applicable federal, state, and local regulations.

#### 1.05 DEFINITIONS:

##### A. Refer to Section 02130 – TRANSPORTATION AND DISPOSAL OF IMPACTED MATERIAL, Item 1.05 for definitions.

#### 1.06 QUALITY CONTROL:

##### A. The work shall conform to applicable local, state and federal regulatory agencies governing the handling of soils and hazardous materials.

##### B. Best Management Practices shall take place while performing the work described in this Section.

### PART 2 – PRODUCTS

#### 2.01 GENERAL:

##### A. At the expense of the Contractor, all personnel shall wear personal protective equipment and protective clothing consistent with the levels of protection required for this work as indicated in the site-specific Health and Safety Plan and in accordance with Section 01380 – HEALTH AND SAFETY PLAN.

##### B. Containers used for hauling the impacted materials shall be constructed of steel, in good condition and designed for the intended purpose of safe, secure storage of hazardous material during loading and transport to an approved disposal facility. The containers

must be containers approved by and labeled in accordance with the U.S. Department of Transportation (DOT).

- C. The containers shall be sift proof and water resistant in accordance with the U.S. DOT regulations.

#### 2.02 FILL MATERIALS:

- A. The backfill material shall meet the requirements specified in Section 02300 – EARTHWORK and be certified clean. Backfill from non-virgin or certified clean sources will be rejected and replaced at no additional cost to the Owner.
- B. Notify the Engineer as to the source of the backfill material. Provide samples as requested by the Engineer.

### PART 3 – EXECUTION

#### 3.01 GENERAL:

- A. The Contractor shall excavate and convey materials to perform site work described in this Contract.
- B. The Contractor shall segregate materials excavated during the course of the Work that are suspected to be impacted based on existing analytical data and/or visual and olfactory appearance or other physical indications of contamination as required by the Engineer.

#### 3.02 EXCAVATION AND RELOCATION OF IMPACTED MATERIAL:

- A. Where soils are identified to be impacted, the Contractor shall excavate, segregate and place these materials on and under sheeting as prescribed in Section 3.05. The Contractor shall excavate and relocate these materials to temporary stockpile location(s).
- B. Contractor shall backfill excavated areas to match existing grades with specified backfill, in accordance with Section 02300 – EARTHWORK.

#### 3.04 CHARACTERIZATION:

- A. The Contractor shall be responsible for characterizing the material for the purpose of obtaining approvals from the disposal facility(ies).
  - 1. The Contractor shall review the existing disposal data provided under Section 00320 – SUBSURFACE DATA. The Contractor shall be aware that the receiving facilities may require more current data and require added analysis to supplement the January 2020 disposal characterization data. The Contractor may perform characterization sampling at no additional cost to the Owner, with prior approval from the Owner and Engineer.

2. The Contractor shall perform all requested lab analyses of excavated material as required by the receiving facility. Characterization sampling may include but is not limited to the following:

Analytical Parameter	EPA Approved Test Method
Total Petroleum Hydrocarbons (TPH)	Method 8100
Volatile Organic Compounds (VOCs)	Method 8260B
Semi-volatile Organic Compounds (SVOCs)	Method 8270D
Polychlorinated Biphenyls (PCBs)	Method 8082A
Compendium of Analytical Methods (CAM) 14 Metals	Method 6010 & 7470
With Engineer Approval - Toxicity characteristic leaching procedure (TCLP)	Method 6010D 1311
Herbicides	Method 8081B
Pesticides	Method 8151A
Ignitability	Method 1030
Conductivity	Method 2510B
Reactive Cyanide	Method 9014
Reactive Sulfide	Method 9030A
pH	9045D

3. For non-impacted material with intended on-site re-use, the Contractor shall also collect a sample every 150 CY and perform sieve analysis and modified proctor moisture density curve analysis in accordance with Section 02300 – EARTHWORK. The re-use of non-impacted material may only be performed with Engineer approval.
4. The Contractor will be permitted to collect additional samples to perform additional testing of the excavated material as required by the facility at no additional cost to the Owner, with prior approval from the Owner and Engineer.
5. The Contractor shall notify the Engineer at least two (2) days prior to sampling and the Engineer must be present for all sampling activities by the Contractor. All sample collection must be approved by the Owner and Engineer in writing, prior to sample collection. Samples rejected for analysis by the Owner or Engineer shall be disposed of at no additional cost to the Owner.

### 3.05 STORAGE OF EXCAVATED MATERIAL:

- A. The Contractor shall be allowed to stockpile potentially impacted material at a location approved by the Owner ending approval/manifests for transport and disposal or reuse if the following conditions are met:
  1. The stockpiled excavated material must be removed off-site as soon as possible and in all cases within 90 days from the day of its initial excavation for hazardous waste and 120 days for non-hazardous waste (hazardous waste as defined in 310 CMR 30.0000 and RCRA).

2. The stockpiled excavated material shall be placed on 10-mil (minimum) polyethylene sheeting and covered with 10-mil (minimum) polyethylene sheeting or 10-mil nylon sheeting.
  3. The polyethylene sheeting shall be bermed around the edges to prevent any infiltration of stormwater or exfiltration of leachate.
  4. The base of the temporary stockpile shall be sloped to create leachate collection points. Collect and dispose of all leachate generated from the stockpiles. Collect and appropriately dispose of all leachate generated from the stockpiles in accordance with Section 02240 – DEWATERING.
- B. The Contractor shall propose an on-Site lay-down area for Owner and Engineer approval prior to the placement and temporary stockpiling of excavated materials. All placement of excavated materials shall comply with project permits.
- C. If any one of these conditions cannot be met, then the Contractor shall store impacted material in water-tight containers within the limits of work at no additional cost to the Owner pending transportation and disposal. The containers must be removed off site within 90 days from the first day of excavation/generation for hazardous waste and 120 days for non-hazardous waste.

END OF SECTION

\\wse03.local\WSE\Projects\MA\Worcester MA\Coes Park\Parking Lot Expansion\Specs\02113 - Excavation and Stockpiling of Impacted Material.docx

## SECTION 02130

### TRANSPORTATION AND DISPOSAL OF IMPACTED MATERIAL

#### PART 1 – GENERAL

##### 1.01 DESCRIPTION:

- A. The intended purpose of the Section is to address the transport and disposal of impacted material that will be encountered during the course of the Work as shown on the Contract Drawings.
- B. Furnish all labor, materials, equipment, and incidentals necessary to transport and dispose of impacted materials. Work includes preparing Bills of Lading and Hazardous Waste Manifests as required, obtaining approval from disposal facilities for disposal, and loading and hauling of excavated materials.
- C. Excavated materials not approved by the Owner for backfilling because of physical or chemical characteristics shall be disposed of as specified herein.
- D. The Contractor will be responsible for the cost of analytical testing of all disposal characterization samples. The Contractor is responsible for the waste profiling requirements including Contractor-prepared LSP Opinion letter, collection and submittal of any disposal characterization samples, and provisions or any other information to obtain approval from the receiving facility.

##### 1.02 RELATED WORK:

- A. Section 00320 – SUBURFACE DATA
- B. Section 00890 – PERMITS
- C. Section 01380 – HEALTH AND SAFETY PLAN
- D. Section 01570 – ENVIRONMENTAL PROTECTION
- E. Section 02113 – EXCAVATION AND STOCKPILING OF IMPACTED MATERIAL
- F. Section 02300 – EARTHWORK

##### 1.03 SUBMITTALS:

- A. Submit to the Engineer, for review, and in accordance with the requirements of the general specifications, the information required by Paragraph 1.03 B., no more than 14 days after issuance of the Notice to Proceed:
- B. The Contractor shall prepare an Excavated Materials Management Plan (EMMP) including the following information:

1. Procedures/sequence of activities related to soil excavation, transport and disposal.
2. All pertinent information relating to the transport of impacted material. The information, at a minimum, shall include:
  - a. Name and address of all transporters.
  - b. Transporter identification number (USEPA or Massachusetts Department of Transportation Transporter) and expiration date.
  - c. Proof of permit, license, or authorization to transport impacted material in all affected states.
  - d. Details of containers to be used for transporting impacted material. Refer to Paragraph 2.01 B. of this Section.
3. The Contractor shall identify each waste stream and propose an appropriate disposal facility that will accept the material. A minimum of three (3) receiving facilities shall be proposed including a minimum of two (2) receiving facilities for impacted material recycling/disposal and one (1) receiving facility for the recycling/disposal of non-impacted material.

The Contractor shall submit to the Engineer, approvals or letters of intent and facility information for each facility proposed, within 14 days of issuance of the Notice to Proceed. For each facility, the Contractor shall submit the following information:

- a. General Information
  - i. Facility Name
  - ii. Facility Address
  - iii. Name of Contract Person
  - iv. Title of Contact Person
  - v. Telephone Number of Contact Person
  - vi. Permit Number
  - vii. Acceptance Criteria of receiving facility including any applicable regulatory standards and/or contaminant-specific limits.
- b. The facility shall specify the volume of material that can be accepted from the site on a weekly and a total basis.
- c. The facility shall provide written confirmation that they are permitted to accept and will accept the classified material of the general quality and quantity described by these Specifications.
- d. The facility shall provide a listing of all current and valid permits, licenses, letters of approval, and other authorizations to operate that they hold, pertaining to the receipt and management of the soils or materials specified in this contract.

- e. The Contractor shall submit a complete list of the disposal facility's permitted allowable contaminant levels and physical characteristic requirements for impacted material, and list any required regulatory approvals for individual waste streams.
- 4. Proof of emergency service agreement with certified emergency response contractor.
- 5. Record keeping information as described in 3.08.
- C. Submit to the Engineer, for review, and in accordance with the requirements Paragraph 3.03, all draft disposal documentation prior to facility or MassDEP submittal including but not limited to Bill of Ladings and associated Contractor-LSP prepared LSP Opinion Letters. The Contractor LSP shall submit the approved BOL to the MassDEP and coordinate with the Owner for eDEP submittal.

#### 1.04 REFERENCES:

The Contractor shall comply with all federal, state, and local regulations, including at a minimum the following regulations:

- A. Massachusetts Department of Environmental Protection (DEP) Policy Number:
  - 1. WSC-13-500, Similar Soils Provision Guidance.
  - 2. WSC-94-400, Interim Remediation Waste Management Policy for Petroleum Contaminated Soils.
  - 3. COMM-97-001, Reuse and Disposal of Contaminated Soils at Massachusetts Landfills.
- B. Massachusetts Contingency Plan (MCP), 310 CMR 40.0000.
- C. Toxic Substances Control Act (TSCA), 40 CFR 761.00.
- D. 310 CMR 30.0000 and the Resource Conservation Recovery Act (RCRA), 40 CFR 148 and 268.
- E. All other applicable federal, state, and local regulations.

#### 1.05 DEFINITIONS:

- A. Impacted Material: Soil, sediment, vegetation, or debris indicated by analytical results to contain any concentrations equal to or greater than 50% of the MCP reportable concentration S-1 (RCS-1) established by 310 CMR 40.0300 and 40.1600. Impacted material also includes soil, sediment, or debris assessed and designated by the Engineer based upon field screening, observation and/or olfactory evidence to be Impacted material.

- B. Non-impacted Material: Soil, sediment, vegetation, or debris having constituent concentrations as determined by off-Site laboratory analysis to be less than 50% of MCP RCS-1 standards.
- C. Excavated Material: All impacted and non-impacted material.

#### 1.06 PERMIT REQUIREMENTS:

- A. The Contractor shall obtain all Federal, State, and local permits required for the transport and disposal of impacted soil. The Contractor shall adhere to all permit requirements.
- B. The Contractor shall document that the disposal facilities proposed have all certifications and permits as required by Federal, State, and local regulatory agencies to receive and dispose of the impacted soil.

### PART 2 – PRODUCTS

#### 2.01 GENERAL:

- A. All Contractor personnel shall wear personal protective equipment and protective clothing consistent with the levels of protection for this Work as indicated in Section 01380 – HEALTH AND SAFETY PLAN.
- B. Containers used for hauling the impacted material shall be constructed of steel, in good condition and designed for the intended purpose of safe, secure storage of hazardous material during loading and transport to an approved facility. The containers shall have a secure cover which will prevent a release of material from truck during transportation. The container and covers shall be approved by the Engineer prior to mobilization of trucks/containers. The containers must be approved by and labeled in accordance with the U.S Department of Transportation (DOT). The containers shall be sift proof and water resistant in accordance with the DOT regulations.

#### 2.02 EQUIPMENT AND VEHICLE DECONTAMINATION:

- A. The Contractor shall provide an equipment and vehicle decontamination station as required in Section 01380 – HEALTH AND SAFETY PLAN.

### PART 3 – EXECUTION

#### 3.01 GENERAL:

- A. Prior to excavating any soil, erosion and sediment control measures shall be implemented per Section 01570 – ENVIRONMENTAL PROTECTION. Also, the excavation area planned for removal shall be moistened with water prior to excavating to control potential dust generation. Additional dust control measures may be required throughout the course of the project in accordance with Section 01562 – DUST CONTROL.

- B. The Owner will be the generator and will sign all manifests and DEP shipping documents. Except for hazardous waste materials that shall be transported under a Hazardous Waste Manifest, non-hazardous soils with concentrations greater than MCP reportable concentrations shall be transported under a Bill of Lading. The Contractor shall prepare all Bills of Lading and Hazardous Waste Manifests and shall submit all transportation paperwork, as required in the EMMP, to the Engineer for approval prior to shipment. The Owner and the Contractor's LSP shall sign all Bills of Lading upon final review and approval.
- C. Utilization of a Hazardous Waste Manifest shall require the use of a licensed hazardous material transporter in conformance with the Massachusetts Hazardous Material Regulations as required by 310 CMR 30.0000. An LSP Opinion is not required when using a Hazardous Waste Manifest for transporting impacted materials.
- D. The Owner shall have final approval over all disposal options based on the analytical data.

### 3.02 NON-IMPACTED MATERIAL:

- A. Unless non-impacted material is tested and approved for on-site reuse by the Engineer, non-impacted material shall be disposed off-site in accordance with the requirements of this Section at no additional cost to the Owner.

### 3.03 IMPACTED MATERIAL:

- A. The Contractor shall transport impacted material for off-site recycling at a licensed asphalt recycling facility, disposal at a landfill, or at another appropriately licensed facility.
- B. Impacted material shall be handled using a Contractor-prepared Bill of Lading. The Contractor shall retain a Licensed Site Professional (LSP) to prepare the LSP opinion letter(s) to accompany the waste profile and Bill of Lading. The Contractor shall submit the proposed landfill or facility disposal documentation to the Engineer for review and approval and obtain facility approval prior to transportation of impacted material.
- C. Impacted material shipped to recycling/disposal facility must meet the selected facility's chemical and physical acceptance criteria. Selected facilities must be established, fully operational, appropriately insured, and be operating in compliance with all applicable local, state, and federal regulations.

### 3.04 WEIGHT AND MEASUREMENT:

- A. The tare and gross weight for every vehicle, container, and trailer transporting soil and/or debris for off-Site reuse, recycling, treatment or disposal shall be measured to determine the net weight.
- B. The Contractor shall provide certified tare and gross weight slips for each load received at the accepted Facility which shall be attached to each returned manifest.

### 3.05 WASTE PROFILES AND MANIFESTS:

- A. The Contractor shall prepare and submit to the Owner and Engineer for review all waste profile applications and questionnaires, and coordinate with disposal facilities and all Federal and State Environmental Agencies. Refer to Paragraph 1.03 B.
- B. The Contractor shall prepare all Hazardous Waste Manifests, Bills of Lading, and material shipping records with all applicable analytical backup, notification, and control forms. Final copies of Bills of Lading shall be signed by the Owner (or his/her designated representative) as generator following submission and approval by the Engineer of draft Bills of Lading.
- C. The Contractor shall also provide certified tare and gross weight slips for each load received at the designated facility which shall be attached to each returned manifest.
- D. The Owner (or his/her designated representative) will be designated as generator and will sign all manifests and waste profile application or questionnaires.
- E. The Contractor shall furnish all generator copies of the Hazardous Waste Manifest to the Owner for submittal to the appropriate regulatory agencies and to retain for the Owner's records.
- F. The Contractor shall submit to the Owner, prior to receiving progress payment, documentation certifying that all materials were transported to, accepted, and disposed of, at the selected disposal facility. The documentation shall include the following, as a minimum.
  - 1. Documentation shall be provided for each load from the site to the disposal facility, including all manifests and any other transfer documentation as applicable.
  - 2. All documentation for each load shall be tracked by the original manifest document number that was assigned by the Engineer at the site.
  - 3. All ORIGINAL signatures (including signatures of Owner and disposal facility's representative) associated with shipment of any material from the site under a Bill of Lading.
  - 4. The Contractor's LSP shall submit the MassDEP-required BOL Attestation of Shipment from the receiving facility(ies) and provide copies of the completed files to the Engineer and Owner.

### 3.06 TRANSPORT OF EXCAVATED MATERIAL:

- A. The Contractor shall not be permitted to transport excavated materials off-site until all disposal or recycling facility documentation has been received, reviewed, and approved by the Engineer.

- B. The Contractor shall take all precaution and any actions necessary, at no additional cost to the Owner, to prevent cross-contamination from transport vehicles to areas outside the “impacted area”. The Contractor shall utilize an equipment and vehicle decontamination station to clean vehicles prior to leaving the site.
- C. The Contractor shall transport impacted materials from the site to the disposal, reuse or recycling facility in accordance with all United State Department of Transportation (DOT), USEPA, and MADEP regulations.
- D. The Hauler(s) shall be licensed in all states affected by transport.
- E. The Contractor shall be responsible for ensuring that free liquid is properly transported. “Wet soils” shall not be loaded for transport. The Contractor shall dewater “wet soils”, and properly dispose of free liquid. The Contractor shall dispose of any free liquids that may result during transportation at no additional cost to the Owner.
- F. Temporary stockpiled soil must be removed from the site in accordance with applicable regulatory deadlines; however, no later than the completion date of this Contract.

### 3.07 DISPOSAL:

- A. Dispose of excavated materials at an approved facility in accordance with all federal, state and local regulations.
- B. The Contractor shall perform analyses on the excavated material as necessary, with prior approval from the Owner and Engineer, to fulfill any disposal testing requirements of the approved Facility.
  - 1. The Contractor shall notify the Engineer at least two (2) days prior to sampling and the Engineer must be present for all sampling activities by the Contractor. The Contractor shall bear all costs incurred in sampling and analyses for those tests required by the facility.
  - 2. The Contractor shall submit a copy of all sampling analyses to the Engineer within two (2) days of receipt of the laboratory report. Analytical data shall be kept confidential, distributed to the Engineer and Owner only.
- C. The Contractor shall provide to the Engineer copies of all weight slips, both tare and gross, for every load weighed and disposed of at the approved facility. The slips shall be tracked by the original manifest document number that was assigned by the Engineer at the site. The Engineer shall make progress payments after receipt of these weight slips.

### 3.08 LOGS, REPORTS, AND RECORDKEEPING:

- A. At a minimum, the Contractor shall maintain daily logs and reports covering the work to be performed for this Section of the Contract. The format shall be developed by the Contractor to include daily logs, weekly reports, and a phase out report. Contractor shall provide Engineer with copies of all logs and reports on a weekly basis.

B. Daily Logs shall include, at a minimum, the following:

1. Date
2. Area (site specific) of work being performed
3. Equipment being utilized by employees
4. Type of work performed
5. References to/copies of manifests, bills of lading, and waste profiles
6. Sample locations and sample identifications
7. Details and documentation of remediation waste management
8. Protective clothing being worn by employees
9. Project manager signature and date

C. Weekly Reports shall include, at a minimum, the following:

1. A summary of the work performed during the week
2. Copies of the daily logs

D. Close Out Report shall include, at a minimum, the following:

1. Summary of work performed under this Section of the Contract
2. Copies of all manifests, bills of lading, and waste profiles
3. Laboratory reports and plans indicating sample locations
4. Project managers signature and date

END OF SECTION

\\wse03.local\WSE\Projects\MA\Worcester MA\Coes Park\Parking Lot Expansion\Specs\02130 - Transportation and Disposal of Impacted Material.docx

## SECTION 02223

### SELECTIVE SITE DEMOLITION

#### PART 1 - GENERAL

##### 1.01 SCOPE OF WORK:

- A. Work under this Section shall consist of the careful removal, storage for reuse, transportation off-site, or demolition, of all structures and site features encountered or noted to be removed or abandoned to a minimum of three feet below finished grade, and the removal and disposal of all materials not called for to be reused or salvaged, in accordance with the contract drawings, these specifications, and Engineer's requirements. Provide all labor, equipment, materials and transportation necessary to complete the work.
- B. Items plan referenced to be removed and stored shall be carefully removed and stored on site in a manner and location designated by the Engineer for reinstallation later as shown on the plans or as indicated by the Engineer.
- C. Items plan referenced, or as indicated by the Engineer to be removed and disposed of shall be removed from the site and properly and legally disposed of by the Contractor.
- D. Items indicated on the contract drawings or in the specifications to be removed and salvaged, or other items required to be removed by the Engineer, shall be transported to a municipal storage facility, located within the City confines, and unloaded and stacked as required by the Engineer.
- E. Items indicated on the contract drawings or in the specification to be removed and reset shall be carefully removed and reset in the same location as existing according to the specification and details.
- F. **The process for demolition and removal of all items within this specification will be superseded by the site's Remedial Action Plan and associated requirements.**
- G. The following scope describes the general work/demolition requirements of this Section.
  - 1. Cement concrete and bituminous concrete pavements.
  - 2. Curbing
  - 3. Chain link fencing and footings complete.
  - 5. Wood guard rail

6. Boulders & wall stone
8. All other features as indicated on the drawings or as required to complete the project as indicated in the plans and specifications

#### 1.02 PROTECTION OF EXISTING STRUCTURES AND UTILITIES:

- A. The Contractor shall assume complete responsibility and liability for the safety and structural integrity of all work and utilities to remain during demolition.
- B. Provide safeguards including, but not limited to, warning signs, barricades, temporary fences, warning lights and other items required for protection of personnel and the general public during performance of all work.
- C. All features related to protection shall be maintained until that work has been completed to the point when such safeguards are no longer required.

#### 1.03 SPECIAL REQUIREMENTS:

- A. The Contractor shall salvage items label to be salvaged and transport these to the **Owner's City Yard or other city-owned property** unless these are called for to be reused or required by the Engineer to be disposed of.
- B. Install erosion controls to protect adjacent areas from eroded materials likely to enter wetlands, resource areas, or drainage ways/systems, downstream of areas disturbed by work activities.
- C. Where items to be demolished are located within or adjacent to pavements, fences, and features to remain, the Contractor shall make provisions to protect those items to remain. Cut concrete pavement back to score line and cut bituminous concrete pavement back far enough so as not to allow disturbance to base course materials. Pavements damaged as a result of Contractor activities shall be replaced to the extent determined by the Engineer at no additional cost to the Owner.

#### 1.04 REFERENCES:

- A. Massachusetts Department of Transportation (MassDOT) Standard Specifications for Highways and Bridges – latest edition.

### PART 2 - PRODUCTS

#### 2.01 BACKFILL:

- A. The Contractor shall provide suitable backfill as specified under Section 02300 of these Specifications, to fill voids left by removal or abandonment of site features, and

shall provide all pipe cap ends, mortar, brick and other material needed to cap off or plug pipes of various sizes and kinds.

- B. Suitable materials shall be used as base course fill and topsoil to the depth as specified herein. Restore disturbed areas with similar materials blended to match the line and grades of adjacent surfaces.

#### 2.02 TEMPORARY FENCE:

- A. The work under these Items shall conform to the relevant provisions of section 644 of the MassDOT Standard Specifications.
- B. The work shall include temporary installation of chain link fence around the perimeter of the work limits where shown on the plans, and as required by the Engineer, and as Contractor sees fit to protect work.
- C. Temporary fence shall consist of 6 foot high chain link fence anchored into a base that is both stable and movable to allow access and adjustment as needed. Reclaimed existing fence fabric and materials may be used with the approval of the Engineer. The Contractor shall submit a shop drawing to the Engineer for approval prior to installation.

### PART 3 - EXECUTION

#### 3.01 SALVAGEABLE MATERIAL:

- A. Frames, grates and other salvageable material shall be carefully removed to minimize damage and stored for later reuse, transport, or removal from site.

#### 3.02 ABANDONED STRUCTURES:

- A. All inlets and outlets shall be plugged with at least eight (8) inches of brick and mortar masonry. Upper portions of masonry structures shall be removed to a depth of three feet. The bottoms of all structures shall be broken to allow drainage, and the structure shall be filled with suitable backfill material placed in six (6) inch layers and thoroughly compacted at each level.
- B. The Engineer shall review work related to abandoned structures before backfilling. Those items not reviewed before backfilling shall be uncovered and backfill procedures observed, at no expense to the Owner.

#### 3.03 ABANDONED PIPES OR CONDUITS:

- A. Plug previously abandoned drainpipes encountered with masonry brick at least eight (8) inches in thickness.
- B. Abandon discontinued water supplies that are encountered during the execution of this contract in accordance with Owner requirements.

- C. Electrical conduits encountered and previously abandoned shall be capped or plugged.

END OF SECTION

## SECTION 02230

### CLEARING AND GRUBBING

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

- A. The Contractor shall do all required clearing and grubbing as indicated on the drawings or herein specified in the area required for construction operations on the Owner's land or in the Owner's permanent or temporary easements and shall remove all debris resulting therefrom.
- B. Unless otherwise noted, all areas to be cleared shall also be grubbed.
- C. The Contractor shall not clear and grub outside of the area required for construction operations.

##### 1.02 RELATED WORK:

Any trees and shrubs specifically designated by the Owner not to be cut, removed, destroyed, or trimmed shall be saved from harm and injury in accordance with Section 01570, ENVIRONMENTAL PROTECTION.

#### PART 2 - PRODUCTS: NOT APPLICABLE

#### PART 3 - EXECUTION

##### 3.01 RIGHT TO WOOD AND LOGS:

The Owner shall have the right to cut and remove logs and other wood of value in advance of the Contractor's operations. All remaining logs and other wood to be removed in the course of clearing shall become the property of the Contractor. **In response to the State/Federal imposed quarantine regarding the Asian Longhorned Beetle infestation, the Contractor shall follow the protocol for handling and disposal of cleared and grubbed materials.**

##### 3.02 CLEARING:

- A. Unless otherwise indicated, the Contractor shall cut or otherwise remove all trees, saplings, brush and vines, windfalls, logs and trees lying on the ground, dead trees and stubs more than 1-foot high above the ground surface (but not their stumps), trees which have been partially uprooted by natural or other causes (including their stumps), and other vegetable matter such as shags, sawdust, bark, refuse, and similar materials.
- B. The Contractor shall not remove mature trees (4-inches or greater DBH) in the Owner's temporary easements.

- C. Except where clearing is done by uprooting with machinery or where stumps are left longer to facilitate subsequent grubbing operations, trees, stumps, and stubs to be cleared shall be cut as close to the ground as practicable but not more than 6-inches above the ground surface in the case of small trees, and 12-inches in the case of large trees. Saplings, brush and vines shall be cut close to the ground.

3.03 GRUBBING:

- A. Unless otherwise indicated, the Contractor shall completely remove all stumps and roots to a depth of 18-inches, or if the Contractor elects to grind the stumps, they shall be ground to a minimum depth of 6-inches.
- B. Any depression remaining from the removal of a stump and not filled in by backfilling shall be filled with gravel borrow and/or loam, whichever is appropriate to the proposed ground surface.

3.04 **PROTOCOL FOR HANDLING AND DISPOSAL OF CLEARED AND GRUBBED MATERIALS:**

- A. **Process all cleared and grubbed vegetative, wood and cellulose based materials (trees shrubs, roots, stumps, branches, leaves, lumber materials twelve inches and under, as measured in all directions, designated for disposal) to a size of less than one inch as measured in two directions by approved mechanical means (wood chipper) prior to disposal/removal offsite.**
- B. **Stockpile within the property limits, as designated by the Owner, all cleared and grubbed vegetative, wood, and cellulose based materials greater than twelve inches, as measured in all directions, designated for disposal/removal offsite.**

END OF SECTION

P:\MA\Worcester MA\Coes Park\Parking Lot Expansion\Specs\Division 2\02230- Clearing and Grubbing.docx

## SECTION 02232

### SELECTIVE CLEARING OF INVASIVE SPECIES

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

- A. The work of this Section includes the following:
  - 1. Pruning, to include all existing trees located within the designated areas of the Project. Work shall also include the removal of limbs as necessary to provide appropriate clearances for various site features, facilities, and park users.
  - 2. Removal of selected living trees and removal of all dead, dying or diseased vegetation from within the project limits in accordance with these specifications.
  - 3. Removal of invasive species and undesirable undergrowth in accordance with these specifications.
- B. Refer to the Contract Drawings for the general quantity and locations of existing trees that require pruning or removal. Trees shall be pruned in conformance with this specification. Tree removals shall be limited to areas as denoted on the plans and shall include the removal of individual trees that would impede the construction of proposed facilities or those that are dead or dying.
- C. Prospective bidders are advised to complete a site visit to review the extent of work required and to confirm existing conditions, access issues, terrain and the general nature of the work of this Section.

##### 1.02 QUALIFICATIONS OF CONTRACTOR:

- A. This work shall be limited to individuals, partnerships and corporations who are actively engaged in the field of Arboriculture, and who demonstrate competence, experience and financial capability to carry out the terms of this project. Eligible contractors/subcontractors must derive a majority of their income from arboricultural work. The Owner may require proof of these qualifications.
- B. All work shall be conducted by qualified and trained personnel under the direct supervision of a **Massachusetts Certified Arborist (MCA)** in the Contractor's employ.

##### 1.03 PERSONNEL:

- A. The Contractor shall submit each employee's name and title prior to the commencement of work. The Contractor shall advise the Owner of any changes in personnel assigned to this contract.
- B. A crew shall consist of one (1) tree trimmer/climber, and one (1) ground person (one of whom shall be a crew foreman). The crew foreman shall have a minimum of five (5) years climbing/pruning experience. At least one (1) crew person shall be an MCA and shall be certified in CPR.
- C. Each trimmer shall be experienced and highly qualified with the necessary tree worker skills to successfully complete the work of this Section, including the ability and training to perform aerial rescue. Said skill shall also include worker safety and ability in compliance with current OSHA and ANSI Z-133.1 Standards.

#### 1.04 SPECIAL REQUIREMENTS:

- A. Trees: The trees to be removed shall be those shown on the plans or designated by the Engineer/Arborist.
- B. Undergrowth: All plants less than 4-inches in diameter, measured at a height of 4 feet 6-inches above the ground, shall be classified as undergrowth. All undergrowth shall be removed from areas shown on the plans, described in the special provisions, or designated by the Engineer; except for those plants designated by the Engineer to be preserved.
- C. General: When specified in the special provisions, stumps shall be treated with an herbicide immediately after cutting to prevent sprouting. The herbicide to be used, and the method and rate of application shall be as specified in the special provisions. The Contractor's licensed herbicide applicator shall follow all applicable instructions, warnings, and safety precautions stated on the manufacturer's label, and shall comply with all laws and regulations governing herbicides that are in effect at the time of use. When work is performed properly in accordance with these specifications, no subsequent recutting of sprouts or seeding growth will be required. All trees and undergrowth cut shall be disposed of in accordance with the applicable requirements of Section 2.03 Removals of these specifications.
- D. **Dutch Elm diseased wood shall be disposed of in accordance with provisions of General Laws, Chapter 87, Section 5, and Chapter 132, Sections 8 and 11 as amended; and in accordance with any additional local regulations.** All wood shall be removed from the site and be properly disposed of in accordance with state and local regulations.
- E. **Asian Longhorn Beetle (ALB) infested wood shall be disposed of in accordance with provisions of General Laws, Chapter 87, Section 5, and Chapter 132, Sections 8 and 11 as amended; and in accordance with any additional local regulations.** All wood shall be removed from the site and be properly disposed of

in accordance with state and local regulations.

- F. No burning shall be permitted on the project site.
- G. Prior to commencing work, the Contractor shall submit a plan to the Owner for legal disposal of removed materials, in conformance with State and Federal regulations.

#### 1.05 STANDARDS AND DEFINITIONS:

- A. All pruning work shall conform to the following:
  - 1. The ANSI A300 'Standard Practices for Trees, Shrubs, and Other Wood Plant Materials' of the Secretariat: National Arborist Association, Post Office Box 1094, Amherst, New Hampshire 03031.
  - 2. American National Standards Institute (ANSI) Standard Z-133.1.
  - 3. National Arborist Association Standards for Pruning
- B. The term 'Owner' shall mean the Owner's designated representative charged with carrying out the requirements of this Project –'Landscape Architect', 'Arborist', 'Engineer', 'Planner', or 'Tree Warden' as referenced herein, rendering approvals for the Owner.
- C. The Engineer will monitor job progress throughout the project and approve all payments. A site walk will be conducted before work begins between the Contractor and the Engineer. Specific trees, undergrowth and invasive species may be identified at this time for removal/eradication.

#### 1.06 EXAMINATION OF SITE AND DOCUMENTS:

- A. The Contractor shall be responsible for having a clear understanding of the existing site conditions and shall be responsible for fully carrying out the work of this Section, regardless of actual site conditions encountered.

#### 1.07 SCHEDULE OF WORK:

- A. The Contractor shall submit a schedule of work for the Owner's review and approval prior to beginning work. Unless otherwise authorized by the Owner, failure of the Contractor to comply with the approved schedule shall be sufficient cause to give notice that the Contractor is in default of the contract.

#### 1.08 PROTECTION OF THE VEGETATION TO BE PRESERVED:

- A. The Contractor shall protect all existing trees, shrubs, lawns and other site features

designated to remain. The placement of protection devices, such as snow fence enclosures, shall, however, be at the Contractor's discretion. Contractor shall consult with a certified arborist to determine adequate tree protection methods, including but not limited to, fencing, root cutting, and mulch or plywood sheeting to protect root systems from compaction.

- B. Damage no plant to remain by burning, pumping water, cutting of live roots or branches, or any other means. Neither vehicles nor equipment shall be parked within the dripline of trees to remain, or wherever damage may result to trees to be saved. Construction material shall not be stored beneath trees to be saved.
- C. The Contractor shall be liable for any damage to any trees, shrub, lawn or other features to remain, and shall immediately report to the Owner. Damaged shrubs or lawns shall be restored or replaced to match existing to remain to the satisfaction of the Owner.
- D. The Contractor shall compensate the Owner for damages by installing replacement tree(s) of the size and species approved by the Owner and of sufficient quantity such that the sum of the caliper inches for replacement trees equals the total caliper inches of the damaged tree(s). Damaged shrubs shall be replaced with shrubs(s) of the same size, species, and quantity, unless determined otherwise by the Owner.
- E. Any plants that are damaged to such an extent as to destroy their value for landscape purposes shall be cut and disposed of, and grass that is damaged shall be reseeded and remulched as necessary by the Contractor at no cost to the Department when so required by the Engineer.
- F. The Contractor shall conduct his operations in such a manner to prevent injury to trees, shrubs, grass, or other types of vegetation that are to remain growing, and also to prevent damage to adjacent property.
- G. When any such injuries to trees or shrubs occur, broken branches shall be removed and rough edges of scarred areas shaped and made smooth in accordance with generally accepted arboricultural and horticultural practices.

#### 1.09 USE AND CARE OF THE SITE:

- A. The Contractor shall leave the work site at the end of each working period in a condition satisfactory to the Owner.
- B. Pavements shall be swept and lawns or other surfaces raked and/or otherwise cleaned of all materials related to the work operation. Degree of clean-up required will be described by the Owner at the outset of the Contractor's work and will be based upon the character of the work area.

- C. All trimmings or any other form of debris (except diseased materials or trimmings from Elms) shall be collected and chipped. The Contractor shall remove all materials and shall dispose of such materials off site in a legal manner.
- D. The Contractor shall be fully and solely responsible for any damage to equipment or vehicles left at the site of the work. All necessary permits shall be obtained by the Contractor.

## PART 2 - PRODUCTS

### 2.01 EQUIPMENT:

- A. Equipment necessary for this Contract shall be properly maintained and in good operating condition to the Owner's satisfaction. The Contractor shall promptly remove and replace any equipment which the Owner deems to be in unsatisfactory condition or otherwise unsuitable.
- B. A disc chipper shall be used which will process material up to twelve (12) inches in diameter.

## PART 3 - EXECUTION

### 3.01 TREE PRUNING:

- A. Under this Section, the Contractor shall furnish all labor, materials, equipment and transportation required to complete all aspects of the work in accordance with all local, state and federal regulations in force at the same time of this contract and in accordance with tree pruning as specified herein.
- B. The work of this Section consists of all tree pruning work and related items as specified herein and includes, but is not limited to:
  - 1. Pruning throughout the designated areas and limb removal required to allow for the proper installation of all proposed improvements. Pruning efforts shall consist of the removal of dead, dying, diseased, interfering, objectionable and weak branches on the main trunks as well as those within the leaf area. Consultation with a certified arborist is recommended. Pruning shall not be performed to an extent which may disrupt the balance of the tree or cause significant alteration to its natural form. An occasional branch one (1) inch or less in diameter may remain within the main leaf area where it is not practical to remove it, unless these limbs will be damaged by routine construction procedures.

### 3.02 TREE PRUNING DESCRIPTION OF WORK:

- A. Tree Pruning and trimming are generally described as the removal and disposal of

limbs, branches and stubs which are either dead, potentially detrimental to the health of the tree or dangerous to pedestrians, visually deficient, interfering or otherwise objectionable as determined by the Owner.

- B. The limits of all trees to be pruned have been identified on the plans or referenced elsewhere in this specification section.
- C. Vehicle access shall be controlled and approved by the Owner.
- D. If the Contractor discovers tree(s) which have not been designated for removal, but whose condition is such that removal is warranted, whether due to death, disease, decay, or structural weakness, such tree(s) shall not be pruned and the Contractor shall immediately report these findings in writing to the Owner and await the Owner's direction before proceeding with work on the particular tree(s) in question.
- E. All tree pruning shall be conducted in a manner that maintains the natural aesthetic characteristics of the species and variety of trees. No topping or dehorning of trees or stubbing back of branches shall be permitted. All cuts shall be made to a lateral branch that is a minimum of one-third (1/3) the size of the branch being removed, unless otherwise instructed by the Owner.
- F. The use of climbing spurs or spiked shoes shall not be permitted and their use will result in the immediate cancellation of the contract.
- G. All cuts shall be made sufficiently close to the parent stem so that wound closure can be readily started under normal conditions. Cuts shall, however, never be made through the branch collar. Slab cuts and rip cuts will result in cancellation of the contract.
- H. All limbs over two (2) inches in diameter to be removed shall be pre-cut to prevent splitting. Any branches that by falling would injure existing trees to remain or other objects shall be lowered to the ground by proper ropes.
- I. On trees known to be diseased and where there is known to be danger of transmitting the disease on tools, tools shall be disinfected with alcohol after each cut between trees.
- J. Lateral branches as well as occasional branch suckers may be retained. Complete removal of secondary laterals and branch suckers resulting in the stripping of major limbs, ("lion tailing") will not be permitted.
- K. All branches and limbs shall be manually lowered to the ground via rope and pulley. This practice must be consistent with the National Arborist Association Standards for Pruning. All grade-level artifacts and landscaping must be protected from damage.

### 3.03 REMOVALS:

- A. The Contractor shall furnish all labor, materials, equipment and transportation required to complete all aspects of the removals work in accordance with all local, state, and federal regulations in force at the time of this contract and in accordance with tree and stump removals as specified herein.

### 3.04 REMOVALS DESCRIPTION OF WORK:

- A. For the purposes of this contract, removals shall also include all species that are dead, dying, or diseased, are undesirable or are considered to be invasive, as recognized by applicable entities of the **Commonwealth of Massachusetts and Massachusetts Association of Arborists**.
- B. The Contractor shall adhere to the specifications and provide suitable facilities for inspecting the work. Failure of the Owner to immediately reject unsatisfactory work or to notify the Contractor of deviations from the specification shall not relieve the Contractor of responsibility to correct or remedy unsatisfactory work.
- C. The Contractor shall only work on trees as designated by the contract documents and/or the Owner. No compensation will be made for work performed on any other tree or trees.
- D. Trees designated to be removed shall be taken down and all leaves, branches and trunks of trees properly disposed of by chipping and removal from the premises.
- E. Fell trees in a manner that allows all site features and those trees to be saved undamaged.
- F. Removal of all the parts of each tree shall be completed on the same day that the tree is cut unless otherwise required by the Engineer.
- G. Stumps of trees removed shall also be removed to eighteen (18) inches below grade by grinding or other means acceptable to the Owner. The void from the stump removal operations shall be filled with ordinary borrow soil to within six (6) inches of finished grade. The top six (6) inches shall be filled with screened loam, moderately tamped to prevent future settling. In grass areas, the disturbed area shall be sown with grass seed of a mix appropriate to the location, as directed by the Owner.
- H. Excavation or grading within the branch spread of trees to be saved shall be performed only under the direction of the Owner unless otherwise required.
- I. All equipment to be used and all work to be performed must be in full compliance with all standards as promulgated by OSHA at the time of bidding, including, but

not limited to those regulations concerning noise levels, protective devices and operator safety.

- J. The Contractor shall be solely responsible for pedestrian and vehicular safety and control within the work site and shall protect the public and its property from injury or damage that could be caused by the progress of the work. To this end the Contractor shall provide, erect, and maintain protective devices acceptable to the Owner, including but not limited to barricades, lights and warning signs.
- K. Any practice employed by the Contractor that is obviously hazardous as determined by the Owner shall be immediately discontinued by the Contractor upon receipt of either written or oral notice from the Owner to discontinue such practice.

### 3.05 SELECTIVE CLEARING AND INVASIVE SPECIES REMOVAL:

- A. The Contractor shall furnish all labor, materials, equipment and transportation required to complete all aspects of the selective clearing and invasive species work in accordance with all local, state, and federal regulations in force at the time of this contract and in accordance with selective clearing and invasive species removal as specified herein.

### 3.06 DESCRIPTION OF WORK-SELECTIVE CLEARING AND INVASIVE SPECIES REMOVAL:

- A. The Contractor's attention is called to the requirements for work under this item. The desired appearance to be attained in certain areas of heavy growth may require three or more operations. First, the obvious dead, dying and diseased trees and undergrowth shall be cut and cleared out of the area. This work includes removal of any previously fallen trees, branches, uprooted stumps and other debris as directed. Next, the area is to be thinned out, as required by the Owner or Engineer, by removing the less desirable trees and brush which interfere with the growth of the better plant material.
- B. Tree up-branching and shaping under this item will be restricted to trees which have limbs and branches restricting sight distance, extending over roadways, shoulders, turn outs, etc. Up-branching or trimming will be required to produce a 6 foot minimum vertical clearance over all locations described hereinbefore, and the removal of limbs and branches involved in this operation shall be accomplished as outlined hereafter.

END OF SECTION

## SECTION 02240

### DEWATERING

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

This section specifies designing, furnishing, installing, maintaining, operating and removing temporary dewatering systems as required to lower and control water levels and hydrostatic pressures during construction; storing, recharging and/or disposing of dewatering fluid; constructing, maintaining, documenting, observing and, except where indicated or required to remain in place, removing of equipment and instrumentation for control of the system.

##### 1.02 RELATED WORK:

- A. Section 00890 – PERMITS
- B. Section 01570 – ENVIRONMENTAL PROTECTION
- B. Section 02252 – SUPPORT OF EXCAVATION
- D. Section 02300 – EARTHWORK

##### 1.03 SYSTEM DESCRIPTION:

- A. Dewatering includes lowering the water table and intercepting seepage which would otherwise emerge from the slopes or bottom of the excavation; increasing the stability of excavated slopes; preventing loss of material from beneath the slopes or bottom of the excavation; reducing lateral loads on sheeting and bracing; improving the excavation and hauling characteristics of soil; preventing rupture or heaving of the bottom of any excavation; and disposing of pumped water.
- B. The Contractor may encounter shallow depth to groundwater at the property. Groundwater, if encountered, shall be pumped to a storage container for temporary storage for (1) recharge on the property in accordance with the MassDEP requirements [310 CMR 40.0045 (C)] or (2) transported off-site for treatment/reuse or disposal in accordance with all applicable local, state and federal regulations.
- C. Dewatering fluids may not be discharged to the sewer or stormwater system.

##### 1.04 QUALITY ASSURANCE:

- A. The Contractor is responsible for the adequacy of the dewatering systems.

- B. The dewatering systems shall be capable of effectively reducing the hydrostatic pressure and lowering the groundwater levels to a minimum of 2 feet below excavation bottom, unless otherwise required by the Engineer, so that all excavation bottoms are firm and dry.
- C. The dewatering system shall be capable of maintaining a dry and stable subgrade until the structures, pipes and appurtenances to be built therein have been completed to the extent that they will not be floated or otherwise damaged.
- D. The dewatering system and excavation support (see Section 02252 – SUPPORT OF EXCAVATION) shall be designed so that lowering of the groundwater level outside the excavation does not adversely affect adjacent structures, utilities or wells.

1.05 SUBMITTALS:

- A. At least two weeks prior to dewatering, the Contractor shall submit a Dewatering Plan indicating how they intend to manage the discharge from any dewatering operations on the project. The Dewatering Plan shall include:
  - 1. A schedule showing the timing of installation and operation of the dewatering system.
  - 2. Size and types of containers or tanks for temporary storage of dewatering fluids. Containers and/or tanks must be provided clean to the site or replaced at no additional cost to the Owner.
  - 3. For dewatering fluid the Contractor elects to recycle or dispose of off-site, written confirmation shall be submitted to the Engineer from each of the disposal or recycling facilities indicating that they will accept the dewatering fluids, and any other materials to be removed as part of this Work. The information submitted shall include as a minimum:
    - a. Name and address of any hazardous waste transporters and disposal facilities, including: United States Environmental Protection Agency (EPA) Identification Number and expiration date.
    - b. Proof of permit, license or authorization to transport and dispose of hazardous waste in all affected states.
    - c. Proof of Insurance.
  - 4. Contractor shall obtain and pay for the analysis of all dewatering fluid samples required by the receiving facility. The Dewatering Plan shall include the proposed dewatering fluid disposal characterization. The Contractor shall coordinate with the Engineer to observe the sampling of dewatering fluids and provide at least three days' notice of planned sampling activities. Samples shall only be collected as approved by the Engineer.

5. Noise controls and ratings of planned equipment complying with Item 3.03 of this Section.
- B. The Contractor shall prepare and provide to the Engineer for review all disposal documentation required by the receiving facility(ies) including but not limited to waste profiles and manifests. All disposed liquids shall be documented. The Contractor shall coordinate with the Owner to obtain generator signature for dewatering fluid disposal of Engineer-approved disposal documentation.
- C. The Contractor shall document and provide to the Engineer a summary of detailed dewatering fluids operations within three (3) months of the start of dewatering activities and again every six (6) months thereafter:
  - a. Dates of dewatering operations;
  - b. Description of the discharge including figures showing the pumping and recharge locations;
  - c. If testing performed with Engineer approval and observation, the concentrations of the oils and/or hazardous materials;
  - d. Location of any dewatering samples;
  - e. The pumping rate and volume of the dewatering operations, and
  - f. A description of any treatment/filtration used works

#### 1.06 REFERENCES:

- A. Massachusetts Department of Environmental Protection (DEP) Policy Number:
  1. WSC-94-320, Construction Activities in Contaminated Areas.
- B. Massachusetts Contingency Plan (MCP), 310 CMR 40.0000.

#### PART 2 - PRODUCTS: NOT APPLICABLE

#### PART 3 - EXECUTION

##### 3.01 DEWATERING OPERATIONS:

- A. All water pumped or drained from the work shall be disposed of in a manner that will not result in undue interference with other work or damage to adjacent properties, pavements and other surfaces, buildings, structures and utilities. Suitable temporary pipes, flumes or channels shall be provided for water that may flow along or across the site of the work. All disposal of pumped water shall conform to the provisions of Section 01570 – ENVIRONMENTAL PROTECTION.
- B. Dewatering facilities shall be located where they will not interfere with utilities and construction work to be done by others.

C. Dewatering procedures for on-site recharge of dewatering fluids to the subsurface shall be as described below:

1. Dewatering fluids may only be recharged at a point within 100 feet of the point of withdrawal to crushed stone at suction end of the pump to aid in minimizing the amount of silt discharged.
2. For dewatering operations with relatively minor flows, pump discharges shall be directed into hay bale sedimentation traps lined with filter fabric. Water is to be filtered through the hay bales and filter fabric.
3. Where indicated on the contract drawings or in conditions of excess silt suspended in the discharge water, silt control bags shall be utilized in catch basins.
4. The Contractor shall be responsible for repair of any damage caused by his/her dewatering operations, at no cost to the Owner.

3.02 NOISE LEVEL REQUIREMENTS:

- A. All primary dewatering equipment shall be electrically operated and shall run on commercial power. Standby equipment shall be independent of commercial power and shall provide dewatering upon primary pump or power failure.
- B. All equipment utilized by the Contractor shall conform to the Department of Environmental Protection Division of Air Quality Control regulations governed by the following policy:

"A source of sound will be considered to be violating the Department's noise regulation (310 CMR 7.10) if the source:

1. Increases the broadband sound level by more than 10 dB(A) above ambient, or
2. Produces a "pure tone" condition - when any octave band center frequency sound pressure level exceeds the two adjacent center frequency sound pressure levels by 3 decibels or more.

These criteria are measured both at the property line and at the nearest inhabited residence. Ambient is defined as the background A-weighted sound level that is exceeded 90% of the time measured during equipment operating hours. The ambient may also be established by other means with the consent of the Department. The Contractor shall construct sound enclosures or utilize other noise reduction techniques if the equipment does not meet the noise level requirements.

3.04 DISPOSAL DOCUMENTATION:

- A. The Owner will be the generator and will sign all disposal documentation. The Contractor shall prepare all disposal documentation including but not limited to waste profiles and shall submit all transportation paperwork to the Engineer for approval prior to shipment.

- B. The OWNER shall have final approval over all disposal options based on the analytical data.

END OF SECTION

\\Wse03.local\WSE\Projects\MA\Worcester MA\Coes Park\Parking Lot Expansion\Specs\02240 - Dewatering (Short Form).docx

## SECTION 02252

### SUPPORT OF EXCAVATION

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

- A. This section of the specification covers wood sheeting and bracing for support of excavations. The requirements of this section shall also apply, as appropriate, to other methods of excavation support and underpinning which the Contractor elects to use to complete the work.
- B. The Contractor shall furnish and place timber sheeting of the kinds and dimensions required, complying with these specifications, where indicated on the drawings or required by the Engineer.

##### 1.02 RELATED WORK:

- A. Section 02240, DEWATERING.
- B. Section 02300, EARTHWORK.

##### 1.03 QUALITY ASSURANCE:

- A. This project is subject to the Safety and Health regulations of the U.S. Department of Labor set forth in 29 CFR, Part 1926, and to the Massachusetts Department of Safety and Department of Labor, Division of Occupational Safety “Excavation & Trench Safety Regulation (520 CMR 14.00)” and “Rules and Regulations for the Prevention of Accidents in Construction Operations (454 CMR 10.0 et seq.).” Contractors shall be familiar with the requirements of these regulations.
- B. The excavation support system shall be of sufficient strength and be provided with adequate bracing to support all loads to which it will be subjected. The excavation support system shall be designed to prevent any movement of earth that would diminish the width of the excavation or damage or endanger adjacent structures.

#### PART 2 - PRODUCTS

##### 2.01 MATERIALS:

- A. Timber sheeting shall be sound spruce, pine, or hemlock, planed on one side and either tongue and grooved or splined. Timber sheeting shall not be less than nominal 2-inches thick.
- B. Timber and steel used for bracing shall be of such size and strength as required in the excavation support design. Timber or steel used for bracing shall be new or undamaged

used material which does not contain splices, cutouts, patches, or other alterations which would impair its integrity or strength.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION:

- A. Work shall not be started until all materials and equipment necessary for their construction are either on the site of the work or satisfactorily available for immediate use as required.
- B. The sheeting shall be securely and satisfactorily braced to withstand all pressures to which it may be subjected and be sufficiently tight to minimize lowering of the groundwater level outside the excavation, as required in Section 02240, DEWATERING.
- C. The sheeting shall be driven by approved means to the design elevation. No sheeting may be left so as to create a possible hazard to safety of the public or a hindrance to traffic of any kind.
- D. If boulders or very dense soils are encountered, making it impractical to drive a section to the desired depth, the section shall, as required, be cut off.
- E. The sheeting shall be left in place where indicated on the drawings or required by the Engineer in writing. At all other locations, the sheeting may be left in place or salvaged at the option of the Contractor. Steel or wood sheeting permanently left in place shall be cut off at a depth of not less than two feet below finish grade unless otherwise required.
- F. All cut-off will become the property of the Contractor and shall be removed by him from the site.
- G. Responsibility for the satisfactory construction and maintenance of the excavation support system, complete in place, shall rest with the Contractor. Any work done, including incidental construction, which is not acceptable for the intended purpose shall be either repaired or removed and reconstructed by the Contractor at his expense.
- H. The Contractor shall be solely responsible for repairing all damage associated with installation, performance, and removal of the excavation support system.

END OF SECTION

## SECTION 02300

### EARTHWORK

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

The Contractor shall make excavations of normal depth in earth for trenches and structures, shall backfill and compact such excavations to the extent necessary, shall furnish the necessary material and construct embankments and fills, and shall make miscellaneous earth excavations and do miscellaneous grading.

##### 1.02 RELATED WORK:

- A. Section 00320, SUBSURFACE DATA
- B. Section 01110, CONTROL OF WORK AND MATERIALS
- C. Section 01570, ENVIRONMENTAL PROTECTION
- D. Section 02071, GEOTEXTILE FABRICS
- E. Section 02113, EXCAVATION AND STOCKPILING OF IMPACTED MATERIAL
- F. Section 02130, TRANSPORTATION AND DISPOSAL OF IMPACTED MATERIAL
- G. Section 02240, DEWATERING
- H. Section 02252, SUPPORT OF EXCAVATION
- I. Section 02745, ASPHALT PAVING
- J. Section 02920, LOAMING AND SEEDING

##### 1.03 REFERENCES:

###### American Society for Testing and Materials (ASTM)

- |      |      |   |
|------|------|---|
| ASTM | C131 | Test Method for Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine. |
| ASTM | C136 | Method for Sieve Analysis of Fine and Coarse Aggregates.  |
| ASTM | C330 | Specification for Lightweight Aggregate for Structural Concrete.  |

- ASTM D1556 Test Method for Density of Soil in Place by the Sand Cone Method.
- ASTM D1557 Test Methods for Moisture-density Relations of Soils and Soil Aggregate Mixtures Using Ten-pound (10 Lb.) Hammer and Eighteen-inch (18") Drop.
- ASTM D2922 Test Methods for Density of Soil and Soil-aggregate in Place by Nuclear Methods (Shallow Depth).

Massachusetts Department of Transportation (MassDOT) Standard Specifications for Highways and Bridges.

Code of Massachusetts Regulations (CMR) 310.40.0032 Contaminated Media and Contaminated Debris

Code of Massachusetts Regulations (CMR) 520 CMR 14.00 Excavation & Trench Safety Regulation

1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

Samples of all materials proposed for the project shall be submitted to the Engineer for review. Size of the samples shall be as approved by the Engineer.

1.05 PROTECTION OF EXISTING PROPERTY:

- A. The work shall be executed in such manner as to prevent any damage to facilities at the site and adjacent property and existing improvements, such as but not limited to streets, curbs, paving, service utility lines, structures, monuments, bench marks, observation wells, and other public or private property. Protect existing improvements from damage caused by settlement, lateral movements, undermining, washout and other hazards created by earthwork operations.
- B. In case of any damage or injury caused in the performance of the work, the Contractor shall, at its own expense, make good such damage or injury to the satisfaction of, and without cost to, the Owner. Existing roads, sidewalks, and curbs damaged during the project work shall be repaired or replaced to at least the condition that existed at the start of operations. The Contractor shall replace, at his own cost, existing benchmarks, observation wells, monuments, and other reference points, which are disturbed or destroyed.
- C. Buried drainage structures and pipes, observation wells and piezometers, including those which project less than eighteen inches (18") above grade, which are subject to damage from construction equipment shall be clearly marked to indicate the hazard. Markers shall indicate limits of danger areas, by means which will be clearly visible to operators of trucks and other construction equipment, and shall be maintained at all times until completion of project.

1.06 DRAINAGE:

- A. The Contractor shall provide, at its own expense, adequate drainage facilities to complete all work items in an acceptable manner. Drainage shall be done in a manner so that runoff will not adversely affect construction procedures or cause excessive disturbance of underlying natural ground or abutting properties.

1.07 FROST PROTECTION AND SNOW REMOVAL:

- A. The Contractor shall, at its own expense, keep earthwork operations clear and free of accumulations of snow as required to carry out the work.
- B. The Contractor shall protect the subgrade beneath new structures and pipes from frost penetration when freezing temperatures are expected.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. COMMON BORROW (ORDINARY BORROW):

Gravel Borrow shall satisfy the requirements listed in MassDOT Specification Section M1.01.0

- B. GRAVEL BORROW :

Gravel Borrow shall satisfy the requirements listed in MassDOT Specification Section M1.03.0, Type b.

- C. CRUSHED STONE:

Crushed stone shall satisfy the requirements listed in MassDOT Specification Section M2.01.

- D. SAND BORROW:

Sand Borrow shall satisfy the requirements listed in MassDOT Specification Section M1.04.0.

- E. PEASTONE:

Peastone shall be smooth, hard, naturally occurring, rounded stone meeting the following gradation requirements:

Passing 5/8 inch square sieve opening	-	100%
Passing No. 8 sieve opening	-	0%

F. BACKFILL MATERIALS:

1. Class B Backfill:

Class B backfill shall be granular, well graded friable soil; free of rubbish, ice, snow, tree stumps, roots, clay and organic matter; with 30 percent or less passing the No. 200 sieve; no stone greater than two-third (2/3) loose lift thickness, or six inches, whichever is smaller.

2. Select Backfill:

Select backfill shall be granular, well graded friable soil, free of rubbish, ice, snow, tree stumps, roots, clay and organic matter, and other deleterious or organic material; graded within the following limits:

<u>Sieve Size</u>	<u>Percent Finer by Weight</u>
3-inch	100
No. 10	30-95
No. 40	10-70
No. 200	0-10

G. STATE HIGHWAY TRENCH BACKFILL:

When required by Permit, Controlled Density Fill (CDF) shall be used to backfill trenches. The CDF shall satisfy the requirements listed in MassDOT Specification Section M4.08.0.

H. SPECIAL PIPE BEDDING MATERIAL

1. The special pipe bedding material shall consist of a filter fabric installed on the trench bottom before backfilling with crushed stone as specified and as shown on the contract drawings. Filter fabric shall be as specified in Section 02071, GEOTEXTILE FABRICS.

I. PROCESSED GRAVEL:

1. Processed gravel shall consist of inert material that is hard, durable stone and coarse sand, free from loam and clay, surface coatings and deleterious materials. The coarse aggregate shall have a percentage of wear, by the Los Angeles Abrasion Test, of not more than 50.
2. The gradation shall meet the following requirements:

<u>Sieve Designation</u>	<u>Percentage Passing</u>
--------------------------	---------------------------

3-in.	100
1 ½-in.	70-100
¾-in.	50-85
No. 4	30-60
No. 200	0-10

3. The approved source of bank-run gravel material shall be processed by mechanical means. The equipment for producing crushed gravel shall be of adequate size with sufficient adjustments to produce the desired materials. The processed material shall be stockpiled in such a manner to minimize segregation of particle sizes. All processed gravel shall come from approved stockpiles.

J. STONE FILL FOR GABIONS:

1. The stone for gabions shall be hard, angular to round, durable and of such quality that they will not disintegrate on exposure to water or weathering during the life of the structure. Gabion rocks shall range between 4-inches and 8-inches. The range in sizes may allow for a variation of 5 percent oversize and/or 5 percent undersize rock, provided it is not placed on the gabion-exposed surface. The size shall be such that a minimum of two layers of rock must be achieved then filling the gabion.

PART 3 - EXECUTION

3.01 DISTURBANCE OF EXCAVATED AND FILLED AREAS DURING CONSTRUCTION:

- A. Contractor shall take the necessary steps to avoid disturbance of subgrade during excavation and filling operations, including restricting the use of certain types of construction equipment and their movement over sensitive or unstable materials, dewatering and other acceptable control measures.
- B. All excavated or filled areas disturbed during construction, all loose or saturated soil, and other areas that will not meet compaction requirements as specified herein shall be removed and replaced with a minimum 12-inch layer of compacted crushed stone wrapped all around in non-woven filter fabric. Costs of removal and replacement shall be borne by the Contractor.
- C. The Contractor shall place a minimum of 12-inch layer of special bedding materials and crushed stone wrapped in filter fabric over the natural underlying soil to stabilize areas which may become disturbed as a result of rain, surface water runoff or groundwater seepage pressures, all at no additional cost to the Owner. The Contractor also has the option of drying materials in-place and compacting to specified densities.

3.02 EXCAVATION:

A. GENERAL:

1. The Contractor shall perform all work of any nature and description required to accomplish the work as shown on the Drawings and as specified.
2. Excavations, unless otherwise required by the Engineer, shall be carried only to the depths and limits shown on the Drawings. If unauthorized excavation is carried out below required subgrade and/or beyond minimum lateral limits shown on Drawings, it shall be backfilled with gravel borrow and compacted at the Contractor's expense as specified below, except as otherwise indicated. Excavations shall be kept in dry and good conditions at all times, and all voids shall be filled to the satisfaction of the Engineer.
3. In all excavation areas, the Contractor shall strip the surficial topsoil layer and underlying subsoil layer separate from underlying soils. In paved areas, the Contractor shall first cut pavement as specified in paragraph 3.02 B.1 of this specification, strip pavement and pavement subbase separately from underlying soils. All excavated materials shall be stockpiled separately from each other within the limits of work.
4. The Contractor shall follow a construction procedure, which permits visual identification of stable natural ground. Where groundwater is encountered, the size of the open excavation shall be limited to that which can be handled by the Contractor's chosen method of dewatering and which will allow visual observation of the bottom and backfill in the dry.
5. The Contractor shall excavate unsuitable materials to stable natural ground where encountered at proposed excavation subgrade, as required by the Engineer. Unsuitable material includes topsoil, loam, peat, other organic materials, snow, ice, and trash. Unless specified elsewhere or otherwise required by the Engineer, areas where unsuitable materials have been excavated to stable ground shall be backfilled with compacted special bedding materials or crushed stone wrapped all around in non-woven filter fabric.

B. TRENCHES:

1. Prior to excavation, trenches in pavement shall have the traveled way surface cut in a straight line by a concrete saw or equivalent method, to the full depth of pavement. Excavation shall only be between these cuts. Excavation support shall be provided as required to avoid undermining of pavement. Cutting operations shall not be done by ripping equipment.
2. The Contractor shall satisfy all dewatering requirements specified in Section 02240 DEWATERING, before performing trench excavations.

3. Trenches shall be excavated to such depths as will permit the pipe to be laid at the elevations, slopes, and depths of cover indicated on the Drawings. Trench widths shall be as shown on the Drawings or as specified.
4. Where pipe is to be laid in bedding material, the trench may be excavated by machinery to, or just below, the designated subgrade provided that the material remaining in the bottom of the trench is not disturbed.
5. If pipe is to be laid in embankments or other recently filled areas, the fill material shall first be placed to a height of at least 12-inches above the top of the pipe before excavation.
6. Pipe trenches shall be made as narrow as practicable and shall not be widened by scraping or loosening materials from the sides. Every effort shall be made to keep the sides of the trenches firm and undisturbed until backfilling has been completed.
7. If, in the opinion of the Engineer, the subgrade, during trench excavation, has been disturbed as a result of rain, surface water runoff or groundwater seepage pressures, the Contractor shall remove such disturbed subgrade to a minimum of 12-inches and replace with crushed stone wrapped in filter fabric. Cost of removal and replacement shall be borne by the Contractor.
8. The Contractor shall obtain a trench permit from the municipality where the trench is located prior to making any excavations of trenches (any subsurface excavation greater than three (3) feet in depth and fifteen (15) feet or less between soil walls as measured from the bottom).
9. All trenches required to be permitted must be attended, covered, barricaded, or backfilled. Covers must be road plates at least ¾-inch thick or equivalent, barricades must be fences at least 6-feet high with no openings greater than 4-inches between vertical supports and all horizontal supports required to be located on the trench-side of the fencing.

C. BUILDING AND FOUNDATION EXCAVATION:

1. Excavations shall not be wider than required to set, brace, and remove forms for concrete, or perform other necessary work.
2. After the excavation has been made, and before forms are set for footings, mats, slabs, or other structures, and before reinforcing is placed, all loose or disturbed material shall be removed from the subgrade. The bearing surface shall then be compacted to meet the requirements of this specification.
3. If, in the opinion of the Engineer, the existing material at subgrade elevation is unsuitable for structural support, the Contractor shall excavate and dispose of the unsuitable material to the required width and depth as required by the Engineer. If, in the opinion of the Engineer, filter fabric is required; the Contractor shall place

filter fabric, approved by the Engineer, as per manufacturer's recommendations. Crushed stone shall then be placed in lifts and compacted to required densities. Backfill shall be placed to the bottom of the proposed excavation.

D. EXCAVATION NEAR EXISTING STRUCTURES:

1. Attention is directed to the fact that there are pipes, manholes, drains, and other utilities in certain locations. An attempt has been made to locate all utilities on the drawings, but the completeness or accuracy of the given information is not guaranteed.
2. As the excavation approaches pipes, conduits, or other underground structures, digging by machinery shall be discontinued and excavation shall be done by means of hand tools, as required. Such manual excavation, when incidental to normal excavation, shall be included in the work to be done under items involving normal excavation.
3. Where determination of the exact location of a pipe or other underground structure is necessary for properly performing the work, the Contractor shall excavate test pits to determine the locations.

3.03 BACKFILL PLACEMENT AND COMPACTION:

A. GENERAL:

1. Prior to backfilling, the Contractor shall compact the exposed natural subgrade to the densities as specified herein.
2. After approval of subgrade by the Engineer, the Contractor shall backfill areas to required contours and elevations with specified materials.
3. The Contractor shall place and compact materials to the specified density in continuous horizontal layers, not to exceed nine (9) inches in uncompacted lifts. The degree of compaction shall be based on maximum dry density as determined by ASTM Test D1557, Method C. The minimum degree of compaction for fill placed shall be as follows:

<u>Location</u>	<u>Percent of Maximum Density</u>
Below pipe centerline	95
Above pipe centerline	92
Below pavement (upper 3 ft.)	95
Embankments	95
Below pipe in embankments	95
Adjacent to structures	92
Below structures	95

4. The Engineer reserves the right to test backfill for conformance to the specifications and Contractor shall assist as required to obtain the information. Compaction testing will be performed by the Engineer or by an inspection laboratory designated by the Engineer, engaged and paid for by the Owner. If test results indicate work does not conform to specification requirements, the Contractor shall reimburse the owner for the testing, remove or correct the defective Work by recompacting where appropriate or replacing as necessary and approved by the Engineer, to bring the work into compliance, at no additional cost to the Owner, including all additional testing. All backfilled materials under structures and buildings shall be field tested for compliance with the requirements of this specification.
5. Where horizontal layers meet a rising slope, the Contractor shall key each layer by benching into the slope.
6. If the material removed from the excavation is suitable for backfill with the exception that it contains stones larger than permitted, the Contractor has the option to remove the oversized stones and use the material for backfill or to provide replacement backfill at no additional cost to the Owner.
7. The Contractor shall remove loam and topsoil, loose vegetation, stumps, large roots, etc., from areas upon which embankments will be built or areas where material will be placed for grading. The subgrade shall be shaped as indicated on the Drawings and shall be prepared by forking, furrowing, or plowing so that the first layer of the fill material placed on the subgrade will be well bonded to the subgrade.
8. Where called for on the Drawings, Lightweight Fill shall be placed and compacted as recommended by the manufacturer. The exact number of passes shall be approved by the Engineer to insure stability of the layer. As soon as the compaction of each layer has been completed, the next layer shall then be placed. The Contractor shall take all necessary precautions during construction activities in operations on or adjacent to the Lightweight Fill to insure that the material is not over-compacted. Construction equipment, other than for compaction, shall not operate on the exposed Lightweight Fill. The top surface of the Lightweight Fill lying directly below the gravel course shall be chinked by additional rolling of the Lightweight Fill to prevent infiltration of fines.

B. TRENCHES:

1. Bedding as detailed and specified shall be furnished and installed beneath the pipeline prior to placement of the pipeline. A minimum bedding thickness shall be maintained between the pipe and undisturbed material, as shown on the Drawings.
2. As soon as practicable after pipes have been laid, backfilling shall be started.
3. Unless otherwise indicated on the Drawings, select backfill shall be placed by hand shovel in 6-inch thick lifts up to a minimum level of 12-inches above the top of pipe.

This area of backfill is considered the zone around the pipe and shall be thoroughly compacted before the remainder of the trench is backfilled. Compaction of each lift in the zone around the pipe shall be done by use of power-driven tampers weighing at least 20 pounds or by vibratory compactors. Care shall be taken that material close to the bank, as well as in all other portions of the trench, is thoroughly compacted to densities required.

4. Class B backfill shall be placed from the top of the select backfill to the specified material at grade (loam, pavement subbase, etc.). Fill compaction shall meet the density requirements of this specification.
5. Water Jetting:
  - a. Water jetting may be used when the backfill material contains less than 10 percent passing the number 200 sieve, but shall be used only if approved by the Engineer.
  - b. Contractor shall submit a detailed plan describing the procedures he intends to use for water jetting to the Engineer for approval prior to any water jetting taking place.
  - c. Compaction of backfill placed by water jetting shall conform to the requirements of this specification.
6. If the materials above the trench bottom are unsuitable for backfill, the Contractor shall furnish and place backfill materials meeting the requirements for trench backfill, as shown on the drawings or specified herein.
7. Should the Engineer order crushed stone for utility supports or for other purposes, the Contractor shall furnish and install the crushed stone as directed.
8. In shoulders of streets and road, the top 12-inch layer of trench backfill shall consist of processed gravel for sub-base, satisfying the requirements listed in MassDOT standard specification M1.03.1.

C. BACKFILLING UNDER BUILDINGS AND FOUNDATIONS:

Material to be used as structural fill under structures shall be special bedding material or gravel borrow, as shown on the Drawings or as required by the Engineer. Where gravel borrow fill is required to support proposed footings, walls, slabs, and other structures, the material shall be placed in a manner accepted by the Engineer. Compaction of each lift shall meet the density requirements of this specification.

D. BACKFILLING ADJACENT TO STRUCTURES:

1. The Contractor shall not place backfill against or on structures until they have attained sufficient strength to support the loads to which they will be subjected. Excavated material approved by the Engineer may be used in backfilling around structures. Backfill material shall be thoroughly compacted to meet the requirements of this specification.
2. Contractor shall use extra care when compacting adjacent to pipes and drainage structures. Backfill and compaction shall proceed along sides of drainage structures so that the difference in top of fill level on any side of the structure shall not exceed two feet (2') at any stage of construction.
3. Where backfill is to be placed on only one side of a structural wall, only hand-operated roller or plate compactors shall be used within a lateral distance of five feet (5') of the wall for walls less than fifteen feet (15') high and within ten feet (10') of the wall for walls more than fifteen feet (15') high.

3.04 DISPOSAL OF SURPLUS MATERIALS:

- A. Surplus excavated materials, which are acceptable to the Engineer, shall be used to backfill normal excavations in rock or to replace other materials unacceptable for use as backfill. Upon written approval of the Engineer, surplus excavated materials shall be neatly deposited and graded so as to make or widen fills, flatten side slopes, or fill depressions; or shall be neatly deposited for other purposes as indicated by the Owner, within its jurisdictional limits; all at no additional cost to the Owner.
- B. Disposal of all rubble shall be in accordance with all applicable local, state and federal regulations.
- C. No excavated material shall be removed from the site of the work or disposed of by the Contractor unless approved by the Engineer. Impacted material shall be handled as specified in Section 02113, EXCAVATION AND STOCKPILING OF IMPACTED MATERIAL and Section 02130, TRANSPORTATION AND DISPOSAL OF IMPACTED MATERIAL.

END OF SECTION

## SECTION 02315

### EXCAVATION, BORROW AND BACKFILL

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

- A. Under this Section, the Contractor shall furnish all labor, materials, equipment and transportation required to complete Excavation, Borrow and Backfill work indicated on the drawings, as designated by the Engineer, or as specified herein, to complete all proposed work.
- B. Without limiting the generality thereof, Excavation, Borrow and Backfill shall include excavating, furnishing borrow materials as necessary and back-filling for the construction of all proposed work from existing grades to finished grades. Work shall include the removal of unclassified material, such as bituminous pavements, curbs, ledge and boulders under one (1) cubic yard in size, concrete, reinforced and plain, structures, fencing of various types, and metal or wood posts; and unsuitable materials of every nature throughout the site within twelve (12) inches below finished subgrade elevations for proposed work; transportation of the excavated materials; back-filling to proposed base course subgrades with approved excavated and/or furnished materials; and the disposal of unsuitable, and/or surplus excavated materials.
- C. Work under this Section shall also include the discing and harrowing of existing grass or topsoil areas to break down all sod clumps and vegetation and the complete excavation, stockpiling, rehandling, spreading, and re-use (placing) of on-site topsoil in conformity with the lines, grades and dimensions shown on the plans. This material may be utilized where general embankment (not beneath pavements or structural improvements) is proposed. The Contractor shall take extreme care in the process of discing and harrowing of the existing topsoil to insure that subsoil to remain in place is not mixed with the topsoil. Disc compacted areas subject to construction traffic to the full depth of topsoil without mixing in subsoil.
- D. Work under this Section shall also include the excavation of existing base courses under existing pavement areas for re-use in proposed fill areas up to base course subgrades or loam borrow subgrades if the existing material is deemed suitable and is excavated without contamination by or mixing with unsuitable materials and subsoils. This material may be utilized for backfill over pipe cover in trenches only if all material over four (4) inches in size is removed prior to back filling. All existing materials shall be removed to the full depth of proposed work.
- E. Work under this Section shall also include the excavation of subsoil to the limit lines of proposed work. If deemed suitable by the Engineer, as meeting the criteria

or intent of paragraph 2.02 of this Specification, this material may be used as fill material for grading and general filling of any unpaved areas to bottom of proposed work. **No subsoil** shall be used for fill at proposed pavement areas or below proposed pipes or structures without meeting the requirements for paragraph 2.02a below.

- F. Work under this Section shall include the furnishing of all borrow materials required to complete the proposed work as designed. Where "processed gravel", "gravel borrow", or "gravel" is indicated in the specifications or on the drawings, only gravel conforming to this section of the specifications may be utilized.
- G. All topsoil/loam for sod, seed or plant material beds, whether re-used or furnished from off-site, shall conform to the loam borrow section of these Specifications.

#### 1.02 RELATED WORK:

- A. Section 00890, PERMITS
- B. Section 01330, SUBMITTALS
- C. Section 02910, SCREENED LOAM BORROW AND TOPSOIL REUSED

#### 1.03 REFERENCE STANDARDS AND SPECIFICATIONS:

- A. References to specific standards, specifications, and tests of the following technical societies, organizations, and governmental bodies may be made in the contract documents.
  - 1. AASHTO - American Association of State Highway and Transportation Officials (tests or specifications).
  - 2. ASTM - American Society for Testing and Materials.
  - 3. MassDOT Standard Specs. - Latest edition of the Standard Specifications for Highways and Bridges, Massachusetts Department of Transportation, hereinafter referred to as the "Massachusetts Standard Specifications."
  - 4. AWWA - American Waterworks Association.

#### 1.04 SAMPLING AND TESTING:

- A. Coordinate with Specification Section **01450**.
- B. Four samples each of materials requested to be tested by the Engineer shall be taken

at the locations ordered by, and in the presence of, the Engineer at the site or at the source of supply and under his direction for testing in accordance with requirements stated herein. The Contractor shall pay for these tests regardless of their results.

- C. Test results shall be submitted directly to the Engineer by a Certified Testing Laboratory to be approved by the Engineer. No material shall be re-used or furnished until the Engineer's approval is given.
- D. All tests of any kind ordered by the Engineer shall be paid for by the Contractor regardless of test results.

#### 1.05 SPECIAL REQUIREMENTS:

- A. If test results indicate that existing base course materials are suitable backfill material per paragraph 2.02, they shall be utilized as fill up to subgrade and for trench backfill over pipe cover. If results indicate that they meet the specifications for gravel, they may be utilized where gravel is proposed.
- B. The sequence of all excavation operations shall be such as to insure the most efficient re-use of suitable excavated materials and the use of a minimum amount of specified borrow.
- C. The Contractor shall inform and satisfy himself as to the character, quantity, and distribution of all material to be excavated. No payment will be made for the placement of any excavated material that is used for purposes other than those designated and as specified herein. Further, these shall be removed at no cost to the Owner if so required by the Engineer.
- D. The Engineer shall have final determination over the excavation, moving, placing and disposition of all materials, and shall determine the suitability of materials to be placed in excavated areas.
- E. All backfill to subgrade, shall be compacted to not less than ninety-five percent (95%) of the maximum dry density of the material as determined by the Standard AASHTO Test Designation T-180-86, Modified Proctor Test.
- F. Unsuitable and/or excess excavated materials shall be removed and properly disposed of in legal disposal areas off-site at no additional cost to the Owner.
- G. Exploratory excavation to locate existing utilities or obstructions shall be at the Contractor's discretion to assist him in the work of this project and no extra payment shall be made for such verification. Although extra payment is not considered, lack of such payment does not constitute a waiver of the Contractor's responsibility to verify all utilities. The contractor must ensure verification of existing services and ensure the safety of the Contractor's work forces.

- H. No on-site excavated backfill materials may be used as base courses for any pavements or structural elements unless test results show these materials to meet this specification for the type of material to be utilized and are so approved by the Engineer.

1.06 SUBMITTALS/COORDINATION:

- A. The Contractor, per Section 01330 SUBMITTALS and Paragraph 1.04 of this Section shall furnish all necessary submittals and certifications as to Certified Testing Laboratory, disposal sites, etc.
- B. The Contractor shall notify Digsafe at 1-888-344-7233 at least seventy-two (72) hours prior to initiating excavation.
- C. Trench permit must be submitted prior to the beginning of any related excavation.

PART 2 - PRODUCTS

2.01 BORROW MATERIALS:

- A. Excavated topsoil and furnished topsoil to be utilized for sodding, seeding and landscaping must conform to Section 02910 Screened Loam in order to be used as Loam Borrow. Existing topsoil not passing tests for Loam Borrow may be considered suitable as general fill below subgrade, in landscaped areas only and may be utilized throughout the proposed sod and seeded areas, up to subgrades of proposed work as long as it meets the requirements of the AUL and Common Borrow, per Specification section 2300.
- B. Gravel Borrow shall be as specified under paragraph 2.04 and shall be utilized whenever gravel is noted, including beneath pavements and structural elements unless otherwise noted. Gravel Borrow shall satisfy the requirements listed in MHD Specification Section M1.03.0, Type b. 3-inches largest dimension.
- C. Although suitable excavated backfill materials and topsoil may be reused to fill to subgrade as specified herein, if there are insufficient quantities of materials available the Contractor shall furnish Suitable Backfill as specified in paragraph 2.02a below.
- D. If approved by the Engineer, Suitable Backfill materials excavated from beneath pavements may be utilized as backfill from twelve (12) inches above the top of pipes so long as all material over four (4) inches in size is removed from the material prior to backfilling and all trench compaction requirements may be met.
- E. Where Sand Borrow is required, materials shall conform to Section M1.04.1 of the Massachusetts Standard Specifications. Utilize Sand Borrow as necessary for pipe bedding and cover.

- F. Where Crushed Stone is required, materials shall conform to Section M2.01 of the Massachusetts Standard Specifications. Utilize Crushed Stone as necessary for granite block setting beds, backfill for sub-drains, and other details as noted in contract documents.

2.02 SUITABLE BACKFILL

- A. All other materials to be placed where Specifications or Drawings call for "fill," "back-filling," or "filling" to subgrade, shall be natural soil, well-graded and free from all organic weak, compressible, and frozen materials, and shall contain no stone larger than four (4) inches in maximum dimension. It shall be of such nature and character that it can be dried and compacted and shall be free of all expansive materials (such as high plastic clays) and of materials subject to decay, decomposition, or dissolution, and shall conform to the following gradations:

<u>U.S. Sieve No.</u>	<u>Total Percent Passing by Weight</u>
4 inch	100
#4	20-75
#40	0-25
#200	0-5

- B. If, sufficient suitable fill material is not available from excavations under this Contract, to complete filling to subgrades as specified above, additional fill, as specified under paragraph 2.02A above, shall be furnished by the Contractor from other sources at no additional cost. Excavated material from the site, and furnished material for use as Suitable Backfill, shall be deemed suitable only if they meet the requirements of paragraph 2.02A above, can be properly compacted, and are satisfactory to the Engineer.
- C. Use Suitable Backfill compacted as specified for general grading as backfill except as specified herein; fill to sub-grades of proposed work where shown.

2.03 CRUSHED STONE FOR TRENCHES (IN WATER ONLY):

- A. If trench excavations contain water, the Contractor shall substitute crushed stone, one **and one-half (1-1 /2) inch minus**, for bedding and backfill, in accordance with MHD Standard Specifications M2.01.2, at no additional cost to the Owner, to three (3) inches above the standing water level; unless otherwise required by the Engineer.

2.04 GRAVEL BORROW:

All references to "Processed Gravel, "Gravel Borrow", or "Gravel" shall conform to the following:

- A. All proposed gravel areas, utilizing salvaged or furnished materials shall conform to Section M1.03.0 Type "b", with maximum stone size two (2) inches in dimension, and Section 150 Embankment, of the Massachusetts Standard Specifications and shall consist of inert material that is hard, durable stone and coarse sand, free from loam and clay, surface coatings, and deleterious materials.
- B. Gradation requirements for gravel borrow shall be determined by the stricter of the MassDOT Standard Spec. M1.03.0, Type B. and the following:

<u>Sieve</u>	<u>Percent Passing</u>
2"	100
1/2"	50-85
No. 4	40-75
No. 50	8-28
No. 200	0-10

- C. Excavated materials from on-site may be utilized in all areas calling for gravel if they pass the test requirements for paragraph 2.04a above except that only stones above four (4) inches must be removed to reutilize the materials.

2.05 SAND BORROW:

The Sand Borrow shall consist of inert material that is hard durable coarse sand, free from loam, clay, roots, trash, frozen materials and other deleterious or organic materials. The sieve gradation requirements shall conform to the stricter of MassDOT Specification Section M1.04.0 and the following:

Percent By Weight Passing

<u>Size of Sieve</u>	<u>Minimum</u>	<u>Maximum</u>
# 4	100	
# 16	55	80
# 50	10	25
#100	2	8
#200	0	2

PART 3 - EXECUTION

3.01 EXCAVATION AND FILLING:

- A. Excavation and filling shall be executed to such depth that sufficient material will be left above the designated grade to allow for specified compaction to the required

sub-grade. Should the Contractor, through negligence or other fault, excavate below the designated lines, he shall replace such excavation with approved materials, in an approved manner and condition, at his own expense.

- B. When the plans require excavation in areas in proximity to existing sidewalks, structures and utilities, it shall be the responsibility of the Contractor, at his own expense, to provide adequate and suitable drainage away from proposed work and existing features or use other satisfactory means and methods to protect and maintain the stability of such construction within or adjacent to the limits of work.
- C. Protect all existing trees, shrubs or other plan referenced features to remain. Hand excavate around all items to remain including tree roots or where utilities must be verified. Exposed tree roots shall be immediately covered with Loam Borrow in accordance with these specifications.
- D. No roots greater than two (2) inches in diameter shall be cut from trees to remain without approval of the Engineer. Roots greater than one-half (1/2) inch in diameter that are cut or broken shall be promptly pruned to a smooth clean cut and painted with an approved compound.
- E. Any removal of existing facilities required in order to achieve the excavation to proceed, such as fences, walls, walkways, etc., shall be accomplished by the Contractor at no additional cost to the Owner. Restoration of these facilities shall be to a condition equal to that before removal, and safe and operational to the satisfaction of the Engineer.
- F. Excavation shall be performed to the lines, grades, and elevations shown on the plans or as required by the Engineer, and shall be made in such a manner that the requirements for formation of the subgrade can be followed.
- G. No excavation shall be started until the Engineer has reviewed and acknowledged the area of proposed construction. All material encountered, of whatever nature within the limits indicated, shall be removed and disposed of as directed. During the process of excavation, the grade shall be maintained in such condition that it will be well drained at all times.
- H. The planes at the bottom of the excavation (in cut), or the top of the fill, when completed, shall be known as the subgrade, and shall be true to the lines, grades and cross section shown on the plans, to allow proposed work (base courses and finished courses) to be completed.
- I. Hardpan, loose rock, boulders or other material unsatisfactory for subgrades shall be excavated to a depth as the Engineer may require below the contemplated subgrade. Muck, peat, matted roots or other yielding material unsatisfactory for subgrade foundation shall be removed to such depth as required to provide a satisfactory foundation. Unsatisfactory materials shall be disposed of by the

Contractor. The portion so excavated shall be refilled with suitable backfill as specified, furnished or obtained from the grading operations, or gravel borrow, as required, and thoroughly compacted. Such excavation and filling beyond the limits called for on the plans shall be considered extra work and shall be processed accordingly. Solid ledge (not able to be removed by machine) or boulders (over 1 c.y.) encountered within the proposed work lines shall be removed as required by the Engineer and shall be considered extra work and processed accordingly. Clean off overburden for measurement by the Engineer and do not proceed without the written approval of the Engineer. Cross sections shall be taken and reviewed by the Engineer for quantity approval.

- J. The removal of existing structures and utilities required to permit the orderly prosecution of the work shall be accomplished by the Contractor as directed and under this Section, unless otherwise shown on the plans. All existing foundations and structures shall be excavated to at least three (3) feet below the bottom of the proposed subgrade and the material properly disposed of off site. All such excavations shall be back-filled with Suitable Backfill and compacted. Floors of structures to be abandoned shall be broken, to ensure drainage, at no additional cost.
- K. All unsuitable excavated material shall be legally disposed of outside of, and away from, the project limits. All suitable excavated material deemed surplus by the Engineer shall become the property of the Contractor and shall be properly removed from the site.
- L. The subgrade under areas to be paved shall be brought to proper line and grade by excavating and/or placement of compacted fill with suitable excavated material or gravel borrow as specified herein. Where filling is not required, the undisturbed subgrade shall be compacted according to the requirements stated herein.
- M. Fills to subgrade level shall be formed of successive layers not exceeding lifts six (6) inches in depth and each layer shall be compacted to not less than 95 percent of maximum dry density of the material as determined by the standard AASHTO Test Designation T-180-86, Modified Proctor Test. Testing shall be done a minimum of 50 feet on center through out the site where pavements are proposed.
- N. No additional payment will be made for materials removed, manipulated or replaced by the Contractor in order to obtain the specified density. Any removal, manipulation, aerating, replacement and re-compaction of materials necessary to obtain the required density shall be considered as incidental to the excavation and compaction operations and shall be performed by the Contractor at no additional cost.
- O. Topsoil excavation and re-handling shall consist of discing and harrowing grassed and existing topsoil areas at ninety (90) degrees to each prior operation to minimum 12-inch depth or as specified by Engineer, and removing topsoil from all areas of proposed work and placing and grading the topsoil in embankment areas. Topsoil

encountered below subgrade shall remain in place unless new paving is to be placed thereon and only as required by the Engineer. Then, such topsoil shall be excavated and re-handled, replaced with Suitable Backfill materials or gravel borrow and compacted as herein specified or as required by the Engineer.

- P. All areas exhibiting grass or weed growth shall be tilled by disc/harrow or rototilled in two directions to completely break up sod clumps prior to stripping the topsoil, and shall be stored in stockpiles if necessary to ensure organic matter decomposition. Such on-site stockpiled materials must be tested prior to reuse, and treated to prevent weed growth.
- Q. After the areas to receive loam borrow or skinned infield (if required) mix have been brought to subgrade, and immediately prior to placing and spreading such material, the subgrade shall be loosened by discing or rototilling to a depth of at least three inches to permit bonding of the finished material to the subgrade material. Then place and spread the loam borrow or skinned infield material to the depths required by the Drawings to establish finish grades. Refer to Screened Loam Specifications and Skinned Infield Mix Specifications (as applicable).
- R. Protect all existing areas against damage due to the work under this Contract, and perform all repair and replacement work to any such areas which are damaged hereunder.
- S. Perform all excavation and back-filling required for the installation of subdrains, utility structures, and utility lines, and appurtenances required to the lines and grades shown on the Contract Drawings and as required by the Engineer.
- T. No extra work shall be initiated without notification of the Engineer in writing, and the written approval of the Engineer in response.
- U. The Contractor shall be responsible for any and all pumping or bailing necessary to complete his operations, and to keep all areas sufficiently dry to guarantee compaction in accordance with paragraph 3.01m. above.
- V. Sawcut, with approved diamond-blade cutting device, at lines of all pavements to remain. Mark out prior to cutting for Engineer's approval.
- W. Where insufficient suitable materials of any kind exist on site for incorporation into the proposed work within proposed work lines, the Contractor shall furnish materials from off site, as necessary and in accordance with these specifications, at no additional cost to the Owner.

### 3.02 DRAINAGE AND DEWATERING:

- A. Upon entering the premises, the Contractor shall assume responsibility for site and surface drainage of all areas affected by its work and shall maintain such drainage

during the life of this Contract in a manner acceptable to the Owner, at all times protecting and maintaining the existing conditions in adjacent areas.

- B. Legally remove by pumping, draining or bailing all water that may accumulate or be found on the site within the contract limits where excavation and grading are to be done. Excavate and form all pump wells, sumps, dams, flumes or other necessary work to keep excavations entirely clear of water. Newly made and existing concrete and masonry shall be protected from injury resulting from dewatering work by the use of canvas, tar paper or by such other sufficient method. Maintain at all times upon the work sufficient and satisfactory pumping machinery, including standby equipment. Provide pump wells or well points and underdrains as may be required, where needed to properly handle the water. Maintain excavations free from water until date of acceptance of the project by the Owner.
- C. Water from excavations shall be disposed of in such a manner as will not cause injury to public health nor to public or private property, nor to existing work, nor to the work completed or in progress, nor cause any interference with the use of the same by the public. Under no circumstances place concrete, place fill, or install appurtenances in excavations containing free water.

### 3.03 SHEETING AND BRACING:

- A. The Contractor shall furnish, put in place, and maintain such sheeting and bracing, etc., as may be required to support the sides of the excavation and to prevent any movement of earth which could in any way diminish the width of the excavation below that necessary for proper construction, or otherwise injure or delay the work or endanger adjacent structures or personnel. If the Engineer is of the opinion that sufficient or proper supports have not been provided at any points, he may order additional supports put in at the expense of the Contractor.
- B. Whenever possible, sheeting shall be driven ahead of the excavation to avoid loss of material from behind the sheeting. If necessary to excavate below the sheeting, care shall be taken to avoid trimming behind the face along which the sheeting will be driven. Care shall be taken to prevent voids outside of the sheeting, but if voids are formed, they shall be immediately filled with sand borrow and compacted.
- C. The Contractor shall leave in place, to be embedded in the backfill, all sheeting, bracing, etc., which the Engineer may require it to leave in place at any time during the progress of the work, for the purpose of preventing injury to structures, personnel, utilities or property at no additional cost. Timber or steel sheeting and bracing to be left in place shall be cut-off at least two (2) feet below finish grade. This shall not constitute a waiver of the Contractor's responsibility to use his own judgement as to where sheeting shall be left in place, regardless of the Engineer's requirement.
- D. All sheeting and bracing not to be left in place shall be carefully removed in such a manner as not to endanger the construction or other structures. All voids left or

caused by withdrawal of sheeting shall be immediately back-filled with approved material and compacted by ramming with tools especially adapted to that purpose, by watering, or otherwise as may be directed.

#### 3.04 TRENCH HAND EXCAVATION:

- A. When approaching the vicinity of the dripline of trees to remain, any roots from vegetation on abutting properties, underground pipes, conduits, or other structures, or any suspected functioning underground features, digging by machinery shall be discontinued and the excavation shall be done by hand. Hand excavation shall also be undertaken when so required by the Engineer. Such hand excavation shall be considered incidental to the trench excavation and no additional compensation will be allowed.
- B. Protection of Existing Structures - All existing pipes, conduits, poles, wires, fences, curbing, property line markers, and other structures which, in the opinion of the Engineer, are not required to be changed in location, shall be carefully supported and protected from injury by the Contractor, and in case of damage, they shall be restored by the Contractor without additional compensation, to as good a condition as that in which they were found.

#### 3.05 BACKFILLING IN OPEN TRENCH:

- A. As soon as practical after the pipe has been installed and tested, back-filling shall begin, and shall thereafter be prosecuted expeditiously.
- B. Drainage pipe shall be back-filled with Suitable Backfill or Gravel Borrow from a plane one (1) foot above the top of the pipe to the proposed subgrade.
- C. The area around the pipe shall be bedded with Sand Borrow and back-filled only with suitable backfill material conforming to paragraphs 2.01D or 2.02B of this Specification, or Gravel Borrow from the mid-diameter of the pipe to twelve (12) inches above the top of the pipe. Substitute crushed stone as specified if water is encountered.
- D. Water pipe shall be back-filled with Suitable Backfill material or Gravel Borrow from six (6) inches above the top of the pipe to the proposed subgrade. The area around the pipe shall be bedded and back-filled only with Sand Borrow per these specifications, to six (6) inches above the top of the pipe.

#### 3.06 BASE COURSE:

- A. The gravel shall be spread and compacted in layers not exceeding six (6) inches in depth compacted measurement and all layers shall be compacted to not less than ninety-five percent (95%) of the maximum dry density of the material as

determined by the Standard AASHTO Test Designation T99 compaction test Method C at optimum moisture content as determined by the Engineer. If the material retained on the #4 sieves is fifty percent (50%) or more of the total sample this test shall not apply and the material shall be compacted to the satisfaction of the Engineer. The specific density of the Gravel Sub-base shall be maintained by determining the number of passes of a roller required to produce a constant and uniform density, after conducting a series of tests either using the sand/volume method or the nuclear device.

- B. Compaction shall continue until the surface is even and true to the proposed lines and grades within a tolerance of three-eighths (3/8) inch above or below the required cross sectional elevations and to a maximum irregularity not exceeding three-eighths (3/8) inch under a ten (10) foot line extended longitudinally. Any specific area of gravel sub-base which, after being rolled, does not form a satisfactory, solid, stable foundation shall be removed and replaced and/or recompacted by the Contractor without extra compensation.
- C. All tests for compaction shall be as ordered by the Engineer and paid for by the Contractor, regardless of their result.

### 3.07 SAND BORROW:

- A. The Contractor shall deliver, spread and compact Sand Borrow to conform to the lines and grades shown on the plans, and shall spread and compact the Sand Borrow in no greater than six (6) inch layers.
- B. Compaction shall continue until the surface is even and true to the proposed lines and grades indicated on the plans or as required by the Engineer.
- C. Sand shall not be placed if it is excessively moist and unable to be satisfactorily spread and compacted.
- D. Compaction for Sand Borrow shall be not less than ninety-five percent (95%) of the maximum dry density as determined by the standard AASHTO-T99, Standard Proctor Test.
- E. Compaction of the sand and any adjoining embankment material shall be done simultaneously so that the respective materials will be confined substantially to the indicated lines.
- F. Sand borrow shall be graded to a true even surface to the proposed lines and grades within a tolerance of three-eighths (3/8) inches above or below the required elevation.
- G. Any tests of materials, and/or compaction, shall be as ordered by the Engineer and paid for by the Contractor regardless of their result. Percolation tests to be verified

in the field by Engineer.

END OF SECTION

P:\MA\Worcester MA\Coes Park\Parking Lot Expansion\Specs\Division 2\02315- Excavation Borrow and Backfill.docx

## SECTION 02329

### SCREENED LOAM BORROW (RE-USED) AND TOPSOIL (NEW IMPORT)

#### PART I - GENERAL

##### 1.01 SCOPE OF WORK

- A. Under this Section, the Contractor shall furnish all labor, materials, equipment and transportation required to furnish and place ½” Screened Loam Borrow as shown on the drawings and as specified. Loam shall be composed of Loam Borrow (Re-Used), or Topsoil (New Import) in compliance with this specification.

##### 1.02 SAMPLES/TESTS

- A. Test results of the on-site loam are provided at the Appendix of Section 02911 Root Zone Mix.
- B. Contractor shall be responsible for amending the Loam Borrow or Topsoil to meet the specification. All amendments shall be submitted prior to start of construction. Tests shall be done after amendment to ensure compliance; the Town reserves the right to test amended soils to ensure uniformity at any time during construction.
- C. To assure that materials fulfill specified requirements regarding textural analysis, organic matter content, pH, and fertility testing shall be undertaken:
  - 1. Prior to site delivery; at source.
  - 2. At time of delivery on site;
  - 3. Immediately following spreading to final locations on site.
- D. Soil sampling shall also indicate if specified soil was supplied uniformly to the minimum specified depth.

##### 1.03 STANDARDS

- A. ASTM - American Society for Testing and Materials
  - a. Comprehensive soil analysis test A05-2 required, pH, N, P, K, and trace minerals.
  - b. A05-1
- B. Amend, fertilize, and add trace materials to correct deficiencies.
- C. Soils report must be prepared within 6 months of planting soil mix placement.
- D. Amend soils as recommended in the reports

1.04 NOTIFICATION

- A. The Contractor shall notify the Owner in writing at least four (4) days in advance of the time he intends spread Screened Loam Borrow.

1.05 QUALITY CONTROL

- A. The Town and the Engineer will determine whether the contractor or sub-contractor is qualified for this work.
- B. Any work deemed unacceptable to the plans and specifications shall be repaired or replaced at no cost to the owner.

PART II - MATERIALS

2.01 LOAM BORROW (RE-USED) OR TOPSOIL (NEW IMPORT)

- A. In accordance with the specific requirements of this project, existing on-site soil may be re-used as Loam Borrow only if it meets this Specification. Existing topsoil that does not meet this Specification may be re-used only up to the subgrade elevation within the limits of areas to receive new Loam Borrow only if it meets standard earthwork and drainage standards for Common Borrow.
- B. Loam Borrow (Re-Used), or Topsoil (New Import) shall be “fine sandy loam” or “sandy loam” determined by mechanical analysis (ASTM D-422) and based on the “USDA” Classification System”. Screened Loam has the following mechanical analysis:

<u>Textural Class</u>	<u>Percentage of Total Weight</u>	<u>Average Percentage</u>
Sand (0.05 – 2.0mm)	50 – 80	73
Silt (0.002 – 0.05mm)	15 – 25	20
Clay (Less than 0.002mm)	5 – 10	7

- C. Loam Borrow (Re-Used), or Topsoil (New Import) shall be a natural product consisting primarily of natural topsoil, free from subsoil, and obtained from an area that has never been stripped. Screened Loam shall not contain less than five percent (5%) nor more than ten percent (10%) organic matter as determined by the loss on ignition of oven-dried samples, at 100°C ± 5°C. To adjust organic matter content, the soil may be amended on site by the addition of compost. Use of organic amendments is accepted only if random soil sampling indicates a

thorough incorporation of these materials. The Loam or any components for mixing shall not be delivered when in a wet or frozen condition.

- D. Loam Borrow (Re-Used), or Topsoil (New Import) shall consist of fertile, friable, natural loam capable of sustaining vigorous plant growth. Loam shall be without admixture of subsoil, and refuse, resulting in a homogeneous material free of stones greater than ½” in the longest dimension, be free of lumps, plants, glass, roots, sticks, excessive stone content, debris, and extraneous matter as determined by the Engineer. Screened Loam shall be within the pH range of 6.0 to 6.5 except as where noted on plans and details. It shall be uncontaminated by salt water, foreign matter and substances harmful to plant growth. The maximum soluble salt index shall be 100. Screened Loam shall not have levels of aluminum greater than 200 parts per million.
- E. If limestone is required to amend the screened loam to bring it within a pH range of 6.0 to 6.5 no more than 50 pounds of limestone per 1,000 square feet of loam, surface application, within a single season.
- F. The Engineer will reject any material delivered to the site that does not meet these Specifications after post-delivery testing. If the delivered screened loam does not meet the specifications stated in this document, the delivered screened loam will be removed by the Contractor at the Contractor’s expense and at the time of rejection.
- G. The Loam Borrow (Re-Used), or Topsoil (New Import) shall not be handled or moved when in a wet or frozen condition.
- H. Soil structure shall not be destroyed through excessive and unnecessary handling or compaction. Inappropriate handling leading to the compaction or deterioration of soil structure will result in rejection of Loam Borrow (Re-Used), or Topsoil (New Import) for use.
- I. At no time should equipment or material rest on the soil.
- J. Under no circumstance shall any equipment exceeding 5 PSI ground pressure be allowed on the Loam Borrow after installation.
- K. Loam Borrow (Re-Used), or Topsoil (New Import) shall be free of plants and their roots, glass, brick, construction debris and other extraneous matter. It shall be uncontaminated by salt water, foreign matter and substances harmful to plant growth. The electrical conductivity (EC2) of a 1:2 soil-water suspension shall be equal to, or less than, 1.0 millimhos/cm. (test material passing #4 sieve).

## 2.02 REUSE OF EXISTING TOPSOIL

- A. Reuse as fill material may be allowed provided material meets Specification section 2300 EARTHWORK- Common Borrow.

## 2.03 Compost

- a. Organic Compost - Compost shall be Grade A quality, derived from organic wastes including sawdust, clean ground wood, leaf and yard residues, and biosolids that meet all State Environmental Agency requirements and shall be composted a minimum of 9 months at temperatures sufficient to break down all woody fibers, seeds, and leaf structures. The product shall be well composted, free of viable weed seeds and contain material of a generally humus nature capable of sustaining growth of vegetation, with no materials toxic to plant growth. Leaf litter compost will not be allowed.

Compost shall have the following properties:

<u>Parameters</u>	<u>Range</u>
Total Ash	15% or less
PH	6.5 – 7.5
Moisture content	35% - 55%
Soluble Salts	< 4.0 mmhos (dS)
Solvate Maturity Test	> 6
Physical contaminants (inserts), %, dry weight basis:	<1%
C:N ratio	15 - 30:1
Particle Size	< 1/2"
Organic Matter Content	> 40%
Bulk Density	< 1000 lbs./cubic yard

Chemical contaminants, mg/kg (ppm): meet or exceed US EPA Class A standard, 40CFR 503.13, Tables 1 and 3 levels

Biological contaminants, select pathogens, fecal coliform bacteria, or salmonella meet or exceed US EPA Class A standard, 40 CFR 503.32(a) level requirements.

Compost generator shall also provide minimum available nitrogen and other macro and micro nutrients to determine fertilizer requirements. Generator shall supply documentation showing state approval for intended use.

- B. Care shall be taken not to overwork the soil, causing it to break down, utilizing only agricultural equipment such as plows, discs, or harrows and portable quarry sieves, screens, or blenders.

## PART III - EXECUTION

### 3.01 PLACEMENT

- A. The Contractor shall furnish and spread Loam Borrow to the depths shown on the contract drawings, which depth shall be the minimum required depth after settlement. No compaction shall be required beyond that extent necessary to place seed or to plant trees to ensure against unevenness or settling below accepted growth lines.
- B. Loosen subgrade to a minimum depth of 4 inches. Decompact any areas compacted by construction.
- C. Rake, float, drag, roll and perform all necessary operations to remove surface irregularities and to provide a firm, smooth surface with positive surface drainage.
- D. Incorporate existing loam and import material into top 4" of existing.
- E. Spread existing loam to depth required to meet thickness, grades, and elevations shown, after light rolling and natural settlement, do not spread if planting soil or subgrade is frozen. Existing loam will need to be supplemented with import planting soil mix to achieve 8" depth planting soil mix. Incorporate import planting soil mix into top 4" of existing loam.
- F. Remove all rocks, sticks and other debris 2" and larger in planting areas and in lawn areas. Box drag and hand rake all seeded areas.
- G. Finish grade after installation of planting soil mix and mulch shall be 1/2" below adjacent paved surfaces unless otherwise specified or detailed.
- H. Soil moisture – Ensure adequate soil moisture prior to planting. Wet soil prior to planting if needed. Do not create muddy soil.

### 3.02 ADDITIVES

- A. The Contractor shall apply all necessary fertilizer and lime to the soil in accordance with the manufacturer and laboratory's recommendations and as required by the sodding, seeding and/or planting specifications referenced elsewhere.
- B. LIMESTONE:
  - a. Lime shall be an approved agricultural limestone containing at least 50 percent total oxides (calcium oxide and magnesium oxide). The material will be ground such that 50 percent of the material will pass through a No. 100 mesh sieve and 98 percent will pass a No. 2 mesh sieve. Lime shall be uniform in composition, dry and free-flowing and shall be delivered to the site in the original sealed containers, each bearing the manufacturer's guaranteed analysis.

END OF SECTION

## SECTION 02376

### TURF REINFORCING MAT

#### 1.0 GENERAL

#### 1.1 SECTION INCLUDES

- A. This section specifies three-dimensional turf reinforcing mat to be installed on portions of the downstream slopes of the reshaped earth embankments where existing mat is damaged during construction. The turf reinforcing mat shall be loamed and seeded during or after installation.

#### 1.2 RELATED SECTIONS

- A. Section 02230 – CLEARING AND GRUBBING
- B. Section 02300 – EARTHWORK
- C. Section 02329 – LOAM BORROW (TOPSOIL)
- D. Section 02920 – SEEDING

#### 1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM):
  1. D 570 - Standard Test Methods for Water Absorption of Plastics.
  2. D 6525 - Standard Test Method for Measuring Nominal Thickness of Geotextiles and Geomembranes.
  3. D 1907 - Test Method for Yarn Number by Skein Method.
  4. D 1388 – Test Method for Stiffness of Fabrics
  5. D 2256 - Test Method for Breaking Strength and Elongation of Yarn by Single Strand Method.
  6. D 3786 - Standard Test Method for Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics.
  7. D 4354 - Practice for Sampling of Geosynthetics for Testing.
  8. D 4355 - Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus).
  9. D 4439 - Terminology for Geotextiles.

10. D 4595 - Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
  11. D 4632 - Test Method for Grab Breaking Load and Elongation of Geotextiles.
  12. D 4759 - Practice for Determining the Specification Conformance of Geosynthetics.
  13. D 4873 - Guide for Identification, Storage, and Handling of Geotextiles.
  14. D 5035 - Standard Test Method for Breaking Force and Elongation of Textile Fabrics (Strip Force).
  15. D 6566 - Test Method for Measuring Mass Per Unit Area of Geotextiles.
- B. Federal Test Method of America (FTMA) CCC-5-191B - Smolder Resistance of Textile Materials.
  - C. Geosynthetic Accreditation Institute - Laboratory Accreditation Program (GAI-LAP).
  - D. International Standards Organization (ISO) 9002 - Quality System Certification.
  - E. Light Projection Analysis - Lumite Test Method for Measuring Light Projection Through Fabric.

#### 1.4 DEFINITIONS

- A. Minimum Average Roll Value (MARV): Property value calculated as typical minus two standard deviations. Statistically, it yields a 97.7 percent degree of confidence that any sample taken during quality assurance testing will exceed value reported.
- B. Typical Roll Value: Property value calculated from average or mean obtained from test data.
- C. Rolled Erosion Control Product (RECP) – A temporary degradable or long-term non-degradable material manufactured or fabricated into rolls designed to reduce soil erosion and assist in the growth, establishment and protection of vegetation.
- D. Turf Reinforcement Mat (TRM) – A long-term, non-degradable RECP composed of UV-stabilized, non-degradable, synthetic fibers, nettings and/or filaments processed into three-dimensional reinforcement matrices designed for permanent and critical hydraulic applications where design discharges exert velocities and shear stresses that exceed the limits of mature natural vegetation. TRMs provide sufficient thickness, strength and void space to permit soil filling and/or retention and the development of vegetation within the matrix.
- E. Erosion Control Blanket (ECB) – A temporary, degradable RECP composed of processed natural or synthetic fibers mechanically, structurally or chemically bound together to form a continuous matrix.

## 1.5 SUBMITTALS

### A. Submit under provisions of Section 01330 – Submittals.

#### 1. Certification:

- a) The Contractor shall provide the Engineer a certificate stating the name of the RECP manufacturer, product name, style, chemical compositions of filaments or yarns and other pertinent information to fully describe the geotextile.
- b) The Manufacturer is responsible for establishing and maintaining a quality control program to assure compliance with the requirements of the specification. Documentation describing the quality control program shall be made available upon request.
- c) The manufacturer's certificate shall state that the furnished RECP meets MARV requirements of the specification as evaluated under the manufacturer's quality control program. The certificate shall be attested to by a person having legal authority to bind the Manufacturer.

2. Manufacturing Quality Control (MQC) test results shall be provided upon request.

3. Independent Performance Test Results shall be provided upon request.

## 1.6 DELIVERY, STORAGE, AND HANDLING

A. RECP labeling, shipment and storage shall follow ASTM D 4873.

B. Product labels shall clearly show the manufacturer or supplier name, style name, and roll number.

C. Each shipping document shall include a notation certifying that the material is in accordance with the manufacturer's certificate.

D. Each RECP roll shall be wrapped with a material that will protect the geotextile from damage due to shipment, water, sunlight, and contaminants.

E. The protective wrapping shall be maintained during periods of shipment and storage.

F. During storage, RECP rolls shall be elevated off the ground and adequately covered to protect them from the following: Site construction damage, extended exposure to ultraviolet (UV) radiation, precipitation, chemicals that are strong acids or strong bases, flames, sparks, temperatures in excess of 160 deg F and any other environmental condition that might damage the RECP.

## 1.7 QUALITY ASSURANCE SAMPLING, TESTING, AND ACCEPTANCE

A. RECP shall be subject to sampling and testing to verify conformance with this specification. Sampling for testing shall be in accordance with ASTM D 4354.

- B. Acceptance shall be in accordance with ASTM D 4759 based on testing of either conformance samples obtained using Procedure A of ASTM D 4354, or based on manufacturer's certifications and testing of quality control samples obtained using Procedure B of ASTM D 4354.
- C. Quality Assurance Sampling and Testing will be waived for ISO 9002 Certified Manufacturing Facilities. Documentation of ISO 9002 Certification shall be provided upon request.

2.0 PRODUCTS

2.1 MATERIALS

A. Turf Reinforcement Mat:

- 1. Three-dimensional, woven 100% UV stabilized polypropylene geosynthetic specially designed for erosion control applications on steep slopes and vegetated waterways.
- 2. Material to exhibit very high interlock and reinforcement capacity with both soil and root systems and demonstrate high tensile modulus.
- 3. Minimum Average Roll Values:

Property	Test Method	Units	Property Requirement
Thickness	ASTM D-6525	mm (in)	16 (0.63)
Resiliency	ASTM D-6524	percent	95
Mass Per Unit Area	ASTM D-6566	G/sq m (oz/sy)	712 (21)
Tensile Strength	ASTM D-5035	kN/m (lbs/ft)	15.5 x 15.5 (1,050 x 1,050)
Tensile Elongation	ASTM D-5035	percent	25 (max)
UV Stability	ASTM D-4355	percent	90 at 1000 hrs

- 4. Performance Properties: In a vegetated state, the RECP must demonstrate acceptable performance when subjected to at least 0.5 hrs of continuous flow producing the following conditions.
  - a) Permissible velocity: 7.6 m/sec (25 ft/sec)
  - b) Permissible tractive force (shear stress): 4.80 kPa (10 psf)
  - c) Performance may be demonstrated by:

- 1) Flume testing at an independent facility under conditions similar to this project provided that the manufacturer can demonstrate that the material tested is functionally equivalent to the material being supplied. This may be demonstrated by providing index property test results (listed in 2.2.A.4) from a GAI-LAP accredited laboratory for both the tested and supplied materials.
  - 2) A documented case history of successful performance as defined by the Engineer at an installation similar to this project where documented hydraulic forces met or exceeded the requirements listed above provided that the manufacturer can demonstrate that the case history material is functionally equivalent to the material being supplied. This may be demonstrated by providing index property test results (listed in 2.2.A.4) from a GAI-LAP accredited laboratory for both the case history and supplied materials.
5. Manufacturing Quality Control: Testing shall be performed at a laboratory accredited by GAI-LAP for tests required for the geosynthetic, at frequency exceeding ASTM D 4354, with following minimum acceptable testing frequency:

Property	Test Frequency sq m (sq yd)
Mass Per Unit Area	1/20,000 (1/24,000)
Tensile Strength	1/20,000 (1/24,000)
Tensile Elongation	1/20,000 (1/24,000)

## 2.2 ACCESSORIES

### A. Ground Anchoring Devices:

1. Length: 12 inches minimum length.
2. U-shaped wire staples or metal pins.
3. Wire staples: Minimum 8 gauge.
4. Metal pins: Steel, minimum 5 mm (0.20 in) in diameter with 40 mm (1.5 in) steel washer.

## 3.0 EXECUTION

### 3.1 PREPARATION

- #### A. Grade and compact areas to be treated with RECP and compacted as indicated or as directed by Engineer.

- B. Remove large rocks, soil clods, vegetation, and other sharp objects that could keep RECP from intimate contact with subgrade.
- C. Prepare seedbed by loosening 50 to 75 mm (2 to 3 in) of soil above final grade.
- D. Select and apply soil amendments, fertilizer, and seed in accordance with Section 02920 – Planting - to scarified surface prior to installation of RECP.
- E. Construct 12 in x 12 in anchor trench at upgrade end and southern edge of installation to inhibit undermining from stray surface water. Excavate 150 x 150 mm (6 in x 6 in) check slots at 7.6 to 9.1 meter (25 to 30 foot) intervals along length of channel. Cut longitudinal anchor slots 100 x 100 mm (4 in x 4 in) at top of each side slope.
- F. Attention is directed to the existing PVC liner sections located on the downstream embankment of the dam. The Contractor should anticipate the presence of this liner when installing the turf reinforcement mat. If the liner is encountered, the Contractor shall protect, preserve and document the location of the PVC liner to the extent practicable.

### 3.2 INSTALLATION

- A. Install RECP at elevations and alignments indicated.
- B. Beginning at downstream end in center of slope, place initial end of first roll of RECP in anchor trench and secure with ground anchor devices at 300 mm (12 in) intervals.
- C. Position adjacent rolls in anchor trench in same manner, overlapping preceding roll minimum 75 mm (3 in).
- D. Secure RECP at 300 mm (12 in) intervals along the trench, backfill and compact with specified soil or as directed by Engineer.
- E. Unroll center strip of RECP upstream over compacted trench. Stop at next check slot or terminal anchor trench. Unroll adjacent rolls of RECPs upstream in similar fashion, maintaining 75 mm (3 in) overlap.
- F. Fold and secure rolls of RECP snugly into transverse check slots. Lay material in bottom of slot, then fold back against itself as indicated. Anchor through both layers of RECP at 300 mm (12 in) intervals. Backfill with soil and compact. Continue unrolling RECP widths upstream over compacted slot to next check slot or terminal anchor trench.
- G. Secure RECP to channel bottom with ground anchoring devices at a frequency of 3 anchors per square meter (2 ½ anchors per square yard). Increased anchoring frequency may be required if site conditions are such that the Engineer determines it necessary.
- H. Alternate installation methods must be approved by Engineer prior to execution.
- I. Soil fill and seed the RECP:

1. Spread and lightly rake 12 to 20 mm (0.5 to 0.8 in) of fine topsoil into RECP to completely fill its thickness.
2. When using lightweight power equipment to fill RECP, avoid sharp turns. Do not drive tracked or heavy equipment over RECP.
3. Smooth out soil by barely exposing top portion of RECP. Do not place excessive soil above material.
4. Broadcast additional seed or mulch above soil-filled mat and water.

END OF SECTION

P:\MA\Worcester MA\Coes Park\Parking Lot Expansion\Specs\Division 2\02376 - Turf reinforcing mat.doc

02376-7

SECTION 02518

TRACER TAPE

PART 1 - GENERAL

1.01 WORK INCLUDED:

This section covers the furnishing, handling and installation of tracer tape, as called for on the drawings.

1.02 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. Six sets of manufacturer's literature on the materials, colors and printing specified herein, shall be submitted to the Engineer for review.
- B. Tape samples shall also be submitted to the Engineer for review.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

Tracer tape shall be by Reef Industries, Houston, TX; Empire Level, Mukwonago, WI; Pro-Line Safety Products Co., W. Chicago, IL; or approved equal.

2.02 TRACER TAPE:

- A. Tracer tape shall be at least 3-inches wide.
- B. Tracer tape for non-ferrous pipe or conduit shall be constructed of a metallic core bonded to plastic layers. The metallic tracer tape shall be a minimum 5-mil thick and must be locatable at a depth of 18-inches with ordinary pipe locaters.
- C. Tracer tape for ferrous pipe or conduit shall consist of multiple bonded plastic layers. The non-metallic tracer tape shall elongate at least 500% before breaking.
- D. The tape shall bear the wording: "BURIED DRAIN LINE BELOW" (with "DRAIN" replaced by "WATER", "SEWER", "ELECTRICAL", "GAS", "TELEPHONE", or "CHEMICAL" as appropriate), continuously repeated every 30-inches to identify the pipe.
- E. Tape colors shall be as follows, as recommended by the American Public Works Association (APWA):

Electric	Red
Water	Blue

Drain

Green

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. Tracer tape shall be installed directly above the pipe or conduit it is to identify, approximately 12-inches below the proposed ground surface.
- B. The Contractor shall follow the manufacturer's recommendations for installation of the tape, as approved by the Engineer.

END OF SECTION

SECTION 02745

PAVING

PART 1 - GENERAL

1.01 WORK INCLUDED:

The Contractor shall furnish all labor, materials and equipment and shall place the pavements as indicated on the drawings and as herein specified.

1.02 RELATED WORK:

A. Section 01562, DUST CONTROL

B. Section 02300, EARTHWORK

1.03 SYSTEM DESCRIPTION:

A. GENERAL

The types of pavement systems to be utilized on this project are as follows:

HOT-MIX PAVEMENT- DENSE BINDER

HOT-MIX PAVEMENT- DENSE MIX

1.04 REFERENCES

The following standards form a part of these specifications and indicate the minimum standards required:

**American Society for Testing and Materials (ASTM)**

ASTM D1557 Test for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 Pound Rammer and 18-Inch Drop

**Commonwealth of Massachusetts Highway Department Standard Specification for Highway and Bridges (MHD)**

MHD 405 Gravel Base Course

MHD 420 Class I Bituminous Concrete Base Course, Type I-1

MHD 460 Class I Bituminous Concrete Pavement

MHD 476 Cement Concrete Pavement

MHD 860 Reflectorized Pavement Markings

## **Federal Specifications**

SS-S-164                Sealing Compound, Hot Poured Type, for Joints in Concrete

SS-S-1401C            Sealants, Joint, Non-Jet-Fuel-Resistant, Hot Applied, for Portland  
Cement and Asphalt Concrete Pavement

1.05    SUBMITTALS:    IN ACCORDANCE WITH REQUIREMENTS OF SPECIAL  
CONDITIONS, SUBMIT THE FOLLOWING:

- A.    Six sets of complete job mix formula shall be submitted to the Engineer at least two weeks before any of the work of this section is to begin.

## PART 2 - PRODUCTS

2.01    GRAVEL SUBBASE:

- A.    Gravel subbase shall consist of inert material that is hard durable stone and coarse sand, free from loam and clay, surface coatings and deleterious materials.
- B.    Gradation requirements for gravel subbase shall be as specified in Section 02300, EARTHWORK for Gravel Borrow.

2.02    BITUMINOUS CONCRETE PAVEMENT:

- A.    Bituminous concrete pavements shall consist of Class I Bituminous Concrete, Type I-1.
- B.    Bituminous concrete mixtures shall be within the composition limits of base courses, binder courses, top courses and surface treatment, in accordance with MHD M3.11.03, with constituents that conform to Table A, below.

TABLE A  
PERCENT BY WEIGHT PASSING SIEVE DESIGNATION

Standard Sieves (in.)	Base Course	Binder Course	Top Course	Surface Treat.
2 in	100			
1 in	55-80	100		
¾ in		80-100		
5/8 in			100	
½ in	40-65	55-75	95-100	
3/8 in			80-100	100
No.4	20-45	28-50	50-76	80-100
No.8	15-33	20-38	37-54	64-85
No.16			26-40	46-68
No.30	8-17	8-22	17-29	26-50
No.50	4-12	5-15	10-21	13-31
No.100*			5-16	7-17
No.200	0-4	0-5	2-7	3-8
Bitumen	4-5	4.5-5.5	5.5-7.0	7-8

\* Percentages shown for aggregate sizes are stated as proportional percentages of total aggregate for the mix.

Unless authorized by the Engineer, no Job-Mix Formula will be approved which specifies:

Less than 4% passing No. 200 for Top Course.  
Less than 6% bitumen for Top Course.

- C. The joint sealant shall be a hot poured rubberized emulsified asphalt sealant meeting the requirements of Federal Specifications SS-S-1401 or SS-S-164.
- D. The tack coat shall be an asphalt emulsion, RS-1 if required, conforming to MHD Section M3.03.0.

PART 3 - EXECUTION

3.01 GENERAL:

- A. Paving courses required for the project shall be as shown on the drawings and as specified herein. Pavement thicknesses specified are measured in compacted inches. If a pavement course thickness exceeds 2-1/2 compacted inches, the course shall be installed in multiple lifts with each lift not exceeding 2-1/2 compacted inches in thickness.

3.02 GRAVEL SUBBASE:

- A. The gravel subbase to be placed under pavement shall consist of 12-inches of gravel evenly spread and thoroughly compacted, or as indicated in the plans.
- B. The gravel shall be spread in layers not more than 4-inches thick, compacted measure. All layers shall be compacted to not less than 95 percent of the maximum dry density of the material as determined by ASTM D1557 Method C at optimum moisture content.

3.03 TEMPORARY BITUMINOUS PAVEMENT:

- A. Where specified and required by the Engineer and after placement of the gravel subbase, the Contractor shall place temporary bituminous pavement above the trench, between the edges of the existing pavement. It shall consist of Class I Bituminous Concrete Pavement, Type I-1, 2-inches thick, in accordance with MHD 460.
- B. The temporary pavement shall be repaired as necessary to maintain the surface of the pavement until replaced by permanent pavement. When so required by the Engineer, the Contractor shall remove the temporary pavement and install or regrade the subbase for installation of permanent pavement.

3.04 PERMANENT BITUMINOUS PAVEMENT:

- A. The bituminous paving mixture, equipment, methods of mixing and placing, and the precautions to be observed as to weather, condition of base, etc., shall be in accordance with MHD 460.

B. BASE COURSE AND BINDER COURSE PAVEMENT:

- 1. Immediately prior to installing the base binder course, the trimmed edges shall be made stable and unyielding, free of loose or broken pieces and all edges shall be thoroughly broomed clean. Contact surfaces of trench sides, curbs, manholes, catch basins, or other appurtenant structures in the pavement shall be painted thoroughly with a uniform coating of asphalt emulsion (tack coat), just before any mixture is placed against them.
- 2. The binder course shall be repaired as necessary to maintain the surface of the pavement until placement of the permanent overlay. If required, the Contractor shall place a leveling course before placing the permanent overlay.
- 3. A Bituminous tack coat shall be placed between all courses of pavement, per details.

3.05 PAVEMENT PLACEMENT:

- A. Unless otherwise permitted by the Engineer for particular conditions, only machine methods of placing the pavement shall be used. The equipment for spreading and finishing shall be mechanical, self-powered pavers, capable of spreading and finishing the mixture true to line, grade, width and crown. The mixtures shall be placed and

compacted only at such times as to permit proper inspection and checking by the Engineer.

- B. After the paving mixtures have been properly spread, initial and intermediate compaction shall be obtained by the use of steel wheel rollers having a weight of not less than 240 pounds per inch width of tread.
- C. Final rolling of the top course or surface treatment pavement shall be performed by a steel wheel roller weighing not less than 285 pounds per inch width of tread at a mix temperature and time sufficient to allow for final smoothing of the surface and thorough compaction.
- D. Immediately after placement of top course or surface treatment pavement, all joints between the existing and new top course or surface treatment pavements shall be sealed with hot poured rubberized asphalt sealant meeting the requirements of Federal Specification SS-S-1401 or SS-S-164.
- E. Where there is no backing for the edges of the curb-to-curb pavement, the Contractor shall provide a gravel transition. The gravel transition shall be installed immediately after the pavement is placed, shall be feathered and extend a minimum of 18 inches, and shall be compacted using the same equipment as for pavement compaction. The gravel shall be uniformly graded material with a maximum size of 3/8 to 1/2 inch.
- F. When required by the Engineer, the Contractor shall furnish and install additional paving to provide satisfactory transition for driveways and walkways impacted by a new curb-to-curb pavement installation. The transition installation will be considered incidental to the curb-to-curb pavement installation.

### 3.09 PAVEMENT REPAIR:

- A. If required in the contract or if permanent pavement becomes rough or uneven, permanent pavement patches and trenches shall be repaired and brought to grade utilizing "infrared" paving methods following completion of the construction.
- B. The Contractor performing the work shall use care to avoid overheating the pavement being repaired.
- C. Pavement repair shall extend a minimum of 6-inches beyond all edges of the pavement patch to assure adequate bonding at the pavement joints.

END OF SECTION

## SECTION 02771

### CURBING

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

- A. This section covers furnishing and installation of granite curb, bituminous concrete curb and precast parking curb, where required, as shown on the Drawings and herein specified.
- B. This section also covers replacement of curbing removed during construction.

##### 1.02 RELATED WORK:

- A. Required earthwork is specified under Section 02300 EARTHWORK.
- B. Section 02745, ASPHALT PAVEMENT.
- C. Section 02775, SIDEWALK CONSTRUCTION AND REPLACEMENT

##### 1.03 REFERENCES:

The following standards form a part of these specifications, as referenced:

Massachusetts Department of Transportation (MassDOT) Standard Specifications for  
Highways and Bridges

##### 1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SECTION 01330 SUBMITTALS, SUBMIT THE FOLLOWING:

Shop drawings, showing dimensions of typical curb sections.

#### PART 2 - PRODUCTS

##### 2.01 GRANITE CURBING:

- A. Granite curbing shall be Type VA-4 conforming to Subsection M9.04.1 of the latest edition of the MassDOT Standard Specifications for Highways and Bridges.
- B. Special shapes and corners shall be supplied as required.

##### 2.02 GRANITE EDGING:

- A. Granite edging shall be Type SB conforming to Subsection M9.04.2 of the latest edition of the MassDOT Standard Specifications for Highways and Bridges.
  - B. Special shapes and corners shall be supplied as required.
- 2.03 BITUMINOUS CONCRETE CURB (HMA)- CAPE COD CURB, HOT MIX ASPHALT CURB
- Curb shall conform to Subsection M3.12.0 of the latest edition of the MassDOT Standard Specifications for Highways and Bridges. Bit. Curb per MassDOT standard Section 501
- 2.04 PRECAST CONCRETE WHEEL STOP, BUMP STOP, PRECAST CONCRETE CURB STOP:
- A. Precast concrete wheel stops shall be formed with concrete rated at 3500 psi at 28 days.
  - B. The manufacturer shall maintain at the manufacturing site a record of material used and their sources, and a copy of concrete mix designs.
  - C. Precast parking lot curb shall be the Standard Precast Bumper Curb as manufactured by Durastone Co., Lincoln, RI, or approved equal.

### PART 3 - EXECUTION

- 3.01 GRANITE CURBING:
- A. Removal and resetting and/or removal and replacing of granite curbing shall be in accordance with Section 580 of the latest edition of the MassDOT Standard Specifications for Highways and Bridges. The curbing shall have a 7-inch reveal unless otherwise required by the Engineer.
  - B. Except as modified herein or on the drawings, installation of curbing shall conform to Section 500 of the MassDOT Standard Specifications for Highways and Bridges.
  - C. Excavation shall be made to the bottom of the 6-inch gravel base below the curbing, the trench being sufficiently wide to permit thorough tamping. The base shall be compacted to a firm, even surface and shall be approved by the Engineer.
  - D. The curbing shall be set on edge and settled into place with a heavy wooden hand-rammer, to the line and grade required, straight and true for the full depth. The joints of the stone curbing shall be pointed with mortar for the full depth of the curbing. At approximately 50-foot intervals, a 1/2-inch joint shall not be filled with mortar but left free for expansion. The ends of the stone curbing at driveways and intersections shall be cut at a bevel or rounded as required by the Engineer.

- E. The trench for the stone curbing shall be backfilled with approved material; the first layer to be 4-inches in depth, thoroughly rammed; the other layers to be more than 6-inches in depth and thoroughly rammed until the trench is filled.
- F. Where indicated on the plans, or as required, drainage openings shall be made through the curbing at the elevations and of the size required.

3.02 GRANITE EDGING:

- A. Except as modified herein and on the drawings, installation of granite edging shall conform to Section 500 of MassDOT Standard Specifications for Highways and Bridges.
- B. The cement concrete base shall be placed on a well-tamped sub-base acceptable to the Engineer, and shall be constructed of 3000 psi concrete, minimum, as shown on the drawings.
- C. The edging shall be set to the proper lines and grades on the concrete base and on a well-tamped sloping gravel surface.

3.03 BITUMINOUS CONCRETE CURB (HMA)- CAPE COD CURB, HOT MIX ASPHALT CURB:

- A. Replacement of bituminous concrete curbs shall be in accordance with Section 500 of the latest edition of the MassDOT Standard Specification for Highways and Bridges and all amendments thereto. The curbing shall have a 6-inch reveal unless otherwise required by the Engineer.
- B. Unless modified herein, installation shall conform to Section 501.64 of the MassDOT Standard Specifications for Highways and Bridges.
- C. When indicated on the plans, or as directed, drainage openings shall be made through the curb at the elevations and of the size required.

3.04 PRECAST CONCRETE WHEEL STOP, BUMP STOP, PRECAST CONCRETE CURB STOP:

- A. Precast parking lot curbing shall be furnished and installed as indicated on the drawings.
- B. Any units, which are cracked, chipped, spalled, or otherwise damaged, shall be removed and replaced with units meeting the specified requirements.

END OF SECTION

SECTION 02775

SIDEWALK CONSTRUCTION AND REPLACEMENT

PART 1 - GENERAL

1.01 WORK INCLUDED:

The Contractor shall furnish all labor, materials, equipment and incidentals required to restore gravel sidewalks and/or construct new or replacement hot mix asphalt or cement concrete sidewalks where required or where existing sidewalks are disturbed by the Contractor, as shown on the drawings and described herein. The Contractor shall also furnish all materials and install wheelchair ramps where shown on the drawings or as required by the Engineer.

1.02 RELATED WORK:

- A. Section 02300, EARTHWORK
- B. Section 02771, CURBING
- C. Section 02745, ASPHALT PAVEMENT

1.03 REFERENCES:

The following standards form a part of these specifications, as referenced:

Massachusetts Department of Transportation (MassDOT)  
Standard Specifications for Highways and Bridges

1.04 SUBMITTALS:

- A. In accordance with Section 01330 SUBMITTALS, the Contractor shall submit shop drawings and/or materials specifications for each component of the work to be performed under this section of the Specifications.

1.05 SYSTEM DESCRIPTION:

- A. HOT MIX ASPHALT AND CEMENT CONCRETE SIDEWALKS AND WHEELCHAIR RAMPS:
  - 1. Except as otherwise indicated, hot mix asphalt and cement concrete sidewalks and wheelchair ramps shall be constructed in accordance with the requirements of Section 701, Sidewalks, Wheelchair Ramps and Driveways, of the latest edition of the MassDOT Standard Specifications for Highways and Bridges, and all amendments thereto.

2. Wheel chair ramps shall be installed in new sidewalks at intersections in accordance with 521 CMR. When curbs or sidewalks are constructed or reconstructed on one side of the street, curb cuts shall also be installed on the opposite sides of the street, where there is a pedestrian path of travel. Curb cuts shall be located within the crosswalk and/or the pedestrian path of travel.
- C. Water boxes, manhole frames, and all other castings shall be carefully set to the proposed finished grade.
- D. Sidewalks shall not be less than 48-inches in width, excluding curbing. An unobstructed path of travel shall be provided which is at least 36-inches clear, excluding curbing.

## PART 2 - PRODUCTS

**Note: Mass DOT does not allow HMA wheelchair ramps**

### 2.01 HOT MIX ASPHALT SIDEWALKS :

- A. Sidewalks shall consist of hot mix asphalt.
- B. Hot mix asphalt shall conform to the requirements of MassDOT M3.11, Table A, Dense Mix.

### 2.02 CEMENT CONCRETE SIDEWALKS AND WHEELCHAIR RAMPS:

- A. Cement concrete sidewalks shall be constructed with air entrained Cement Concrete with a minimum compressive strength of 4000 psi at 28 days.
- B. Cement concrete shall conform to the requirements of MassDOT M4.02.

## PART 3 - EXECUTION:

### 3.01 HOT MIX ASPHALT SIDEWALKS:

- A. The subgrade for the sidewalks shall be shaped parallel to the proposed surface of the sidewalks and shall be thoroughly rolled and tamped. All depressions occurring shall be filled with suitable material and again rolled or tamped until the surface is smooth and hard in order for a gravel foundation to be placed upon it.
- B. The hot mix asphalt sidewalk shall be a minimum of 3 compacted inches thick, laid in two equal courses. The sidewalk cross-pitch shall be 1.5% max and .5% minimum or shall match the existing sidewalk.

### 3.02. CEMENT CONCRETE SIDEWALKS AND WHEELCHAIR RAMPS:

- A. Concrete for sidewalks and wheelchair ramps shall be a minimum of 4-inches thick. At driveways, the sidewalks shall be 6-inches thick.
- B. The subgrade for the walk or driveway shall be shaped to a true surface conforming to the proposed slope of the walk, thoroughly rolled at optimum moisture content and tamped with a power roller weighing not less than one ton and not more than 5 tons. All depressions occurring shall be filled with suitable material and again rolled or tamped until the surface is smooth and hard.
- C. After the subgrade has been prepared as hereinbefore specified, a subbase of gravel borrow at optimum moisture content shall be placed, thoroughly rolled by a power roller, and tamped. The gravel borrow shall be a minimum of 8-inches in thickness.
- D. The forms for sidewalks shall be smooth, free from warp, strong enough to resist springing out of shape, and deep enough to conform to the thickness of the proposed walk. All mortar or dirt shall be completely removed from forms that have been previously used. The forms shall be well staked, thoroughly braced, and set to the established lines with their upper edge conforming to the grade of the finished walk. The finished walk shall have sufficient pitch from the outside to the edge of the walk to provide for surface drainage. This cross-pitch shall be 1.5% max and 0.5% minimum unless otherwise required by the Engineer. Before the concrete is placed, the subbase for sidewalks shall be thoroughly dampened until it is moist throughout but without puddles of water.
- E. Concrete shall be conveyed from the place of mixing to the place of deposit in such a manner that no mortar will be lost, and the composition of the mix shall be uniform, showing neither excess nor lack of mortar in any one place. The consistency shall be such that water will float to the surface under heavy tamping. The concrete shall be placed as close to its final position as practicable and thoroughly consolidated, with precautions taken not to overwork it while it is still plastic. The concrete shall be thoroughly spaded along the forms or screeds to eliminate voids and honeycombs at the edges. Retempering of concrete will not be permitted.
- F. Concrete shall be placed in alternate slabs not exceeding 30 feet in length. Slabs shall be separated by transverse preformed expansion joint filler ½-inch thick. The surface of all concrete sidewalks shall be uniformly scored into block units of not more than 40 square feet. The depth of the scoring shall be at least one quarter of the thickness of the sidewalk.
- G. When concrete sidewalks are constructed adjacent to curbing, building foundations, retaining walls, light pole bases or other fixed structures, ½-inch thick premolded joint filler shall be used between the newly constructed sidewalk and the structure.
- H. Finishing of the concrete surface shall be done by experienced and competent cement finishers as soon as is practicable. Finishing shall be delayed until all bleed water and water sheen has left the surface and the concrete has begun to stiffen. The concrete surface shall be finished as directed with a steel trowel or wood float to give a smooth, uniform and attractive surface finish and uniformly scored into block units or areas of not more than 36 square feet. Following this, the Contractor shall draw a medium nylon push broom lightly

over the surface perpendicular to the path of travel to produce a non-slip surface. Application of neat cement to the surface to hasten hardening is prohibited.

- I. The Contractor shall protect the newly placed concrete surface against vandalism and marking or defacing and must stand ready to replace any blocks which, in the opinion of the Engineer, are excessively marked or defaced, at no additional cost to the Owner. When completed the walks shall be kept moist and protected from traffic and weather for at least 3 days.
- J. Adequate protection shall be provided where temperatures of 40°F or lower occur during placing of concrete and during the early curing period. The minimum temperature of fresh concrete after placing and for the first 3 days shall be maintained above 55°F. In addition to the above requirements, an additional 3 days of protection from freezing shall be maintained.

END OF SECTION

SECTION 02829

STEEL BARRIER GATE

PART 1 – GENERAL

1.01 WORK INCLUDED:

- A. Furnish and install a Barrier Gate in the location(s) indicated on Drawings.

1.02 RELATED WORK:

- A. Section 02300 - EARTHWORK
- B. Section 03302 - FIELD CONCRETE

1.03 SYSTEM DESCRIPTION:

- A. The Contract Drawings show the character and extent of the work to be performed and provided but does not attempt to show all methods, materials and details of construction, etc. Supplementary components customarily necessary to complete an item, though such parts are not definitely shown or specified, shall be included as part of the gate.

1.04 REFERENCES:

- A. The following standards form a part of this specification, as referenced:

American Society of Testing and Materials

ASTM	A36	Structural Steel
ASTM	A53	Pipe, Steel, Black and Hot-Dipped Zinc-Coated Welded and Seamless
ASTM	A153	Zinc Coating (Hot-Dip) on Iron and Steel Products

American Welding Society

AWS	Code Standard for Arc and Gas Welding
-----	---------------------------------------

1.05 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SECTION 01330 SUBMITTALS, SUBMIT THE FOLLOWING:

- A. Before fabricating or assembling of any components, the Contractor shall submit shop drawings for all work included in this section.

PART 2 – PRODUCTS:

2.01 MATERIALS:

- A. Steel pipe shall be Schedule 40 and the size as indicated on the Drawings.
- B. Steel pipe shall conform to ASTM A53.
- C. Steel shapes, plates and bars shall conform to ASTM A36.
- C. Posts, bar gate and diagonal brace diameters shall be as shown on the drawings.
- D. Finish shall be galvanized and painted black. No site welding or painting on site shall be allowed.

PART 3 – EXECUTION

3.01 QUALITY ASSURANCE;

- A. Barrier Gate shall be complete in accordance with this section and the contract Drawings.
- B. All intersecting pipe joints shall be shop fillet welded.

3.02 INSTALLATION:

- A. Barrier Gate shall be installed at the location(s) indicated on the Contract Drawings and in accordance with this section.
- B. The gate components shall be assembled as shown on the drawings, welded all sides and ground smooth, galvanized, and painted prior to delivery to the site.
- C. The posts shall be encased in concrete foundations as shown on the drawings.
- D. A padlock shall be furnished to the Owner, and if applicable, keyed to the Owner's standard requirements.

3.03 PAINTING:

- A. All exposed pipe and appurtenances to be painted with Zinc Rich Primer plus one coat of Catalyzed Epoxy and a finish coat of Acrylic Polyurethane by Tnemec Co. or approved equal.

3.04 CLEAN-UP:

- A. Remove all excess materials from the work-site when completed with the Barrier Gate installation.

END OF SECTION

Document18

## SECTION 02920

### SEEDING

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

- A. This Section includes furnishing all labor, materials, equipment, seed and incidental materials necessary to accomplish all grass seeding and related work, complete in place, maintained, and accepted, in accordance with the Contract Drawings and Specifications. All grassed areas disturbed by the Contractor's operations shall be repaired as herein specified.
- B. The Contractor shall bear the responsibility and cost of furnishing and applying water or any other substances, as necessary to ensure the sustainability of grass seeded areas, as part of the work of this contract.

##### 1.02 RELATED WORK:

- A. Section 02329, LOAM BORROW

##### 1.03 SUBMITTALS:

In accordance with requirements of Section 01330 SUBMITTALS, the Contractor shall submit the following to the Engineer for review and approval:

- A. Information for seed mixes including the following:
  - 1. Name and address of the seed supplier.
  - 2. Source of origin and dates of harvest for each of the various types of seed
  - 3. Certification of seed mix composition and proportion, indicating named seed varieties by percent, percent germination, purity, and percent crop seed, percent inert matter, and percent weed seed content.
  - 4. Estimated number of seeds per pound of each type of seed in the mix
- B. Information detailing proposed limestone, fertilizers, insecticides, herbicides, fungicides, mulch materials, hydroseeding materials (as required), and slope protection material (as required) to be applied to seeded areas.
- C. Watering, fertilizing and maintenance schedule.

- D. Marked up prints indicating the square footage of all proposed seeded areas with quantities of various soil additives and amendments, and quantities of seed for each area prior to beginning work.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. LOAM BORROW:

- 1. Loam Borrow shall be as specified in Section 02329, LOAM BORROW.

C. FERTILIZER:

- 1. Fertilizer shall be a complete, standard commercial fertilizer, homogenous and uniform in composition, dry and free-flowing, and shall be delivered to the site in the manufacturer's original sealed containers, each bearing the manufacturer's guaranteed analysis and marketed in compliance with State and Federal Laws. All fertilizer shall be used in accordance with the manufacturer's recommendations.
- 2. The analysis for supplemental maintenance fertilizer shall have a ratio of Nitrogen (N) – Phosphorous (P) – Potassium (K) of approximately 4 – 1 – 2 and shall be applied to deliver 1 pound of Nitrogen per 1000 square feet, or as approved by the Engineer. At least 50 percent of nitrogenous elements shall be Urea-form or derived from organic sources and contain no less than 3 percent water soluble Nitrogen.

D. SEED:

- 1. Seed shall be of an approved perennial variety mixture, the previous year's crop, clean, and high in germinating value. Weed seed content shall be less than 0.5 percent and include no noxious weeds. Seed shall be obtained from a reliable seed company and shall be accompanied by certificates of compliance relative to mixture purity and germinating value. Seed shall be furnished and delivered in new, clean, sealed and properly labeled containers. All seed shall comply with applicable State and Federal laws. Seed that has become wet, moldy or otherwise damaged shall not be accepted.
- 2. Grass seed for cross-country areas, slopes and other areas not normally mowed shall conform to the following requirements:

Botanical and Common Names	Proportion by Weight	Germination Rate	Purity Minimum
Creeping Red Fescue (Festuca rubra)	50%	85%	95%
'Kentucky 31' Tall Fescue			

(Festuca arundinacea ‘Kentucky 31’)	30%	85%	95%
Perennial Ryegrass (Lolium perenne)	10%	90%	98%
Red Top (Agrostis alba)	5%	85%	92%
Ladino White Clover (Trifolium repens ‘Ladino’)	5%	85%	96%

- Seed mix for Detention Basin shall be “New England Erosion Control/Restoration Mix for Detention Basins and Moist Sites” as provided by New England Wetland Plants, Inc. 820 west street, Amherst, MA 01002, 413-548-8000, [info@newp.com](mailto:info@newp.com). or approved equal. Mix shall include a selection of native grasses and wildflowers designed to colonize generally moist, recently disturbed sites where quick growth of vegetation is required for slope and basin stabilization and long term establishment of native vegetation.

E. TEMPORARY COVER CROP:

- Temporary cover crop shall conform to the following requirements:

Botanical and Common Names	Proportion by Weight	Germination Rate	Purity Minimum
Annual Ryegrass (Lolium multiflorum)	80% min.	85%	%
Creeping Red Fescue (Festuca rubra)	4% min.	85%	95%
Perennial Ryegrass (Lolium perenne)	3% min.	90%	98%
Red Clover (Trifolium pratense)	3% min.	90%	%
Other Crop Grass	0.5% max.		
Noxious Weed Seed	0.5% max.		
Inert Matter	1.0% max.		

F. MULCH:

1. Materials to be used in mulching seeded areas shall be free of weed seed and shall conform to the following requirements:

- a. Straw Mulch shall consist of stalks or stems of grain after threshing.

- b. No hay mulch or salt hay shall be used.

G. HYDROSEED MULCH, TACKIFIERS AND WATER RETENTION AGENTS:

1. Wood fiber mulch for Hydroseed application shall be a manufactured product of natural wood cellulose fibers with a non-toxic green marking dye incorporated to ensure uniform distribution. Mulch shall be packed in sealed original containers, clearly labeled with brand name and manufacturer. It shall have delivered moisture content less than 12 percent.
2. Hydroseed tackifier shall be a powdered starch-based product approved by the Engineer. Hydroseed tackifier shall be applied in conjunction with the hydroseed slurry in accordance with the manufacturer's recommendations.
3. Moisture retention agent shall be a powdered starch-based product, approved by the Engineer, and shall be capable of retaining up to 400 times their weight in water. Moisture retaining agents shall be added to the hydroseed slurry in accordance with the manufacturer's recommendations. Moisture retention agent shall be 'Hydro-Gel', as manufactured by Finn Corporation, Fairfield, OH.

H. SLOPE EROSION PROTECTION:

1. Erosion control blanket shall be 100 percent biodegradable mesh with 100 percent biodegradable straw or straw/coconut fill. Fill shall be held together by biodegradable fastening. Weight shall be 0.50 pounds per square yard. Erosion control blankets shall be applied parallel to direction of water flow. The erosion control blankets shall be by North American Green, Evansville, IN or approved equal. For slopes 2:1 or greater, erosion control blanket shall be composed of 70 percent straw 30 percent coconut fiber, Model SC150. For slopes less than 2:1, erosion control blanket shall be a high velocity straw matting, Model S150.
2. Six-inch wire staples shall be placed in accordance with the manufacturer's recommendations to anchor the mesh material. Staples shall be biodegradable.

I. WATER:

1. Water shall be furnished by the Contractor, unless otherwise specified, and shall be suitable for irrigation and free from ingredients harmful to plant growth and viability. The delivery and distribution equipment required for the application of water shall be the furnished by the Contractor, at no additional cost to the Owner.

J. INSECTICIDES:

1. No insecticides shall be used on-site without the Contractor notifying and obtaining prior approval of the Engineer.
2. Insecticides shall be EPA registered and approved for use in public open spaces. All insecticides shall be handled by State licensed applicators only, delivered in the original sealed manufacturer's containers, and used in accordance with the manufacturer's instructions.
3. Insecticide use shall be limited and selective, only to control specific insect infestations, as identified by the Contractor or the Owner's Representative, that may result in the disfigurement, decline, or death of plant materials.
4. Grub control insecticide shall be Proturf Insecticide III, as manufactured by A.M. Scotts & Sons, Inc.; Dursban Granules, as manufactured by Old Fox Chemical Corp., or ACMC; or approved equal.

K. HERBICIDES:

1. No herbicides shall be used on-site without the Contractor notifying and obtaining prior approval of the Engineer.
2. All herbicides shall be EPA registered and approved for use in public open spaces. All herbicides shall be handled by State licensed applicators only, delivered in the original sealed manufacturer's containers, and used in accordance with the manufacturer's instructions.
3. Herbicide for post-emergent application shall be glyphosate contact, 'Roundup', as manufactured by Monsanto, Inc., or approved equal.
4. Herbicide use shall be limited and selective, only to control specific weed infestations that have been identified by the Contractor or the Owner's Representative.

L. FUNGICIDES:

1. No fungicides shall be used on-site without the Contractor notifying and obtaining prior approval of the Engineer.
2. Fungicides shall be EPA registered and approved for use in public open spaces. All fungicides shall be handled by State licensed applicators only, delivered in the original sealed manufacturer's containers, and used in accordance with the manufacturer's instructions.

3. Fungicide use shall be limited and selective, only to control specific fungal pathogenic disease infestations, as identified by the Contractor or the Owner's Representative that may result in the disfigurement, decline, or death of plant materials.

### PART 3 - EXECUTION

#### 3.01 GENERAL:

- A. All work shall be performed by skilled workers with a minimum of 2 years of seeded lawn construction and establishment experience and under the full-time supervision of a qualified foreman.
- B. Seeding operations shall not begin less than 4 days after the application of lime and fertilizer and the seedbed areas are reviewed and approved by the Engineer.
- C. Seeding shall be done when soil and weather conditions permit in early spring, until June 15, or from September 10 to October 15, unless otherwise approved. If it becomes necessary for seed to be sown after June 15, provisions shall be made for supplementary water and using a mulch cover over lawn areas.
- D. If there is a delay in seeding, during which weeds grow, or soil is washed out, the Contractor shall eliminate the weeds by chemical or physical means, or replace the soil before sowing the seed, without additional compensation. Immediately before seeding is begun, the soil shall be lightly raked.
- E. Seed shall be sown at the approved rate, on a non-windy day by machine, or as approved by the Engineer.
- F. The surface shall be kept moist by a fine spray until the seed shows uniform germination over the entire area. Wherever poor germination occurs in areas larger than 3 square feet, the Contractor shall reseed, roll, and water as necessary to obtain proper germination.
- G. If there is insufficient time in the planting season to complete soil preparations, fertilizing, and seeding, permanent seeding may be left until the following planting season, at the option of the Contractor, or as required by the Engineer. In that event, a temporary cover crop shall be sown. This cover crop shall be cut and watered as necessary until the beginning of the following planting season, at which time it shall be plowed or harrowed into the soil, the area shall be fertilized and the permanent seed crop shall be sown as specified.
- H. Protection of all newly loamed and graded areas is required and shall be accomplished by whatever means necessary such as mulch applied with a tackifier, or by other means approved by the Engineer. The Contractor shall be responsible for the prevention of siltation in areas beyond the limit of work and for all means of protection throughout the maintenance period at no additional cost to the Owner.

3.02 SURFACE PREPARATION:

- A. If approved by the Engineer, the entire site area to be seeded shall be treated with an approved herbicide, in accordance with the manufacturer's instructions, not less than 7 days before the start of seeding operations.
- B. If approved by the Engineer, grub control insecticide shall be spread on the surface of the seedbed, in accordance with the manufacturer's instructions, after the seedbed has been properly graded, not less than 24 hours before the start of seeding operations.

3.03 BROADCAST SEEDING, PLACING MULCH AND SLOPE EROSION PROTECTION:

- A. The seed mix shall be broadcast at 6 pounds per 1000 square feet, as recommended by the seed supplier, or as required by the Engineer. Seed shall be divided into 2 equal amounts and uniformly distributed in 2 applications at right angles to each other. Seed shall then be raked lightly into the soil to a depth of 1/4-inch.
- B. If mulch is not necessary the seed shall be directly firmed into the soil with a roller that will apply pressure between 75 and 100 pounds per linear foot of width.
- C. Straw Mulch shall be used based on time of seeding as previously specified over all seeded areas, as designated on the plans, or as otherwise required. If mulch is to be used, it shall be loosely spread to a uniform depth at a rate of 4-1/2 tons per acre to provide 1/4-inch of cover, or as otherwise required. The seed and mulch shall then be firmed into the soil with a roller that will apply a pressure between 75 and 100 pounds per foot of width.
- D. Straw Mulch may be applied by mechanical apparatus, if in the judgment of the Engineer, the apparatus spreads the mulch uniformly and forms a suitable mat to control slope erosion. The apparatus shall be capable of spreading at least 80 percent of the hay or straw in lengths of 6-inches or more, otherwise it shall be spread by hand without additional compensation.
- E. Slope erosion control blankets shall be placed as indicated on the plans or as required by the Engineer.

3.04 HYDROSEEDING:

- A. The application of lime, fertilizer, grass seed and mulch may be accomplished in a single operation with the use of approved hydroseeding equipment. The materials shall be mixed with water in the machine and kept in an agitated state in order that the materials may be uniformly suspended in the water. The slurry shall be of such consistency that it can be sprayed from a hydroseed gun or through at least 200 feet of 1½- inch diameter hose. The spraying equipment shall be so designed that when the solution is sprayed over an area, the resulting deposits of lime, fertilizer, grass seed, and mulch shall be equal to the specified quantities.

- B. Prior to the start of hydroseeding, the Contractor shall furnish to the Engineer, in writing, the weights of limestone, fertilizer, grass seed, mulch, tackifier (as required) and moisture retention agent (as required) per 100 gallons of water to be used. This statement should also specify the number of square yards of seeding that can be covered with the solution specified above. If the results of hydroseeding operations are unsatisfactory, the Contractor will be required to abandon this method and to apply the lime, fertilizer, grass seed and mulch by other means.
- C. Seed shall be incorporated with the mulching material to obtain a minimum hydroseeded sown coverage of 200 pounds of the specified seed mix per acre, as recommended by the seed suppliers, or as required by the Engineer.
- D. Wood fiber mulch shall be uniformly spread over certain selected seeded areas at the minimum rate of 1,400 pounds per acre unless otherwise directed. Mulch shall be placed by spraying from an approved spraying machine with pressure sufficient to cover the entire area in a single operation.
- E. The Contractor shall immediately cleanup hydroseed oversprays from plant materials, pavements, furnishings, etc., to the satisfaction of the Engineer.

### 3.05 MAINTENANCE:

- A. The Contractor shall maintain and protect the entire seeded area, as necessary to ensure dense healthy growth, until completion of the guarantee period and final acceptance of the project, or for 60 days, whichever is longer. If lawns are planted in late summer or during the fall, maintenance shall continue through the following spring for at least 30 days. Maintenance shall include watering as specified, liming, fertilizing, removal of stones, control of weeds, insect pests and fungal pathogens, and regular mowing. Defective work shall be corrected as soon as possible after it becomes apparent and weather and season permit.
- B. The first cutting of lawn areas shall be done when the grass is between 2½ - to 3-inches in height. The lawn shall be cut no shorter than 2-inches in height and shall be regularly mowed as necessary to maintain the above-prescribed conditions. All cuttings shall be removed from the lawn during the maintenance period and disposed of off-site.
- C. The Contractor shall be responsible to regularly water seeded areas with the equivalent of 1-inch minimum of rainfall per week, or as necessary to develop and sustain dense, green growth.
- D. Six weeks after turf has established, and only during the months of April, May, or September, the Contractor shall apply fertilizer as specified above, at one half the rate recommended by the initial soils laboratory tests, or as required by the Engineer.
- E. The Contractor shall be responsible for securing all seeded areas from physical damage as necessary, including warning signs, barriers, temporary fencing, or other means of protection, through the guarantee period until final acceptance. All damaged areas shall be

repaired to reestablish healthy vigorous growth of turf to the satisfaction of the Engineer, at no additional cost to the Owner. All temporary barriers shall remain the property of the Contractor and shall be removed by the Contractor upon final acceptance by the Engineer.

- F. Pavement shall be kept clean and clear of cuttings and debris at all times during the maintenance period to the satisfaction of the Engineer.

### 3.06 INSPECTION AND PRELIMINARY ACCEPTANCE:

- A. At the beginning of the planting season following that in which the permanent grass crop is sown, seeded areas will be inspected. Any section not showing dense, vigorous growth shall be promptly reseeded by the Contractor at no additional cost to the Owner. The seeded areas shall be watered, weeded, cut and otherwise maintained by the Contractor, as many times as necessary, in accordance with these specifications, until they are accepted.
- B. The Contractor shall provide written notice to the Engineer not less than 10 days before the anticipated date of inspection for preliminary acceptance. The Engineer shall recommend preliminary acceptance of the work of this Section only after completion and re-inspection of all necessary repairs, renewals, or replacements.
- C. Inspection and acceptance of seeded areas may be requested and granted in part, provided the areas for which acceptance is requested are relatively substantial in size, and with clearly definable boundaries. Acceptance and use of these areas by the Owner shall not waive any other provisions of this Contract.

### 3.07 GUARANTEE:

- A. Seeded areas shall be guaranteed until final acceptance of the project, or, in the case of late summer or fall planting, the guarantee period shall extend through the following spring.
- B. When the work is accepted in part, the guarantee period shall extend from each partial acceptance to the terminal date of the last guarantee period. All guarantee periods terminate at one time.
- C. Guarantee shall not apply to the replacement of seeded lawns resulting from the removal, loss, or damage due to occupancy of the project in any part; vandalism or acts of neglect on the part of others; physical damage by animals, vehicles, etc.; and Acts of God, including but not limited to, catastrophic fire, hurricanes, riots, war, etc.
- D. In the instance of curtailment of water by local water authorities (when supply was to be furnished by the Owner), the Contractor shall furnish all necessary water by water tanker, the cost of which will be approved and paid for by the Owner.

### 3.08 FINAL INSPECTION AND FINAL ACCEPTANCE:

- A. At the end of the guarantee period, the Contractor shall provide written notice to the Engineer not less than 10 days before the anticipated date of final inspection for final acceptance.
- B. The Engineer shall recommend final acceptance of the work of this Section only after completion and re-inspection of all necessary repairs, renewals or replacements.

END OF SECTION

Document2

## SECTION 03200

### CONCRETE REINFORCEMENT

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

This section of the specification covers the furnishing and installation of reinforcement for cast-in-place concrete.

##### 1.02 RELATED WORK:

- A. Section 01450, STRUCTURAL TESTS AND INSPECTIONS
- B. Section 03300, CAST-IN-PLACE CONCRETE

##### 1.03 SYSTEM DESCRIPTION:

Materials and construction shall conform to ACI 318 and ACI 350 unless otherwise noted on the design drawings or modified herein.

##### 1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. The Contractor shall furnish the Engineer with complete checked, reinforcing steel shop drawings and bar lists. Shop drawing shall include grade of steel used as well as splice lengths.
- B. Mill test reports shall accompany drawings. Fabrication shall not commence until the drawings and mill test reports have been released by the Engineer.
- C. When fiber reinforcement is used, Contractor shall submit manufacturer's data confirming that material meets the specification.

##### 1.05 REFERENCES:

- A. The following standards form a part of these specifications:

#### American Concrete Institute (ACI)

ACI 318	Building Code Requirements for Structural Concrete
ACI 347	Recommended Practice for Concrete Formwork
ACI 350	Code Requirements for Environmental Engineering Concrete Structures

ACI SP-66 ACI Detailing Manual

American Society for Testing and Materials (ASTM)

ASTM A185 Standard Specification for Welded Steel Wire Fabric for Concrete Reinforcement

ASTM A497 Specification for Welded Deformed Steel Wire Fabric for Concrete Reinforcement

ASTM A615 Deformed Billet-Steel Bars for Concrete Reinforcement

ASTM A775 Epoxy-coated Reinforcing Steel Bars

ASTM A884 Epoxy-coated Welded Wire Fabric

American Welding Society (AWS)

AWS 12.1 Recommended Practices for Welding Reinforcing Steel, Metal Inserts and Connections in Reinforced Concrete Construction

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Steel reinforcing bars shall conform to ASTM A615, Grade 60, and A775 if epoxy-coated bars are specified.
- B. Welded steel wire fabric shall conform to ASTM A185 or ASTM A497 and ASTM A884 if epoxy-coated fabric is specified. Gauge and spacing of wires shall be as indicated on the drawings.
- C. Reinforcing steel shall be detailed in accordance with ACI SP-66 modified as applicable to conform to ACI 350.
- D. Reinforcement shall be accurately formed to the dimensions indicated on the drawings. Bars shall be shipped to the site with bars of the same size and shape, fastened in bundles with securely wired-on metal identification tags listing both size and mark.
- E. Any bar showing cracks after bending shall be discarded.
- F. Steel failing to meet the requirements of this specification or the drawings will be rejected and shall be removed from the site immediately.

2.02 FIBER REINFORCEMENT:

When called for on the drawings, concrete engineered reinforcing fibers shall be polypropylene, collated, fibrillated fibers from Fibermesh Co., 4019 Industry Drive, Chattanooga, TN; Forta Corporation, One Hundred Forta Drive, Grove City, PA; or approved equal. Only fibers designed and manufactured specifically for use in concrete from virgin polypropylene and so certified by the manufacturer shall be acceptable.

### PART 3 - EXECUTION

#### 3.01 STEEL INSTALLATION:

- A. Before being placed in position, reinforcement shall be thoroughly cleaned of loose mill and rust scale, dirt, and other coatings (including ice), that reduce or destroy bond. When there is a delay in depositing concrete after reinforcement is in place, bars shall be reinspected and cleaned as necessary.
- B. After forms have been oiled, but before concrete is placed, all steel shall be securely wired in the exact position called for, and shall be maintained in that position until all concrete is placed and compacted. Chair bars and supports shall be provided in a number and arrangement satisfactory to the Engineer.
- C. Concrete blocks having a minimum bearing area of 2-inches by 2-inches and equal in quality to that specified for the slab, shall be used for supporting reinforcing bars for slabs on grade. Wood blocks, stones, brick chips, etc., shall not be used to support reinforcement.
- D. Metal supports shall be of types that will not penetrate the surface of formwork or slab and which will not show through or stain surfaces that are to be exposed to view, painted or unpainted.
- E. Welding of reinforcing bars will be permitted only where permission of the Engineer has been obtained in advance. Such welding shall be performed only under conditions established by the Engineer, and in accordance with AWS 12.1.
- F. Reinforcement, which is to be exposed for a considerable length of time after having been placed, shall be painted with a heavy coat of cement grout, if required by the Engineer.

#### 3.02 FIBER INSTALLATION:

- A. Fibermesh fibers shall be used in concrete as indicated on the drawings or as specified and in strict accordance with the manufacturer's recommendations as to type and amount. The fiber manufacturer or approved distributor shall provide the services of a qualified employee for pre-job meeting and initial job start up.

END OF SECTION

SECTION 03300  
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 WORK INCLUDED:

This Section covers all concrete and all related items necessary to place and finish the concrete work.

1.02 RELATED WORK:

- A. Section 01450, STRUCTURAL TESTS AND INSPECTIONS
- B. Section 02300, EARTHWORK
- C. Section 03100, CONCRETE FORMWORK
- D. Section 03200, CONCRETE REINFORCEMENT
- E. Section 07920, JOINT PROTECTION

1.03 Items furnished under other Sections and installed under this Section include, but are not limited to:

- 1. Items embedded in concrete, including anchors, sleeves, floor drains, castings, frames for hatches, angles, nosings, and other miscellaneous metals.

1.04 REFERENCES:

- A. The following standards form a part of these specifications:

American Concrete Institute (ACI)

- |         |  |
|---------|--|
| ACI 301 | Specifications for Structural Concrete   |
| ACI 302 | Recommended Practice for Concrete Floor and Slab Construction                    |
| ACI 304 | Recommended Practice for Measuring, Mixing, Transporting, and Replacing Concrete |
| ACI 305 | Recommended Practice for Hot Weather Concreting                                  |

ACI	306	Recommended Practice for Cold Weather Concreting
ACI	318	Building Code Requirements for Structural Concrete
ACI	347	Recommended Practice for Concrete Formwork
ACI	350	Code Requirements for Environmental Engineering Concrete Structures

American Society for Testing and Materials (ASTM)

ASTM	C33	Concrete Aggregates
ASTM	C39	Compressive Strength of Cylindrical Concrete Specimens
ASTM	C42	Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM	C87	Effect of Organic Impurities in Fine Aggregate on Strength of Mortar
ASTM	C94	Ready-Mixed Concrete
ASTM	C143	Standard Method for Slumps of Portland Cement Concrete
ASTM	C150	Portland Cement
ASTM	C171	Sheet Materials for Curing Concrete
ASTM	C231	Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM	C260	Air-Entraining Admixtures for Concrete
ASTM	C309	Liquid Membrane-Forming Compounds for Curing Concrete
ASTM	C494	Chemical Admixtures for Concrete
ASTM	D1751	Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM	D1752	Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction

1.05 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SECTION 01330 SUBMITTALS, SUBMIT THE FOLLOWING:

A. Shop drawings of the materials specified herein.

- B. Statement of materials constituting the design of mixes which satisfy the specified strength for each size aggregate as required by ASTM C94 shall be submitted to the Engineer within one week following award of the contract.
- C. Provide one copy of the "Certificate of Delivery" for each load of concrete as it arrives on the site, under the provisions of ASTM C94.

PART 2 - PRODUCTS

2.01 CONCRETE:

- A. Concrete conforming to the requirements listed below shall be used where indicated on the drawings. Unless otherwise indicated, concrete used as fill under foundations, and elsewhere approved by the Engineer, shall be the 3,000 psi mix.

TABLE

Minimum Strength at 28 days (psi)	Comp.	Maximum ratio (gallons per bag of cement)*	Water/Cement per bag of	Cement Factor: 94 lb. Bags per cubic yard minimum**
3000		0.59 (6.9)		5.5
4000		0.48 (5.6)		6.5
5000		0.40 (4.7)		7.4

\* Based on air-entrained concrete. If non-air-entrained concrete is called for, the listed maximum water/cement ratios may be increased slightly, as approved by the Engineer. The water is the total water in the mix, including free water on the aggregate.

\*\* These are minimum amounts; increase as necessary to meet mix requirements.

- B. Concrete shall conform to ASTM C94. One copy of the Certificate of Delivery required by ASTM C94 shall be delivered to the Engineer immediately upon arrival of each load of concrete at the site. The Contractor shall be responsible for the design of the concrete mixtures.
- C. Standard compression tests of all proposed mixes shall be made by the testing laboratory or other satisfactory evidence shall be presented that the design mixes will attain the minimum strengths listed on the design drawings or called for herein, within the limitations of the ACI Code. No concrete shall be delivered to the job site until the Engineer has approved the design mixes.
- D. All concrete (unless otherwise directed) shall contain an air-entraining agent. Air entrained concrete shall have an air content by volume of 3 to 6 percent for

1-1/2-inch aggregate and 4 to 8 percent for 3/4-inch aggregate. The air content shall be the responsibility of the testing laboratory and in accordance with ASTM C231.

- E. All concrete shall contain a mid-range water reducer to minimize cement and water content of the mix, at the specified slump, in accordance with ASTM C494.
- F. Slump for all concrete shall be from 3-inch to 4-inch, except for concrete using a superplasticizer, when the maximum slump shall be 8-inches. Any concrete having a slump greater than 4-inches (8-inches with superplasticizer) shall be promptly removed from the site.
- G. No calcium chloride or admixtures containing calcium chloride shall be added to the concrete. No admixture other than those specified shall be used in concrete without the specific written permission of the Engineer in each case.
- H. No additional water, except for the amount indicated by the design mix shall be added to the concrete without the prior permission of the Engineer.

#### 2.02 CEMENT:

- A. The cement shall be an approved brand of American manufactured Portland Cement, Type IIA conforming to ASTM C150. The brand name and type of cement proposed for use shall be submitted to the Engineer for approval immediately following award of contract. Only one color of cement, all of the same manufacture, shall be used for the work.
- B. When the use of high-early-strength Portland cement (Type IIIA) is permitted by the Engineer the same strength requirements shall apply, but the indicated strengths shall be attained in 7 days instead of 28 days.

#### 2.03 ADMIXTURES:

- A. Air entraining agent shall be in accordance with ASTM C260.
- B. Water reducing agent shall be a mid-range water reducer meeting ASTM C494, Type A.
- C. Water reducing agent-retarder shall be in accordance with ASTM C494, Type D.
- D. Superplasticizer agent shall be in accordance with ASTM C494, Type F or Type G and contain no more than 0.1% chloride ions. Product may be plant added or field added based on the best application considering distance, temperature and time.

#### 2.04 AGGREGATES:

- A. Except as otherwise noted, aggregate shall conform to the requirements of ASTM C33.
- B. Fine aggregate shall consist of washed inert natural sand conforming to the requirements of ASTM C33.
- C. Coarse aggregate shall consist of well-graded crushed stone or washed gravel conforming to the requirements of ASTM C33.
- D. The following designated sizes of aggregate shall be the maximum employed in concrete.
  - 1. 2-inch for mass concrete
  - 2. 1½-inch for reinforced sections 18-inch and over in thickness
  - 3. ¾-inch for reinforced and unreinforced sections less than 18-inch thickness.

2.05 WATER:

- A. Water for concrete shall be potable, free from injurious amounts of oil, acid, alkali, organic matter and other deleterious substances.

2.06 GROUT:

- A. Grout shall be mixed in the proportions of one part Portland Cement to 2 parts sand, by volume. Only sufficient water shall be used to enable grout to barely hold its shape when squeezed into a ball in the hand. Aggregate for grout shall conform to the requirements of the reference specification for concrete. Prior approval of the Engineer shall be obtained for the use of proprietary grouts, and the instructions of the Engineer shall be followed in their use.

2.07 CURING MATERIALS:

- A. Curing compound shall be a curing/hardener compound such as Acurion by AntiHydro, Sikaguard Cure/Hard by Sika, Super Diamond Clear by Euclid or approved equal.
- B. Curing paper shall be a fiber-reinforced laminated Kraft bituminous product conforming to the requirements of ASTM C171.

2.08 JOINT FILLER:

- A. Prefomed joint filler strip shall conform to ASTM D1751 or D1752, having a thickness as indicated on the drawings.

- B. Fillers shall be provided in pieces of the full thickness required. Use of multiple layers of thin pieces to make-up the full thickness will not be permitted.

2.09 JOINT SEALANT:

- A. Joint sealant for construction and control joints shall be a two-part polysulfide base sealant conforming to Thiokol's Building Trade Performance Specification, Class A (self-leveling), Type II (hardness: 35-45 Shore A).

2.10 DETECTABLE WARNING PANEL FOR WHEELCHAIR RAMPS:

- A. Detectable warning panels shall meet requirements of MassDOT Construction standard E107.6.5 and City of Worcester standards.

PART 3 - EXECUTION

3.01 GENERAL:

- A. Under no circumstances shall concrete that has set or partially set before placing be used; and no re-tempering of concrete or grout will be permitted.

3.02 PREPARATION:

- A. Before placing concrete, forms and the space to be occupied by the concrete shall be thoroughly cleaned, and reinforcing steel and embedded metal shall be free from dirt, oil, mill scale, loose rust, paint or other material which would tend to reduce the bond.
- B. Unless otherwise indicated, a moisture barrier shall be used under all slabs placed on the ground in accordance with ACI 302.1R. The moisture barrier shall be fungi-resistant and shall have a vapor permeance rating not exceeding 0.01 perms (Perms [grains/ft<sup>2</sup>\*hr\*in. Hg]) per ASTM F1249 or ASTM E96) and 10 mils thickness (49 lbs/MSF). The moisture barrier shall be a high-performance underslab vapor retarder made from polyethylene resins that exceed ASTM E1745, Class A. Sheets shall be lapped 6-inches at joints and sealed with 2-inch wide tape or as recommended by the manufacturer. The vapor barrier should have all laps, seams, penetrations and terminations sealed and should carry across footings.
- C. When no moisture barrier is used, the earth, concrete, masonry, or other water-permeable material against which concrete is to be placed shall be thoroughly saturated with water immediately before concrete is placed. No concrete shall be placed until the consolidation of the ground and the arrangement and details of forms and reinforcing have been inspected and approved by the Engineer.

- D. When joining fresh concrete to concrete which has attained full set, the latter shall be cleaned by chipping and washing off all dirt and scum and laitance. It then shall be moistened prior to placing new concrete.
- E. Concrete surfaces that act as a seat for structural members (other than those resting on grout) shall be troweled to an extremely flat and level surface. If necessary, such surfaces shall be ground off to achieve the required flatness and level.
- F. Fill concrete on top of concrete shall be placed in the locations indicated on the drawings or designated by the Engineer. Before fill concrete is placed, the following procedures shall be used to prepare surfaces; all dirt, scum and laitance shall be removed by chipping and washing. The clean, roughened base surface shall be saturated with water, but shall have no free water on the surface. A coat of 1:2 cement-sand grout, approximately 1/8-inch thick, shall be well scrubbed into the thoroughly dampened concrete base. The concrete fill shall be placed immediately, before grout has dried or set. Fill concrete shall be brought to the lines and grades shown on the drawings or approved by the Engineer.
- G. Concrete for thrust and anchor blocks shall be placed against undisturbed earth and wooden side forms shall be used to provide satisfactory lines and dimensions. Felt roofing paper shall be placed to protect joints. No concrete shall be placed so as to cover joints, bolts or nuts, or to interfere with the removal of the joints. Minimum bearing areas and dimensions shall be as shown on the drawings.

### 3.03 MIXING:

- A. Concrete shall be ready-mixed, or transit-mixed, as produced by equipment acceptable to the Engineer. No hand-mixing will be permitted. Adding water in controlled amounts during the mixing cycle shall be done only with the express approval of, and in the presence of the Engineer.
- B. Ready-mix or transit-mixed concrete shall be transported to the site in watertight agitator or mixer trucks loaded not in excess of rated capacities for the respective conditions as stated on the nameplate. Discharge at the site shall be within 1-1/2 hours after cement was first introduced into the mix. Central mixed concrete shall be plant-mixed a minimum of 1-1/2 minutes per batch and then shall be truck-mixed or agitated a minimum of 8 minutes. Agitation shall begin immediately after the pre-mixed concrete is placed in the truck and shall continue without interruption until discharge. Transit-mixed concrete shall be mixed at mixing speed for at least 10 minutes immediately after charging the truck, followed by agitation without interruption until discharged.
- C. All central plant and rolling stock equipment and methods shall conform to the latest Truck Mixer and Agitator Standards of the Truck Mixer Manufacturers'

Bureau of the National Ready-Mixed Concrete Association, as well as ACI 304 and ASTM C94.

- D. Attention is called to the importance of dispatching trucks from the batching plant so that they shall arrive at the site of the work just before the concrete is required, thus avoiding excessive mixing of concrete while waiting or delays in placing successive layers of concrete in the forms.

### 3.04 INSTALLATION/APPLICATION/ERECTION:

A. Placing:

1. No concrete shall be placed by pumping methods without the prior written approval of the Engineer. Should the Contractor be allowed to place concrete by pumping methods, procedures, mix design of concrete, and all other precautions shall be in accordance with ACI 304.2R and as approved by the Engineer.
2. Concrete shall be placed in alternate areas, as defined by the construction and control joints indicated on the design drawings. A minimum of 3 days shall elapse between placement of adjacent sections.
3. Segregation of the concrete shall be prevented during handling; should any segregation occur, the concrete shall be remixed before it is placed. Concrete shall be placed in the forms in horizontal layers not over 1 to 2 feet thick. Concrete shall not be allowed to drop freely more than 4 feet. If the free drop to the point of placement must exceed 4 feet, the Contractor shall obtain the approval of the Engineer for the proposed method of depositing the concrete. The concrete shall not be required to flow over distances greater than 3 feet in any direction in the forms or on the ground, unless otherwise permitted by the Engineer.
4. Unless otherwise noted, the work begun on any day shall be completed in daylight of the same day.
5. "Cold Joints" are to be avoided, but if they occur, they are to be treated as bonded construction joints.
6. Chutes for conveying concrete shall be of U-shaped design and sized to insure a continuous flow of concrete. Flat (coal) chutes shall not be employed. Chutes shall be metal or metal-lined, and each section shall have approximately the same slope. The slope shall not be less than 25 nor more than 45 degrees and shall be such as to prevent segregation of the ingredients. The discharge end of the chute shall be provided with a baffle plate or spout to prevent segregation. If the discharge end of the chute is more than 5 feet above the surface of the concrete in the forms, a spout shall be used and the lower end maintained as near the surface of deposit as practicable. When

the operation is intermittent, the chute shall discharge into a hopper. Chutes shall be thoroughly cleaned before and after each run, and the debris and any water shall be discharged outside the forms. Concrete shall not be allowed to flow horizontally more than 5 feet.

7. Concrete during and immediately after depositing shall be thoroughly compacted by means of suitable tools. Internal type mechanical vibrators shall be employed to produce the required quality of finish. Vibration shall be done by experienced operators under close supervision and shall be carried on long enough to produce homogeneity and optimum consolidation without permitting segregation of the solid constituents or "pumping" or migration of air. All vibrators shall be supplemented by proper wooden spade puddling adjacent to forms to remove included bubbles and honeycomb. This is essential for the top lifts of walls. All vibrators shall travel at least 10,000 rpm and be of adequate capacity. At least one vibrator shall be used for every 10 cubic yards of concrete per hour. In addition, one spare vibrator in operating condition shall be on the site.
8. Concrete slabs on the ground shall be well-tamped into place and foundation material shall be wet, tamped, and rolled until thoroughly compacted prior to placing concrete.
9. Concrete shall be deposited continuously in layers of such thickness that no concrete will be deposited on concrete that has hardened sufficiently to cause the formation of seams and planes of weakness within the section. If a section cannot be placed continuously, construction joints may be located at points as provided for in the drawings or approved by the Engineer.
10. Chutes, hoppers, spouts, adjacent work, etc., shall be thoroughly cleaned before and after each run, and the water and debris shall not be discharged inside the form.

B. Concrete Placing During Cold Weather:

1. Concrete shall not be placed on frozen ground, and no frozen material or material containing ice shall be used. Materials for concrete shall be heated when concrete is mixed, placed, or cured when the mean daily temperature is below 40°F, or is expected to fall to below 40°F, within 72 hours, and the concrete after placing shall be protected by covering, heat, or both. No accelerant shall be used to prevent freezing.
2. The temperature of concrete surfaces shall not be permitted to drop below 50°F. for at least 7 days after placement of the concrete.
3. All details of Contractor's handling and protecting of concrete during freezing weather shall be subject to the approval of the Engineer. All procedures shall be in accordance with provisions of ACI 306.

C. Concrete Placing During Hot Weather:

1. Concrete just placed shall be protected from the direct rays of the sun and the forms and reinforcement just prior to placing shall be sprinkled with cold water. The Contractor shall make every effort to minimize delays that will result in excessive mixing of the concrete after arrival on the job.
2. During periods of excessively hot weather (90°F, or above) ingredients in the concrete shall be cooled insofar as possible and cold mixing water shall be used to maintain the temperature of the concrete at permissible levels all in accordance with the provisions of ACI 305. Any concrete with a temperature above 90°F, when ready for placement will not be acceptable, and will be rejected.
3. Temperature records shall be maintained throughout the period of hot weather giving air temperature, general weather conditions (calm, windy, clear, cloudy, etc.) and relative humidity. The record shall include checks on temperature of concrete as delivered and after placing in forms. Data should be correlated with the progress of the work so that conditions surrounding the construction of any part of the structure can be ascertained.

D. Pipes and Embedded Metals:

1. Special care shall be taken to bring the concrete into solid contact with pipes and iron work embedded in the walls and floors, particularly underneath and around all pipes where a head of water exists, making watertight joints.
2. In general, such embedded items are not shown on the structural design drawings. Design drawings of the other trades shall be consulted for their location and details.
3. Anchor bolt location, size and details shall be verified with the equipment manufacturer's certified drawings before installation.
4. Anchor bolts, reglets, sleeves, edge angles and similar embedded items will be provided, delivered to the site under other Sections of the specification, for installation under this Section.
5. Where edge angles, etc., have nuts welded on to receive machine screws, the threads of the nuts shall be protected from concrete, and the concrete shall be excluded from the space to be occupied by the screw, by the use of wood plugs or other effective means.
6. Inserts required for hanging mechanical and electrical items will be provided and installed in the forms under the mechanical and electrical Sections of the specification.
7. Should the Contractor be allowed to leave openings in the concrete for pipes or ironwork, to await the arrival of items that would delay the prosecution of

the work, the openings shall be subject to the approval of the Engineer. Appropriate construction joints shall be provided. In filling any such openings with concrete, a mixture of 1: 1-1/2 : 3 shall be used and a watertight bond shall be secured between the old and new concrete.

8. In bolting miscellaneous items to concrete after the concrete has set, expansion bolts of an approved pattern and type shall be used. The Contractor shall submit to the Engineer, for approval, the types of expansion bolts. Expansion bolts shall not be used until they are approved.

E. Curing:

1. Concrete curing shall be performed as specified in ACI 301 and as stated herein. All curing procedures shall have prior approval of the Engineer.
2. Concrete Floors

Concrete floors which are to receive paint, concrete fill, mortar setting beds, grout fill, or any other subsequent finish shall be cured by one of the following procedures immediately after completion of placement and finishing:

- a. Ponding or continuous sprinkling.
  - b. Application of absorptive mats or fabric kept continuously wet.
  - c. Application of sand kept continuously wet.
  - d. Application of waterproof sheet materials conforming to ASTM C171.
  - e. Application of curing compounds conforming to ASTM C309, if it can be demonstrated to the Engineer's satisfaction that the compound is applicable and that it will not prevent bonding of the subsequent finish to be received. Compound shall be placed at a rate of 200 square feet per gallon, in two applications perpendicular to each other.
3. Curing procedure shall be continued for at least 7 days.
    - a. Moisture loss from surface placed against metal or wood forms shall be minimized by keeping forms wet until removal.
    - b. Curing shall be continued for at least 7 days. When forms are removed during the curing period, surfaces shall be cured by spraying or by the use of a curing compound as previously specified.
    - c. Surfaces shall be protected from traffic or damage until surfaces have hardened sufficiently. If necessary, 1/2-inch thick plywood sheets shall be used to protect the exposed surface.

F. Bracing and Supports:

1. All concrete members shall be adequately and safely supported and braced until the permanent supports and braces are installed.
2. Backfilling against exterior walls shall not be done until supporting slabs are in place and have attained 70 percent of design strength, otherwise walls shall be braced against earth lateral pressure, using a system approved by the Engineer.
3. Backfilling against retaining walls shall not commence until the wall concrete has reached its 28-day strength.

G. Removing Forms and Supports:

1. Removal of forms shall take place in accordance with ACI 347, Section 3.6. Except as otherwise specifically authorized by the Engineer, forms shall not be removed until the concrete has aged for the following number of day-degrees or attained 50 percent strength. (Day-degrees equals the total of number of days times the average daily air temperature at the surface of concrete. For example, 5 days at a daily average temperature of 60°F. equals 300 day-degrees.)

<u>Location</u>	<u>Day-Degrees</u>
Beams and Slabs	500
Walls and Vertical Surfaces	200

2. Shores under beams and slabs shall not be removed until the concrete has attained at least 70 percent of the specified cylinder strength and also sufficient strength to support safely its own weight and the construction loads upon it.

H. Patching:

1. Defective concrete and honeycombed areas as determined by the Engineer shall be chipped down reasonably square and at least one-inch deep to sound concrete by means of hand chisels or pneumatic chipping hammers. Irregular voids or surface stones need not be removed if they are sound, free of laitance, and firmly imbedded in the parent concrete, subject to Engineer's final inspection. If honeycomb exists around reinforcement, chip to provide a clear space at least 1-inch wide all around the steel. For areas less than 1-1/2 inches deep, the patch may be made following the procedure for filling form tie holes, described in the subsection below, using adequately dry (non-trowelable) mixtures to avoid sagging. Thicker repairs will require build-up in 1-inch layers on successive days. Unless otherwise indicated,

thicker repairs shall be made with Vertipatch mortar mixture blended with Acryl-Set, both by Master Builders, Inc., Cleveland, Ohio, or approved equal.

2. For concrete areas exposed to serious abrasion and/or impact forces, the Engineer may order the use of grout with a non-shrink metallic aggregate (Embeco by Master Builders, Inc.; Ironite by Fox Industries, Madison, IL; or approved equal) as an additive in the proportions listed below:

Material	Small Patches		Large Formed Patches	
	Volumes	Weights	Volumes	Weights
Cement	1.0	1.0	1.0	1.0
Metal Aggregate	0.15	0.25	0.2	0.33
Sand	1.5	1.5	1.5	1.0
Pea Gravel	--	--	1.5	1.5

I. Finishing of Formed Surfaces:

1. All concrete that is to be left exposed to view shall be scraped to remove projecting imperfections left by voids in the forms.
2. In addition to scraping, exterior exposed concrete shall be covered with a cement-base plaster mix. The mix shall consist of Thoroseal Plastic Mix and Acryl 60, as manufactured by Standard Drywall Products, Miami, FL, or approved equal. It shall be mixed and applied in accordance with the manufacturer's recommendations.
3. In addition to scraping, interior concrete surfaces which will be exposed to view and concrete surfaces which are to be prepared and painted as specified in Section 09900, PAINTING, shall receive a smooth rubbed finish, in accordance with ACI 301 and as described below.
4. To permit satisfactory finishing, forms shall be removed from the vertical faces of the concrete as early as is possible without damaging the surface. Immediately after stripping forms, any fins or projections left by the forms shall be chipped off, and the surfaces rubbed smooth.
5. Form tie holes and other voids and faults shall be patched. Voids shall be cleaned out, roughened, thoroughly wetted, coated with neat cement paste, and filled with mortar of cement and sand in the same proportions, materials, and color as used in the concrete. The surface of the patch shall be flush with the surrounding surface after finishing operations are complete. Surface shall be kept continuously damp until patches are firm enough to be rubbed without damage.

6. Rubbing shall be performed while the surface is wet using a carborundum or cement sand brick, to achieve a smooth uniform, even textured finish. Patched and chipped areas shall be blended to match as closely as possible the appearance of the rest of the surface. No cement wash or plastering will be permitted, and no mortar shall be used except as required above.
7. Where finishing is performed before the end of the curing period, concrete shall under no circumstances be permitted to dry out, and shall be kept continuously moist from time of placing until end of curing period, or until curing membrane is applied.

J. Concrete Floor Finishing Requirements:

Unless designated otherwise, concrete floors shall have a troweled finish as specified in Section 11.7 of ACI 301. Troweled finishes shall conform to the requirements of "Class A Tolerances," Section 11.9 as specified in ACI 301.

K. \*Monolithic Floor Finish:

1. Monolithic floor finish shall be applied to areas designated on the drawings.
2. A curing compound, of a type and color as recommended by the manufacturer, shall be applied to the surface to receive the monolithic floor finish.
3. Metallic aggregate hardener for monolithic floor finish shall be "Durpolate" manufactured by Castle Chemical Corp., "Proplate" manufactured by Protex Industries, Inc., "Hydroment" manufactured by USM Corporation, or approved equal. The aggregate shall include an inorganic pigment with color to be selected by the Engineer.
4. The dry shake shall be applied with not less than 80 pounds per 100 square feet, proportioned and installed in accordance with the recommendations of the manufacturer. The dry shake shall be distributed uniformly over the surface of freshly floated concrete, floated in, troweled over and cured in the normal manner.
5. All areas with a monolithic finish shall be completely protected during construction with a plywood cover.

L. Testing:

Concrete inspection and testing shall be performed by the Engineer or by an inspection laboratory, designated by the Engineer, engaged and paid for by the Owner. The laboratory shall supply testing equipment, and the preparation of samples and all testing shall be performed by the laboratory personnel. Full assistance and cooperation, concrete for samples, and such auxiliary personnel and equipment as needed shall be provided by the Contractor.

1. **The Contractor shall provide all field testing and inspection services, and shall pay for all such services. The Engineer shall approve the testing laboratory and shall inform the Contractor when samples are to be taken for testing. The Contractor shall forward all test results to the Engineer as soon as they are available.**
  - a. The Testing Laboratory shall conform to the requirements of ASTM E-329 as modified in **780 CMR R1 in the Massachusetts State Building Code**. The State Board of Building Regulations and Standards shall license them.
2. At least one slump test shall be performed from each truckload of concrete. The sample for slump shall be taken from the middle third of a truckload. Air content tests shall be made at the discretion of the Engineer. If the measured slump or air content falls outside the specified limits, a check test shall be made immediately on another portion of the same sample. In the event of a second failure, the concrete shall be considered to have failed the requirements of the specification and shall be immediately removed from the jobsite to be discarded.
3. The Contractor shall advise the Engineer of his readiness to proceed with concrete placement at least one working day prior to each placement. The Engineer will inspect the preparations for concrete, including the preparation of previously placed concrete, the reinforcing, and the alignment and tightness of formwork. No placement shall be made without the prior approval of the Engineer.
4. A minimum of four standard compression test cylinders shall be made and tested for **each 100 cubic yards or fraction thereof** for each type and design strength of concrete from each day's placement of concrete. One cylinder shall be tested at 7 days and two cylinders at 28 days. The fourth cylinder from each set shall be kept until the 28 day test report on the second and third cylinders in the same set has been received. The Engineer reserves the right to require test cylinders to be made for each truckload of concrete if the nature of the project or project experience indicates such additional tests are required for proper control of concrete quality; **such tests will be at the CONTRACTOR'S expense.**
5. The strength level shall be considered satisfactory so long as the averages of all sets of three consecutive strength test results equal or exceed the specified strength  $f'_c$ , and no individual strength test (average of two cylinders) result falls below the specified strength  $f'_c$  by more than 500 psi.
6. In the event the average compressive strength of the two 28 day cylinders do not achieve the required level, the Engineer may elect to test the fourth cylinder immediately or test it after 56 days.

M. Failure to Meet Requirements:

1. The Engineer shall have the right to reject concrete represented by low strength tests or to agree to further testing of the concrete. Rejected concrete shall be promptly removed and replaced with concrete conforming to the specification. The decision of the Engineer as to whether substandard concrete is to be accepted or rejected or additional tests shall be conducted shall be final. All direct and indirect costs associated with further curing and testing of the concrete shall be at the Contractor's expense. All costs associated with removing rejected concrete, placing new concrete, and conducting tests on new concrete shall be at the Contractor's expense.
2. If the Engineer agrees to consider further curing and/or testing of the concrete before making a final decision, the Contractor shall submit a detailed plan to the Engineer, including proposed criteria for acceptance of the concrete. The plan may include additional curing of the concrete, drilling and testing of cores, load testing of the structure, or a combination.
3. If additional curing is permitted before further inspection and testing, the Contractor shall provide any necessary materials and labor to further cure the suspect concrete.
4. If drilling and testing of cores is permitted, the Contractor shall be responsible for obtaining the cores, including provision of ladders, scaffolding, and such incidental equipment as may be required. If additional curing is permitted, cores shall be drilled after the curing period, and shall be in accordance with ASTM Methods C39 and C42. The Contractor shall repair all core holes to the satisfaction of the Engineer.
5. The burden of proof, including, but not limited to the work of cutting and testing the cores, inspection, evaluation, engineering, repair of the holes, or removal and replacement of the concrete in question, and all associated costs therefor, shall be at the expense of the Contractor.
6. If load testing of the concrete is permitted, and if not otherwise indicated, slabs or beams under load test shall be loaded with their own weights plus a superimposed load of 2 times the design live load. The load shall be applied uniformly over the portion being tested in the approved manner and left in position for 24 hours. The structure shall be considered satisfactory if deflection "D" in feet, at end of 24-hour period, does not exceed the following value:

$$D \text{ equals } 0.001 (L \times L)/t$$

in which "L" is span in feet, "t" is depth of slab, or beam in inches. If deflection exceeds "D" in the above formula, the concrete shall be considered

faulty unless within 24 hours after removal of the load, the slab, or beam under test recovers at least 75 percent of the observed deflection.

7. If the suspect concrete still fails to meet specification requirements, the Engineer shall have the right to reject the concrete, have it removed and replaced, in accordance with paragraph 5 above, or to require mechanical strengthening of the concrete to satisfy project requirements. The Contractor shall submit a removal and replacement plan for review by the Engineer.

N. Test for Watertightness:

1. All concrete shall be watertight against leakage or groundwater infiltration. Special care shall be taken in the construction joints and any noticeable leakage or seepage causing wet spots on the concrete walls or slabs shall be repaired by and at the expense of the Contractor and by methods approved by the Engineer. See Section 03150, WATERSTOPS.
2. All liquid holding concrete structures shall be tested for leakage before backfilling and after the concrete has attained the specified minimum 28-day design strength, as indicated by test cylinders.
3. The structure shall be filled with water to the overflow level, allowed to stand for at least 24-hours, and refilled to overflow to begin the test. After 72 hours, the liquid loss per 24 hour period shall be determined, either by measuring the amount required to refill the tank to overflow, by measuring the drop in water level, or by an equivalent procedure approved by the Engineer. Evaporative losses shall be calculated and deducted from the measured loss to determine net liquid loss (leakage). If the leakage per 24-hour period exceeds the allowable, the structure shall be repaired and retested until the leakage falls within the allowable limit.
4. For structures designed to hold water, one twentieth of one percent leakage will be allowed during a 24-hour period. No leakage (zero leakage) will be permitted for structures designed to hold liquid chemicals or fuels.
5. The Contractor shall pay all costs (including water) incurred in the testing for watertightness.
6. The Engineer shall be given a minimum notice of 48 hours prior to commencement of the leakage test.

END OF SECTION

## SECTION 06100

### ROUGH CARPENTRY

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

- A. This Section covers tools, equipment, labor, and materials necessary to perform rough carpentry work complete and miscellaneous carpentry items not specified elsewhere including fasteners and supports.
- B. Nails, screws, bolts, anchors, brackets, and other hardware for fastening and securing items provided under this section of the specification shall be furnished under this section.

##### 1.02 RELATED WORK:

- A. Section 02252, SUPPORT OF EXCAVATION
- B. Section 03300, CAST-IN-PLACE CONCRETE
- C. Section 09900, PAINTING

##### 1.03 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SECTION 01330, SUBMITTALS, SUBMIT THE FOLLOWING:

Certificates of wood treatment upon delivery of treated wood product. Treated wood product shall bear appropriate American Wood Preservers Bureau (AWPB) quality mark.

##### 1.04 DELIVERY:

Lumber, plywood, and other wood material shall be delivered to the job dry, and shall be protected from injury, dirt, dampness, and extreme changes of temperature and humidity at all times.

#### PART 2 - PRODUCTS

##### 2.01 MATERIALS:

###### A. LUMBER:

- 1. The grades of all materials under this section shall be defined by the rules of the recognized associations of lumber manufacturers producing the material specified, but the maximum defects and blemishes permissible in any specified grades shall not exceed the limitations of the American Lumber Standards.

2. Lumber shall bear the grade and trademark of the association under whose rules it is produced, and a mark of mill identification. Lumber shall be of sound stock, thoroughly seasoned, kiln dried to a moisture content not exceeding 15 percent.
3. All lumber for nailers, furring, and blocking shall be seasoned No. 1 Dimension of Common pine, fir, or spruce, S4S.
4. Materials not specifically listed shall be of an accepted grade dictated by good practice.

B. WOOD PRESERVATION TREATMENT:

1. The nailers, blocking, sills, and similar items encased in or in contact with concrete, masonry, or the ground shall be pressure treated with a pentachlorophenol preservative solution. The pentachlorophenol shall meet the requirements of the American Wood-Preserver's Association, AWWA Standard P-8, "Standards for Oil-Borne Preservatives." The solvent carrier shall meet the requirements of AWWA Standard P-9 "Standard for Hydrocarbon Solvents for Oil-Borne Preservatives." The preservative solution shall be equivalent to five percent of pure pentachlorophenol.
2. The treatment shall be applied in accordance with AWWA Standard C-2 (lumber, timber, etc.), C-9 (plywood) or C-28 (lumber treated before laminating). Penetration of pentachlorophenol shall be determined using the penta check method, Section 5, AWWA Standard A-3. Retention of pentachlorophenol shall be a minimum of 0.40 pounds per cubic foot of wood for in ground exposures. The treating company shall furnish a notarized certificate of treatment that indicates all pertinent details of the treatment.
3. Before the preservative treatment is applied, the lumber to be treated shall be sawed to exact lengths required, and bored ready for use in the work so far as practicable, in order to reduce to a minimum cutting or boring of lumber after treatment. Only lumber of the same kind and approximately the same size and seasoning shall be treated in any one charge. All surfaces of treated lumber cut after treatment shall receive two heavy brush coats of pentachlorophenol solution before the lumber is placed in the work.

PART 3 - EXECUTION

3.01 CONSTRUCTION:

- A. Work shall be erected plumb, true and square.
- B. Coordinate delivery and erection of prefabricated components. Field applied items shall be installed in accordance with good trade practices. Cutting and carpentry for other

trades shall be performed. Cut ends of lumber previously treated with preservative specified shall be brush coated with the same material.

END OF SECTION

Document2.

SECTION 07920

JOINT PROTECTION

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. This section covers the sealing of joints designated on the drawings or specified herein, including but not limited to, concrete to concrete, masonry to concrete, structural steel to concrete, structural steel to masonry, and any other metal surfaces butting to another metal, concrete or masonry.
- B. The above-mentioned joints shall be sealed even if not called out on the drawings.
- C. Seal beneath threshold and other items required to be set in caulking compound shall be by the trade installing the item.

1.02 RELATED WORK:

- A. Section 03300, CAST-IN-PLACE CONCRETE

1.03 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 basic designation only.

American Society for Testing and Materials (ASTM)

ASTM C920 Specification for Elastomeric Joint Sealant

ASTM C 1193 Standard Guide for Use of Joint Sealants

ASTM D1667 Specification for Flexible Cellular Materials – Vinyl Chloride  
Polymers and Copolymers (Closed-cell Foam)

United States of America Standards Institute (USA)

USA 116.1 Standard Specification for Polysulfide-Base Sealing Compounds for  
the Building Trade

- B. When reference is made to one of the above standards, the revisions in effect at the time of bid opening shall apply.

1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SECTION 01330  
SUBMITTALS, SUBMIT THE FOLLOWING:

- A. Manufacturer's literature of the materials of this section.

1.05 DELIVERY, STORAGE, AND HANDLING:

- A. Materials shall be delivered to the site in the original, unopened, factory-sealed containers, bearing the manufacturer's label fully identifying the material and the producing company.
- B. Handle materials with care. Do not dump from trucks or delivery vehicles nor handle in any manner likely to cause damage.

1.06 QUALITY ASSURANCE:

- A. Materials shall not be applied in wet weather or to wet or damp surfaces. No work shall be performed when temperature is below 40 degrees Fahrenheit. Surfaces shall not be caulked until thirty days after completion of concrete, masonry work, or patching, whichever is later. At least three good drying days shall immediately precede application. Application shall in each case be in accordance with the instructions of the manufacturer of the material, except as modified herein.
- B. Surrounding areas which are not to be coated shall be completely protected from spray, spattering, or dripping, using drop cloths or other protective measures, as required. Spillage or dripping which occurs shall be immediately and completely removed, leaving no stain. Solvents or cleaning methods shall be those recommended by the manufacturer of the material being used.
- C. Furnish the service of a competent field representative of the approved manufacturer of the sealant. The field representative shall be present at the work site prior to any mixing of components to instruct on application and inspection of procedures and to inspect the finish or the prepared surfaces prior to application of the sealant. The representative shall make at least one additional visit to the site as the work progresses and shall report on each visit to the Contractor and the Engineer, advising as to whether the application is being performed in accordance with this specification and the printed instructions of the manufacturers.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

- A. Sealants and primers for use with sealants shall be as manufactured by J.B. Fred Kuhls, Brooklyn, New York; Minwax Co., Inc., New York, New York; Dewey and Almy Chemical Division of W.R. Grace & Co., Cambridge, Massachusetts; Sonneborn Building Products, New York, New York; or an approved equal product.

2.02 MATERIALS:

- A. Sealants

1. Sealants shall be non-staining materials conforming to the requirements of United States of America Standards Institute "Standard Specification for Polysulfide-Base Sealing Compounds for the Building Trade", USA 116.1. Compound shall be Class A (self-leveling), or Class B (non-sag), as applicable in each case for the joint to be caulked. Color of sealant shall match as closely as possible the color of the surrounding materials, and when used adjacent to masonry work the compound shall match the color of the mortar in the masonry joints. Precise color shall in all cases be subject to the approval of the Engineer.
- B. Joint Cleaner
1. Non-corrosive and non-staining type, recommended by sealant manufacturer and compatible with joint forming materials.
- C. Primer
1. Primer shall be non-staining type as recommended by the manufacturer of the sealant.
- D. Back-Up Material
1. Back-up material for sealer shall be a non-staining, compressible, closed-cell joint filler of polyvinyl chloride, neoprene vinyl, or a similar inert and permanent back-up material approved in advance by the Engineer. Back-up materials containing oil or grease and materials which are not compatible with the primers and caulking compound shall not be used. Tremco Joint Backing and Dow Corning "Ethafoam" are approved back-up materials.
- E. Bond Breaker
1. Bond breaker tape shall be an adhesive-backed glazed butyl or polyethylene tape which will satisfactorily adhere to the premolded joint filler or concrete surface as required. The tape shall be the same width as the joint.
  2. Bond breaker for concrete other than where tape is specifically called for shall be either bond breaker tape or a nonstaining type bond prevention coating such as Williams Tilt-up Compound by Williams Distributors, Inc. Silcoseal 77 by Nox-Crete Incorporated or equal.

### PART 3 - EXECUTION

#### 3.01 EXAMINATION:

- A. Verify that substrate surfaces and joint openings are ready to receive work.
- B. Verify that joint backing and release tapes are compatible with sealant.

#### 3.02 PREPARATION:

- A. Where recommended by the manufacturer of the sealant, primer shall be used before sealant is applied. Copper to be in contact with sealant shall be primed with five-pound cut shellac or as recommended by the sealant manufacturer, before sealant material is applied. Aluminum, stainless steel, and other materials shall have any protective film removed using a cloth dampened with Toluol, Xylol, or other suitable solvent.

### 3.03 APPLICATION:

- A. Sealant shall be mixed and applied in accordance with the manufacturer's printed directions. No materials shall be added to the compound.
- B. Joints and spaces to be caulked shall be clean, dust-free, and dry. Mortar droppings, construction debris, and other foreign matter shall be removed from the joint before it is caulked. Raking out excess mortar in masonry and similar joints which are to be caulked shall be performed by the trade responsible for installing the mortar.
- C. The joint or space to be sealed shall be packed tight with approved filler materials, leaving a space approximately square in cross-section, and in no case deeper than half of its width, to receive the caulking compound. Filler materials shall be sufficiently wider than the joint in which they are used to provide adequate resistance when sealant material is being gunned into the joint.
- D. Sealant shall be applied with a gun, using a nozzle of proper size to fit the joint width, and shall be forced into the joints with sufficient pressure to expel all air and fill the joint solid. Superficial pointing of joints with a skin bead will not be accepted. Sealant shall be uniformly smooth and free from wrinkles and shall have a slightly concave joint profile when dry. Intersections of beads shall form neat miters. Sealant at edges of the joint shall be flush with the edges of the adjacent surfaces. Excess sealant material shall be removed. Improperly filled or finished joints shall be raked out and resealed.
- E. Sealant depth shall not exceed one-half of joint width.
- F. Particular care shall be taken not to soil adjacent surfaces. Spillage or excess material shall be removed immediately, leaving no stain. Masking tape shall be used as required to protect surrounding surfaces and prevent staining. Masking tape shall be removed immediately after tooling of the sealant. Adjacent surfaces soiled by operations under this section shall be cleaned to equal their condition before the start of the caulking work.
- G. Spaces left between walls and elements of roof shall be filled with back-up material inserts and then caulked on both sides.

END OF SECTION

SECTION 09900

PAINTING

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. This Section covers field painting and coating of surfaces, complete. Shop painting of metal items is specified under the applicable item.
- B. A schedule listing the various types of surfaces to be painted and the types of paints to be applied is included herein.
- C. Unless otherwise indicated, the following items shall not be painted:
  - 1. Labels on equipment, such as Underwriters' Laboratories and Factory Mutual, equipment identification, performance rating, and name or nomenclature plates.
  - 2. Moving parts of operating units, exposed bolt threads, mechanical and electrical parts, such as valve and damper operators, linkages, sensing devices, motor and fan shafts.
  - 3. Electrical conduit unless mounted on painted or finished surfaces or exposed in a finished room.
  - 4. Structural steel not exposed to view, and other parts of buildings also not exposed to view.
  - 5. Stainless steel.
  - 6. Concrete.
  - 7. Plumbing fixtures.
  - 8. Fiberglass and polyethylene storage tanks.
  - 9. Uninsulated PVC piping (to be banded only)
  - \* 10. Factory prefinished architectural components.
  - \* 11. Electrical panels and cabinets factory finish painted.

---

\* Except for touch-up painting when required

1.02 RELATED WORK:

1.03 SYSTEM DESCRIPTION:

- A. The term "paint" as used herein includes emulsions, enamels, paints, stains, varnishes, sealers, and other coatings, organic or inorganic, whether used as prime, intermediate, or finish coats.
- B. The Contractor shall do a complete painting job throughout the work in accordance with generally approved modern practices for work of high quality. Unless otherwise specified, all materials and surfaces customarily painted shall be given not less than one shop coat and two field coats or one prime coat and two finish coats, regardless of whether or not the surface to be painted is specifically mentioned.
- C. Paints containing lead shall not be used.
- D. To ensure a satisfactory painting job it is essential that the paints applied in the shop and in the field be mutually compatible. The Contractor shall determine what shop paints have been used and shall verify that field applied paints are compatible therewith.
- E. The colors of finish coatings shall be selected by the Engineer from color chips submitted by the Contractor for review. The color selection shall be in the form of a schedule indicating the colors to be used on the various surfaces. The colors used in the final work shall be in accordance with the color schedule and shall match the selected color chips.
- F. All coating systems used for potable water applications shall be previously approved by the National Sanitation Foundation (N.S.F.) in accordance with Standard 61. Evidence of such approval shall be an approval letter from N.S.F. listing the submitted materials.
- G. Paints submitted shall meet all Federal and State E.P.A. regulations pertaining to volatile organic compounds (VOC) compliance.

1.04 REFERENCES:

- A. The following standards form a part of these specifications, and indicate the minimum standards required:

American Society for Testing and Materials (ASTM)

ASTM     F1869     Moisture Vapor Emission Rate Using Anhydrous Calcium Chloride

1.05 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SECTION 01330  
SUBMITTALS, SUBMIT THE FOLLOWING:

- A. Manufacturer's literature of proposed paints.
- B. Painting schedule.
- C. **Three (3)** sets of color chips for selection of colors.

1.06 DELIVERY AND STORAGE:

- A. Paint shall be delivered to the site in the manufacturer's sealed containers. Each container shall bear the manufacturer's label, listing the brand name, type and color of paint, and instructions for thinning. Thinning shall be done only in accordance with directions of the manufacturer. Job mixing or job tinting may be done when approved by the Engineer and for preparing sample colors.
- B. Painting materials shall be stored and mixed in a single location designated by the Engineer for this purpose. The Contractor shall not use any plumbing fixture or pipe for mixing or for disposal of any refuse. It shall carry all necessary water to its mixing room, and shall dispose of all waste outside of the building in a suitable receptacle. The Contractor will be held responsible for any damage done due to failure to observe these precautions.
- C. The paint storage area shall be kept clean at all times, and any damage thereto or to its surroundings shall be repaired. Any oily rags, waste, etc., shall be removed from the building every night, and every precaution shall be taken to avoid danger of fire.
- D. Heat must be provided in the storage area if paints are to be stored during winter months. The temperature shall be maintained above 40 degrees F. at all times.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. PAINT SCHEDULE:

Except as otherwise indicated, all paint used shall be of the type listed in the schedule below, by Tnemec Company, Inc., or equivalent paints by Sherwin-Williams Company, International Paints, or other approved paint fully equal to paint manufactured by the above named companies. No brand other than those named will be considered for approval unless the brand and type of paint proposed for each item in the following painting schedule are submitted in writing to the Engineer, along with sufficient data supported by certified tests.

PAINT SCHEDULE

<u>Key</u>		<u>Tnemec</u>	<u>Note 1</u>
AGE	Acryli Gloss Enamel	1029 Enduratone	3.5
APE	Acrylic Polyurethane	73 Endura-Shield Enamel	3.0
ABF	Cementitious Block Filler	130 Envirofill	80-100 s.f./gal
BO	Bleaching Oil	Note 5	
CEE	Catalyzed Epoxy	L69F Epoxoline II	4.0
CEM	Catalyzed Epoxy Mastic	27 WB Typoxy	Note 3
CEP	Catalyzed Epoxy Primer	L69F Epoxoline	3.0
EMC	Epoxy Modified Cement	218 Mortar-Clad	Fill/Surface
EP	Epoxy-Polyamide (thinned 30% #4 thinner)	FC 22 Pota-pox	25-30
EPW	Water-based Epoxy Primer	151 Elasto-Grip	1.0-1.5
HGV	High Gloss Varnish		Note 2
HSE	High Solids Epoxy (Minimum 69%)	L69 Epoxy	6.0
MA	Modified Acrylic	115 Uni-bond	3.0
MAE	Modified Acrylic Elastomer	156 Envirocrete	6.0-8.0
MCU	Moisture Cured Urethane	Series 1 - Omnithane	2.5-3.0
MPE	Modified Polyamine Epoxy	Series 435 - Permaglaze	15-20 mils
NE	Novolac Epoxy	282 Tneme-Glaze	7.5
PEF	Polyamine Epoxy Finish	280 Tneme-Glaze	6.0-8.0
PEP	Polyamine Epoxy Primer	201 Epoxoprime	6.0-8.0
PVA	PVA Sealer	151 Elasto Grip	0.75-1.5
PWC	Potable Water Coating	Series FC 22 Pota Pox	25-30
SA	Silicone Aluminum	39-1261 (Note 4)	1.5
VB	Vapor Barrier	262 Elasto Shield	50-100
WP	Wood Primer	151 Elasto-Grip	1.0-1.5
WS	Wood Sealer	Note 2	-

<u>Key</u>		<u>Tnemec</u>	<u>Note 1</u>
Z	Zinc-Rich Primer	90G-1K97 Tneme-Zinc	2.5

- Notes
- 1: Minimum Dry Film Thickness/Coat (mils)
  - 2: Furnished by reputable manufacturer and acceptable to the Engineer.
  - 3: Shall be used as a tie-coat between incompatible paints @ 3.0-4.0 mils.
  - 4: This paint is suitable for temperatures up to 1200°F and must be final cured at 400°F for one hour.
  - 5: Bleaching oil is a translucent gray paint stain with a chemical additive to enhance the natural bleaching tendencies of cedar shingles.

B. PAINTING SCHEDULE:

Paint shall be applied in accordance with the paint key listed on the following schedule and defined in the preceding Paint Schedule:

<u>Item</u>	<u>Field Coats</u>		
	1st	2nd	3 <sup>rd</sup>
<u>Metals:</u>			
Exposed exterior structural steel including monorails and supports	*Z	CEE	APE
Exterior miscellaneous galvanized and nonferrous metals and piping (SP7 required)	CEE	APE	--
Exposed electrical conduit, conduit fittings, outlet boxes	See	Electrical Specifications	

\* Spot Prime

\*\*\*For existing, painted masonry walls, use EPW primer, followed by two coats of MAE.

^ If galvanized metal is provided with a light topcoat sealer, light brush blast surface preparation is required prior to first field coat

B. SPARE PAINT:

1. Furnish to the Owner one unopened gallon of each type and color of paint used on the work.
2. Furnish both components for each type and color of epoxy paints used on the work.

PART 3 - EXECUTION

3.01 SURFACE PREPARATION:

- A. Before any surface is painted, it shall be cleaned carefully of all dust, dirt, grease, loose rust, mill scale, old weathered paint, efflorescence, etc. All necessary special preparatory treatment shall then be applied. Where required, imperfections and holes in surfaces to be painted shall be filled in an approved manner.
- B. Cleaning and painting shall be so programmed that dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- C. Surfaces which have been cleaned, pretreated, or otherwise prepared for painting, shall be painted with the first field coat as soon as practicable after such preparation has been completed, but in any event prior to any deterioration of the prepared surface.
- H. All nonferrous metal surfaces to be painted shall be cleaned of all dirt, grease, oil and other foreign substances uniformly profiled per SSPC SP 7.
- I. All galvanized surfaces to be painted shall be brush blasted to create a uniform surface profile per SSPC SP7.
- J. Before application of the first full field coat, abraded areas of all non-galvanized ferrous metal items having shop coats shall be touched up with paint of the type indicated on the Painting Schedule.
- K. All items of equipment such as motors, pumps, instrumentation panels, electrical switchgear, and similar items, that have been given shop coats, paint filler, enamel or other treatment customary with the manufacturer, shall have, after installation, all scratches and blemishes touch up prior to application of the first field coat. Factory prefinished items not to be field painted shall be touched up with matching paint to repair any areas damaged during installation.
- N. Hardware accessories, machine surfaces, plates, lighting fixtures, and similar items in place prior to cleaning and painting, and not intended to be painted, shall be removed during painting operations and repositioned upon completion of each area or shall otherwise be protected.

### 3.02 APPLICATION:

- A. Paint shall be used and applied as recommended by the manufacturer without being extended or modified, and with particular attention to the correct preparation and condition of surfaces to be painted.
- B. Paint shall be applied only within the temperature range recommended by the manufacturer. Painting of surfaces when they are exposed to the sun shall be avoided.
- C. Paint shall not be applied to wet or damp surfaces and shall not be applied in rain, snow, fog, or mist, or when the relative humidity exceeds 85 percent.

- D. No paint shall be applied when it is expected that the relative humidity will exceed 85 percent or that the air temperature will drop below 40°F within 18 hours after the application of paint. Dew or moisture condensation should be anticipated and if such conditions are prevalent, painting shall be delayed until midmorning to be certain that the surfaces are dry. Further, the days painting should be completed well in advance of the probable time of day when condensation will occur, in order to permit the film an appreciable drying time prior to the formation of moisture.
- E. All paint shall be applied under favorable conditions by skilled painters and shall be brushed out carefully to a smooth, even coating without run or sags. Enamel shall be applied evenly and smoothly. Each coat of paint shall be allowed to dry thoroughly, not only on the surface but also throughout the thickness of the paint film before the next coat is applied. Finish surfaces shall be uniform in finish and color, and free from flash spots and brush marks. In all cases, the paint film produced shall be satisfactory in all respects to the Engineer.
- F. Exposed nails and other ferrous metal or surfaces to be painted with water-thinned paints shall be spot primed with aluminum paints.
- G. In order to provide contrast between successive coats, each coat shall be of such tint as will distinguish it from preceding coats.
- H. The Contractor shall not only protect its work at all times, but shall also protect all adjacent work and materials by the use of sufficient drop cloths during the progress of the work. Upon completion of the work, it shall clean up all paint, spots, oil, and stains from floors, glass, hardware, and similar finished items.
- I. Paint shall be applied so as to obtain coverage per gallon and the dry film thickness recommended by the manufacturer. Dry film thickness readings shall be taken to insure that required thicknesses have been achieved. The Contractor shall record in a manner satisfactory to the Engineer, the quantities of paint used for successive coats on the various parts of the work.
- J. Spraying with adequate apparatus may be substituted for brush application of those paints and in those locations for which spraying is suitable.
- K. If paints are thinned for spraying, the film thickness after application shall be the same as though the unthinned paint were applied by brush. That is, the addition of a thinner shall not be used as a means of extending the coverage of the paint, but the area covered shall be no greater than the area that would have been covered with the same quantity of unthinned paint.
- L. Blast cleaned metal surfaces shall be coated immediately after cleaning, before any rusting or other deterioration or contamination of the surface occurs. Blast cleaned surfaces shall be coated not later than 8 hours after cleaning under ideal conditions or sooner if conditions are not ideal.

- M. The use of carbon dioxide or carbon monoxide emitting heaters is not permitted during the painting operation. Only indirect hot-air systems shall be permitted.

3.05 PARKING LOT LINE PAINTING:

- A. Paint for parking lot lines shall conform to Federal Specification TT-P-115-E Type I. Paint shall be 11-3 PPG Industries, Pittsburgh, PA, Series 6 Tneme-Cryl, Tnemec, St. Louis, MO, or approved equal.
- B. Contractor shall prepare the pavement surface according to the recommendations of the paint manufacturer.
- C. Applied markings shall have clean-cut edges, true and smooth alignment and uniform film thickness of 15 mils,  $\pm 1.0$ .
- D. The Contractor shall be responsible for removing, to the satisfaction of the Engineer, tracing marks, and spilled paint applied in an authorized area.

3.06 CLEANUP:

- A. The Contractor shall at all times keep the premises free from accumulation of waste material and rubbish caused by ITS employees or work. At the completion of the painting, IT shall remove all tools, scaffolding, surplus materials, rubbish from and about the buildings and shall leave its work "broom clean" unless more exactly specified.
- B. The Contractor shall also, upon completion, remove all paint where it has been spilled, splashed, or splattered on all surfaces, including floors, fixtures, equipment, furniture, glass, hardware, etc., leaving the work ready for inspection.

END OF SECTION

.Document1

## SECTION 16010

### ELECTRICAL WORK - GENERAL PROVISIONS

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

- A. The work covered by this section of the specifications consists of furnishing all labor, equipment, appliances, materials and incidentals in connection with the installation of the complete electrical systems as herein specified and as shown on the drawings.
- B. It is not the intent that the drawings shall show every junction box, conduit, wire, fitting, device, accessory, etc., but the Contractor shall be required to furnish without additional expense all transportation, labor and materials necessary to complete the electrical systems in accordance with the best practice of the trade.
- C. Unless otherwise specified, materials of the same classifications, used for the same purpose shall be the product of the same manufacturer.
- D. The work shall include furnishing and installing the following items:
  - 1. Grounding System
  - 2. Raceways
  - 3. Handholes
  - 4. Lighting fixtures
  - 5. Feeder and Branch Circuit Conductors
  - 6. Solderless Lugs and Connectors
  - 7. Empty conduit for future security equipment.
- E. Electric Service
  - 1. Existing electrical is to be extended and utilized to power new lighting.
- F. Interpretation of Drawings
  - 1. The Drawings are diagrammatic only and are not intended to show exact locations of outlets and conduit runs.

2. All three-phase circuits shall be run in separate conduits unless otherwise shown on the Drawings.
3. The Contractor shall verify with the Engineer the exact locations and mounting heights of lighting fixtures, switches and receptacles prior to installation.
4. Any work installed contrary to Contract Documents, or without approval by the Engineer, shall be changed or replaced as required by the Engineer and no extra compensation will be allowed the Contractor for making these changes.
5. The locations of equipment, fixtures, and similar devices shown on the Drawings are approximate only. Exact locations shall be as approved by the Engineer during construction. The Contractor shall obtain in the field all information relevant to the placing of electrical work and in case of any interference with other work, shall proceed as required by the Engineer and shall furnish all labor and materials necessary to complete the work in an approved manner.
6. The number of conductors shown on the Drawings are not necessarily the correct number required. As many conductors as are required in each case shall be installed.
7. The ratings of electrically operated devices together with the size shown for their branch circuit conductors and conduits are approximate only and are indicative of the probable power requirements insofar as can be determined in advance of the purchase of equipment.
8. Unless otherwise specified, all conduits, wires, and cables and the support systems for the conduits and cables that are required to make the electrical connections to equipment shall be furnished and installed. All connections to equipment shall be made as shown, specified, and required and in accordance with the approved shop and setting drawings.
9. The Contractor shall verify, in the field, all measurements necessary for his work and shall assume responsibility for their accuracy.

1.02 LOCAL CONDITIONS:

- A. The Contractor shall provide and place all sleeves for conduits penetrating floors, walls, partitions, etc. The Contractor shall locate all necessary slots for his work and these shall be formed before concrete is poured.
- B. All cutting and patching shall be done in a thoroughly workmanlike manner.

- C. Before submitting proposals, the Contractor is expected to inspect the site and survey the conditions to be encountered in the performance of the work. Failure to familiarize himself with the conditions shall not relieve the Contractor's responsibility for full completion of the work in accordance with the provisions of the Contract.

1.03 PERMITS AND INSPECTION:

- A. Permits, fees and notices shall be in accordance with the General Conditions.
- B. All work shall meet or exceed the latest requirements of all national, state, county, municipal and other authorities exercising jurisdiction over electrical construction at this project.
- C. All required permit and inspection certificates shall be obtained, paid for, and given to the Owner at the completion of the work.

1.04 CODES AND STANDARDS:

- A. Unless indicated or specified otherwise, materials and workmanship shall conform with the latest editions of the following codes, standards and specifications.
  - 1. Massachusetts Electrical Code
  - 2. National Bureau of Standards Handbook H-30 National Electrical Safety Code
  - 3. State and Local Codes, and all other authorities having jurisdiction
  - 4. Underwriter's Laboratories, Inc. (UL)
  - 5. American National Standards Institute, Inc.
  - 6. Institute of Electrical and Electronic Engineers (IEEE)
  - 7. National Electrical Manufacturers Association (NEMA)
  - 8. National Board of Fire Underwriters
  - 9. International Municipal Signal Association (IMSA)
  - 10. Insulated Power Cable Engineers Associated Specifications
  - 11. American Society for Testing Materials Specifications

1.05 REVIEW OF MATERIALS:

- A. Material and Equipment Schedules. As soon as practicable and within thirty days after the date of notice to proceed and before commencement of installation of any materials or equipment, the Contractor shall submit to the Engineer six (6) complete Brochures for approval of materials, fixtures, and equipment to be incorporated in the work. The list shall include manufacturer's name, catalog numbers, cuts, diagrams, drawings, and such other descriptive data as may be required. No consideration will be given to a partial submittal from time to time. Approval of materials will be based on manufacturer's published ratings. Any materials, fixtures and equipment listed that are not in accordance with the specification requirements will be rejected.
- B. Substitutions: Substitution of material or equipment shall be in accordance with the General Conditions.
- C. Shop Drawings. Shop drawings shall be submitted to the Engineer for review in accordance with the Division 1. Shop drawings shall be submitted for, but not limited to the following:
  - 1. Wire and Cable
  - 2. Hangers and Supports
  - 3. Raceways
  - 4. Lighting fixtures and poles
  - 5. Handholes
- D. Submit the following information with all equipment shop drawings.
  - 1. Manufacturer's certified scale drawings, cuts, or catalogs, including installation details and manufacturer's name.
  - 2. Manufacturer's specifications, including certified performance characteristics and capacity ratings.
  - 3. Electrical wiring diagrams and controls, where applicable.
  - 4. Certificate of compliance with Code, where applicable.
  - 5. Detail of all conduit stub-up with conduit size and dimensions.

- E. Equipment shop drawings and wiring diagrams must be prepared specifically for this installation. Standard factory wiring diagrams with a revision marked in ink for this installation will be accepted.
- F. All control and wiring diagrams shall be complete with the following description:
  - 1. Sequence of operation
  - 2. Sequence of interlocking
  - 3. Legend
  - 4. Wiring Numbers
- G. All equipment shop drawings shall be properly identified and indicate the Article number of the specifications or the Drawing number which applies to the submitted item.
- H. Shop drawings for the items listed above shall be submitted for approval in accordance with the preceding paragraphs. The Engineer, however, reserves the right to require submittal of shop drawings on any other material or equipment to be installed under this Section not specifically listed above.

1.06 MINOR DEVIATIONS:

- A. The work as shown on the drawings is diagrammatic and is intended to show the work included and the arrangement of the various systems.
- B. It is not intended that the accompanying plans and specifications cover every detail of the required installation. Furnish and install equipment, materials and labor as shown or specified, as are usually furnished, or as are needed to make a complete and satisfactory operating installation, whether mentioned or not, omitting only those items which are specifically excluded.
- C. Locations and mounting heights of equipment and/or devices as shown are approximately correct. The Engineer reserves the right to relocate any equipment or device prior to actual installation at no extra cost to the Owner.
- D. No deviation from layout shall be made without written approval from the Engineer.

1.07 TEMPORARY LIGHT AND POWER:

- A. The Contractor shall provide temporary light and power and pay all energy charges as described in Division 1.

1.08 ELECTRICAL REFERENCE SYMBOLS:

- A. Symbols shown on the drawings shall approximate location of fixtures, outlet boxes, and conduit runs, and other equipment, unless otherwise detailed. The exact location shall be governed by structural conditions and obstructions. This is not to be construed to permit redesigning systems. All outlets shall be interconnected as shown on the drawings. Locate and install all boxes and equipment where they will be readily accessible.

1.09 PHASE IDENTIFICATION:

- A. The entire system of wiring shall be phased by color code as follows:
  - 1. Wires No. 6 AWG and smaller shall have a continuous colored outer covering.
  - 2. Wires larger than No. 6 AWG shall be identified at all points of termination by gummed tape, plastic tape, etc., applied to the wire.
  - 3. Bus bars in motor control centers and panelboards shall be properly identified by color as herein specified.
  - 4. Code colors for 120/208 volt systems shall be:
    - a. Phase A - Black
    - b. Phase B - Red
  - 5. Neutral wires shall be white or grey.
  - 6. Equipment ground wires shall be green.
  - 7. The same colors shall be used for the same phases throughout the entire project.

1.10 PROTECTION AND CLEANING OF EQUIPMENT:

- A. All electrical equipment, upon receipt, shall be adequately stored and protected from damage.
- B. After installation, all electrical equipment shall be protected to prevent damage during the construction period. Openings in conduits and boxes shall be closed to prevent entrance of foreign materials.
- C. The interior of boxes and cabinets shall be left clean. Exposed surfaces shall be cleaned and plate surfaces polished.

1.11 OPERATION AND MAINTENANCE MANUALS:

- A. The Contractor shall furnish the Owner with three (3) copies of complete operating and maintenance manuals. Manuals shall include all equipment, maintenance instruction, parts list, warranties, schematic diagrams of control systems, and lubrication charts.
- B. Manuals shall contain only that information which specifically applies to this project, and all unrelated material shall be deleted. During the instruction period, herein specified, this manual shall be used and explained. Each copy of manual shall be clearly indexed and include a directory of all subcontractors and maintenance contractors, indicate the area of their responsibility, and list the name and telephone numbers of the responsible member of each organization. This material shall have a clear plastic protective shield over each sheet of data.
- C. Each manual shall be bound in an expandable plastic covered hard bound binder. Binders shall be three (3) straight post type or ring type binders. The manual's front cover and side cover shall be stamped "Operation and Maintenance Manual -- Electrical Systems" along with the project title.

1.12 OPERATING AND MAINTENANCE INSTRUCTIONS:

- A. A competent Engineer shall be provided by the Contractor to instruct operating personnel in the operation and maintenance of equipment and systems.

1.13 SPARE PARTS DATA:

- A. The Contractor shall furnish a complete list of recommended spare parts and supplies for the equipment furnished with current unit prices and source of supply.

1.14 TESTS:

- A. The Electrical Subcontractor shall perform all tests at the completion of the work and the results furnished to the Owner and Engineer in writing. Tests shall include, but not be limited to: all systems test free of shorts or grounds, proper neutral connections, ground system resistance, secondary voltages at main distribution panel, power panels and lighting panels, all lighting fixtures with lamps in place for 10 hours.
- B. Upon completion of all work, the Electrical Subcontractor shall furnish, in duplicate, certificates of inspections from all inspectors and authorities having jurisdiction, notarized letters from the manufacturers stating that authorized Factory Engineers or agents have inspected and tested the installation of their respective systems and found same to be in satisfactory operating condition.

- C. Furnish all labor, material, instruments, supplies and services and bear all costs for the accomplishment of the tests.

1.15 GUARANTEE:

- A. The Contractor shall guarantee equipment and performance of the installation and equipment in accordance with the GENERAL CONDITIONS.
- B. Lamps shall be furnished and installed in each lighting fixture as soon as fixtures are properly hung. Replace all lamps that fail within one year after final acceptance at no additional cost. If the Contractor fails to replace lamps during the guarantee period, after a second request the Owner may replace lamps and back-charge Contractor.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. The materials used in all systems shall be new, unused and as hereinafter specified. All materials where not specified shall be of the very best of their respective kinds. Samples of materials or manufacturer's specification shall be submitted for approval as required by the Engineer.
- B. Materials and equipment used shall be U.L. listed wherever such approved materials and equipment is available.
- C. Electrical equipment shall at all times during construction be adequately protected against mechanical injury or damage by water. If any apparatus has been damaged, such damage shall be repaired by the Contractor at his cost and expense. If any apparatus has been subject to possible damage by water, it shall be thoroughly dried out and put through such special tests as required by the Engineer, at the cost and expense of the Contractor, or shall be replaced by the Contractor at his own expense.

PART 3 EXECUTION

3.01 INSTALLATION

- A. All work shall be executed in full accordance with the National Electrical Code and local rulings. Should any work be performed contrary to said rulings, ordinances and regulations, this Contractor shall bear full responsibility for such violations and assume all costs arising therefrom.

- B. Load Balance. Check the load balance on the phases of the various systems and reconnect where necessary as approved by the Engineer to provide equal division of the loads between the phases of the various systems.
- C. Before starting the work, confer with all other trades relative to the location of pipes, and apparatus or fixtures to be installed by them and select locations for the work which will avoid possible conflicts with the work of other trades involved. All differences or conflicting conditions concerning the work shall be called to the attention of the Engineer for adjustment before starting work. For such work performed or materials installed in violation of the above clause the work shall be readjusted to the complete satisfaction of the Engineer at the sole expense of the Electrical Subcontractor.
- D. Cleanup
1. This Contractor shall cooperate with other workmen and with the General Contractor in the daily removal of debris from the work site.
  2. This Contractor shall leave "broom clean" all areas where he has interrupted or completed his work.
  3. He shall cooperate with the General Contractor in good housekeeping procedures.
  4. At the completion of his work, prior to the final inspection, this Contractor shall clean all devices, plates, fixtures, glassware, switches, cabinets, exposed conduits, fittings, etc. and shall have the premises in a thoroughly clean condition.

END OF SECTION

## SECTION 16050

### BASIC ELECTRICAL MATERIALS AND METHODS

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

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

##### 1.02 SUMMARY

- A. This Section includes the following:
  - 1. Raceways.
  - 2. Building wire and connectors.
  - 3. Supporting devices for electrical components.
  - 4. Electrical identification.
  - 5. Cutting and patching for electrical construction.
  - 6. Touchup painting.

##### 1.03 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. FMC: Flexible metal conduit.
- C. IMC: Intermediate metal conduit.
- D. LFMC: Liquidtight flexible metal conduit.
- E. RNC: Rigid nonmetallic conduit.
- F. RSC: Rigid Steel Conduit galvanized

##### 1.04 SUBMITTALS

- A. Product Data: conduit, wire, lighting fixtures, pole bases and handholes
  
- B. Shop Drawings: Electrical equipment.

- C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

#### 1.05 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

#### 1.06 COORDINATION

- A. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work.
- B. Coordinate electrical service connections to components furnished by utility companies.
  - 1. Coordinate installation and connection of exterior underground distribution.
  - 2. Comply with requirements of authorities having jurisdiction.
- C. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.

### PART 2 - PRODUCTS

#### 2.01 RACEWAYS

- A. EMT: ANSI C80.3, zinc-coated steel, with set-screw or compression fittings.
- B. FMC: Zinc-coated steel.
- C. IMC: ANSI C80.6, zinc-coated steel, with threaded fittings.
- D. RSC: Zinc-coated steel.
- E. LFMC: Zinc-coated steel with sunlight-resistant and mineral-oil-resistant plastic jacket.
- F. RNC: NEMA TC 2, Schedule 40 PVC, with NEMA TC3 fittings.
- G. Raceway Fittings: Specifically designed for the raceway type with which used.

#### 2.02 CONDUCTORS

- A. Conductors, No. 10 AWG and Smaller: Solid or stranded copper.

- B. Conductors, Larger Than No. 10 AWG: Stranded copper.
- C. Insulation: Thermoplastic, rated at 75 deg C minimum.
- D. Wire Connectors and Splices: Units of size, ampacity rating, material, type, and class suitable for service indicated.

#### 2.03 SUPPORTING DEVICES

- A. Material: Cold-formed steel, with corrosion-resistant coating acceptable to authorities having jurisdiction.
- B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.
- C. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.
- D. Expansion Anchors: Carbon-steel wedge or sleeve type.
- E. Toggle Bolts: All-steel springhead type.

#### 2.04 ELECTRICAL IDENTIFICATION

- A. Identification Devices: A single type of identification product for each application category. Use colors prescribed by ANSI A13.1, NFPA 70, and these Specifications.
- B. Raceway and Cable Labels: Comply with ANSI A13.1, Table 3, for minimum size of letters for legend and minimum length of color field for each raceway and cable size.
  - 1. Type: Pretensioned, wraparound plastic sleeves. Flexible, preprinted, color-coded, acrylic band sized to suit the diameter of the item it identifies.
  - 2. Type: Preprinted, flexible, self-adhesive, vinyl. Legend is over-laminated with a clear, weather- and chemical-resistant coating.
  - 3. Color: Black letters on orange background.
  - 4. Legend: Indicates voltage.
- C. Colored Adhesive Marking Tape for Raceways, Wires, and Cables: Self-adhesive vinyl tape, not less than 1 inch wide by 3 mils thick.
- D. Underground Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape with the following features:
  - 1. Not less than 6 inches wide by 4 mils thick.
  - 2. Compounded for permanent direct-burial service.
  - 3. Embedded continuous metallic strip or core.
  - 4. Printed legend that indicates type of underground line.

- E. Tape Markers for Wire: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.
- F. Color-Coding Cable Ties: Type 6/6 nylon, self-locking type. Colors to suit coding scheme.

## 2.05 CONCRETE BASES

- A. Concrete Forms and Reinforcement Materials: As specified in Division 3 Section "Cast-in-Place Concrete."
- B. Concrete: 3000-psi, 28-day compressive strength as specified in Division 3 Section "Cast-in-Place Concrete."

## 2.06 TOUCHUP PAINT

- A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.
- B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

## PART 3 - EXECUTION

### 3.01 ELECTRICAL EQUIPMENT INSTALLATION

- A. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.
- B. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.

### 3.02 RACEWAY APPLICATION

- A. Use the following raceways for outdoor installations:
  - 1. Exposed: RSC.
  - 2. Concealed: RSC.
  - 3. Underground, Single Run: RNC.
  - 4. Underground, Grouped: RNC.
  - 5. Underground Security: HDPE SDR9
  - 6. Boxes and Enclosures: NEMA 250, Type 3R or Type 4.

### 3.03 RACEWAY AND CABLE INSTALLATION

- A. Install raceways and cables at least 6 inches away from heat generating equipment.
- B. Use temporary raceway caps to prevent foreign matter from entering.
- C. Make conduit bends and offsets so ID is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.
- D. Use raceway and cable fittings compatible with raceways and cables and suitable for use and location.
- E. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of the pull wire.
- F. Install signal system raceways, 2-inch trade size and smaller, in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements, in addition to requirements above.

### 3.04 WIRING METHODS FOR POWER AND LIGHTING

- A. Feeders: Type THHN/THWN insulated conductors in raceway.
- B. Underground Feeders and Branch Circuits: Type THWN or single-wire, Type UF insulated conductors in raceway.
- C. Branch Circuits: Type THHN/THWN insulated conductors in raceway.
- D. Branch Circuits: Type THW or THHN/THWN insulated conductors in raceway where exposed.
- E. Branch Circuits: Type THW or THHN/THWN insulated conductors in raceway where exposed.
- F. Remote-Control Signaling and Power-Limited Circuits: Type THHN/THWN insulated conductors in raceway for Classes 1, 2, and 3, unless otherwise indicated.

### 3.05 WIRING INSTALLATION

- A. Install splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than un-spliced conductors.
- B. Connect outlet and component connections to wiring systems and to ground. Tighten electrical connectors and terminals, according to manufacturer's published torque-

tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

### 3.06 ELECTRICAL SUPPORTING DEVICE APPLICATION

- A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.
- B. Dry Locations: Steel materials.
- C. Support Clamps for PVC Raceways: Click-type clamp system.
- D. Selection of Supports: Comply with manufacturer's written instructions.
- E. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 200-lb design load.

### 3.07 SUPPORT INSTALLATION

- A. Install support devices to securely and permanently fasten and support electrical components.
- B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.
- C. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.
- D. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.

### 3.08 IDENTIFICATION MATERIALS AND DEVICES

- A. Install at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated in the Contract Documents or required by codes and standards. Use consistent designations throughout Project.
- C. Self-Adhesive Identification Products: Clean surfaces before applying.
- D. Identify raceways and cables with color banding as follows:

1. Bands: Pretensioned, snap-around, colored plastic sleeves or colored adhesive marking tape. Make each color band 2 inches wide, completely encircling conduit, and place adjacent bands of two-color markings in contact, side by side.
  2. Band Locations: At changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
  3. Colors: As follows:
    - a. Telecommunication/Security System: Green and yellow.
- E. Tag and label circuits designated to be extended in the future. Identify source and circuit numbers in each cabinet, pull and junction box, and outlet box. Color-coding may be used for voltage and phase identification.
- F. Install continuous underground plastic markers during trench backfilling, for exterior underground power, control, signal, and communication lines located directly above power and communication lines. Locate 6 to 8 inches below finished grade. If width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches, overall, use a single line marker.
- G. Color-code 208/120-V system secondary service, feeder, and branch-circuit conductors throughout the secondary electrical system as follows:
1. Phase A: Black.
  2. Phase B: Red.
  3. .

### 3.09 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger, in both directions, than supported unit. Follow supported equipment manufacturer's anchorage recommendations and setting templates for anchor-bolt and tie locations, unless otherwise indicated. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 3 Section "Cast-in-Place Concrete."

### 3.10 FIELD QUALITY CONTROL

- A. Inspect installed components for damage and faulty work, including the following:
1. Raceways.
  2. Building wire and connectors.
  3. Supporting devices for electrical components.
  4. Electrical identification.
  5. Concrete bases.
  6. Cutting and patching for electrical construction.
  7. Touchup painting.

### 3.11 REFINISHING AND TOUCHUP PAINTING

- A. Refinish and touch up paint. Paint materials and application requirements as recommended by manufacturers.
  - 1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
  - 2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
  - 3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
  - 4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

### 3.12 CLEANING AND PROTECTION

- A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.
- B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 16123  
CONDUCTORS AND CABLES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

1.03 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Qualification Data: For testing agency.
- C. Field Quality-Control Test Reports: From a qualified testing and inspecting agency engaged by Contractor.

1.04 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Testing agency as defined by OSHA in 29 CFR 1910.7 or a member company of the International Electrical Testing Association and that is acceptable to authorities having jurisdiction.
  - 1. Testing Agency's Field Supervisor: Person currently certified by the International Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NFPA 70.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for 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, the manufacturers specified.
  - 2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

### 2.02 CONDUCTORS AND CABLES

- A. Available Manufacturers:
  - 1. Alcan Aluminum Corporation; Alcan Cable Div.
  - 2. American Insulated Wire Corp.; a Leviton Company.
  - 3. General Cable Corporation.
  - 4. Senator Wire & Cable Company.
  - 5. Southwire Company.
- B. Refer to Part 3 "Conductor and Insulation Applications" Article for insulation type, cable construction, and ratings.
- C. Conductor Material: Copper, solid conductor for No. 10 AWG and smaller, stranded for No. 8 AWG and larger.
- D. Conductor Insulation Types: Type THHN-THWN, XHHW, UF complying with NEMA WC 5 or 7.

### 2.03 CONNECTORS AND SPLICES

- A. Available Manufacturers:
  - 1. AFC Cable Systems, Inc.
  - 2. AMP Incorporated/Tyco International.
  - 3. Hubbell/Anderson.
  - 4. O-Z/Gedney; EGS Electrical Group LLC.
  - 5. 3M Company; Electrical Products Division.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

## PART 3 - EXECUTION

### 3.01 CONDUCTOR AND INSULATION APPLICATIONS

- A. Exposed Feeders: Type THHN-THWN, single conductors in raceway
- B. Exposed Branch Circuit: Type THHN-THWN, single conductors in raceway.
- A. Underground Feeders and Branch Circuits: Type THHN-THWN, single conductors in raceway.

### 3.02 INSTALLATION

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means; including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.
- E. Support cables according to Division 16 Section "Basic Electrical Materials and Methods."
- F. Identify and color-code conductors and cables according to Division 16 Section Basic Electrical Materials and Methods.

### 3.03 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
  - 1. Use oxide inhibitor in each splice and tap conductor if copper to existing aluminum conductors is required.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches of slack.

### 3.04 FIELD QUALITY CONTROL

D. Testing: Perform the following field quality-control testing:

1. After installing conductors and cables and before electrical circuitry has been energized, test for compliance with requirements.
2. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.

E. Test Reports: Prepare a written report to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

END OF SECTION

SECTION 16130  
RACEWAYS AND BOXES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.
- B. Related Sections include the following:
  - 1. Division 16 Section "Basic Electrical Materials and Methods" for supports, anchors, and identification products.

1.03 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. ENT: Electrical nonmetallic tubing.
- C. FMC: Flexible metal conduit.
- D. IMC: Intermediate metal conduit.
- E. LFMC: Liquidtight flexible metal conduit.
- F. LFNC: Liquidtight flexible nonmetallic conduit.
- G. RNC: Rigid nonmetallic conduit.
- H. RSC: Rigid Steel Conduit.

1.04 SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

- B. Shop Drawings: Show fabrication and installation details of components for raceways, fittings, boxes, enclosures, and cabinets.
- C. Shop Drawings: Signed and sealed by a qualified professional engineer.
  - 1. Design Calculations: Calculate requirements for selecting seismic restraints.
  - 2. Detail assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

#### 1.05 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

### PART 2 - PRODUCTS

#### 2.01 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for 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, the manufacturers specified.
  - 2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

#### 2.02 METAL CONDUIT AND TUBING

- A. Available Manufacturers:
  - 1. AFC Cable Systems, Inc.
  - 2. Alflex Inc.
  - 3. Grinnell Co./Tyco International; Allied Tube and Conduit Div.
  - 4. LTV Steel Tubular Products Company.
  - 5. Manhattan/CDT/Cole-Flex.
  - 6. O-Z Gedney; Unit of General Signal.
  - 7. Wheatland Tube Co.
- B. Rigid Steel Conduit: ANSI C80.1.

- C. Aluminum Rigid Conduit: ANSI C80.5.
- D. IMC: ANSI C80.6.
- E. Plastic-Coated Steel Conduit and Fittings: NEMA RN 1.
- F. Plastic-Coated IMC and Fittings: NEMA RN 1.
- G. EMT and Fittings: ANSI C80.3.
  - 1. Fittings: Compression type.
- H. FMC: Zinc-coated steel.
- I. LFMC: Flexible steel conduit with PVC jacket.
- J. Fittings: NEMA FB 1; compatible with conduit and tubing materials.

## 2.03 NONMETALLIC CONDUIT AND TUBING

- A. Available Manufacturers:
  - 1. American International.
  - 2. Anamet Electrical, Inc.; Anaconda Metal Hose.
  - 3. Certainteed Corp.; Pipe & Plastics Group.
  - 4. Condux International.
  - 5. Electri-Flex Co.
  - 6. RACO; Division of Hubbell, Inc.
  - 7. Spiralduct, Inc./AFC Cable Systems, Inc.
  - 8. Thomas & Betts Corporation.
- B. ENT: NEMA TC 13.
- C. RNC: NEMA TC 2, Schedule 40 and Schedule 80 PVC.
- D. ENT and RNC Fittings: NEMA TC 3; match to conduit or tubing type and material.
- E. LFNC: UL 1660.

## 2.04 BOXES, ENCLOSURES, AND CABINETS

- A. Available Manufacturers:
  - 1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
  - 2. Emerson/General Signal; Appleton Electric Company.
  - 3. Hoffman.
  - 4. Hubbell, Inc.; Killark Electric Manufacturing Co.

5. O-Z/Gedney; Unit of General Signal.
  6. RACO; Division of Hubbell, Inc.
  7. Robroy Industries, Inc.; Enclosure Division.
  8. Spring City Electrical Manufacturing Co.
  9. Thomas & Betts Corporation.
- B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.
  - C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover.
  - D. Nonmetallic Outlet and Device Boxes: NEMA OS 2.
  - E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
  - F. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.
  - G. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.
    1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
    2. Nonmetallic Enclosures: Plastic, finished inside with radio-frequency-resistant paint.

## 2.05 FACTORY FINISHES

- A. Finish: For raceway, enclosure, or cabinet components, provide manufacturer's standard paint applied to factory-assembled surface raceways, enclosures, and cabinets before shipping.

## PART 3 - EXECUTION

### 3.01 RACEWAY APPLICATION

- A. Outdoors:
  1. Exposed: RSC.
  2. Concealed: RSC.
  3. Underground, Single Run: RNC.
  4. Underground, Grouped: RNC.
  5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
  6. Boxes and Enclosures: NEMA 250, Type 3R or 4.
- B. Minimum Raceway Size: 1/2-inch trade size.

- C. Raceway Fittings: Compatible with raceways and suitable for use and location.
  - 1. Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
  - 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduits.
- D. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.
- E. Do not install aluminum conduits embedded in or in contact with concrete.

### 3.02 INSTALLATION

- A. Complete raceway installation before starting conductor installation.
- B. Support raceways as specified in Division 16 Section "Basic Electrical Materials and Methods."
- C. Install temporary closures to prevent foreign matter from entering raceways.
- D. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above the finished slab.
- E. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated.
- F. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.
  - 1. Run parallel or banked raceways together on common supports.
  - 2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
- G. Join raceways with fittings designed and approved for that purpose and make joints tight.
  - 1. Use insulating bushings to protect conductors.
- H. Tighten set screws of threadless fittings with suitable tools.
- I. Terminations:

1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
  2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.
- J. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.
- K. Signal System Raceways, 2-Inch Trade Size and Smaller: In addition to above requirements, install raceways in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.
- L. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
1. Where conduits pass from warm to cold locations.
  2. Where otherwise required by NFPA 70.
- M. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.
- N. Flexible Connections: Use maximum of 72 inches of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations. Install separate ground conductor across flexible connections.

### 3.03 PROTECTION

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
  2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

### 3.04 CLEANING

- A. After completing installation of exposed, factory-finished raceways and boxes, inspect exposed finishes and repair damaged finishes.

END OF SECTION