



## **SECTION 312000**

### **EARTHWORK**

#### **PART 1 - GENERAL**

##### **1.01 GENERAL PROVISIONS**

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION I – GENERAL REQUIREMENTS, which are hereby made a part of this Section of Specifications.
- B. Equality of material, article, assembly or system other than those named or described in this Section shall be determined in accordance with the provisions of the CONTRACT AND GENERAL CONDITIONS.

##### **1.02 DESCRIPTION OF WORK**

- A. Work included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
  - 1. Excavating, backfilling and compacting the Site as required to complete the Work shown on the Drawings and as specified herein, including selective excavation as required to expose and complete remove building foundations, slabs on grade, utilities, tunnels, and other site features and appurtenances.
  - 2. Removing, handling, and disposing any objectionable materials including wire, metals, and organic and undesirable soils or debris.
  - 3. Compacting of soil materials utilizing approved methods and equipment to achieve the minimum specified soil density.
  - 4. Cutting, capping, and related removal of underground utilities.
  - 5. Limited site survey of terminations points for utilities and final grades.

##### **1.03 RELATED WORK**

- A. Section 013543 – ENVIRONMENTAL PROTECTION PROCEDURES
- B. Section 015000 – TEMPORARY FACILITIES AND CONTROLS
- C. Section 026100 – EXCAVATED SOIL AND MATERIAL MANAGEMENT PLAN
- D. Section 311000 – SITE PREPARATION
- E. Section 312319 - DEWATERING
- F. Section 312500 – EROSION AND SEDIMENTATION CONTROLS



#### 1.04 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referenced in text by basic designation only. The list provided below is not intended to be all inclusive of each regulation prevailing over the work. The latest version of the document listed shall govern the work performed.

- A. American Society of Testing Materials (ASTM)
1. ASTM D 2487, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
  2. ASTM D1556 – 07, Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
  3. ASTM D 1557, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort.
  4. ASTM D3017, Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
  5. ASTM C33 / C33M – 08, Standard Specification for Concrete Aggregates.
  6. ASTM D422 – 63(2007), Standard Test Method for Particle-Size Analysis of Soils.
  7. ASTM D6938 – 08a, Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
  8. ASTM D4318 – 05, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils ASTM E329 - 08 Standard Specification for Agencies Engaged in Construction Inspection and/or Testing.
  9. ASTM E329 – 08, Standard Specification for Agencies Engaged in Construction Inspection and/or Testing.
  10. ASTM D412 – 06ae2, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension.
  11. ASTM D2240 – 05, Standard Test Method for Rubber Property—Durometer Hardness.
- B. Massachusetts Department of Environmental Protection, 310 CMR 19.000, Massachusetts Solid Waste Management Regulations.



# HARVARD

## Campus Services

ENVIRONMENTAL HEALTH & SAFETY

- C. Massachusetts Department of Environmental Protection, 310 CMR 40.0000, Massachusetts Contingency Plan.
- D. Harvard University, Construction Environmental Health and Safety Standard.

### 1.05 DEFINITIONS

- A. Harvard Project Manager: A representative of the Property Owner, President and Fellows of Harvard College
- B. Engineer: Authorized representative of the Harvard Project Manager. Engineer shall be the Architect or Designer of Record for the project.
- C. ACM: Asbestos Containing Material
- D. ASTM – American Society for Testing and Materials
- E. Backfill: Soil materials used to raise subgrade elevations to existing grades.
- F. Borrow: Satisfactory soil imported from off-site for use as backfill.
- G. Contractor : Refers to the General Contractor and/or Subcontractor responsible for the Work under contract with Project Manager
- H. EPA: United States Environmental Protection Agency
- I. Excavation: Removal of material encountered below subgrade elevations and to lines and dimensions indicated.
  - 1. Bulk Excavation: Excavation more than 10 feet width and more than 30 feet in length.
  - 2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Engineer shall be without additional compensation.
- J. LSP: Licensed Site Professional
- K. MCP: Massachusetts Contingency Plan
- L. Mass DEP: Massachusetts Department of Environmental Protection
- M. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other fabricated stationary features constructed above or below the ground surface scheduled for removal as shown on the Drawings.
- N. Subgrade: Surface or elevation remaining after completing excavation, or top surface of backfill.
- O. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings except as otherwise directed herein.



P. TEM: Transmission Electron Microscopy

#### 1.06 SUBMITTALS

- A. The Contractor shall submit each item in this Section according to the Conditions of the Contract and Section 013300, for information only, unless otherwise indicated.
- B. The Contractor shall provide a Stockpile Management Plan that describes procedures for tracking the location and contents of any stockpile on the Site or off-site at an approved Harvard facility. The Plan shall provide, at a minimum, the following:
1. Proposed locations for stockpiles and proposed contents (i.e., processed rubble, topsoil, etc.)
  2. Procedures for identifying stockpiles (i.e., numbering, signage, etc.)
  3. Procedures for daily monitoring of the stockpiles with regard to siltation controls and covering tarps.
  4. Procedures for providing environmental protection Section 013543 – Environmental Protection.
- C. The Contractor shall, prior to the delivery of any incoming backfill material to be used at the project site, provide the contact information for the facility in which the backfill originates and the results of analytical testing of representative samples of the material for review and acceptance. The Contractor shall demonstrate that the incoming backfill material is naturally deposited soil, meets Harvard's soil Group I-1 and I-2 categories, and the analyte concentrations of the off-site backfill do not exceed the Method 1, S-1 concentrations of the MCP. For stone that is equal to or larger than ¼" inch diameter and originating from a virgin borrow source, only the name, address, and a statement that the site is not an environmentally impacted site will be required. Stone dust from bedrock borrow sources in areas of naturally occurring elevated Arsenic (typically central and northern Massachusetts) will require further review by EH&S.
1. The Contractor shall provide the name and address of the source from which the backfill originates, type and operation of the facility where the backfill originates, volume of soil coming from each source area, and the name of the qualified firm and analytical laboratory that performed the material sampling and testing.
  2. The Contractor shall provide soil analyses for the following parameters: MCP 14 metals; TCLP for any RCRA metal with a total concentration in excess of the "20X rule"; Extractable and Volatile Petroleum Hydrocarbons (EPH/VPH) by Mass DEP methodologies; Volatile and Semi-Volatile Organic Compounds (by EPA Method 8260B with Method 5035 and EPA Method 8270, respectively), herbicides/pesticides and PCBs. The soil shall not contain any visual evidence of debris or potential asbestos containing materials (ACMs).
  3. The Contractor shall collect one soil sample for analysis stated above (1.06 C (2)) from each borrow pit identified for backfill material. For project extending beyond one year, annual analysis of the borrow pit soil shall be required.
  4. For non-borrow pit source material, the Contractor shall test the backfill at a frequency of one sample for every 500 cubic yards (cy) for the first 5,000 cy of material, and then one sample per 1,000 cy of material thereafter for the analysis stated above. The Contractor shall demonstrate that the soil meets Harvard's



- soil Group I-1 and I-2 and the analyte concentrations of the backfill soil do not exceed the Method 1,S-1 concentrations of the MCP.
5. No backfill will be accepted from off-site sources that are now or were formerly listed as sites regulated under the MCP, unless approved by the Project Owner's LSP, and under other corrective actions including CERCLA and RCRA.
  6. Urban backfill will not be accepted from off-site sources.
  7. Test results must be submitted a minimum of four (4) weeks prior to use of borrow to provide for data review by Owner.
  8. The Contractor shall provide an LSP opinion indicating the backfill material meets the criteria established above.
- D. The Contractor shall provide Material Test Reports from a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
1. Classification according to ASTM D 2487 of each on-site and borrow soil material proposed for backfill.
  2. Laboratory compaction curve according to ASTM D 1557 for each onsite and borrow soil material proposed for backfill.
- E. The Contractor shall provide pre-excavation documentation identifying existing conditions of adjoining construction and site improvements by means of video, photograph, and written documentation, including finish surfaces that might be misconstrued as damage caused by earthwork operations. Submit before earthwork begins. Maintain a catalog of up-to-date photographs at the Site.
- F. The Contractor shall prior to starting backfilling work, submit performance data for the compacting equipment to be utilized. The maximum thickness of material lifts shall be 12 inches and will be verified by field compaction testing. Sufficient leveling and compaction equipment shall be provided to do the work of spreading and compaction of the material promptly after it has been deposited. When such equipment is inadequate to spread and compact the material, the Contractor shall reduce the rate of excavation and placing of the backfill or employ additional equipment.
- G. The Contractor shall provide a fifty pound sample of every source material to the Engineer. The Engineer may perform confirmatory compaction testing if directed by Harvard. The Contractor shall pay for this testing.
- H. The Contractor shall submit the qualifications of the Registered Professional Land surveyor to be hired to perform various portions of the Work, as applicable.
- I. The Contractor shall provide documentation verifying the accuracy of field engineering work. Submit five (5) stamped copies of final record drawings of field engineering layouts and as-built survey. All drawings shall be stamped and signed by a Massachusetts Registered Professional Engineer in the appropriate discipline. Submit an electronic file (.dwg format) on CD of all final plans.



1.07 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Harvard or others unless permitted in writing by Engineer and then only after arranging to provide temporary utility services according to requirements indicated.
  - 1. Notify Harvard not less than five (5) calendar days in advance of proposed utility interruptions.
  - 2. Do not proceed with utility interruptions without the Harvard Project Manager's written permission.
  - 3. Contact utility-locator service for area where Project is located before excavating.
- B. Demolish and completely remove from the Site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

1.08 QUALITY ASSURANCE

- A. Employ a qualified surveyor, registered with the Commonwealth of Massachusetts as a Professional Land Surveyor, as required for the particular characteristics of the work being performed
- B. Tests and analysis of geotechnical properties of the soil material shall be performed in accordance with ASTM D422, ASTM D1557, ASTM D6938, and ASTM D4318. Engage a qualified independent geotechnical engineering testing agency to perform field quality control testing qualified according to ASTM E 329.
- C. Allow testing agency to inspect and test subgrades and each backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.
- D. If tests indicate materials do not meet specified requirements, the Contractor shall identify an alternative borrow source, test the new material, and submit results to the Engineer at no cost to Harvard.
- E. The Contractor shall be responsible for managing and tracking all materials excavated and placed in stockpiles for testing. Documentation of the material handling is specified in the project work plan in Section 013300.
- F. The Contractor shall perform in place density tests in accordance with ASTM D1556 or D6938 as the Work progresses, to determine the degree of compaction. Any corrective work required as a result of such tests, such as additional compaction, or a decrease in the thickness of layers, shall be performed by the Contractor at no additional expense to Harvard. In place density testing shall be made at the Contractor's expense by a qualified geotechnical testing laboratory.
- G. The Contractor shall perform in place density testing at a minimum frequency of one test per lift but no less than one test per 200 cubic yards of material placed in any one lift. Compaction testing will be performed in accordance with ASTM D6938 and D3017.
- H. When testing agency reports that subgrades, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; re-compact and re-test until specified compaction is obtained. Any corrective



work required shall be performed by the Contractor, at no additional expense to Harvard. In-place density testing shall be made at the Contractor's expense by the geotechnical testing laboratory.

1.09 WEATHER LIMITATIONS

- A. Material excavated when frozen or when air temperature is less than 32 degrees F shall not be used as backfill until material completely thaws.
- B. Material excavated during inclement weather shall not be used as backfill until after material drains and dries sufficiently for proper compactions.
- C. Material containing moisture greater than 2% above optimum moisture content, frost, or snow will not be used as backfill. Subgrades or placed backfill that demonstrates moisture greater than 2% above optimum moisture content, frost, or snow will not be backfilled over until the material has been dried to below 2% above optimum moisture and is free of frost and snow.

**PART 2 - PRODUCTS**

2.01 SOIL MATERIALS

- A. Provide approved imported off-site soil materials when sufficient satisfactory soil materials are not available from site excavations.
- B. Provide soil free of debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups. Unsatisfactory soils also include soils with chemical constituent at concentrations equal to or greater than RCS-1.
  - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at the time of compaction.
- D. Naturally Deposited Soils: Soils native to the subject site. In New England naturally deposited surficial soils are typically of glacial origin. Naturally deposited soils do not include introduced fill material which is typically identified as clean uniform grain size material with little silt. Mine pits are naturally occurring deposits typically of glacial deposit (i.e. outwash area or river bed gravel etc.)
- E. Select Borrow:
  - 1. Use only material free from roots, leaves, and organic matter, and free of ice, snow, frost and frozen soil particles.
  - 2. Select borrow shall meet the following gradation:
 

<u>Sieve</u>	<u>Percentage by Weight Passing</u>
<u>Designation</u>	<u>Square Mesh Sieves</u>



3 in.	100
1-1/2 in.	70 - 100
3/4 in.	50-85
No. 4	30 - 50
No. 50	10-25
No. 200	0 - 5

3. Soil particles shall conform to the physical property requirements of ASTM C33.

F. Processed Rubble: Processed rubble shall consist of UNCOATED concrete, brick, asphalt, and stone fragments processed (crushed to maximum particle size of 6-inches in diameter) from the demolition of the structure and foundations and free from trash debris, wood, metal, refuse, ice, snow, stumps, and other organic deleterious materials. Process rubble shall be well-graded and uniformly blended. Recycled process rubble must meet the sieve gradation below:

<u>Sieve Designation</u>	<u>Percentage by Weight Passing Square Mesh Sieves</u>
3 in.	100
No. 4	20 - 100
No. 200	0 - 20

**PART 3 - EXECUTION**

3.01 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. Preparation of subgrade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface is specified in Section 311000 – SITE PREPARATION.
- C. Protect and maintain erosion and sedimentation controls, which are specified in Section 312500 – EROSION AND SEDIMENTATION CONTROLS, during earthwork operations.
- D. Provide protective insulating materials to protect subgrades and foundation soils against freezing temperatures or frost.

3.02 EXCAVATION

- A. The Contractor shall excavate to the lines, grades and dimensions shown and as necessary to accomplish the Work. Excavate to within tolerance of plus or minus 1.0 foot except where dimensions or grades are shown or specified as maximum or minimum. Allow for working space.
- B. Excavate only to the extent required to complete the required work. Do not over-excavate without written authorization of the Engineer.





### 3.03 UTILITY ABANDONMENT

- A. Terminate utilities in accordance with the utility owner's requirements unless otherwise specified herein.
- B. The following utilities shall be permanently terminated and removed from the building to a distance 10 feet away from the building and in the manner shown or described on the Drawings.
  - 1. Water service
  - 2. Sanitary sewer
  - 3. Gas
  - 4. Storm Drainage
  - 5. Steam Supply and Condensate
  - 6. Electric, telephone and communications service and manholes.
  - 7. Site lighting
- C. The Contractor shall take measures to protect from damage those utilities, or portions thereof, which are designated to remain as shown on the Drawings. Provide protection as required such as marking, blocking, bracing, stabilizing, supporting, and retaining.
- D. Utilities to remain that are damaged by the Contractor shall be repaired/replaced to the satisfaction of the utility owner at Contractor's expense.
- E. The Contractor shall clearly identify as-built locations of permanent or temporary utility cuts/caps or terminations on the appropriate site plans and shall physically mark such locations at the Site. This work shall be performed by a Registered Land Surveyor.

### 3.04 DEWATERING AND DRAINAGE

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding the Site and surrounding area.
- B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
  - 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches. Do not direct surface water runoff towards other buildings or structures.
  - 2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.
- C. The Contractor shall control surface water and groundwater such that excavation is performed in-the-dry in accordance with Section 312319 – DEWATERING.



### 3.05 EXPLOSIVES

- A. Explosives: Do not use explosives.

### 3.06 TEMPORARY EARTH SUPPORT

- A. The Contractor shall furnish, place, and maintain such sheeting, shoring, bracing, and underpinning as necessary at locations necessary to support the sides of excavations and to prevent danger to persons or damage to pavements, facilities, utilities, or structures, and to prevent injurious caving or erosion or the loss of ground and to maintain pedestrian and vehicular traffic as directed and required.
- B. In all sheeting, shoring, and bracing operations, care shall be taken to prevent injury to persons or damage to structures, facilities, utilities, and services. Any injuries to persons shall be the responsibility of the Contractor; and any damage to the work or Contractor's property occurring as a result of settlement, water or earth pressure, or other causes due to inadequate bracing, or other construction operations of the Contractor, shall be satisfactorily repaired or made good by the Contractor, at no additional expense to Harvard.
- C. Construction of all earth support systems shall be in accordance with Harvard's Environmental Health and Safety Construction Safety Standard.

### 3.07 STORAGE OF SOIL MATERIALS

- A. Stockpile all materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover exposed soil stockpiles with at least 6 mil of ballasted polyethylene sheeting to prevent windblown dust. Provide erosion control measures as shown on the Drawings and in accordance with Section 312500 – EROSION AND SEDIMENTATION CONTROL.
- B. Stockpile soil materials away from edge of excavations. Do not stockpile materials within drip line of remaining trees.
- C. Stockpile excavated material that is suitable for use as backfill until material is needed.
- D. Post signs indicating proposed use of material stockpiled. Post signs that are readable from all directions of approach to each stockpile. Signs should be clearly worded and readable to equipment operators from their normal seated position. Bi-lingual signage may be necessary.
- E. Confine material storage to within the Limits of Work and approved work areas. Do not obstruct roads or streets.
- F. Do not stockpile excavated material adjacent to trenches and other excavations unless excavation side slopes and excavation support systems are designed, constructed, and maintained for stockpile loads.



- G. Do not stockpile excavated materials near or over existing facilities, adjacent property, or completed Work, if weight of stockpiled material could induce excessive settlement.
- H. No stockpiling of demolition debris including concrete, brick, asphalt materials that are not intended for onsite reuse will be permitted. Stockpiled materials intended for use or reuse as backfill material shall have adequate erosion controls measures in place. These erosion controls may include hay bale and silt fence perimeters around the pile(s) and polyethylene sheet covers on the pile(s) as specified in Section 312500 – EROSION AND SEDIMENTATION CONTROLS.

### 3.08 BACKFILL

- A. Backfill Material Selection: Unless otherwise specified or directed, material used for backfill shall meet the requirements specified under Part 2 - PRODUCTS.
- B. All demolished features shall be backfilled such that finished grades match adjacent grades.
- C. After backfilling excavations, the Contractor shall maintain the surfaces of backfill areas in good condition so as to present a smooth surface at all times level with adjacent surfaces. The Contractor shall repair any subsequent settling over backfilled areas immediately, in a manner satisfactory to the Engineer, and such maintenance shall be provided by the Contractor for the life of this Contract, at no additional expense to Harvard.
- D. The finished subgrade of the backfilled excavations shall not be disturbed by traffic or other operations and shall be maintained in a satisfactory condition until the finished courses are placed. The storage or stockpiling of materials on finished subgrade will not be permitted.
- E. The Contractor shall provide uniform smooth grading of all areas to be graded, as indicated and as directed, including excavated and backfilled sections, embankments and adjacent transition areas, and all areas disturbed as a result of the Contractor's operations. The finished surfaces shall be reasonably smooth, compacted and free from surface irregularities.
- F. *[FOR RE-USE OF NON-COATED CRUSHED Asphalt, Brick, Concrete - Recycled, pulverized concrete may be reused as backfill on site in accordance with local, state, and federal rules and regulations and Section 024100 – BUILDING AND ANCILLARY STRUCTURES DEMOLITION of these Specifications and as approved by the Engineer. Recycled, pulverized concrete shall only be backfilled within the limits of the on-site building that has been demolished. COATED CRUSHED Asphalt, Brick, Concrete may be reused as backfill onsite in accordance with local, state, and federal rules and regulations provided that the appropriate Beneficial Use Determinations have been filed and chemical testing is favorable for reuse.]*
- G. Place backfill on stable subgrades free of mud, frost, snow or ice. Subgrades that demonstrate weaving, rutting, or other signs of instability shall not be backfilled until the subgrade has stabilized to the satisfaction of the Engineer or the material has been removed and replaced with select or other backfill and has been approved by the Engineer.



- H. Frozen material shall not be used nor shall borrow be placed on frozen material. If during the construction, the top layer becomes frozen, the frozen material shall be removed before a succeeding layer is placed thereon.

### 3.09 SOIL BACKFILL

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so backfill material will bond with existing material.
- B. Place and compact backfill material in layers to required elevations.
- C. Place soil backfill on subgrades free of mud, frost, snow, or ice.

### 3.10 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent backfill layer before compaction to within 2 percent of optimum moisture content.
  - 1. Do not place backfill material on surfaces that are muddy, frozen, or contain frost or ice.
  - 2. Remove and replace, or scarify and air-dry, otherwise satisfactory soil material that exceeds optimum moisture content by two (2) percent and is too wet to compact to specified dry unit weight.

### 3.11 COMPACTION OF BACKFILL MATERIALS

- A. Place backfill in layers not more than 12 inches in loose depth for material compacted by heavy compaction equipment, and not more than 6 inches in loose depth for material compacted by hand-operated tampers.
- B. Place the backfill soil materials evenly on all sides to required elevations.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:
  - 1. All backfill – 92%.
- D. Compact processed rubble by proof rolling the material a minimum of six passes of a ten-ton vibratory roller:

### 3.12 GRADING

- A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to lines, and elevations as directed.
  - 1. Provide a smooth transition between adjacent existing grades and new grades as is shown on the Drawings.



2. Cut out soft spots, backfill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finished subgrades to required elevations within plus or minus 2 inches.

### 3.13 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.
- B. Allow testing agency to inspect and test subgrades and each backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.
- C. When testing agency reports that subgrades, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

### 3.14 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and re-establish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
  1. Scarify or remove and replace soil material to depth as directed by Engineer; reshape and re-compact.
- C. Where settling occurs before Project final acceptance elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
  1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

### 3.15 AS-BUILT TOPOGRAPHIC SURVEY AND SITE PLAN

- A. During the project, determine the location (Coordinates & Elevations) for the following for inclusion on the As-Built Site Plan:
  1. All subsurface structures not completely removed in the course of demolition.
  2. All disconnected, and abandoned, capped/plugged utility disconnections serving the Project Site.
  3. All backfilled excavations.



- B. After backfilling and compaction is complete, the Surveyor shall complete an as-built topographic survey of the entire site within the Limit of Work. Provide the required number of as-built site plans showing contour lines at a 2' contour interval, stamped by a Professional Land Surveyor licensed in the Commonwealth of Massachusetts.
- C. As-built site plans shall also indicate the locations on the site where crushed building debris was used for backfill.
- D. Existing site plans will be provided to Contractor in electronic format for use as a base plan.
- E. Final as-built site plans shall show coordinates for at least one corner of each building foundation that has been buried on the Site.

### 3.16 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off the property.

### 3.17 OIL AND HAZARDOUS MATERIAL CONTAMINATION

- A. Soil characterization details are located in the Project Documents. However, contaminated soil other than previously identified may be encountered during foundation excavation or at other areas of the site. In the event that contaminated soil is encountered, notify the Harvard Project Manager and EH&S. Contaminated materials will be handled in accordance with Section 026100 – EXCAVATED SOIL AND MATERIAL MANAGEMENT PLAN.
- B. Contractor personnel working in areas of the site where contamination is likely to be encountered shall be appropriately trained, as required in the Contractor's Health and Safety Plan.
- C. When working in areas of the site where contamination is likely to be encountered, Contractor's Site Safety Officer shall monitor the work area in accordance with the Contractor's Health and Safety Plan.