MIT
Design Standards

DIVISION 31 — Earthwork

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Department of Facilities

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1. 311000 - SITE CLEARING

1.1 Project Includes

Site clearing includes the following as applicable to the project:

1. Protection of previously installed erosion control devices and/or stormwater BMPs.
2. Protection of existing trees, vegetation, landscaping, and site improvements not scheduled for clearing which might be damaged by construction activities.
3. Trimming of existing trees and vegetation as recommended by arborist for protection during construction activities.
4. Clearing and grubbing stumps and vegetation, removal and disposal of debris, rubbish, designated trees, and site improvements.
5. Topsoil stripping and stockpiling.
6. Temporary erosion control, siltation control, and dust control.
7. Temporary protection of adjacent property, structures, benchmarks, and monuments.
8. Temporary removal and relocation of site lighting, site furnishings, fencing, play structures and other site improvements scheduled for reuse.
9. Watering of trees and vegetation during construction activities.
10. Removal and legal disposal of cleared materials.

1.2 Operations

Prevent damage to existing improvements indicated to remain, including improvements on and off site. Protect existing trees and vegetation indicated to remain. Do not stockpile materials, and disallow traffic within drip line of existing trees to remain. Provide and maintain temporary guards to encircle trees or groups of trees to remain; obtain approval of protective measures before beginning work.

Water vegetation as required to maintain health. Do not tear or rip tree roots during excavation with machinery; certified arborist shall root prune utilizing an air spade prior to excavating or trenching as directed by Owner. Cover temporarily exposed roots with wet burlap and backfill as soon as possible.

If construction operations damage vegetation, repair or replace vegetation or pay damages as acceptable to the MIT Project Manager. Remove heavy growths of grass before stripping. Stockpile satisfactory topsoil containing no large stones, foreign matter and weeds on site for reuse.

Completely remove all improvements including stumps and debris except for those indicated to remain. Remove below grade improvements at least 12 inches below finish grade and to the extent necessary so as not to interfere with new construction. Remove abandoned mechanical and electrical work as required. Consult with Owner for permission before leaving any abandoned utilities in place.

Prevent erosion and siltation of bare soils. Protect streets, sidewalks, catch basins and piping from sedimentation. Control windblown dust. Cover or seed stockpiles remaining longer than 14 days. Any soils required for removal will be tested and stockpiled at end of day, and off-site disposal will be coordinated thru Owner and MIT EHS at MIT approved sites. Remove waste materials and unsuitable soil from site and dispose of in a legal manner with MIT approval.

2. 312000 - EARTH MOVING

2.1 Project Includes

Earthwork operations. Refer to Division 01 for construction specifications for Section 013514 - MIT Specialized Root Zone and Soil Excavation and Section 013515 - MIT Imported Fill Criteria and Management.

2.2 Quality Assurance

Compaction:

1. Under structures, building slabs, steps, pavements, and walkways, 95 percent maximum density, ASTM D1557.
2. Under lawns or unpaved areas, 90 percent maximum density, ASTM D1557.

Grading Tolerances Outside Building Lines:

1. Lawns, unpaved areas, and walks, plus or minus 1 inch.
2. Pavements, plus or minus 1/2 inch.

Grading Tolerance for Fill Under Building Slabs:

1. Plus or minus 1/2 inch measured with 10-foot straightedge.

2.3 Products

1. Earth moving materials may include:

    a. Subbase Material: Graded gravel or crushed stone.
    b. Bedding Course: Graded crushed gravel and sand.

c. Borrow Soil: Off-site soil for fill or backfill.
d. Drainage Fill: Washed gravel or crushed stone.
e. Common Fill: Mineral soil free from unsuitable materials.
f. Structural Fill: Graded gravel.
g. Impervious Fill: Gravel and sand mixture.

2. Applications may include:

a. Excavation, filling, compacting and grading operations both inside and outside building limits as required for below-grade improvements and to achieve grades and elevations indicated. Provide trenching and backfill for mechanical and electrical work and utilities.
b. Subbase materials, drainage fill, common fill, and structural fill materials for slabs, pavements, and improvements.
c. Suitable fill from off-site if on-site quantities are insufficient or unacceptable, and legal disposal of excess fill off-site.
d. Imported fill materials will be tested and approved by MIT according to Section 312322 prior to shipment to MIT.

3. Rock excavation without blasting unless blasting is specifically authorized.

2.4 Installation

Excavation is unclassified and includes excavation to subgrade regardless of materials encountered. Repair excavations beyond elevations and dimensions indicated as follows:

1. At Structure: Concrete or compacted structural fill.
2. Elsewhere: Backfill and compact as directed.

Maintain stability of excavations; coordinate shoring and bracing as required by authorities having jurisdiction. Prevent surface and subsurface water from accumulating in excavations. Stockpile satisfactory materials for reuse, allow for proper drainage and do not stockpile materials within drip line of trees to remain or RPZ, whichever is larger.

Compact materials at the optimum moisture content as determined by ASTM D 1557 by aeration or wetting to the following percentages of maximum dry density:

1. Structure, Pavement, Walkways: Subgrade and each fill layer to 95 percent of maximum dry density to suitable depth.
2. Unpaved Areas: Top 6 inches of subgrade and each fill layer to 90 percent maximum dry density.

Place acceptable materials in layers not more than 8 inches loose depth for materials compacted by heavy equipment and not more than 4 inches loose depth for materials compacted by hand equipment to subgrades indicated as follows:

1. Structural Fill: Use under foundations, slabs on grade in layers as indicated.
2. Drainage Fill: Use under designated building slabs, at foundation drainage and elsewhere as indicated.
3. Common Fill: Use under unpaved areas.
4. Subbase Material: Use under pavement, walks, steps, piping and conduit.

Grade to within 1/2 inch above or below required subgrade and within a tolerance of 1/2 inch in 10 feet.

Protect newly graded areas from traffic and erosion. Recompact and regrade settled, disturbed and damaged areas as necessary to restore quality, appearance, and condition of work.

Control erosion to prevent runoff into sewers or damage to sloped or surfaced areas.

Control dust to prevent hazards to adjacent properties and vehicles. Immediately repair or remedy damage caused by dust including air filters in equipment and vehicles. Clean soiled surfaces.

Dispose of waste and unsuitable materials off-site in a legal manner.

3. 312500 - EROSION AND SEDIMENTATION CONTROLS

3.1 Project Includes

Implementing an erosion and sediment control program to minimize erosion and siltation during the construction phase of all campus sites subject to land disturbance.

1. Projects that meet the City of Cambridge requirements for the Land Disturbance regulations are required to develop and follow a site specific Stormwater Pollution Prevention Plan (SWPPP) and shall follow the erosion and sedimentation controls as outlined in this plan.

These erosion and sediment control provisions are the minimum requirements for an erosion control program. The Contractor shall provide additional erosion and sediment control materials and methods as required to affect the erosion and siltation control principles described herein.

1. Erosion control measures shall be established at the beginning of construction and maintained during the entire period of construction. On-site areas which are subject to severe erosion, and off-site areas which are especially vulnerable to damage from erosion and/or sedimentation, are to be identified and receive special attention.
2. All land-disturbing activities are to be planned and conducted to minimize the size of the area to be exposed at any one time, and the length of time of exposure.
3. Surface water runoff originating upgrade of exposed areas should be controlled to reduce erosion and sediment loss during the period of exposure.

4. When the increase in the peak rates and velocity of storm water runoff resulting from a land-disturbing activity is sufficient to cause accelerated erosion of the receiving stream bed, provide measures to control both the velocity and rate of release so as to minimize accelerated erosion and increased sedimentation of the stream.
5. All land-disturbing activities are to be planned and conducted so as to minimize off-site sedimentation damage.
6. The Contractor is responsible for cleaning out and disposing of all sediment once the storage capacity of the sediment facility is reduced by one-half. Sediment disposal will be conducted to meet regulatory requirements.
7. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established. Condition of erosion control device shall be checked twice each month or more frequently as required. Damaged and/or deteriorated items shall be replaced.
8. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.2 Submittals

Proposed methods, materials to be employed, and schedule for effecting erosion and siltation control and preventing erosion damage shall be submitted for approval. Submittals shall include:

1. Proposed methods for effecting erosion and siltation control including 1" = 40' scale plans indicating location of erosion control devices and siltation basins.
2. List of proposed materials, including manufacturer's product data.
3. Schedule of erosion control program indicating specific dates from implementing programs in each major area of work.

3.3 Quality Assurance

The objective is to minimize to the maximum extent practicable, sediments or pollutants exiting the site, entering the public right-of-way or being deposited into any Water Resource or stormwater drainage system.

1. In order to meet these objectives, the Contractor shall:

    a. Implement measures intended to keep soil on site or out of water resources, stormwater drainage systems or the public right-of-way as the first step in any development.
    b. Remove any soil that enters the public right-of-way.
    c. Protect stormwater inlets that are functioning during the course of the development by approved sediment control measures so that sediment-laden water cannot enter the inlets without first being properly treated.
    d. Apply permanent or temporary soil stabilization to denuded development site areas in conformance with the City of Cambridge Wastewater and Stormwater Management Guidelines.
    e. Plant replacement vegetative cover in accordance with the City of Cambridge Wastewater and Stormwater Management Guidelines.

f. Secure or protect soil stockpiles throughout the project with temporary or permanent soil stabilization measures, protect all stockpiles on the site and those transported from the site. All handling of soils shall be done in accordance with the City of Cambridge Wastewater and Stormwater Guidelines and all applicable federal, state and local laws, rules and regulations. Soil stockpiles will be covered at the end of the day. Stockpiles remaining greater than 14 days must be seeded.
g. Post signage on the site of the permitted land disturbing activity that identifies the DPW 24-hour Hotline Number (617-349-4800).
h. Sequence activities to minimize simultaneous areas of land disturbance.
i. Maximize groundwater recharge as approved by DPW.
j. Properly manage on-site construction and waste materials.
k. Site Dewatering: Water pumped from the site shall be reviewed by MIT EHS for possible permit implications and shall be treated by temporary sedimentation basins, grit chambers, sand filters, upflow chambers, hydro-cyclones, swirl concentrators or other appropriate controls. Water shall not be discharged in a manner that causes erosion or flooding of the site or receiving channels or a wetland.

When MIT or the Architect determines that special site conditions may prevent compliance with the objectives outlined above, MIT or Architect may require additional erosion, sediment and pollutant control measures as set forth in the City of Cambridge Wastewater and Stormwater Management Guidelines.

1. Special site conditions may include, but are not limited to, the following:
   a. Slopes before development that are greater than 10 percent (1 Vertical: 10 Horizontal).
   b. Land disturbance of a natural vegetative buffer within 50 feet of a wetland and or waterbody.
   c. The development site is located entirely or partially within a Flood Plain Overlay District.
2. Required additional control measures may include but are not limited to:
   a. Requiring that a Massachusetts registered professional engineer (P.E.), other professional certified by the State of Massachusetts with experience or qualifications in preparing erosion and sediment control plans, a registered CPESC or Massachusetts registered Landscape Architect prepare or implement the Erosion and Sediment Control Plan.
   b. Limiting the quantity of denuded soil at any given time
   c. Requiring a bond, letter of credit or other guarantee.

Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years.

Use experienced installers.

Deliver, handle, and store materials in accordance with manufacturer's instructions.

3.4 Products

Silt fence shall be a wire-bound woodroll snow fence covered with filter fabric. Fence shall be 4 ft. high minimum, and shall have 3/8 in. by 1-1/2 in. wide pickets, approximately 2 in. apart, bound together with at least 13 gage minimum, galvanized steel wire.

Hay bales for construction of erosion control devices shall be new, firm, wire- or nylon-bound livestock feed-grade and free of weed seed.

Erosion Control Blankets shall be specifically designed and engineered using 100% biodegradable materials for ecologically sensitive areas like wetlands, stream bank stabilization, forest lands.

1. Utilize woven nettings of type and material to ensure consistent quality and performance while limiting the potential for wildlife entanglement.

Temporary Seed shall conform to MHD Specifications Section M6.03.0, "Seed for Slopes and Shoulders".

Filter baskets shall be Fossil Filter, manufactured by Kristar Enterprises, Inc. KriStar Enterprises, Inc. Cumming, Georgia or approved equal. Baskets shall be installed at all catch basins in lieu of Hay Bale Catch Basin Filters.

3.5 Installation

Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction. Coordinate with work of other sections.

3.6 Maintenance and Removal of Erosion Control Devices

Wetland areas, water courses, and drainage swales adjacent to construction activities shall be monitored twice each month, within 24 hours after rainfall, or daily if there is an active Stormwater Pollution Prevention Plan (SWPPP) in place for the site, for evidence of silt intrusion and other adverse environmental impacts, which shall be corrected immediately upon discovery.

Culverts and drainage ditches shall be kept clean and clear of obstructions during construction period.

Maintenance of Erosion Control Devices unless required otherwise by the SWPPP:

1. Sediment behind the erosion control device shall be checked twice each month and after each heavy rain. Silt shall be removed if greater than 6 in. deep.
2. Condition of erosion control device shall be checked twice each month or more frequently as required. Damaged and/or deteriorated items shall be replaced. Erosion control devices shall be maintained in place and in effective condition.

3. Hay bales shall be inspected frequently and maintained or replaced as required to maintain both their effectiveness and essentially their original condition. Underside of bales shall be kept in close contact with the earth below at all times, as required to prevent water from washing beneath bales.
4. Sediment shall be removed from the retention ponds at the completion of the Project and periodically during construction. Sediment deposits shall be removed when sediment has accumulated to a depth of 12 in. or as directed.
5. Sediment deposits shall be disposed of off-site, in a location and manner which will not cause sediment nuisance elsewhere.

Removal of Erosion Control Devices

1. Erosion control devices shall be maintained until all disturbed earth has been paved or vegetated, at which time they shall be removed. After removal, areas disturbed by these devices shall be regraded and seeded.
2. Erosion control netting shall be kept securely anchored until start of permanent turf construction.
3. Erosion protection material shall be kept securely anchored until acceptance of completed slope or entire Project, whichever is later.

4. 313100 - SOIL TREATMENT

4.1 Integrated Pest Management (IPM)

Comply with MIT integrated pest management requirements, included in the EH&S Thematic Folder.

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