SECTION 312316.26 - ROCK REMOVAL

This Section includes removal of subsurface rock during excavation by mechanical method or use of explosives to assist in removal. Delete references to explosives where not permitted. This Section is structured to be edited for rock identified from data in the geotechnical report or rock discovered by conventional excavation.

This Section includes provision for Work performed using unit price payment method, when applicable.

This Section includes performance, proprietary, and descriptive specifications. Edit to avoid conflicting requirements.

1. GENERAL
   * + 1. RELATED DOCUMENTS
          1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
       2. SUMMARY
          1. Section Includes:

Removing [**identified**] [**and**] [**discovered**] rock during excavation.

[**Expansive tools**] [**Explosives**] to assist rock removal.

* + - * 1. Related Sections:

Section 310000 - Earthwork.

* + - 1. REFERENCE STANDARDS

List reference standards included within text of this section. Edit the following for Project conditions.

* + - * 1. National Fire Protection Association:

NFPA 495 - Explosive Materials Code.

* + - * 1. Uniform Code 5607 – Blasting.
        2. Code of Federal Regulations Title 29 - Labor, Part 1926 Safety and Health Regulations for Construction (OSHA).
      1. DEFINITIONS

Select one of the following rock definitions that apply to the Project. When both of the first two paragraphs apply, edit "rock" statements throughout this section accordingly. Site rock can also be defined by equipment horsepower or equipment removal capability required to remove rock.

* + - * 1. Rock: Limestone, sandstone, shale, granite and similar material in solid beds or masses in its original or stratified position which can be removed only by blasting operations, drilling, wedging, or use of pneumatic tools, and boulders with a volume greater than 1.0 cu yd. Concrete building foundations and concrete slabs, not indicated, with a volume greater than 1.0 cu yd shall be classified as rock.

Limestone, sandstone, shale, granite, and similar material in a broken or weathered condition which can be removed with an excavator or backhoe equipped with a bucket with ripping teeth or any other style bucket shall be classified as earth excavation.

Masonry building foundations, whether indicated or not, shall be classified as earth excavation.

* + - * 1. Unauthorized Rock Removal:

The removal of any rock prior to performing the measurements/work required to determine quantities (Article 3.2).

The removal of material below required elevation indicated on the Drawings or beyond lateral dimensions indicated or specified without specific written direction by the Director’s Representative.

If quantities of rock removal are to be provided on the Drawings, differentiate between and provide separate measurements for ‘General Rock Removal’ and ‘Trench and Pier Rock Removal’. In general, the cost of ‘Trench and Pier Rock Removal’ far exceeds that for ‘General Rock Removal’.

* + - * 1. General Rock Removal: Quantities of rock removal will be paid for as General Rock Removal when:

The width of rock removed, as per measurement limits, is greater than or equal to the total excavation depth required.

Boulders removed have a volume greater than 1.0 cu yd.

* + - * 1. Trench and Pier Rock Removal: Quantities of rock removal will be paid for as Trench and Pier Rock Removal when the width of rock removed, as per measurement limits, is less than the total excavation depth required.
      1. SUBMITTALS
         1. Submittals for this Section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
         2. Manufacturer’s installation instructions shall be provided along with product data.
         3. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).
         4. Rock Removal Procedure: Submit a detailed outline of intended rock removal procedure for the Director’s Representative’s information. This submittal will not relieve the Contractor of responsibility for the successful performance of the Work.

Retain one or both of first two subparagraphs below if rock removal by explosive method is permitted.

Blasting plan approved by Director’s Representative. Indicate types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats or cover, amount of explosive load, drill hole pattern, delay pattern, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on Project site and adjacent properties. Include seismographic monitoring during blasting operations.

Seismic survey report from seismic survey agency.

* + - * 1. Measurement data for quantities of rock removal.
        2. Survey Report: Submit survey report on conditions of buildings near locations of rock removal.

Include the following paragraph only when rock removal by explosive method is used.

* + - * 1. Quality Assurance Submittals:

Blasters Qualification Data: Submit the following for each blaster:

Name and addresses of the required number of similar projects which meet the experience criteria.

Affidavit from each blaster.

* + - 1. QUALITY ASSURANCE
         1. Pre-Rock Removal Conference: Before the rock removal work is scheduled to commence, a conference will be called by the Director's Representative at the Site for the purpose of reviewing the Contract Documents and discussing requirements for the Work. The conference shall be attended by the Contractor's Representative and the person supervising the rock removal operations.

Include the following paragraphs only when rock removal by explosive method is used.

* + - * 1. Blasting: Comply with applicable requirements in NFPA 495, "Explosive Materials Code."
        2. Regulatory Requirements: Obtain the proper permit(s) to blast from authorities having jurisdiction before explosives are bought to the Site.
        3. Explosives Firm: The company and persons performing the blasting operations shall be personally experienced in the handling and use of explosives and shall furnish documentation of performance of, in a safe manner, a minimum of **five** blasting operations on similar projects.

Certifications: Affidavit, for each blaster, certifying that blaster is competent in performing the type of blasting required

* + - * 1. Seismic Survey Firm: An independent testing agency, acceptable to Director’s Representative, experienced in seismic surveys and blasting procedures with minimum of five years documented experience.
      1. PROJECT CONDITIONS

Include this article only when rock removal by explosive method is prohibited.

* + - * 1. Explosive methods and the use of explosive materials will not be permitted.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

Include the following paragraphs only when rock removal by explosive method is used.

* + - * 1. Conduct survey and document conditions of buildings near locations of rock removal, prior to blasting, [**and photograph existing conditions identifying existing irregularities**].
        2. Advise Director’s Representative of adjacent buildings or structures in writing, prior to executing seismographic survey. Explain planned blasting and seismic operations.
        3. Obtain seismic survey prior to rock excavation to determine maximum charges that can be used at different locations in area of excavation without damaging adjacent properties or other work.
      1. SCHEDULING
         1. Schedule Work to avoid [**working hours of**] [**disruption to**] occupied buildings nearby.

Include the following paragraphs only when rock removal by explosive method is used.

* + - * 1. Conduct blasting operations between hours of <**\_\_\_\_\_\_\_\_**> and <**\_\_\_\_\_\_\_\_**> only.
        2. When blasting operations will interfere with the work of related contracts (if any), schedule blasts during break and lunch periods or other non-work hours.

1. PRODUCTS
   * + 1. MATERIALS

When NFPA 495 is included in this Section by reference, edit or delete the following paragraphs. Edit the following paragraphs depending on removal method chosen.

* + - * 1. Explosives: Type recommended by explosive firm following seismic survey [**and required by authorities having jurisdiction**].
        2. Delay Device: [**Type recommended by explosives firm.**] <**\_\_\_\_\_\_\_\_.**>
        3. Blast Mat Materials: [**Type recommended by explosives firm.**] <**\_\_\_\_\_\_\_\_.**>
        4. Mechanical Disintegration Compound: [**Grout mix of <\_\_\_\_\_\_\_\_> materials that expand on curing.**] <**\_\_\_\_\_\_\_\_.**>
        5. Seismograph: [**Type recommended by explosives firm.**] <**\_\_\_\_\_\_\_\_.**>

1. EXECUTION
   * + 1. EXAMINATION
          1. Examine and verify site conditions and note any subsurface irregularities, site defects, or site deterioration affecting Work of this section. Make this information available to the Director’s Representative upon request.
       2. PREPARATION
          1. Identify required lines, levels, contours, and datum.

If a large quantity (greater than 1,000 cubic yards) of rock is being removed it is required that a licensed surveyor be retained to measure the top of rock prior to and following removal on a specified grid pattern. Be sure language in paragraph below is revised to indicate the specified grid pattern.

* + - * 1. Prior to removing material classified as rock, excavate test pits down to rock for the purpose of verifying the presence of sound rock and determining top of rock elevations.

Verification of Sound Rock: Demonstrate to the Director’s Representative that materials to be classified as rock cannot be removed utilizing a backhoe or excavator equipped with any form of bucket, including a bucket equipped with ripping teeth.

Required Measurements: Take elevations and measurements as required for the purpose of determining the quantities of rock removal. Record all measurement data and submit a copy of the data to the Director's Representative. Backfill test pits prior to rock removal as directed. Unless otherwise indicated or directed, excavate test pits as follows:

For Structures: One pit for each structure or one pit for each 1000 sq ft, whichever is greater.

For Paved Areas: 3 pits for each 2500 sq ft.

For Utility Lines: One pit for each 100 linear ft.

If rock removal quantities are greater than 1,000 cubic yards, the measurement of the top of rock elevations both prior to and following removal of rock shall be performed by a New York State licensed surveyor.

* + - * 1. Schedule a site meeting with the Director’s Representative and facility personnel to review the rock removal procedures in detail.
        2. If required, have seismographs in place and operational as well as all safety equipment and/or fencing.
      1. ROCK REMOVAL BY MECHANICAL METHOD
         1. Excavate and remove rock by mechanical method.

Drill holes and use [**expansive tools**] [**wedges**] [**mechanical disintegration compound**] to fracture rock.

* + - * 1. Cut away rock at bottom of excavation to form level bearing.
        2. Remove loose fragments to provide an unfractured, suitable base per engineering design for [**footings.**] [**foundations.**] <**\_\_\_\_\_\_\_\_.**>
        3. In utility trenches, excavate to **6 inches** below invert elevation of pipe and **24 inches** wider than pipe diameter.

Retain only one of the following two paragraphs.

* + - * 1. Remove from State Property and dispose of excess and unsuitable rock materials.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

* + - * 1. Transport excess and unsuitable rock materials to spoil areas on State property designated by the Director's Representative and dispose of such materials as directed.
        2. Correct unauthorized rock removal as follows:[**in accordance with backfilling and compacting requirements of Section 310000**] [**as directed by Director’s Representative.**]

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

* + - 1. ROCK REMOVAL BY EXPLOSIVE METHODS

Edit the following paragraphs as required for Project conditions.

* + - * 1. Provide seismographic monitoring during progress of blasting operations.
        2. Disintegrate rock and remove from excavation.
        3. Remove rock at excavation bottom to form level bearing.
        4. Remove loose fragments to provide an unfractured, suitable base per engineering design for [**footings.**] [**foundations.**] <**\_\_\_\_\_\_\_\_.**>

Retain only one of the following two paragraphs.

* + - * 1. Remove from State Property and dispose of excess and unsuitable rock materials.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

* + - * 1. Transport excess and unsuitable rock materials to spoil areas on State property designated by the Director's Representative and dispose of such materials as directed.
        2. Correct unauthorized rock removal as follows:[in accordance with backfilling and compacting requirements of Section 310000] [as directed by Director’s Representative.]
      1. VOLUME DETERMINATION
         1. Top of Rock Elevations established prior to the performance of any rock removal (Article 3.2) will be used to determine the depth of rock removed. Measurements for the base and width of the rock excavation shall be taken of the actual rock cut, as required for the Work, or to the specified measurement limits, whichever is smaller. Unless otherwise directed in writing, measurement limits for this work shall be as follows:

Cast-in-Place Concrete:

Vertical Limit: Bottom of rock cut for cast-in-place concrete bearing on rock shall be the bottom of concrete elevation indicated on the Drawings.

Horizontal Limit: Limit measurement between vertical side surfaces at bottom of rock cut to the following:

| **Actual Depth of**  **Rock Cut** | **Distance Beyond Edge of Concrete**  **in Each Direction** |
| --- | --- |
| Under 3 Feet | 18 Inches |
| 3 to 15 Feet | 24 Inches |
| Over 15 Feet | 30 Inches |

Precast Concrete Structures: Measurement will be based on the size of the precast concrete structure specified or indicated on the Drawings.

Vertical Limit: Bottom of rock cut for precast concrete structure shall be 12 inches below the required bottom of structure elevation.

Horizontal Limit: Limit measurement between vertical side surfaces at bottom of rock cut to the following:

| **Actual Depth of**  **Rock Cut** | **Distance Beyond Edge of**  **Concrete in Each Direction** |
| --- | --- |
| Under 5 Feet | 12 Inches |
| 5 to 15 Feet | 18 Inches |
| Over 15 Feet | 24 Inches |

Pipe:

Vertical Limit: Bottom of rock cut for pipe in trench shall be 6 inches below the required pipe invert elevation, with depth measured from the mean surface of the rock.

Horizontal Limit: Limit measurement between vertical side surfaces at bottom of rock cut to the following:

| **Actual Depth of Rock Cut** | **Trench Width** |
| --- | --- |
| Under 10 Feet | 24 Inches plus Pipe OD |
| 10 to 15 Feet | 36 Inches plus Pipe OD |
| Over 15 Feet | 48 Inches plus Pipe OD |

Conduit:

Vertical Limit: Bottom of rock cut for conduit in trench shall be as required for the indicated depth of the conduit.

Horizontal Limit: Limit measurement between vertical side surfaces at bottom of rock cut to the following:

| **Actual Depth of Rock Cut** | **Trench Width** |
| --- | --- |
| Under 3 Feet | 24 Inches, except where wider width is required by the multiple horizontal conduits. |
| 3 to 10 Feet | 36 Inches, except where wider width is required by the Drawings or directed for multiple horizontal conduits. |

Poles for Overhead Electrical Service:

Vertical Limit: Bottom of rock cut for poles shall be as required for the indicated depth of the pole.

Horizontal Limit: Limit measurement between vertical side surfaces at bottom of rock cut to OD of pole butt plus 6 inches.

Foundation Drains: Where drains and foundation share the same rock cut, the horizontal measurement limit, on the drain side of the footing, shall be 30 inches from edge of concrete to vertical side surface of rock at bottom of cut unless otherwise shown on the Drawings.

* + - 1. FIELD QUALITY CONTROL

Delete paragraph below if blasting is not permitted.

* + - * 1. Provide the Director’s Representative with the recorded top of rock elevations. Prior to the performance of any rock removal operations obtain, in writing, that the Director’s Representative has reviewed the information and is in agreement with the measurements taken.
        2. Notify the Director’s Representative at least [**3 working days**] in advance of all phases of blasting operation.
        3. Request visual inspection of foundation bearing surfaces by **[Director’s Representative]**[**inspection agency**] <**\_\_\_\_\_\_\_\_**> before installing subsequent work.
      1. CLEANING
         1. Where footings and walls will rest entirely on rock, clean rock surfaces free of soil and loose rock.

END OF SECTION 312316.26