

SECTION 31 23 16.26

ROCK REMOVAL

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Scope:
1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to perform rock removal required for the Work, including disposing of excavated rock material.
 2. Obtain permits required by authorities having jurisdiction for rock removal Work, including transporting, storing, and using blasting materials.
 3. Perform rock removal Work in compliance with Laws and Regulations applicable permits, and requirements of authorities having jurisdiction.
- B. Coordination:
1. Review procedures under this and other Sections and coordinate the Work that must be performed with or before rock removal.
- C. Related Sections:
1. 31 23 05, Excavation and Fill.
- D. Measurement: Limits of rock removal shall be as follows:
1. Structures: Limit for all structures shall be bounded by the following:
 - a. Bottom of footing, drainage course material, or compacted backfill.
 - b. Pre-construction rock surface.
 - c. Vertical planes located 12 inches outside footing.
 2. Trenches: Limit for trenches shall be bounded by the following:
 - a. Width of trenches shall be the outside diameter or outside edge (as applicable) of the Underground Facility plus six inches, exclusive of pipe bells, branches, hubs, spurs, or cradles. Sides of trench shall be considered vertical.
 - b. Depth of trench shall be six inches below the outside of the Underground Facility in the trench unless indicated otherwise on the Drawings.
 - c. Length shall be equal to installed length of the Underground Facility, measured horizontally.
 3. No payment will be made for additional quantity outside the limits described in this Section.

1.2 REFERENCES

- A. Standards referenced in this Section are:
1. United States Bureau of Mines (USBM), Report of Investigations (RI) 8507.

1.3 TERMINOLOGY

- A. The following words or terms are not defined but, when used in this Section, have the following meaning:
1. "Rock removal" is removal of igneous, metamorphic, or sedimentary rock or stone; boulders over two cubic yards in volume in open areas and boulders over one cubic yard in volume in trenches; and mass concrete; that cannot be removed using rippers or other mechanical methods and therefore requires drilling and blasting or use of large excavator-mounted pneumatic breakers. The following material will not be measured nor allowed for payment as rock removal:
 - a. Soft, weathered or disintegrated rock that can be removed by normal excavating equipment, including bulldozers with rippers and large trackhoes with rock teeth or rock buckets.
 - b. Loose or previously blasted rock.
 - c. Broken stone in rock fills.
 - d. Rock or stone that falls into the excavation from outside limits of excavation shown or indicated in the Contract Documents.
 - e. Boulders that can be removed without drilling, blasting, or pneumatic breakers.
 - f. Pavements, sidewalks, and gutters of concrete, asphalt, or masonry.
 2. "Trenches" means excavations having vertical sides whose depth exceeds its width, made for Underground Facilities and drainage beds.

1.4 QUALITY ASSURANCE

- A. Qualifications:
1. Professional Engineer for Delegated Design:
 - a. CONTRACTOR or blasting Subcontractor shall retain, as required, a registered professional engineer legally qualified to practice in same state as the Site. Professional engineer shall have at least five years experience conducting structural evaluations and structural condition assessments.
 - b. Responsibilities include:
 - 1) Preparing written requests for clarifications or interpretations of the Contract Documents for submittal to ENGINEER by CONTRACTOR.
 - 2) Performing condition assessments of structures damaged by blasting.

1.5 SUBMITTALS

- A. Informational Submittals: Submit the following:
1. Test and Evaluation Reports:
 - a. Rock surface survey information, in accordance with Article 3.1 of this Section.
 - b. Blasting records, when requested by ENGINEER, in accordance with Paragraph 3.2.F of this Section.

- c. Vibration and overpressure monitoring results, in accordance with Paragraph 3.3.A.3 of this Section.
- d. Reports related to any structure damage that may occur as a result of blasting, signed and sealed by the delegated design professional engineer.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Top-of-Rock Survey:
 - 1. Prior to blasting and rock removal, CONTRACTOR shall survey and measure the elevation of the top of rock to determine the in-place quantity of rock to be excavated.
 - 2. Uncover rock to be excavated in sections or areas acceptable to ENGINEER for surveying.
 - 3. Conform to Section 01 71 23, Field Engineering.
 - 4. Submit to ENGINEER field notes, site plan showing rock elevations measured, cross-sections of rock surface when necessary or required by ENGINEER, and detailed estimation of quantity of rock to be excavated.

3.2 BLASTING AND ROCK REMOVAL

- A. Perform blasting in accordance with Laws and Regulations relative to blasting, storage and use of explosives, and rock removal.
- B. Perform rock removal adjacent to Underground Facilities and above-ground utilities and life-safety facilities with utmost care, after properly notifying and coordinating with utility owners, life-safety facility owners, and authorities having jurisdiction.
- C. Perform blasting to avoid endangering persons or property, and damaging or weakening adjacent foundations, structures, sheeting, bracing, and other facilities. Cover or otherwise suitably confine blasting.
- D. CONTRACTOR shall be fully responsible for injury and damage caused by blasting, and shall repair or replace all injury and damage immediately, as accepted by ENGINEER at no additional cost to OWNER.
- E. Limit Criteria for Blasting Vibration, Particle Velocity, and Airblast Overpressure:
 - 1. Amount of vibration, frequency and overpressure generated by blasting shall not exceed limits in Laws or Regulations, and limits established by authorities having jurisdiction.
 - 2. Maximum peak particle velocity (PPV) shall not exceed limits indicated in Figure B-1, Appendix B, of the USBM RI 8507.

3. Peak airblast overpressure measured at location of nearest occupied, above-ground structure (considering wind direction) shall not exceed 0.014 psi.
- F. Keep records of all blasts, including: date; location, depth, number, and diameter of drill holes; type and amount of explosive; and other pertinent data. Submit records to ENGINEER when requested.
- G. Removal by Methods Other than Blasting:
 1. Where conditions of hazard exist, or clearances with existing facilities, piping, or structures are very small, or where the potential for damage to persons or property is strong, perform rock removal by means other than blasting.
- H. Removal and Disposal of Rock:
 1. Remove blasted or broken rock from excavations with suitable equipment in accordance with Section 31 23 05, Excavation and Fill.

3.3 SITE QUALITY CONTROL

- A. Blast Monitoring:
 1. Perform seismic blast monitoring in accordance with Laws and Regulations.
 2. Monitor blasting to allow evaluation of compliance with the limitations specified in the Contract Documents. At minimum, monitor each blast as follows:
 - a. Blast Monitoring Zone: Monitor vibrations at exterior walls of all structures within 500 feet of each blast.
 - b. If no structures are located within specified blast monitoring zone, monitor vibrations at three equally spaced radial points located at perimeter of specified blast monitoring zone.
 - c. Monitor overpressures for all structures within specified blast monitoring zone.
 3. Submit vibration and overpressure monitoring results to ENGINEER within 24 hours of blasting. CONTRACTOR's monitoring does not relieve CONTRACTOR of responsibility for controlling vibration and overpressure during blasting.

3.4 UNAUTHORIZED ROCK REMOVAL

- A. Rock removal outside the limits shown or indicated in the Contract Documents or that is not approved by ENGINEER, including removal, disposal, and backfill, will be at CONTRACTOR's expense.
- B. Fill unauthorized excavation below pipe or foundation with compacted select fill as directed by ENGINEER in writing, at no additional cost to OWNER. Backfill other unauthorized excavation as specified in Section 31 23 05.

++ END OF SECTION ++

