### 215-4 DISPOSAL

Unless otherwise indicated in the contract, all materials recovered during demolition become the property of the Contractor to remove from the project. Disposal by burning is permitted, subject to applicable sections of the *Standard Specifications*, State and local ordinances.

Dispose of materials and debris in accordance with Section 802.

### 215-5 MEASUREMENT AND PAYMENT

There will be no direct payment for removing the buildings listed in the contract. Payment for this work will be included in the contract lump sum price for *Clearing and Grubbing*.

Where underground storage tanks are indicated in the contract, there will be no direct payment for the assessment or closure. Payment for this work will be included in the contract lump sum price for *Clearing and Grubbing.*

As an exception to the above, when the description of the work covered by a particular building removal item does not contain information concerning the presence of asbestos material or UST and the asbestos material or UST are discovered after the opening of bids, the Engineer may have the work performed by others or the cost of removal and disposal of such asbestos material or UST will be paid in accordance with Article 104-7.

# SECTION 220
# BLASTING

### 220-1 DESCRIPTION

Use blasting as needed to excavate, break up or remove rock, construct stable rock cut slopes and for other approved reasons. This section applies to all types of blasting including production, controlled, pre-split, trim, trench and secondary blasting except blasting adjacent to highway structures. See Article 410-9 for blasting adjacent to highway structures. Unless required otherwise in the contract, design blasts for the vibration and air overpressure limits in this section. Pre-split rock cuts at locations shown on the plans and as directed. Provide blasting plans, blast monitoring and post-blast reports as necessary or required. Perform blasting in accordance with the contract, accepted submittals and as directed. Use a prequalified Blasting Contractor for blasting.

### 220-2 MATERIALS

Refer to Division 10.

| Item | Section |
|---|---|
| Coarse Aggregate | 1005 |

Use coarse aggregate (standard size No. 67 or 78M) for stemming.

### 220-3 CONSTRUCTION METHODS

Notify the Engineer and all occupants and owners of residences, businesses and utilities near where blasting will occur of the intention to use explosives. Inform the Engineer, occupants and owners of blasting at least 48 hours before each blast. When blasting in the vicinity of an open travel way, provide traffic control in accordance with the contract and Section 1101.

Control blasting to avoid endangering lives or damaging property. The Contractor is responsible for any injuries and damages due to blasting in accordance with Article 107-11 except for damage to wells and springs, unless the Contractor did not use reasonable care to prevent such damage. Exercise the utmost care when blasting near sensitive environmental or populated areas, urban or sensitive communities or historical structures. Comply with all the latest applicable Federal, State and local codes, laws and regulations, as well as professional society standards for the storage, transportation and use of explosives. Keep a copy of all regulations on site and in case of conflict, the more stringent applies.

The Blaster-in-Charge has authority over the handling, use and security of explosives and is responsible for designing, planning, coordinating, supervising and monitoring blasting. Assign a Blaster-in-Charge to the project that has at least 5 years of experience with blasting similar to that anticipated for the project. Use a Blaster-in-Charge approved as a Blaster-in-Charge (key person) for the Blasting Contractor. The Blaster-in-Charge or designated Assistant Blaster-in-Charge shall be on site during blasting.

When blasts will be within 1,000 feet of a utility, house, residence, building, business or any other structure, a blasting plan and blast monitoring that meet Subarticles 220-3(B) and 220-3(C) are required. Otherwise, provide a blasting plan and monitor blasts as needed.

**(A) Vibration and Air Overpressure Limits**

Define "peak particle velocity" (PPV) as the maximum ground vibration velocity measured in any direction. Design blasts so the PPV at any utility or structure does not exceed the "Alternative Blasting Level Criteria" from Appendix B of the *U.S. Bureau of Mines Report of Investigations 8507*. Design blasts so the maximum air overpressure at any structure does not exceed 133 dB (linear).

If the PPV or air overpressure limits are exceeded at any utility or structure in any direction from blasts, the Engineer may suspend blasting until the post-blast report is reviewed and a new or revised blasting plan is accepted. Unless required otherwise in the contract or directed, design production, pre-split and trench blasts in accordance with the following:

(1) Production Blasting

(a) For 1.5:1 (H:V) rock cut slopes without pre-splitting, do not use production blast holes more than 4 inches in diameter within 10 feet of finished slope faces or neat lines.

(b) Do not drill production holes below bottom of adjacent pre-split blast holes

(c) Use delay blasting to detonate production blast holes towards a free face

(2) Pre-splitting

(a) Do not use pre-split blast holes more than 3 inches in diameter

(b) Space pre-split holes no more than 10 hole diameters apart (wider pre-split blast hole spacing may be approved by the Engineer if test blast results are satisfactory)

(c) Limit subdrilling to the offset width between lifts

(d) Do not subdrill more than 2 feet below finished grade

(e) Pre-split rock at least 30 feet beyond production blasting lifts or to the end of rock cuts

(f) Provide benches or lifts with a maximum height of 25 feet.

(g) Do not use ammonium nitrate fuel oil (ANFO) or other bulk loaded products

(h) Use cartridge explosives or other explosive types design for pre-splitting

(i) Use charges with a maximum diameter of half the pre-split blast hole diameter except for charges in bottom 2 feet holes

(j) If pre-split and production blast holes are fired in the same blast, fire pre-split holes at least 25 milliseconds before production holes

**(B) Blasting Plan**

When required, submit the proposed blasting plan signed by the Blaster-in-Charge for all blasting for acceptance. Acceptance of this plan does not relieve the Contractor of responsibility and liability for blasting in accordance with the contract.

Submit the blasting plan to the Resident Engineer and the appropriate Geotechnical Engineering Unit regional office at least 30 days before starting blasting. Do not deliver explosives to the project site or begin blasting until a blasting plan is accepted. Provide detailed project specific information in the blasting plan that includes the following:

(1) Work procedures and safety precautions for storage, transportation, handling and detonation of explosives;

(2) Explosive products and devices for dry and wet blast holes including explosives, primers and detonators with MSDS;

(3) Drilling equipment including methods for maintaining blast hole alignment;

(4) Typical plan, profile and sectional views for blasting showing blasting limits, blast hole diameters, depths, inclinations and spacing, burden, subdrill depths and minimum and maximum charge per delay;

(5) Initiation and delay methods and delay times;

(6) Equipment and procedures for blast monitoring with calibration certificates dated within one year of submittal date; and

(7) Post-blast report format.

If alternate blasting procedures are proposed or necessary, a revised blasting plan submittal may be required. If blasting deviates from the accepted submittal without prior approval, the Engineer may suspend blasting until a revised plan is accepted.

**(C) Blast Monitoring**

If necessary or required, monitor blasts using seismographs capable of measuring air overpressure and vibration in the vertical, longitudinal and transverse directions. At a minimum, monitor vibration and air overpressure at the closest utility or structure to each blast and the closest utility or structure in the direction of each blast in accordance with the accepted blasting plan. Include the following in post-blast reports for each blast monitoring location:

(1) Type, identification and specific location of seismograph,

(2) Distance and direction from blast,

(3) PPV in each direction and peak vector sum, and

(4) Maximum air overpressure level.

**(D) Blasting Requirements**

Before beginning drilling, a pre-blast meeting may be required to discuss the blasting and if applicable, blast monitoring. Schedule this meeting after any blast plans have been accepted. The Resident or District Engineer, Roadway Construction Engineer, Geotechnical Operations Engineer, Contractor and Blaster-in-Charge will attend this pre-blast meeting.

Drill and blast in accordance with the contract and if applicable, the accepted blast plan. Use explosives in accordance with all applicable government regulations, professional society standards and manufacturer guidelines and recommendations. Do not allow ANFO to leach into bodies of water.

Before blasting for excavations, remove all overburden material along top of excavations for at least 30 feet beyond blasting or rock limits, whichever is less. Inspect any free faces to ensure adequate burden. Drill blast holes within 3 inches of plan location and maintain hole alignment when drilling.

Pre-split rock cuts as required so irregularities between pre-split blast holes are less than 1 foot from finished slope faces. Alignment is crucial for pre-split holes. Maintain pre-split hole alignment within 6 inches of rock cut slopes and parallel to adjacent pre-split blast holes. Monitor and accurately measure pre-split hole alignment during drilling with a method acceptable to the Engineer. When rock cut heights require multiple benches or lifts, offset pre-split blast holes horizontally for each lift no more than the clearance necessary for drilling equipment.

Cover blast holes after drilling to prevent unwanted backfill and identify and mark each blast hole with hole number and depth. Blast holes shall be free of obstructions the entire depth. Load blast holes without dislodging material or caving in hole walls. Stem blast holes 5 inches or larger in diameter with No. 67 stone and blast holes smaller than 5 inches in diameter with No. 78M stone. Do not stem blast holes with drill cuttings.

Contain flyrock within construction limits. Use matting when blast monitoring or traffic control is required. Soil cover may be used instead of matting, if approved. If flyrock occurs outside the construction limits, the Engineer may suspend blasting until the post-blast report is reviewed and a new or revised blasting plan is accepted. When traffic control is required for blasting, have equipment standing by to remove material that interferes with traffic flow. Check for misfires immediately after each blast before signaling all clear.

Remove all loose, hanging and potentially dangerous material from rock cut slopes by scaling. The Contractor is responsible for the stability of rock cuts. If rock cuts are damaged during blasting, stabilize cuts to the satisfaction of the Engineer. Resume drilling only after scaling is complete. Adjust blast hole alignments to account for any drift occurring in preceding drilling or lifts.

Define “secondary blasting” as blasting to reduce the size of naturally occurring boulders or those resulting from initial blasting. Use an approved method for secondary blasting consisting of small explosive charges in small diameter blast holes. Define “mudcapping” as placing unconfined explosive charges in contact with rock without blast holes and covering charges with mud. Do not use mudcapping for blasting.

**(E) Post-Blast Report**

Submit a post-blast report within 3 days of each blast or before the next blast, whichever is sooner. Provide post-blast reports signed by the Blaster-in-Charge that include the following:

(1) Material data information about explosive products and devices including explosives, primers and detonators;

(2) Scaled blast drawings with cross sections showing blasting limits, blast hole diameters, depths, inclinations and spacing, burden, subdrill depth, free face location and any joints, bedding planes, weathered zones, voids or other significant rock structure information;

(3) Loading pattern diagram with location and amount of each type of explosive including primers and detonators;

(4) Locations and depths of stemming, column heights and maximum charge per delay for each type of loading;

(5) Delay and initiation diagram showing delay pattern, sequence and times;

(6) Results and effectiveness of the blast and any proposed changes to subsequent blasting;

(7) If applicable, blast monitoring results; and

(8) Blast damage report when necessary.

**(F) Blast Damage Report**

If damage occurs from blasting, notify the Engineer immediately and submit a blast damage report with the post-blast report that includes the following:

(1) Property owner's and injured person's, if any, names, addresses and telephone numbers;

(2) Details and description of property damage and injury, if any, with photographs or video; and

(3) Any associated tort claims, complaint letters and other applicable information.

### 220-4 MEASUREMENT AND PAYMENT

Pre-splitting of Rock will be measured and paid in square yards. Pre-splitting will be measured along the slope faces of pre-split rock cuts as the square yards of exposed pre-split rock. No payment will be made for unsatisfactory pre-splitting as determined by the Engineer.

No direct payment will be made for all other blasting including blasting plans, blast monitoring, post-blast reports, scaling and stabilizing rock cuts.

No direct payment will be made for blasting for roadway excavation. Blasting for roadway excavation will be incidental to the contract unit price for *Unclassified Excavation* in accordance with Article 225-7 or the lump sum price for *Grading* in accordance with Article 226-3.

No direct payment will be made for blasting for any pipe, utility or foundation excavation. Blasting for these items will be incidental to the compensation for the excavation. Where no direct payment is made for excavation, blasting will be incidental to the work and no separate payment for will be made for blasting.

Payment will be made under:

| Pay Item | Pay Unit |
|---|---|
| Pre-splitting of Rock | Square Yard |

# SECTION 225
# ROADWAY EXCAVATION

### 225-1 DESCRIPTION

Excavate, place and compact or satisfactorily dispose of all materials encountered within the limits of the work necessary for the construction of the roadway that are not to be removed under another contract item.

Perform all excavation in conformity with the lines, grades and cross sections shown in the plans or established by the Engineer.

Use care not to cause instability or displacement of the underlying or adjacent materials during construction. The Engineer reserves the right to effect the removal from the grading operation of any equipment that is causing instability or displacement of underlying or adjacent materials to the detriment of the section being constructed.

Construct false sumps in accordance with the details in the plans and at the locations shown in the plans or at other locations as directed.