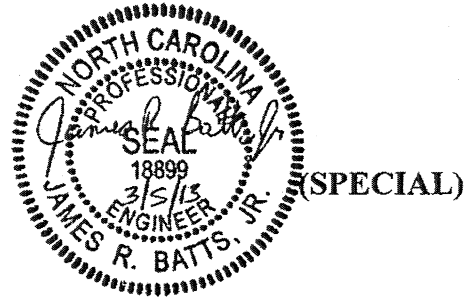
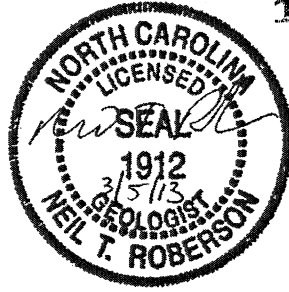


R-2241A

137

ROCK BLASTING

DESCRIPTION



Use blasting as needed to excavate, break up or remove rock, construct stable rock cut slopes and for other approved reasons. This provision applies to all types of blasting including production, controlled, cushion, trim, trench and secondary blasting except blasting adjacent to highway structures. See Article 410-11 of the Standard Specifications for blasting adjacent to highway structures. 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 by the Engineer. Use a prequalified Blasting Contractor for blasting.

PROJECT REQUIREMENTS

Blasting within 300 meters of the structure listed below is subject to the following warning levels and not-to-exceed limits measured at the premises of the structure.

Structure	Location	
Residence, 1.5 SBKD	Parcel 38, Left of -L- Sta. 22+30	
Variable	Warning Level	Not-to-Exceed Limit
Vibration (PPV) > 40 Hz	0.75 in/sec (19 mm/sec)	1.0 in/sec (25 mm/sec)
Vibration (PPV) < 40 Hz	0.40 in/sec (10 mm/sec)	0.50 in/sec (13 mm/sec)
Air-overpressure (noise)	120 dBL	133 dBL

The Contractor must notify the Engineer a minimum of 7 days prior to any blasting within 300 meters of the structure listed above.

If warning levels are exceeded, the Engineer may require additional blasting monitoring. If vibration and/or air-overpressure recorded are higher than not-to-exceed limits, the Engineer may suspend blasting until the post-blast report is reviewed and a new or revised blasting plan is accepted.

Design and perform rock blasting such that no flyrock occurs. If flyrock occurs, the Engineer may suspend blasting operations in accordance with Article 108-7 of the Standard Specifications and require a revised general blast plan.

MATERIALS

Refer to Division 10 of the Standard Specifications.

Item	Section
Coarse Aggregate	1005 of the Standard Specifications

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

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 travelway, provide traffic control in accordance with the contract and Section 1101 of the Standard Specifications.

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 of the Standard Specifications. 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.

When blasts will be within 300 meters of a utility, house, residence, building, business or any other structure, a blasting plan and blast monitoring that meet Subarticles (B) and (C) below 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.

(B) Blasting Plan

When required, submit the proposed blasting plan 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 2 copies and a PDF copy of the blasting plan at least 30 days before starting blasting. Do not deliver explosives to the project site or begin blasting until a blasting plan is accepted. Submit one copy to the Resident Engineer and the other copy and PDF copy to the appropriate Geotechnical Engineering Unit regional office. 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, and Contractor 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 ammonium nitrate fuel oil (ANFO) to leach into bodies of water.

Before blasting for excavations, remove all overburden material along top of excavations for at least 10 meters beyond blasting or rock limits, whichever is less. Inspect any free faces to ensure adequate burden. Drill blast holes within 75 mm of plan location and maintain hole alignment when drilling.

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 13 cm or larger in diameter with No. 67 stone and blast holes smaller than 13 cm 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 2 copies and a PDF copy of a post-blast report within 3 days of each blast or before the next blast, whichever is sooner. Provide post-blast reports 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.

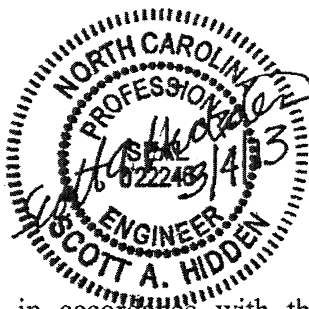
MEASUREMENT AND PAYMENT

No direct payment will be made for 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 will be made for blasting.

No additional payment will be made and no extension of completion date or time will be allowed when the Engineer suspends blasting.



SPECIAL

GEOTEXTILE FOR PAVEMENT STABILIZATION:**Description**

Furnish and install geotextile for pavement stabilization in accordance with the contract. Geotextile for pavement stabilization may be required to prevent longitudinal pavement cracks and provide separation between the subgrade and pavement structure at locations shown on the plans.

Materials

Load, transport, unload and store geotextiles such that they are kept clean and free of damage. Label, ship and store geotextiles in accordance with Section 7 of AASHTO M288. Geotextiles with defects, flaws, deterioration or damage will be rejected. Do not unwrap geotextiles until just before installation and do not leave geotextiles exposed for more than 7 days before covering geotextiles with base course.

Use geotextiles with a minimum roll width of 13 ft (4 m) that meet the requirements of Article 1056-1 of the *Standard Specifications*. Provide Type 1 Certified Mill Test Report in accordance with Article 106-3 of the *Standard Specifications* with minimum average roll values (MARV) as defined by ASTM D4439 for geotextile properties. For testing geotextiles, a lot is defined as a single day's production.

Machine direction (MD) and cross-machine direction (CD) are as defined by ASTM D4439. Use woven polyester or polypropylene geotextiles with properties meeting the following requirements.

Property	ASTM Test Method	Requirement (MARV)
Wide Width Tensile Strength @ 5% Strain (MD & CD)	D4595	1900 lbs/ft (27.7 kN/m)
Wide Width Tensile Strength @ Ultimate (MD & CD)	D4595	4800 lbs/ft (70.0 kN/m)
Permittivity	D4491	0.10 sec ⁻¹
Apparent Opening Size ¹	D4751	#30 (0.60 mm)
Ultraviolet Stability (retained strength) ²	D4355	70 %
Melting Point	D276	300°F (150°C)

¹US Sieve No. per AASHTO M92
²After 500 hours of exposure

Construction Methods

Construct embankments to subgrade elevation in accordance with the contract. The Engineer will determine if a geotextile for pavement stabilization is required at locations shown on the plans based on testing subgrade soils for quality. For subgrades that are not stabilized, allow 24

calendar days for the Engineer to determine if a geotextile for pavement stabilization is required. When using geotextiles on stabilized subgrades, stabilize subgrade soils to 12" (300 mm) beyond the bottom of the base course as shown on the plans.

Place the geotextile for pavement stabilization on the subgrade immediately below the pavement structure as shown on the plans. Place geotextiles in slight tension free of kinks, folds, wrinkles or creases. Install geotextiles with the machine direction (MD) perpendicular to the roadway centerline. The MD is the direction of the length or long dimension of the roll. Do not splice or overlap geotextiles in the MD such that splices or overlaps are parallel to the roadway centerline. Extend geotextiles 12" (300 mm) beyond the bottom of the base course as shown on the plans.

Cover the entire subgrade at each location by placing geotextile rolls adjacent to each other in the cross-machine direction (CD), i.e., perpendicular to the MD. The CD is the direction of the width or short dimension of the roll. Overlapping adjacent geotextiles in the CD is permitted but not required. Overlap geotextiles in the direction that base courses will be placed to prevent lifting the edge of the top geotextile.

Do not damage the geotextile for pavement stabilization when constructing base courses. Place and compact base courses in accordance with the *Standard Specifications*. Do not operate heavy equipment on the geotextiles more than necessary to construct the pavement structure. Replace any damaged geotextiles to the satisfaction of the Engineer.

Measurement and Payment

Geotextile for Pavement Stabilization will be measured and paid for in square yards (meters). Geotextiles will be measured along the top surface of the subgrade and no additional payment will be made for overlapping geotextiles. The contract unit price bid for *Geotextile for Pavement Stabilization* will be full compensation for supplying, transporting and installing geotextiles.

Payment will be made under:

Pay Item	Pay Unit
Geotextile for Pavement Stabilization	Square Yard (Meter)