

EDWARDS UNDERGROUND
WATER DISTRICT

Report 92-01

**Blasting Effects
on Engineered Structures**

Appendices H, I, J



APPENDIX H
SEWER PIPE AND MANHOLE SPECIFICATIONS

CITY OF SAN ANTONIO, TEXAS
DEPARTMENT OF PUBLIC WORKS

DESIGN CRITERIA
FOR
PUBLIC WORKS CONSTRUCTION

JANUARY, 1986

C: 741

CHAPTER IV

SANITARY SEWER DESIGN

INTRODUCTION

As the condition of surface and subsurface water resources has deteriorated in the state and nation, the collection, treatment and disposal of sewage has increasingly become the concern of federal, state and local governments. The Environmental Protection Agency of the federal government, the Department of Health and the Water Development Board of the state of Texas and the Department of Wastewater Management of the City of San Antonio are agencies charged with the control of wastewater facilities in the San Antonio area.

The following discussion addresses the overall design problems involved as specifically required by the City of San Antonio for use within its boundaries, its Extra Territorial Jurisdiction (ETJ), and for connection to and service by its sewage collection and disposal system.

Other requirements governing the design of sewerage systems are those outlined by the Texas Department of Health's Rule No. 301.79.05, "Design Criteria for Sewerage Systems", reference to which will be made throughout this Chapter of the Design Manual. Copies of the above noted "Rule" may be obtained from the offices of the Texas Register Division of the office of the Texas Secretary of State, or from the Division of Wastewater Surveillance and Technology of the Texas Department of Health, 1100 West 49th Street, Austin, Texas 78756. The Design Engineer engaged in the

development of sewage collection and disposal systems for the City of San Antonio would do well to have a copy of the Rule, and be thoroughly familiar with its requirements. Construction technical requirements are set forth in the City's "Standard Specifications for Public Works Construction".

FLOW FROM CONTRIBUTING POPULATION

All public sewerage systems proposed for location within the jurisdiction of the City of San Antonio and/or proposed for connection to, or service by, the City's Regional Sewerage System require the design and construction approval of the City's Director of the Department of Wastewater Management representative.

Within the City of San Antonio and its Extra Territorial jurisdiction (ETJ) sanitary sewers shall be designed of sufficient size to serve the maximum anticipated flow from all areas tributary to the line in question, and must conform with the Sanitary Sewer Master Plan recommendations on file in the office of the Director of Wastewater Management. The peak flows of domestic sewage, peak flows of waste from industrial plants, and storm water infiltration shall all be considered in the design of sewers. Estimates of flows from contributory population to be served in the future must be considered and included in the design. Consideration shall also be given to the maximum anticipated capacity of institutions contributing to the sewer line--usually over a 50 year period.

I. Residential Area Contribution

Flow from contributing residential areas shall be estimated from the following table:

<u>Type of Residential Area</u>	<u>Peak Contribution Per Person in Gallons Per Day</u>	<u>Average Daily Flow Per Person in Gallons Per Day</u>
a. Middle Income, New Construction	240	156
b. Middle Income, Old Construction	152	115
c. Low to Middle Income, Old Construction	198	128
d. Low Income	111	72
e. Middle Income, Apartments	180	117
f. Low to Middle Income, Apartments	152	99

Sewer mains shall be designed for the above peak flows for all existing residential areas, or for new planned residential subdivisions.

a. Off-Site Sewer Mains.

In the case of proposed off-site sewer mains, where development of a portion of the contributing area is planned, but development of the remaining area is unplanned and unsure, the following assumptions should be made: The undeveloped area shall be assumed to have 4 persons per lot and 3 lots per acre. The peak flow from this area shall be 250 gallons per person per day. These assumptions are for single family development only and corresponds to a peak, or pipe design flow of 3,000 gallons per acre per day. The acreage considered is 70% of the entire area to be served, including streets. For the case of developments other than single family, the minimum peak flow to be considered shall be 5,000 gallons per acre per day.

II. Commercial, Industrial, Institutional Contribution

Contributing sewage flows from commercial, industrial or institutional facilities will vary with the number of persons employed or residing within such facilities, and with the type of facility. Such flows can only be determined by the Architect/Engineer responsible for the development of the facility. His determination of the population and usage of the development shall be utilized in estimating the contributing flow to the sewer. Final contributing flow for design purposes will be as approved by the Director of the Department of Wastewater Management.

In the absence of specific data, the flows from various types of institutions can be obtained from the Texas Department of Health, Rule 301.79.05.001-.014, "Design Criteria for Sewerage Systems", prepared in conjunction with the Texas Water Development Board. Paragraph .004 of said Rule entitled, "Wastewater Treatment Facilities" lists average daily sewage flows, in gallons per person, for various types of facilities. In paragraph .002 of said Rule entitled, "Sewage Collection System", the requirement is made that sewers be designed based upon experience. The City requires a factor of 2-1/2 times the average daily flow.

III. Infiltration Contribution

Present day pipe, jointing materials and construction methods were developed to minimize infiltration and exfiltration of sewer lines. The Texas Department of Health Rule, stated above, requires that infiltration into a sewer line be kept to a minimum of 200

gallons per inch of pipe diameter per mile of pipe per day. In San Antonio, specifications require that all new public sewer lines be "air tested" so that the State requirement is met, and accordingly the amount of infiltration, as a contributing factor is quite small for design requirements for new areas as described in Section I herein. Similarly, where lines are located in flood prone areas, water-tight manholes and covers are required to further control infiltration.

Only in certain special cases will infiltration have an appreciable effect on the design of the sewer by contributing to the peak flow. Where new outfall sewers, or interceptors, are constructed to relieve peak flows in older City sewer systems, that is, those developed and constructed prior to present day standards, considerable infiltration may occur. In such cases infiltration may be estimated from the following table:

<u>SOURCE OF INFILTRATION</u>	<u>AMOUNT OF INFILTRATION IN GALLONS PER DAY PER ACRE</u>
Residential Area, Level to 7% Land Slope	700
Residential Area, 7% to 15% Land Slope	500
Totally Undeveloped Areas	360
High Water Table, Creek beds, Lake Areas	1450
Business & Industrial Areas	1000

In the engineering development of new sewer systems, either with public or private funds, the design engineer should estimate

the peak contributing flows from all sources into the system and review the results with the Department of Wastewater Management engineers prior to development of the final plans.

SEWER LINE DESIGN

I. Hydraulics

Once peak flows have been determined for a particular sewer line, design of the line shall be based upon the following criteria. No sewer mains smaller than 8 inches in diameter shall be constructed. House laterals shall be a minimum of 6 inches in diameter. Sewers shall be designed on the assumption that the line, flowing full, shall not flow less than a velocity of two feet per second. Discharge and velocities shall be determined by using Manning's formula,

$$Q = \frac{1.486 A R^{2/3} S^{1/2}}{n} \text{ where}$$

A = Area of pipe in square feet.

R = Hydraulic radius, Area/Wetted Perimeter.

S = Slope of line in feet/foot.

n = Mannings roughness coefficient (Use 0.013)

Q = Discharge in cubic feet per second.

and, Velocity = Q/A.

To achieve the minimum two feet per second velocity for pipes flowing full the following minimum slopes shall be used:

MINIMUM SLOPES

<u>PIPE SIZE</u>	<u>MINIMUM SLOPE, FEET/100 FEET</u>
8"	0.40'
10"	0.25'
12"	0.20'
15"	0.15'
18"	0.11'
21"	0.09'
24"	0.08'
27"	0.06'
30"	0.055'
33"	0.05'
36"	0.045'

For larger pipes, Manning's formula shall be used and slopes determined so that the velocity of flow is not less than two feet per second. Maximum velocities in sewer lines shall be limited to 15 feet per second so as to minimize erosion, and to prevent displacement from shock or vibrations.

II. Pipe Alignment

a. Sewer mains shall be designed with straight alignment and on a uniform grade between manholes. In special cases where curvature must be introduced, the radius of curvature shall be limited to 200 feet, or the pipe manufacturer's minimum radius for air test purposes, whichever is larger. In any case, such curved pipe must pass the standard Air Test for sanitary Sewers as required by City Specifications.

b. In new subdivisions, sewers shall be located in the center line of streets and four (4) feet from the north or east lines where in alleys or as otherwise approved.

c. All sewer lines shall be placed to line and grade as directed by the Director of the Department of Wastewater Management.

III. Manhole Location

Manholes shall be provided on sewer lines at all intersections of sewers, at intersections of streets or alleys where sewer lines may be added in the future, at ends of sewer lines for clean-out purposes, at changes in alignment, grade, or pipe size, and at ends of inverted siphons. Along straight runs of pipe, manholes shall also be placed at a minimum spacing in accordance with the following table:

MAXIMUM DISTANCE BETWEEN MANHOLES

<u>PIPE SIZE</u>	<u>MANHOLE SPACING</u>
8" thru 15"	400 feet
18" thru 21"	500 feet
24" thru 27"	600 feet
30" thru 33"	650 feet
36"	700 feet
Over 36"	1800 feet

IV. Manholes

Where manholes are placed along straight runs of pipe in accordance with the above table, the pipe shall be laid continuous through the manhole and invert shaping constructed around the bottom half of the pipe. Where there is an angular change in the alignment of the pipe the downstream pipe invert shall be set 0.1 feet lower to offset energy losses in the manhole. And, where a larger pipe is introduced at a manhole, the soffits of the pipes shall be set at the same elevation.

Manholes used in sewer systems shall be City standard manholes, either precast, or monolithic, shallow or extra depth, and shall be water-tight where located in flood prone areas, creek bottoms or in areas with high water tables, and in the Edwards Aquifer Recharge Zone. Manholes and other pertinent sewer details shall conform to the "Sanitary Sewer Standards" of the Department of Wastewater Management.

V. Sewers Over the Edwards Aquifer Recharge Zone

Sewer systems constructed over the Recharge Zone of the Edwards Aquifer shall conform to the latest revision of the Texas Water Development Board Rule 331.1 to 331.11. The Design Engineer shall verify whether or not the system is located over the aquifer recharge zone and furnish documentation.

VI. Force Mains

The use of pressure sewers, or force mains, may be considered when justified by unusual terrain or geological formations, low population density, difficult construction, or other circumstances where a pressure system would offer an advantage over a gravity system and where such system is approved by the Director of the Department of Wastewater Management. The Design Engineer should document the need for a pressure sewer system and submit it to the Department of Wastewater Management for Preliminary approval. The method of service is at the discretion of the Director of the Department of Wastewater Management.

Pressure systems, where approved, shall meet all of the design criteria outlined in Section (d) "Pressure Sewer Systems: of paragraph .002, "Sewerage Collection Systems" of the previously referenced Rule 301.79.05, "Design Criteria for Sewerage Systems" of the Texas Department of Health.

LIFT STATIONS

In certain instances, where topography or geology present problems, sewage lift stations may be designed into the collection system for temporary or permanent use. Where lift stations seem to be economical or necessary, the Design Engineer should present the proposal to the Director of the Department of Wastewater Management, prior to preparation of plans. The final determination of the method of service for a particular area rests with the Director of the Department of Wastewater Management. His approval is required before plans are prepared for a lift station.

Lift stations shall be designed in accordance with the requirements of paragraph .003, "Lift Stations", of the Texas

Department of Health Rule quoted above. Such problems as location, all weather access road, responsibility for operation and maintenance, emergency storage of sewage in the event of a breakdown or power failure, possible alternate power source and appropriate operational plans must be taken into account in planning the project.

WASTEWATER TREATMENT FACILITIES

The criteria for designing wastewater treatment facilities is complex and varied depending upon the quantity and quality of the sewage to be treated and the method employed to dispose of the effluent. All wastewater facilities plans are subject to review and approval by the Texas Department of Water Resources in conjunction with the Texas Department of Health. Accordingly, such facilities must meet the design requirements of paragraph .004, "Wastewater Treatment Facilities" of the Texas Department of Health Rule 301.79.05, latest edition and revisions thereto. Sewage treatment plants and sewage collection systems outside the City Limits but within the City's five-mile extra-territorial jurisdiction are subject to review and approval by the Director of the Department of Wastewater Management and must also conform to the requirements of the Texas Department of Health and the Texas Department of Water Resources. The developer shall provide written statements from applicable federal agencies accompanied by plans approved by all applicable federal agencies prior to construction. Specific design parameters not covered in the Rule shall be supplied to the Designer by the Director of the Department of Wastewater Management.

STREET REPAIRS

Repairs to streets because of sanitary sewer construction should be taken into account in the planning phase of the project. Repair requirements may vary widely from one project to another, however the intent should always be to leave the street in a condition equal to, if not better than, that which existed before construction of the sewer. Restoration of the street should be considered a part of the capital improvement program rather than burdening the Street Maintenance Division with the cost of the repairs necessitated by the sewer project.

I. General Requirements

A majority of sanitary sewer projects will involve relatively all diameter pipe. In such cases, it will usually be sufficient to neatly saw the pavement, excavate the trench, lay pipe and back-fill the trench and then patch the base material and pavement to a thickness and condition like the original street section. In other cases, where pipe and trench size are larger, or contractor manipulations damage the pavement surface beyond the limits of the trench it may be necessary to follow-up the patching operation with a surface treatment, or asphaltic pavement overlay. In still other cases, the size of pipe, and width and depth of trench may be such that a substantial portion of the street is destroyed. In this case complete reconstruction of the pavement and base may be warranted. Although it may be difficult to determine the precise nature of street repairs that may be required on the project, the Design Engineer should make an attempt to determine these requirements and include them in the plans.

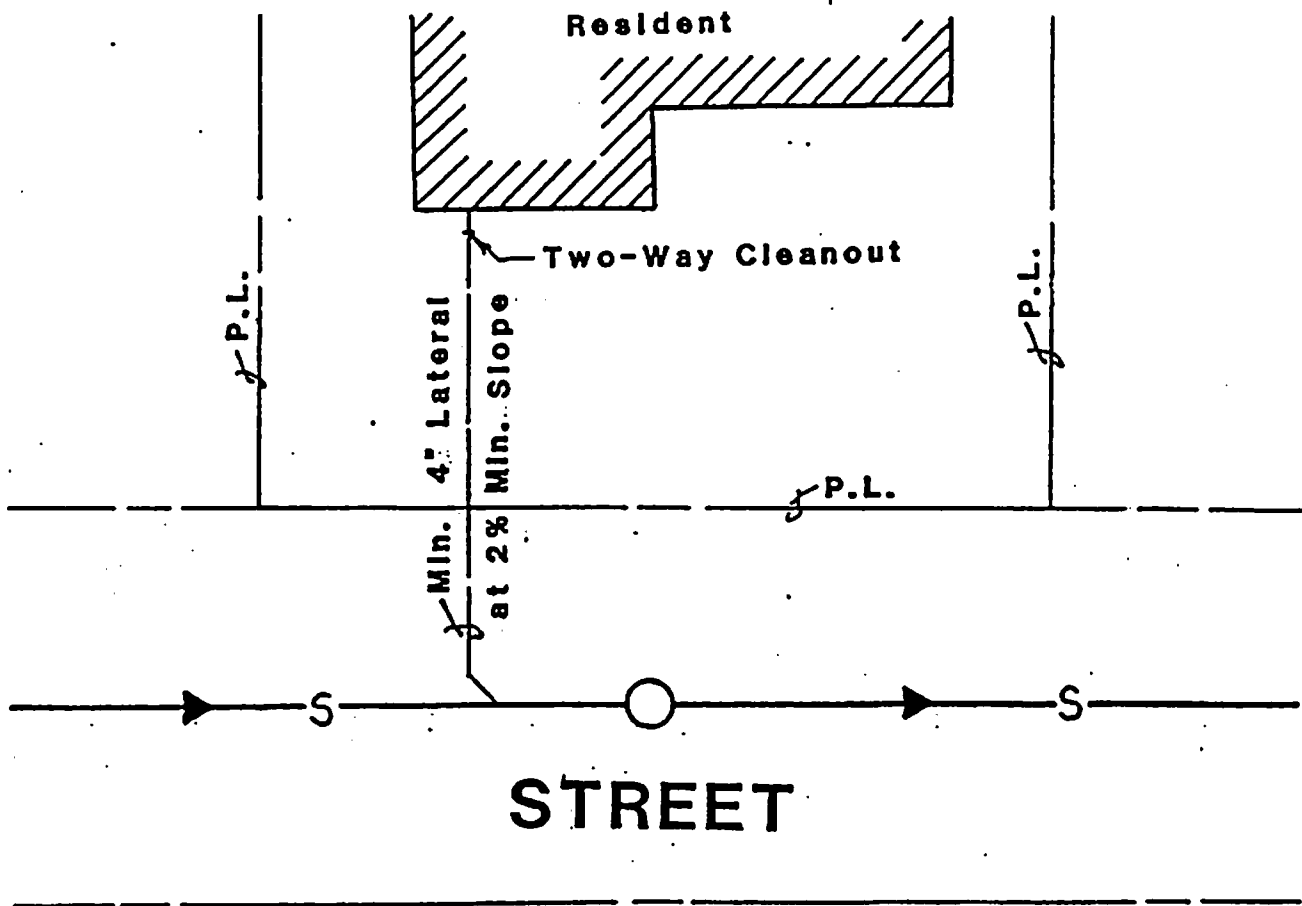
II. Unsewered Areas

"Unsewered Areas" in San Antonio are those areas of the City which have been platted, subdivided and developed, but which have no sewer system in place for whatever reason. When a sewer project involves providing sewers to such areas, it is necessary to build the sewer laterals for the house connections as well as the sewer main in the street. The policy in these cases is to construct the lateral to the edge of the street pavement plus two feet. Construction of these laterals to either side of the street at each lot, and the main as well, all but destroys the street pavement. In these cases the project plans should include reconstruction of the street pavement, base and subgrade, from curb to curb. Curbs, sidewalk, driveways, etc. shall be replaced only if disturbed by the sewer construction.

UTILITY COORDINATION

As with other public works projects, the Design Engineer for a sanitary sewer project must take into consideration the possible conflicts with other existing or planned utilities. These utilities must be located from records, or by field survey if necessary, and conflicts avoided where possible. If a conflict is unavoidable, the Design Engineer must work with the utility company involved and try to resolve the problem in a way that is most cost effective for both the City and the utility.

LATERAL LAYOUT

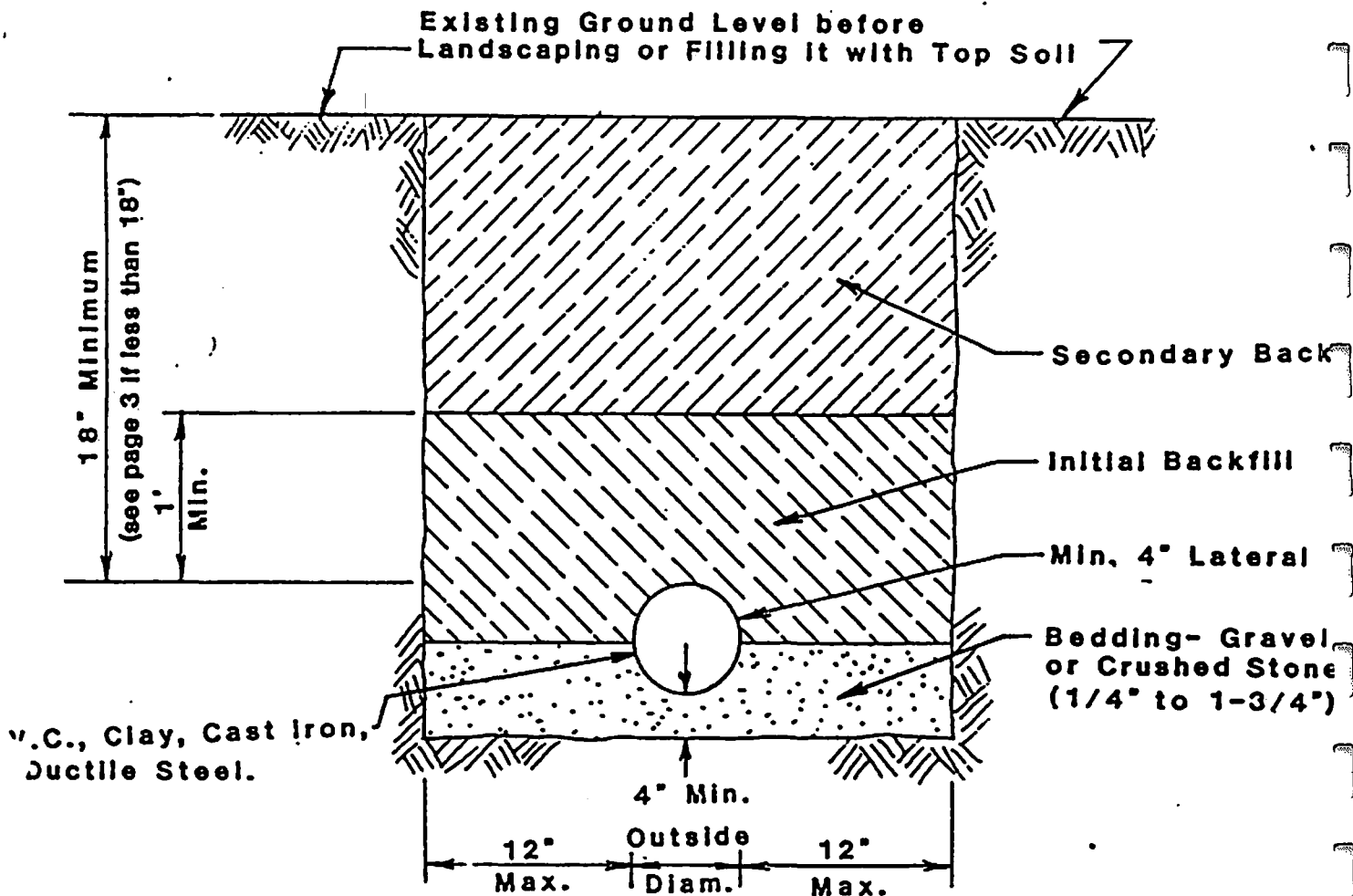


NOTES:

- 1.) Materials for Sanitary Sewer Lateral shall conform to the City of San Antonio Standard Specifications for Private Sewage Facilities. All flexible pipe shall conform to a minimum of ASTM Designation D-3034 (Schedule 40 or better for 4" lateral and SDR-35 or better for 6" lateral) with compression joint gaskets or shall be solvent joint.
- 2.) A. If the property is on the Edwards Recharge Zone, TWC requires that a Registered Professional Engineer, Registered Sanitarian, or appropriate City Inspector inspect and certify the service lateral prior to covering in accordance with 31 TAC SS331.4 (b)(9). A letter of certification must be sent to the TWC San Antonio office.

B. If the property is inside San Antonio City Limits, a permit is required from the City of San Antonio Building and Zoning Plumbing Section (299-8241).
- 3.) No blasting shall be permitted when tying a lateral into an existing sewer main.

CROSS-SECTION

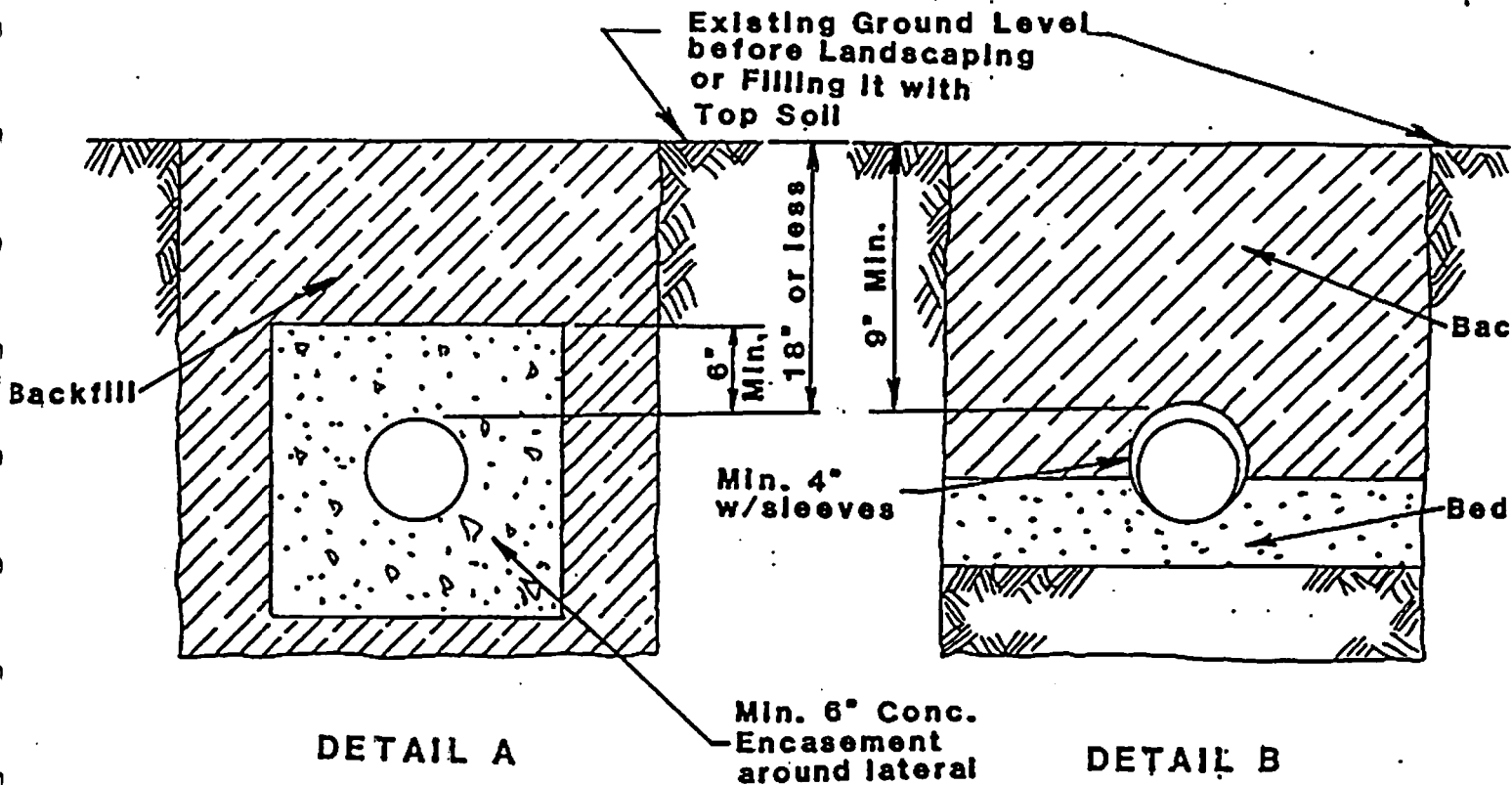


BACKFILLING: Backfill for laterals shall be divided into three (3) separate zones:

- 1.) Bedding - Where acceptable materials are encountered at the pipe bearing level, they shall be acceptable for bedding purposes. Where unacceptable materials, such as water, silt, muck, trash, debris, or rock, in ledge or boulder, are found at the pipe bearing level, or if flexible pipe is used, the trench should be under excavated as directed and backfilled with crushed stone or gravel, 1/4" to 1-3/4" size. The embedding shall extend up the sides of the pipe sufficiently to embed the lower quadrant of the pipe.
- 2.) Initial Backfill - Shall extend from the bedding surface to one foot (1') above the top of the pipe. Where acceptable laying conditions exist, the excavated materials may be used as initial backfill material. Where unacceptable laying conditions, and materials are encountered, or where flexible pipe is to be laid, the initial backfill shall consist of well graded gravels, crushed screenings or sand, or material approved by the inspector.
- 3.) Secondary Backfill - Shall extend from one foot (1') above the pipe to the top of the trench, and shall consist of materials removed from the trench, and shall be free from brush, debris, and junk, and contain no stones greater than one-half (1/2) the trench width.

LATERAL CROSS-SECTION

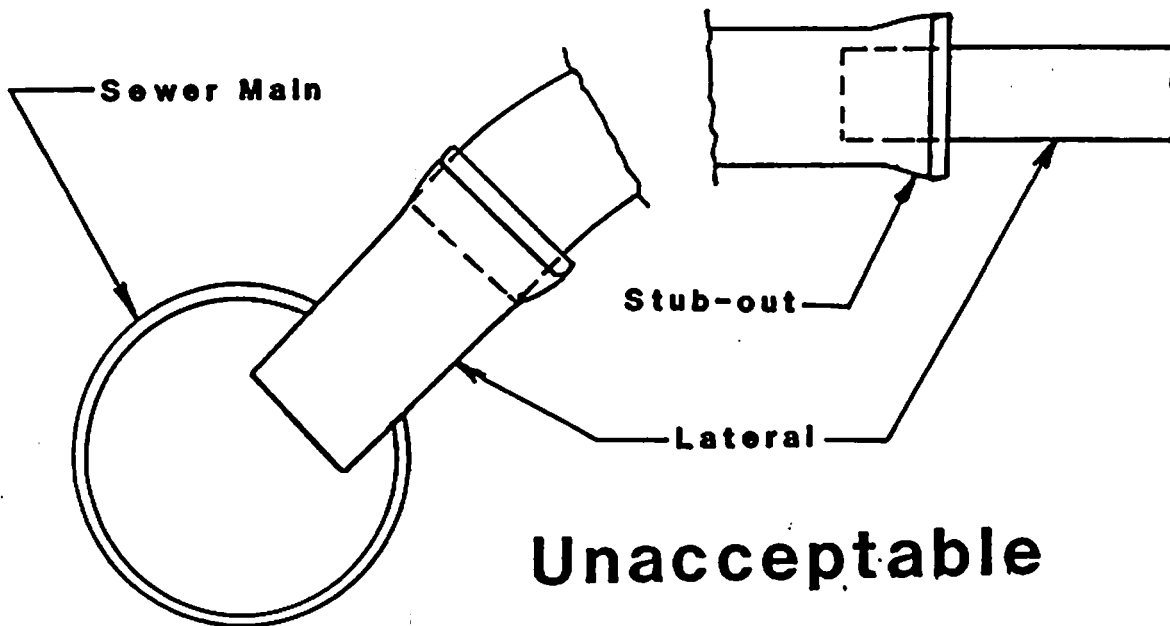
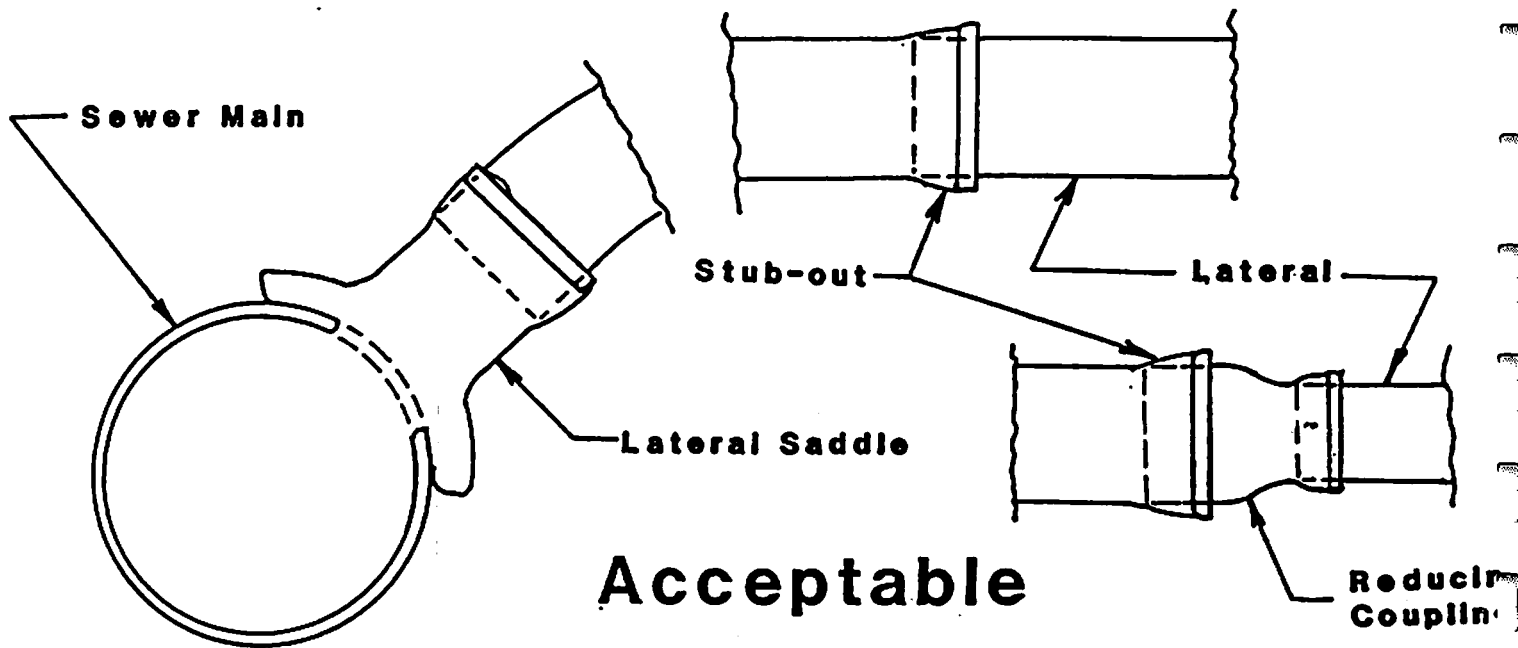
With less than 18" of cover to Top of pipe



NOTES:

- 1.) A minimum of Eighteen inches (18") of cover over the top of the Lateral shall be maintained, or the Lateral must be:
 - A. Encased with six inches (6") of concrete having a minimum compression strength of 2500 P.S.I. (Detail "A"), or
 - B. Instead of concrete encasement, Sleeving with bigger diameter pipe can be used for the entire length of less than eighteen inches (18") in depth (Detail "B"). The Sleeving material shall be of the same material as the lateral and must have at least nine inches (9") of cover material to the existing ground level.
- 2.) Bedding and Backfill must conform to the requirements for Bedding and Initial Backfill on page 2.

LATERAL CONNECTION TO EXISTING SEWER MAIN/STUB-OUT



NOTES:

The saddle shall be permanently bonded to the existing main by the use of compounds or clamps as recommended by the manufacturer.

SPECIAL SPECIFICATIONS

ITEM NO. 400ER2D

EXCAVATION, TRENCHING AND BACKFILLING

400ER2D.1 DESCRIPTION: This section shall govern the excavation, trenching and backfilling for storm drainage pipe, sanitary sewers and pipe culverts, unless otherwise noted on the plan details and the specifications. The work shall include all necessary pumping or bailing, sheeting, drainage and the construction and removal of any required cofferdams. All existing utilities shall be protected from damage during the excavation and backfilling of trenches, and if damaged, shall be replaced by the Contractor at his expense. Unless otherwise shown on the plans and bid proposal all excavation shall be unclassified, and shall include all materials encountered regardless of their nature or the manner in which they are removed.

400ER2D.2 EXCAVATION: The Contractor shall perform all excavation of every description and of whatever substances encountered, to the lines and grades shown on the plans or determined by the Engineer. During excavation, material suitable for backfilling shall be stockpiled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave ins. All excavated materials not required or suitable for backfill shall be removed and wasted as indicated on the drawings or as directed by the Engineer. Such grading shall be done as may be necessary to prevent surface water from flowing into trenches or other excavations, and any water accumulating therein shall be removed by pumping or by other approved methods. Shoring and sheeting shall be done as may be necessary for the protection of the work, adjoining property, and for the safety of the personnel. Unless otherwise indicated, excavation shall be by open cut except that short sections of a trench may be tunneled, if in the opinion of the Engineer, the pipe or structure can be safely and properly installed or constructed, and backfill can be properly tamped in such tunnel sections.

400ER2D.3 TRENCHING:

1. Trench walls shall be vertical and the practice of undercutting at the bottom or flaring at the top will not be permitted unless at the Engineer's direction. In special cases where trench flaring is permitted and directed by the Engineer, the trench walls shall remain vertical to a depth of at least one foot (1') above the top of the pipe. The bottom of the trench shall be square or slightly curved to the shape of the trenching machine cutters. The bottom of the trenches shall be accurately graded to provide uniform bearing and support for each

section of pipe on the undisturbed soil at every point along its entire length, except for the portions of pipe sections where it is necessary to excavate for bells and for the proper sealing of pipe joints. Bell holes and depressions for joints shall be dug after the trench bottom has been graded in order that the pipe rest upon the prepared bottom for as nearly its full length as practicable. Whenever over-excavation occurs, the under-cut trench shall be restored to grade, to the satisfaction of the Inspector, by replacement of excavated material compacted to the same density as the surrounding natural ground. Whenever wet or otherwise unstable soil that is incapable of properly supporting the structure or pipe, as determined by the Engineer, is encountered in the bottom of the trench, such soil shall be removed to the depth shown on the plans or determined by the Engineer and the trench backfilled to the proper grade with a subgrade filler as specified in Item No. 410, "Gravel Subgrade Filler". Trench bottoms for sanitary sewers shall conform to Paragraph 2, "Sanitary Sewer Backfilling" of Section 400ERZD.4, "Backfilling".

The depth of cut indicated on cut sheets, as furnished by the Engineer, is from the off-set or cut hub elevation to the invert of the pipe. The width of the trench shall be at least the outside diameter of the pipe plus six inches (6") on each side of the pipe for pipe sizes under forty-two inches (42") in diameter.

The maximum working room for pipe forty-two inches (42") in diameter and under shall be twelve inches (12") from each side of the pipe to the face of the trench walls. Where sheathing and bracing are used, a maximum twelve inch (12") working space, measured from the pipe to the face of the sheathing, will be allowed. For pipe over forty-two inches (42") in diameter the maximum width of the trench shall be such that the working space from the pipe to the trench wall, or sheathing as the case may be, will be a minimum of twelve inches (12"), and a maximum of twenty-four inches (24"). If allowable trench widths are exceeded through over-shooting of rock, caving of earth trenches or over excavation, the Contractor shall employ corrective measures or alternatives designs as determined by the Engineer.

It shall be understood that the depth of cut as indicated on the cut sheet may be more or less than the actual excavated depth due to ground conditions existing at the site. For this reason the Engineer shall determine the depth for pay purposes based on the surface elevation prior to the Contractor's operation and the invert of the sewer line. The Engineer's decision shall be final.

2. Where water, silt, mud, trash, debris or rock in ledge, boulder or coarse gravel (particle size larger than 3/4 inch) is encountered at the bearing level, the Contractor shall, as directed by the Inspector, under-excavate and remove

such materials to a depth not less than four inches (4") below the bottom of the pipe and replace with a material conforming to the requirements of Item No. 401, "Gravel Subgrade Filler". Trench bottoms for sanitary sewers shall conform to Item 400ERZD.4, 2, "Sanitary Sewer Backfilling".

400ERZD.4 BACKFILLING:

1. General: Excavation shall not be backfilled until the construction structures or appurtenances as installed conform to the requirements specified. The excavation shall be carefully backfilled with the excavated materials approved for backfilling, consisting of earth, loam, sandy clay, sand and gravel, soft shale or other approved materials, free from large clods of earth or stones. Where pipe is specially coated for protection against corrosion, care shall be taken to to damage the coating. Any excavation improperly backfilled, or where settlement occurs, shall be re-opened to the depth required for proper compaction, then refilled and compacted with the surface restored to the required grade and compaction. The use of sand backfill shall not be allowed, except for sanitary sewers as noted herein.

All compaction shall be such that the apparent dry density of each layer shall not less than ninety percent (90%) of the maximum dry density as determined by tests on samples as outlined in Texas Highway Department Testing Method Tex 113-E, unless otherwise shown on the plans.

2. Sanitary Sewer Backfilling: Backfill for sanitary sewers is divided into three (3) separate zones: (a) bedding, the material in trench bottom in direct contact with the bottom of the pipe; (b) initial backfill, the backfill zone extending from the surface of the bedding to a point one foot (1') above the top of the pipe; and (c) secondary backfill, the backfill zone extending from the initial backfill surface to the top of the trench. Materials and placement for each of the zones shall be as described herein.

(a). Bedding:

- (1). Existing stable materials and laying conditions encountered at the pipe bearing level which are acceptable for bedding purposes are:

Trench bottom at bearing level free of water, muck, debris and rock in boulder, ledge or coarse gravel (particle size larger than 1 3/4 inch) formations.

Coarse sands and gravels with maximum particle size of 1 3/4 inch, various graded sands and gravels containing small percentages of fines,

generally granular and non-cohesive, either wet or dry, fine sands and clayey gravels, fine sand, sand-clay mixtures and gravel-clay mixtures.

- (2). Existing unstable materials and laying conditions encountered at the pipe bearing level which are not acceptable for bedding purposes are:

Water, silt, muck, trash or debris at trench bottom at bearing level or rock, in ledge or boulder, or coarse gravel (particle size larger than 1 3/4 inch) formations.

- (3). Subgrade Filler: Where unacceptable materials as defined in Item 2, (a) (2) above, exist at the bearing level they shall be removed, as directed by the Inspector, and replaced to a minimum depth of four inches (4") or one-eighth (1/8) of the outside diameter of the pipe, whichever is greater, as directed by the Inspector, with subgrade filler material. The subgrade filler material shall extend up the sides of the pipe sufficient to embed the lower quadrant of the pipe. Subgrade filler material shall conform to the requirements of Item No. 410, "Gravel Subgrade Filler". Rock saw cutting are acceptable if criteria of Item No. 410 can be met.

- (b). Initial Backfill: Initial backfill is defined as backfill having a thickness in its compacted state from the surface of the bedding to a point one foot (1') above the top of the pipe. Initial backfill shall be constructed in accordance with details shown on the plans and these specifications.

- (1). Select Initial Backfill: Select Initial Backfill material shall conform to the requirements of Item No. 410, "Gravel Subgrade Filler". Rock saw cutting are acceptable if criteria of Item No. 410 can be met.

For sewer lines less than twenty-four inches (24") in diameter select initial backfill material shall be placed in two (2) lifts. The first lift shall be spread uniformly and simultaneously on each side and under the shoulders of the pipe to the mid-point or spring line of the pipe. The first lift of select initial backfill shall be inspected and approved prior to placement of the second lift. The second lift of select initial backfill material

shall extend from the spring line of the pipe to a depth sufficient to produce a compacted depth of material a minimum of one foot (1') above the top of the pipe. The second lift shall be evenly spread in a similar manner as the first lift.

For sewer line twenty-four inches (24") in diameter and larger select initial backfill material shall be evenly and simultaneously spread alongside, under the shoulders or haunches of the pipe and over the pipe in twelve-inch (12") lifts of a depth sufficient to produce a compacted depth of material a minimum of one foot (1') above the top of the pipe.

No mechanical or hand compaction will be required on an approved select initial backfill material.

(c). Secondary Backfill:

Secondary backfill is defined as backfill from one foot (1') above the top of the pipe to the top of the trench. Secondary backfill shall be constructed in accordance with details shown on the plans and these specifications.

Secondary backfill shall generally consist of materials removed from the trench and shall be free of brush, debris and junk. No rock or stones having any dimension larger than one-half the trench width, or twenty-four (24") inches at the largest dimension, whichever is less, shall be used in the secondary backfilling zone. In special cases where excessive width and/or depth of the trench permit, and only with approval of the Inspector, larger rocks may be incorporated into the backfill provided that the surrounding compactable soil may be properly and adequately compacted. Such oversized rocks shall be used only where the pipe has at least five feet (5') of cover over the top of the pipe, and where the top of the rocks are at least two feet (2') below the street or ground surface. These large stones may be placed in the secondary backfill provided they are well separated and arranged so that no interference with backfill settlement or the initial backfill zone will result. Secondary backfill material shall be composed of primarily compactable soil materials.

Water jetting shall be delivered under sufficient volume and pressure through an approved jetting hose and pipe nozzle. The jetting hose shall have a minimum inside dimension of two inches (2"). The jetting hose

shall be connected to an approved minimum two-inch (2") water pump capable of delivering water at the volume and pressure as required by the Engineer. The pipe nozzle shall be of sufficient length to introduce the water at a depth of not less than one foot (1') above the preceding lift. Points of trench jetting shall be staggered along the length of the trench and spaced at not more than three feet (3') on centers. Each five foot (5') lift of secondary backfill shall be jetted initially at a depth of not more than one foot (1') above the preceding lift. Sufficient water shall be introduced into the secondary backfill to cause complete subsidence of the backfill and develop free standing water at the surface of each lift, except in rock construction where free standing water is not required.

After the final lift has been jetted as approved, twelve (12) hours shall be allowed for the reduction of the materials moisture content. When the backfill moisture content is acceptable for mechanical or pneumatic compaction, the surface shall be compacted to the satisfaction of the Inspector. The surface of the final lift of trenches subject to traffic shall be compacted by ditch tamping equipment.

Ditch tamping equipment shall be mechanical tamping machines having a minimum of 500-pound, twelve inch (12") square tamper, capable of developing 4000 foot-pounds at full stroke. All of the secondary backfill shall be completed to the density specified in Paragraph 1, Section 400ERZD.4, "Backfilling".

400ERZD.5 DISPOSAL OF EXCAVATED MATERIALS: The excess excavated material, not utilized after all fill requirements have been met, shall become the property of the Contractor and he shall dispose of it by hauling and wasting outside the limits of the right-of-way of this project and of public thoroughfares and water courses, in conformity with pertinent City ordinance and in a manner meeting the approval of the Engineer.

400ERZD.6 MEASUREMENT: Excavation, Trenching and Backfill will not be measured for payment.

400ERZD.7 PAYMENT: No direct payment shall be made for excavation, trenching and backfilling for pipe sanitary sewers, and all costs in connection therewith shall be included in the applicable contract price for the item to which the work pertains.

Subgrade filler will be measured and paid for at the contract unit price as provided for in item No. 410, "Gravel Subgrade Filler."

SPECIAL SPECIFICATIONS

ITEM NO. 402ER2D

SANITARY SEWERS

402ER2D.1 DESCRIPTION: This item shall govern the furnishing, installation and jointing of sanitary sewer pipe of the size and type specified by the project plans and specifications.

All sanitary sewer mains shall be constructed in accordance with the specifications herein outlined and in conformity with the required lines, grades and details shown on the plans and as directed by the Engineer. Successful passage of the air test as described under Item No. 518 shall be required for the acceptance of the mains.

402ER2D.2 MATERIALS FOR SANITARY SEWER PIPE: Materials for sanitary sewer pipe may be either rigid or flexible.

1. **Rigid Pipe:** For diameter up to twelve inches (12"): ductile iron, for diameters greater than twelve inches (12"): concrete, ductile iron, cast iron and prestressed cylinder pipe, shall be, for the purpose of this specification, known as rigid pipe.
2. **Flexible Pipe:** For diameter up to twelve inches (12"): PVC SDR 26, for diameters greater than twelve inches (12"): PVC SDR 35
or Reinforced Plastic Mortar Pipe.
 - a. When flexible pipe is used, selected initial backfill in accordance with Item No. 400ER2D, "Excavation, Trenching and Backfilling", shall be mandatory.
 - b. Any flexible conduit having a deflection of the inside diameter greater than ASTM D-3034, seven and one-half percent (7-1/2%) after installation will not be accepted. A GO, NO-GO Deflection Testing Mandrell built in accordance with the detail drawing as shown on the standard detail sheet, shall be furnished at the Contractor's expense and shall be used in testing pipe deflection for acceptance, unless directed otherwise by the Engineer.
 - c. **Working room:** The working room for flexible pipe shall be a minimum of six inches (6") and a maximum of twelve inches (12") from each side of the pipe to the face of the trench walls. The maximum twelve-inch requirement will be waived when the pipe is provided a concrete cover as shown on the standard detail sheet of the plans.

3. Concrete Pipe:

- a. Concrete pipe and fittings less than eighteen inches (18") in diameter shall conform to ASTM Designation C-14.
- b. Concrete pipe and fittings, eighteen inches (18") and larger in diameter shall conform to ASTM Designation C-76, Class III or C-655 in accordance with paragraph 401.2.1.a of these specifications.
- c. When the depth of cover over the top of the pipe is over fourteen feet (14'), concrete pipe less than eighteen inches (18") in diameter shall be extra strength and shall conform to ASTM Designation C-14, Class III.
- d. When the depth of cover over the top of the pipe is over fourteen feet (14'), concrete pipe eighteen inches (18") and larger in diameter shall conform to ASTM Designation C-76, Class IV or C-655 in accordance with paragraph 401.2.1.a of these specifications.
- e. All joints and joint material for concrete pipe and fittings shall conform to ASTM Designation C-443.

- 4. Reinforced Plastic Mortar Pipe, Non-Pressure Type:** Reinforced plastic mortar pipe, non-pressure type, shall be a factory-formed conduit of polyester resin, continuous roving glass fibers and silica sand built up in laminates to meet the requirements of ASTM D-3262 including the appendix and subsequent specifications.

Joints: Joints for pipe and fittings shall be confined compression rubber gasket bell and spigot type joints conforming to the material and performance requirements of ASTM C-443.

Fittings: Fittings shall conform to the joint and strength requirements as specified herein for pipe of similar size. Lateral openings of 4-inch and 6-inch sizes shall be made using A.B.S. sewer saddles conforming to ASTM D-2661. The ends will be bell and spigot.

- 5. Poly (Vinyl Chloride) (PVC) Sewer Pipe:** Pipe, fittings and joints shall conform to ASTM Designation D-3034, F-679 and D-3212 with the exception that Solvent Cement Joints shall not be used.

6. Force Mains: PVC force mains, fittings and joints shall meet or exceed the requirements of ASTM Designation D-2441 with the exception that Solvent Cement Joints shall not be used. The pressure rating and size shall be as shown on the plans.
7. Water Main Crossings: Where gravity or force main sewers are constructed in the vicinity of water mains, the requirements of the "Rules and Regulations for Public Water Systems" of the Texas Department of Health, Water Hygiene Division, adopted 1978, shall be met.
8. Cast Iron Pipe and Fittings: Cast iron pipe shall conform to the requirements of the latest revision of ASA Specification A21.6 or A21.8 thickness Class 22 except pipe fourteen (14") inches or larger shall be Class 23 if the laying depth is over eight (8') feet.

Fittings for cast iron pipe shall have not less than the thickness, class and pressure rating for the cast iron pipe specified. Fittings shall be furnished with the type of joint or any end combination thereof as specified. Mechanical joint fittings shall be furnished complete with glands, gaskets and bolts. Bolts shall be "Cor-Ten" or approved equal.

Flanged fittings shall be faced and drilled in accordance with ASA Specifications B 16.1.

Joints shall be as provided by the manufacturer.

9. Ductile Iron Pipe and Fittings: Ductile Iron Pipe shall conform to the requirements of the latest revision of A.N.S.I. Standard A21.51 (A.W.W.A. Standard C151), "Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand-lined Molds, for Water or Other Liquids". Thickness or Class shall be that required for Laying Condition Type 4 or 5, in accordance with actual conditions at the site. In addition, Ductile Iron Pipe may be "thickness designed" in accordance with the requirements of the latest revision of A.N.S.I. Standard A21.50 (A.W.W.A. C150), "Thickness Design of Ductile Iron Pipe". Thickness design shall be based on standard laying condition 4 or 5 in accordance with conditions at the site. Fittings for ductile iron pipe shall have not less than the thickness, class or pressure rating specified for ductile iron pipe. Fittings shall be furnished with all necessary glands, gaskets, bolts, etc., as may be required to complete the joints.

Rubber-gasket joints for mechanical joints or "push on" type joints shall conform to the requirements of A.N.S.I. Standard A21.11 (A.W.W.A. Standard C111), "Rubber-Gasket Joints for Ductile Iron Pressure Pipe and Fittings", latest revision.

10. Prestressed Concrete Cylinder Pipe: Prestressed concrete pipe and fittings shall conform to AWWA Specification C-301.
11. Lateral line will be ductile iron or PVC SDR 26 or equal and extend five feet (5') beyond the curb, or water main, whichever is farther from the main. All connections of the lateral line to the main will be by an approved saddle, or manufactured tee or wye. Breaking of a main to tie in a lateral or use of cement or other grout material in making of joints or connections is prohibited. Two feet (2') of the lateral will be concrete capped, commencing one foot (1') from end of pipe and ending three feet (3') from end of pipe. The location of the lateral pipe end will be marked up two (2) #4 rebars tied together and embedded vertically in the concrete cap and extending vertically to within twelve inches (12") of top of curb. Backfill requirements are the same as other 402ER2D, Sanitary Sewers.
12. All sanitary sewer pipe and fittings produced within the jurisdiction of the City of San Antonio shall be tested and stamped by the City of San Antonio Materials Testing Laboratory at the source of supply. All shipments of pipe not so tested and stamped shall be accompanied by a certificate of compliance to these specifications prepared by an independent testing laboratory and signed by a registered professional engineer.

402ER2D.3 CONSTRUCTION METHODS

1. Pipe twenty-four inches (24") and smaller shall rest on an undisturbed earth foundation, continuously, throughout its length, true to line and grade. When bell and spigot pipe is used, the position of the pipe bells shall be determined by measurement, and cross excavation just adequate to admit the pipe bells without bearing shall be cut. It is specifically provided, however, that if rock occurs in boulder, ledge or coarse gravel formations at the bearing level it shall be removed to a depth of not less than four inches (4") below the lowest bearing level.

of the pipe and replaced with approved select bedding material in conformance with Item 400ERZD.4, 2, (a), "Bedding", after which fine grade and excavation for bells shall be done in the manner described above.

2. Where the pipe to be laid is larger than twenty-four inches (24") in diameter, the trench bottom shall be shaped by fine grading to firmly embed the lower quadrant of the pipe. At the direction of the Engineer, the Contractor shall provide a template for shaping purposes. Conditions of rock and undercutting shall be as specified for pipe sizes less than twenty-four inches (24") in diameter.

An alternate to the above, the bottom of the trench may be undercut and the lower quadrant of the pipe embedded in approved select bedding material in conformance with Item 400ERZD.4, 2, (a), "Bedding", in accordance with lines and thickness as shown on the plan details.

3. Subgrade Filler: When laying pipe in unstable materials as defined by Item 400ERZD.4, 2, (a) (2), "Bedding", the contractor shall, when directed by the Inspector, underexcavate and remove existing unstable materials or rock, as directed by the Inspector and replace with subgrade filler material as directed and defined by Item 400ERZD.4, 2, (a) (3), "Subgrade Filler".
4. Pipe Laying: The owner will inspect all pipe before it is placed in the trench and will reject any sections found to be damaged or defective to a degree that would affect the function of the pipe. Rejected pipe shall be immediately removed from the site of the work. The Contractor shall be required to commence construction and laying of pipe at the downstream end of the sanitary sewer outfall line and proceed non-stop in a forward upstream direction.

No pipe shall be laid within ten feet (10') of any point where excavation is in progress. Pipe laying shall proceed upgrade with the tongue or spigot pointing in the direction of flow. Pipe shall be lowered into the trench without disturbing the prepared foundation or the trench sides. The drilling of lifting holes in the field will not be permitted. Pipe shall be installed by means of a concentric pressure being applied to the pipe with "come-alongs". Pulling or pushing a joint of pipe in place by using a crane, bulldozer, or backhoe will not be

permitted. Pipe shall be pulled home in a straight line with all parts of the pipe on line and grade at all times. No side movement or up and down movement of the pipe will be permitted during or after the pulling operation. Should coupled joints of pipe be out of line or off grade, they shall be removed one joint at a time and brought to the proper line and grade. The lifting or moving of several joints of coupled pipe at one time to close a partially open joint or to fine grade under laid joints of pipe will not be permitted.

No pipe shall be installed in tunnels except as provided on the plans, or with the permission of the Engineer. If the Contractor finds it necessary to install pipe in tunnels not provided on the plans, he shall submit to the Engineer, prior to commencement of work, a detailed outline of procedures, methods, and use of materials depending on existing soil conditions.

No horizontal or vertical curves shall be permitted, except as authorized by the City. The minimum radius for the type sewer pipe used shall be as recommended by the manufacturer or greater and approved by the City.

Before leaving the work unattended, the upper ends of all pipelines shall be securely closed with a tight fitting plug or closure. The interior of laid pipe shall be kept free from dirt, silt, gravel or foreign material at all times. All pipe in place must be approved before backfilling.

402ERZD.4 MEASUREMENT:

1. All sewer pipe will be measured from center of manhole to center of manhole or end of main. Measurement will be continuous through any fittings in the main, even though the fittings are pay items of the contract.
2. Pipe fittings, including wyes, tees and bends will be measured as the total number of units installed, regardless of material.

402ERZD.5 PAYMENT:

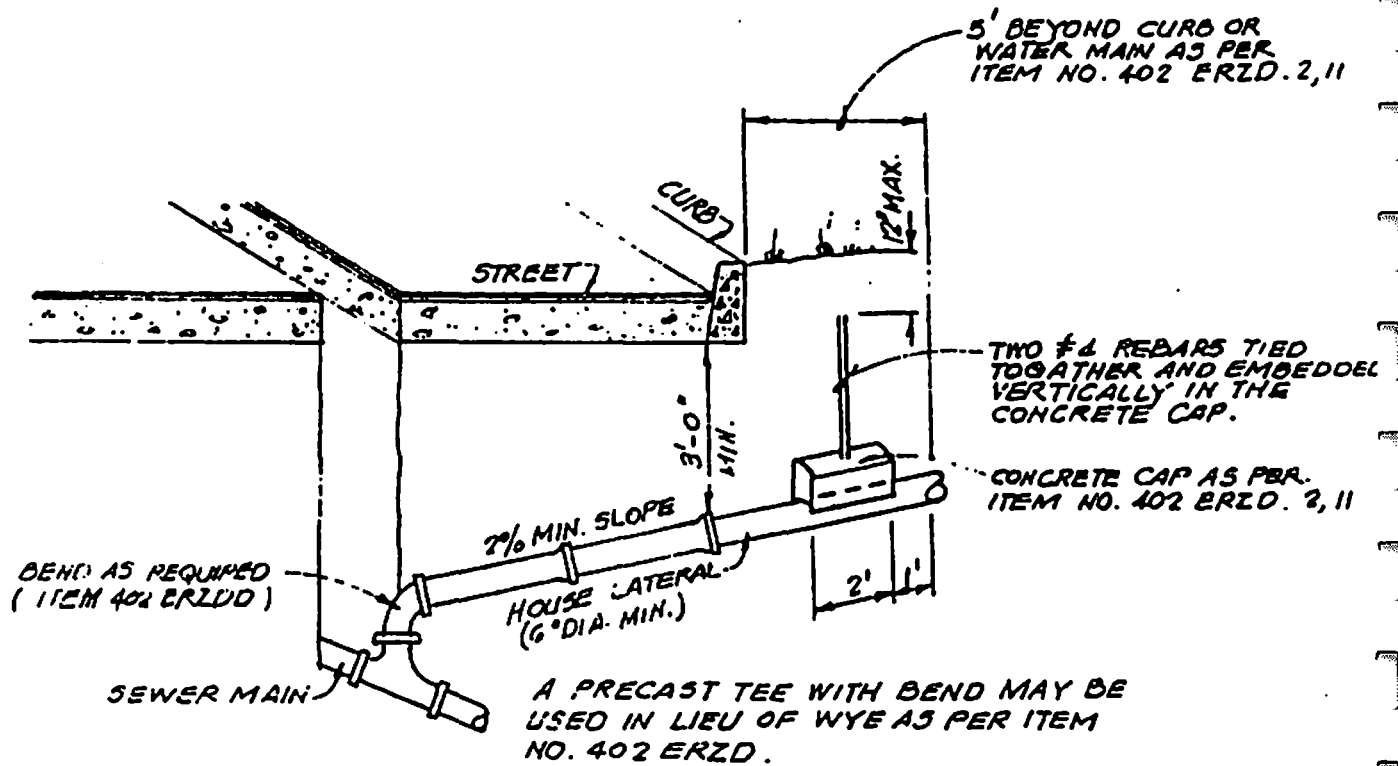
1. Sewer pipe will be paid for at the contract bid price per linear foot complete in place for the types, size and depth constructed. Said price shall be full compensation

for furnishing all materials, including pipe, trenching, pumping, shoring and bracing, sand cushion, concrete plugs, laying and jointing, backfilling, tamping, water, labor, tools, equipment and other incidentals necessary to complete the work. Subgrade filler will be paid for under Item No. 410, "Subgrade Filler".

2. Sewer pipe fittings shall be paid for at the contract bid price per each.
3. Pay cuts will be measured from the top of ground prior to the Contractor's operation, and along the centerline of the pipe to the invert of the pipe.

Payment will be made under:

PAY ITEM NO. 402ERZDA: Sanitary Sewers	- per linear foot.
PAY ITEM NO. 402ERZDB: Wyes	- per each.
PAY ITEM NO. 402ERZDC: Tees	- per each.
PAY ITEM NO. 402ERZDD: Bends	- per each.



HOUSE LATERAL DETAIL 402 ERZD

SPECIAL SPECIFICATIONS

ITEM NO. 402ERZD

SANITARY SEWERS

402ERZD.1 DESCRIPTION: This item shall govern the furnishing, installation and jointing of sanitary sewer pipe of the size and type specified by the project plans and specifications.

All sanitary sewer mains shall be constructed in accordance with the specifications herein outlined and in conformity with the required lines, grades and details shown on the plans and as directed by the Engineer. Successful passage of the air test as described under Item No. 518 shall be required for the acceptance of the mains.

402ERZD.2 MATERIALS FOR SANITARY SEWER PIPE: Materials for sanitary sewer pipe may be either rigid or flexible.

1. Rigid Pipe: For diameter up to twelve inches (12"): ductile iron, for diameters greater than twelve inches (12"): concrete, ductile iron, cast iron and prestressed cylinder pipe, shall be, for the purpose of this specification, known as rigid pipe.
2. Flexible Pipe: For diameter up to twelve inches (12"): PVC SDR 26, for diameters greater than twelve inches (12"): PVC SDR 35 or PVC with a minimum stiffness factor of 46 or Reinforced Plastic Mortar Pipe.
 - a. When flexible pipe is used, selected initial backfill in accordance with Item No. 400ERZD. "Excavation, Trenching and Backfilling", shall be mandatory.
 - b. Any flexible conduit having a deflection of the inside diameter greater than ASTM D-3034, seven and one-half percent (7-1/2%) after installation will not be accepted. A GO, NO-GO Deflection Testing Mandrell built in accordance with the detail drawing as shown on the standard detail sheet, shall be furnished at the Contractor's expense and shall be used in testing pipe deflection for acceptance, unless directed otherwise by the Engineer.
 - c. Working room: The working room for flexible pipe shall be a minimum of six inches (6") and a maximum of twelve inches (12") from each side of the pipe to the face of the trench walls. The maximum twelve-inch requirement will be waived when the pipe is provided a concrete cover as shown on the standard detail sheet of the plans.
3. Concrete Pipe:
 - a. Concrete pipe and fittings less than eighteen inches (18") in diameter shall conform to ASTM Designation C-14.

- b. Concrete pipe and fittings, eighteen inches (18") and larger in diameter shall conform to ASTM Designation C-76, Class III or C-655 in accordance with paragraph 401.2.1.a of these specifications.
 - c. When the depth of cover over the top of the pipe is over fourteen feet (14'), concrete pipe less than eighteen inches (18") in diameter shall be extra strength and shall conform to ASTM Designation C-14, Class III.
 - d. When the depth of cover over the top of the pipe is over fourteen feet (14'), concrete pipe eighteen inches (18") and larger in diameter shall conform to ASTM Designation C-76, Class IV or C-655 in accordance with paragraph 401.2.1a of these specifications.
 - e. All joints and joint material for concrete pipe and fittings shall conform to ASTM Designation C-443.
4. Reinforced Plastic Mortar Pipe, Non-Pressure Type: Reinforced plastic mortar pipe, non-pressure type, shall be a factory-formed conduit of polyester resin, continuous roving glass fibers and silica sand built up in laminates to meet the requirements of ASTM D-3262 including the appendix and subsequent specifications.

Joints: Joints for pipe and fittings shall be confined compression rubber gasket bell and spigot type joints conforming to the material and performance requirements of ASTM C-443.

Fittings: Fittings shall conform to the joint and strength requirements as specified herein for pipe of similar size. Lateral openings of 4-inch and 6-inch sizes shall be made using a A.B.S. sewer saddles conforming to ASTM D-2661. The ends will be bell and spigot.

- 5. Poly (Vinyl Chloride) (PVC) Sewer Pipe: Pipe fittings and joints shall conform to ASTM Designation D-3034, F-679 and D-3212 with the exception that Solvent Cement Joints shall not be used.
- 6. Force Mains: PVC force mains, fittings and joints shall meet or exceed the requirements of ASTM Designation D-2441 with the exception that Solvent Cement Joints shall not be used. The pressure rating and size shall be as shown on the plans.
- 7. Water Main Crossings: Where gravity or force main sewers are constructed in the vicinity of water mains, the requirements of the "Rules and Regulations for Public Water Systems" of the Texas Department of Health, Water Hygiene Division, adopted 1978, shall be met.
- 8. Cast Iron Pipe and Fittings: Cast iron pipe shall conform to the requirements of the latest revision of ASA Specification A21.6 or A21.8 Thickness Class 22 except pipe fourteen (14") inches or larger shall be Class 23 if the laying depth is over eight (8') feet.

Fittings for cast iron pipe shall have not less than the thickness,

class and pressure rating for the cast iron pipe specified. Fittings shall be furnished with the type of joint or any end combination thereof as specified. Mechanical joint fittings shall be furnished complete with glands, gaskets and bolts. Bolts shall be "Cor-Ten" or approved equal.

Flanged fittings shall be faced and drilled in accordance with ASA Specifications B 16.1.

Joints shall be as provided by the manufacturer.

9. Ductile Iron Pipe and Fittings: Ductile Iron Pipe shall conform to the requirements of the latest revision of A.N.S.I. Standard A21.51 (A.W.W.A. Standard C151), "Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand-lined Molds, for Water or Other Liquids". Thickness or Class shall be that required for Laying Condition Type 4 or 5, in accordance with actual conditions at the site. In addition, Ductile Iron Pipe may be "thickness designed" in accordance with the requirements of the latest revision of A.N.S.I. Standard A21.50 (A.W.W.A. C150), "Thickness Design of Ductile Iron Pipe". Thickness design shall be based on standard laying condition 4 or 5 in accordance with conditions at the site. Fittings for ductile iron pipe shall have not less than the thickness, class or pressure rating specified for ductile iron pipe. Fittings shall be furnished with all necessary glands, gaskets, bolts, etc., as may be required to complete the joints.

Rubber-gasket joints for mechanical joints or "push on" type joints shall conform to the requirements of A.N.S.I. Standard A21.11 (A.W.W.A. Standard C111), "Rubber-Gasket Joints for Ductile Iron Pressure Pipe and Fittings", latest revision.

10. Prestressed Concrete Cylinder Pipe: Prestressed concrete pipe and fittings shall conform to AWWA Specification C-301.
11. Lateral line will be ductile iron or PVC SDR 26 or equal and extend five feet (5') beyond the curb, or water main, whichever is farther from the main. All connections of the lateral line to the main will be by an approved saddle, or manufactured tee or wye. Breaking of a main to tie in a lateral or use of cement or other grout material in making of joints or connections is prohibited. Two feet (2') of the lateral will be concrete capped, commencing one foot (1') from end of pipe and ending three feet (3') from end of pipe. The location of the lateral pipe end will be marked up two (2) #4 rebars tied together and embedded vertically in the concrete cap and extending vertically to within twelve inches (12") of top of curb. Backfill requirements are the same as other 402ERZD, Sanitary Sewers.
12. All sanitary sewer pipe and fittings produced within the jurisdiction of the City of San Antonio shall be tested and stamped by the City of San Antonio Materials Testing Laboratory at the source of supply. All shipments of pipe not so tested and stamped shall be accompanied by a certificate of compliance to these specifications prepared by an independent testing laboratory and signed by a registered professional

engineer.

402ERZD.3 CONSTRUCTION METHODS

1. Pipe twenty-four inches (24") and smaller shall rest on an undisturbed earth foundation, continuously, throughout its length, true to line and grade. When bell and spigot pipe is used, the position of the pipe bells shall be determined by measurement, and cross excavation just adequate to admit the pipe bells without bearing shall be cut. It is specifically provided, however, that if rock occurs in boulder, ledge or coarse gravel formations at the bearing level it shall be removed to a depth of not less than four inches (4") below the lowest bearing level of the pipe and replaced with approved select bedding material in conformance with Item 400ERZD.4, 2, (a), "Bedding", after which fine grade and excavation for bells shall be done in the manner described above.
2. Where the pipe to be laid is larger than twenty-four inches (24") in diameter, the trench bottom shall be shaped by fine grading to firmly embed the lower quadrant of the pipe. At the direction of the Engineer, the Contractor shall provide a template for shaping purposes. Conditions of rock and undercutting shall be as specified for pipe sizes, less than twenty-four inches (24") in diameter.

An alternate to the above, the bottom of the trench may be undercut and the lower quadrant of the pipe embedded in approved select bedding material in conformance with Item 400ERZD.4, 2, (a), "Bedding", in accordance with lines and thickness as shown on the plan details.

3. Subgrade Filler: When laying pipe in unstable materials as defined by Item 400ERZD.4, 2, (a) (2), "Bedding", the contractor shall, when directed by the Inspector, underexcavate and remove existing unstable materials or rock, as directed by the Inspector and replace with subgrade filler material as directed and defined by Item 400ERZD.4, 2, (a) (3), "Subgrade Filler".
4. Pipe Laying: The owner will inspect all pipe before it is placed in the trench and will reject any sections found to be damaged or defective to a degree that would affect the function of the pipe. Rejected pipe shall be immediately removed from the site of the work. The Contractor shall be required to commence construction and laying of pipe at the downstream end of the sanitary sewer outfall line and proceed non-stop in a forward upstream direction.

No pipe shall be laid within ten feet (10') of any point where excavation is in progress. Pipe laying shall proceed upgrade with the tongue or spigot pointing in the direction of flow. Pipe shall be lowered into the trench without disturbing the prepared foundation or the trench sides. The drilling of lifting holes in the field will not be permitted. Pipe shall be installed by means of a concentric pressure being applied to the pipe with "come-alongs". Pulling or pushing a joint of pipe in place by using a crane, bulldozer, or backhoe will not be permitted. Pipe shall be pulled home in a straight line with all parts of the pipe on line and grade at all

times. No side movement or up and down movement of the pipe will be permitted during or after the pulling operation. Should coupled joints of pipe be out of line or off grade, they shall be removed one joint at a time and brought to the proper line and grade. The lifting or moving of several joints of coupled pipe at one time to close a partially open joint or to fine grade under laid joints of pipe will not be permitted.

No pipe shall be installed in tunnels except as provided on the plans, or with the permission of the Engineer. If the Contractor finds it necessary to install pipe in tunnels not provided on the plans, he shall submit to the Engineer, prior to commencement of work, a detailed outline of procedures, methods, and use of materials depending on existing soil conditions.

No horizontal or vertical curves shall be permitted, except as authorized by the City. The minimum radius for the type sewer pipe used shall be as recommended by the manufacturer or greater and approved by the City.

Before leaving the work unattended, the upper ends of all pipelines shall be securely closed with a tight fitting plug or closure. The interior of laid pipe shall be kept free from dirt, silt, gravel or foreign material at all times. All pipe in place must be approved before backfilling.

402ERZD.4 MEASUREMENT:

1. All sewer pipe will be measured from center of manhole to center of manhole or end of main. Measurement will be continuous through any fittings in the main, even though the fittings are pay items of the contract.
2. Pipe fittings, including wyes, tees and bends will be measured as the total number of units installed, regardless of material.

402ERZD.5 PAYMENT:

1. Sewer pipe will be paid for at the contract bid price per linear foot complete in place for the types, size and depth constructed. Said price shall be full compensation for furnishing all materials, including pipe, trenching, pumping, shoring and bracing, sand cushion, concrete plugs, laying and jointing, backfilling, tamping, water, labor, tools, equipment and other incidentals necessary to complete the work. Subgrade filler will be paid for under Item No. 410, "Subgrade Filler".
2. Sewer pipe fittings shall be paid for at the contract bid price per each.
3. Pay cuts will be measured from the top of ground prior to the Contractor's operation, and along the centerline of the pipe to the invert of the pipe.

Payment will be made under:

PAY ITEM NO. 402ERZDA:	Sanitary Sewers	- per linear foot.
PAY ITEM NO. 402ERZDB:	Wyes	- per each.
PAY ITEM NO. 402ERZDC:	Tees	- per each.
PAY ITEM NO. 402ERZDD:	Bends	- per each.

APPENDIX I
TANK SPECIFICATIONS

SPECIFICATIONS

Double Wall Fiberglass-Coated Underground Storage Tank for Installation on Edwards Aquifer Recharge Zone

One (1) BUFFHIDE double wall composite all welded steel underground storage tank complete to first fitting. The tank shall be fabricated in accordance with U.L. standard 1746 and bear the "Underwriters" Label Type I Secondary Containment Composite for Steel Underground Tanks for Flammable and Combustible Liquids.

This tank is intended for installation and use in accordance with the Standard for Installation of Oil Burning Equipment, NFPA No. 31, and the Flammable and Combustible Liquids Code, NFPA No. 30, of the National Fire Protection Association.

CAPACITY: 10,000 gallons

NOMINAL DIAMETER; 8 feet

FIBREGLASS WRAP: 100 mils

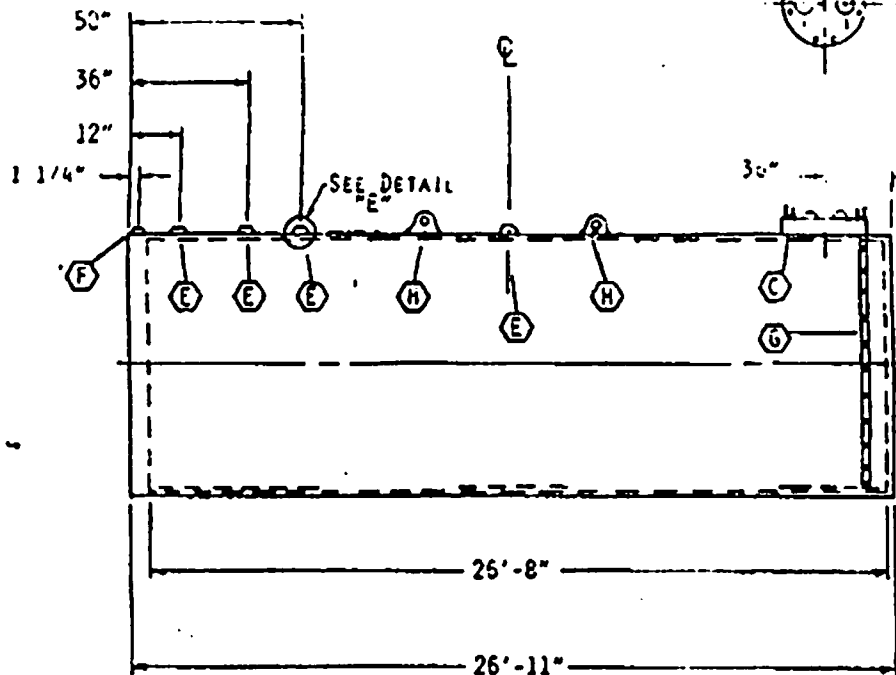
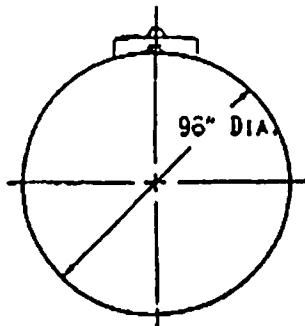
FITTINGS: Midwest Standard, Six (6) 5-inch Threaded Openings with
4-inch X 5-inch Nylon Bushings,
One (1) 24-inch manway located at the center of the tank,
Striker Plates,
Lifting Lugs

ACCESSORIES: Fiberglass Kit,

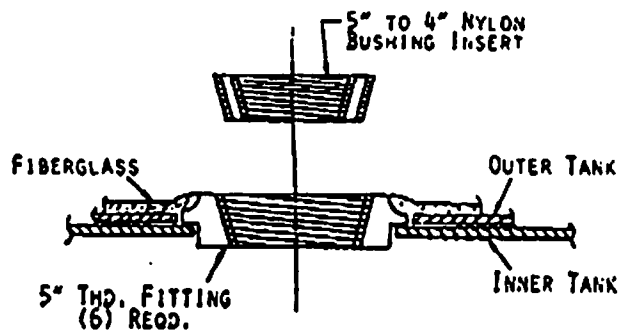
Gauge Stick and Gauge Charts

EXTERNAL: Sandblast, Fiberglass Wrap

WARRANTY: 30 Years



MARK	QUAN	SIZE	DESCRIPTION
A			
B			
C	1	24"	INVERTED MANWAY
D			
E	6	4"	REDUCED BY 5" TO 4" NYLON BUSHINGS
F	1	2"	REDUCED BY 3" TO 2" NYLON BUSHING
G			LADDER
H	2		LIFT LUGS



DETAIL "E"

NOTES:

- PAINT - EXTERNAL, BUFFHIDE COATING
- LABEL - UL 1746 & ACT-100
- SERVICE - MOTOR FUEL
- OUTER TANK - 360° OUTER TANK COMPLETELY CONTAINS INNER TANK
- MONITOR WELL - 2" VOID SPACE AT END OF THE TANK TO PROVIDE ACCESS TO MONITOR
- METAL THKNS - 1/4" INNER TANK
10 GA. OUTER TANK
- BUMP PLATE - UNDER ALL OPENINGS
- EST. WEIGHT - 15,600 LBS.

APPROVED: _____
DATE: _____

CUSTOMER: UNIVERSITY OF TEXAS

WATCO TANKS, INC. <small>P.O. BOX 240 LA VERNE, TEXAS 76112</small>		
10,000 GALLON BUFFHIDE DOUBLE WALL COMPOSITE UNDERGROUND TANK		
<small>OWN BY</small> DW	<small>DATE</small> 4/24/91	<small>OWN NO</small> J-541-1
<small>APPROVED BY</small>		

SPECIFICATIONS

Double Wall Fiberglass Reinforced Plastic (FRP)

Underground Storage Tank

for Installation on Edwards Aquifer Recharge Zone

One (1) double wall Fiberglass Reinforced Plastic (FRP) underground storage tank complete to first fitting. The tank shall be fabricated in accordance with ASTM standard document D4021-86 and U.L. standard 1316, File MH 9061, and bear the "Underwriters" Label.

This tank is intended for installation and use in accordance with the Standard for Installation of Oil Burning Equipment, NFPA No. 31, and the Flammable and Combustible Liquids Code, NFPA No. 30, of the National Fire Protection Association.

CAPACITY: 10,000 gallons

NOMINAL DIAMETER; 8 feet

MATERIALS: 100% resin and glass fiber reinforcement with no sand fillers

INTERSTITIAL SPACE: Space between primary and secondary shell walls allows for free flow of leaked product and monitoring of same.

FITTINGS: Two (2) 30-inch-diameter manways located approximately 8 feet from the center of the tank, with three (3) 4-inch NPT fittings per manway cover,

Two (2) 30-inch-diameter manway extensions five (5) feet long,

Two (2) 4-inch monitor fittings at opposite ends of the tank,

Lifting Lugs

WARRANTY: 30 Years

Double Wall FRP Tanks For Fuel Storage

Guide Specifications for Double Wall Fiberglass Reinforced Plastic (FRP) Underground Storage Tanks

SHORT FORM:

The contractor shall provide Double Wall Fiberglass Reinforced Plastic (FRP) Underwriter's Laboratories (U.L.) labeled underground storage tanks as shown on the drawings. Sizes and fittings shall be as shown. The tanks shall be fiberglass tanks as manufactured by XERXES CORPORATION.

Tanks shall be tested and installed with pea gravel or crushed stone as specified in the current installation instructions provided with the tank.

LONG FORM: Section 13177-1

Part I General

1.01 Related Work Specified in Other Sections

- A. Liquid Level Gauges: Section 15174
- B. Plastic Pipe: Section 15064
- C. Anchor Bolts: Section 05501
- D. Cast-in-Place Concrete: Section 03300

1.02 Quality Assurance

- A. Acceptable Manufacturer: XERXES CORPORATION
- B. Governing Standards, as applicable:
 - 1. ASTM standard document number D4021-86.
 - 2. Underwriters Laboratories, Inc. (U.L.) Standard for Safety 1316, File MH 9061 for storage of flammable liquids. A U.L. certification plate shall be attached to each tank.
 - 3. National Fire Protection Association (NFPA) Standards:
 - NFPA 30: Flammable and Combustible Liquids Code.
 - NFPA 30A: Automotive and Marine Service Station Code.
 - NFPA 31: Installation of Oil Burning Equipment.
 - 4. National Sanitation Foundation, Standard 14.
 - 5. Factory Mutual Systems approval IM7AOAF
 - 6. Military Specification No. MIL-T-52777.
 - 7. City of New York Department of Buildings M.E.A., Division #161-89-M.

1.03 Submittals

- A. Shop Drawings: Contractor shall submit _____ copies of shop drawings for each tank. Drawings shall show locations of all fittings, accessories, and critical dimensions.
- B. Catalog Data: Contractor shall submit _____ copies of manufacturer's literature to include _____ copies of manufacturer's current installation instructions.

Part II Products

2.01 Double Wall Fiberglass Reinforced Plastic (FRP) Underground Storage Tanks:

A. Loading Conditions—Tank shall meet the following design criteria:

- 1. Internal Load: Tank shall withstand 5 psi air pressure test with 5 to 1 safety factor. Contractor shall individually test tanks prior to installation to test for leakage. Maximum test pressure is 5 psi.
- 2. Vacuum Test: To verify structural integrity every tank shall be vacuum tested by the manufacturer at the factory to 11.5 inches of mercury.

3. Surface Loads: Tank shall withstand surface H-20 axle loads when properly installed according to current manufacturer's installation instructions.

4. External Hydrostatic Pressure: Buried in ground with 7' of overburden over the top of the tanks, the hole fully flooded and a safety factor of 7:1 against general buckling.

5. Tanks shall support accessory equipment such as heating coils, drop tubes, submersible pumps, and ladders when installed according to tank manufacturer's recommendations and limitations.

B. Product Storage:

- 1. Tanks shall be capable of storing petroleum products with specific gravity up to 1.1.
- 2. Tanks shall be vented to atmospheric pressure. The tank is not designed as a pressure vessel, except for use with vapor recovery systems, provided the pressure or vacuum does not exceed 1 p.s.i.
- 3. Tanks shall be capable of storing gasoline or gasohol (10% ethanol and 90% gasoline mixture); 90.5% gasoline and 9.5% Oxinol-50 (4.75% methanol and 4.75% GTBA mixture); Dupont EPA waiver (gasoline with 5% methanol and a minimum of 2.5% cosolvent, the blend may contain a maximum concentration of up to 3.7 weight percent oxygen in the final fuel); MTBE (methyl tertiary butyl ether)—gasoline with up to 20%, by volume, of MTBE; gasoline/water/ethanol or methanol blend motor fuels including neat or near neat methanol or ethanol fuels at ambient temperatures; jet fuel; av-gas; kerosene; diesel fuel; new or used motor oil; potable water⁽¹⁾ at ambient underground temperatures; or used for fuel oil at temperatures not to exceed 150°F.

C. Materials:

- 1. Tanks shall be manufactured with 100% resin and glass fiber reinforcement with no sand fillers.

D. Tank Dimensions (refer to Xerxes literature on gallonage).

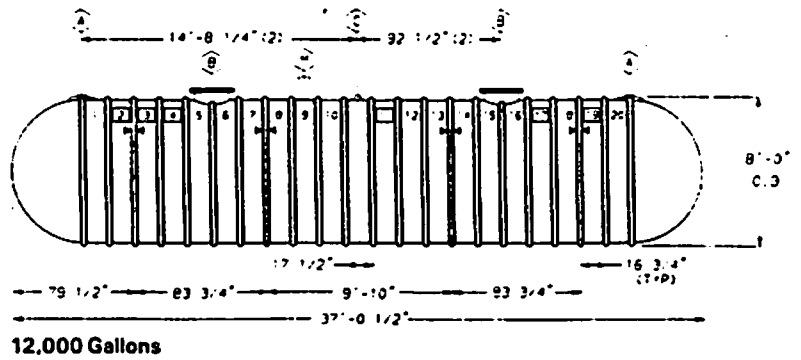
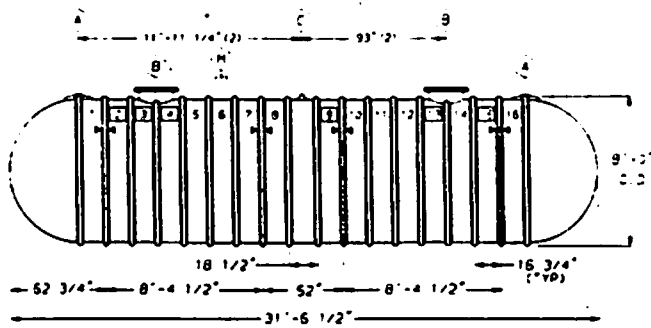
- 1. Tank shall have nominal capacity of _____ gallons.
- 2. Tank shall have nominal outside diameter of _____ feet.
- 3. Tank shall have approximate overall length of _____ feet.

E. Interstitial Space

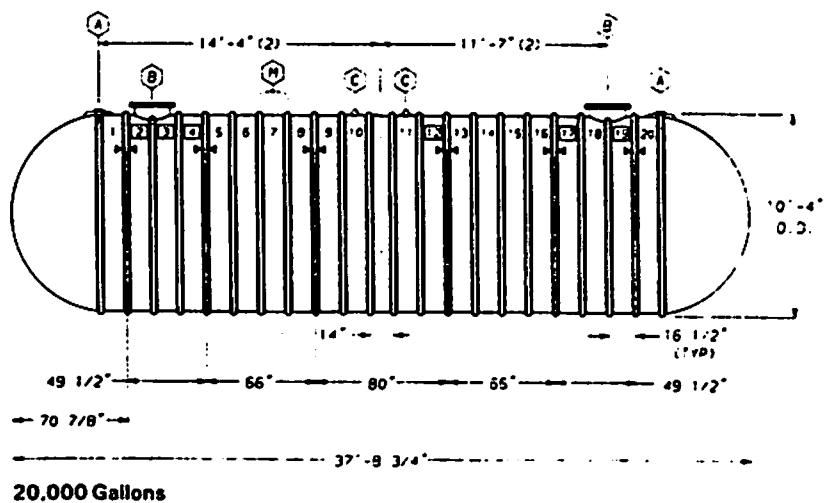
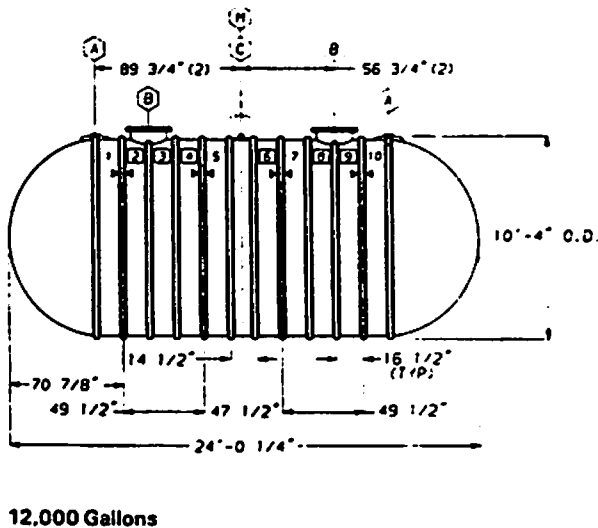
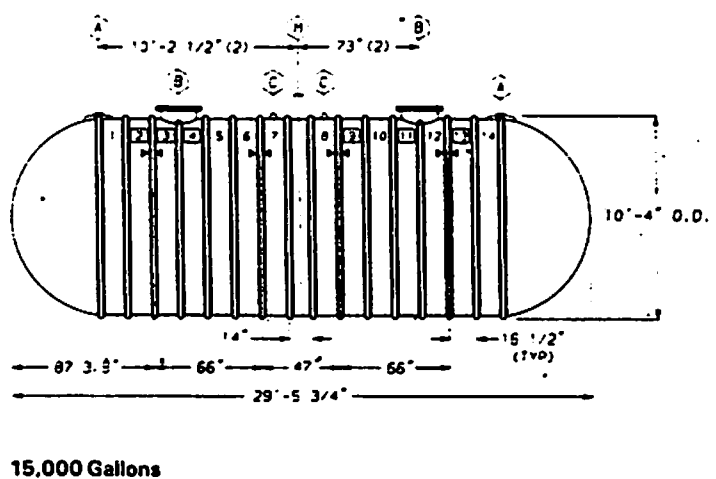
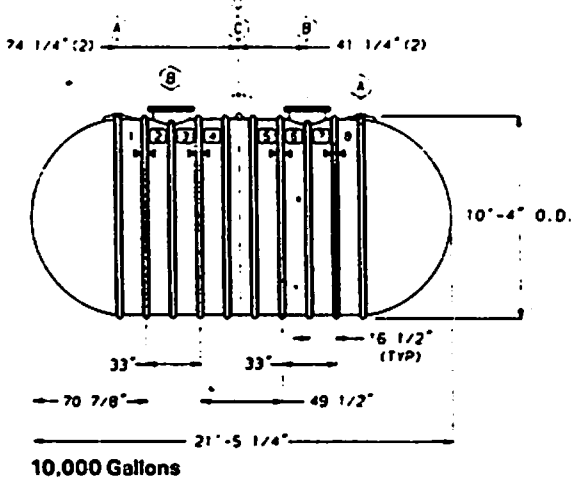
- 1. Tank shall have a space between the primary and secondary shell walls to allow for the free flow and containment of all leaked product from the primary tank. Space also allows the insertion of a monitoring device through a monitoring fitting.

⁽¹⁾Cleaning and steam curing recommended.

8' Diameter Tanks Cont.



10' Diameter Tanks



- Symbol Identification**
- (A) 4" NPT Monitor/Vent
 - (B) 22" Diameter Manway
(3-4" NPT fittings in each cover on 3,000 gal. or larger;
4-4" NPT in 550, 1,000 or 2,500 gal.)
 - (C) Lift Lug
 - (M) Liquid reservoir (optional)
 - ▬ Strap location

Standard Tank Notes:

1. Tank bottom gauge/deflector plates are standard under every manway and service fitting.
2. Anchoring strap locations are indicated by arrows on each side of certain ribs. Straps are to be placed on the top of these ribs.
3. Standard service fittings to the primary tank are 4" NPT half couplings. All primary tank fittings are mounted on the manways. (Additional manways and fittings are available on made-to-order tanks.)
4. Monitor Fittings. Two 4" monitor fittings, one located at each end of the tank on most models, provide access to the rib cavity and the interstice at the bottom of the tank.
5. Monitoring capabilities. Four generic types of monitoring systems may be used with Xerxes' double wall tanks. Note that certain restrictions may be applicable.

A. Hydrostatic Monitor. When a hydrostatic monitoring system is used, the level of liquid in the reservoir may be monitored to detect a leak in either the inner or outer wall of the tank. Optional reservoir sensors supplied by Xerxes are available.

B. Vacuum Monitoring. When vacuum monitoring is used, a maximum of 3" mercury (1.5 p.s.i. max.) must be maintained.

C. Liquid Sensors. When dry interstitial monitors are used, the monitor is positioned within the rib at each end of the tank on most models. The interstice may be either vented or sealed.

D. Positive Air Pressure. When positive air pressure monitoring is used, the maximum air pressure is 3 p.s.i.

Steam Curing (optional)

When tanks are specified for containment of other than petroleum based products, i.e. potable water, a special steam cure is available. The N.S.F. (National Sanitation Foundation) label (M.W. required) is available from several Xerxes facilities.

A

Monitor Fittings

If tanks are ordered with a dry interstitial space, the fitting permits monitoring through a rib passage to the bottom of the tank. The fittings, located on both ends of the tank, allow for the placement of probe(s) to detect the presence of liquid in the interstitial space. One monitor fitting is standard in the 550, 1,000 and 2,500 gallon tanks; and two are standard in 3,000 gallon through 30,000 gallon tanks.



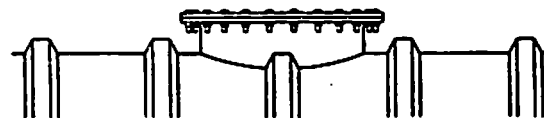
B

Fiberglass Flanged Manways

Manways provide both access to the interior of the tank as well as a location for service fittings. The standard manway I.D. is 22". Manways with 30" and 36" I.D.'s are available on certain larger tanks. Each manway is provided with a steel cover, with plated bolts, nuts and washers and a U.L. listed gasket. Manways are placed in standard locations as shown on the tank specification drawings.

NPT Fittings

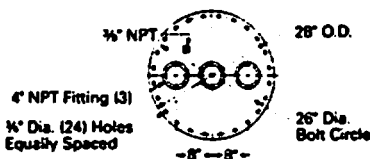
Steel NPT service fittings in the manway cover are available in 2", 4", 6" and 8" half couplings. Standard tanks, 3,000 gallons and larger, have manways with 3-4" NPT fittings in each cover. On 550, 1,000 and 2,500, 4-4" NPT fittings in the cover are provided. Gauge/deflector plates are included under all service fittings.



B-1

22" Manway Cover

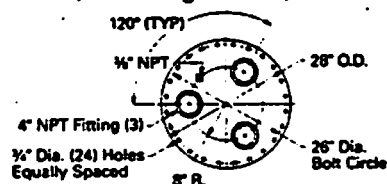
(3-4" In-line fittings)



B-2

22" Manway Cover

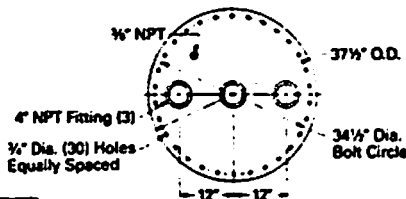
(3-4" Fittings at 120°)



B-3

30" Manway Cover

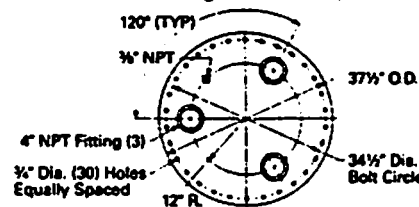
(3-4" In-line fittings) Optional



B-4

30" Manway Cover

(3-4" Fittings at 120°) Optional



C

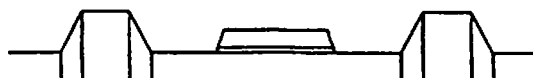
Lifting Lugs

See technical tank drawings for locations.

D

Through-The-Wall Service Fitting (TWF)

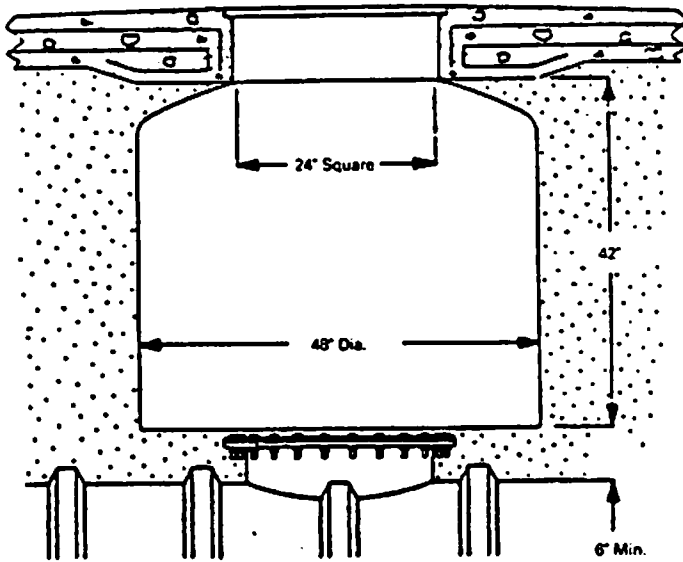
This service fitting allows access to the interior of the primary tank. Fittings through both shell walls (TWF) (not in a manway cover) must be located along the top centerline of the tank or the U.L. label will be void, and are available in 2", 4" or 6" NPT.



XERXES DWT-II Appurtenances and Accessories

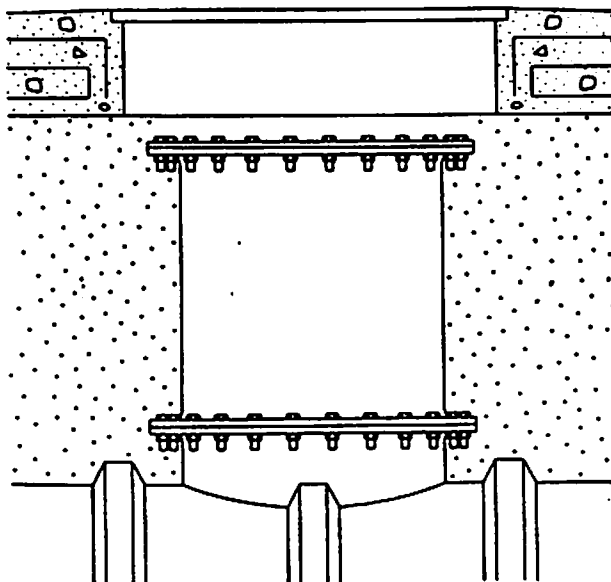
E Fiberglass Manway Riser (optional)

A manway riser provides access to the manway from grade and prevents backfill material from covering the manway or equipment mounted on manway. Two risers may be used on tanks greater than 4,000 gallons capacity. Only one riser may be used on smaller tanks. Additional risers are available up to 6-ft. in height.



F Manway Extensions (optional)

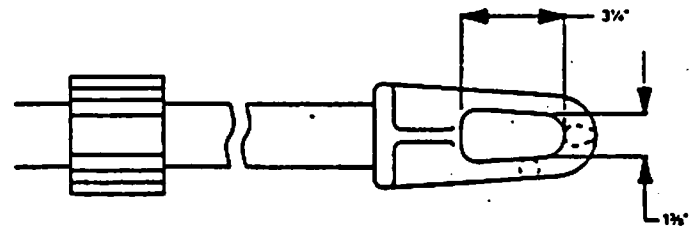
Tank entry in high ground water conditions and/or deep burials may require manway extensions. When bolted to the manway, it provides a watertight access to the tank interior. Available in 22", 30" and 36" diameters in two foot lengths or more. Extensions include nuts, bolts, washers, and a gasket.



G FRP Holddown Straps (optional)

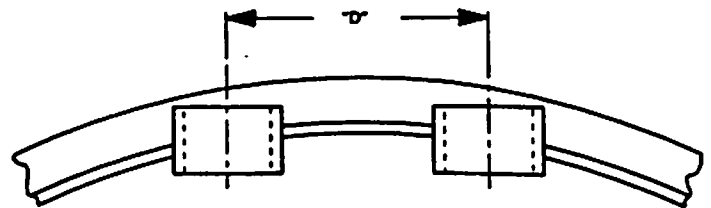
Straps are used when a tank requires anchoring. The straps provide the link between the tank and the owner supplied anchoring hardware. For more information on straps and their use, refer to Xerxes' Installation and Warranty Manual.

Nominal Tank Size (gallons)	Outside Diameter	Number Required	Buoyancy Load (per strap, lbs.)
550; 1,000	4'	2	4,200
2,500; 3,000; 4,000	6'	2	18,000
6,000	6'	4	18,000
6,000	8'	2	25,000
8 to 12,000	8'	4	25,000
10 to 15,000	10'	4	25,000
20,000	10'	6	25,000
25,000	10'	8	25,000
30,000	10'	10	25,000



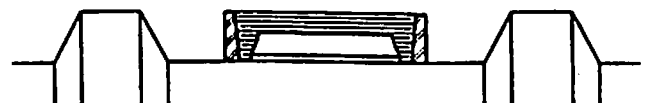
H Duplex Service Fittings (optional)

Duplex service fittings allow for the placement of two service connections in one location. Fittings are placed astride the tank's centerline in any standard fitting location. Available in 2", 4" and 6" NPT sizes. (Note: Dimension D is 6-inches for 2" fittings, 12-inches for 4" and 6" fittings.)



I Secondly Contained Service Fittings (optional)

Secondarily contained service fittings, typically a 4" NPT within a 6" NPT, allow the tank to be connected to a secondarily contained piping system.



Installation of Underground Petroleum Storage Systems

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NOVEMBER 1979**

**American Petroleum Institute
1220 L Street, Northwest
Washington, D.C. 20005**



operation should be confirmed by a qualified person at least once a year.

If an impressed current cathodic protection system is used, it is necessary to verify—at least once a month—that the rectifier is operating. Such systems are subject to vandalism, and the electrical service may be disconnected by accident or on purpose, making periodic inspections mandatory. While it may be feasible for local personnel to monitor operation, a qualified person should conduct an on-site test and inspection of the facility no less than once a year to measure the structure-to-soil and structure-to-structure potentials, and the rectifier voltage and current output.

The installation of cathodically protected systems usually involves the use of wiring connections between anodes and test stations. The exact location of such wiring and anodes should be carefully identified on a plot plan of the facility, and a copy of this plan should be kept at the site. A notice board should be placed adjacent to the tank location reading:

CAUTION: THIS SITE HAS CATHODICALLY PROTECTED TANKS. BEFORE EXCAVATING, CONTACT.

(Insert name and telephone number of company representative.)

3. TANKS

A number of factors must be considered in the (1) selection, (2) location, (3) installation, and (4) testing of tanks.

(1) Selection: Primary considerations in tank selection include the material required for the anticipated service, tank dimensions, and the capacity desired.

(a) As previously noted, the material to be used at a particular site will depend upon the conditions at that location (see "Introduction"). Steel fabrication should comply with the latest issue of UL 58, Steel Underground Tanks for Flammable and Combustible Liquids. Both steel and FRP tanks should bear the applicable UL Label.

(b) Selection of tank dimensions is somewhat flexible. This can be of importance where a high water table exists or where rock conditions or suction pumping lift requirements dictate a shallow installation. Tanks of the same nominal capacity can be secured in many areas, with various diameters and lengths.

For example: 6,000 gallon steel tanks are available in the Eastern U.S. in diameter/length combinations of 95"/17'; 84"/21'; and 72"/29'.

The shorter lengths may be required to fit a site with restricted dimensions.

Note: Prior to installation, tanks should be measured to confirm the tank gauging chart(s) that should be supplied by the manufacturer. It is necessary to have this information available for product purchase/sale transactions, as well as for testing and maintenance to determine any leakage that may occur as a result of installation or subsequent damage or corrosion.

(c) Tanks of the most commonly used capacities are available in most areas. FRP tanks are available in any size normally used at service stations. Steel tanks can be secured for underground petroleum service in almost

any capacity. The selection of tankage capacities and numbers for a particular site are discussed in detail in API Bulletin No. 1611, Service Station Tankage Guide, 1961.

(2) Location: Whenever possible, tank fill openings should be located so that a minimum amount of maneuvering will be required by the truck or transport making the product delivery. The driveway grade should be such that the tank truck will drain properly.

(a) Tanks should be located so that the parked tank truck will not be on the public right of way, block the driveway to consumer use, obstruct the motorist's view of the service station building, or interfere with the operator's use or visual control of the driveway.

(b) Regulations may permit underground tanks to be located closer than 10' to a building, but care should be taken to avoid possible damaging effects to the foundation of the building where this option is used.

(3) Installation: Tank excavations should be sufficiently large to provide a minimum clearance of 12" (in the case of steel tanks) and 18" (for FRP tanks) in all horizontal directions. The excavation should be deep enough to provide for a backfill below the bottom of the tank of at least 6" for steel tanks and 12" for FRP tanks. The burial depth of the tank is dependent on local regulations, the type of finished surface to be applied, soil conditions, topography, suction pumping lift requirements, and the piping cover needed.

In areas not subject to traffic, the cover depth of underground tanks should be a minimum of 24", or not less than 12" plus a reinforced concrete slab not less than 4" in thickness. Where tanks are subject to or likely to be subject to traffic, cover depths should be a minimum of 36", or not less than 18" of well-tamped material plus at least 6" of reinforced concrete or 8" of asphaltic concrete.

(a) Backfill below, around and above tanks should be clean, noncorrosive porous material, such as clean washed sand or gravel for steel tanks and, for FRP tanks, must be in accordance with manufacturer's specifications.

Backfilling operations are most important to the life of the installation. The owner should continuously supervise these operations to ensure that only specified materials and installation methods are followed by the contractor.

(b) It is recommended that tanks be ballasted with product as soon as possible after backfilling. Water ballast may be used as an alternative, but it is necessary to defer installation of submerged pumping units in the tank until after the water ballast is removed. If ballasting is necessary in order to prevent tank flotation (from a high water table or from rain), the end-use product should be used as a first choice.

(c) With product ballast, attention is required in handling, inventory control, and safeguarding against accidents or thefts. All fill caps and pumps should be locked during unattended periods.

(d) Anchoring should be used to prevent tank flotation from a high water table. When a concrete slab is used for anchoring, tanks should be separated from the slab by no less than 12" of sand. Tanks should not be set directly on the concrete nor placed on hard or sharp material that could cause deformation or damage to

either the tanks or tank coatings. Anchor straps should be installed so as not to damage tanks or tank coatings and to ensure that the tank is electrically isolated from the anchor straps. This can be accomplished by placing a section of rubber tire between the tank and anchor strap.

The entire installation should comply with the requirements of NFPA Code 30.

(4) Testing: Requirements for the testing of underground tanks vary with state and local regulations. Tests can be performed (1) at the time of the delivery of the tank to the site; (2) in hole prior to covering; (3) after installation but prior to completing the backfilling; and (4) after the paving and all piping has been installed.

(a) Since damage can occur to tanks at any stage of construction, specific testing requirements would be dictated by the degree of control the owner must exercise. Any damage to the exterior coating should be repaired using material of similar nature.

(b) Testing should comply with NFPA Code 30 requirements.

(c) As a minimum, it is recommended that all tanks be tested with air pressure prior to installation. **PRESSURE MUST NOT EXCEED 5 POUNDS PER SQUARE INCH (psi).** All fittings, seams and visible dents should be soaped during this period, and inspected for bubbling.

4. PIPING

As is the case with tanks, proper care must be taken in the (1) selection, (2) installation, and (3) testing of piping for underground tankage.

(1) Selection: The location of the piping will determine the type and size that should be used.

(a) Schedule 40 steel pipe, either galvanized or wrapped black iron, or UL approved nonmetallic pipe is recommended for all underground piping; and Schedule 40 galvanized steel pipe should be used for above-ground vent piping. Piping with a 1½" or 2" diameter is generally used. As a minimum, couplings and fittings should be 150-lb. malleable iron.

(b) Delivery piping from tanks to dispensers should be sized according to the recommendation of the pump manufacturer. In determining size, consideration must be given to the length of runs, flow rates, and number of dispensers to be served.

(c) Siphons may be used to equalize product levels in two or more tanks storing the same product. Material for siphons may be galvanized iron, wrapped black iron, or nonmetallic. It is recommended that siphon piping be

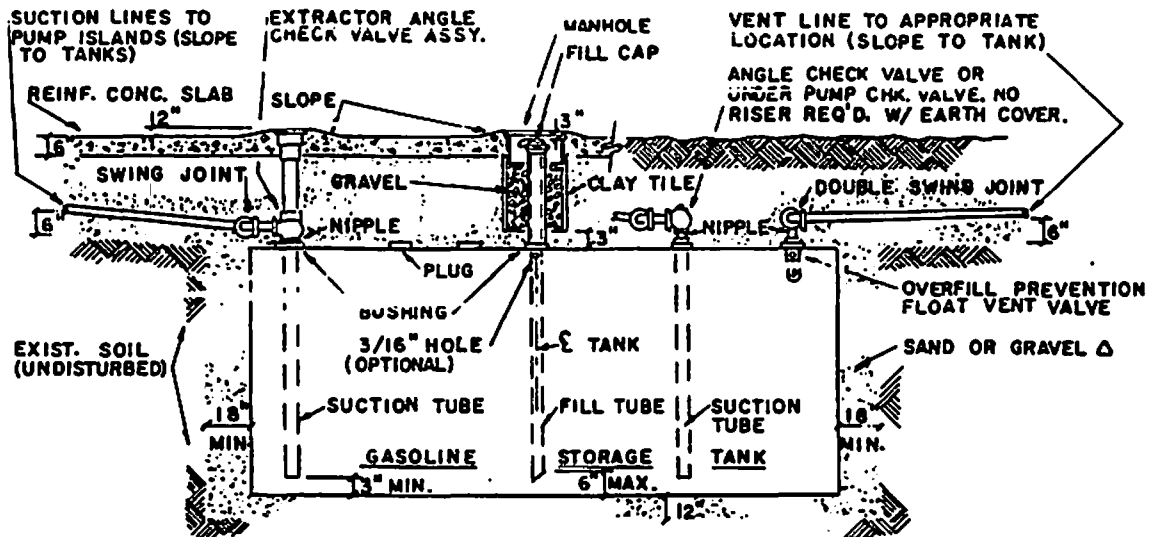
the same size as the suction and/or delivery lines to the dispensers.

(d) Each tank should be vented through adequately sized piping. This is necessary to prevent the build-up of excessive pressure, or the blow-back of vapor or liquid at the fill opening, while the tank is being filled. The maximum rate of fill can be limited by the diameter of the vent line. Two-inch diameter vents (in lengths up to 150') should be adequate for flow rates incurred using 4" delivery equipment. If nonmetallic pipe is used for underground vent piping, special adapters are required at the point where this pipe connects with the steel swing joint. Such adapters are available from the pipe manufacturer.

(2) Installation: Product lines should be run in a single trench between the tank area and the pump island area. Similarly, vent lines, between the tank area and the building or other structure to which the above-ground vent lines are attached, should be placed in a single trench.

FIGURE 2

TANK PIPING DETAILS - SUCTION SYSTEM



PIPING DETAILS FOR TANKS — UNDER CONCRETE

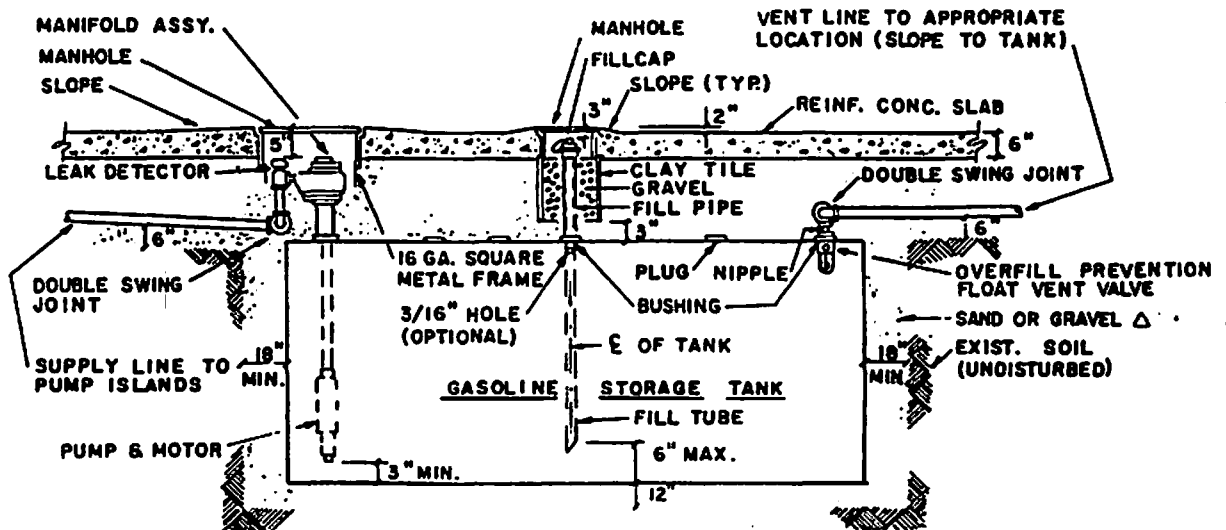
△ PEA GRAVEL FOR NON-METALLIC TANKS (OR MFR. APPROVED ALTERNATE)

NO SCALE

NOTE: ELIMINATE CONC. SLAB IN NON-TRAFFIC AREAS & CONSTRUCT CONC. PADS (ONLY) AROUND MANHOLES. THE EXTR. ANGLE CHECK RISER IS NOT REQ'D. W/ EARTH COVER.

FIGURE 3

TANK PIPING DETAILS - SUBMERGED SYSTEM

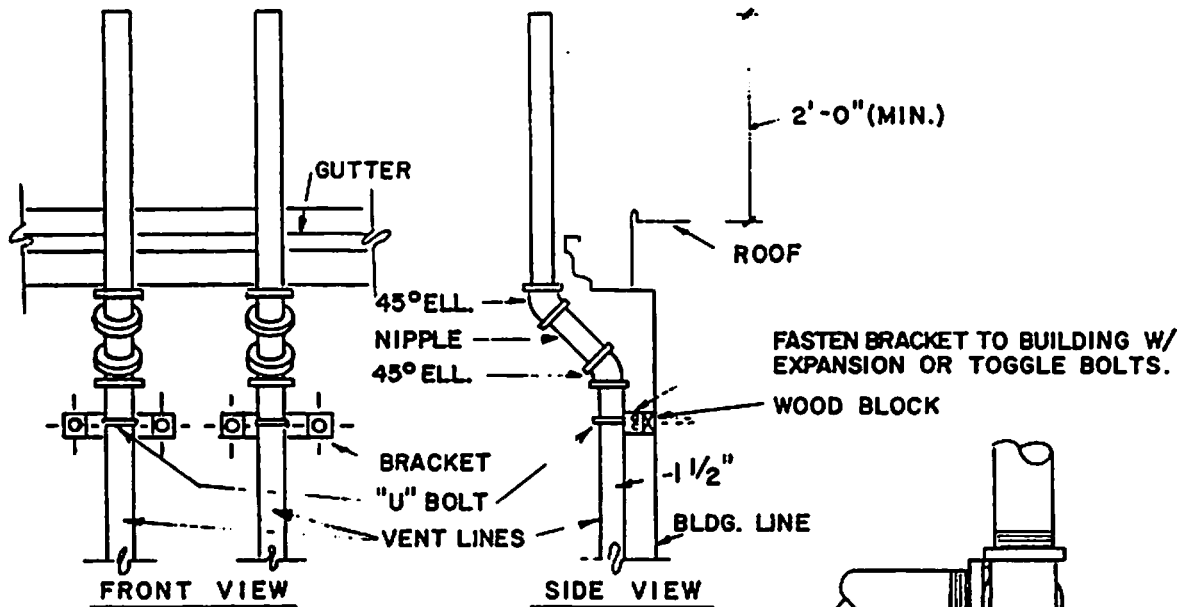


PIPING DETAILS FOR TANKS — UNDER CONCRETE

△ PEA GRAVEL FOR NON-METALLIC TANKS (OR MFR. APPROVED ALTERNATE)

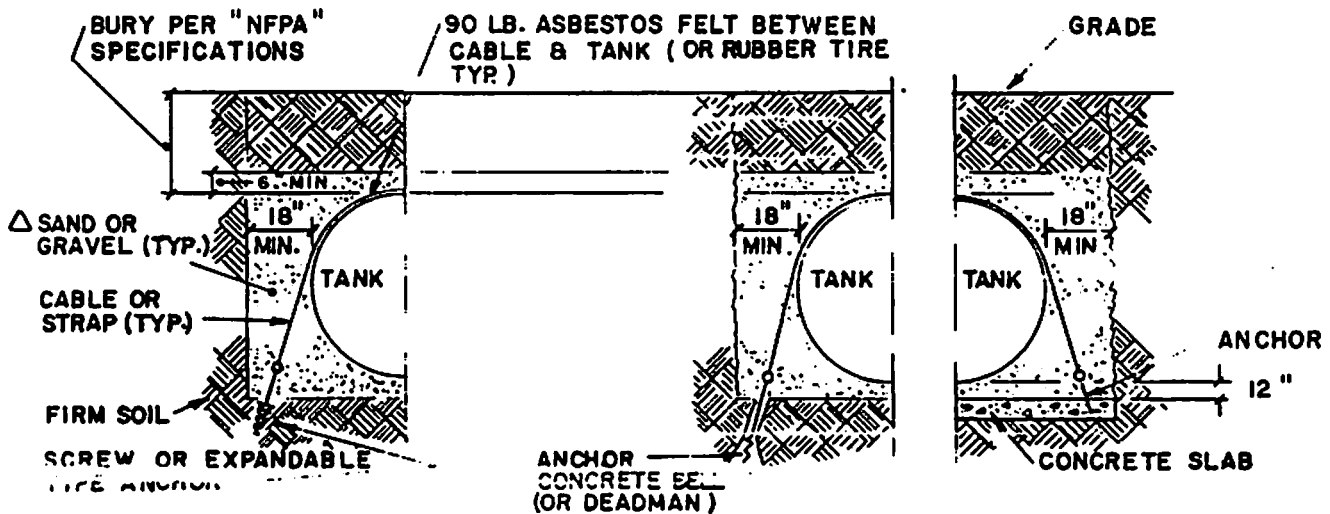
NO SCALE

NOTE: ELIMINATE CONC. SLAB IN NON-TRAFFIC AREAS & CONSTRUCT CONC. PADS (ONLY) AROUND M.H.'S.

FIGURE 4**MISCELLANEOUS DETAILS**

VENT DETAILS
NO SCALE

TYPICAL SWING JOINT
(ISLAND & VENT TERMINAL)
NO SCALE



NOTE: SEE MANUFACTURERS RECOMMENDATIONS FOR ANCHOR AND INSTALLATION INSTRUCTIONS.

TANK INSTALLATION
(WHERE SUB-SURFACE WATER CONDITIONS EXIST.)
NO SCALE

△ PEA GRAVEL FOR NON-METALLIC TANKS (OR MFR. APPROVED ALTERNATE)

FIGURE 5

PUMP ISLAND PIPING - SUCTION & SUBMERGED

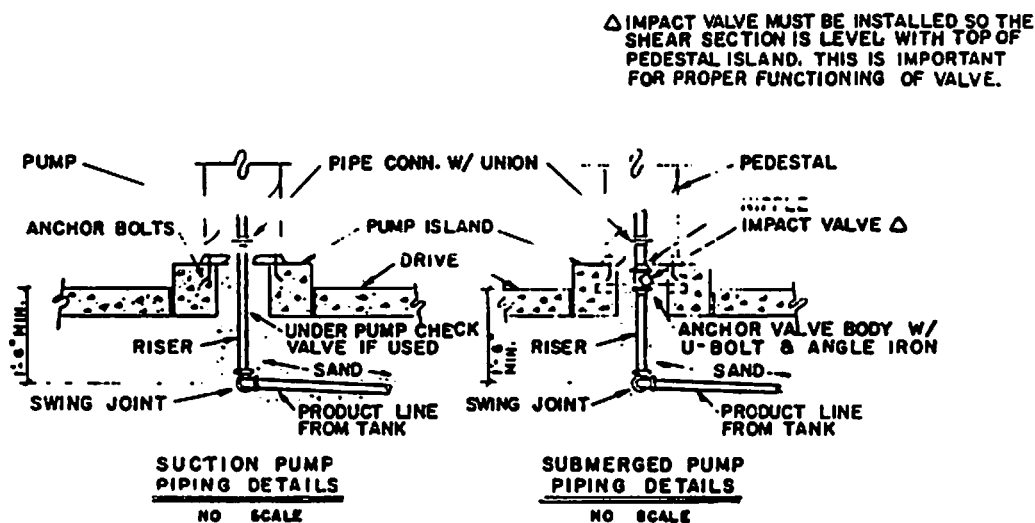
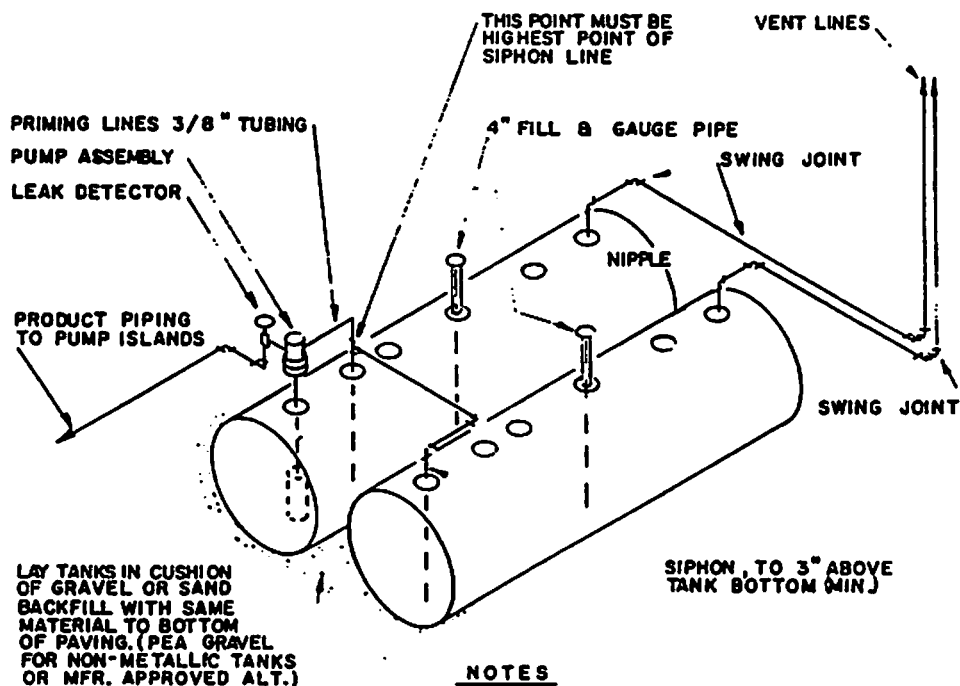


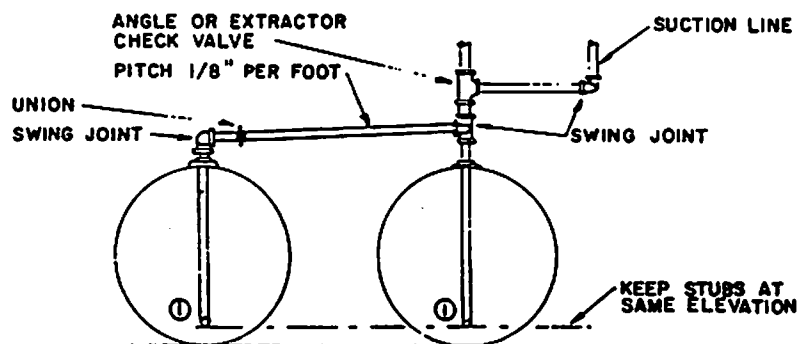
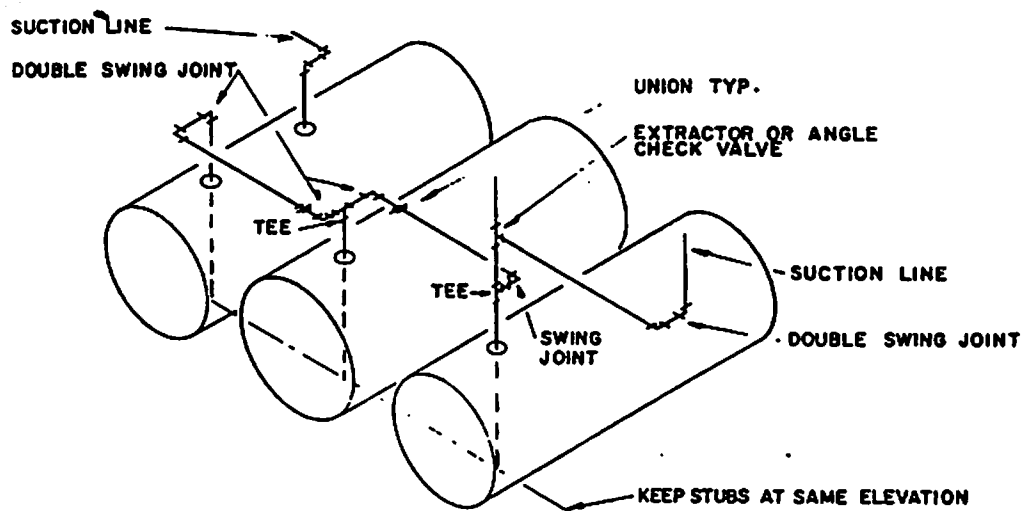
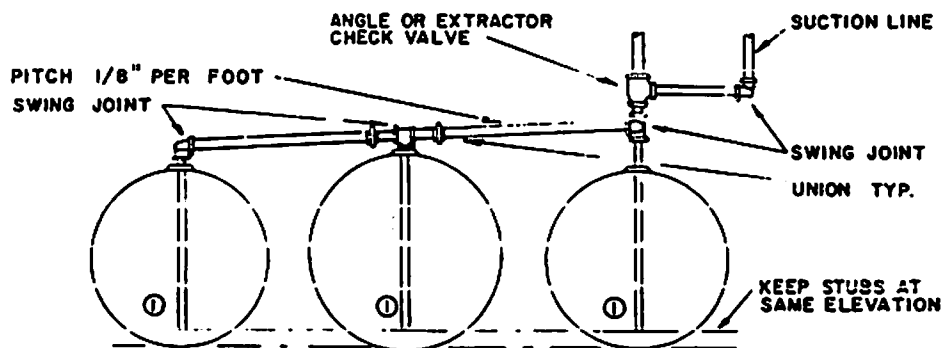
FIGURE 6

TYPICAL REMOTE PUMPING SIPHON SYSTEM



NOTES

1. TANK BOTTOMS TO BE AT SAME ELEVATION.
2. SWING JOINTS TO BE INSTALLED WITH APPROXIMATELY 45° BEND WITHOUT TWISTING.
3. BOTTOM OF SIPHON STUBS TO BE AT SAME ELEVATION.

FIGURE 7**TYPICAL SUCTION PUMP SIPHON SYSTEM****2 - TANKS TO 1- OR MORE PUMPS****ISOMETRIC OF 3-TANKS TO 1- OR MORE PUMPS****3-TANKS TO 1- OR MORE PUMPS**

- ① WHEN EXISTING U.G. TANKS, THE BOTTOMS OF WHICH ARE NOT ON THE SAME LEVEL, ARE TO BE TWINNED, BOTTOMS OF SUCTION STUBS MUST BE ON THE SAME LEVEL.

1-1400-1179-2M
 1-1400-1780-4M
 1-1400-7780-2M
 1-1400-6780-3M
 1-1400-6781-5M
 1-1400-6785-3.5M



UNDERWRITERS LABORATORIES INC.

an independent, not-for-profit organization testing for public safety

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July 1, 1983

**STANDARD FOR
GLASS-FIBER-REINFORCED PLASTIC UNDERGROUND STORAGE TANKS
FOR PETROLEUM PRODUCTS**

UL 1316, FIRST EDITION

Accompanying this transmittal notice is a copy of the first edition of UL 1316.

THIS EDITION OF THE STANDARD IS NOW IN EFFECT EXCEPT FOR PARAGRAPHS 6.1, 18 AND 19.1, WHICH BECOME EFFECTIVE OCTOBER 19, 1983 AS INDICATED IN THE SMALL PRINT NOTE FOLLOWING THE AFFECTED ITEM.

New product submittals made prior to a specified future effective date will be judged under all of the requirements in this standard unless the applicant specifically requests that the product be judged under current requirements. However, should the applicant elect this option, it should be noted that compliance with all the requirements in this standard will be required as a condition of continued Listing and Follow Up Service after the effective date and understanding of this should be signified in writing.

The requirements in this standard are substantially in accordance with UL's bulletins on this subject dated January 27, 1982, and April 14, 1983.

Revised and/or additional pages may be issued from time-to-time.



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July 1, 1983

**STANDARD FOR
GLASS-FIBER-REINFORCED PLASTIC UNDERGROUND STORAGE TANKS
FOR PETROLEUM PRODUCTS**

UL 1316, FIRST EDITION

Accompanying this transmittal notice is a copy of the first edition of UL 1316.

THIS EDITION OF THE STANDARD IS NOW IN EFFECT EXCEPT FOR PARAGRAPHS 6.1, 18 AND 19.1, WHICH BECOME EFFECTIVE OCTOBER 19, 1983 AS INDICATED IN THE SMALL PRINT NOTE FOLLOWING THE AFFECTED ITEM.

New product submittals made prior to a specified future effective date will be judged under all of the requirements in this standard unless the applicant specifically requests that the product be judged under the current requirements. However, should the applicant elect this option, it should be noted that compliance with all the requirements in this standard will be required as a condition of continued Listing and Follow-Up Service after the effective date and understanding of this should be signified in writing.

The requirements in this standard are substantially in accordance with UL's bulletins on this subject dated January 27, 1982, and April 14, 1983.

Revised and/or additional pages may be issued from time-to-time.

JULY 1, 1983

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UL 1316
STANDARD FOR
GLASS-FIBER-REINFORCED PLASTIC UNDERGROUND
STORAGE TANKS FOR PETROLEUM PRODUCTS

FIRST EDITION

First Impression July 1, 1983

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FOREWORD

A. This Standard contains basic requirements for products covered by Underwriters Laboratories Inc. (UL) under its Follow-Up Service for this category within the limitations given below and in the Scope section of this Standard. These requirements are based upon sound engineering principles, research, records of tests and field experience, and an appreciation of the problems of manufacture, installation, and use derived from consultation with and information obtained from manufacturers, users, inspection authorities, and others having specialized experience. They are subject to revision as further experience and investigation may show is necessary or desirable.

B. The observance of the requirements of this Standard by a manufacturer is one of the conditions of the continued coverage of the manufacturer's product.

C. A product which complies with the text of this Standard will not necessarily be judged to comply with the Standard if, when examined and tested, it is found to have other features which impair the level of safety contemplated by these requirements.

D. A product employing materials or having forms of construction differing from those detailed in the requirements of this Standard may be examined and tested according to the intent of the requirements and, if found to be substantially equivalent, may be judged to comply with the Standard.

E. UL, in performing its functions in accordance with its objectives, does not assume or undertake to discharge any responsibility of the manufacturer or any other party. The opinions and findings of UL represent its professional judgment given with due consideration to the necessary limitations of practical operation and state of the art at the time the Standard is processed. UL shall not be responsible to anyone for the use of or reliance upon this Standard by anyone. UL shall not incur any obligation or liability for damages, including consequential damages, arising out of or in connection with the use, interpretation of, or reliance upon this Standard.

F. Many tests required by the Standards of UL are inherently hazardous and adequate safeguards for personnel and property shall be employed in conducting such tests.

GENERAL

1. Scope

1.1 These requirements cover spherical or horizontal cylindrical, atmospheric-type tanks of glass-fiber-reinforced plastic (FRP) that are intended for the underground storage of petroleum-based flammable and combustible liquids.

1.2 These requirements do not cover tanks for use with alcohol or alcohol-blended fuels. Such tanks are covered by these and additional requirements.

1.3 These tanks are completely assembled and tested for leakage before shipment.

1.4 These tanks are intended for installation and use in accordance with the Standard for the Installation of Oil-Burning Equipment, ANSI/NFPA 31, the Flammable and Combustible Liquids Code, ANSI/NFPA 30; and the manufacturer's instructions.

1.5 These requirements do not cover optional accessories for these tanks, such as heating coils or hotwells; nor do they cover compartmented tanks.

2. General

2.1 If a value for measurement is followed by a value in other units in parentheses, the second unit may be only approximate. The first stated value is the requirement.

2.2 A component of a product covered by this standard shall comply with the requirements for that component and shall be used in accordance with its recognized rating and other limitations of use. A component need not comply with a specific requirement that:

A. Involves a feature or characteristic not needed in the application of the component in a product covered by this standard, or

B. Is superseded by a requirement in this standard.

CONSTRUCTION

3. General

3.1 A tank shall be provided with one or more lugs for lifting that are attached to the tank or can be attached to a fitting on the tank. Also, see Strength of Lifting Fittings Tests, Section 10.

3.2 A tank shall be capable of being anchored.

4. Pipe Connections

4.1 A fitting for pipe connection shall be standard threaded pipe coupling (see the Standard for Welded and Seamless Wrought Steel Pipe, ANSI B36.10-1979), a threaded flange, a standard half pipe nipple, or a bolted and gasketed flange connection. The connection shall be bonded directly to the tank.

4.2 All openings in a tank shall be located in the top. They shall be located on the longitudinal centerline of the top if the tank is cylindrical. If the tank is spherical, the openings shall be located on the vertical centerline of the tank.

Exception: If the application of a tank is such that openings in the top for pipe connection are required to be grouped, the openings may be located not more than 12 inches (305 mm) from the longitudinal centerline of the top of a cylindrical tank or the vertical centerline of a spherical tank provided the upper end of each pipe coupling or other fitting for pipe connection terminates above the top of the shell.

4.3 An opening in a tank shall be closed with wooden plug, metal cover, or the equivalent, to protect the threads and exclude foreign matter while the tank is in storage or in transit.

4.4 A tank shall have a fitting of a size not less than that specified in Table 4.1 for attachment of vent pipe.

4.5 An opening for connection of a vent pipe shall not be located in a manhole cover.

Exception: In a spherical tank, all openings may be grouped together in a manhole cover.

TABLE 4.1
SIZE OF VENT-PIPE FITTING

Tank Capacity		Nominal Pipe Size, Inches ^a
U. S. Gallons	Liters	
0–500	0–1,893	1-1/4
501–3,000	1,896–11,356	1-1/2
3,001–10,000	11,360–37,854	2
10,001–20,000	37,858–75,708	2-1/2
20,001–35,000	75,712–132,489	3
35,001–50,000	132,493–189,270	4

Nominal pipe size specifications are in accordance with the Standard for Welded and Seamless Wrought Steel Pipe, ANSI B36.10–1979.

5. Manholes

5.1 A manhole, if provided in a tank, shall be located above the highest normal liquid level and shall be of the bolted-cover type.

5.2 A manhole-cover joint shall be provided with gasket at least 1/8 inch (3.2 mm) thick of material acceptable for use with the liquid to be stored.

6. Deflection Plates

6.1 A tank shall have a deflection plate of steel at least 0.053 inch (1.35 mm) thick or aluminum at least 1/8 inch (3.2 mm) thick. The deflector plate shall be at least 9 inches (229 mm) wide, and at least 1 square foot (0.09 m²) in area under (1) each opening, or (2) one opening that is marked as specified in paragraph 18.5.

Paragraph 6.1 effective October 19, 1983

PERFORMANCE

7. General

7.1 One sample of a tank is to be subjected to each of the tests specified in paragraphs 8.1 through 8.2. However, the same sample need not be subjected to all tests. If a manufacturer produces a line of cylindrical tanks that differ only in shell length, the longest tank may be tested as representative of the entire line. For a line of spherical tanks that differ only in diameter, only the largest diameter tank need be tested.

8. Leakage Test

8.1 A tank, including fittings, shall be tested as described in paragraph 8.2 and shall not leak.

8.2 The tank is to be pressurized for 5 minutes to the applicable value specified in Table 8.1, and the entire surface is to be brushed with a leak-detection fluid. Continuous formation of bubbles at any location on the tank surface is evidence of leakage.

TABLE 8.1
LEAKAGE-TEST PRESSURES

Maximum Diameter of Tank, Feet (m)	Applied Pressure, Psig (kPa)
10 (3.0) or less	5 (34)
More than 10	3 (21)

9. Strength of Pipe Fittings Tests

Torque

9.1 A length of pipe shall be threaded into a fitting for pipe connection and shall be tightened to the torque specified in Table 9.1. The fitting shall not crack or split and the threads shall not strip.

TABLE 9.1
TORQUES ON PIPE FITTINGS

Nominal Pipe Size, Inches ^a	Torque, Pound-Inches (N·m)
3/4	2000 (226)
1	2400 (271)
1-1/4	2900 (328)
1-1/2	3100 (350)
2	3300 (373)
2-1/2	3500 (395)
3	3600 (407)
3-1/2	3700 (418)
4	3800 (429)
6	4200 (475)
8	4600 (520)

Nominal pipe size specifications are in accordance with the Standard for Welded and Seamless Wrought Steel Pipe, ANSI B36.10–1979.

Bending Moment

9.2 The bond between a fitting for pipe connection and the tank shall be subjected to a bending moment of 2000 pound-feet (2700 N-m) as described in paragraph 9.3. The bond shall not be damaged.

9.3 A 4-foot (1.2-m) length of Schedule 40 steel pipe is to be threaded into the fitting. A force is then to be applied to the top of the pipe. For a cylindrical tank, the force is first to be applied parallel to the longitudinal axis of the tank, and then transverse to the longitudinal axis of the tank. For a spherical tank, the force is first to be applied in any one direction and then perpendicular to the direction in which the force was first applied. The applied force is to be increased so that the bending moment is increased from zero to 2000 pound-feet (2712 N-m) in 250 pound-feet (339 N-m) increments. If the Schedule 40 pipe bends before the required bending moment is reached, the test is to be stopped and the fitting is to be examined for compliance with the requirements specified in paragraph 9.2.

Leakage

9.4 After each of the tests specified in paragraphs 9.1 and 9.2, the tank is to be subjected to the Leakage Test, Section 8.

10. Strength of Lifting Fittings Tests

10.1 A fitting intended to be used to lift and move a tank shall be subjected for 1 second to a load equal to twice that imposed by lifting the empty tank. If more than one fitting is provided on a tank, the load is to be divided between the fittings in proportion to the loads to which they are subjected by lifting the tank as intended. The fitting shall not be damaged or damage the tank.

10.2 Following the test described in paragraph 10.1, the tank is to be subjected to the Leakage Test, Section 8.

11. Water-Load Test

11.1 A tank shall be (1) placed in a sand bed so that approximately one-eighth of the tank diameter is buried, and (2) filled to capacity with water for 1 hour. The tank shall not be damaged.

12. External Pressure Test

General

12.1 A tank shall be tested either as described in paragraph 12.2 or, at the manufacturer's option, as described in paragraphs 12.3 and 12.4. The tank shall not implode or otherwise be damaged.

Method I

12.2 The empty tank is to be installed in a test pit using the recommended anchoring system and the specified backfill procedure. The pit is then to be filled with water to such a level that the tank is submerged to its maximum recommended burial depth. The tank is to remain submerged for 24 hours. While the tank is still submerged, it is to be subjected for 1 minute to a partial internal vacuum so that the internal pressure on the tank is 5 inches of mercury (17.9 kPa) less than the external pressure imposed by the hydrostatic head.

Method II

12.3 The tank is to be placed, at points simulating the use of hold-down straps, on saddles padded with 1/2-inch (12.7-mm) thick expansion joint material. The tank is to be filled to capacity with water for 24 hours, and then is to be drained.

12.4 After the procedure described in paragraph 12.3, the tank is to be subjected for 24 hours to a partial internal vacuum so that the difference between the internal and external pressures on the tank is equal to that which would exist if the empty tank were submerged in water to its maximum recommended burial depth. The vacuum is then to be increased, for 1 minute, so that the internal pressure on the tank is 5.3 inches of mercury (17.9 kPa) less than the previous value.

13. Internal Pressure Test

13.1 A tank shall withstand without rupture for 1 minute an internal pressure as specified in Table 13.1.

TABLE 13.1
INTERNAL PRESSURE TEST

Maximum Diameter of Tank, Feet (m)	Applied Pressure, Psig (kPa)
10 (3.0) or less	25 (172)
More than 10	15 (103)

14. Physical Properties of Materials Tests

General

14.1 Samples cut directly from a tank are to be used for the tests described in paragraphs 14.2–14.12. At least 84 samples are to be used. The samples are to measure approximately 5 by 9 inches (127 by 229 mm) and are to be cut to minimize the amount of curvature, that is, so that the 5-inch dimension is parallel to the cylinder circumference.

Air-Oven Aging

14.2 Four as-received samples and 12 samples conditioned as described in paragraph 14.3 are to be subjected to the strength tests specified in paragraphs 14.4 and 14.5. The strength of the conditioned samples shall be at least 80 percent of the strength of the unconditioned samples.

14.3 Three groups of four samples are to be conditioned for 30, 90, and 180 days, respectively, in an air-circulating oven at a temperature of 70°C (158°F). Two of the samples from each group are then to be tested as specified in paragraph 14.4 and the remaining two are to be tested as specified in paragraph 14.5.

14.4 Samples are to be subjected to the flexural strength test described in Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials, ANSI/ASTM D790–81, using a cross-head speed of 0.1 inch per minute (2.5 mm/min) and with the inside surface facing down. Five specimens are to be cut from each sample, parallel to the longest dimension of the sample, in accordance with ASTM D790–81.

14.5 Samples are to be subjected to the Izod impact-strength test described in Test Methods for Impact Resistance of Plastics and Electrical Insulating Materials, ASTM D256–81. Five specimens are to be cut from each sample, parallel to the longest dimension of the sample, and as described in ASTM D256–81.

Immersion

14.6 Four as-received samples and 56 samples conditioned as described in paragraphs 14.8–14.10 are to be subjected to the tests specified in paragraphs 14.4 and 14.5. The strength of each sample that has been immersed in a Type A liquid shall be at least 50 percent of the strength of an unconditioned sample. The strength of each sample that has been immersed for 180 days in a Type B liquid shall be at least 30 percent of the strength of an unconditioned sample.

14.7 An immersion test liquid is classed as either Type A or Type B according to the following:

A. Type A liquids represent either an actual product to be stored or an outside soil condition.

B. Type B liquids are more severe than expected conditions and are intended to indicate whether additional testing is required to determine the acceptability of the material.

14.8 Samples are to be immersed in each of the liquids specified in Table 14.1 for 30, 90, and 180 days. A separate group of 14 samples (total of 42 samples) is to be used for each immersion period for each of the test liquids.

14.9 The liquids are to be maintained at 38°C (100°F) during the tests. The edges of all samples for immersion are to be coated with the same resin the tank is made from to minimize edge effects during the immersion. For the tests specified in paragraphs 14.4 and 14.5, specimens are to be cut from the centers of the samples that have been subjected to the immersion conditioning.

TABLE 14.1
IMMERSION-TEST LIQUIDS^a

Immerse	Type B
Premium unleaded gasoline	Toluene
Regular unleaded gasoline	Distilled water ^b or deionized water ^c
No. 2 fuel oil	Hydrochloric acid (5 percent) ^d
ASTM Reference Fuel C ^e	Nitric Acid (5 percent) ^d
Sulfuric acid (pH=3)	Sodium carbonate-sodium bicarbonate solution (pH=10) ^f
Saturated sodium chloride	Sodium hydroxide (pH=12)
No. 6 fuel oil ^g	Sodium hydroxide (5 percent) ^d

^a Test parameters, such as temperature and concentrations of media, are increased in severity over those of normal operating conditions to obtain observable deterioration in a reasonable period of time. This accelerated test may not give any direct correlation with service performance. However, the method yields comparative data on which to base judgment as to expected service.

^b Distilled water having a maximum electrical conductivity of 2.0 ppm and a maximum electrical conductivity of 5.0 micromhos/cm at 25°C (77°F), as described for Type IV grade reagent water in the Standard Specification for Reagent Water, ASTM D1193-77.

^c Deionized water having a maximum electrical conductivity of 5.0 micromhos/cm at 25°C (77°F), as described for Type IV grade reagent water in ASTM D1193-77.

^d Percentage by weight.

^e As described in the Test Method for Rubber Property - Effect of Liquids, ASTM D471-79.

^f A pH of 10 can be obtained by mixing 10.6 g/L of sodium carbonate and 8.4 g/L of sodium bicarbonate. A pH meter is to be used and the ratio of sodium carbonate to sodium bicarbonate adjusted as needed. The pH is to be checked several times during the test.

^g Optional, to be used only at the request of and at the temperature specified by manufacturer.

14.10 After immersion, specimens cut from each of the samples from each immersion group are to be tested separately as specified in paragraphs 14.4 and 14.5. The results of the tests are to be evaluated according to paragraph 14.6 and, in addition, the results from immersion in each of the Type A liquids are to be extrapolated to obtain 270-day retention values. The extrapolated strength shall be

not less than 50 percent of the strength of unconditioned samples. If the extrapolated value is less than 50 percent for a particular liquid, an additional group of 14 samples is to be immersed in that liquid for a total of 270 days as described in paragraph 14.9, and then tested as described in paragraphs 14.4 and 14.5. The strength of the samples shall be not less than 50 percent of that of an unconditioned sample.

Impact

14.11 A sample shall be tested as described in paragraph 14.12 and shall not crack or show rupture of the laminate. Crazing is acceptable.

14.12 Four samples are to be conditioned for 1 hour in a cold box maintained at minus 29° (minus 20°F). These samples and four additional unconditioned samples are then to be clamped, one at a time, between two steel rings having an inside diameter of 4-1/4 inches (108 mm). A 1.18-pound (0.536-kg) steel ball is to be dropped once from height of 6 feet (1.8 m) to strike the outside surface of each sample.

15. Earth-Load Test

15.1 A tank shall be subjected to the test specified in paragraphs 15.2 and 15.3 and shall not implode, leak, or otherwise be damaged.

15.2 An empty tank of each diameter is to be installed in a test pit or an apron is to be constructed around the four sides of the tank. Backfilling is to be done according to the manufacturer's installation instructions. The tank is to be covered so that it is 3 feet (0.9 m) below the surface of the fill. The tank is to remain buried for at least 1 hour.

15.3 The tank is then to be subjected to the Leakage Test, Section 8.

MANUFACTURING AND PRODUCTION TESTS

16. Leakage Test

16.1 Each tank shall be tested, as a routine production-line test, for leakage as described in paragraph 8.2. If leakage is noted, the tank shall be repaired and retested.

17. Internal Vacuum Test

17.1 Each tank shall withstand, without rupture, an internal partial vacuum according to the equation:

$$V = (1/2 D + h) \times 0.88 \text{ inches Hg/ft}$$

in which:

V is the vacuum in inches Hg,

D is the tank diameter in feet, and

h is the maximum recommended burial depth in feet, but not less than 3 feet.

Exception: A lower internal vacuum may be used if it can be shown that the lower value, applied to the tank above ground, is representative of the specified value applied to the buried tank.

MARKING

18. General

18.1 All required markings shall be permanent, as paint or paper labels imbedded in clear resin on the outside surface of the tank.

18.2 Each tank shall be legibly marked with the name of the manufacturer or a distinctive marking by which it may be identified as the product of a particular manufacturer.

18.3 If a manufacturer produces tanks at more than one factory, each tank shall have a distinctive marking to identify it as the product of a particular factory.

18.4 Each tank shall be marked with information that is deemed necessary by the manufacturer. This marking shall include at least the following:

A. "Maximum test pressure X psig" or the equivalent, in which X is 5 for tanks 10 feet (3 m) in diameter or less and 3 for tanks larger than 10 feet in diameter.

B. "Keep tank vented," or the equivalent.

C. "Follow installation instructions," or the equivalent.

D. The word "CAUTION" and the following or the equivalent: "To reduce the risk of damage to the tank, do not fill tank prior to backfilling."

E. "Do not roll or drop tank," or the equivalent.

18.5 If a tank has a steel deflection plate under only one opening as covered in item (2) of paragraph 6.1, the opening shall be marked to indicate that dipstick measurements shall be made only at that location.

Paragraph 18.5 effective October 19, 1983

19. Installation Instructions

19.1 Two copies of the manufacturer's installation instructions shall be provided with each tank, one of which shall be embedded in clear resin on the outside surface of the tank.

Paragraph 19.1 effective October 19, 1983

19.2 The installation instructions shall include (1) the method of intended lifting, including the intended distribution of the load between the fittings if more than one fitting is provided, and (2) indication that the backfill to be used shall be either pea gravel or compacted, clean dry sand, as specified by the manufacturer.



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**STANDARD FOR
STEEL UNDERGROUND TANKS FOR FLAMMABLE
AND COMBUSTIBLE LIQUIDS**

UL 58, EIGHTH EDITION

Accompanying this transmittal notice is a copy of the eighth edition of UL 58.

A CHANGE IN REQUIREMENTS IS INDICATED BY A VERTICAL LINE IN THE MARGIN ON THE AFFECTED PAGE. EDITORIAL CHANGES ARE NOT SO MARKED.

THIS EDITION OF THE STANDARD IS NOW IN EFFECT EXCEPT FOR PARAGRAPHS 3.3, 3.4, 5.6 and 12.3, WHICH BECOME EFFECTIVE JUNE 1, 1987 AS INDICATED IN THE SMALL PRINT NOTE FOLLOWING THE AFFECTED ITEM.

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The requirements in this standard are substantially in accordance with UL's bulletin on this subject dated January 17, 1984. The bulletin is now obsolete and may be discarded.

As indicated on the title page, this standard is an American National Standard.

Revised and/or additional pages may be issued from time to time.



APRIL 15, 1986

ANSI/UL 58—1985

UL 58

**STANDARD FOR
STEEL UNDERGROUND TANKS FOR FLAMMABLE
AND COMBUSTIBLE LIQUIDS**

First Edition — October, 1925
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Sixth Edition — December, 1971
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(The fifth and previous editions were originally titled "Underground Tanks for Flammable Liquids")

EIGHTH EDITION

April 15, 1986

Approval as an American National Standard covers the numbered paragraphs on pages dated April 15, 1986. These pages should not be discarded when revised or additional pages are issued if it is desired to retain the approved text. Revisions of this standard will be made by issuing revised or additional pages bearing their dates of issue.

An effective date included as a note immediately following certain requirements is one established by Underwriters Laboratories Inc.

Approved as ANSI B137.1—1971, July 27, 1971
Approved as ANSI B137.1—1976, July 23, 1976
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F. Many tests required by the Standards of UL are inherently hazardous and adequate safeguards for personnel and property shall be employed in conducting such tests.

GENERAL

3. General

1. Scope

1.1 These requirements cover horizontal atmospheric-type steel tanks intended for the storage underground of flammable and combustible liquids.

1.2 These tanks are intended for installation and use in accordance with the Standard for the Installation of Oil-Burning Equipment, NFPA 31, and the Flammable and Combustible Liquids Code, NFPA 30.

1.3 Tanks covered by these requirements are cylindrical tanks that are fabricated, inspected, and tested for leakage before shipment from the factory as completely assembled vessels.

1.4 These requirements do not apply to tanks covered by the Standard for Welded Steel Tanks for Oil Storage, ANSI/API 650, nor tanks intended for use in chemical and petrochemical plants.

2.1 If a value for measurement is followed by a value in other units in parentheses, the second value may be only approximate. The first stated value is the requirement.

CONSTRUCTION

3. Capacities, Dimensions, and Metal Thicknesses

3.1 Capacities, dimensions, and construction detail shall comply with the applicable requirements of this standard.

3.2 Tables 13.1 and 13.2 give capacities for cylindrical tanks in gallons per foot of length and in liters per meter of length. For a tank with conical heads the total capacity is obtained by adding one-third the height of the heads to the shell length.

TABLE 3.1
THICKNESS OF STEEL

Capacity		Maximum Diameter		Minimum Thickness					
				Carbon Steel				Stainless Steel	
				Uncoated		Galvanized			
U.S. Gallons	dm ³	Inches	m	Inches	mm	Inches	mm	Inches	mm
Up to 285	Up to 1078	42	1.07	0.067	1.70	0.070	1.78	0.071	1.80
286 to 560	1082 to 2120	48	1.22	0.093	2.36	0.097	2.46	0.071	1.80
561 to 1100	2124 to 4164	64	1.63	0.123	3.12	0.126	3.20	0.086	2.18
1101 to 4000	4168 to 15142	84	2.13	0.167	4.24			0.115	2.92
4001 to 12000	15145 to 45425	126	3.20	0.240	6.10			0.158	4.01
12001 to 20000	45429 to 75708	144	3.66	0.302	7.67			0.209	5.31
20001 to 50000	75712 to 189270	144	3.66	0.365	9.27			0.240	6.10

^a42 inches (1.07 m) for carbon steel and 48 inches (1.22 m) for stainless steel.

3.3 The total capacity of a tank shall not be (1) less than the rated nominal capacity and (2) more than 105 percent of the rated nominal capacity.

Paragraph 3.3 effective June 1, 1987

3.4 The total capacity is to be determined at the level of the lowest opening when the tank is in the intended installation position.

Paragraph 3.4 effective June 1, 1987

3.5 The overall length of a tank shall not be greater than six times its diameter.

3.6 A tank shall be constructed from steel not thinner than specified in Table 3.1 for its capacity and diameter.

3.7 The thickness of steel is to be determined by five micrometer readings equally spaced along the edge of the full piece as rolled. Thickness is to be determined on the sheet not less than 3/8 inch (9.5 mm) from a cut edge and not less than 3/4 inch (19 mm) from a mill edge.

3.8 To provide for manufacturing variations in applying Table 3.1, a plus tolerance of 5 percent in maximum capacity and a plus tolerance of 5 percent in either the maximum diameter or the maximum length is permitted for tanks constructed of 0.107-inch (4.24-mm) or thicker steel.

Paragraph 3.8 effective June 1, 1987

4. Materials

4.1 A tank shall be constructed of commercial or structural grade carbon steel or of Type 304 or 316 stainless steel, as noted in paragraphs 4.2 and 4.3. Only new material shall be used.

4.2 Carbon steel shall:

A. Comply with the Specification for Structural Steel, ASTM A36—81a; or Specification for Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip, Commercial Quality, Hot-Rolled Carbon, ASTM A569—72 (Reapproved 1979); or Specification for Hot-Rolled Carbon Steel Sheet and Strip, Commercial Quality, Heavy Thickness Coils (Formerly Plate), ASTM A635—81; or

B. Have (1) a carbon content of 0.3 percent or less, or a carbon equivalency of 0.53 percent or less, and (2) mechanical strength and welding characteristics at least equivalent to one of the steels specified in item A.

4.3 Stainless steel shall comply with the Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip, ASTM A167—82; or Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels, ASTM A240—82C.

ASTM A 569 - 72

ASTM A 635 - 81

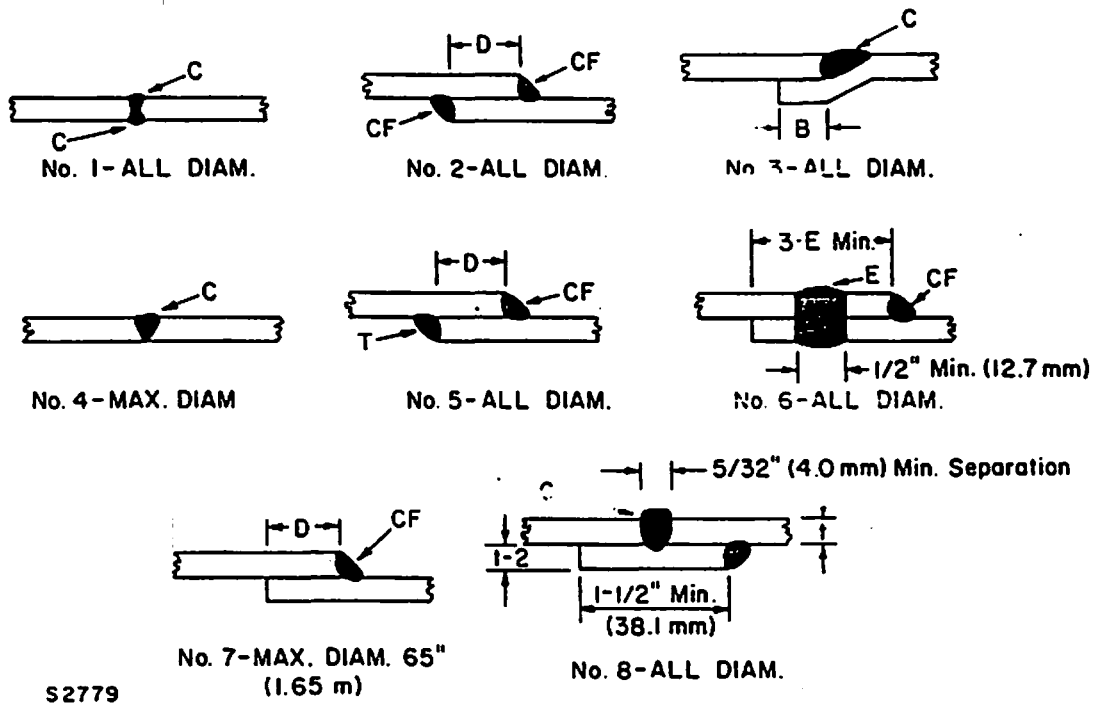
5. Shell Joints

5.1 A shell joint of a tank shall be one of the constructions illustrated in Figure 5.1 except that:

A. Shell joint No. 4 in Figure 5.1 shall not be used on a tank larger than 96 inches (2.44 m) in diameter, and

B. Shell joint No. 7 in Figure 5.1 shall not be used on a tank larger than 65 inches (1.65 m) in diameter.

FIGURE 5.1
SHELL JOINTS



- B — Overlap — 1/2 inch (12.7 mm) minimum.
- C — Continuous welds.
- CF — All lap welds shall be continuous full fillet welds.
- D — Overlap — 1/2 inch (12.7 mm) minimum for diameters 48 inches (1.2 m) or less; 3/4 inch (19.1 mm) minimum for diameters over 48 inches (1.2 m).
- E — 1/2 inch (12.7 mm) minimum diameter lock weld, not over 12 inches (305 mm) apart.
- T — Tack weld 1 inch (25 mm) spots, not over 12 inches (305 mm) apart.
- t — Thickness of backup bar to be same as shell thickness.

6. Heads and Head Joints

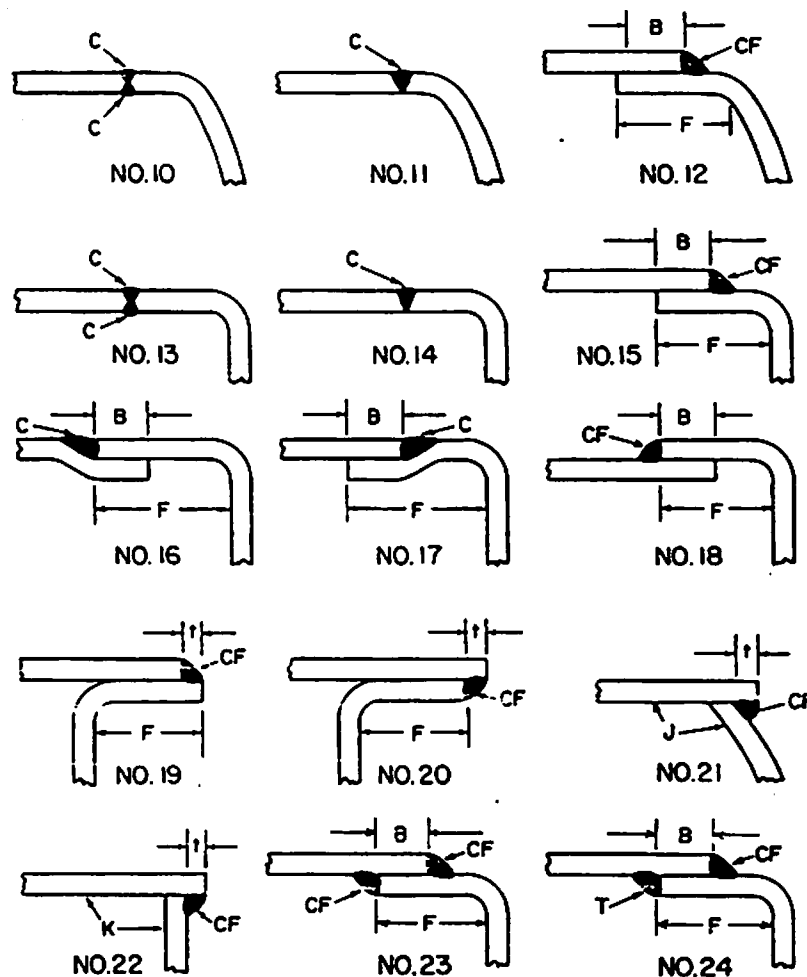
6.1 A head of a tank shall be constructed of not more than two pieces for diameters of 48 inches (1.22 m) or less, three pieces for diameters of from 49 to 96 inches (1.24 to 2.44 m), and four pieces for diameters of from 97 to 144 inches (2.46 to 3.66 m). When two

or more pieces are used, joints shall comply with the requirements for shell joints in paragraph 5.1.

6.2 A head of a tank may be flat, dished, or conical.

6.3 A head of a tank shall be attached to the shell by one of the joints illustrated in Figure 6.1.

FIGURE 6.1
HEAD JOINTS FOR ALL DIAMETER TANKS



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- B — Overlap — 1/2 inch (12.7 mm) minimum.
- C — Continuous welds.
- CF — Shall be continuous full fillet welds.
- F — Not less than five times head thickness — minimum
1/2 inch (12.7 mm).
- J — Joint No. 21 — Minimum thickness of 0.167 inch
(4.24 mm).
- K — Joint No. 22 — Heads require bracing. (see No. 22
figure) 0.167
(4.24 mm).

- T — Tack weld 1 inch (25 mm) spots, not over 12 inches
(305 mm) apart.

- t — Minimum, 1 X shell thickness.

Heads may be flat, dished, or conical.

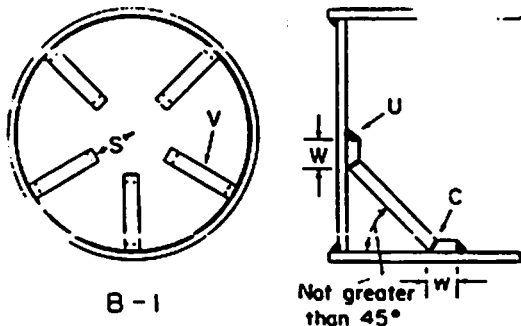
Height of cone heads — not less than one-twelfth diameter.

Height of dished heads shall conform to Table 6.1.

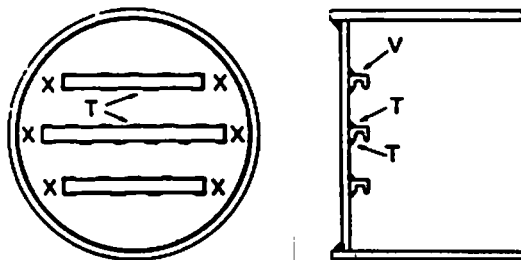
6.5 An unflanged flat head of a tank shall be braced in accordance with Figure 6.2, No. 1 or 2, and the head and shell shall be made of steel not less than 1/2 inch (12.7 mm) thick.

6.6 A conical head of a tank shall be braced in accordance with Figure 6.2, No. 3, and the head and shell shall be made of steel not less than 1/2 inch (12.7 mm) thick.

FIGURE 6.2
BRACING FOR UNFLANGED
FLAT HEADS AND BULKHEADS

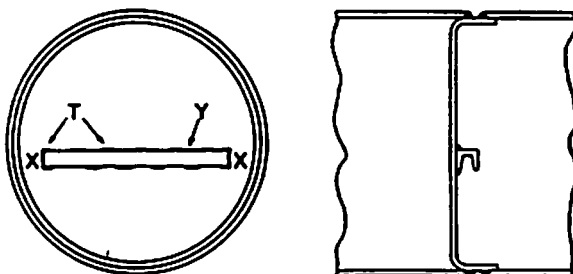


B-1



B-2

BRACING FOR FLANGED FLAT BULKHEADS



B-3

S2781

FIGURE 6.2 (Cont'd)

- C — Weld.
- S — From center, approximately 1/2 of diameter.
- V — Weld three sides each foot.
- V — Bracing.
- W — Minimum length of foot.

- T — Tack welds, not over 12 inches (305 mm) apart.
- V — Bracing.
- X — Not over 2 inches (51 mm) from shell.

BRACING FOR FLANGED FLAT
BULKHEADS

- T — Tack welds, not over 12 inches (305 mm) apart.
- X — Not over 2 inches (51 mm) from shell.
- Y — Bracing (locate 6 inches (150 mm) below center of head).

6.6 A conical head of a tank shall have a height of not less than one-twelfth the diameter of the tank.

6.7 The depth of dish of a dished head shall not be less than that specified in Table 6.1.

6.8 Strut bracing for unflanged flat heads and bulkheads shall comply with Table 6.2.

6.9 Surface bracing for unflanged flat heads and bulkheads shall comply with Table 6.3.

6.10 Surface bracing for flanged flat bulkheads shall comply with Table 6.4.

TABLE 6.1
DISHED HEADS — MINIMUM HEIGHT

Diameter		Minimum Dish		Diameter		Minimum Dish	
Inches	m	Inches	mm	Inches	m	Inches	mm
Up to 60	Up to 1.52	1-1/2	38	97—108	2.46—2.74	4-1/2	114
61—72	1.55—1.83	2	51	109—120	2.77—3.05	5-1/2	140
73—84	1.85—2.13	2-1/2	64	121—132	3.07—3.35	7	178
85—96	2.16—2.44	3-1/2	89	133—144	3.38—3.66	8	203

NOTE — The use of standard S.I. (metric) sizes and weights of angles, channels, and I-beams as substitutes for the U.S.A. structural units specified in Tables 6.2, 6.3, and 6.4 shall be based on those sizes and weights having an equal or greater section modulus (S).

TABLE 6.2
STRUT BRACING FOR UNFLANGED FLAT HEADS AND BULKHEADS^a

Diameter Head		Channels		Angles		W ^a	
Inches	m	Size, Inches	Section Modulus(s) In. ³	Size, Inches	Section Modulus(s) In. ³	Inches	mm
Up to — 60	Up to 1.52	1 by 3/8 by 1/8	0.048 ^b	1 by 1 by 1/8	0.031	1	25.0
61—72	1.55—1.83	1 by 3/8 by 1/8	0.048 ^b	1-1/4 by 1-1/4 by 1/8	0.049	1-1/4	32.0
73—84	1.85—2.13	1 by 1/2 by 1/8	0.063 ^b	1-1/2 by 1-1/2 by 1/8	0.072	1-1/2	38.0
85—96	2.16—2.44	1 by 1/2 by 1/8	0.063 ^b	1-3/4 by 1-3/4 by 3/16	0.140	1-3/4	44.0
97—108	2.46—2.74	1-1/2 by 3/4 by 1/8	0.147 ^b	2 by 2 by 3/16	0.190	2	51.0
109—120	2.77—3.05	3 inches — 4.1 pounds	1.1 ^b	2 by 2 by 1/4	0.250	2	51.0
121—132	3.07—3.35	3 inches — 4.1 pounds	1.1 ^b	2-1/2 by 2-1/2 by 5/16	0.480	2-1/2	64.0
133—144	3.38—3.66	3 inches — 4.1 pounds	1.1 ^b	2-1/2 by 2-1/2 by 5/16	0.480	2-1/2	64.0

^aSee Figure 6.2, No. 1.

^bFlange of channel welded to head or bulkhead and shell.

TABLE 6.3
SURFACE BRACING FOR UNFLANGED FLAT HEADS AND BULKHEADS^a

Diameter Head		Channels		Angles	
Inches	m	Size	Section Modulus(s) In. ³	Sizes, inches	Min. Section Modulus(s) In. ³
Up to 60	Up to 1.52	3 inches — 4.1 pounds	1.1 ^b	2 by 2 by 3/8 or 2 1/2 by 2 1/2 by 1/4	0.35
61—72	1.55—1.83	3 inches — 4.1 pounds	1.1 ^b	3 by 3 by 7/16 or 3-1/2 by 3-1/2 by 5/16	0.95
73—84	1.85—2.13	4 inches — 5.4 pounds		3-1/2 by 3-1/2 by 1/2 or 4 by 4 by 3/8	1.50
85—96	2.16—2.44	5 inches — 6.7 pounds	3.0 ^b	4 by 4 by 1/2 or 5 by 3-1/2 by 3/8	2.00 ^c
97—108	2.46—2.74	5 inches — 6.7 pounds	3.0 ^b	4 by 4 by 3/4 or 6 by 4 by 3/8	2.80 ^b
109—120	2.77—3.05	6 inches — 8.2 pounds	4.3 ^b	5 by 5 by 5/8 or 6 by 4 by 1/2	3.90 ^b
121—132	3.07—3.35	7 inches — 9.8 pounds	6.0 ^b	5 by 5 by 3/4 or 6 by 4 by 9/16	4.50 ^b
133—144	3.38—3.66	7 inches — 9.8 pounds	6.0 ^b	5 by 5 by 3/4 or 6 by 4 by 9/16	4.50 ^b

^aSee Figure 6.2, No. 2.

^bShort leg of angle or flange of channel welded to head or bulkhead.

TABLE 6.4
SURFACE BRACING FOR FLANGED FLAT BULKHEADS^a

Diameter Head		I-Beams		Channels	
Inches	m	Size	Section Modulus(s) In. ³	Size	Section Modulus(s) In. ³
72—84	1.83—2.13	3 inches — 5.7 pounds	1.7 ^b	3 inches — 4.1 pounds	1.1 ^b
85—96	2.16—2.44	3 inches — 5.7 pounds	1.7 ^b	4 inches — 5.4 pounds	1.9 ^b
97—108	2.46—2.74	4 inches — 7.7 pounds	3.0 ^b	5 inches — 6.7 pounds	3.0 ^b
109—120	2.77—3.05	5 inches — 10 pounds	4.8 ^b	5 inches — 6.7 pounds	3.0 ^b
121—132	3.07—3.35	5 inches — 10 pounds	4.8 ^b	6 inches — 8.2 pounds	4.3 ^b
133—144	3.38—3.66	5 inches — 10 pounds	4.8 ^b	6 inches — 8.2 pounds	4.3 ^b

^aSee Figure 6.2, No. 3.

^bFlange of I-beam or channel welded to bulkhead.

7. Compartment Tanks

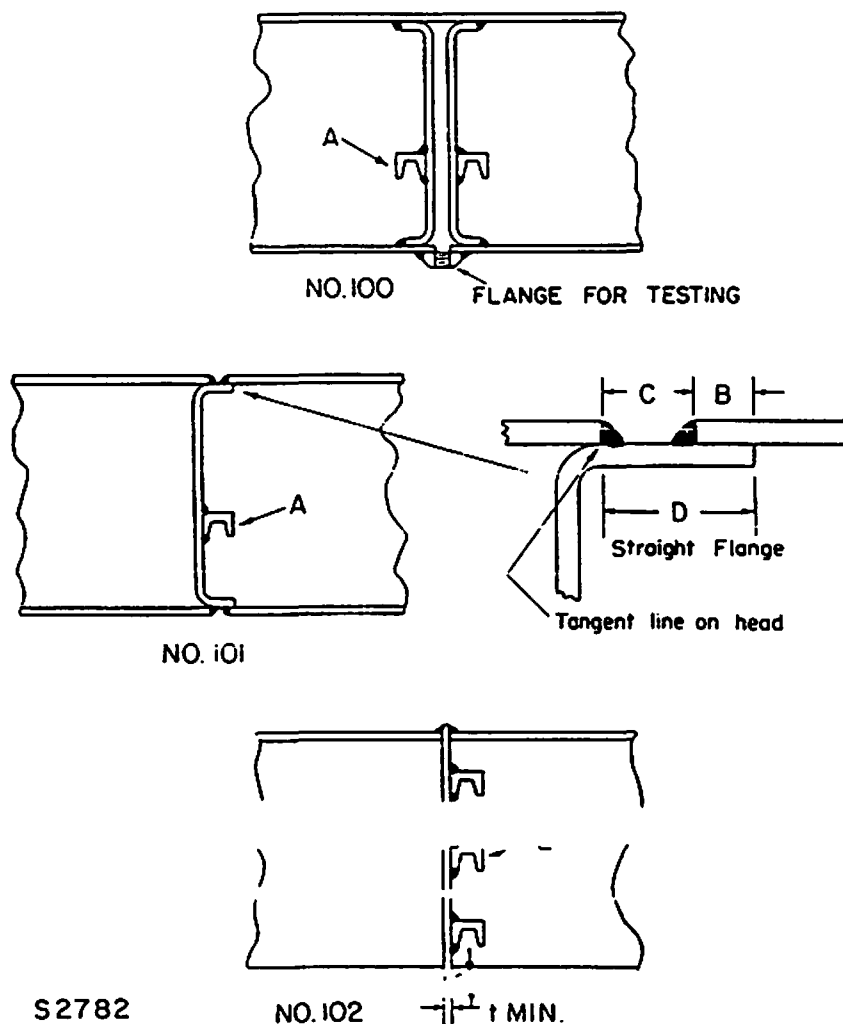
7.1 Bulkheads of a compartment tank shall be constructed so that any leakage through joints will be directed to the outside of the tank rather than from one compartment to another. See Figure 7.1 for acceptable bulkhead constructions.

7.2 A single bulkhead of a compartment tank, illustrated in Nos. 101 and 102 of Figure 7.1, shall be constructed of one piece of material and may be flat or dished. The height of a dished bulkhead shall not be less than that specified in Table 6.1.

7.3 A bulkhead of a double bulkhead tank, illustrated in No. 100 in Figure 7.1, shall be constructed of not more than two pieces for diameters of 48 inches (1.22 m) or less, three pieces for diameters of from 49 to 96 inches (1.24 to 2.44 m), and four pieces for diameters of from 97 to 144 inches (2.46 to 3.66 m). When two or more pieces are used, joints shall comply with the requirements for shell joints in paragraph 5.1.

7.4 The minimum thickness of metal employed for a bulkhead depends upon the tank diameter and shall not be less than that specified in Table 3.1.

FIGURE 7.1
BULKHEADS FOR COMPARTMENT TANKS



A — Bracing as per Table 6.4 if diameter exceeds
72 inches (1.8 m)

B — 1/2 inch (12.7 mm)
3/4 inch (19.1 mm)

C — 1 1/4 inch (31.8 mm)

D — 1 1/2 inch (38.1 mm)

an unflanged flat bulkhead of a compartment tank shall be braced in accordance with Figure 6.2, No. 1, and shall be made of steel not less than 1/8 inch (4.24 mm) thick.

A flanged flat bulkhead of a compartment tank more than 72 inches (1.83 m) in diameter shall be braced as illustrated in No. 3 of Figure 6.2.

A flanged flat bulkhead 72 inches (1.83 m) or less in diameter does not require bracing.

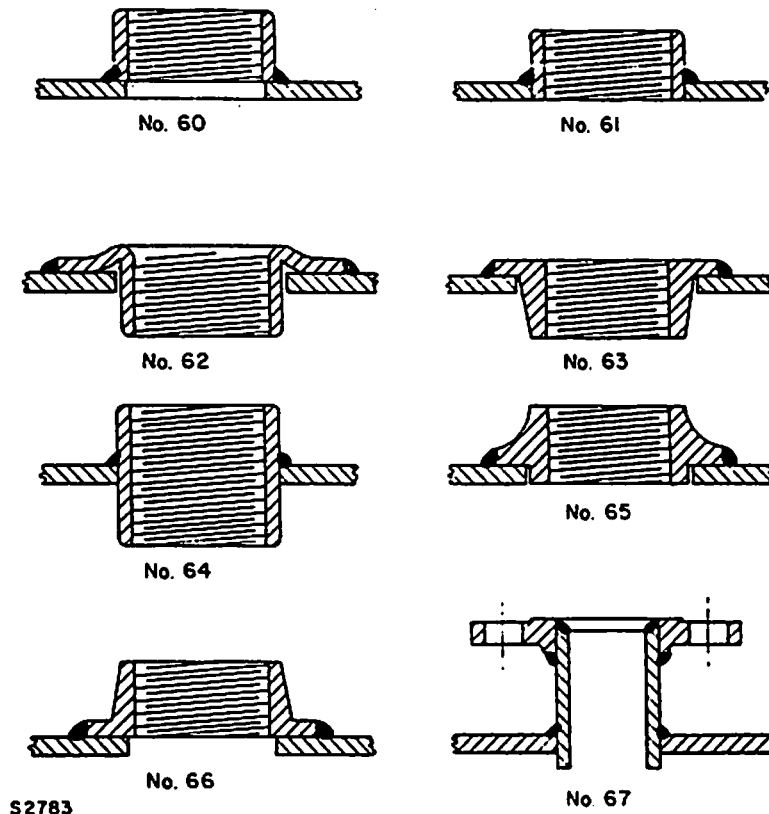
8. Pipe Connections

8.1 A pipe connection shall be provided by welding to the tank a standard threaded pipe coupling, a reduced flange, or a standard half pipe nipple, or by a bolted and gasketed flanged connection welded to a pipe nipple that in turn, is welded to the tank.

8.2 Conventional types of pipe connections are illustrated in Figure 8.1.

8.3 The minimum length of thread in a pipe connection shall be specified in Table 8.1.

FIGURE 8.1
PIPE CONNECTIONS



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All welds are to be full fillet welds, at least 1/8 inch (3.2 mm) radius.

- No. 60 — Half pipe coupling.
- No. 61 — Half pipe coupling.
- No. 62 — Pressed steel, hub inside tank only.
- No. 63 — Forged steel, hub inside tank.
- No. 64 — Full pipe coupling.
- No. 65 — Forged steel, with pilot.
- No. 66 — Forged steel, without pilot.
- No. 67 — Standard pipe nipple and welding flange.

TABLE 8.1
PIPE CONNECTIONS

Pipe Size ^a Nominal	Minimum Length of Thread		Minimum Thickness of Flange Section of Pressed-Steel Fittings	
	Inches	mm	Inches	mm
1/8	1/4	6.4		
1/4	3/8	9.5		
3/8	3/8	9.5		
1/2	1/2	12.7		
3/4	5/8	15.9	0.123	3.12
1	5/8	15.9	0.138	3.51
1-1/4	11/16	17.5	0.138	3.51
1-1/2	3/4	19.1	0.138	3.51
2	3/4	19.1	0.138	3.51
2-1/2	1	25.4	0.167	4.24
3	1	25.4	0.167	4.24
3-1/2	1	25.4	0.167	4.24
4	1-1/8	28.6	0.167	4.24
5	1-3/16	30.2		
6	1-1/4	31.7		
8	1-3/8	34.9		

^aStandard for Welded and Seamless Wrought Steel Pipe, ANSI B36.10—1979.TABLE 8.2
SIZE OF VENT-PIPE FITTING

Capacity of Tank		Nominal Pipe Size ^a , Inches
U.S. Gallons	L	
0 to 500	Up to 1895	1-1/4
500 to 3000	1900 to 11355	1-1/2
3001 to 10000	11360 to 37855	2
10001 to 20000	37860 to 75710	2-1/2
20001 to 35000	75715 to 132490	3
35001 to 50000	132495 to 189270	4

^aStandard for Welded and Seamless Wrought Steel Pipe, ANSI B36.10—1979.

8.4 A pressed-steel pipe-connecting fitting shall be (1) installed with the hub section on the inside of the tank shell, (2) installed in accordance with Figure No. 62 of Figure 8.1. The minimum thickness of the flange section shall be as specified in Table 8.1.

8.5 A half pipe nipple shall be welded to the tank shell as illustrated in Fig. 8.7 or Figure 8.8.

8.6 Except as indicated in paragraphs 8.7 and 8.8, all openings in a tank shall be located in the top, parallel with the longitudinal axis of the tank.

8.7 If the application of a tank is such that pipe-connecting openings in the top are required to be grouped, the openings may be located off center of the longitudinal axis under the conditions specified in paragraph 8.8.

8.8 No opening in the shell of a tank shall be located more than 12 inches (305 mm) from the longitudinal centerline of the top, and the top end of the pipe coupling or other pipe-connecting fitting welded to the tank shall terminate above the top of the shell.

8.9 All openings in a tank shall be closed with wooden plugs, metal covers, or the equivalent, to protect the threads and exclude foreign matter while the tank is in storage or in transit.

8.10 Each tank shall have a pipe connection of a size not less than that specified in Table 8.2 for attachment of a vent pipe.

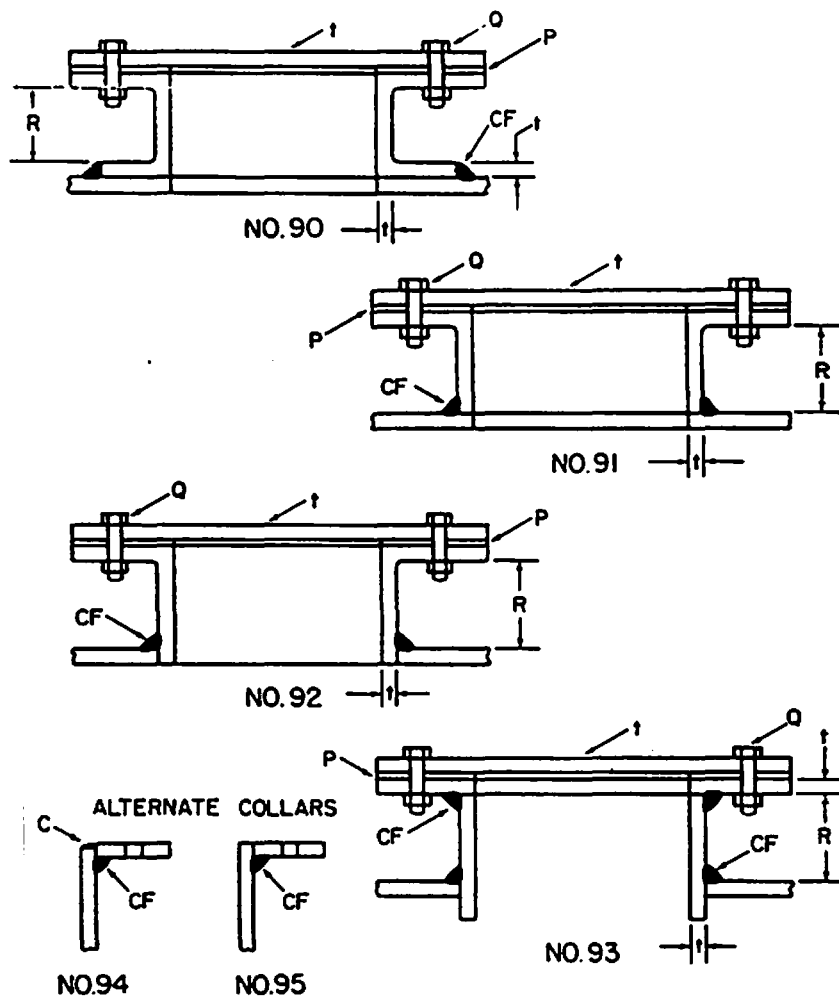
8.11 An opening for connection of a vent pipe shall not be located in a manhole cover.

9. Manholes

A manhole, if provided in a tank, shall be located above the highest intended liquid level and shall be of the bolted cover type as illustrated in Figure 9.1.

The manhole cover joint shall be provided with a gasket of material determined to be acceptable for the liquid to be stored and shall not be less than 1/8 inch (3.2 mm) thick.

FIGURE 9.1
CONVENTIONAL MANHOLES



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- CF — Continuous full fillet weld.
- P — Gasket material, 1/8 inch (3.2 mm) thick minimum — ring or face gasket.
- Q — Minimum, 1/2 inch (12.7 mm) bolts spaced 4 inch (102 mm) centers maximum.
- R — Minimum, 2 inches (51 mm) for tanks 6 feet (1.8 m) in diameter or larger.
- t — Not less than 0.167 inch (4.24 mm) thick.

10. Heating Coils and Hot Wells

10.1 A heating coil or hot well that is provided as a part of a tank assembly and that handles a fluid other than that stored in the tank, such as steam or hot water, shall have no joints in the portion of the coil or well that is located within the tank unless the joints are continuously welded or brazed.

10.2 Inlet and outlet connections of a heating coil or a hot well shall be located above the highest intended liquid level. A continuous weld shall be made where a connection pierces the shell of the tank or a manhole cover.

MANUFACTURING AND PRODUCTION TESTS

11. General

11.1 Each tank, before painting, shall be tested by the manufacturer and proved tight against leakage by:

A. Applying internal air pressure and using soap-suds, linseed oil, or equivalent material for the detection of leaks. The test pressure is to be 5–7 psig (34.5–48.3 kPa); or

B. Completely filling the tank with water and applying an additional 5 psig (34.5 kPa) pressure while the tank is placed in the position in which it will be installed.

11.2 If leaks are noted during the test, the tank shall be made tight by welding and retested. Defects in welds shall be repaired by chipping or melting out from one or both sides of the joint, as required, and rewelding.

11.3 Each compartment of compartment tanks shall be separately tested for leakage.

MARKING

12. General

12.1 Each tank shall be marked with the name of the manufacturer or a distinctive marking, which may be in code, by which it may be identified as the product of a particular manufacturer.

12.2 If a manufacturer produces tanks at more than one factory, each tank shall have a distinctive marking to identify it as the product of a particular factory.

12.3 Each tank shall be marked with the minimum gage steel used in its construction.

Paragraph 12.3 effective June 1, 1987

TABLE 1
GALLON CAPACITY PER FOOT OF LENGTH

Diameter in Inches	U.S. Gallons 1-Foot Length	Diameter in Inches	U.S. Gallons 1-Foot Length	Diameter in Inches	U.S. Gallons 1-Foot Length
24	23.50	65	172.38	105	449.82
25	25.50	66	177.72	106	456.30
26	27.58	67	183.15	107	467.70
27	29.74	68	188.66	108	475.89
28	31.99	69	194.25	109	485.00
29	34.31	70	199.92	110	493.70
30	36.72	71	205.67	111	502.70
31	39.21	72	211.51	112	511.90
32	41.78	73	217.42	113	521.40
33	44.43	74	223.42	114	530.24
34	47.16	75	229.50	115	540.00
35	49.98	76	235.66	116	549.50
36	52.88	77	241.90	117	558.51
37	55.86	78	248.23	118	568.00
38	58.92	79	254.63	119	577.80
39	62.06	80	261.12	120	587.52
40	65.28	81	267.69	121	597.70
41	68.58	82	274.34	122	607.27
42	71.97	83	281.07	123	617.26
43	75.44	84	287.88	124	627.00
44	78.99	85	294.78	125	638.20
45	82.62	86	301.76	126	647.74
46	86.33	87	308.81	127	658.60
47	90.13	88	315.95	128	668.47
48	94.00	89	323.18	129	678.95
49	97.96	90	330.48	130	690.30
50	102.00	91	337.86	131	700.17
51	106.12	92	345.33	132	710.90
52	110.32	93	352.88	133	721.71
53	114.61	94	360.51	134	732.60
54	118.97	95	368.22	135	743.58
55	123.42	96	376.01	136	754.64
56	127.95	97	383.89	137	765.78
57	132.56	98	391.84	138	776.99
58	137.25	99	399.88	139	788.30
59	142.02	100	408.00	140	799.68
60	146.88	101	416.00	141	811.14
61	151.82	102	424.48	142	822.69
62	156.83	103	433.10	143	834.32
63	161.93	104	441.80	144	846.03
64	167.12				

TABLE 13.2
LITER CAPACITY PER METER
OF LENGTH

Diameter in mm	Liters (dm ³) 1-meter Length
600	282.7
700	384.8
800	502.7
900	636.2
1000	785.4
1100	958.2
1200	1131.0
1300	1327.3
1400	1539.4
1500	1767.2
1600	2010.6
1700	2269.8
1800	2544.7
1900	2835.3
2000	3141.6
2100	3463.6
2200	3801.3
2300	4154.8
2400	4523.9
2500	4908.8
2600	5309.3
2700	5725.6
2800	6157.5
2900	6605.2
3000	7068.6
3100	7547.7
3200	8042.5
3300	8553.0
3400	9079.2
3500	9621.2
3600	10178.8
3700	10752.1
3800	11341.2



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November 22, 1989

STANDARD FOR

EXTERNAL CORROSION PROTECTION SYSTEMS FOR STEEL UNDERGROUND STORAGE TANKS

UL 1746, FIRST EDITION

Accompanying this transmittal notice is a copy of the first edition of UL 1746.

THIS EDITION OF THE STANDARD IS NOW IN EFFECT EXCEPT FOR PARAGRAPHS 1 — 13.12 AND 15.3 — 15.10 AND TABLES 13.1, 13.2, AND 15.1, WHICH BECOME EFFECTIVE OCTOBER 1, 1991 AS INDICATED IN THE SMALL PRINT NOTE FOLLOWING THE AFFECTED ITEMS.

New product submittals made prior to a specified future effective date will be judged under all of the requirements in this standard unless the applicant specifically requests that the product be judged under the current requirements. However, should the applicant elect this option, it should be noted that compliance with all the requirements in this standard will be required as a condition of continuing and Follow-Up Services after the effective date and understanding of this should be signified in writing.

The requirements in this standard are substantially in accordance with UL's bulletin on this subject dated November 25, 1987. The bulletin is now obsolete and may be discarded.

Revised and/or additional pages may be issued from time to time.

Subscribers to UL's services in the area covered by this standard will receive these revised and/or additional pages automatically. Others may receive such pages by subscribing to UL's subscription service for revisions. See UL's CATALOG OF STANDARDS FOR SAFETY for a description of the revision subscription service, the cost of the service for this standard, and ordering information.

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UL 1746
STANDARD FOR
EXTERNAL CORROSION PROTECTION SYSTEMS
FOR STEEL UNDERGROUND STORAGE TANKS
FIRST EDITION

November 22, 1989

New product submittals made prior to a specified future effective date will be judged under all of the requirements in this standard, including those having a future effective date, unless the applicant specifically requests that the product be judged under the current requirements. However, should the applicant elect this option, it should be noted that compliance with all the requirements in this standard will be required as a condition of continued Listing and Follow-Up Services after the effective date and understanding of this should be signified in writing.

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INTRODUCTION

1. Scope

1.1 These requirements cover preengineered corrosion protection systems. Part I covers factory-installed galvanic-type cathodic protection. Part II covers factory assembled composite (steel tank with nonmetallic external cladding) systems.

1.2 These corrosion protection systems are intended to be completely installed at the factory on carbon steel underground storage tanks that comply with the Standard for Steel Underground Tanks for Flammable and Combustible Liquids, UL 58.

1.3 These corrosion protection systems are intended for use where soil resistivity is not less than 4000 ohm-cm.

1.4 These corrosion protection systems are intended to be operated and maintained in accordance with the manufacturer's instructions.

1.5 These requirements do not cover the additional protective measures that may be needed when tanks provided with these corrosion protection systems are installed in the presence of stray currents.

1.6 A product that contains features, characteristics, component, materials, or systems new or different from those in use when the standard was developed, and that involves a risk of fire, electric shock, or injury to persons, shall be evaluated using the appropriate additional component and end-product requirements as determined necessary to maintain the level of safety for the user of the product as originally anticipated by the intent of this standard.

2. General

Components

2.1 Except as indicated in paragraph 2.2, a component of a product covered by this standard shall comply with the requirements for that component.

2.2 A component need not comply with a specific requirement that:

- A. Involves a feature or characteristic needed in the application of the component to the product covered by this standard, or
- B. Is superseded by a requirement in this standard.

2.3 A component shall be used in accordance with its recognized rating established for the intended conditions of use.

2.4 Specific components are recognized as being incomplete in construction features or restricted in performance capabilities. Such components are intended for use only under limited conditions, such as certain temperatures not exceeding specified limits, and shall be used only under those specific conditions for which they have been recognized.

Units of Measurements

2.5 If a value for measurement is followed by a value in other units in parentheses, the second value may be only approximate. The first stated value is the requirement.

References

2.6 Any undated reference to a code or standard appearing in the requirements of this standard shall be interpreted as referring to the latest edition of that code or standard.

Glossary

2.7 CLAD — The words "clad" or "cladding" refer to an FRP (fiberglass-reinforced plastic) coating, of substantial thickness, as used for the exterior surface of a Composite Tank (Part II).

2.8 HOLIDAY — A small fault or pin hole that permits current drainage through the dielectric coating.

Terminology

2.9 In the following text, a requirement that applies only to a particular type of tank is so identified by a specific reference in that requirement to the type or types of tank involved. Absence of such specific reference or use of the term "tank" indicates that the requirement applies to all underground storage tanks unless indicated otherwise.

CONSTRUCTION

3. General

3.1 The construction and assembly of a corrosion protection system shall be evaluated based on its intended application and use.

4. Materials

4.1 Only new materials and components shall be used in the fabrication of corrosion protection systems for steel underground storage tanks.

PART I — PREENGINEERED CATHODIC PROTECTION SYSTEMS

CONSTRUCTION

5. Components

Galvanic Anodes

5.1 A galvanic anode for use in a cathodic protection system shall be one of the following:

- A. High-purity zinc anode with the composition specified in Table 5.1 and complying with ASTM B418-73 (Type II), Specification for Cast and Wrought Galvanic Zinc Anodes for Use in Saline Electrolytes, or
- B. Magnesium anode with one of the compositions specified in Table 5.2.

TABLE 5.1
ZINC ANODES

Element	Percent Composition
Aluminum	0.005 maximum
Cadmium	0.003 maximum
Iron	0.0014 maximum
Zinc	Remainder
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TABLE 5.2
MAGNESIUM ANODES

Element	Percent Composition			
	Type I ^a	Type II ^a	Type III ^a	MG-MN Alloy ^b
Aluminum	5.0—7.0	5.3—6.7	5.3—6.7	0.010 maximum
Zinc	2.0—4.0	3.5	2.5—3.5	0.0
Manganese	0.15 minimum	0.15 minimum	0.15 minimum	0.5—1.30
Copper	0.1 maximum	0.05 maximum	0.02 maximum	0.02 maximum
Silicon	0.30 maximum	0.30 maximum	0.10 maximum	0.0
Iron	0.003 maximum	0.003 maximum	0.003 maximum	0.02 maximum
Nickel	0.003 maximum	0.003 maximum	0.002 maximum	0.001 maximum
Others	0.3 maximum	0.3 maximum	0.3 maximum	0.05 maximum
Magnesium	Remainder	Remainder	Remainder	0.3 maximum total Remainder

^aThese anodes are commonly referred to as AZ-63 Type I, II, and III H1.

^bHigh-potential anode.

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5.2 Anodes shall be packaged in a water-permeable container and the assembly shall comply with the Anode Assembly Durability Test specified in Section 8. Anodes shall be surrounded by a minimum of 1 inch of backfill mixture complying with the requirements of paragraph 5.6.

5.3 A cored anode shall be fabricated with a galvanized steel core situated axially within the anode.

5.4 A cored anode shall be provided with a No. 12 AWG Type TW or larger solid conductor copper lead wire soldered or welded to the core. The anode lead wire shall comply with the gasoline- and oil-resistance requirements of the Standard for Thermoplastic-Insulated Wires and Cables, UL 83. The lead wire-anode joint shall be insulated by filling the joint recess with an electrical potting compound.

5.5 A weld-on zinc anode shall be provided with an integral weldable steel core for welding directly to the tank.

Backfill Materials

5.6 Backfill material, used in the "bag" around the anode, shall be a low-resistivity mixture consisting of (1) 75 percent hydrated gypsum, 20 percent bentonite, and 5 percent anhydrous sodium sulfate by weight, or (2) an equivalent mixture that shall provide a backfill resistivity of 50 ohm-cm or less and which provide equivalent resistance to anode passivation.

Insulating Devices (Bushings and Gaskets)

5.7 Insulating devices shall be fabricated of nonconductive materials and shall comply with Section 11, Tests for Insulating Devices (Bushings and Gaskets). These insulating devices shall electrically isolate the tank from attached piping.

Dielectric Coatings

5.8 Dielectric coatings shall be capable of being repaired in the field in the event that holidays occur during shipping and handling. Dielectric coatings shall comply with the requirements in Section 10, Dielectric Coatings.

Pressure Wire Connectors

5.9 The clamping movement of a connector shall be constructed in such a manner that it is capable of accepting a wire size of at least No. 12 AWG (3.3 mm²).

5.10 Examples of acceptable clamping means include: (1) direct-bearing screws with or without use of a pressure plate, (2) a pressure plate and a screw, (3) deformation of the connector barrel (crimping) using a special tool, or (4) a nut threaded onto a split screw.

5.11 There shall be no sharp edges or corners on the outer edge of a connector that would be likely to damage insulation that it might contact.

5.12 A pressure wire connector shall comply with the Pullout Test specified in Section 9.

6. Cathodic Protection System Assembly

General

6.1 Preengineered cathodic protection system shall consist of the following components:

- A. Dielectric coating
- B. Electrical insulating devices (bushing and gaskets)
- C. Galvanic anodes
- D. Test station provision

6.2 Cathodic protection systems shall be constructed to provide a minimum system design based upon a 5000 ohm-cm soil resistivity.

Dielectric Coatings

6.3 Dielectric coatings shall be applied to a exposed exterior tank surfaces, including attachments such as anode holders and attachment lugs. Crevices into which the coating will not penetrate or cannot be properly bonded shall be seal-welded prior to application of the coating.

Electrical Isolation Devices

6.4 All tank openings shall be supplied with electrical insulating devices (bushings or gaskets) installed prior to shipment.

6.5 Tank openings and insulating devices shall be closed with a wooden plug, metal cover, or equivalent to protect the threads or flange and gasket face from damage and to exclude foreign material while the tank is in storage or transit.

Galvanic Anodes

6.6 The effective coverage radius of galvanic anodes as used in this standard shall be 17 feet (5.2 m). Therefore, tanks greater than 34 feet (10.4 m) long require both head- and shell-mounted anode assemblies.

6.7 At least two anodes shall be installed on each tank. Anodes shall be mounted a distance of one-sixth the tank diameter from the tank bottom. Multiple head-mounted anodes are to be centered about this location.

Exception: Shell-mounted anodes may be mounted in other positions when required for shipping purposes provided they are mounted below the diametral midpoint of the tank.

6.8 Anodes shall be located so as to distribute the anode system current uniformly about the length of the tank. When tank length is 34 feet (10.4 m) or less, anodes shall be equally distributed on each head of the tank. When tank length is greater than 34 feet, anodes shall be equally distributed on the tank heads and shell.

6.9 Galvanic anode requirements for each tank shall be calculated in accordance with the method specified in paragraph 6.10 — 6.14, or by a method shown to be equivalent by test or derivation.

6.10 Total system current requirement shall be calculated as follows:

$$I = 0.025 \times 10^{-3} \frac{\text{amperes}}{\text{ft}^2} \times A$$

where:

I = total system current requirement, ampere

A = total tank exterior surface area including welded-on attachments, square feet

6.11 The resistance of galvanic anodes in soil shall be calculated by the following equation:

$$R = \frac{0.0626 \times P \times (\ln (4 \times L/r) - 1)}{L}$$

where:

R = anode resistance, ohm

P = soil resistivity = 4000 ohm-cm

L = anode length, inches

r = equivalent radius, inches = radius of cylindrical anodes, or $\frac{\sqrt{A}}{\pi}$ for noncylindrical anodes

A = cross-sectional area of anode, square inches

6.12 Available galvanic anode current shall be calculated on the basis of anode-cathode driving potential and the resistance of the anode in soil as follows:

$$i = \frac{EC - EA}{R}$$

where:

i = available anode, current, ampere

EC = cathode solution potential, volts = minus 0.85 volt

EA = anode solution potential, volts as specified in Table 6.1

R = anode resistance, ohm

6.13 The sum of the available anode current for the individual anode shall be equal to or greater than the total system current (see paragraph 6.10).

6.14 The minimum required galvanic anode weight shall be determined by the following equation:

$$W = \frac{262,800 \times i}{C \times N \times U}$$

where:

W = minimum required anode weight, pounds

i = available anode current, ampere

C = anode energy capability ampere-hours per pound

N = anode efficiency, decimal

U = anode utilization factor, decimal

(See Table 6.1 for values for C , N , and U)

TABLE 6.1
ANODE DATA

Item	Anode Type		
	Magnesium		
	Zinc	AZ-63	Mg-Mn
C	372	1000	1000
N	0.9	0.50	0.50
U	0.85	0.85	0.85
EA	-1.1	-1.55	-1.73

C — Anode energy capability, ampere-hours per pound.

N — Anode efficiency.

U — Anode utilization factor.

EA — Anode solution potential, volts.

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6.15 The lead wire of cored anodes shall be (1) thermite-welded or (2) mechanically fastened to the tank using a weldable steel pressure wire connector complying with the requirements of Section 9, Torque and Pullout Tests for Pressure Wire Connectors. Prior to connecting the lead wire or pressure connector to the tank, the weld area should be cleaned by scraping or a equivalent method. Anodes shall be installed with a loop consisting of at least 8 inches (20 mm) of free wire to provide strain relief.

6.16 Cored anodes shall be secured to the tank by means of anode holder assemblies complying with Section 8, Anode Pull and Durability Test.

6.17 Wire connectors and any exposed bare lead wire conductor shall be covered with insulating tape complying with the requirements for weather resistant insulating tape as described in the Standard for Insulating Tape, UL 510, or equivalent means.

6.18 Weld-on zinc anodes shall be seal-welded directly to the tank. Weld-on anodes shall be installed with a gap of at least 2 inches between the anode and the tank.

7. Test Station Provision

7.1 Each tank fitted with a preengineered cathodic protection system shall be provided with a pressure wire connector welded to the tank shell not more than 12 inches (305 mm) from the top centerline of the tank, for connection to a test station. The connector shall comply with the requirements in Section 9, Torque and Pullout Tests for Pressure Wire Connectors.

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8. Anode Pull and Durability Tests

Anode Lead Wire Pull Test

8.1 The lead wire of the anode shall withstand a direct pull of 70 pounds (311 N) for a period of 1 minute. The test is to be performed using a tension-testing machine, or equivalent, that will increase the force gradually until the test force is achieved.

Anode Assembly Durability Test

8.2 An anode assembly shall not become inoperable nor shall the anode shift to a position closer than 0.50 inch (12.7 mm) from the container wall after being subjected to the durability test described in paragraph 8.3.

8.3 A representative anode assembly is to be soaked in water for a period of 4 hours and then allowed to dry for a period of at least 48 hours. The packaged anode assembly is then to be mounted onto a fixture simulating its attachment to a tank. The test fixture is to be mounted onto a vibration test machine with a platform having a horizontal surface capable of producing a sinusoidal vibration in the vertical linear plane. The sample is to be vibrated at a frequency of 5 hertz at a double amplitude of vibration of 1 inch (25.4 mm) for a period of 1 hour.

9. Torque and Pullout Tests for Pressure Wire Connectors

General

9.1 After being subjected to the tests specified in paragraphs 9.2 and 9.3, there shall be no breakage of the conductor, stripping of threads, shearing of parts, separation of the conductor from the connector, or other damage to the connector.

Tightening Torque

9.2 The connection between the wire and the connector is to be made in accordance with Tables 9.1, 9.2, and 9.3. The specified torque is to be applied by:

- A. Tightening the fastening until the specified value of torque is attained; and
- B. Maintaining this value, with a static torque reading, for 5 seconds.

TABLE 9.1
TIGHTENING TORQUE FOR SCREWS, POUND-INCHES (N·m)

Wire Size, AWG (mm ²)	Slotted Head No. 18 and Larger		Hexagonal Head	
	Slot Width — 0.047 inch (1.2 mm) or Less and Slot Length 0.25 inch (6.4 mm) or Less	Slot Width — Over 0.047 inch (1.2 mm) or Slot Length Over 0.025 inch (6.4 mm)		
			Split Bolt	Other
12—10 (3.3—5.3)	20 (2.3)	35 (4.0)	80 (9.0)	75 (8.5)
8 (8.4)	25 (2.8)	40 (4.5)	80 (9.0)	75 (8.5)

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TABLE 9.2
TIGHTENING TORQUE FOR SCREWS LESS THAN NO. 10

Slot Length of Screw, Inch (mm)		Tightening Torque, Pound-Inches (N-m)	
		Slot Width of Screw, Inch (mm)	
		Smaller Than 0.047 (1.2)	0.047 (1.2) and Larger
Less than 5/32	(4)	7 (0.79)	9 (1.0)
5/32	(4)	7 (0.79)	12 (1.4)
3/16	(4.8)	7 (0.79)	12 (1.4)
7/32	(5.6)	7 (0.79)	12 (1.4)
1/4	(6.4)	9 (1.0)	12 (1.4)
9/32	(7.1)		15 (1.7)
Above 9/32	(7.1)		20 (2.3)

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TABLE 9.3
TIGHTENING TORQUE FOR SOCKET HEAD SCREWS

Socket Size, Inch (mm)	Tightening Torque, Pound-Inches (N-m)
1/8 (3.2)	45 (5.1)
5/32 (4.0)	100 (11.3)
3/16 (4.8)	120 (13.6)
7/32 (5.6)	150 (16.9)
1/4 (6.4)	200 (22.6)
5/16 (7.9)	275 (31.1)
3/8 (9.5)	375 (42.4)
1/2 (12.7)	500 (56.5)
9/16 (14.3)	600 (67.8)

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Pullout Test

9.3 A connector-wire assembly shall be subjected to a direct pull of 70 pounds (311 N) for a period of 1 minute without separation or movement of the parts relative to one another. The test is to be performed using a tension-testing machine, or equivalent, that will increase the force gradually until the test force is achieved.

10. Dielectric Coating Tests

General

10.1 The samples specified in this section, consist of the dielectric coating applied to a minimum No. 14 MSG [0.007 inch minimum (mm)] steel plate 9 by 5 inches (225 by 125 mm). The coating is to be applied to both sides of the steel plate in accordance with the manufacturer's recommended application procedures. The edges of the samples are to be sealed with the resin used to manufacture the samples.

Impact Test Following Conditioning

10.2 Unconditioned samples and the samples conditioned as specified in paragraphs 10.4 and 10.6 shall be subjected to the impact test specified in paragraph 10.7.

10.3 The samples shall not be affected by impact to the extent that holidays form further than 1 inch (25.4 mm) from the point of impact when tested in accordance with ASTM G62—Test Method for Holiday Detection in Pipeline Coatings.

10.4 Representative sample coupons are to be conditioned in an air-circulating oven at a temperature of 70°C (158°F) for 30, 90, and 180 days.

Exception: Representative sample coupons may be conditioned in an air-circulating oven at a temperature of 60°C (140°F) for 30, 90, 180, and 270 days.

10.5 Two groups of samples are to be subjected to 180 and 360 hours, respectively, of light and water exposure in accordance with Method I of the Standard Practice for Operating Light-Exposure Apparatus (Carbon-Arc Type) With or Without Water for Exposure of Nonferrous Metallic Materials, ASTM G23-81, using apparatus designated Type D or DH in ASTM G23-81 during each operating cycle of 120 minutes, the samples are to be exposed to light alone for 10 minutes and to light and water for 10 minutes.

10.6 Samples are to be conditioned for 16 hours in a cold box maintained at minus 29°C (minus 20°F).

10.7 Each sample is to be clamped between two steel rings having an inside diameter of 4-1/4 inches (108 mm). A 1.18 pound (0.536 kg) steel ball is to be dropped once from a height of 6 feet (1.8 m) to strike the coating.

Resistance to Environmental Fluids Test

10.8 After being immersed as specified in paragraph 10.9 the coating shall not crack or flake, nor shall the coating dissolve from the surface to the extent that the base steel becomes visible. The coating on the holiday samples shall not disbond more than 1.5 square inch (968 mm²).

10.9 Samples are to be immersed vertically in each of the liquids specified in Table 10.1 for 30, 90, 180, and 270 days, respectively, so that the liquid level covers one half of the test sample. Four of the samples are to be prepared with a 1/4 inch (6.4 mm) diameter holiday. The test liquids are to be maintained at 38°C (100°F) during the tests.

TABLE 10.1
RESISTANCE TO ENVIRONMENTAL LIQUIDS TEST SOLUTIONS

Sulfuric Acid (pH3)	Nitric Acid (1 percent)
Saturated Sodium Chloride Solution	Sodium Hydroxide (pH12)
Distilled Water	
Hydrochloric Acid (1 percent)	
Sodium Carbonate-Sodium Bicarbonate Solution (pH10)	

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10.10 The current demand of the undrilled samples is to be measured (both before and after immersion) in accordance with Section 9.13 of ASTM G8-79, Test Method for Cathodic Disbonding of Pipeline Coatings. The current demand shall not exceed 0.04 milliampere per square foot (0.9 milliampere/m²).

Flexibility Test

10.11 After being loaded as specified in paragraph 10.12, the coating shall not be damaged to the extent that holiday form in the coating when the sample is subjected to the holiday test specified in paragraph 10.17.

Exception: Holidays or other damage to areas in immediate contact with the supports or loading nose may be disregarded.

10.12 Samples are to be placed in a constant rate of traverse testing machine with a span of 6 inches (152.4 mm). The loading nose and supports are to be aligned such that the axes of the cylindrical surfaces are parallel and the loading nose is midway between the supports. The testing machine is to apply the load at 0.1 inch (2.5 mm) per minute until a deflection is obtained, as determined by the following equation.

$$\text{Deflection} = \frac{9.7 \times 10^{-6}}{6t}$$

where:

t = sample thickness (steel plus coating)

Abrasion Resistance Test

10.13 After being tested as specified in paragraph 10.14 the coating shall not be damaged to the extent that holidays form in the coating when the sample is subjected to the holiday test specified in paragraph 10.17.

10.14 Samples are to be subjected to three drops in accordance with ASTM G13-77, Test Method for Impact Resistance of Pipeline Coatings, except that flat plate specimens are to be used instead of pipe samples.

Cathodic Disbondment Test

10.15 After being subjected to the test specified in paragraph 10.16 the unperforated samples shall not disbond from the steel surface. The disbonded area of the perforated samples shall not exceed 1.5 square inch (968 mm²).

10.16 Samples are to be subjected to Method B of ASTM G8-79, Test Method for Cathodic Disbonding of Pipeline Coatings, except that flat panel specimens are to be used instead of pipe specimens. Half of the samples are to be perforated per ASTM G8-79. The temperature of the electrolyte is to be maintained at $23 \pm 3^\circ\text{C}$ during the test. The samples are to be subjected to the test for 28 days.

Holiday Test

10.17 Samples are to be tested in accordance with ASTM G62-79, Test Methods for Holiday Detection in Pipeline Coatings.

11. Tests for Insulating Devices (Bushings and Gaskets)

General

11.1 Insulating devices for use with underground storage tank systems shall be made of nonconductive material to electrically insulate the underground tank from the piping system. Threaded bushings shall be capable of accepting a standard threaded pipe in accordance with the Standard for Welded and Seamless Wrought Steel Pipe, ANSI B36.10-1979. Insulating devices may form part of a bolted and gasketed flanged connection.

Leakage Test

11.2 An insulating device shall not leak when subjected to the Leakage Test specified in paragraphs 11.3-11.6.

11.3 Samples shall be installed in the test fixture simulating a tank fitting as specified in the manufacturer's installation instructions. The assembly is to be partially filled with regular unleaded gasoline and sealed by installing (1) a threaded pipe plug into a threaded bushing or (2) a blind flange onto a flange-type connection.

11.4 The assembly is to be inverted so that the gasoline contacts the insulating device and subjected to the following conditioning program: 4 cycles consisting of 16 hours at 0°F (minus 17.8°C) followed by 8 hours at 120°F (49°C); 72 hours at 0°F ; 8 hours at 120°F ; and 16 hours at 0°F .

11.5 The assembly is to be tested for leakage at room temperature prior to and following the conditioning program, and also following each temperature segment of the conditioning program.

11.6 The assembly is to be tested for leakage by aerostatically pressurizing the assembly to 5 psig (35 kPa) and brushing the device with a leak-detection solution. Continuous formation of bubbles is evidence of leakage.

Resistance to Automotive Fuels Test

11.7 An insulating device shall not exhibit a weight change greater than 5 percent; a volumetric change greater than 5 percent; nor shall the dimension change be greater than 5 percent after being subjected to the tests specified in paragraph 11.8.

11.8 Samples of the insulating device material are to be immersed in each of the liquids specified in Table 11.1 for 70 hours. The test liquids are to be maintained at 23°C (73.4°F) during the tests.

TABLE 11.1
RESISTANCE TO AUTOMOTIVE FUELS TEST LIQUIDS
FOR INSULATING DEVICES

ASTM Reference Fuel A
ASTM Reference Fuel C
15 percent ethanol — 85 percent Fuel C
15 percent methanol — 85 percent Fuel C

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Dielectric Strength Test

11.9 An insulating device shall not break down electrically when subjected to the tests specified in paragraphs 11.10 and 11.11.

11.10 Samples are to be immersed in deionized or distilled water for 24 hours. The samples are then to be installed in a test fixture simulating a tank fitting. Threaded bushings are to be plugged with a threaded pipe plug. Flange-type bushings are to be capped with a blind flange. Test leads are to be attached to the test fixture and either the pipe plug or the blind flange. A 500 volt dc potential is then to be applied across the leads for a period of 1 minute.

11.11 The test is to be repeated using pipe joint sealant where recommended by the manufacturer.

Aging Test

11.12 An insulating device shall not crack when subjected to the test specified in paragraph 11.13.

11.13 Samples are to be aged in a circulating air oven for 7 days at a temperature of 87°C (188.6°F). Following aging, the samples are to be installed in a test fixture simulating a tank fitting and tested for leakage by pressurizing to 5 psig (34 kPa) with air.

Tensile Strength Test

11.14 The insulating device material shall have a tensile strength of at least 8700 psi (60,000 kPa) after conditioning for 70 hours at 23°C (73.4°F) and 50 percent relative humidity, and shall retain at least 95 percent of the original strength following a 7 day exposure in a circulating air oven at 87°C (188.6°F).

11.15 Samples of the insulating device material are to be tested in accordance with ASTM D638-84, Test Method for Tensile Properties of Plastics, using Type I specimens.

PART II — COMPOSITE TANKS CONSTRUCTION

12. Components

General

12.1 Composite tank corrosion protection systems shall consist of a steel tank with a nonmetallic external cladding and nonmetallic caps to cover external attachments (such as lift lugs) and unused tank openings.

12.2 External claddings shall be capable of being repaired in the field in the event that holidays occur during shipping and handling.

12.3 Composite tanks shall be fabricated using steel tanks that comply with the Standard for Steel Underground Tanks for Flammable and Combustible Liquids, UL 58.

Exception: The thickness of steel used may be reduced to the thickness specified in Table 12.1, provided the tank is additionally tested in accordance with paragraph 15.2.

TABLE 12.1
THICKNESS OF STEEL FOR COMPOSITE TANKS

Capacity		Maximum Diameter		Minimum Thickness							
				Carbon Steel				Stainless Steel			
				Uncoated		Galvanized					
U.S. Gallons	dm ³	Inches	m	Inch	mm	Inch	mm	Inch	mm	Inch	mm
Up to 285	Up to 1078	a	a	0.067	1.70	0.070	1.78	0.071	1.80		
288 to 560	1082 to 2120	48	1.22	0.067	1.70	0.070	1.78	0.071	1.80		
561 to 1100	2124 to 4164	64	1.63	0.093	2.36	0.097	2.48	0.098	2.18		
1101 to 4000	4168 to 15,142	84	2.13	0.123	3.12			0.115	2.92		
4001 to 12,000	15,145 to 45,425	126	3.20	0.167	4.24			0.158	4.01		
12,001 to 20,000	45,429 to 75,708	144	3.66	0.240	6.10			0.209	5.31		
20,001 to 50,000	75,712 to 189,270	144	3.66	0.302	7.67			0.240	6.10		

^a42 inches (1.07 m) for carbon steel and 48 inches (1.22 m) for stainless steel.

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PERFORMANCE

13. Physical Properties of Materials Tests

General

13.1 Representative samples of the composite tank cladding system as specified in Table 13.1 shall be used for these tests.

Paragraph 13.1 effective October 1, 1991

TABLE 13.1
SAMPLES FOR PHYSICAL PROPERTIES OF
MATERIALS AND CORROSION EVALUATION TESTS

Exposure/Test	Number of Test Coupon	Coupon Type (see below)
"As-Received"	10	A
Air-Oven Aging	20	A
Light and Water Exposure	10	A
"As-Received"	10	B
Environmental Fluids	40	B
Impact and Cold	10	C
Corrosion Evaluation	50	C
Permeance/Cladding Dissolution	20	D

COUPON TYPE

A — 7.5 by 9 inch (178 by 229 mm) cladding coupons fabricated per the proposed production procedure of the minimum allowable production thickness. Each coupon is then to be cut to provide one 2.5 by 9 inch (64 by 229 mm) sample and one 5 by 9 inch (127 by 229 mm) sample and both samples marked for identification. The 5 by 9 inch sample shall be edge-sealed with the resin used to manufacture the coupons.

B — Identical to Type A, or manufactured at twice the minimum allowable production thickness (as an alternative to the single-sided exposure samples).

C — 6 by 9 inch (152 by 229 mm) coupons with cladding of the minimum allowable production thickness fabricated per the proposed production procedure on one side of a flat No. 14 MSG (0.075 inch nominal) steel plate.

D — 6 by 6 inch (152 by 152 mm) flat cladding coupons fabricated per the proposed production procedure of the minimum allowable production thickness.

(TM-472)

Table 13.1 effective October 1, 1991

Air-Oven Aging

13.2 Representative sample coupons are to be conditioned in an air-circulating oven at a temperature of 70°C (158°F) for 30, 90, and 180 days, respectively.

Paragraph 13.2 effective October 1, 1991

13.3 Following the conditioning, the sample are to be prepared and tested to determine flexural modulus and fiber strength as well as Izod impact strength. The flexural properties tests are to be conducted in accordance with ANSI/ASTM D790-84a, Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials using a crosshead speed of 0.1 inch per minute (2.59 mm/minute). The Izod Impact Tests are to be conducted in accordance with ASTM D256-84, Test Methods for Impact Resistance of Plastics and Electrical Insulating Materials.

Paragraph 13.3 effective October 1, 1991

13.4 The Izod, flexural modulus, and fiber strength of each sample that has been conditioned in the air-circulating oven shall be at least 80 percent of the as-received sample.

Paragraph 13.4 effective October 1, 1991

Resistance to Environmental Fluids Test

13.5 Representative sample coupons are to be immersed in the test solutions noted in Table 13.2 for 30, 90, and 180 days. The test liquids are to be maintained at a temperature of 38°C (100°F) during the immersion periods.

Paragraph 13.5 effective October 1, 1991

TABLE 13.2
RESISTANCE TO ENVIRONMENTAL LIQUIDS TEST SOLUTIONS

Type A
Sulfuric Acid (pH3)
Saturated Sodium Chloride Solution
Type B
Distilled Water
Hydrochloric Acid (1 percent)
Sodium Carbonate-Sodium Bicarbonate Solution (pH10)
Nitric Acid (1 percent)
Sodium Hydroxide (pH12)
(TM-473)

Table 13.2 effective October 1, 1991

13.6 Following the immersions, selected samples are to be removed from the test solutions then prepared and tested per paragraph 13.3.

Paragraph 13.6 effective October 1, 1991

13.7 The samples shall show no evidence of blistering, softening, crazing, or other damage that could impair the performance of the cladding.

Paragraph 13.7 effective October 1, 1991

13.8 The izod, flexural modulus, and fiber strength of each sample that has been immersed in a Type B solution shall be at least 30 percent of the as-received sample.

Paragraph 13.8 effective October 1, 1991

13.9 The izod, flexural modulus, and fiber strength of each sample that has been immersed in a Type A solution shall be at least 50 percent of the as-received sample. In addition, the results from the immersion in each of the Type A solutions are to be extrapolated (using regression analysis techniques) to obtain 270-day retention values. The extrapolated values shall not be less than 50 percent of the as-received values. If the extrapolated value is less than 50 percent for a particular solution, an additional coupon is to be immersed in that solution for a total of 270 days as described in paragraph 13.5. The samples are then to be tested per paragraphs 13.6 and 13.7. The izod, flexural modulus, and fiber strength of the 270-day samples shall not be less than 50 percent of the as-received samples.

Paragraph 13.9 effective October 1, 1991

Light and Water Exposure Test

13.10 Representative sample coupons are to be conditioned as described in paragraph 13.11 then prepared and tested per paragraph 13.3.

Paragraph 13.10 effective October 1, 1991

13.11 The samples are to be subjected to 180 and 360 hours of light and water exposure in accordance with Method I of the Standard Practice for Operating Light-Exposure Apparatus (Carbon-Arc Type) With or Without Water for Exposure of Nonmetallic Materials, ASTM G23-81, using apparatus designated Type D or DH in ASTM G23-81. During each operating cycle of 120 minutes, the coupons are to be exposed to light alone for 102 minutes and to light and water for 18 minutes.

Paragraph 13.11 effective October 1, 1991

13.12 The izod, flexural modulus, and fiber strength of each sample that has been subjected to the light and water exposure shall be at least 80 percent of the as-received sample.

Paragraph 13.12 effective October 1, 1991

Impact and Cold Exposure Test

13.13 Clad steel samples are to be conditioned for 16 hours in a cold box maintained at minus 29°C (minus 20°F). These samples and additional unconditioned samples are to be clamped, one at a time, between two steel rings having an inside diameter of 4-1/4 inches (108 mm). A 1.18 pound (0.536 kg) steel ball is to be dropped once from a height of 6 feet (1.8 m) to strike the clad surface of the sample.

13.14 The samples shall not crack, nor show rupture of the cladding, and the cladding shall not separate or uplift from the steel.

14. Corrosion Evaluation Tests

General

14.1 Representative samples of the composite tank cladding system as detailed in Table 13.1 shall be used for these tests.

Corrosion Evaluation Test

14.2 Nonmetallic cylinders measuring approximately 5 inches (127 mm) in diameter by 10 inches (254 mm) long are to be fitted to the cladding side of the samples and secured with an adhesive. The cylinders are then to be filled with the test solutions noted in Table 14.1 (capped to prevent evaporation) and placed in a chamber maintained at a temperature of 38°C (100°F) for 30, 90, and 180 days.

14.3 Following the exposures, selected samples are to be removed from the chamber. The cladding is to be removed from the steel and the steel examined for corrosion. There shall be no corrosion of the base steel.

14.4 The cladding shall show no evidence of blistering, softening, crazing, or other damage that could impair the performance of the cladding.

14.5 If corrosion has not occurred following the 180 day exposures but permeation of a particular test solution through the cladding is evident or indicated by the Permeation/Cladding Dissolution Test, paragraphs 14.6 — 14.8, an additional two samples are to be exposed to that test solution for 270 days. Following the 270 day exposure there shall be no corrosion of the base steel.

Permeation/Cladding Dissolution Test

14.6 The thickness of the cladding samples used for this test are to be measured and the values recorded for comparison to production samples.

14.7 The cladding samples are to be sealed with an adhesive to glass dishes containing the solutions specified in Table 14.1. After the sealing material has cured, the assemblies are to be weighed on an analytical balance. The assemblies are then to be inverted so that the solutions contact the cladding samples and placed in a chamber at a temperature of 38°C (100°F).

TABLE 14.1

CORROSION EVALUATION TEST SOLUTIONS

Saturated Sodium Chloride Solution
Sodium Carbonate-Sodium Bicarbonate Solution (pH10)
Potassium Biphthalate Buffer Solution (pH4)
Distilled Water
Sodium Hydroxide (pH12)

(TM-474)

14.8 The assemblies are to be reweighed monthly for a period of 180 days. At the conclusion of the test, the samples are to be remeasured and any loss due to dissolution or permeation is to be recorded.

15. Composite Tank Assembly Tests

General

15.1 The following tests pertain to all composite tanks:

- A. Strength of Pipe Fittings Test — Torque
- B. Strength of Pipe Fittings Test — Bending Moment
- C. Strength of Lift Fittings Test
- D. Tank Impact Test
- E. Leakage Test
- F. Tank Examination and Holiday Test

15.2 The following tests pertain only to composite tanks built using steel with the thickness specified in Table 12.1.

- A. Water Load Test
- B. Earth Load Test
- C. External Pressure Test

Strength of Pipe Fittings Test — Torque

15.3 Each fitting design shall be subjected to this test. The fitting shall not crack or split, the threads shall not strip, and no damage to the tank, fitting, or cladding shall occur as a result of this test.

Paragraph 15.3 effective October 1, 1991

15.4 A length of pipe is to be threaded into a fitting for pipe connection and is to be tightened to the torque specified in Table 15.1.

Paragraph 15.4 effective October 1, 1991

TABLE 15.1
TORQUES ON PIPE FITTINGS

Nominal Pipe Size, Inches ^a	Torque, Pound-Inches (N·m)
3/4	2000 (226)
1	2400 (271)
1-1/4	2900 (328)
1-1/2	3100 (350)
2	3300 (373)
2-1/2	3500 (395)
3	3600 (407)
3-1/2	3700 (418)
4	3800 (429)
6	4200 (475)
8	4600 (520)

^aNominal pipe size specifications are in accordance with the Standard for Welded and Seamless Wrought Steel Pipe, ANSI B36.10-1979.

(TM-475)

Table 15.1 effective October 1, 1991

15.5 Following this test, the tank is to be subjected to the holiday and leakage tests specified in paragraphs 15.14 — 15.17.

Paragraph 15.5 effective October 1, 1991

Strength of Pipe Fittings Test — Bending Moment

15.6 Each fitting design shall be subjected to this test. The fittings shall not crack or split, and no damage to the tank fitting or cladding shall occur as a result of this test.

Paragraph 15.6 effective October 1, 1991

15.7 A 4 foot (1.2 m) length of Schedule 40 steel pipe is to be threaded into the fitting. A force is then to be applied to the top of the pipe. For a cylindrical tank, the force is first to be applied parallel to the longitudinal axis of the tank and then transverse to the longitudinal axis of the tank. For a spherical tank, the force is first to be applied in any one direction and then perpendicular to the direction in which the force was first applied. The applied force is to increase so that the bending moment is increased from 0 to 2000 pound-feet (2712 N·m) in 250 pound-feet (339 N·m) increments. If the Schedule 40 pipe bends before the required bending moment is reached, the test is to be stopped and the fitting examined for compliance with the requirements in paragraph 15.6.

Paragraph 15.7 effective October 1, 1991

15.8 Following this test, the tank is to be subjected to the holiday and leakage tests specified in paragraphs 15.14 — 15.17.

Paragraph 15.8 effective October 1, 1991

Strength of Lift Fittings Test

15.9 A fitting intended to be used to lift and move a tank shall be subjected for 1 second to a load equal to twice that imposed by lifting the empty tank. If more than one fitting is provided on a tank, the load is to be divided between the fittings in proportion to the loads to which they are subjected by lifting the tank as intended. The load is to be applied, however, without the benefit of a spreader-bar. Neither the fitting nor the tank shall be damaged.

Paragraph 15.9 effective October 1, 1991

15.10 Following this test, the tank is to be subjected to the holiday and leakage tests specified in paragraphs 15.14 — 15.17.

Paragraph 15.10 effective October 1, 1991

Tank Impact Test

15.11 There shall be no damage to the tank as indicated by a crack, debonding, delamination visible from the outside, or detection of holidays (per paragraphs 15.16 and 15.17) at impact heights of 40 inches (1016 mm) or less. There shall be no breaking of pieces, separation of cladding, uplift of cladding, or puncture with impact heights greater than 40 inches and less than 72 inches (1829 mm). Holidays that are apparent by visual inspection are permissible at impact heights greater than 40 inches and less than 72 inches.

15.12 A representative sample tank is to be subjected to blows from a 12 pound (5.4 kg) steel ball swung on a 6 foot (1.8 m) tether. The tether is to be fixed at a point directly above the impact point and the ball swung backward and up away from the tank to the indicated distance measured vertically above the point of impact and then allowed to swing freely to the tank. The vertical height above the impact point is to be varied from 10 to 72 inches (254 to 1829 mm) with no two impacts on the same point. Both head and shell are to be tested.

15.13 Following this test, the tank is to be subjected to the holiday and leakage tests specified in paragraphs 15.14 — 15.17.

Leakage Test

15.14 There shall be no leakage when a complete composite tank assembly, including fittings and manways, is aerostatically pressurized to 5 psig (35 kPa) and brushed or sprayed with a leak-detection solution.

15.15 Formulation of sustained bubbles is considered to be evidence of leakage.

Tank Examination and Holiday Test

15.16 Following each of the tests specified in this section the complete tank assembly is to be physically examined for damage.

15.17 A complete tank assembly is to be subjected to a holiday test using a 35,000 volt electrical resistance holiday detector.

Water Load Test

15.18 A tank shall not be damaged by the water load test described in paragraph 15.19.

15.19 A tank shall be placed on a bed of sand so that approximately 1/8 of the tank diameter is buried. The tank is then to be filled to capacity with water and allowed to remain in this condition for 1 hour.

15.20 Following this test, the tank is to be subjected to the holiday and leakage tests specified in paragraphs 15.14 — 15.17.

Earth Load Test

15.21 A tank shall not implode, leak, or otherwise be damaged as a result of the earth load test described in paragraph 15.22.

15.22 An empty tank is to be installed in a test pit or an apron is to be constructed around the four sides of the tank. The tank is then to be backfilled according to the manufacturer's installation instructions such that the top of the tank is at least 3 feet (914 mm) below the surface of the fill. The tank is to remain in this condition for a period of at least 1 hour.

15.23 Following this test, the tank is to be subjected to the holiday and leakage tests specified in paragraphs 15.14 — 15.17.

External Pressure Test

15.24 The tank shall not collapse nor implode while subjected to a 24 hour burial and shall not leak as a result of the test described in paragraph 15.25.

15.25 An empty tank is to be installed in a test pit using the recommended anchoring system and the manufacturer's specified backfill procedure. The pit is then to be filled with water to such a level that the tank is submerged to its maximum burial depth, the tank is to remain submerged for 24 hours. While the tank is still submerged, it is to be subjected for 1 minute to partial internal vacuum so that the internal pressure on the tank is 5.3 inches of mercury (17. kPa) less than the external pressure imposed by the hydrostatic head.

MANUFACTURING AND PRODUCTION TESTS

16. Leakage Test (All Tanks)

16.1 Each tank shall be tested, as a production-line test, to determine there is no leakage at any insulation device, if provided, or elsewhere. This test shall be conducted prior to the application of the cathodic coating or cladding system. If leakage is noted, the device shall be tightened, repaired, or replaced and then the tank retested.

17. Anode Continuity Test

17.1 Each cathodically protected tank shall be tested to determine that there is continuity of the anode, lead wire, and tank connection. If discontinuity of the anode circuit is found, it shall be repaired or replaced and then retested.

18. Holiday Test

18.1 Each composite tank shall be subjected to the holiday test specified in paragraph 15.17. If any holidays are detected, they shall be repaired and the tank retested.

MARKING

19. General

19.1 A product shall be legibly and permanently marked with:

- A. The manufacturer's name, trade name, or trademark or other descriptive marking by which the organization responsible for the product may be identified;
- B. A distinctive catalog number or the equivalent; and
- C. The date or other dating period of manufacture not exceeding any three consecutive months.

Exception No. 1: The manufacturer's identification may be in a traceable code if the product is identified by the brand or trademark owned by a private labeler.

Exception No. 2: The date of manufacture may be abbreviated; or may be in a nationally accepted conventional code or in a code affirmed by the manufacturer, provided that the code:

- A. Does not repeat in less than 30 years.
- B. Does not require reference to the production records of the manufacturer to determine when the product was manufactured.

19.2 All markings shall be legible and permanent as afforded by a stamped or printed metal nameplate or label, by a decalcomania transfer, by a pressure-sensitive label or label secured with cement or adhesive, or the equivalent.

19.3 A pressure-sensitive label or a label secured by cement or adhesive shall comply with the applicable requirements for "Outdoor" use labels in the Standard for Marking and Labeling Systems, UL 969.

19.4 Each cathodically protected tank, and its installation instruction sheet, shall be marked with the following (or equivalent):

- A. "DO NOT REMOVE OR CROSSTHREAD NONMETALLIC INSULATING BUSHING/GASKET."
- B. "DO NOT DISCONNECT ANODE LEAD WIRE(S)."
- C. "THIS TANK IS TO BE MONITORED AND INSPECTED FOR PROPER OPERATION WITHIN 6 MONTHS OF INSTALLATION AND THEREAFTER IN ACCORDANCE WITH FEDERAL AND LOCAL REGULATIONS."
- D. "RUN TEST STATION WIRE TO SURFACE."
- E. "IF TANK-TO-SOIL POTENTIAL IS LESS THAN -0.85 V, CONTACT CATHODIC PROTECTION SYSTEM MANUFACTURER."

19.5 Each tank shall be marked with the following (or equivalent):

A. "FOLLOW INSTALLATION INSTRUCTIONS."

B. "LIFT TANK ONLY WITH LIFT FITTINGS PROVIDED."

19.6 If a manufacturer produces tanks at more than one factory, each tank shall have a distinctive marking to identify it as the product of a particular factory.

APPENDIX J
BLAST REGULATIONS



City of Austin

Founded by Congress, Republic of Texas, 1839
Department of Transportation and Public Services,
One Texas Center, 505 Barton Springs Rd., Austin, Texas 78704

RECEIVED

OCT 25 1989

E. U. W. D. *UKP*

FILE NO. _____
SUBJECT _____

October 18, 1989

Ms. Diane Poteet
Edwards Underground Water District
P. O. Box 15830
San Antonio, Texas 78212

Reference: City of Austin Blasting Ordinance with amendments

Dear Ms. Poteet:

Enclosed, please find a copy of the City of Austin Uniform Fire Code, Article 77. This document along with the amendments on pages 21-27 forms the current City of Austin Blasting Ordinance.

If we may be of further help or provide any other information, please do not hesitate to call.

With best regards,

Everett Anglin

Everett Anglin, Blasting Inspector
Construction Inspection Division
P. O. Box 1088
Austin, Texas 78767

Encl: Art. 77, UFC as amended

ARTICLE 77 EXPLOSIVES AND BLASTING AGENTS

Division I GENERAL

Scope

Sec. 77.101. This article shall apply to the manufacture, possession, storage, sale, transportation and use of explosives and blasting agents.

Exceptions

Sec. 77.102. (a) Nothing in this article shall be construed as applying to:

1. The armed forces of the United States or the state militia.
2. Explosives in forms prescribed by the official United States Pharmacopoeia.
3. The sale, possession or use of fireworks.
4. The possession, transportation and use of small arms ammunition.
5. The possession, storage, transportation and use of not more than one pound of black sporting powder, 20 pounds of smokeless powder and 2000 small arms primers for hand loading of small arms ammunition for personal use.
6. The transportation and use of explosives or blasting agents by the United States Bureau of Mines, the Federal Bureau of Investigation, the United States Secret Service or Police and Fire Departments acting in their official capacities.
7. Special industrial explosive devices which in the aggregate contain less than 50 pounds of explosives.

Definitions

Sec. 77.103. For definitions of BLASTING AGENT, BULLET RESISTANT, INHABITED BUILDING, EXPLOSIVES, GUNPOWDER, SPECIAL INDUSTRIAL EXPLOSIVE DEVICE, SPECIAL INDUSTRIAL HIGH-EXPLOSIVE MATERIAL and TEST BLASTING CAP NO. 8, see Article 9.

Permits

Sec. 77.104. (a) Permits shall be obtained:

1. To manufacture, possess, store, sell or otherwise dispose of explosives or blasting agents.
2. To transport explosives or blasting agents.
3. To use explosives or blasting agents.
4. To operate a terminal for handling explosives or blasting agents.
5. To deliver to or receive explosives or blasting agents from a carrier at a terminal between the hours of sunset and sunrise.

6. To transport blasting caps or electric blasting caps on the same vehicle with explosives. See Section 4.108.

(b) Permits required by Section 77.104 (a) of this article shall not be issued for:

1. Liquid nitroglycerin.
2. Dynamite (except pelatin dynamite) containing over 60 percent of liquid explosive ingredient.
3. Dynamite having an unsatisfactory absorbent or one that permits leakage of a liquid explosive ingredient under any conditions liable to exist during storage.
4. Nitrocellulose in a dry and uncompressed condition in quantity greater than 10 pounds net weight in one package.
5. Fulminate of mercury in a dry condition and fulminate of all other metals in any condition except as a component of manufactured articles not herein-after forbidden.
6. Explosive compositions that ignite spontaneously or undergo marked decomposition, rendering the products or their use more hazardous, when subjected for 48 consecutive hours or less to a temperature of 167°F.
7. New explosives until approved by the U.S. Department of Transportation, except that permits may be issued to educational, governmental or industrial laboratories for instruction or research purposes.
8. Explosives condemned by the U.S. Department of Transportation.
9. Explosives not packed or marked in accordance with the requirements of the U.S. Department of Transportation.
10. Explosives containing an ammonium salt and a chlorate.

(c) No person shall keep or store, nor shall any permit be issued to keep or store, any explosives at any place of habitation or within 100 feet thereof.

(d) No person possessing a permit for storage of explosives at any place shall keep or store any greater amount or other kind of explosives than are authorized in such permit.

(e) The chief may require that any operations permitted under the provisions of Section 77.104 (a) 2 or 3 shall be supervised at any or all times by employees of the fire department designated by the chief to see that all safety and fire regulations are observed. Where, in the opinion of the chief, no undue hazard to life or property exists, the required supervision may be waived.

Bond Required

Sec. 77.105. Before a permit is issued, as required by Subsection (a) 3. of Section 77.104, the applicant shall file with the jurisdiction a corporate surety bond in the principal sum of \$100,000 or a public liability insurance policy for the same amount for the purpose of the payment of all damages to persons or property which arise from, or are caused by, the conduct of any act authorized by the permit upon which any legal judgment results. The chief may specify a greater or lesser amount when, in his opinion, conditions at the location of use indicate a greater or

SEE
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lesser amount is required. Public agencies shall be exempt from this bond requirement.

General Requirements

Sec. 77.106. (a) The manufacture of explosives shall be prohibited unless such manufacture is authorized by the chief.

(b) The storage of explosives and blasting agents is prohibited within the limits established by law as the limits of the district in which such storage is to be prohibited, except for temporary storage for use in connection with approved blasting operations, provided, however, this prohibition shall not apply to wholesale and retail stocks of small arms ammunition, explosive bolts, explosive rivets or cartridges for explosive-actuated power tools in quantities involving less than 500 pounds of explosive material.

(c) The chief may limit the quantity of explosives or blasting agents to be permitted at any location.

(d) No person shall possess, offer for sale, sell or display explosives or blasting agents at any location not authorized by permit issued by the chief.

SEE 77.107 FOR PERMIT FOR CLASS II MAGAZINES

Division II STORAGE

Storage of Explosives

Sec. 77.201. (a) Explosives, including special industrial high-explosive materials, shall be stored in magazines which meet the requirements of this article.

(b) Magazines shall be at all times in the custody of a competent person who shall be at least 21 years of age and who shall be held responsible for compliance with all safety precautions.

(c) Smoking, matches, open flames, spark-producing devices and firearms shall be prohibited inside or within 50 feet of magazines. Combustible materials shall not be stored within 50 feet of magazines.

(d) The land surrounding magazines shall be kept clear of brush, dried grass, leaves, trash and debris for a distance of at least 50 feet.

(e) Magazines shall be kept locked except when being inspected or when explosives are being placed therein or being removed therefrom.

(f) Magazines shall be kept clean, dry and free of grit, paper, empty packages and rubbish.

(g) Magazines shall not be provided with other than approved artificial heat or light. Approved electric safety flashlights or safety lanterns may be used.

(h) Blasting caps, electric blasting caps, detonating primers, primed cartridges or any item such as a squib or electric match, the function of which is to ignite or detonate propellants, fireworks or explosives, shall not be stored in the same magazine with other explosives.

(i) Magazines shall be of two types, namely, Class I and Class II.

(j) Storage of explosives in quantities exceeding 100 pounds shall be in a Class I magazine, except that a Class II magazine may be used for temporary storage of a larger quantity of explosives at the site of blasting operations where such amount constitutes not more than one day's supply for use in current operations. At the end of the day's operations any remaining explosives shall be safely destroyed or returned to a Class I magazine.

(k) Storage of explosives in quantities of 100 pounds or less shall be in Class I or Class II magazines, except that explosives in any quantity when stored in remote locations shall be in Class I, bullet-resistant magazines.

(l) Class I and Class II magazines shall be located away from inhabited buildings, passenger railways, public highways and other magazines in conformity with the provisions of the American Table of Distances for Storage of Explosives, Table No. 77.201, except as provided in Subsection 77.201 (m).

(m) At the site of blasting operations, a distance of not less than 100 feet shall be maintained between Class I magazines and the blast area.

Class II magazines shall be kept not less than 150 feet from the blast area when the quantity of explosives temporarily kept therein is in excess of 25 pounds and not less than 50 feet when the quantity of explosives is 25 pounds or less.

(n) Packages of explosives shall not be unpacked or repacked in a magazine nor within 50 feet of a magazine or in close proximity to other explosives. Opened packages of explosives shall be securely closed before being returned to a magazine.

(o) Magazines shall not be used for the storage of any metal tools nor any commodity except explosives, blasting agents and oxidizers used in compounding blasting agents. The quantity of blasting agents and oxidizers shall be included when computing the total quantity of explosives for determining distance requirements.

(p) When an explosive has deteriorated to an extent that it is in an unstable or dangerous condition, or if nitroglycerin leaks from any explosive, then the person in possession of such explosive shall immediately report the fact to the chief and, upon his authorization, shall proceed to destroy such explosives and clean floors stained with nitroglycerin in accordance with the instructions of the manufacturer. Only experienced persons shall do the work of destroying explosives.

TABLE NO. 77.201—AMERICAN TABLE OF DISTANCES FOR STORAGE OF EXPLOSIVES AND MINIMUM SEPARATION OF AMMONIUM NITRATE AND BLASTING AGENTS FROM EXPLOSIVES AND BLASTING AGENTS

EXPLOSIVES		DISTANCE IN FEET WHEN STORAGE IS BARRICADED			
Pounds Over	Pounds Not Over	From Inhabited Buildings	From Public Highways Classes A to D	From Passenger Railways—Public Highways with Traffic Volume of More than 3,000 Vehicles Day	Separation of Magazines
				Barricaded	
2	5	70	30	51	6
5	10	90	35	64	8
10	20	110	45	81	10
20	30	125	50	93	11
30	40	140	55	103	12
40	50	150	60	110	14
50	75	170	70	127	15
75	100	190	75	139	16
100	125	200	80	150	18
125	150	215	85	159	19
150	200	235	95	175	21
200	250	255	105	189	23
250	300	270	110	201	24
300	400	295	120	221	27
400	500	320	130	238	29
500	600	340	135	253	31
600	700	355	145	266	32
700	800	375	150	278	33
800	900	390	155	289	35
900	1,000	400	160	300	36
1,000	1,200	425	165	318	39
1,200	1,400	450	170	336	41
1,400	1,600	470	175	351	43
1,600	1,800	490	180	366	44
1,800	2,000	505	185	378	45
2,000	2,500	545	190	408	49
2,500	3,000	580	195	432	52
3,000	4,000	635	210	474	58
4,000	5,000	685	225	513	61
5,000	6,000	730	235	546	65
6,000	7,000	770	245	573	68
7,000	8,000	800	250	600	72
8,000	9,000	835	255	624	75
9,000	10,000	865	260	645	78
10,000	12,000	875	270	687	82
12,000	14,000	855	275	723	87
14,000	16,000	900	280	756	90
16,000	18,000	940	285	786	94
18,000	20,000	975	290	813	98
20,000	25,000	1,055	315	876	105
25,000	30,000	1,130	340	933	112
30,000	35,000	1,205	360	981	119
35,000	40,000	1,275	380	1,026	124

(Continued)

EXPLOSIVES		DISTANCE IN FEET WHEN STORAGE IS BARRICADED			
Pounds Over	Pounds Not Over	From Inhabited Buildings	From Public Highways Classes A to D	From Passenger Railways—Public Highways with Traffic Volume of More than 3,000 Vehicles Day	Separation of Magazines
				Barricaded	
40,000	45,000	1,340	400	1,008	129
45,000	50,000	1,400	420	1,101	135
50,000	55,000	1,460	440	1,190	140
55,000	60,000	1,515	455	1,173	145
60,000	65,000	1,565	470	1,206	150
65,000	70,000	1,610	485	1,236	155
70,000	75,000	1,655	500	1,263	160
75,000	80,000	1,695	510	1,293	165
80,000	85,000	1,740	520	1,317	170
85,000	90,000	1,760	530	1,344	175
90,000	95,000	1,790	540	1,368	180
95,000	100,000	1,815	545	1,392	185
100,000	110,000	1,835	550	1,437	195
110,000	120,000	1,855	555	1,479	205
120,000	130,000	1,875	560	1,521	215
130,000	140,000	1,890	565	1,557	225
140,000	150,000	1,900	570	1,593	235
150,000	160,000	1,935	580	1,629	245
160,000	170,000	1,965	590	1,662	255
170,000	180,000	1,990	600	1,695	265
180,000	190,000	2,010	605	1,725	275
190,000	200,000	2,030	610	1,755	285
200,000	210,000	2,055	620	1,782	295
210,000	220,000	2,100	635	1,836	315
220,000	230,000	2,155	650	1,890	335
230,000	240,000	2,215	670	1,950	360
240,000	250,000	2,275	690	2,000	385

NOTES:

- For exceptions, see Section 77.201 (n).
- "Natural barricade" means natural features of the ground, such as hills, or timber of sufficient density that the surrounding exposures which require protection cannot be seen from the magazine when the trees are bare of leaves.
- "Artificial barricade" means an artificial mound or revetted wall of earth of a minimum thickness of 3 feet, except as set forth in Note 13.
- "Barricaded" means that a building containing explosives is effectually screened from a magazine, building, railway or highway, either by a natural barricade or by an artificial barricade of such height that a straight line from the top of any sidewall of the building containing explosives to the eave line of any magazine or building, or to a point 12 feet above the center of a railway or highway will pass through such intervening natural or artificial barricade.
- "Inhabited building" means a building regularly occupied in whole or in part as a habitation for human beings, or any church, schoolhouse, railroad station, store or other structure where people are accustomed to assemble, except any building or

(Continued)

structure occupied in connection with the manufacture, transportation, storage or use of explosives.

6. "Railway" means any steam, electric or other railroad or railway which carries passengers for hire.
7. "Highway" means any street or public road. "Public highways, Classes A to D," are highways with average traffic volume of 3000 or less vehicles per day.
8. When two or more storage magazines are located on the same property, each magazine must comply with the minimum distances specified from inhabited buildings, railways and highways and, in addition, they shall be separated from each other by not less than the distances shown for "separation of magazines," except that the quantity of explosives contained in cap magazines shall govern in regard to the spacing of said cap magazines from magazines containing other explosives.

EXCEPTION: Two or more magazines may be separated from each other by less than the specified "separation of magazines" distances when such two or more magazines, as a group, are considered as one magazine and the total quantity of explosives stored in such group shall be treated as if stored in a single magazine located on the site of any magazine of the group and shall comply with the minimum of distances specified from other magazines, inhabited buildings, railways or highways.

9. This table applies only to the manufacture and permanent storage of commercial explosives. It is not applicable to transportation of explosives or any handling or temporary storage necessary or incident thereto. It is not intended to apply to bombs, projectiles or other heavily encased explosives.
10. All types of blasting caps in strengths through No. 8 cap shall be rated at 1 1/4 pounds of explosives per 1000 caps. For strengths higher than No. 8 cap, the manufacturer shall be consulted.
11. For quantity and distance purposes, detonating cord of 50 to 60 grains per foot shall be calculated as equivalent to 9 pounds of high explosives per 1000 feet. Heavier or lighter core loads shall be rated proportionately.
12. For unbarricaded condition, the specified distance for "barricaded" shall be doubled.
13. The minimum separation between stores of explosives or blasting agents from barricaded stores of ammonium nitrate shall be not less than 16.7 percent of the distance given for separation of magazines in Table No. 77.201. The minimum separation between stores of explosives or blasting agents from barricaded stores of blasting agents shall be not less than 60 percent of the distance given for separation of magazines in Table No. 77.201. The distance determined from the above shall be multiplied by six if barricades are not provided.

For the purpose of this note, the weight of the larger mass shall be used to determine the required separation; however, the weight of ammonium nitrate may be reduced by 50 percent. The required separation between inhabited buildings, public highways and railroads shall be not less than set forth in Table No. 77.201 using the sum of all explosives and blasting agents that are at a distance less than set forth in the table. The distance shall be measured from closest edge of the explosive material. Class A explosives as defined by the Department of Transportation shall be within Class I magazines. For the purposes of this note, artificial barricades of sand or dirt shall have a thickness not less than the following:

Weight of Explosive or Blasting Agent		Barricade Thickness (Inches)
Pounds Over	Pounds Not Over	
	2,000	12
2,000	6,000	15
6,000	12,000	20
12,000	25,000	25
25,000	40,000	30
40,000	60,000	35
60,000	100,000	40
100,000	200,000	50
200,000	300,000	60

Gunpowder

Sec. 77.202. (a) The chief may authorize the storage of smokeless powder not to exceed 100 pounds, black sporting powder not to exceed 5 pounds, and small arms primers not to exceed 20,000 in approved establishments. Smokeless powder exceeding 20 pounds shall be stored in an approved Class II magazine. Black sporting powder, when authorized, shall be stored in an approved Class II magazine. Small arms primers shall be stored in a manner prescribed by the chief.

(b) The display of smokeless powder shall be only in original containers and shall not exceed 20 pounds.

(c) Small arms primers shall not be stored or displayed with smokeless powder or other explosives.

(d) Smokeless powder shall not be repackaged except in original-type containers, and repackaging shall be permitted only in locations designated and approved by the chief.

(e) The repackaging of black sporting powder shall not be permitted.

Class I Magazines

Sec. 77.203. (a) A magazine may be a building or excavation, tunnel or igloo, or military-type magazine or a portable magazine constructed as required in this section.

(b) Class I magazines shall be bullet resistant, fire resistant, weatherproof, theft resistant and well ventilated.

EXCEPTION: Magazines used for the storage of blasting agents, Class B and Class C explosives need not be bullet resistant.

(c) Building-type magazines shall be constructed of masonry, wood, metal or a combination of these materials when bullet resistance is required.

1. Masonry units not less than 8 inches in thickness with all hollow spaces filled with concrete, well-tamped sand or equivalent material, or
2. Reinforced concrete not less than 6 inches in thickness, or
3. Steel walls of minimum manufacturer's standard gage No. 14 (.0747-inch)

may be used, provided there are two layers spaced at least 6 inches apart with all hollow spaces filled with concrete, well-tamped sand or equivalent material, or

4. One layer of manufacturer's standard gage No. 6 (.1943-inch) or heavier steel, lined on the interior with a minimum of 4 inches of wood, or
5. Two layers of manufacturer's standard gage No. 6 (.1943-inch) or heavier steel, spaced a minimum ½ inch apart and lined on the interior with a minimum of 2 inches of wood, or
6. Two layers of wood, at least 2 inches nominal thickness each, spaced a minimum of 4 inches apart with the hollow spaces filled with concrete, well-tamped sand or equivalent material.
7. The roof shall also be protected when the magazine is located where it is possible to fire a bullet directly through it into the explosives stored inside.

NOTE: Any sheeting used shall be tongue-and-groove lumber, plywood or approved equal.

(d) Doors shall be of bullet-resistant construction and shall be installed in such a manner that the hinges and hasps cannot be removed when the doors are locked and closed.

Doors shall be equipped with substantial and approved means of locking. Each door shall be equipped with two separate locks or a lock requiring two separate keys. All padlocks shall be protected with steel caps constructed so as to prevent sawing or lever action on the locks or hasps.

(e) Floors of magazines shall be securely fastened in place and shall be capable of withstanding the loads imposed.

(f) The roofs and exterior sides of building-type magazines may be of wood construction covered with not less than No. 26 gage (.016-inch) steel metal. Roofs of building-type magazines located where it is possible to fire a bullet directly through the roof into the magazine at such an angle that the bullet would strike the explosives therein shall be constructed according to Section 77.203 (c) or equipped with a sand tray located at the eave line and covering the entire magazine ceiling area except that necessary for ventilation. Sand in the sand tray shall be maintained at a depth of not less than 4 inches.

(g) Magazines shall be ventilated to minimize dampness and heating of stored explosives. Ventilation openings shall be screened with 14 mesh, No. 21 gage wire to prevent the entrance of sparks and shall be protected in a manner that will maintain the bullet resistance of the magazine.

(h) Magazine interiors shall have a smooth finish with all nails, screws, bolts and nuts countersunk or blinded.

(i) The approaches to magazines shall be provided with warning signs reading **EXPLOSIVES—KEEP OFF** in red letters not less than 4 inches in height and a stroke of at least ⅜ inch. The lettering shall be imposed upon a white background. Location of signs shall be within 100 feet of the magazine and so placed that a bullet through the sign will not strike the magazine.

(j) Post an additional warning sign on the door with the letters not less than 2

inches in height and a stroke of ⅜ inch on a contrasting background reading **EXPLOSIVES, DANGEROUS.**

Class II Magazines

Sec. 77.204. (a) Class II magazines shall be constructed of wood, metal, fiber or a combination thereof, or any equivalent construction.

(b) Class II magazines shall be well constructed as follows:

1. Two inch nominal thickness lumber, covered on the exterior with a minimum of No. 20 manufacturer's standard gage steel, or
2. Two thicknesses of 1 inch plywood covered on the exterior with a minimum of No. 20 manufacturer's standard gage steel, or
3. Fiber equal in strength to wood as indicated in Items Nos. 1 and 2 above, covered on the exterior with a minimum of No. 20 manufacturer's standard gage steel, or
4. Minimum No. 14 manufacturer's standard gage steel, lined on the interior with one layer of 1-inch-thick plywood, or
5. Material of equal strength and fire resistance.

(c) Class II magazines containing explosives and located in buildings shall be located for easy removal in case of fire and, when required by the chief, shall be equipped with approved wheels or casters.

(d) Class II magazines shall be painted red and, when size permits, shall bear lettering in white on sides and top at least 3 inches high with a ½-inch stroke which reads **EXPLOSIVES.**

(e) Class II magazines containing explosives left at locations where no one is in attendance shall be adequately secured to prevent their theft.

Division III

USE, HANDLING AND TRANSPORTATION

Use and Handling of Explosives

Sec. 77.301. (a) Blasting operations shall be conducted during daylight hours except when authorized at other times by the chief.

(b) The handling and firing of explosives shall be performed only by the person possessing a valid Explosives Certificate issued by the chief or by employees under his direct personal supervision who are at least 18 years of age.

(c) A person while under the influence of intoxicants or narcotics shall not handle explosives.

(d) A person shall not smoke or carry matches while handling explosives or while in the vicinity thereof.

(e) An open-flame light shall not be used in the vicinity of explosives.

(f) Whenever blasting is being conducted in the vicinity of gas, electric, water, fire alarm, telephone, telegraph or steam utilities, the blaster shall notify the appropriate representative of such utilities at least 24 hours in advance of blasting.

specifying the location and intended time of such blasting. In an emergency, this time limit may be waived by the chief.

(g) Blasting operations shall be conducted in accordance with nationally recognized good practice.

(h) Before a blast is fired, the person in charge shall make certain that all surplus explosives are in a safe place, all persons and vehicles are at a safe distance or under sufficient cover and a loud warning signal has been sounded.

(i) Due precautions shall be taken to prevent accidental discharge of electric blasting caps from current induced by radio or radar transmitters, lightning, adjacent power lines, dust storms or other sources of extraneous electricity.

These precautions shall include:

1. The suspension of all blasting operations and removal of persons from the blasting area during the approach and progress of an electrical storm.
2. The posting of signs warning against the use of mobile radio transmitters on all roads within approximately 500 feet of the blasting operations.
3. Compliance with nationally recognized good practice when blasting within one and one-half miles of broadcast or high-power shortwave transmitters.

(j) When blasting is done in a congested area or in close proximity to a building, structure, railway, highway or any other installation that may be damaged by material being thrown into the air, the blast shall be covered with an adequate blasting mat.

(k) Tools used for opening packages of explosives shall be constructed of nonsparking materials.

(l) Empty boxes and paper and fiber packing materials which have previously contained high explosives shall not be used again for any purpose but shall be disposed of in a manner approved by the chief.

(m) Explosives shall not be abandoned.

Transportation of Explosives

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Sec. 77.302. (a) Explosives shall not be carried or transported in or upon a public conveyance or vehicles carrying passengers for hire.

(b) Vehicles used for transporting explosives shall be strong enough to carry the load without difficulty and shall be in good mechanical condition. If vehicles do not have a closed body, the explosives shall be covered with a flameproof and moistureproof tarpaulin or other effective protection against moisture and sparks. Such vehicles shall have tight floors, and exposed spark-producing metal on the inside of the body shall be covered with wood or other nonsparking material to prevent contact with packages of explosives. Packages of explosives shall not be loaded above the sides of open-body vehicles.

(c) Explosives shall not be transported on any vehicle not authorized by the chief.

(d) Every vehicle when used for transporting explosives shall be equipped with not less than one approved-type fire extinguisher with a minimum rating of 2-A,

10-B:C, or two approved-type fire extinguishers, one of which shall have a minimum rating of 2-A and the other a minimum rating of 10-B:C. Extinguishers shall be so located as to be readily available for use.

(e) It shall be the duty of the person to whom a permit has been issued to transport explosives over the highways of the municipality, to inspect those vehicles employed by him to determine that:

1. The extinguishers are filled and in operating condition.
2. Electric wires are insulated and securely fastened.
3. The motor, chassis and body are reasonably clean and free of excessive grease and oil.
4. The fuel tank and fuel line are securely fastened and are not leaking.
5. Brakes, lights, horn, windshield wipers and steering mechanism are functioning properly.
6. Tires are properly inflated and free of defects.
7. The vehicle is in proper condition for transporting explosives.

(f) Spark-producing metals or spark-producing metal tools shall not be carried in the body of a vehicle transporting explosives.

(g) Only those dangerous articles authorized by the U.S. Department of Transportation to be loaded with explosives shall be carried in the body of a vehicle transporting explosives.

(h) A person shall not smoke, carry matches or any other flame-producing device, or carry any firearms or loaded cartridges while in or near a vehicle transporting explosives, or drive, load or unload any such vehicle in a careless or reckless manner.

(i) Vehicles transporting explosives shall be in the custody of drivers who are physically fit, careful, capable, reliable, able to read and write the English language, not addicted to the use or under the influence of intoxicants or narcotics and not less than 21 years of age. They shall be familiar with state and municipal traffic regulations and the provisions of this article governing the transportation of explosives.

(j) Vehicles transporting explosives shall display explosives signs on both sides, front and rear conforming to the requirements of the vehicle code.

(k) Blasting caps and electric blasting caps when transported on the same vehicle with other explosives shall be separated from the other explosives by containment within a Class II magazine.

(l) Vehicles transporting explosives shall be routed to avoid congested traffic and densely populated areas.

(m) Explosives shall not be transported through any completed vehicular tunnel or subway except on approval of the chief.

(n) Vehicles transporting explosives shall not be left unattended at any time within the jurisdiction.

(o) Unless authorized by the chief, a person other than the driver and one

assistant who is at least 18 years of age shall not ride on any vehicle transporting explosives.

(p) The fire and police departments shall be promptly notified when a vehicle transporting explosives is involved in an accident, breaks down or catches fire. Only in the event of such an emergency shall the transfer of explosives from one vehicle to another be allowed on highways within the jurisdiction and only when qualified supervision is provided. Except in such an emergency, a vehicle transporting explosives shall not be parked before reaching its destination except at stopping and parking places designated and approved by the chief.

(q) Delivery shall be made only to authorized persons and into approved magazines or approved temporary storage or handling areas.

(r) Vehicles containing explosives shall not be taken into a garage or repair shop for repairs or storage.

Explosives and Blasting Agents at Terminals

Sec. 77.303. (a) The chief may designate the location and specify the maximum quantity of explosives or blasting agents which may be loaded, unloaded, reloaded or temporarily retained at each terminal where such operations are permitted.

(b) Shipments of explosives or blasting agents delivered to carriers shall comply with the U.S. Department of Transportation regulations.

(c) Carriers shall immediately notify the chief when explosives or blasting agents are received at terminals.

(d) Carriers shall immediately notify consignees of the arrival of explosives or blasting agents at terminals.

(e) Truck terminals where explosives are loaded, unloaded or transferred shall conform to the following conditions:

1. There shall be no aboveground storage tanks of flammable or combustible liquids or other hazardous substances on the terminal proper or on immediately adjoining property which would present a significant exposure hazard.
2. There shall be no structures or occupancies on immediately adjoining property which would constitute a serious exposure hazard to the terminal.
3. The terminal property shall be sufficiently large that dock or vehicle storage areas containing explosives shall be a minimum of 50 feet from any structure on adjoining property.
4. Adequate access to adjoining streets shall be provided to and from the terminal property. Local routes between terminals and deviations from state approved routes shall be prescribed by the chief.
5. Explosives shall be kept in vehicles to the greatest extent possible. During transferring or loading operations, the explosives should remain on the ground or on docks for as short a time as possible.
6. Specific areas of docks shall be designated for the temporary "storage" of explosives during loading or transferring operations. A minimum distance shall be specified and maintained between this designated area and all other

materials on the dock. Combustible storage and particularly flammable or combustible liquids shall be kept at the greatest possible distance from this designated area.

7. At all times, a watchman or guard shall be on duty on the terminal property, and he shall be capable of driving all equipment in the area. At times when there are a substantial number of vehicles carrying explosives in the terminal, additional persons capable of driving shall be provided.
8. Adequate security against unauthorized persons' entering the terminal shall be provided. In metropolitan areas, this will require a fence and adequate gates.
9. The terminal shall be adequately lighted for normal observation of all vehicles containing explosives.
10. Adequate fire-protection appliances shall be provided for the loading dock near the designated explosives area and near parked vehicles.
11. A specific area of the terminal property shall be designated for vehicles containing explosives.
12. Vehicles containing any special inherent hazard, such as mechanical refrigeration equipment, shall be kept separated from the area designated for the parking of explosives vehicles.
13. Shipments of explosives shall be transported without unnecessary delay, keeping the explosives in the terminal an absolute minimum length of time, not to exceed 48 hours, excluding Sundays and holidays.

Blasting Agents, General

Sec. 77.304. (a) Except when subject to U.S. Department of Transportation regulations, blasting agents shall be stored, handled and used in the same manner as explosives.

(b) Any ammonium nitrate stored at a closer distance to the blasting agent storage area than as provided in (c) below shall be added to the quantity of blasting agents to calculate the total quantity involved for application of Table No. 77.201.

(c) Minimum intraplant separation distances between mixing units and the ammonium nitrate storage areas and blasting agents storage areas shall be in conformity with Table No. 77.201, Note 13.

Mixing Blasting Agents

Sec. 77.305. (a) Buildings or other facilities used for mixing blasting agents shall be located away from inhabited buildings, passenger railways and public highways, in accordance with the provisions of Table No. 77.201.

(b) Not more than eight hours' production of blasting agents or the limit determined by Table No. 77.201, whichever is less, shall be permitted in or near the building or other facility used for mixing blasting agents. Larger quantities shall be stored in magazines.

(c) Buildings or other facilities used for the mixing of blasting agents shall be designed and constructed in accordance with the Building Code.

(d) Compounding and mixing of recognized formulations of blasting agents shall be conducted in accordance with nationally recognized good practice.

(e) Smoking or open flames shall not be permitted in or within 50 feet of any building or facility used for the mixing of blasting agents.

(f) Empty oxidizer bags shall be disposed of daily in a manner approved by the chief.

Transportation of Blasting Agents

Sec. 77.306. Vehicles transporting blasting agents not subject to U.S. Department of Transportation regulations shall comply with all requirements of Section 77.302 except that they shall be marked or placarded on both sides, front and rear, with the words **BLASTING AGENTS** in letters not less than 4 inches in height and approximately a 3/4-inch stroke on a contrasting background.

Seizure of Explosives and Blasting Agents

Sec. 77.307. The chief may seize, take, remove or cause to be removed at the expense of the owner all explosives, ammunition or blasting agents offered or exposed for sale, stored, possessed or transported in violation of this article.

Division IV

MANUFACTURING, ASSEMBLING AND TESTING

Manufacturing, Assembling and Testing

Sec. 77.401. Any person planning to manufacture, assemble, test or load explosives, ammunition, blasting agents or fireworks shall furnish to the chief the following information:

1. The exact location of the place of manufacture.
2. The kind or kinds of explosives, ammunition, blasting agents or fireworks to be manufactured or processed and the property of hazardous materials to be used.
3. The names and addresses of individual owners, partners or officers of a corporation.
4. A map of the operating premises with the operating buildings indicated in which greater than one pound of explosives is manufactured, handled, used or stored. The maximum amount of explosives greater than one pound to be used in each building, number of persons in each operating building, barricade locations and dimensions and the location and capacity of storage magazines.
5. This article shall not be construed as applying to, or prohibiting the mixture of, blasting agents such as nitrocarbonitrate or ammonium nitrate-fuel oil in the loading area, provided all necessary safety precautions are taken.
6. A copy of the general safety rules which the manufacturer will enforce, including plans for emergency procedures in the event of fire or explosion.

Plans of Plant

Sec. 77.402. A copy of the plans of the plant shall be kept in the office on the premises of each explosive, ammunition, blasting agents or fireworks manufacturing plant and shall be made available to the chief or his authorized representative upon request.

Training

Sec. 77.403. Workmen who handle explosives or explosive charges shall be instructed in the hazards of the materials and processes in which they are to be engaged and with the safety rules governing such materials and processes.

Emergency Procedure

Sec. 77.404. Emergency procedures shall be formulated for each plant which will include personal instruction in any emergency that may be anticipated. All personnel shall be made aware of an emergency warning signal.

Intraline Distance

Sec. 77.405. This distance is the minimum permitted between any two buildings within one operating line. Intraline distances are also used for separating certain specified areas, buildings and locations even though actual line operations are not involved. Intraline distance separation is expected to protect explosives in buildings from propagation detonation due to blast effects but not against the possibility of propagation detonation due to fragments.

Intraline Separation of Operating Buildings

Sec. 77.406. (a) All mass detonating explosives Class A and fireworks manufacturing buildings, including those where explosive charges are assembled, manufactured, prepared or loaded, shall be separated from all other buildings, including magazines, within the confines of the manufacturing plant at a distance not less than those shown in the following Table No. 77.406 when the buildings are barricaded.

(b) When a building or magazine containing explosives is not barricaded, the intraline distances shown shall be doubled.

TABLE NO. 77.406—MINIMUM INTRALINE SEPARATION BETWEEN BARRICADED OPERATING BUILDINGS CONTAINING CLASS A EXPLOSIVES OR FIREWORKS MANUFACTURING

EXPLOSIVE OR FIREWORKS IN POUNDS		MINIMUM DISTANCE IN FEET	EXPLOSIVE OR FIREWORKS IN POUNDS		MINIMUM DISTANCE IN FEET
Over	Not Over		Over	Not Over	
50	50	30	20,000	25,000	265
100	100	40	25,000	30,000	280
200	200	50	30,000	35,000	295
300	300	60	35,000	40,000	310
400	400	65	40,000	45,000	320
500	500	70	45,000	50,000	330
600	600	75	50,000	55,000	340

(Continued)

TABLE NO. 77.406—MINIMUM INTRALINE SEPARATION BETWEEN BARRICADED OPERATING BUILDINGS CONTAINING CLASS A EXPLOSIVES OR FIREWORKS MANUFACTURING—(Continued)

EXPLOSIVE OR FIREWORKS IN POUNDS		MINIMUM DISTANCE IN FEET	EXPLOSIVE OR FIREWORKS IN POUNDS		MINIMUM DISTANCE IN FEET
Over	Not Over		Over	Not Over	
1 (lb)	7 (lb)	50	55,000	60,000	350
7 (lb)	500	85	60,000	65,000	360
500	900	90	65,000	70,000	370
900	1,000	95	70,000	75,000	385
1,000	1,500	105	75,000	80,000	390
1,500	2,000	115	80,000	85,000	395
2,000	3,000	130	85,000	90,000	400
3,000	4,000	140	90,000	95,000	410
4,000	5,000	150	95,000	100,000	415
5,000	6,000	160	100,000	125,000	450
6,000	7,000	170	125,000	150,000	475
7,000	8,000	180	150,000	175,000	500
8,000	9,000	190	175,000	200,000	525
9,000	10,000	200	200,000	225,000	550
10,000	15,000	225	225,000	250,000	575
15,000	20,000	245			

Operation—Buildings and Equipment

Sec. 77.407. (a) Operating buildings or rooms in which more than 50 pounds of explosives or fireworks are present at any time shall be constructed with at least one wall of explosion-relief type. The relief wall shall be placed so as to be of least hazard to workmen in adjacent buildings.

(b) When explosive venting is required, the venting area will be calculated on 1 square foot for each 35 cubic feet of building or room area.

(c) All rooms or buildings shall have adequate aisle space and at least two exits separated from each other by a distance equal to not less than one half of the length of the maximum overall diagonal dimension of the room or area served measured in a straight line between exits. Openings in fire walls shall be equipped with approved, self-closing fire doors. All exit doors shall open in the direction of exit travel and be equipped with panic hardware.

EXCEPTION: Cubicles 100 square feet or less and occupied by not more than two persons working within 12 feet of an unobstructed passageway may have one exit.

(d) All electrical wiring and equipment shall be acceptable for the hazard involved and installed in accordance with requirements for wiring and equipment in hazardous locations.

(e) Effective bonding and grounding means shall be provided to prevent accumulation of static charges where static charges are a hazard.

(f) Explosives dust shall not be exhausted to the atmosphere. Where vacuum dust-collection systems are used, they shall comply with the following requirements:

1. Adequate filters must be installed between the source vacuum and the point of pickup to prevent explosives from entering the vacuum pump or exhauster.

2. The explosive dust-collection system shall be designed to prevent pinch points—threaded fittings exposed to the hazardous dust and sharp turns, dead ends, pockets, etc., in which explosives may lodge and accumulate outside the collecting chamber.

3. The entire vacuum collection system shall be made electrically continuous and be grounded to a maximum resistance of 5 ohms.

4. Chambers in which the dusts are collected shall not be located in the operating area unless adequate shields for the maximum quantity of material in the collector are furnished for personal protection.

EXCEPTION: Wet dust-type collectors.

5. More than two rooms may not be serviced by a common connection to a vacuum collection chamber. Where interconnections are used, means shall be employed to prevent propagation of an incident by way of the collection piping.

6. When collecting the more sensitive explosives such as black powder, lead azide or other high-energy materials, a "wet" collector which moistens the dust close to the point of intake and maintains the dust wet until removed for disposal shall be used. Wetting agents shall be compatible with the explosives.

7. Explosive dusts shall be removed from the collection chamber as often as necessary to prevent overloading. The entire system shall be cleaned at a frequency that will eliminate hazardous concentrations of explosive dusts in pipes, tubing, and/or ducts.

(g) Squirrel cage blowers shall not be used for exhausting hazardous fumes, vapors or gases. Only nonferrous fan blades shall be used for fans located within the ductwork and through which hazardous materials are exhausted. Motors shall be located outside the duct.

(h) Work stations for small amounts of explosives (less than one pound) shall be separated by distance, barrier or other means so that fire in one station will not ignite material in the next work station. When necessary, each operator shall be protected by a personnel shield located between the operator and the explosive device or explosive material being processed. This shield and its support shall be a tested design to withstand a blast from the maximum amount of explosives allowed behind it.

Explosive Operations

Sec. 77.408. (a) When the type of material and processing warrants, mechanical operations involving explosives in excess of one pound shall be carried on at isolated stations or at intraline distances, and machinery shall be controlled from remote locations behind substantial barricades or at intraline separations so that workmen may remain at a safe distance while machinery is operating.

(b) The working area where the screening, grinding, blending and other processing of static-sensitive explosives or pyrotechnic materials is done shall be maintained above 20 percent relative humidity. If the relative humidity drops below 20 percent, the above operations shall be stopped and secured until the

relative humidity can be raised above 20 percent. It is desirable to keep the relative humidity above 20 to 30 percent, except where metal powders are involved, and then the relative humidity shall be between 50 and 60 percent.

(c) Means shall be provided and used to discharge static electricity from hand trucks, huggies and similar equipment before they enter buildings containing static-sensitive explosives. It is recommended that conductive wheels, including metal wheels which could not cause sparks, be used on such equipment.

(d) Bulk explosives shall be kept in covered containers when not being used or processed. Explosives shall not be stored or transported in open containers.

(e) The quantity of explosive materials at any particular work station shall be limited to that posted on the load limit signs, and not to exceed four hours' supply of material or four hours' supply of product, except that when this quantity would introduce a serious hazard, such quantities shall be limited to a lesser amount.

(f) Appropriate receptacles with covers shall be provided for each station for disposing of waste material and debris. These waste receptacles shall be emptied and cleaned as often as necessary but not less than once each day or at the end of each shift.

(g) General safety rules and operating instructions governing the particular operation or process carried on at that location shall be available at each station. The rules shall include requirements for bonding and grounding, permissible cleaning agents to use and other precautions deemed necessary for safe operation.

(h) Personnel and explosive limits shall be posted.

(i) Regular maintenance and repair work shall not be permitted in an explosive building until explosives are removed and the area is made safe. This does not prohibit minor adjustments or emergency repairs to secure immediate safety.

(j) Spilled or dropped explosives shall be cleaned up at once.

(k) Shipping containers, cleaning rags and other materials contaminated with explosives shall be removed daily and disposed of in a safe manner.

(l) Fireworks, explosives or explosive charges shall not be stored near any source of heat.

Location of Explosive Detonations for Testing

Sec. 77.409. (a) Detonation or ignition of explosive charges or fireworks for testing shall be done only in a location so isolated by distance in accordance with the Quantity and Distance Table No. 77.201, or where barriers shall be provided that will protect any person connected with the test.

(b) Adequate shelter or distance shall be provided to protect employees detonating explosives.

(c) When tests are being conducted or explosives are being detonated, only authorized persons shall be present. Areas where explosives are regularly or frequently detonated or burned shall be fenced and posted with adequate warning signs. Adequate warning devices shall be used before burning or detonating explosives to warn persons who might approach from any direction that they are approaching a danger zone.

Disposal of Waste Explosives and Fireworks

Sec. 77.410. (a) Sites for destruction of explosives shall be located at the maximum practicable safe distance from inhabited buildings, public highways, operating buildings and all other exposures. The separation shall be not less than the inhabited building distance (see Table No. 77.201). When possible, barricades shall be utilized between the site and inhabited buildings.

(b) Provision shall be made so scrap explosive material will not be placed in any burn location until at least 48 hours after the last fires have gone out.

(c) A blasting shelter shall be provided near the burn area for emergency use.

CITY OF AUSTIN, TEXAS

AMENDMENTS TO ARTICLE 77 UNIFORM FIRE CODE 1988 EDITION

PART 37. UFC Section 77.103 is hereby amended to read as follows:

Sec. 77.103 Definitions

For definitions of BLASTING AGENT, BLASTER'S LICENSE, BULLET RESISTANT, INHABITED BUILDING, EXPLOSIVES, GUNPOWDER, SPECIAL INDUSTRIAL EXPLOSIVE DEVICE, SPECIAL INDUSTRIAL HIGH-EXPLOSIVE MATERIAL AND TEST BLASTING CAP NO. 8, see Article 9.

PART 38. UFC Section 77.104 is hereby amended by adding the following:

.....

(f) When in the opinion of the Chief there is a substantial danger to life, health or property in the immediate area exposed to the blasting for which a permit is being requested, said request shall be denied.

(g) The Chief may in the interest of public safety require that the persons engaged in the use of explosive meet specific licensing requirements (See Sec. 77.107(a)2 below) as a term of the permit.

(h) The Chief may require written comments on each permit application from the various affected City of Austin departments. When in the opinion of the Chief such departments have a valid objection to the issuance of a permit, no permit shall be approved until such objection has been resolved to the satisfaction of the Chief.

(i) To obtain a permit the licensed blaster shall file with the Chief an application in writing on a form to be furnished by the Chief. Each application shall describe the proposed work, the location of such work, and such other pertinent information as may be required.

(j) Permit Fees. Permits authorized by the provisions of Sec. 77.104(a) shall be issued only upon payment of the appropriate fee as established by the City Council. City of Austin departments shall not be required to pay permit fees when engaged in such work as described in this section.

PART 39. UFC Article 77 is hereby amended by adding Section 77.107 which reads as follows:

Section 77.107 Blasting Licenses

(a) General.

1. No person shall engage in the use of explosive material within the City of Austin unless that person is licensed under the provision of this article or is under the direct supervision of a person licensed under this article.
2. No person shall engage in the use of explosive material within the City of Austin unless that person meets the specific licensor requirements of the blasting permit granted (see Section 77.104 above) or be under the direct supervision of a person so licensed.
- 3. A license issued hereunder is valid for a period of one (1) year.
4. A license may be renewed each year upon presentation of credible documentary proof that the license holder has been actively engaged in blasting operations the preceding year.
5. The license application fee and license application renewal fee will be established by action of the City Council.
6. No license shall be assigned or transferred.
7. After taking the Class "S" examination, a person holding a current Class "B" license may convert it to a Class "S" license at any time without payment of fee. A Class "B" license holder may convert to a Class "S" license at renewal time. The fee for this will be the set Class "S" renewal fee.
8. If an applicant for a blasting license fails to pass the examination, the applicant shall not be eligible for reexamination for a period of thirty (30) days. If an applicant fails to pass the examination at any subsequent time, the applicant shall not be eligible for another examination for a period of six (6) months following such failure. Another license application fee will have to be paid for each test subsequent to the third test administered.
9. A Class "C" license holder shall not be named on a blasting permit as the responsible blaster except on a permit for blasting operations involving uninhabited areas. An uninhabited area is a point without a person,

animal, structure or road within a distance of five hundred (500) feet.

10. A Class "S" license holder is restricted to blasting operations involving swimming pools and septic systems.
11. Class "B" and Class "C" license holders are restricted from blasting operations involving swimming pools and septic systems unless a Class "S" release is attached to their license. To obtain a Class "S" release they must pass the Class "S" blaster's test.
12. All work performed by persons licensed under the provisions of this article shall be done in strict compliance with all federal and state laws and City of Austin ordinances. Violation of any law or ordinance will be cause for the Chief to revoke or suspend a license granted under this article. Whenever the Chief believes that any grounds for revocation or suspension of a license exist, he shall give written notice to the holder of the license. The Chief will hold a hearing at which the license holder may appear either personally or by representative and present evidence and make statements. If the Chief's decision is to revoke or suspend the license, the license holder may appeal in accordance with Section 2.303 of this Code.
13. The Chief may order the stop of blasting operations in the interest of public health or safety.

(b) **BLASTER CLASSIFICATIONS AND REQUIREMENTS THEREFOR.**

1. General Requirements for all license classes:
 - A. Be at least twenty-one (21) years of age;
 - B. Be in adequate physical and mental condition to perform the work required;
 - C. Achieve a passing score on a test appropriate to the license class desired.
 - D. Be able to understand and give written and oral directions in the English language;
 - E. Not have been convicted of a felony or two or more misdemeanors within two (2) years preceding the date of application for license, for a crime involving intoxication. Intoxication is defined as not having the normal use of mental or physical facilities by reason of the introduction of alcohol, a controlled substance, a drug, or a combination of two or more of those substances into

the body (V.A.T.S. art. 6252-13c and art. 6252-13d apply).

- F. Have a working knowledge of federal, state and local laws and regulations pertaining to explosive materials.
- G. Have no revoked, suspended, or terminated blaster's license, or any criminal action involving blasting activities pending in a federal, state or municipal court of law; and,
- H. Pay the license application fee in accordance with the schedule established by the City Council.

2. In addition to the General Requirements, the applicant must satisfy the following requirements for the class license indicated:

A. Class "A"

- (i) Has held a Class "B" blaster's license from the City of Austin for at least two (2) years or the applicant has at least six (6) years of experience in the field of transporting, storing, handling, and using explosive materials and submits credible documentary proof of such.
- (ii) Be knowledgeable in designing blasting programs, in calculating powder factors, and in the deployment and the precise use of delay blasting for all phases of construction.
- (iii) Be capable of instructing others in the explosives field.

B. Class "B"

Has held a Class "C" blaster's license from the City of Austin for a period of at least two (2) years or has at least four (4) years of experience in the field of transporting, storing, handling, and using explosive materials, and submits credible documentary proof of such.

C. Class "C"

Has at least two (2) years of experience in the field of transporting, storing, handling, and using explosive materials, and submits credible documentary proof of such.

D. Class "S"

Has held a Class "B" blaster's license from the City of Austin for a period of at least two (2) years or has at least four (4) years of experience in the field of transporting, storing, handling, and using explosive materials, and submits credible documentary proof of such.

PART 40. UFC Section 77.301 is hereby amended by adding the following which reads as follows:

.

(n) All exposed blasting cap lead wires in the ground from previous shots shall be removed at the end of the work day.

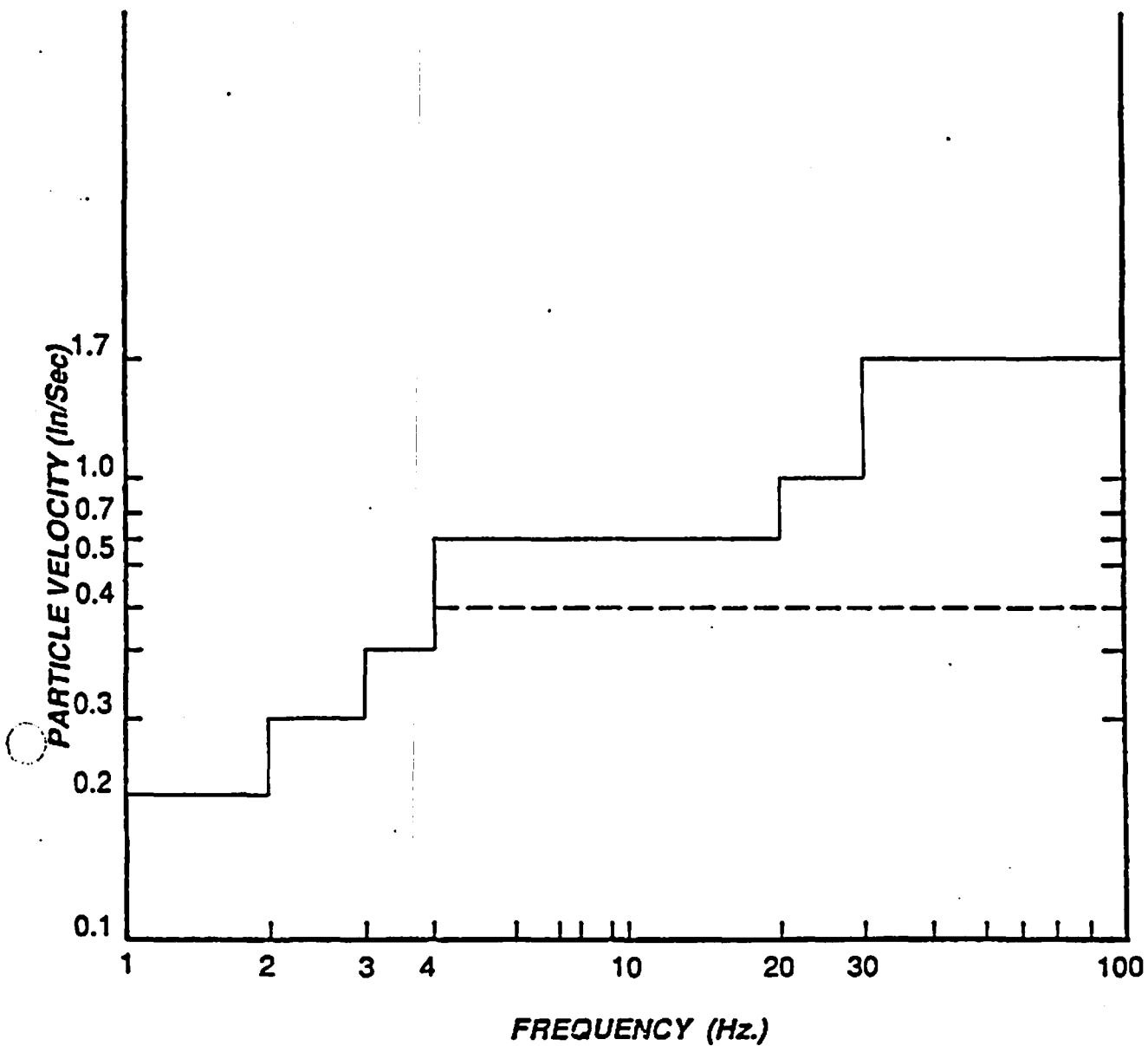
(o) Particle velocities shall not exceed the safe levels indicated in Figure 77.301 (below) and in no case shall particle velocities exceed 1.7 inches per second. Monitoring of particle velocities for all blasting operations shall be carried out as required in this section. When particle velocities exceed 0.5 inches per second, blast frequencies shall also be monitored. Particle velocities or frequencies in excess of the prescribed limits specified herein shall require the immediate suspension of blasting and the initiation of procedures to correct the excess velocity or frequency. The Chief may grant or require, deviations from this limit as required to adequately protect the public safety. Air over pressures shall not exceed 129 decibels on 5/6 hertz high pass monitoring system.

(p) ~~A blast monitor, such as a seismic blast recording machine, is required during all blasting operations for which a permit is issued by the City of Austin. A monitoring technician, not employed by a blasting operator, shall be used whenever a blast monitor is required. Monitoring technicians shall be trained in the proper placement of monitor sensors and proper function of the instrument to be used. All monitoring reports shall carry the seal of a State of Texas Professional Engineer and shall be retained on file by the permit holder. These reports shall be made available on request.~~

EXCEPTION: When in the opinion of the Chief the damage to structures or buildings due to blasting operations is unlikely, the requirements of this subsection may be waived.

(q) Only blasting trunk wire of 18 gauge minimum shall be used while conducting blasting operations under permits.

(r) Approved blasting machines shall be used. All other equipment is prohibited.



UFC Figure 77.301: Safe levels of blasting vibration in combination with velocity and displacement

(s) Detonating cord may be used only when approved on the blasting permit. Unauthorized use of detonating cord shall result in the revocation of the blasting permit and the blaster's license.

(t) The Chief shall set other conditions to the approval of the permit application that are necessary to adequately protect public health and safety. These conditions may include, but are not limited to, reduced allowable particle velocities, additional monitoring, increased insurance protection, hours of operation, type and amount of explosives used and engineered blasting plans.

(u) Written approval is required for blasting to be conducted on Sunday, legal holidays, or between the hours of 5:00 p.m. and 8:00 a.m. on other days.

(v) All blasting operations shall be preceded by a preblast notification to the owners or managers of all affected premises. The range of the preblast notification shall be at the discretion of the blaster or as required by the permit.

PART 41. UFC Section 78.102 is hereby amended by adding the following:

(d) The fee for this permit shall be as established by the City Council.

PART 42. UFC Article 78 is hereby amended by adding Section 78.107 which reads as follows:

Sec. 78.107 Jurisdiction

(a) This article is applicable within all territory in the City of Austin, annexed for full purposes as per the Charter of the City of Austin, Article I., Sec. 6.

(b) The doing or performing of any act in violation of this Article is additionally defined as a nuisance and prohibited within the full-purpose corporate limits of the City of Austin and within five thousand (5,000) feet outside the full-purpose corporate limits. The Chief shall enforce this Article as it may be necessary to prevent and summarily abate and remove the nuisance in accordance with V.T.C.A., Local Government Code 217.042. This section shall not apply within any portion of such five thousand (5,000) foot area which is contained within the corporate limits, limited purpose annexation areas, or extraterritorial jurisdiction of another municipality as defined in V.T.C.A., Local Government Code 1.005.

~~PART 43. UFC Section 79.201 is hereby amended by adding the following:~~

~~(h) Liquids in Plastic Containers. Class I and Class II liquids in plastic containers shall not be stored in general-purpose~~

From Department
— of —
Mines and Minerals
503 EAST MAIN STREET
BENTON, ILLINOIS 62812
Address Correction Requested

Illinois Department of Mines and Minerals
Land Reclamation Division

PERMANENT PROGRAM BLASTING RULES AND REGULATIONS

62 Ill. Adm. Code 1700-1850 (1987)
Surface Coal Mining and Reclamation Operations

Section 1780.13 Operation Plan: Blasting

Each application shall contain a blasting plan for the proposed permit area, explaining how the applicant will comply with the requirements of 62 Ill. Adm. Code 1816.61 through 1816.68 and including the following:

- a) This plan shall include, at a minimum, information setting forth the limitations the operator will meet with regard to ground vibration and airblast, the bases for those limitations, and the methods to be applied in controlling the adverse effects of blasting operations.
- b) Each application shall contain a description of any system to be used to monitor compliance with the standards of 62 Ill. Adm. Code 1816.67 including the type, capability, and sensitivity of any blast-monitoring equipment and proposed procedures and locations of monitoring.
- c) Blasting operations within five hundred (500) feet of active underground mines require approval of the Department and Federal Mine Safety and Health Administration (MSHA).

(Source: Amended at 11 Ill. Reg. 8602, effective July 1, 1987)

Section 1816.11 Signs and Markers

- a) **Specifications.** Signs and markers required under this Part shall:
 - 1) Be posted and maintained by the person who conducts the surface mining activities;
 - 2) Be of a uniform design throughout the operation that can be easily seen and read;
 - 3) Be made of durable material; and
 - 4) Conform to local ordinances and codes.
- b) **Duration of maintenance.** Signs and markers shall be maintained during the conduct of all activities to which they pertain.
- c) **Mine and permit identification signs.**
 - 1) Identification signs shall be displayed at each point of access to the permit area from public roads.
 - 2) Signs shall show the name, business address, and telephone number of the person who conducts the surface mining activities and the identification number of the current permit authorizing surface mining activities.
 - 3) Signs shall be retained and maintained until after the release of all bonds for the permit area.
- d) **Perimeter markers.** The perimeter of a permit area shall be clearly marked before the beginning of surface mining activities.
- e) **Buffer zone markers.** Buffer zones shall be marked along their boundaries as required under Section 1816.57.
- f) **Topsoil markers.** Where topsoil or other vegetation supporting material is segregated and stockpiled as required under Section 1816.22, the stockpiled material shall be clearly marked.
- g) **Where required by State law, the operator shall replace section, township and other legal markers which serve to delineate political or geographic boundaries.**

Source: Amended at 11 Ill. Reg. 8131, effective July 1, 1987)

Section 1816.61 Use of Explosives: General Requirements

- a) Each person who conducts surface mining activities shall comply with all applicable State and Federal laws in the use of explosives.
- b) All blasting operations shall be conducted by persons certified by the Department in accordance with 62 Ill. Adm. Code 1850.
- c) Blast design.
 - 1) An anticipated blast design shall be submitted if blasting operations will be conducted within:
 - A) One thousand (1,000) feet of any building used as a dwelling, public building, school, church, or community or institutional building outside the permit area; or
 - B) Five hundred (500) feet of an active or abandoned underground mine.
 - 2) The blast design may be presented as part of the permit application or at a time, before the blast, approved by the Department.
 - 3) The blast design shall contain sketches of the drill patterns, delay periods, and decking and shall indicate the type and amount of explosives to be used, critical dimensions, and the location and general description of structures to be protected, as well as a discussion of design factors to be used, which protect the public and meet the applicable air blast, flyrock, and ground vibration standards in Section 1816.67.
 - 4) The blast design shall be prepared and signed by a certified blaster.

(Source: Amended at 11 Ill. Reg. 8131, effective July 1, 1987)

Section 1816.62 Use of Explosives: Pre-Blasting Survey

- a) At least thirty (30) days before initiation of blasting in a permit area, the operator shall notify, in writing, all residents or owners of structures located within one-half (1/2) mile of the permit area how to request a pre-blast or condition survey.
- b) Upon written request to the Department and the person who conducts the surface mining activities by a resident or owner of a dwelling or structure that is located within one-half (1/2) mile of any portion of the permitted area, or by the owner of a dwelling or structure at a distance greater than one-half (1/2) mile from the permit area but within one (1) mile of the blasting area and within an area determined by the Department to be appropriate in a particular situation on the basis of complaints or other information received by the Department, the person who conducts the surface mining activities shall promptly conduct a pre-blasting survey or a condition survey of the dwelling or structure. For any structure where, in accordance with this Section, a survey has been requested by a previous resident or previous owner and the survey has been conducted by the permittee and copies of the survey report have been provided to the previous owner or resident and the Department, the permittee shall only be required to provide a copy of the previously completed survey report to any new or subsequent owner upon written request by the new or subsequent owner. If a structure is renovated, modified, or added to, subsequent to a pre-blast survey or a condition survey, then upon request to the Department a survey of such additions, modifications and renovations shall be performed in accordance with this Section.
- c) The survey shall determine the condition of the dwelling or structure and document any pre-blasting or existing damage and other physical factors that could reasonably be affected by the blasting. Structures such as pipelines, cisterns, wells and other water systems warrant special attention such as the review of construction, drilling or completion specifications; however, the assessment of these structures may be limited to surface conditions.
- d) Any surveys requested more than ten (10) calendar days prior to the published scheduled beginning of blasting shall be completed by the operator before the start of blasting. If the request is made after the start of blasting the person who conducts the surface mining activity shall conduct a condition survey of the dwelling or structure. A condition survey shall contain information identical to a pre-blasting survey. The intent of this Section is to provide for either a pre-blasting or condition survey only.

- e) A written report of the survey shall be prepared and signed by the person who conducted the survey. The report may include recommendations of any special conditions or proposed adjustments to the blasting procedure which should be incorporated into the blasting plan to prevent damage. Copies of the report shall be provided to the person requesting the survey and to the Department within thirty (30) days of the the date the survey was completed. If the person requesting the survey disagrees with the results of the survey, he or she may notify, in writing, both the permittee and the Department of the specific areas of disagreement. Instructions as to whom and to where the written comments on the results of the survey should be forwarded shall be included with the survey report.

(Source: Amended at 11 Ill. Reg. 8131, effective July 1, 1987)

Section 1816.64 Use of Explosives: Public Notice of Blasting Schedule

- a) All blasting shall be conducted from sunrise to sunset, and at times announced in the blasting schedule. The Department shall limit the area covered, timing and sequence of blasting, as listed in the schedule, if such limitations are necessary and reasonable in order to protect public health, safety or welfare.
- b) Unscheduled blasting may be conducted only where public or operator health and safety so require. When an operator conducts an unscheduled blast, the operator, using audible warning signals, shall notify residents within one-half (1/2) mile of the blasting site and document the reason(s) for the unscheduled blast in accordance with subsection 1816.68(a)(17).
- c) Blasting schedule publication.
 - 1) Each person who conducts surface mining activities shall publish a blasting schedule at least thirty (30) days, but not more than sixty (60) days, before beginning a blasting program in which blasts that use more than five (5) pounds of explosive or blasting agent are detonated. The blasting schedule shall be published in a newspaper of general circulation in the locality of the blasting site.
 - 2) Copies of the schedule shall be distributed by mail to local governments and public utilities and mailed or delivered to each residence within one-half (1/2) mile of the proposed blasting area and to every other person within or outside such area to whom the Department requires to be mailed, and daily notices shall be provided to such persons prior to any blasting.
 - 3) The person who conducts the surface mining activities shall republish and redistribute the schedule by mail at least every twelve (12) months and revise and republish the schedule at least thirty (30) days but not more than sixty (60) days before blasting in areas not covered in the current schedule or if the actual blasting times differ from the time periods listed in the current schedule for more than twenty percent (20%) of the blasts fired.
- d) Blasting schedule contents.
 - 1) A blasting schedule shall not be so general as to cover the entire permit area or all working hours, but shall identify as accurately as possible the location of the blasting sites and the time periods when blasting will occur.

- 2) The blasting schedule shall contain at a minimum:
- A) Identification of the specific areas in which blasting will take place;
 - B) Dates and time periods when explosives are to detonated;
 - C) Methods to be used to control access to the blasting area;
 - D) Types of audible warnings and all-clear signals to be used before and after blasting, and
 - E) Name, address, and telephone number of operator.
- e) Public notice of changes in blasting schedules.

Before blasting in areas or at times not in a previous schedule, the person who conducts the surface mining activities shall prepare a revised schedule according to the procedures in subsections (c) and (d).

(Source: Amended at 11 Ill. Reg. 8131, effective July 1, 1987)

Section 1816.66 Use of Explosives: Blasting Signs, Warnings, and Access Control

- a) Blasting signs shall meet the specifications of Section 1816.11. The operator shall:
 - 1) Conspicuously display signs reading "Blasting Area" along the edge of any blasting area that comes within one hundred (100) feet of any public road right-of-way, and at the point where any other road provides access to the blasting area; and
 - 2) At all entrances to the permit area from public roads or highways, place conspicuous signs which state "Warning! Explosives in Use" and which clearly list and describe the meaning of the audible blast warning and all-clear signals that are in use, and which explain the marking of blasting areas and charged holes awaiting firing within the permit area.
- b) Warning and all-clear signals of different character or pattern that are audible within one-half (1/2) mile of the blast shall be given. Each person within the permit area and each person who resides or regularly works within one-half (1/2) mile of the permit area shall be notified of the meaning of the signals in the blasting schedule. The requirement to supply daily notice may be fulfilled by the audible warning signals.
- c) Access to the blasting area shall be controlled to prevent the presence of livestock or unauthorized personnel during blasting and until an authorized representative of the person who conducts the surface mining activities has reasonably determined:
 - 1) That no unusual circumstances, such as imminent slides or undetonated charges, exist; and
 - 2) That access to and travel in or through the area can be safely resumed.
- d)
 - 1) Blasting shall not be conducted within three hundred (300) feet of any building used as a dwelling unless waived by the owner or within three hundred (300) feet of a school, church, hospital, or nursing facility.
 - 2) Blasting shall not be conducted within one hundred (100) feet of facilities including, but not limited to, disposal wells, petroleum or gas storage facilities, municipal water storage facilities, fluid-transmission pipelines, or water and sewage

lines.

(Source: Added at 11 Ill. Reg. 8131, effective July 1, 1987)

Section 1816.67 Use of Explosives: Control of Adverse Effects

- a) Blasting shall be conducted to prevent injury to persons, damage to public or private property outside the permit area, adverse impacts on any underground mine, and change in the course, channel or availability of ground or surface water outside the permit area.

b)

- 1) Air blast shall be controlled so that it does not exceed the values specified below at any dwelling, public building, school, church, or commercial or institutional structure, unless such structure is owned by the person who conducts the surface mining activities and is not leased to any other person. If a building owned by the person conducting surface mining activities is leased to another person, the lessee may sign a waiver relieving the operator from meeting the air blast limitations of this subsection. The waiver shall be submitted to the Department before beginning blasting.

Lower frequency limit of measuring system, Hz \pm 3dB	Maximum level in dB
0.1 Hz or lower--flat response ¹	134 peak
2.0 Hz or lower--flat response	133 peak
6.0 Hz or lower--flat response	129 peak

¹ Only when approved by the Department

- 2) The measuring systems used shall have a flat frequency response of at least two hundred (200) Hz at the upper end.
- 3) The person who conducts blasting may satisfy the provisions of subsection (b) by meeting any of the three (3) specifications in the chart in subsection (b)(1).
- 4) If necessary to prevent damages specified in subsection (a), the Department shall specify lower maximum allowable airblast levels than those in subsection (b)(1) for use in the vicinity of a specific blasting operation.

c)

- 1) When the cube root scaled distance, as defined in subsection (c)(2), to the nearest dwelling, public building, school, church, or commercial or institutional structure has a value less than 500 and when:
- A) The burden to hole depth ratio is greater than 1.0, or
- B) The top stemming height is less than seventy percent

(70%) of the burden dimension, the air blast produced by that blast shall be measured, recorded, analyzed, and reported pursuant to subsection (h) and Section 1816.68(b). This subsection shall not apply to horizontal blast holes drilled from the floor of the pit.

- 2) Cube root scaled distance equals the distance, in feet, from the blast to a specified location divided by the cube root of the maximum weight of explosives, in pounds, to be detonated in any eight (8) millisecond period.
 - 3) To ensure compliance with the limits contained in this Section, the Department may require an air blast measurement of any or all blasts, and may specify the location of such measurements.
- d) Flyrock, including blasted material traveling in the air, or along the ground, shall not be cast beyond the permit boundaries or beyond the area of regulated access required under Section 1816.66(c), or more than one-half the distance to the nearest dwelling or other occupied structure.
- e) In all blasting operations, except as otherwise authorized in this Section, the maximum peak particle velocity shall not exceed one (1) inch per second at the location of any dwelling, public building, school, church, or commercial or institutional building. At distances greater than five thousand (5,000) feet from the blast to any structures described in this subsection, the maximum allowable peak particle velocity shall not exceed 0.75 inch per second at the locations of the structures described in this subsection. At distances less than three hundred (300) feet from the blast to any structures described in this subsection, the maximum allowable peak particle velocity shall not exceed 1.25 inch per second at the locations of the structures described in this subsection. These limits shall apply separately to each component of motion as defined in Section 1816.67(h). The Department shall reduce peak particle velocity limits if determined necessary to provide damage protection, if so recommended in any pre-blast survey or condition survey report provided pursuant to Section 1816.62.
- f) If blasting is conducted to prevent adverse impacts on any underground mine and changes in the course, channel, or availability of ground, or surface water outside the permit area, then the maximum peak particle velocity limitation of subsection (d) shall not apply at the following location:
- 1) At structures owned by the person conducting the mining

activity, and not leased to another party; and

- 2) At structures owned by the person conducting the mining activity, and leased to another party, if a written waiver by the lessee is submitted to the Department prior to blasting.
- g) When the scaled distance, as defined below, has a value less than sixty (60) at the nearest dwelling, public building, school, church, or commercial or institutional structure, a seismograph recording shall be made at or near the closest structure requiring protection.
 - 1) Scaled Distance - The distance, in feet, from the blast to a specified location divided by the square root of the maximum weight of explosives, in pounds, to be detonated in any eight (8) millisecond period.
 - 2) To ensure compliance with the limits contained in this Section, the Department may require a seismograph recording of any or all blasts and may specify the location at which such recordings are made.
- h) As used herein, seismograph recording or record or air blast recording or record shall mean:

A visually inspectable cartesian representation of the time history of the particle velocity levels or air blast levels versus time. Time is represented on the "X" axis. The particle velocity is shown by three traces representing mutually perpendicular components of motion. The components are oriented vertically, transversely, and longitudinally to the horizontal direction from the recording location to the location of the blast. The air blast time history is represented by a single trace. The record or recording includes either an analog representation of, or a written description of the vertical scale for the particle velocity traces and the air blast trace. The units for the particle velocity traces and scale are in inches per second. The units for the air blast trace and scale are millibars, pounds per square inch, or decibels. The recording also includes an analog or descriptive time scale. The time units are in seconds.

(Source: Added at 11 Ill. Reg. 8131, effective July 1, 1987)

Section 1816.68 Use of Explosives: Records of Blasting Operations

- a) A record of each blast, including seismograph reports, shall be retained by the operator for at least three (3) years and shall be available for inspection by the Department and the public on request. The record is to be completed by the end of the work day following the day in which the blast occurred, including the seismograph meter reading, if available, and shall contain the following data:

- 1) Name of the operator conducting the blast;
- 2) Location, date, and time of blast;
- 3) Name, signature, and certification number of the blaster conducting the blast;
- 4) The name of the owner or resident of, and the direction and distance, in feet, to the nearest dwelling, school, church, or commercial, or institutional building either:
 - A) Not located in the permit area; or
 - B) Not owned by the person who conducts the surface mining activities.
- 5) Type of material blasted;
- 6) Number of holes, burden, and spacing;
- 7) Diameter and depth of holes;
- 8) Types of explosives used;
- 9) Total weight of explosives used;
- 10) Weight of explosives used per hole;
- 11) Maximum weight of explosives detonated within any eight (8) millisecond period;
- 12) Maximum number of holes or decks detonated within any eight (8) millisecond period;
- 13) Initiation system;
- 14) Type and length of stemming;
- 15) Type of delay detonator and delay periods used;

- 16) Sketch of the delay pattern, including decking;
 - 17) Reasons and conditions for each unscheduled blast; and
 - 18) Wind velocity and direction.
- b) Air blast and/or ground vibration recordings, or photographic copies thereof, where required, shall be kept at the mine site office for a period of three (3) years following the date of the blast, and shall be available for inspection by the Department and the public on request. The recordings shall include the following:
- 1) Maximum air blast and/or ground vibration levels recorded;
 - 2) The exact location of the monitoring equipment, and its distance from the blast, and the date and time of the recording;
 - 3) Name of the person and firm making the recording;
 - 4) Name of the person and firm analyzing the recording. The recording shall be signed and dated by the person performing the analysis; and
 - 5) The type of instrument, sensitivity, and calibration signal or certification of annual calibration. When the recordings required at Sections 1816.67(c) and 1816.67(g) are produced via digitized systems, the sampling rate of the digitizer, in samples per second, shall be stated.

(Source: Amended at 11 Ill. Reg. 8131, effective July 1, 1987)

Section 1817.61 Use of Explosives: General Requirements

- a) Sections 1817.61 through 1817.68 apply only to surface blasting activities incident to underground mining, including, but not limited to, initial rounds of slopes and shafts.
- b) Each person who conducts surface mining activities shall comply with all applicable State and Federal laws in the use of explosives.
- c) All blasting operations shall be conducted by persons certified by the Department in accordance with 62 Ill. Adm. Code 1850.
- d) Blast design.
 - 1) An anticipated blast design shall be submitted if blasting operations will be conducted within:
 - A) One thousand (1,000) feet of any building used as a dwelling, public building, school, church, or community or institutional building outside the permit area; or
 - B) Five hundred (500) feet of an active or abandoned underground mine.
 - 2) The blast design may be presented as part of the permit application or at a time, before the blast, approved by the Department.
 - 3) The blast design shall contain sketches of the drill patterns, delay periods, and decking and shall indicate the type and amount of explosives to be used, critical dimensions, and the location and general description of structures to be protected, as well as a discussion of design factors to be used, which protect the public and meet the applicable air blast, flyrock, and ground vibration standards in Section 1817.67.
 - 4) The blast design shall be prepared and signed by a certified blaster.

(Source: Amended at 11 Ill. Reg. 8250, effective July 1, 1987)

Section 1817.62 Use of Explosives: Pre-Blasting Survey

- a) At least thirty (30) days before initiation of blasting in a permit area, the operator shall notify, in writing, all residents or owners of structures located within one-half (1/2) mile of the permit area how to request a pre-blast or condition survey.
- b) Upon written request to the Department and the person who conducts the surface mining activities by a resident or owner of a dwelling or structure that is located within one-half (1/2) mile of any portion of the permitted area, or by the owner of a dwelling or structure at a distance greater than one-half (1/2) mile from the permit areas but within one (1) mile of the blasting area and within an area determined by the Department to be appropriate in a particular situation on the basis of complaints or other information received by the Department, the person who conducts the surface mining activities shall promptly conduct a pre-blasting survey or a condition survey of the dwelling or structure. For any structure where, in accordance with this Section, a survey has been requested by a previous resident or a previous owner and the survey has been conducted by the permittee and copies of the survey report have been provided to the previous owner or resident and the Department, the permittee shall only be required to provide a copy of the previous completed survey report to any new or subsequent owner upon written request by the new or subsequent owner. If a structure is renovated, modified or added to, subsequent to a pre-blast survey or a condition survey, then upon request to the Department a survey of such additions, modifications and renovations shall be performed in accordance with this Section.
- c) The survey shall determine the condition of the dwelling or structure and document any pre-blasting or existing damage and other physical factors that could reasonably be affected by the blasting. Structures such as pipelines, cisterns, wells and other water systems warrant special attention such as the review of construction, drilling or completion specifications; however, the assessment of these structures may be limited to surface conditions.
- d) Any surveys requested more than ten (10) calendar days prior to the published scheduled beginning of blasting shall be completed by the operator before the start of blasting. If the request is made after the start of blasting the person who conducts the surface mining activity shall conduct a condition survey of the dwelling or structure. A condition survey shall contain information identical to a pre-blasting survey. The intent of this Section is to provide for either a pre-blasting or condition survey only.

- e) A written report of the survey shall be prepared and signed by the person who conducted the survey. The report may include recommendations of any special conditions or proposed adjustments to the blasting procedure which should be incorporated into the blasting plan to prevent damage. Copies of the report shall be provided to the person requesting the survey and to the Department within thirty (30) days of the date the survey was completed. If the person requesting the survey disagrees with the results of the survey, he or she may notify, in writing, both the permittee and the Department of the specific areas of disagreement. Instructions as to whom and to where the written comments on the results of the survey should be forwarded shall be included with the survey report.

(Source: Amended at 11 Ill. Reg. 8250, effective July 1, 1987)

Section 1817.64 Use of Explosives: General Performance Standards

- a) The operator shall notify, in writing, residents within one-half (1/2) mile of the blasting site and local governments of the proposed times and locations of blasting operations. Such notice of times that blasting is to be conducted may be announced weekly, but in no case less than twenty four (24) hours before blasting will occur.
- b) Unscheduled blasting may be conducted only where public or operator health and safety so require. When an operator conducts an unscheduled blast, the operator, using audible warning signals, shall notify residents within one-half (1/2) mile of the blasting site and document the reason(s) for the unscheduled blast in accordance subsection 1817.68(a)(17).
- c) All blasting shall be conducted between sunrise and sunset. The Department shall limit the area covered, timing and sequence of blasting as listed in the schedule, if such limitations are necessary and reasonable in order to protect public health, safety or welfare.

(Source: Added at 11 Ill. Reg. 8250, effective July 1, 1987)

Section 1817.66 Use of Explosives: Blasting Signs, Warnings, and Access Control

- a) Blasting signs shall meet the specifications of Section 1817.11. The operator shall:
 - 1) Conspicuously display signs reading "Blasting Area" along the edge of any blasting area that comes within one hundred (100) feet of any public road right-of-way, and at the point where any other road provides access to the blasting area; and
 - 2) At all entrances to the permit area from public roads or highways, place conspicuous signs which state "Warning! Explosives in Use" and which clearly list and describe the meaning of the audible blast warning and all-clear signals that are in use, and which explain the marking of blasting areas and charged holes awaiting firing within the permit area.
- b) Warning and all-clear signals of different character or pattern that are audible within one-half (1/2) mile of the blast shall be given. Each person within the permit area and each person who resides or regularly works within one-half (1/2) mile of the permit area shall be notified of the meaning of the signals in the blasting schedule. The requirement to supply daily notice may be fulfilled by the audible warning signals.
- c) Access to the blasting area shall be controlled to prevent the presence of livestock or unauthorized personnel during blasting and until an authorized representative of the person who conducts the surface mining activities has reasonably determined:
 - 1) That no unusual circumstances, such as imminent slides or undetonated charges, exist; and
 - 2) That access to and travel in or through the area can be safely resumed.
- d)
 - 1) Blasting shall not be conducted within three hundred (300) feet of any building used as a dwelling unless waived by the owner or within three hundred (300) feet of a school, church, hospital, or nursing facility.
 - 2) Blasting shall not be conducted within one hundred (100) feet of facilities including, but not limited to, disposal wells, petroleum or gas storage facilities, municipal water storage facilities, fluid-transmission pipelines, or water and sewage

lines. .

(Source: Added at 11 Ill. Reg. 8250, effective July 1, 1987)

Section 1817.67 Use of Explosives: Control of Adverse Effects

- a) Blasting shall be conducted to prevent injury to persons, damage to public or private property outside the permit area, adverse impacts on any underground mine, and change in the course, channel or availability of ground or surface waters outside the permit area.

b)

1)

- A) Air blast shall be controlled so that it does not exceed the values specified below at any dwelling, public building, school, church, or commercial or institutional structure, unless such structure is owned by the person who conducts the surface mining activities and is not leased to any other person. If a building owned by the person conducting surface mining activities is leased to another person, the lessee may sign a waiver relieving the operator from meeting the air blast limitations of this subsection. The waiver shall be submitted to the Department before beginning blasting.

Lower frequency limit of measuring system, Hz ± 3 dB	Maximum level in dB
0.1 Hz or lower--flat response ²	134 peak
2.0 Hz or lower--flat response	133 peak
6.0 Hz or lower--flat response	129 peak

² Only when approved by the Department

- B) The measuring systems used shall have a flat frequency response of at least two hundred (200) Hz at the upper end.

- 2) The person who conducts blasting may satisfy the provisions of subsection (b) by meeting any of the three (3) specifications in the chart in subsection (b)(1).
- 3) If necessary to prevent damages specified in subsection (a), the Department shall specify lower maximum allowable airblast levels than those of subsection (b)(1) for use in the vicinity of a specific blasting operation.

c)

- 1) When the cube root scaled distance, as defined in subsection (c)(2), to the nearest dwelling, public building, school, church, or commercial or institutional structure has a value less than 500 and when

- A) The burden to hole depth ratio is greater than 1.0, or

B) The top stemming height is less than seventy percent (70%) of the burden dimension,

the air blast produced by that blast shall be measured, recorded, analyzed, and reported pursuant to subsection (h) and Section 1817.68(b).

- 2) Cube root scaled distance equals the distance, in feet, from the blast to a specified location divided by the cube root of the maximum weight of explosives, in pounds, to be detonated in any eight (8) millisecond period.
 - 3) To ensure compliance with the limits contained in this Section, the Department may require an air blast measurement of any or all blasts, and may specify the location of such measurements.
- d) Flyrock, including blasted material traveling in the air, or along the ground, shall not be cast beyond the permit boundaries or beyond the area of regulated access required under Section 1817.66(c), or more than one-half the distance to the nearest dwelling or other occupied structure.
- e) In all blasting operations, except as otherwise authorized in this Section, the maximum peak particle velocity shall not exceed one (1) inch per second at the location of any dwelling, public building, school, church, or commercial or institutional building. At distances greater than five thousand (5,000) feet from the blast to any structures described in this subsection, the maximum allowable peak particle velocity shall not exceed 0.75 inch per second at the locations of the structures described in this subsection. At distances less than three hundred (300) feet from the blast to any structures described in this subsection, the maximum allowable peak particle velocity shall not exceed 1.25 inch per second at the locations of the structures described in this subsection. These limits shall apply separately to each component of motion as defined in Section 1817.67(h). The Department shall reduce peak particle velocity limits if determined necessary to provide damage protection if so recommended in any pre-blast survey or condition survey report provided pursuant to Section 1817.62.
- f) If blasting is conducted to prevent adverse impacts on any underground mine and changes in the course, channel, or availability of ground or surface water outside the permit area, then the maximum peak particle velocity limitation of subsection (d) shall not apply at the following locations:
- 1) At structures owned by the person conducting the mining

activity, and not leased to another party;

- 2) At structures owned by the person conducting the mining activity, and leased to another party, if a written waiver by the lessee is submitted to the Department prior to blasting.
- g) When the scaled distance, as defined below, has a value of less than sixty (60) at the nearest dwelling, public building, school, church, or commercial or institutional structure, a seismograph recording shall be made at or near the closest structure requiring protection.
- 1) Scaled Distance = The distance, in feet, from the blast to a specified location divided by the square root of the maximum weight of explosives, in pounds, to be detonated in any eight (8) millisecond period.
 - 2) To ensure compliance with the limits contained in this Section, the Department may require a seismograph recording of any or all blasts and may specify the location at which such recordings are made.
- h) As used herein, seismograph recording or record or air blast recording or record shall mean a visually inspectable cartesian representation of the time history of the particle velocity levels or air blast levels versus time. Time is represented on the "X" axis. The particle velocity is shown by three traces representing mutually perpendicular components of motion. The components are oriented vertically, transversely, and longitudinally to the horizontal direction from the recording location to the location of the blast. The air blast time history is represented by a single trace. The record or recording includes either an analog representation of, or a written description of the vertical scale for the particle velocity traces and the air blast trace. The units for the particle velocity traces and scale are in inches per second. The units for the air blast trace and scale are millibars, pounds per square inch, or decibels. The recording also includes an analog or descriptive time scale. The time units are in seconds.

(Source: Added at 11 Ill. Reg. 8250, effective July 1, 1987)

Section 1817.68 Use of Explosives: Records of Blasting Operations

- a) A record of each blast, including seismograph reports, shall be retained by the operator for at least three (3) years and shall be available for inspection by the Department and the public on request. The record is to be completed by the end of the work day following the day in which the blast occurred, including the seismograph meter reading, if available, and shall contain the following data:

- 1) Name of the operator conducting the blast;
- 2) Location, date, and time of blast;
- 3) Name, signature, and certification number of the blaster conducting the blast;
- 4) The name of the owner or resident of, and the direction and distance, in feet, to the nearest dwelling, school, church, or commercial, or institutional building either:
 - A) Not located in the permit area; or
 - B) Not owned by the person who conducts the surface mining activities;
- 5) Type of material blasted;
- 6) Number of holes, burden, and spacing;
- 7) Diameter and depth of holes;
- 8) Types of explosives used;
- 9) Total weight of explosives used;
- 10) Weight of explosives used per hole;
- 11) Maximum weight of explosives detonated within any eight (8) millisecond period;
- 12) Maximum number of holes or decks detonated within any eight (8) millisecond period;
- 13) Initiation system;
- 14) Type and length of stemming;
- 15) Type of delay detonator and delay periods used;

- 16) Sketch of the delay pattern, including decking;
 - 17) Reasons and conditions for each unscheduled blast; and
 - 18) Wind velocity and direction.
- b) Air blast and/or ground vibration recordings, or photopgraphic copies thereof, where required, shall be kept at the mine site office for a period of three (3) years following the date of the blast, and shall be available for inspection by the Department and the public on request. The recordings shall include the following:
- 1) Maximum air blast and/or ground vibration levels recorded;
 - 2) The exact location of the monitoring equipment, and its distance from the blast, and the date and time of the recording;
 - 3) Name of the person and firm making the recording;
 - 4) Name of the person and firm analyzing the recording. The recording shall be signed and dated by the person performing the analysis; and
 - 5) The type of instrument, sensitivity, and calibration signal or certification of annual calibration. When the recordings required at Sections 1817.67(c) and 1817.67(g) are produced via digitized systems, the sampling rate of the digitizer, in samples per second, shall be stated.

(Source: Amended at 11 Ill. Reg. 8250, effective July 1, 1987)

TITLE 62: MINING
CHAPTER I: DEPARTMENT OF MINES AND MINERALS

PART 1850
TRAINING, EXAMINATION AND CERTIFICATION OF BLASTERS

Section	
1850.5	Definition
1850.12	Applicability
1850.13	Training
1850.14	Examination
1850.15	Application and Certification
1850.16	Denial, Issuance of Notice of Infraction, Suspension, Revocation, and other Administrative Actions
1850.17	Judicial Review

AUTHORITY: Implementing and authorized by Surface Mining Control and Reclamation Act of 1977, (30 U.S.C. 1201 et seq.); and 30 CFR 816, 817 and 850) and The Surface Coal Mining Land Conservation and Reclamation Act, (Ill. Rev. Stat. 1983, ch. 96 1/2, pars. 7901.01 et seq.).

SOURCE: Adopted at 10 Ill. Reg. 3018, effective March 15, 1986.

Section 1850.5 Definition

The following term has the specified meaning:

"Blaster" means a person directly responsible for blasting operations in surface coal mining operations who is certified under this Part.

Section 1850.12 Applicability

Twelve months following the approval of this Part by the Office of Surface Mining pursuant to applicable federal regulations adopted under the Federal Surface Mining Control and Reclamation Act, 30 U.S.C. 1201, et seq. (1982), or twelve months following the effective date of this Part, whichever occurs later, each person directly responsible for blasting operations in surface coal mining operations shall be required to be a blaster as defined in this Part.

Section 1850.13 Training

- a) Training required herein, for those persons not previously trained in the subjects required herein, shall be conducted by the operator or his representative. The operator's representative may include, but is not limited to junior colleges, consultants, and explosives manufacturers. The training must meet the requirements of this Section.
- b) The training for blasters certification shall include instruction in:
 - 1) The design and layout of blasts, including geology, topography and the proper use of delays.
 - 2) Control of ground vibration.
 - 3) Control of flyrock and air blast.
 - 4) Design and loading of boreholes.
 - 5) Priming and boosting.
 - 6) Tamping and stemming, including methods and materials.
 - 7) Blast initiation systems.
 - 8) The use of blasting machines.
 - 9) The use of circuit testing equipment.
 - 10) The general properties of explosives, including blasting agents, and selection criteria.
 - 11) Ground vibration, air blast and monitoring.
 - 12) The use of ground vibration and air blast records as blast design factors.
 - 13) The need for accurate reports and blasting logs and their proper preparation.
 - 14) Current Illinois and Federal laws and regulations pertaining to blasting at the minesite, including 62 Ill. Adm. Code 1780.13, 1816.11(f), 1816.61 to 1816.68, 1817.61 to 1817.68; this Part; 62 Ill. Adm. Code 220.130; an Act, regulating the manufacture, possession, storage, transportation, use, sale or gift of explosives, 1939 Ill. Laws 508, as amended (Ill. Rev. Stat. 1983, ch. 96 1/2, pars. 4801); 30 CFR 816.61 to

816.68 (1985), 48 Fed. Reg. 9806-9807, 9492, 9809, 44780 (1983); 817.61 to 817.68 (1985), 48 Fed. Reg. 9809-9811, 9492, 44781 (1983); and Subpart 850 (1985), 48 Fed. Reg. 9492 (1983); 30 CFR 56.6000-56.6250 (1985), 50 Fed. Reg. 5040 (1985); 30 CFR 57.6000-57.6250 (1985), 50 Fed. Reg. 4082 (1985); 36 Fed. Reg. 9634 (1971); 43 Fed. Reg. 12320 (1978).

- 15) Planning for unpredictable blasting hazards to the public and mine personnel. Illustrative examples are adverse weather, stray electrical currents, flyrock, radio frequency energy, and misfires.
 - 16) Signs, warning signals and control of the potential flyrock area.
 - 17) Blasting plan requirements.
 - 18) Pre-blast and condition surveys and their use in blast design.
 - 19) Required blasting notices.
 - 20) Training and certification requirements.
 - 21) Handling, transportation and storage of explosives.
 - 22) New technology as it develops and is implemented in the field. The Department shall advise operators of new technology which should be included in future training programs.
- c) The blaster shall provide direction and on-the-job training to all non-certified blasting personnel under his supervision.

Section 1850.14 Examination

- a) Written examinations for blaster certification shall be administered at least semiannually, but not more than quarterly, on dates, times, and at locations announced by the Department via news releases, and direct communication with operators and individuals who request in writing to be so notified. Such notification shall be made at least sixty (60) days prior to the scheduled date of the examination. All persons scheduled for a regular examination session will be so notified in writing at least one (1) week prior to the scheduled exam date.
- b) Reexaminations shall be scheduled, if needed, for those persons who do not pass the regularly scheduled examination. The reexamination shall be scheduled approximately forty-five (45) days after each regular examination. The Department shall also allow for examination at this time those persons who have newly applied for certification at least thirty (30) days prior to the scheduled reexamination date. All persons scheduled for examination or reexamination during the reexamination session will be so notified by letter at least one (1) week prior to the scheduled reexamination session.
- c) If the applicant cannot attend the examination or reexamination session for which he or she is scheduled, the applicant shall so inform the Department at least one (1) day in advance of the examination date. Failure to do so will result in the application being rejected, and the applicant having to reapply for certification. Any person who cannot attend such a session and who informs the Department in accordance with this Section will be scheduled for the next examination or reexamination session.
- d) Applicants for blaster certification shall be examined in the topics set forth in Section 1850.13(b).

Section 1850.15 Application and Certification

- a) Each applicant shall submit a completed application for certification on forms supplied by the Department. In order to be scheduled for the next examination session, the application must be received by the Department not less than forty-five (45) days prior to that examination date. The Department shall review each application promptly and complete the review of each application not less than thirty (30) days following the date of receipt of the application. Any applicant whose completed application has been received, reviewed, and accepted by the Department more than fifteen (15) days prior to a regularly scheduled examination session shall be scheduled for that session. Any applicant whose application has been received, reviewed, and accepted less than fifteen (15) days before a regularly scheduled session will be included with the next regularly scheduled session or the next reexamination session. The following documents shall be included with the completed application form:
 - 1) A notarized statement from the applicant's employer or other person, including, but not limited to certified blaster or fellow employee, having personal knowledge of the applicant's blasting experience, and affirming that the applicant has had at least two (2) years' blasting experience.
 - 2) Proof that the applicant has successfully completed a blaster training course or courses that cover the material listed in Section 1850.13(b).
- b) The Department shall review each application, including required documents, for completeness and the accuracy of the statements contained in the application and required documents. The Department's acceptance of an application shall be based on the applicant's compliance with the requirements of this Part.
- c) Each applicant shall be required to pass a written examination established by the Department. The examination shall be based on the requirements of Section 1850.13(b). The minimum passing score shall be seventy percent (70%) correct answers. The Department retains the sole right to determine whether any or all responses to examination questions are correct.
- d) Any applicant whose application is denied shall be so informed in writing, within thirty (30) days of the date the applicant is found to be not qualified. Reason(s) for such denial shall be included with the notification. Each applicant who meets the requirements of subsection (a) above and who passes the examination required in subsection (b) above shall be issued a

blaster certificate as soon as practicable thereafter, but not more than forty-five (45) days after the examination date. Any applicant who meets the requirements of Section 1850.15(a), but who does not pass the examination, shall be so notified within fifteen (15) days of the examination date. That person may, upon written request, review his or her examination at the Department's Springfield office. Such request must be made and the review completed not less than ten (10) days prior to the reexamination date for which the applicant is scheduled. The review must be done during the Department's regular business hours. Any person who does not pass the examination shall be scheduled for the next reexamination session, pursuant to Section 1850.14(b).

- e) An employed blaster shall have readily available for inspection his or her certificate at the mine site.
- f) A temporary blaster certificate will be issued to any individual who applies to the Department for such certification and who provides a photocopy of his or her valid blaster certificate issued in another state with an Office of Surface Mining approved certification program, or the name of the state where the certificate was issued and the certificate number. The period of the temporary blaster certificate shall not exceed six months from the date of issuance. Such a temporary certificate shall be issued only once to any individual in any continuous five (5) year period.
- g) Each certificate shall be valid for five (5) years from the date of issuance. Recertification following expiration shall be in accordance with the application, examination, and certification requirements of this Part.
- h) Blaster certification shall not be assigned or transferred.
- i) Blasters shall not delegate their responsibility to any individual who is not a certified blaster.
- j) The blaster shall take reasonable precaution to protect his or her certificate from loss, theft, or unauthorized duplication. Such loss, theft, or duplication shall be reported to the Department without delay.

Section 1850.16 Denial, Issuance of Notice of Infraction, Suspension, Revocation, and other Administrative Actions

- a) The Department shall deny an application for, or revoke or suspend a certificate under the provisions of this Section if the Department finds that the applicant or certificant is, or was at the time of application or issuance, a person convicted of a felony under the laws of this or any other jurisdiction within the prior five (5) years, or who has been a patient in a mental institution within the prior five (5) years. The Department, when determining whether to revoke or suspend and when determining the length of a suspension, shall in addition to other factors, consider the nature of the felony of which the applicant was convicted, or the condition for which the applicant was confined to a mental institution, as well as the length of time since the conviction or confinement.

b)

- 1) The Department shall, when in the best interest of protecting public safety and public and private property, issue to the blaster a written notice of infraction, requiring remedial action, when, on the basis of any inspection, the Department determines that the blaster has committed any of the following infractions:

- A) Noncompliance with State Act Section 3.13 or 62 Ill. Adm. Code 1780.13, 1816.11(f), 1816.61 to 1816.68, 1817.61 to 1817.68, or this Part, or 62 Ill. Adm. Code 220.130, or an Act, regulating the manufacture, possession, storage, transportation, use, sale, or gift of explosives, 1939 Ill. Laws 508 as amended. (Ill. Rev. Stat. 1983, ch. 96 1/2, pars. 4801) or 30 CFR 816.61 to 816.68 (1985), 48 Fed. Reg. 9806-9807, 9492, 9809, 44780 (1983) or 30 CFR 817.61 to 817.68 (1985), 48 Fed. Reg. 9809-9811, 9492, 44781 (1983) or 30 CFR 850 (1985), 48 Fed. Reg. 9492 (1983) or 30 CFR 56.6000-56.6250 (1985), 50 Fed. Reg. 5040 (1985) or 30 CFR 57.6000-57.6250 (1985), 50 Fed. Reg. 4082 (1985); 36 Fed. Reg. 9634 (1971); 43 Fed. Reg. 12320 (1978).
- B) Providing false information or a misrepresentation to obtain certification.
- C) Unlawful use in the workplace of or current addiction to alcohol, narcotics, or other dangerous drugs.
- D) Noncompliance with any lawful order issued under the authority of The Surface Mined Land Conservation and Reclamation Act (30 U.S.C. 1201, et seq. (1982), Section

3.13 of the State Act, or 62 Ill. Adm. Code 1780.13, 1816.11(f), 1816.61 to 1816.68, 1817.61 to 1817.68, 1840.2, 1814.12, or this Part.

- 2) The maximum time allowed to abate the infraction by completing the remedial action shall be stated in the notice and shall include consideration of the nature of the infraction, as well as the availability of resources to complete the abatement. Remedial actions may include, but need not be limited to, a requirement to receive additional training or undergo reexamination to demonstrate competence. A copy of such notice shall be forwarded to the blaster's employer. Any such notice may be terminated when the remedial action has been completed, modified to correct deficiencies or errors or make other changes in the notice or to change the required abatement date, or vacated if the infraction did not occur or occurred as the result of sabotage by persons other than the blaster.
 - 3) The blaster may file a request for review, and if desired, a hearing within thirty (30) days of the receipt of the notice of infraction. The request shall include the blaster's name, certification number, identification of the notice, and the date of the notice. The request shall be forwarded to: Hearings, Illinois Department of Mines and Minerals, Land Reclamation Division, 227 South Seventh Street, Springfield, Illinois 62701. If a hearing is requested, the hearing shall be conducted in accordance with 62 Ill. Adm. Code 1845.19(b), (c) and (d) and shall be held at a location in Illinois as near the blaster's place of employment as a hearing room can be located. The Department shall give at least five (5) days notice of the date, time and location of the hearing to the blaster, his or her employer, the Director, Office of Surface Mining, and any person who filed a report which led to the notice that was issued.
 - 4) The filing of a request for hearing shall not act as a stay of the remedial actions required as part of the notice of infraction.
- c)
- 1) The Department, upon a finding of willful commission of an infraction by the blaster, shall issue to the blaster a written notice to show cause why his certification should not be suspended or revoked for a specified period (not to exceed the term of the certificate).
 - 2) The blaster shall have twenty-one (21) days from the receipt of the notice or other time period necessary for adequate

response as may be set out in the notice, in which to file an answer and request a hearing. If the blaster files an answer to the show cause order and requests a hearing, a public hearing shall be provided and conducted in accordance with 62 Ill. Adm. Code 1845.19(b), (c) and (d). The Department shall give thirty (30) days written notice of the date, time and location of the hearing to the Director, Office of Surface Mining, the blaster, and the blaster's employer, and any person who filed a report which led to the order that was issued.

- 3) If the Department determines that the infraction resulting from the willful act on the part of the blaster creates an imminent danger to health or safety of the public or imminent damage to public or private property, the Department shall immediately issue a temporary suspension of the blaster's certificate. The temporary suspension shall be in writing, and shall, with reasonable specificity, set forth the nature of the infraction and the imminent danger or damage incurred or about to be incurred. Such suspension shall be subject to a hearing to be provided not less than fifteen (15) days after the blaster's receipt of the temporary suspension. The hearing shall determine whether the suspension shall be continued, terminated or whether the certificate shall be revoked. Temporary suspension issued under the authority of this subsection shall not exceed fifteen (15) days. The hearing shall be conducted in accordance with 62 Ill. Adm. Code 1845.19(b), (c) and (d) and shall be held at the Department's Springfield office or its field office located at Marion, Illinois.
- 4) Upon written notice of revocation, including the findings upon which the notice is based, the blaster shall without delay surrender the revoked certificate to the Department.

Section 1850.17 Judicial Review

All final administrative decisions of the Department shall be subject to judicial review pursuant to the Illinois Administrative Review Law, (Ill. Rev. Stat. 1983, ch. 110, pars. 3-101, et seq.) as amended.

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TITLE 25. RULES AND REGULATIONS
PART I. DEPARTMENT OF ENVIRONMENTAL RESOURCES
Subpart D. ENVIRONMENTAL HEALTH AND SAFETY
ARTICLE IV. OCCUPATIONAL HEALTH AND SAFETY

CHAPTER 209. COAL MINES

Subchapter A. GENERAL SAFETY IN BITUMINOUS COAL STRIP MINES

Authority

The provisions of this Subchapter A issued under act of May 31, 1945, P.L. 1198 § 4.2 (52 P.S. § 1396.4b).

Source

The provisions of this Subchapter A adopted November 5, 1971, effective December 1, 1971, 1 Pa. B. 2162.

GENERAL PROVISIONS

§ 209.1. Information to workmen.

When first employed, every workman shall have his attention directed to the provisions of this Subchapter and he shall be furnished a printed copy of the provisions of this Subchapter by the operator.

§ 209.2. Supervision of operations.

A foreman shall be employed or designated at every operation. In case of necessary absence, a competent person shall be appointed to act as foreman. If a strip mine operates more than one shift, an assistant foreman shall be designated to supervise this work. A foreman may supervise two operations if they are within easy walking distance of each other.

§ 209.3. Safety inspections.

(a) The foreman, or a competent person designated by the operator, shall make a daily examination of each operation, including machinery, to insure, as far as practicable, safe working conditions for all employees.

(b) The person making the inspection shall sign a log-book, maintained for this purpose, stating that such inspection has been made. Any hazardous or unsafe conditions, if not corrected immediately, shall be noted in the log-book to insure that corrective action will be taken as soon as practicable. Such log-book shall be available at the operation for inspection by the district mine conservation inspector and other authorized Departmental personnel.

SAFETY CLOTHING

§ 209.11. Headgear.

All persons entering the pit shall wear hard hats as a protection against falling materials.

§ 209.12. Shoes.

All persons at the operation subject to the hazard of toe injuries shall wear safety toe shoes.

§ 209.13. Eye protection.

All persons employed in or about the operation where the eyes are in danger of being injured due to flying particles, or other hazards, shall wear safety goggles or other adequate eye protection.

EQUIPMENT

§ 209.21. Moving parts and gears.

All gears and moving parts of all machinery and equipment shall be adequately and safely guarded.

§ 209.22. Repair of equipment.

(a) Any guard or protective device removed for repairs or alterations shall be promptly replaced. The machine or equipment from which the guard is removed shall not be operated until such guard is replaced.

(b) All machinery shall be brought to a complete rest prior to oiling, greasing, refueling or repairing.

(c) While greasing, repairing or making adjustments to the boom of shovels or draglines, the boom shall be lowered to a position where the work can be done from the ground.

(d) When repairs are being made to the blade of a bulldozer, the blade and its assembly shall be braced, blocked and supported.

§ 209.23. Catwalks.

Any catwalks on machinery and equipment shall be provided with a suitable hand rail and kept free of obstruction at all times.

§ 209.24. Machines at rest.

The buckets of all machinery and the blade of the bulldozer shall be lowered to the ground position while the machine is at rest or out of service.

§ 209.25. Mobile machinery.

(a) Operators of all mobile machinery and equipment shall stop all machines and place the controls in "OFF" position prior to leaving the controls or the cabs. In the event of any manner of power failure or other unusual condition, the machine shall be stopped immediately and the controls placed in the "OFF" position. Operation of the machine shall not be resumed until properly authorized to do so.

(b) All mobile equipment shall be provided with an approved, audible warning device. Prior to the movement of such equipment, forward or backward, the operator shall sound the device as a warning that the machinery is being moved. All men in the immediate vicinity shall respond immediately by moving to a safe place away from the moving machine.

§ 209.26. Operating equipment.

(a) Equipment that revolves in an arc shall have a minimum of three (3) feet of clearance from the highwall, low wall or any other obstruction.

(b) The bulldozer operator shall at all times keep a safe distance from the edge of all vertical or abrupt excavations or fills.

(c) Equipment operators shall not lift or swing machinery over men working in the pit area.

§ 209.27. Loading trucks.

While being loaded, all truck drivers shall remain in the cabs of their truck. No person shall be permitted on the sides or top of the truck while it is being loaded.

EXCAVATING

§ 209.31. Angle of earth cuts.

All earth cuts above the rock shall be sloped to an angle not exceeding forty-five (45) degrees.

§ 209.32. Removal of rocks.

Loose and overhanging rocks or rock ledges shall be immediately removed.

§ 209.33. Upkeep of low walls.

Low walls shall be kept safe and sloped in such a manner as to prevent any overhanging material.

§ 209.34. Pipe lines and wells.

There shall be no excavating within one hundred (100) feet of any pipe lines or active or inactive oil or gas wells until precautions have been taken to insure and prevent inadvertent rupturing of the lines or wells.

§ 209.35. Night operations.

When stripping or other operations are done at night, the pit in the vicinity of the work shall be well illuminated.

EXPLOSIVES

§ 209.41. Jurisdiction of Department.

The storage and use of any blasting agent at any bituminous coal strip mine operation shall be under the exclusive jurisdiction of the Department.

§ 209.42. Ammonium nitrate.

(a) Ammonium nitrate shall be considered an explosive only after it has been mixed with an organic material such as fuel oil or other sensitizing material.

(b) The mixing of ammonium nitrate with the sensitizing agent must be done away from the storage area. The storage area shall be kept clean and free of any other organic material.

§ 209.43. Storage magazine.

(a) The permanent storage magazine shall be made of incombustible material and reasonably bullet-proof. There shall be no metal or sparking material exposed inside the magazine. There shall be no openings except for entrance or ventilation. The magazine shall be provided with doors constructed of at least three-eighths inch steel plate lined with at least two inches of wood or equivalent thereof. All doors shall be closed and securely locked while the magazine is unattended. All openings for ventilation shall be screened.

(b) The magazine shall not be located within two hundred (200) feet of any active strip mine pit, operating deep mine, strip mine access road, occupied dwelling or public

road, unless barricaded. The areas surrounding the magazine, for a distance of twenty-five (25) feet, shall be kept free of all combustible material. Smoking or open lights are prohibited within twenty-five (25) feet of the magazine.

(c) Suitable warning signs shall be erected, so located that a bullet passing through the sign will not strike the magazine. If magazines are to be illuminated electrically, lamps shall be of the vapor proof type, properly wired and installed. Sensitized ammonium nitrate shall not be stored in stacks exceeding six (6) feet in height.

(d) Where trailers are used for permanent storage magazines, the following shall be adhered to:

(1) To insure protection against fire, the outside of the trailer-top, sides, and bottom-shall be made of metal.

(2) The trailer shall be lined with four (4) inches of hardwood on the top, sides and ends.

(3) The floor of the trailer shall be of wood construction, at least two (2) inches in thickness.

(4) The doors on the inside shall be made of three (3) thicknesses of seven-eighth inch matched hardwood boards covered on the outside with three-eighth inch steel plate.

(5) There shall be no exposed metal parts (nails, bolts, etc.) inside the magazine.

(6) The trailer magazines shall be adequately ventilated. There shall be at least one hole on each side of the magazine. At the top of the magazine holes shall be at least six (6) inches square. At the bottom of the magazine holes shall be at least three (3) inches square. All ventilation holes shall be covered with at least six (6) gauge, three-quarter inch mesh screen.

(7) Ammonium nitrate shall not be stacked closer than twelve (12) inches from the ends, sides or roof of the trailer magazine.

(8) The area surrounding the trailer for a distance of twenty-five (25) feet shall be kept clear of combustible material.

(e) Magazines used for temporary storage of explosives or detonators shall be constructed in the form of stout wooden boxes, covered with not less than twenty-four (24) gauge sheet iron, with a hinged lid, a proper lock and be fire resistant. These boxes shall be kept securely locked when not in use. Only sufficient materials for one days work shall be kept in the temporary storage magazines.

(f) Electric detonators shall not be stored with other explosives. Detonators shall be kept separated and locked apart from explosives.

(g) Open lights or other sources of flame are prohibited in or about temporary or permanent storage magazines.

§ 209.44. Smoking prohibited.

Smoking is prohibited while handling explosives.

§ 209.45. Transportation of explosives.

(a) When explosives are transported from the permanent storage magazine to the temporary magazine or to the area of the blasting operation, the vehicle shall be insulated with wood and the load shall be covered with a tarpaulin. The vehicle shall be identified with "explosive" signs displayed on both sides, front and rear. The truck shall be attended at all times times by the driver of the vehicle who shall be solely responsible for the contents of the explosives truck or vehicle.

(b) The detonators shall be transported in a separate compartment from the explosives. Detonators are not permitted to be carried in the cab of the truck.

§ 209.46. Competency of blaster.

All blasting, including the preparation of charges and loading of the holes, shall be done by a competent person (blaster) designated by the operator.

§ 209.47. Materials in blasting area.

No more than the amount of explosives and detonators that are required for one series of shots shall be permitted in the vicinity of the area to be blasted.

BLASTING

§ 209.51. Making primers.

Primers shall not be made up until the charge is ready to be placed in the hole.

§ 209.52. Time for firing.

Any holes or series of holes containing electrical detonators shall be fired immediately after charging.

§ 209.53. Ceasing operations.

(a) When explosives are being loaded in drill holes in preparation for a shot, all work within a radius of 50 feet of the blast area, except for the work being accomplished by the persons engaged in the blasting operation, shall cease and all machinery within the confines of this area shall be brought to a complete rest. After inspection of the blast area by the Department, the Department may establish an alternate distance limitation.

(b) When a shot is about to be set off or fired, all machinery within a radius of five hundred (500) feet shall be brought to a complete rest, all work cease within the confines of this area and all workmen shall retreat to a safe location. The five hundred (500) foot guideline shall take effect when the blaster first begins to wire the shot.

Source

The provisions of section 209.53(a) amended on April 20, 1982, effective October 16, 1982, 12 Pa. B. 3736.

§ 209.54. Specifications for tamping blocks.

Tamping sticks or blocks used for stemming the holes for blasting shall be made of wood or other soft non-sparking material.

§ 209.55. Electric detonation.

Explosives shall be detonated electrically. The detonator wires shall be shunted or short circuited until immediately before connecting the lead wires with the source of current.

§ 209.56. Primacord or other devices.

Primacord or any other similar blasting device - by means of which one or more blasts may be fired by the use of detonators attached thereto on the outside of the hole - may be used for blasting purposes, and fired either by electric blasting cap or by another device.

§ 209.57. Responsibility for connection and firing.

The person who makes the connection to the detonator wires shall make all other connections and finally fire the blast.

§ 209.58. Mudcapping.

(a) Mudcapping shall be permitted only where it would endanger the safety of the workmen to drill the rock to be blasted.

(b) If mudcapping is necessary, a maximum of ten (10) pounds of explosive shall be used.

§ 209.59. Disconnecting shot firing cables.

Shot firing cables shall be disconnected immediately from the blasting unit after each shot, and the firing ends of the cable shall be shunted.

§ 209.60. Protection of persons and property.

(a) When a blast is about to be fired, sufficient warning shall be given that any person or persons approaching the blast area may be warned of the danger and shall be given ample time to retreat a safe distance from the blast area.

(b) Public highways and all entrances to the operation shall be barricaded and guarded by the operator in all cases where such highways and entrances to the operations are located within one thousand (1,000) feet of any point where a blast is about to be fired.

(c) Where a blast is about to be fired within two hundred (200) feet of a pipe line, the operator shall exercise such necessary caution as may be needed for the protection of the pipe line. The operator shall notify the owner of said line of his intention to blast, giving a description of the precautionary measures that will be taken.

(d) When blasting is to be done within one thousand (1,000) feet of schools, public buildings or occupied dwellings, it shall be done only during the time designated by the mine conservation inspector of the district. Prior to such blasts, the operator or foreman in charge of the blasting operation shall, within twenty-four (24) hours prior to the blast, notify all persons within this area that a blast is to be detonated. Approval of the method of notification shall be obtained from the mine conservation inspector prior to commencing any such blasting.

(e) No blasting shall be done within the confines of an area of two hundred (200) feet of a public building or occupied dwelling unless prior written consent of the property owner has been obtained.

(f) Blasting shall be prohibited in all cases where the effect of such blasting is liable to change the course or channel of any stream. No blasting shall be done so close to the banks of a stream that the banks would be ruptured or broken permitting the water to enter the pit.

§ 209.61. Misfired shots.

(a) The blaster shall wait at least thirty minutes prior to returning to a misfired shot or series of shots.

(b) When a charge has misfired, extra precaution shall be taken in the recovery of the explosive and blasting cap.

§ 209.62. Post-blasting examination of area.

The blaster shall make a thorough examination for misfires or other dangers following all blasts, before the workmen are permitted to return to the vicinity.

§ 209.63. Return to area.

No person shall be permitted to return to the blasted area for a period of five (5) minutes where multiple shooting has been done.

§ 209.64. Blasting hours.

Blasting hours shall be between sunrise and sunset.

§ 209.65. Prohibition of blasting by mine conservation inspector.

The mine conservation inspector may prohibit blasting in specific areas where the safety of the public is endangered.

OXYGEN AND GAS

§ 209.71. Marking containers.

All oxygen and gas tanks or cylinders shall be plainly and clearly marked.

§ 209.72. Restriction on use.

(a) All oxygen and gas tanks or cylinders and their contents shall be used solely for their intended purpose.

(b) All oxygen and gas hose lines, gauges, and valves shall be maintained and used in a safe operating condition. Defective tanks, cylinders, gauges, hose lines, torches or other welding or burning equipment shall be promptly removed from use or service. Such defective equipment shall not be used, put back or returned to service until such has been repaired, corrected and made safe.

(c) Oxygen or gas shall not be used under direct pressure from tanks or cylinders but must be used under reduced pressure not exceeding pressures recommended by the manufacturers of said oxygen or gas.

(d) Oxygen or gas shall not be used near oil, grease, or fine coal dust until such oil, grease, or fine coal dust is adequately cleaned from the area where such work is to be done, thoroughly wetted or made inert by the use of rock dust or other approved inert material.

§ 209.73. Storage of containers.

(a) All oxygen and gas tanks or cylinders shall be kept a reasonable distance from the area where the cutting and welding is being done to prevent heat from affecting such tanks or cylinders and possible accidents to employees.

(b) All oxygen and gas tanks or cylinders shall be protected from power lines or energized electrical machinery or circuits.

(c) All oxygen and gas tanks, when empty, shall be plainly marked "empty" and shall be promptly moved to the central storage or distribution station.

§ 209.74. Personnel and equipment.

(a) The person or persons assigned to work with oxygen or gas shall be properly trained in its use and purpose and fully conversant with the dangers of its misuse.

(b) Any person or persons using oxygen or gas shall be provided with goggles, shields, and protective fireproof clothing (gloves, apron or coveralls). His clothing shall be reasonably free of oil, grease, and other flammable substances.

(c) A suitable wrench, designed for oxygen and gas tanks, shall be in the possession of the person authorized to use the equipment.

§ 209.75. Lighting torches.

Only an approved type of spark-lighter shall be use for lighting torches. The use of matches, cigarette lighters, electric arcs or hot metal to light or re-light a torch is prohibited.

§ 209.76. Transportation of tanks and cylinders.

(a) Oxygen and gas tanks or cylinders shall not be transported with the hoses and gauges attached.

(b) The valve protection caps shall be placed on all tanks or cylinders, for which caps are provided, when not in use and when being transported.

§ 209.77. Testing for leaks.

Tests for leaks on hose valves or gauges shall be made only with a soft brush and soapy water or soap suds.

ELECTRICITY

§ 209.81. Enclosing of terminals.

Storage battery terminals shall be enclosed so as to reduce short circuiting to a minimum.

§ 209.82. Criteria for apparatus and conductors.

All electrical apparatus and conductors shall be of sufficient size and power to accomplish the work for which they are designed. They shall be efficiently covered and safeguarded, and so installed, worked and maintained as to reduce to a minimum any danger from accidental shock or fire. They shall be of such construction, and so worked, that rise of temperature caused by ordinary working will not damage the insulating material.

§ 209.83. Operation near power lines.

When machinery is being operated or being moved under power lines, an interval of fifteen (15) feet shall be maintained between the farthest reaching point of such equipment and said power lines, or as much more as deemed necessary as recommended by the mine conservation inspector or the utility company.

§ 209.84. Protective gloves and tools.

Employers shall furnish suitable insulating gloves and insulated tools to employees performing work that requires them to come in contact with electrical equipment involving shock hazards.

§ 209.85. Rubber mats.

Insulating rubber mats shall be placed on the floor at all electrical switch boxes and control breakers to reduce the hazard of electrical shock.

§ 209.86. Trailing cables.

Trailing cables to electrically powered machinery shall be maintained in a safe operating condition. Any and all splices shall be mechanically and electrically efficient. Trailing cables shall be inspected by the foremen, or other designated individual, at least once a week. Any defective cable that could cause an electrical shock or arc shall be immediately removed from service and shall not be reused until properly repaired.

§ 209.87. Protection of electric cables.

Mobile equipment shall not travel or be permitted to travel over electric cables unless such cables are adequately protected.

FIRE PROTECTION

§ 209.91. Fire extinguishers.

(a) The minimum acceptable size of fire extinguisher shall be of the four-unit dry chemical (7-1/2 pounds) type or the equivalent thereof.

(b) Fire extinguishers shall be kept and maintained on each piece of mobile equipment and in all buildings.

(c) A fire extinguisher shall be provided and maintained in the area where any burning or welding is being done.

(d) A fire extinguisher shall be kept and maintained on vehicles transporting oxygen or gas tanks or cylinders.

§ 209.92. Flammable liquids.

(a) Gasoline or other fuels, other than those contained in the fuel tanks, shall not be stored on machinery or equipment.

(b) Flammable liquids - oils, grease, gasoline, and other similar materials - shall be stored in buildings or compartments used exclusively for this purpose.

(c) Flammable liquids shall not be used to clean machinery.

(d) Gasoline or kerosene shall not be used to kindle a fire.

§ 209.93. Smoking and open lights.

Smoking and the use of open lights is prohibited in all places where flammable liquids and materials are stored and in all fire-hazard areas.

ACTIVE OR ABANDONED DEEP MINES

§ 209.101. Notification of responsible official.

The superintendent or mine foreman of any deep mine shall be notified immediately when a stripping operation may in any way interfere with the safe operation of the active deep mine.

§ 209.102. Protection of employees.

Special precautions shall be taken to protect the employees where excavating is being done in the vicinity of an abandoned deep mine or portion thereof, which may contain a dangerous accumulation of water or gas.

§ 209.103. Openings in abandoned mines.

All openings made into abandoned deep mine workings shall be immediately closed or fenced off. If fenced, an approved danger sign shall be placed on the fence to serve as a warning for persons not to enter.

TIPPLES AND LOADING RAMPS

§ 209.111. Equipment required.

(a) An adequate bumping block, at least eight (8) inches in height, shall be installed at all dumping points.

(b) Both sides of the ramp shall be provided with securely anchored rubbing boards.

(c) Guard rails shall be installed on both sides of coal loading docks.

(d) All walkways and stairs shall have hand rails.

(e) Elevated platforms, floor openings and runways shall be provided with toeboards.

§ 209.112. Ladders.

All ladders shall be securely fastened. Permanent ladders, more than ten (10) feet in height, shall be provided with a backguard.

§ 209.113. Hazards to passage.

Platforms, stairways and runways shall be kept clear of stumbling and slipping hazards and maintained in good repair.

§ 209.114. Lighting.

Lights shall be provided, where needed, on all walkways, stairways, ramps, ladders, openings and other means of ingress or egress.

§ 209.115. Housekeeping.

Good housekeeping shall be practiced in and about the buildings, yards and equipment.

FIRST AID

§ 209.121. Equipment required.

First aid equipment and supplies shall be provided, maintained and suitably housed at every strip mine operation. An adequate amount of first aid equipment shall include:

- (1) One (1) stretcher
- (2) Two (2) woolen blankets
- (3) One (1) waterproof blanket
- (4) One (1) set of first aid charts
- (5) Twenty-four (24) sterilized, 40 inch triangular bandages
- (6) Twelve (12) sterilized, 1 inch, bandage compresses
- (7) Thirty-two (32) sterile, 1 inch adhesive compresses
- (8) Sixteen (16) sterilized, 2 inch bandage compresses
- (9) Eight (8) sterilized, 4 inch bandage compresses
- (10) Five (5) packages of sterile gauze, 1 yard square, folded
- (11) Five (5) packages of sterile picric acid gauze, 1 yard square, folded, or the equivalent approved for the treatment of burns
- (12) Four (4) packages of amoules of aromatic spirits of ammonia for internal use.
- (13) Two (2) packages of inhalant amoules of aromatic spirits of ammonia
- (14) Twelve (12) paper cups (open, nested)
- (15) Two (2) tourniquets
- (16) One (1) pair dressing scissors
- (17) One (1) pair tweezers
- (18) Six (6) splints of yucca or similar material

§ 209.122. Personnel required.

A minimum of two (2) men trained in the fundamentals of first aid shall be employed at each strip mine operation. If fifty or more men are employed at one operation, the number of men trained in the fundamentals of first aid shall be at least five.

Subchapter B. EXPLOSIVES IN ANTHRACITE COAL STRIP MINES

Authority

The provisions of this Subchapter B issued under act of June 27, 1947, P.L. 1095, § 20 (52 P.S. § 681.20).

Source

The provisions of this Subchapter B adopted November 5, 1971, effective December 1, 1971, 1 Pa. B. 2162.

GENERAL PROVISIONS

§ 209.141. Report required.

Each stripping operator shall furnish the district mine inspector with a written report of each stripping blast of overburden on a form to be furnished by the Department of Environmental Resources. This report shall contain the following information: Plan of blasting including depth of hole, spacing and burden; number of holes fired; amount of explosives in each hole; total amount of explosives used; diameter of holes; name of explosives representative and other information.

§ 209.142. Investigation of complaints.

(a) If complaints relative to blasting are received, the strip mine inspector shall make a prompt investigation, visiting the complainants to determine the magnitude of the blasting disturbance. If, after consideration of the quantities of explosives, etc., the proximity to the source of complaint and the magnitude of disturbance, the inspector deems it necessary, he shall determine the method of blasting to be used, making as many tests and corrections as may be necessary to achieve a satisfactory result.

(b) During the course of such testing and correction, the inspector may require seismograph readings. If so, the strip mine operator shall furnish, at his own expense, the means of obtaining seismograph readings. Complete copies of all seismograph recordings and the interpretation of thereof shall be furnished to the strip mine inspector.

(c) Upon completion of the testing, the strip mine inspector shall instruct the strip mine operator, in writing, of the maximum allowable plan of blasting for the operation.

(d) The operator may not change or exceed the plan without receiving prior written permission from the strip mine inspector.

§ 209.143. Blasting license required.

No person shall be employed to act as blaster or shot-firer, nor shall any person be placed in charge of blasting, preparation of charges or loading of blast holes, unless he is the possessor of a "Blasting License" issued by the Pennsylvania Department of Labor and Industry.

§ 209.144. Compliance with manufacturers' rules.

Unless otherwise specified in this Subchapter, the manner of handling, storing, use or blasting of any explosives, detonators, detonating fuse, etc., shall be in accordance with the rules of the manufacturers. The rules of the manufacturers shall be endorsed with the signature of the strip mine operator or a responsible official of the operation using such explosives.

§ 209.145. Responsibility of permittee.

(a) Notwithstanding any other regulations, no blasting, whether of overburden or of coal, shall be done or performed in such manner and under such circumstances or conditions as to eject debris into the air, as to constitute a hazard or danger or do harm or damage to persons or property in the area of the blasting.

(b) The holder of a coal stripping permit shall be responsible for the conduct of blasting on the stripping site and shall supervise the same, whether blasting is done by the holder of the certificate or any other person.

EXPLOSIVES

§ 209.151. Storage magazines.

(a) The permanent explosives storage magazines shall be bullet, fire and weatherproof, protected from fire, and constructed in accordance with data provided by the Department. Blasting caps or electric detonators shall not be stored in the same magazine with other explosives.

(b) Surface magazines for the separate storage of detonators need not be bulletproof, but they shall be in accordance with other requirements for storing explosives.

(c) The area surrounding magazines for the storage of explosives or detonators shall be kept free of rubbish, dry grass or other combustible materials.

(d) No open lights or flame producing devices may be taken into any explosives storage magazine. If magazines are electrically lighted, the lamps shall be a vapor proof type properly installed and wired.

(e) Magazines used for temporary storage of explosives or detonators shall be constructed in the form of stout wooden boxes, covered with not less than twenty-four

(24) gauge sheet iron, with a hinged lid, a proper lock and be fire resistant. These boxes shall be kept securely locked when not in use. Only sufficient materials for one days work shall be kept in the temporary storage magazines.

(f) Electric detonators shall not be stored with other explosives. Detonators shall be kept separated and locked apart from explosives.

§ 209.152. Storage restrictions.

Explosives or detonators may not be stored in otherwise occupied buildings and may not be stored in conjunction with tools, supplies or equipment of any kind.

§ 209.153. Frozen explosives.

Explosives that have been frozen shall not be used, but shall be returned to the manufacturer.

§ 209.154. Ammonium nitrate.

The use of fertilizer grade ammonium nitrate (prilla) as a blasting agent is recognized. From the moment this material is mixed with fuel oil or sensitized by admixture with any other substance, either at the site or as a premix such as ANFO, it shall be subject to all of the regulations that apply to any other explosive, and shall be stored, handled and used in accordance with said regulations.

PREPARATION FOR BLASTING

§ 209.161. Limited quantities at site.

(a) Explosives shall be delivered to the site at the time of charging the holes. Excessive quantities of explosives shall not be on the site. If more than one truck load is required, the additional truck or trucks shall be stationed off the site in a safe position until the explosive is required.

(b) Any excess blasting materials shall be removed from the area before blasting.

§ 209.162. Mudcapping.

Mudcapping shall be prohibited unless a situation arises where drilling would be hazardous. If mudcapping becomes necessary, not more than ten (10) pounds of explosives may be used in any one blast. Not more than one (1) charge may be considered as constituting a blast, unless such charges are detonated with instantaneous electrical initiating devices.

§ 209.163. Covering trunk lines.

All trunk lines of Primacord should be covered. However, trunk lines of Primacord shall be covered if they are within 2,000 feet of occupied buildings.

§ 209.164. Covering blast holes.

(a) All blast holes shall be covered securely during the interval between drilling and blasting.

(b) All blast holes drilled and abandoned without blasting, and all exploratory drill holes not otherwise used shall be completely backfilled.

§ 209.165. Making primers.

Primers shall be made up at the site by the person in charge of the blast.

§ 209.166. Stranded wire prohibited.

No stranded wire shall be used in any blasting circuit.

§ 209.167. Number of detonators.

The number of detonators in a blasting circuit, instantaneous or delayed, shall not exceed the rated capacity of the blasting machine.

§ 209.168. Testing equipment.

(a) The blasting machine shall be tested frequently to insure that the power output is adequate.

(b) All blasts fired electrically shall be thoroughly tested by means of a galvanometer containing a silver chloride cell immediately before initiation. Each detonator and the entire circuit shall be so tested.

§ 209.169. Tamping tools.

Tamping sticks or blocks shall be of wood or soft non-sparking materials.

§ 209.170. Stemming material.

Stemming material or tamping material shall not contain lumps.

§ 209.171. Removing stuck cartridges.

(a) Large diameter cartridges that have become stuck in a blast hole shall not be driven through with a dolly. After pouring water into the hole, attempts may be made to dislodge or pierce the cartridge with a spear-shaped wooden block or a small diameter wooden pole.

(b) If a cartridge is primed with a detonator, no attempt shall be made to remove the cartridge or force it through the hole by any means.

§ 209.172. Authorized personnel.

When blast holes are being charged preparatory to blasting, only those persons necessary to the work of charging the holes shall be allowed at the scene.

SPECIAL WARNINGS AND PRECAUTIONS

§ 209.181. Pipe lines.

Where a blast is to be fired within 200 feet of a pipe line, the operator shall exercise such necessary caution as may be needed for the protection of the pipe line. The operator should also notify the owner of said line of his intention to blast giving a description of the precautionary measures that will be taken.

§ 209.182. Streams.

(a) Blasting shall be prohibited in all cases where the effect of such blasting is liable to change the course or channel of any stream, without first obtaining a permit from the Department.

(b) No blasting shall be done so close to the banks of a stream that the banks would be ruptured or broken permitting the water to enter the strip mine pit.

§ 209.183. Public highways.

Public highways shall be barricaded and guarded by the operator in all cases where

such highway or highways are located within 800 feet of any point where a blast is about to be fired.

§ 209.184. Electrical equipment and facilities.

(a) Electrical equipment or short wave radio transmitters shall not operate in the area while blast holes are being charged. Power sources in the area shall be disconnected.

(b) When blasting in the immediate vicinity of high voltage electric transmission lines, the proper officials of the power company must be notified to permit the arrangement of safety requirements and repair facilities.

§ 209.185. Deep mines.

(a) Where a strip mine is operating in the proximity of an active deep mine, the strip mine operator shall notify the strip mine inspector in advance of his intention to blast. The strip mine inspector shall, in turn, notify the deep mine inspector and together they shall instruct both the strip mine operator and the deep mine operator as to procedure.

(b) Prior to blasting, the strip mine operator shall give sufficient advance notice to the deep mine operator, superintendent or mine foreman of his intention to blast.

(c) The deep mine operator, superintendent or mine foreman shall remove all workmen from the mine. The strip mine operator shall ascertain that all workmen have been removed from the mine before blasting.

(d) Where there is a known or suspected connection between the deep mine and the strip mine, the operator, superintendent or mine foreman of the deep mine shall, after the blast, make or cause to be made sufficient tests to insure the absence of carbon monoxide or other harmful gases before allowing workmen to re-enter the mine.

(e) The deep mine operator, superintendent or mine foreman shall make or cause to be made sufficient examinations of the deep mine to determine whether any other danger exists before allowing workmen to re-enter the mine, just as other pre-shift examinations are made.

§ 209.186. Smoking or flame.

Smoking or any fire or flame producing device shall not be permitted within the area when blast holes are being loaded.

§ 209.187. Warnings.

Before any blast is fired ample warning shall be given, and it must be determined that all persons are in a place of safety.

BLASTING

§ 209.191. Time for blasting.

(a) No blast holes may be charged during the course of an electrical storm.

(b) Blasting shall proceed promptly after the holes have been charged.

(c) Blasting shall not be permitted at any strip mine prior to one-half hour after sunrise or after one-half hour before sunset.

(d) Blasting in the immediate vicinity of residential areas shall be subject to time schedules set by the mine inspector. The inspector, in setting up such schedules, shall take into account the working and sleeping habits of the residents, and particularly the presence of seriously ill persons in the nearby homes.

§ 209.192. Detonation.

(a) Explosives shall be detonated electrically and the detonator wires shall be shunted or short-circuited until immediately before connecting the lead wires with the source of current; provided that Primacord or other similar detonating devices, by means of which one or more blasts may be fired by the use of detonators attached thereto on the outside

of the hole, may be used for blasting purposes, and fired either by electric blasting cap or by fuse and cap.

(b) No blast shall be detonated from a positive power circuit. Any blast detonated electrically shall be initiated by a blasting machine. The lead wires shall not be connected to the blasting machine until immediately before initiating the blast. The lead wires shall be disconnected immediately after blasting and shunted. The blasting machine shall be kept in good condition and shall be the personal charge of the person initiating the blast.

§ 209.193. Responsibility for connections and firing.

The person who makes the connections to detonator wires shall make all other connections and finally fire the blast.

MATTERS FOLLOWING BLASTING

§ 209.201. Misfired holes.

(a) All blast areas shall be examined immediately after blasting for misfired holes. Misfired holes shall be disposed of by drilling and blasting a parallel hole at least five (5) feet away, by repriming and blasting or by washing out with a jet of water. Any work in connection with the disposal of a misfired hole shall be under the direct supervision of a responsible official.

(b) If, during the course of excavation following blasting, any evidence of a missed hole is discovered, excavation shall immediately cease. A responsible supervisor shall be notified and the further exploration or disposal of such a missed hole shall be under his direct supervision.

§ 209.202. Return to area.

A responsible official or other competent authorized person representing the operator shall make a thorough examination before the workmen are permitted to return to the blast area.

§ 209.203. Permit suspension or revocation.

If, as a result of a stripping blast, in either coal or overburden, the material is hurled through the air causing damage to homes or other property or endangering public safety, health and general welfare, the Department may, for the first offense, suspend the stripping permit for a period of one (1) month and for the second offense may revoke the stripping permit of the operator.

**TITLE 25. RULES AND REGULATIONS
PART I. DEPARTMENT OF ENVIRONMENTAL RESOURCES
Subpart D. ENVIRONMENTAL HEALTH AND SAFETY
ARTICLE IV. OCCUPATIONAL HEALTH AND SAFETY**

CHAPTER 210. USE OF EXPLOSIVES

Authority

The provisions of this Subchapter A issued under § 1901-A of the Administrative Code of April 9, 1929, P.L. 177 (71 P.S. § 510-20).

Source

The provisions of this Subchapter A adopted January 18, 1973, effective February 2, 1973, 3 Pa. B. 183.

Subchapter A. BLASTER'S LICENSE

§ 210.1. Examinations.

(a) The Division of Explosives, Bureau of Surface Mine Reclamation, Department of Environmental Resources, shall conduct examinations for Blaster's Licenses and issue credentials to eligible persons by category as specified in § 210.2(b).

(b) Examinations shall be conducted as needed for applicants for Blaster's Licenses at designated places in the Commonwealth.

(c) The questions comprising the examinations shall be prepared by the Division of Explosives of the Department of Environmental Resources and shall be taken to each examination together with acceptable answers in sealed envelopes which seals shall not be broken until the start of the examination.

(d) Forms for application will be furnished on request by the Division of Explosives. Each such application shall be notarized and mailed to the Chief of the Division of Explosives and shall be accompanied by a check or money order in the amount of \$50, payable to the "Commonwealth of Pennsylvania."

(e) Each application for Blaster's License shall be accompanied by a signed, notarized statement from the applicant's employer or employers or other responsible persons certifying that the applicant has had at least one year of qualifying experience as a "Blaster Learner" in the handling and use of explosives under the direction of a licensed blaster, and that in the opinion of the employer or employers or such other persons, the applicant is qualified by experience and is physically and mentally fit to hold a Blaster's License.

(f) Applicants for Blaster's License will be notified as to when and where to appear for examination.

Source

The provisions of section 210.1 amended October 21, 1980, effective November 8, 1980, 10 Pa. B. 4294.

§ 210.2. Issuance and status of licenses-fees.

(a) A Blaster's License will be issued only to persons who are at least nineteen years of age upon written application signed by the individual who seeks to be licensed in conformity with paragraph (e) of § 210.1.

(b) Applicants will be examined for licensing in seven categories based on employment and experience, such as:

General Blasting	Steel Mill Slag and Salamander Blasting
Trenching and Construction	Surface Mining
Seismic and Pole Line Work	Deep Mining
Black Powder	

Licenses issued to successful applicants shall be restricted accordingly.

(c) Licensing for other categories will require reexamination based on the classification requested. All applicants for reexamination shall be made in writing on forms provided by the Division of Explosives and shall be accompanied by proper fee of \$50. An applicant for a Blaster's License shall not bring to the examination any type of reference material, nor shall he confer during the course of the examination with anyone except a member of the Division staff.

(d) If the applicant passes the examination, the Division may issue a Blaster's License to him which, if granted, shall be effective until September 1 next following the date of issuance.

(e) Any Blaster upon request shall exhibit his Blaster's License to any duly authorized representative of the Department of Environmental Resources to his employer or to any authorized representative of his employer, or to any police officer acting in the line of duty.

(f) Any Blaster's License may be suspended for a stated length of time for due cause by the Chief of the Division of Explosives. Any Blaster's License may be revoked by the Secretary after a written notice to the holder of the license and a hearing before a committee of experts appointed by the Secretary. An appeal may be made to the Environmental Hearing Board.

(g) Applicants failing to appear for scheduled examinations shall forfeit the fee unless:

(1) They have given written notice to the Division of Explosives prior to examining date.

(2) A valid certified medical excuse is submitted in writing.

Final determination of refund of fee or admittance to subsequent examination without re-application fee shall be at the discretion of the Division.

(h) All applicants for Blaster's License shall be notified in writing whether they have qualified or failed to qualify for Blaster's License. Applicants failing to qualify in examination may reapply for examination by submitting a new application accompanied by proper fee of \$50.

Source

The provisions of section 210.2 amended October 21, 1980, effective November 8, 1980, 10 Pa. B. 4294.

§ 210.3. Annual renewal of blaster's licenses.

(a) Each blaster may apply to renew his Blaster's License each year by application to be mailed to the Division of Explosives, Department of Environmental Resources, Harrisburg, Pennsylvania. Applications shall be made on forms to be supplied by said Division of Explosives, shall be signed by the applicant and accompanied by check or money order payable to the "Commonwealth of Pennsylvania," for the annual fee of \$10. Renewal forms will be mailed annually by said Division of Explosives to each blaster at the address shown on his prior application. The Division of Explosives may in its discretion refuse to renew any Blaster's License for due cause after notice to the applicant and a hearing before a committee of experts appointed by the Secretary. The Chief of the Division of Explosives, for due cause may summon any licensed blaster for reexamination. If renewal of a Blaster's License shall be granted, the renewal will be for the period of one year, from September 1, through August 31.

(b) Any licensee who fails to renew his license for any one year shall be required to apply for reexamination by submitting proper application accompanied by \$50 fee.

Source

The provisions of section 210.3 amended October 21, 1980, effective November 8, 1980, 10 Pa. B. 4294.

§ 210.4. Transferability.

(a) No Blaster's License granted to any person under the provision of Act 362 of 1957 and of these Regulations shall be transferable to any other person or persons, and any attempt to effect such transfer shall automatically cancel the license.

§ 210.5. Restrictions on blasting operations.

(a) No person shall detonate explosives in blasting operations unless he has given satisfactory evidence to his employer that he has had practical experience in the handling and use of explosives under conditions existing at the site of the proposed blasting operations, is qualified to perform the duties of Blaster at said site and has a Blaster's License. A licensed blaster shall be in charge of, and responsible for the preparation of, and the firing of, any blast. The blast shall be fired only by the licensed blaster in charge. When more than one licensed blaster is engaged in the preparation for blast, the operations management shall designate the licensed blaster in charge. The licensed blaster in charge may authorize a laborer or other person not qualified to perform general blasting operations, to load and unload explosives, prepare explosives for use in blasting, transport explosives at or near a job site, charge explosives into drill holes, tamp or otherwise prepare explosives for detonation, and set fuses and detonating wires. However, all of the above duties shall be performed only under the direct supervision and direction and in the presence of said licensed blaster in charge, who shall be responsible for the conduct of the persons acting under his direction.

(b) No person shall be permitted to detonate explosives unless another person is present within calling distance and able and ready to render assistance in the event of accident or injury.

(c) Use of explosives by licensed blasters shall be in accordance with all Rules and Regulations for the Storage, Handling and Use of Explosives, and the manner of transporting dynamite, black powder, fuse, blasting caps, electric blasting caps or detonators, electric squibs, primacord, sensitized ammonium nitrate or any other explosive shall be in accordance with the Regulations relating to the marking or placarding of motor vehicles transporting dangerous articles on the public highways of the Commonwealth of Pennsylvania.

(d) No person shall put or place in any waters within or on the boundaries of this Commonwealth any explosives without first securing a permit from the Pennsylvania Fish Commission.

(e) Blasting operations near streams shall be prohibited in all cases where the effect of the blasting is liable to change the course or channel of any stream without first obtaining a permit from the Department of Environmental Resources.

§ 210.6. Learners.

An employer may designate a reasonable number of his employees who are at least eighteen years of age as "Blaster Learners." However, not more than six such learners shall be assigned to one licensed blaster. The learners shall work under the direct supervision and direction and in the presence of said licensed blaster who shall be experienced in the use and handling of explosives at the job site.

**TITLE 25. RULES AND REGULATIONS
PART I. DEPARTMENT OF ENVIRONMENTAL RESOURCES
Subpart D. ENVIRONMENTAL HEALTH AND SAFETY
ARTICLE IV. OCCUPATIONAL HEALTH AND SAFETY**

CHAPTER 211. STORAGE, HANDLING AND USE OF EXPLOSIVES

Authority

The provisions of this Chapter issued under AC § 1901-A and § 1920-A (71 P.S. §§ 510-20).

Source

The provisions of this Chapter adopted June 14, 1972, effective June 24, 1972, 2 Pa. B. 1067. Sections 211.78 amended July 20, 1972, effective August 14, 1972, 2 Pa. B. 1439.

GENERAL PROVISIONS

§ 211.1. Administration.

The rules set forth in these regulations shall apply to every establishment within this Commonwealth.

(1) No person or persons shall remove or make ineffective any safeguard, safety appliance or device attached to machinery except for the purpose of immediately making repairs or adjustments; and any person or persons who remove or make ineffective any such safeguard, safety appliance or device for repairs or adjustments shall replace the same immediately upon the completion of such repairs or adjustments.

(2) Every employer or person exercising direction or control over any person or persons who remove such safeguard, safety appliance or device, or over any person or persons for whose protection it is designed, shall have the safeguard, safety appliance or device so removed promptly and properly replaced.

(3) Every employee shall use all safeguards, safety appliances or devices furnished for his protection and shall carry out all regulations which may concern or affect his conduct.

§ 211.2. Definitions.

For the application of these regulations:

(1) *Establishment* - Shall mean any place within the Commonwealth of Pennsylvania where work is done for compensation, to whomever payable, supervision over which has been given by statute to the Department of Environmental Resources.

(2) *Magazine* - Shall mean a building or structure, other than a factory building, used exclusively for the storage of explosives.

(3) *Explosives* - Shall mean and include any chemical or other substance intended for the purpose of producing an explosion or that contains oxidizing or combustible units or other ingredients in such proportions or quantities that ignition by fire, by friction, by concussion, by percussion or by detonator may produce an explosion capable of causing injury to persons or damage to property. The term explosive includes, but is not limited to the following: Black Powder (all varieties), dry gun cotton, nitroglycerine, dynamite, chlorates, fulminates, all sensitized ammonium nitrate compositions and any other of their compounds or mixtures, smokeless powder, wet gun cotton and wet nitrostarch.

(4) *Primer* - Shall mean a cartridge or package of explosive material containing a properly inserted and attached fuse cap, an electric blasting cap, or a cartridge or package to which detonating cord has been attached for the purpose of initiating the detonation of a column of explosives.

(5) *Stemming* - Shall mean that inert material placed in a borehole after the explosive charge for the purpose of confining the explosion gases in the borehole or that inert material used to separate the explosive charges (decks) in decked holes.

(6) *Building* - Shall mean a building regularly occupied in whole or in part as a habitation for human beings or any church, schoolhouse, railroad station, store or other building where people are accustomed to live, work or assemble, but does not mean or include buildings in which the business of manufacturing explosives or explosive component parts is carried on in an explosives plant.

(7) *Explosive plant* - Shall mean and include all lands, with buildings situated thereon, used in connection with the manufacturing or processing of explosives or in which any process involving explosives is carried on, or the storage of explosives thereat, as well as any premises where explosives are used as component part or ingredient in the manufacture of any article or device.

(8) *Factory building* - Shall mean any building or other structure (excepting magazines) containing explosives in which the manufacture of explosives, or any processing involving explosives, is carried on, and any building where explosives are used as a component part or ingredient in the manufacture of any article or device.

(9) *Railroad* - Shall mean and include any steam, electric or other railroad which carries passengers for hire.

(10) *Highway* - Shall mean and include any public street, public alley or public road.

(11) *Barricade* - Shall mean natural features of the ground such as hills, timber of sufficient density that surrounding exposures cannot be seen when the trees are bare of leaves, or an efficient artificial barricade consisting of an artificial mound or properly revetted wall of earth not less than three (3) feet thick at the top.

(12) *Person* - Shall mean and include individuals, firms, partnerships, associations, corporation, receivers or any officer of the Commonwealth or any agent or officer of the above mentioned classes employing any person in this Commonwealth.

(13) *Department* - Shall mean the Department of Environmental Resources.

(14) *Board* - Shall mean the Environmental Quality Board.

(15) *Secretary* - Shall mean the Secretary of Environmental Resources.

(16) *Approved* - Shall mean approved by the Environmental Quality Board.

(17) *Vehicle* - Shall mean any rolling stock or equipment, whether self-propelled or otherwise and shall include all trailers.

(18) *Charge weight* - Shall mean the weight in pounds of an explosive charge.

(19) *Actual distance* - Shall mean the distance in feet from the blast location to the nearest dwelling house, public building, school, church, commercial or institutional building neither owned nor leased by the person conducting the blast.

(20) *Delay interval* - Shall mean the time interval in milliseconds between successive detonations of the delay devices used.

(21) *Scaled distance (Ds)* - Shall mean the actual distance (D) in feet divided by the square root of the maximum explosive weight (W) in pounds that is detonated per delay period for delay intervals of eight (8) milliseconds or greater; or the total weight of explosive in pounds that is detonated within as interval less than eight (8) milliseconds. This means that

$$D_s = \frac{D}{\sqrt{W}}$$

Thus,

$$\text{Scaled Distance} = \frac{\text{Actual Distance}}{\sqrt{\text{Charge Wt. Per Delay Period}}}$$

Example: Given an actual distance of 1,000 feet and a Charge Weight per delay period of 400 pounds, find the Scaled Distance

$$D_s = \frac{1000}{\sqrt{400}} = \frac{1000}{20} = 50$$

Once the safe minimum Scaled Distance has been determined, the safe maximum Charge Weight per delay for any blast can be determined by use of the relationship:

$$W = \left(\frac{D}{D_s} \right)^2$$

Thus,

$$\text{Charge Weight} = \left(\frac{\text{Actual Distance}}{\text{Scaled Distance}} \right)^2$$

Example: Given an Actual Distance of 1,000 feet and a Scaled Distance of 50, find the Charge Weight.

$$\text{Charge Weight} = \left(\frac{1000}{50} \right)^2 = (20)^2 = 400 \text{ lbs.}$$

STORAGE OF EXPLOSIVES

§ 211.31. License and fees.

(a) Every person storing or in possession of explosives shall be required to have a license for each magazine used for the storage of such explosives. License shall be issued by the Department upon receipt of information showing compliance with the provisions of these regulations.

(b) Licenses shall be kept posted conspicuously in or about the magazine for which issued. Licenses shall expire annually on the thirty-first day of December and shall be renewed upon payment of the required fee.

(c) Fees for the issuances or renewal of licenses shall be as follows:

Explosives	\$50
Caps	\$50

(d) If constructing a Class A or a Class B magazine, a fee of \$50 shall accompany the application for approval of plans. This includes site location approval. Reference should be made to §211.40 of this title (relating to plans of site location and magazines). Checks, money orders, or drafts should be made payable to "Commonwealth of Pennsylvania."

(e) If plans are to be approved for Class A or Class B magazines, separate checks for approval of plans and for licenses shall accompany applications.

(f) Applications and checks should be mailed to the Department of Environmental Resources, Division of Mines, Quarries and Explosives, Harrisburg, Pennsylvania.

Source

The provisions of section 211.31 amended October 21, 1980, effective November 8, 1980, 10 Pa. B. 4294.

§ 211.32. Location of Magazines.

(1) No explosives shall be kept or stored within the Commonwealth unless the following rules and regulations are complied with, nor shall any explosives be stored in this Commonwealth other than in magazines of approved type as hereafter provided.

(2) Magazines in which more than fifty (50) pounds of explosives are kept and stored, must be detached from other structures. Magazines where more than five thousand (5,000) pounds of explosives are kept or stored must be located at least two hundred (200) feet from any other magazines. Magazines where quantities of explosives over twenty-five thousand (25,000) pounds are kept and stored, must have an increase over two hundred (200) feet, of two and two thirds ($2 \frac{2}{3}$) feet for each one thousand (1,000) pounds of explosives in excess of twenty-five thousand (25,000) pounds stored. Provided, that the said distances between magazines may be disregarded where the total quantity stored in said magazines, considered as a whole, complies with the quantity and distance table as given in Paragraph 3. In all cases, the quantity of explosives contained in cap magazines shall govern in regard to spacing said cap magazines from magazines containing other explosives, but under no circumstances shall a magazine containing blasting caps be within a less distance than one hundred (100) feet, not barricaded, or fifty (50) feet, barricaded, from any magazine other than cap magazine. Where magazines are protected by natural or efficient barricades, the distance above specified may be reduced one-half. No blasting caps or other detonating or fulminating caps or detonators shall be kept or stored in any magazine in which other explosives are kept or stored.

(3) Magazines in which explosives are kept or stored must be located at distances from buildings, railroads and highways in conformity with the following quantity and distance table (see Chart I.)

(4) Whenever the buildings, railroad or highway to be protected is effectually screened from the factory building or magazine where explosives are had, kept or stored either by natural features of the ground or by efficient artificial barricades of such height that any straight line drawn from the top of any side wall of the factory building or magazine to any part of the building to be protected will pass through such intervening natural or efficient artificial barricades and any straight line drawn from the top of any side wall of the factory building or magazine to any point twelve (12) feet above the center of the railroad or highway to be protected, will pass through such natural, or efficient artificial barricades, the applicable distance in the quantity and distance tables may be reduced one-half.

(5) No quantity in excess of three hundred thousand (300,000) pounds or in the case of blasting caps, no number in excess of twenty million (20,000,000) caps shall be stored in any factory building or magazine.

(6) Excepting only at a factory building or while being used, no person shall have, keep or store explosives at any place within this Commonwealth unless such explosives are completely enclosed or encased in tight metallic, wooden, or fiber containers, and except while being transported or used or in the custody of a common carrier awaiting shipment, or pending delivery during the time permitted by Federal Law, explosives shall be kept in a magazine. No person having explosives in his possession or control, shall under any circumstances permit or allow any grains or particles to be or remain on the outside or about the containers in which such explosives are held. All containers in which explosives are held shall be plainly marked with the name of the explosives contained therein.

Chart I.

QUANTITY AND DISTANCE TABLE FOR UNBARRICADED MAGAZINES

Column 1				Column 2	Column 3	Column 4
Quantity that may be kept or stored from nearest building, highways or railroad				Distance from nearest building	Distance from nearest railway	Distance from nearest highway
Blasting and electric blasting caps		Other explosives		(feet)	(feet)	(feet)
Number over	Number not over	Pounds over	Pounds not over			
1,000	5,000	-	-	30	20	10
5,000	10,000	-	-	60	40	20
10,000	20,000	-	-	120	70	35
20,000	25,000	-	50	145	90	45
25,000	50,000	50	100	240	140	70
50,000	100,000	100	200	360	220	110
100,000	150,000	200	300	520	310	150
150,000	200,000	300	400	640	380	190
200,000	250,000	400	500	720	430	220
250,000	300,000	500	600	800	480	240
300,000	350,000	600	700	860	520	260
350,000	400,000	700	800	920	550	280
400,000	450,000	800	900	980	590	300
450,000	500,000	900	1,000	1,000	610	310
500,000	750,000	1,000	1,500	1,060	640	320
750,000	1,000,000	1,500	2,000	1,200	720	360
1,000,000	1,500,000	2,000	3,000	1,300	780	390
1,500,000	2,000,000	3,000	4,000	1,420	850	420
2,000,000	2,500,000	4,000	5,000	1,500	900	450
2,500,000	3,000,000	5,000	6,000	1,560	910	470
3,000,000	3,500,000	6,000	7,000	1,610	970	490
3,500,000	4,000,000	7,000	8,000	1,660	1,000	500
4,000,000	4,500,000	8,000	9,000	1,700	1,020	510
4,500,000	5,000,000	9,000	10,000	1,740	1,040	520
5,000,000	7,500,000	10,000	15,000	1,780	1,070	530
7,500,000	10,000,000	15,000	20,000	1,950	1,170	580
10,000,000	12,500,000	20,000	25,000	2,110	1,270	630
12,500,000	15,000,000	25,000	30,000	2,260	1,360	680
15,000,000	17,500,000	30,000	35,000	2,410	1,450	720
17,500,000	20,000,000	35,000	40,000	2,550	1,530	760
-	-	40,000	45,000	2,680	1,610	800
-	-	45,000	50,000	2,800	1,680	810
-	-	50,000	55,000	2,920	1,750	880
-	-	55,000	60,000	3,030	1,820	910
-	-	60,000	65,000	3,130	1,880	910
-	-	65,000	70,000	3,220	1,940	970
-	-	70,000	75,000	3,310	1,990	1,000
-	-	75,000	80,000	3,390	2,040	1,020
-	-	80,000	85,000	3,460	2,080	1,040
-	-	85,000	90,000	3,520	2,120	1,060
-	-	90,000	95,000	3,580	2,150	1,080
-	-	95,000	100,000	3,663	2,180	1,090
-	-	100,000	125,000	3,670	2,200	1,110
-	-	125,000	150,000	3,800	2,280	1,140
-	-	150,000	175,000	3,930	2,360	1,180
-	-	175,000	200,000	4,060	2,440	1,220
-	-	200,000	225,000	4,190	2,520	1,260
-	-	225,000	250,000	4,310	2,590	1,300
-	-	250,000	275,000	4,430	2,660	1,340
-	-	275,000	300,000	4,550	2,730	1,380

§ 211.33. Type and Construction of Magazines.

(1) Magazines in which explosives shall be kept or stored shall be of four classes:

Magazines of Class A
Magazines of Class B
Magazines of Class C
Daily Use Magazines

(A) Class A magazines shall consist of those containing more than two hundred (200) pounds but not in excess of three hundred thousands (300,000) pounds of dynamite or other explosives, or more than five thousand (5,000) but not in excess of twenty million (20,000,000) blasting caps or electric blasting caps.

These magazines may be permanently located, or they may be temporarily located.

(B) Class B magazines shall for the purpose of these regulations be known as Industrial Storage Magazines, and shall include such as are in close proximity to and supplying explosives for immediate operation or when the limited quantity stored does not warrant construction of a Class A magazine, and containing not in excess of two hundred (200) pounds of explosives or five thousand (5,000) blasting caps.

When Class B magazines are required underground they shall be located that accidental discharge of the explosive contained therein would not cut off the escape of persons.

Class B magazines when used underground shall contain not more than twenty-four (24) hours supply of dynamite, black powder, fuse, blasting caps or electric blasting caps, electric squibs or other explosives.

(C) Class C magazines are for underground use only and shall consist of those in which not more than one (1) twenty-five (25) pound keg of black powder nor one (1) fifty (50) pound box of dynamite or other explosives are kept underground at one work place to supply the needs of an operator, unless more is necessary to accomplish one day's work. Not more than one class C magazine each for explosives and caps may be kept at one place, and these shall be located at a distance of not less than fifty (50) feet from a working face, not less than ten (10) feet from any tracks or electric conductors in all cases where such distance is available.

No explosives, blasting caps or electric blasting caps shall be permitted to remain in a Class C magazine off shift.

(D) Daily use magazines shall consist of those in which not more than one (1) day's requirement nor more than two hundred (200) pounds of dynamite or other explosive is transported from a Class A or a Class B magazine for use for such limited time and in such locations as would make erection of a Class A or a Class B magazine impracticable. Not more than one (1) daily use magazine each for explosives and caps shall be transported to a work location.

No explosives, blasting caps or electric blasting caps shall be allowed to remain over night in daily use magazines.

(2) Permanently located Class A magazines shall be constructed as follows:

(A) *Frame* - The walls shall be constructed of two by six (2 x 6) inch studding with two (2) inch plank or seven-eighths (7/8) inch tongued and grooved or ship lap boards or the equivalent for the outside wall. The inside wall shall be lined with tongued and grooved reebers or equivalent. The outer wall shall be covered with not less than No. 26 gauge galvanized corrugated iron or sheet steel on the outside. The space between the outer and inner wall shall be filled with a minimum of 5 inches of dry, clean sand or a weak mixture of cement mortar. All lumber shall be well seasoned

and free from loose knots, wind shakes, bark edges or decay. These magazines shall be approved only for locations under the direct control of the explosives manufacturer at a manufacturing site. The term "manufacturing site" as used herein shall not be applicable to sites approved for the field mixing of ammonium nitrate fuel compositions or the like.

(B) *Brick* - The wall shall be eight (8) inches in thickness. The bricks shall be of medium soft variety laid in cement mortar containing not over 25% lime.

(C) *Concrete* - The walls shall be six (6) inches in thickness constructed of nine (9) parts sand and one (1) part cement, and one-half (1/2) inch face surface of three (3) parts sand and one (1) part cement.

(D) *Concrete blocks* - The walls shall be constructed of eight (8) inch, cored concrete blocks having a minimum strength rating of one thousand (1,000) pounds. The space in the blocks shall be filled with dry clean sand or a weak mixture of cement mortar.

(E) *Fabricated metal* - Walls and roof to consist of sectional sheets of approximately No. 14 gauge metal, securely fastened together. Walls to be lined with five (5) inches of dry, white oak, five (5) inches of dry, clean sand, or four (4) inches of brick or weak cement mortar.

(F) Lining for magazines as specified in paragraph (1) and (6) may be omitted in those magazines under direct control of the manufacturer on a manufacturing site provided they are used for the storage of black powder only or for the storage of not more than 100,000 blasting caps.

(3) The following applies to all permanently located magazines:

(A) The foundation shall rest upon an adequate footer and shall be constructed of stone laid in cement, concrete or concrete block. Magazines of less than thirty thousand (30,000) pounds capacity shall have seven eighths (7/8) inch tongued and grooved flooring. Magazines of larger capacity shall have double flooring. All flooring must be blind or secret nailed.

(B) The floor and ceiling shall be constructed to within two (2) inches of the walls in order to provide a two (2) inch ventilation space.

(C) All nail heads shall be countersunk and filled. No metal shall be exposed within the building in any location where it might come in contact with explosive containers or explosive materials.

(D) Buffer rails shall be provided on all walls to facilitate ventilation and to prevent contact of explosives boxes with the walls. These rails shall consist of horizontal runs of boards from corner to corner on each wall, the boards to be offset from the walls by two-inch by two-inch (2" x 2") nailing strips securely fastened into the wall. The buffer boards shall be not less than one (1) inch thick and not less than three (3) inches nor more than six (6) inches in width and shall be separated each from the other by a distance not greater than the width of the boards. The nailing strips shall be spaced on two (2) foot centers starting four (4) inches from each corner. The bottom edge of the lowest board shall fit tightly against the magazine floor.

(E) The door shall be a minimum of three (3) feet wide and six (6) feet high constructed of at least three (3) layers of seven-eighths (7/8) inch hard wood lumber and covered on the outside with a steel plate at least three-eighths (3/8) inch thick.

(F) A bullet-proof sand ceiling shall be used, except where permission for other construction is granted by the Department, constructed as follows: Form a box by laying a floor of a good grade of tongued and grooved boards, or equivalent on ceiling joists and build a one by five (1 x 5) inch rim, line with one (1) layer of roofing felt and fill with five (5) inches of dry, clean sand.

(G) Except for fabricated metal magazines the outer roof shall be covered with not less than No. 26 galvanized iron fastened to seven-eighths (7/8) inch sheathing. A galvanized iron ridge roof shall be used.

(H) The cornice of the roof shall be constructed of not less than No. 26 gauge galvanized flat iron, bent over roof sheathing and ends of rafters and extending three (3) inches down the wall.

(I) Gutters and down spouts shall be used on door side.

(J) Foundation ventilators shall be spaced not more than five (5) feet center to center on both sides and ends and the roof equipped with necessary ventilators.

Foundation ventilators shall be equipped with outside metal screens to prevent entry of wild life, fire, burning embers, sparks and the like and shall be so constructed as to preclude direct line of sight through the foundation wall.

(K) All materials and workmanship used in the construction of magazines shall be first class.

(L) The magazine shall be located in an isolated place. A damp location shall be avoided.

(M) The premises on which explosives are kept or stored must conspicuously defined and marked by signs containing the words "EXPLOSIVES - KEEP OFF." Such signs must not be placed on magazines, but shall be so located that a bullet passing through the sign will not strike magazine.

(N) Magazines shall be used exclusively for the storage of explosives and explosive supplies.

(O) When any magazine is erected, installed, placed or maintained in any city, borough or community where a fire department is maintained, the custodian of such magazine shall immediately notify the chief of said fire department as to the location thereof. Special licenses shall be required for magazines to be used within the city of Pittsburgh.

(P) No explosives shall be stored or kept in any building used in whole or in part as a dwelling, school, theatre, or other place where people are accustomed to live, work or assemble.

(Q) All magazines shall be provided with substantial locks. When padlocks are used, they shall be securely guarded by a properly constructed steel hood to prevent tampering, and two padlocks shall be used on each magazine door. The staple or (eye) through which the padlock is inserted shall be case-harden sufficiently to resist the attack by a hack saw blade or the like. Locks shall be quality locks with case hardened shackle and shall be theft proof.

(4) Temporarily located Class A magazines shall be constructed as follows:

(A) *Walls of No. 14 Gauge Metal* - When the exterior walls and roof consist of sectional sheets, or the equivalent, of approximately No. 14 gauge metal securely fastened together, the walls and ceiling shall be lined with five (5) inches of dry white oak wood and the metal floor shall be lined with a tight wood floor consisting of a minimum of one (1) inch of tongued and grooved lumber or the equivalent, securely cemented into position. The wood lining on the sides may be replaced with five (5) inches of dry, clean sand, or with four (4) inch thick solid concrete blocks or four (4) inches of brick or weak cement mortar, provided that these alternate lining materials shall be faced on the inside of the magazine with not less than three-quarter (3/4) inch thick, exterior grade plywood or the equivalent, and provided that the inside surface of the metal wall shall be lined with a minimum thickness of one-half (1/2) inch of exterior grade plywood.

These magazines shall be supported on secure foundations as wood posts, brick piers § 211.33.3, or equivalent cribbing of railroad ties or the like may be employed. When these magazines consist of modified over-the-road trailers, the tires need not be removed.

(B) *Walls of one-fourth (1/4) Inch Welded Steel Plate* - When a magazine consists essentially of a welded steel box with a flat or sloping top (roof), fabricated from one-fourth (1/4) inch steel plate, it shall be lined on the sides and top with a minimum of four (4) inches of dry white oak wood and the bottom shall be lined with a tight wood floor consisting of a minimum thickness of one-half (1/2) inch of exterior grade plywood or the equivalent, securely cemented into position.

(C) *Walls of three-eighths (3/8) Inch Welded Steel Plate* - When a magazine consists essentially of a welded steel box with a flat or sloping top, fabricated from three-eighths (3/8) inch steel plate, it shall be lined on the sides and top with a minimum of two (2) inches of dry white oak. The bottom shall be lined with a tight wood floor consisting of a minimum thickness of one-half (1/2) inch of exterior grade plywood or the equivalent, securely cemented into position.

(5) The following applies to all temporarily located Class A magazines:

(A) The foundation shall be constructed as specified in § 211.33.3, or a securely mounted cribbing of railroad ties or the like shall be acceptable.

(B) Buffer rails shall be installed in accordance with the specifications in § 211.33.3, except that one by one (1 x 1) inch nailing strips shall be permitted.

(C) Magazine doors shall comply with the specifications for doors as stipulated in § 211.33.3.

(D) The wood lining specified above for the sidewalls of temporarily located Class A magazines may be replaced with five (5) inches of dry, clean sand, with four (4) inch thick solid concrete blocks, or with four (4) inches of brick or weak cement mortar, provided these alternate lining materials shall be faced on the inside of the magazine with not less than three-quarter (3/4) inch thick exterior grade plywood or the equivalent, and provided that the inside surface of the metal wall shall be lined with a minimum thickness of one-half (1/2) inch of exterior grade plywood.

(E) Adequate ventilation shall be provided with suitable means to prevent ingress of sparks or burning embers, rain, snow, leaves or stray rifle bullets. When magazines of the type defined in § 211.33.4b and 211.33.4c exceed ten (10) feet in length, they shall be fabricated with two (2) ventilators in the roof, and one (1) ventilator on each side and on each end. The ventilation openings shall be placed in or near the ceiling and as close to floor level as is practicable.

(F) On trailer type magazines there shall be a minimum of two (2) ventilators on each side at the bottom as near floor level as possible, and there shall be a minimum of one (1) ventilator on each end and on each side as near as possible to the top of the trailer.

(G) All nail heads shall be countersunk and filled. No metal shall be exposed within the magazine in locations where it might come in contact with explosives containers or explosive materials.

(6) Class B magazines shall be constructed as follows:

(A) *Walls of one-fourth (1/4) Inch Welded Steel Plate.* - When Class B magazines are fabricated with one-fourth (1/4) inch steel plate they shall be so constructed as to comply with the specifications outlined in § 211.33.46. The wood lining specified for the side walls may be replaced with other materials as specified in § 211.33.5. Ventilation shall be as specified in § 211.33.5. The doors shall be of convenient dimension, but shall conform in all other respects with specifications outlined in § 211.33.3. Foundations shall conform to specifications set forth in § 211.33.3 and 211.33.5.

(7) Class C magazines shall be constructed as follows:

(A) Class C magazines shall consist of metal-covered or plain wooden boxes with a hinged lid and means for locking. They may be equipped with handles for carrying purposes. Class C magazines may be used only under the conditions specified in § 211.33.1. These magazines shall be constructed of planed one (1) inch tongued and grooved lumber or exterior grade plywood. In construction, all joints shall be filled with white lead. There shall be no exposed metal inside these magazines. Metal covering, if employed, shall not be thinner than No. 24 gauge.

(8) Daily use magazines shall be constructed as follows:

(A) Daily use magazines shall consist of welded metal boxes lined with wood and equipped with a hinged metal cover with locking means provided. The magazines shall be fabricated with not less than one-fourth (1/4) inch thick steel plate and lined on all sides and bottom with not less than two (2) inches of dry, white oak, the lining to extend even with the top of the box. The hinged lid shall be two (2) inches wider and two (2) inches longer than the outside dimensions of the box and shall be provided on all four (4) sides with a one-quarter (1/4) inch drip edge to prevent entrance of water. The lid shall be lined with two (2) inches of dry, white oak positioned and dimensioned to just fit inside the box lining when closed. Hinges shall be set back at least three-eighths (3/8) inch from the side of the box to permit full opening of the lid. There shall be no exposed metal inside the lining of these magazines.

§ 211.34. Plans of Site Location and Magazines.

(1) It shall be the duty of any person, or persons before permission is granted

to construct a Class A or Class B magazine to furnish the Department of Environmental Resources with the following:

(A) Maps, plans or sketches of the topographical site location showing the nearest buildings, nearest railways, nearest highways, and also showing existing barricades if any and barricades that are intended to be used. These plans shall be drawn with a scale of one hundred (100) or two hundred (200) feet to the inch. These plans must be furnished in triplicate.

(B) Plans and specifications of the proposed magazine shall also be furnished and shall be included as part of the topographical site plan. (NOTE - A fee of twenty dollars (\$20.00) payable to the Commonwealth of Pennsylvania must accompany plans and specifications submitted for approval for the construction of Class A and Class B magazines and include site location plans approval under provision of the Fire and Panic Act.)

(C) It shall be unlawful to start construction of any Class A magazine within this Commonwealth before the approval of topographical site location, plans and specifications is given and approved by the Department of Environmental Resources.

§ 211.35. Handling and Housekeeping.

(1) No package of explosives shall at any time be opened within fifty (50) feet of any magazine. Use only wooden, rubber, rawhide, fiber, zinc or babbitt mallet and wood wedge when opening packages of explosives.

(2) No artificial light shall be used in magazines, except approved portable electric dry cell battery lamps or lanterns or approved type for explosive buildings.

(3) All magazines shall be kept free from grit, paper, rubbish and empty packages.

(4) Explosives shall be kept in closed containers.

(5) Only authorized persons shall be permitted to have access to magazines.

(6) All premises surrounding magazines must be kept free from brush, dry grass, and similar growth for at least twenty-five (25) feet around magazine and no inflammable materials shall be placed near or about magazines. Any unsound trees in the vicinity shall be removed if they are of such height as would permit them to fall on a magazine.

§ 211.36. Records of Disposition of Explosives

(1) No person, firm, association or corporation shall engage in the manufacture, storage, handling, use or sale of explosives without obtaining a proper permit from the Department.

(2) Every person, firm association or corporation selling, giving away, or distributing explosives shall be referred to collectively as the seller in interpretation of this Rule, and any person or organization purchasing or receiving as a gift explosives from a seller shall be referred to as the purchaser.

(3) The seller shall be required to have a permit issued by the Department for the purchase, possession and sale of explosives. This permit shall be required of jobbers, wholesalers, dealers, and retailers, whether or not they physically handle, store or have possession of the explosives. This permit is also required for all non-residents who desire to sell explosives within the Commonwealth. Whether explosives are picked up by the purchaser or delivered by the seller, they shall be delivered only to a licensed magazine, or to a particular blast immediately to be loaded and fired which will require use of the entire quantity of explosives delivered. Sellers permit forms shall be prepared in duplicate and forwarded to the Department of Environmental Resources, Division of Mines, Quarries and Explosives for validation. After validation one copy of form will be retained in the Department files and the other returned to the applicant for retention in his files.

(4) The purchaser shall be required to have a purchaser's permit issued by the Department for the purchase of explosives from a seller. This permit shall show the name, address, type of business engaged in by the purchaser, and location at which the explosives are to be used and the purpose for which they are to be used. The permit shall show

also the location of the purchaser, explosives storage magazines and the current storage magazine license numbers as well as the names and license numbers of all licensed blasters employed by the purchaser.

A special permit shall be issued to those purchasers who do not store explosives, but who elect to have their blasting operations performed by others who bring to a given blast only the quantity of explosives required for that blast. Storage magazine license numbers will not show on these special permits but there shall be shown the name and address of the persons doing the blasting and the names and license numbers of licensed blasters employed by the persons doing the blasting. The special permit shall show also the names and license numbers of any licensed blasters employed by the purchaser.

(5) Permit forms shall be in triplicate, one copy being retained in the Department offices, one copy to be delivered to the seller by the purchaser at the time of first purchase, and one copy to be retained by the purchaser. These records shall be retained at least until the end of the calendar year next following the year of issue.

(6) Permits expire on April 30, and are renewable on May 1 of each year.

(7) Permits are not transferable.

(8) A permit may be suspended for a stated length of time for due cause by the Associate Deputy for Mines and Land Protection upon recommendation by the Chief of the Division of Mines, Quarries and Explosives. A permit may be revoked by the Secretary of the Department of Environmental Resources after written notice to the holder of the permit and a hearing before the Environmental Hearing Board.

(9) The seller shall keep at all times as accurate journal or form of record in which must be legibly entered from time to time as made, each and every sale or gift of explosives. Such record must show name and address and purchaser's permit number where applicable, of person to whom sale or gift was made, if the purchaser is not known to the seller, a record shall be made of the motor vehicle operator's license number and motor vehicle registration number, the name of person to who delivered, and business of person to whom delivered, business of person who received same, and the purchaser's permit number. The identifying data shall be recorded on the sales slip. This record must be kept at the local office or place of business for at least the current year plus one year, and so much of the data therein contained as may relate to any special inquiry shall be furnished to the Secretary of Environmental Resources, or authorized representative, on proper demand therefore for the express purpose of determining whether such explosives were used for an unlawful purpose.

(10) Daily inventory shall be kept by a competent responsible person of all explosives and blasting caps received and/or being used in the field, such as used from the Daily Use Magazine, also Class A or Class B magazines used for storage, and if on a rare occasion being used from a truck or van if and when such practice is condoned or approved.

§ 211.37. Existing Magazines.

Magazines, erected prior to the promulgation of these regulations, which comply with the intent and purpose of the regulations but are not in accordance with all detailed specifications may remain at the discretion of the Department. The Department shall have the authority to compel changes necessary to comply with regulations, or to reduce the capacity in accordance with requirements governing construction or distance tables.

§ 211.38. Blasting Caps.

Blasting caps and electric blasting caps may be transported in the same motor vehicle with high explosives, as follows: The blasting caps and electric blasting caps shall be packed in outside shipping containers, or in packages in an outside box made of 1 inch lumber lined with suitable padding material not less than 1/2 inch thick or a box made of not less than 12 gauge sheet metal lined with plywood or other suitable material not less than 3/8 inch thick so that no metal is exposed. Hinged cover and fastening device are required on boxes. These boxes must be loaded in motor vehicle so that contents of box will be immediately accessible for removal.

SAFETY PRECAUTIONS

§ 211.41. General.

Explosives for which these Safety Precautions are compiled are those generally used for commercial purposes and include black powder, high explosives, blasting caps and electric blasting caps.

The following precautions should always be observed in shipping, storing, handling or delivering explosives, or when near explosives.

(1) Black powders are ignited (exploded) by spark, flame or heat above 516 degrees Fahrenheit.

(2) High explosives (of which dynamite is the best known) are exploded by detonation, usually by blasting caps or electric blasting caps; they burn rapidly and while burning are liable to explode and will explode if heated to a temperature exceeding 360 degrees Fahrenheit or by the impact of a bullet fired into them.

(3) Blasting caps and electric blasting caps are devices having aluminum or copper shells which protect and contain a very sensitive explosive which will explode from sparks, shock, heat or by friction. Do not touch, pick or disturb the explosive contained therein.

(4) Whenever it becomes necessary to destroy damaged explosives, immediately communicate with the manufacturers for advice and instruction.

(5) Do not carry or allow others to carry matches or to smoke.

(6) Do not allow shooting or allow anyone to have cartridges or firearms.

(7) Do not allow unauthorized persons near explosives.

(8) Keep constant watch for broken, defective or leaky packages.

(9) Do not allow metal bale hooks or other metal tools to be used.

(10) Do not open or re-cooper packages of explosives with metal tools.

(11) Do not leave explosives unless they are stored in a locked magazine or under continuous observation of responsible persons.

(12) Do not carry blasting caps or electric blasting caps or any explosives in your pockets, or leave them around where children or others can meddle with them.

(13) Do not store, use or handle explosives in or near a residence.

(14) Do not allow explosives to become wet or be exposed to the weather.

(15) Do not throw packages of explosives violently down or slide them along floors or over each other, or handle them roughly in any manner.

(16) Children or other unauthorized persons shall not be permitted to be present where explosives are being handled or used.

(17) It is prohibited to handle, use, or be near explosives during the approach or progress of an electric storm. All persons shall retire to a place of safety. Guards shall be posted to prevent trespass by unauthorized persons.

(18) Explosives or blasting equipment that are obviously deteriorated or damaged shall not be used.

(19) Abandonment of any explosives, explosive devices or any other materials which might be detonated, ignited or decomposed in such manner as to endanger persons or property shall be prohibited. The supplier shall be consulted regarding return, or destruction of explosives.

(20) All persons employed in operations where there may be exposure to falling objects shall be provided with, and shall wear protective hats or caps.

(21) It shall be prohibited to uncoil the wires or use electric blasting caps in the vicinity of operating radio-frequency transmitters except at safe distances. The manufacturer or the Institute of Makers of Explosives pamphlet on "Radio Frequency Hazards" shall be consulted. See Appendix A.

(22) No person shall be permitted to prepare or detonate explosive charges unless another person is present within calling distance, and able and ready to render assistance in the event of accident or injury.

(23) A test shall be made for presence of stray currents to any blasting operations in the vicinity of electric lines such as transmission lines, electrified railways and the like. Electric blasting caps shall not be used if stray currents are present.

(24) Notwithstanding any other Regulations, no blasting, whether of overburden, stone, clay or other material, shall be done or performed in such manner and under such circumstances or conditions as to eject debris into the air, as to constitute a hazard or danger or do harm or damage to persons or property in the area of the blasting.

(25) Blasts shall be fired only between sunrise and sunset unless otherwise authorized by the Department.

§ 211.42. Transportation of Explosives.

Transportation within the Commonwealth of Pennsylvania of explosives or explosives devices on highways, streets or other public ways or toll roads, including the Pennsylvania Turnpike, shall be in accordance with stipulations and regulations for the transportation of explosives as set forth from time to time by the Hazardous Substances Transportation Board.

Transportation of explosives on ways other than highways, streets, or other public ways or toll roads, shall be within the purview of Act 537, approved July 1, 1937, P.L. 2681, as amended, and shall be in accordance with stipulations and regulations set forth herein.

(1) All shipments of explosives, upon reaching destination, shall be unloaded immediately and the vehicle shall be removed from the storage or blasting area. Under no circumstances shall a vehicle be used for the storage of explosives.

(2) Repairs shall not be made on any vehicle containing explosives; prior to commencing repairs all explosives shall be removed to another vehicle or stored in accordance with the regulations for the storage, handling and use of explosives.

(3) Every vehicle used for transporting explosives shall be equipped with and obviously display proper signs or markings on each side, front and rear, with the word "EXPLOSIVES" in letters not less than four (4) inches high.

(4) Dynamite packages which are stained or show other signs of leakage shall not be transported without first consulting the manufacturer for advice.

(5) No person shall load or unload explosives from any vehicle while the engine is operating. All actions necessary to prevent the movement of the vehicle, while being loaded or unloaded, must be taken.

(6) No smoking shall be permitted in or about any vehicle used for the transportation of explosives, when being loaded or unloaded or in any stage of transportation or distribution of blasting materials; and no smoking signs shall be posted.

(7) Any vehicle transporting explosives within the State must bear the latest safety inspection sticker of the Bureau of Motor Vehicles of the Commonwealth of Pennsylvania.

(8) Explosives in excess of two thousand (2000) pounds shall be transported in closed-body vehicles; if open-bodied vehicles are used for lesser loads the ends and sides shall be high enough to prevent explosives from falling off, and the load shall be covered with a fire-resistant tarpaulin.

(9) The inside of the bed used for transporting explosives shall be of wood or other non-sparking material.

(10) When the vehicle is being used for the transportation of explosives, metals, metal tools, blasting machines or other articles or materials likely to damage such explosives may be transported in the same vehicle provided the different parts of such loads are separated by substantial bulkheads so constructed as to be capable to prevent such damage. Explosives and blasting caps or electric blasting caps shall be separated each from the other and from other materials by four (4) inch thick bulkheads. See § 211.38.

(11) No materials such as matches, firearms, electric storage batteries, flammable substances, acids, oxidizing agents (other than ammonium nitrate in original containers), or corrosive compounds shall be transported in the same vehicle with explosives.

(12) The vehicle shall be equipped with not less than two (2) fire extinguishers, approved by the National Board of Underwriters; and shall be easily accessible, filled and ready for immediate use.

(13) The chassis, engine, pan and all other parts of the truck shall be kept free of all surplus oil and grease.

(14) Any person transporting explosives shall be responsible for a daily inspection of the vehicle and a log of such inspection shall be maintained. This log shall set forth the following:

- (A) That all fire extinguishers are filled and ready for immediate use,
- (B) That all electric wiring is completely insulated,
- (C) That the chassis, engine and all other parts of the truck are free of surplus grease or oils,
- (D) That the fuel tank and fuel lines have no leaks,
- (E) That the condition of the vehicle is such as to meet the requirements for inspection under the Motor Vehicle Code of the State.

(15) Explosives shall be transported in their original containers or in State-approved and licensed magazines. See § 211.38.

(16) When transporting explosives, the vehicle shall be driven by licensed driver, who shall be twenty-one (21) years of age or older, careful, capable, reliable, able to read and write the English language; and who shall not be addicted to the use of intoxicants or narcotics. It shall be the duty of any person employing a driver of a vehicle to be used for the transporting of explosives to obtain proof of age of such driver.

(17) Special care shall be exercised to the end that packages or other containers containing explosives shall not catch fire from sparks or hot gases from the exhaust tailpipe.

(18) In the event of any emergency involving any vehicle transporting any explosives, every available means shall be employed to prevent individuals, other than those employed in the protection of persons or property or in the removal of hazards or wreckage, from congregating in the vicinity; such means shall also be employed to prevent smoking, to keep flame away, and to safeguard against the aggravation of the hazard present.

(19) Refueling of vehicles while transporting explosives shall be prohibited.

(20) In the event that any motor vehicle laden with explosives is entangled with another or with any other object or structure, following an accident, no attempt shall be made to disentangle, either vehicle, or the laden vehicle from the object or structure, until the explosives, together with fragments thereof, are removed to another vehicle or stored in accordance with the regulations for the storage, handling and use of explosives.

§ 211.43. Storing Explosives.

A competent person shall always be in charge of explosives and magazines in which explosives are stored, shall keep magazine keys, and shall be responsible that all proper safety precautions are taken.

(1) If artificial light is needed, use only an approved electric flash light or electric lantern. Do not use oil burning or chemical lamps, lanterns, candles or matches. See also § 211.35.2.

(2) Moisture damages all kinds of explosives, therefore every precaution should be taken to keep them perfectly dry.

(3) Do not for any length of time expose explosives of any kind, or any type of fuse, to sources of heat such as from radiators, steam pipes, stoves or any other sources of heat, such as direct rays of the sun. Such heat tends to separate and decompose the explosives ingredients. Every effort shall be made to keep explosives and fuse cool and dry.

(4) Keep the door of a magazine securely locked when not engaged in the magazine.

(5) Keep ground around magazines clear of leaves, grass, trash, stump or debris to a distance of twenty-five (25) feet to prevent fire reaching them. Any unsound trees in the vicinity sufficiently tall as to fall on a magazine shall be removed.

(6) If leak develops in magazine roof or walls, repair it at once.

(7) Always use oldest stock first.

(8) Open boxes of explosives shall not be stored in magazines. Partially used boxes of explosives shall be resealed before return to magazine storage.

(9) When black powder and dynamite are both stored in one magazine store each explosive separately.

(10) Dynamite boxes should be laid flat, top side up. Black powder should be stored with kegs standing on ends, bungs down, or on sides, "seams down."

Corresponding grades and brands should be stored together in such manner that brand and grade marks will show. All stock should be stored so as to be easily counted and checked and so that the oldest stocks can be delivered or used first.

(11) Always be on the lookout for dynamite cases showing stains of any nature caused by leakage of any substance from within the case and report it immediately.

(12) Black powder kegs should be thoroughly shaken by hand sufficiently often to prevent caking. Do not knock against floor or against each other.

(13) Magazine floors should be regularly swept and kept clean. Destroy sweepings from dynamite magazine floors by burning. Destroy sweepings from black powder magazine floors by throwing them in water.

(14) In case magazine floors become stained with nitroglycerine, scrub well with a stiff broom, hard brush or mop with a solution prepared as follows: Dissolve one (1) pound of sodium sulfide in 1 1/2 quarts of water, add 3 1/2 quarts of denatured alcohol and one (1) quart of acetone. Stir until a uniform mixture results and store in a polyethylene bottle. Use plenty of liquid so as to thoroughly decompose the nitroglycerine.

(15) Do not have loose dynamite, black powder or blasting supplies exposed in any magazine.

(16) Do not pile damaged or unusable explosives with usable stocks.

(17) Do not keep or use any steel or metal tools in a magazine or store any commodity except explosives in a magazine.

(18) Do not open packages of explosives or pack or repack explosives in a magazine or within 50 feet of a magazine.

(19) Do not leave explosives lying around where children or people can meddle with them. Always keep them under lock and key in a suitable magazine.

(20) Do not store explosives in any building or structure in which persons may live, work or assemble, or in any place where in event of an accident loss of life or property might result.

(21) Blasting caps, electric blasting caps, non-electric MS delay caps or similar devices shall not be stored in the same box, container, or magazine with other explosives.

(22) Detonating cord, cast primers and the like shall not be stored with blasting caps, electric blasting caps or like devices.

(23) Magazine rules shall be posted in every magazine and these rules shall be complied with.

(24) The person or company who is the ultimate user, upon receiving delivery of explosives at a magazine shall, by means of a suitable stamp, mark each package, case shipping container, bag or other container such as carton for electric blasting caps with an identifying code designation. This code shall serve to identify the buyer and to show the date of receipt of material.

§ 211.44. Instrumentation.

(1) All three-component portable displacement seismographs currently in use will be approved until further notice by the Department of Environmental Resources.

(2) A direct reading velocity instrument shall be approved by the Department of Environmental Resources only if it has a frequency range of 2 cycles per second to 150 cycles per second or greater, a velocity range of 2.0 in/sec. or greater, adheres to design criteria for portable seismographs as outlined in USBM RI-5708, USBM RI-6487, and meets such standards as are established from time to time by the Department of Environmental Resources.

(3) Three-component instruments of both the direct reading velocity type and the displacement type will be approved by the Department of Environmental Resources for use as follows:

(A) Particle velocity reading may be calculated from results obtained by a displacement instrument or obtained from an approved direct reading velocity instrument in any blasting operation where all of the following conditions exist:

- (i) Recording distance is over 200 feet from the blast.
- (ii) Scaled distance is numerically greater than 25.
- (iii) Frequency range is 40 cycles per second or less.

(B) A direct reading velocity instrument will be required in any blasting operation where all of the following conditions exist:

- (i) Recording distance is less than 200 feet from the blast.
- (ii) Scaled distance is numerically less than 50.

(C) A direct reading velocity instrument will be required in any blasting operation where all of the following conditions exist:

- (i) Recording distance is more than 200 feet from the blast.
- (ii) Scaled distance is numerically less than 25.

(D) A direct reading velocity instrument will be required in any blasting operation where all of the following conditions exist:

- (i) Recording distance is more than 200 feet from the blast.
- (ii) Frequency range is in excess of 40 cycles per second.
- (iii) The analysis of Seismic Data shall be conducted by a completely independent company, one not related to the company performing the blasting or for whom the blasting is being performed.

§ 211.45. Blasting Operations.

In all blasting operations, except as hereinafter provided, a scaled distance of fifty (50) or numerically greater may be used to determine the maximum charge weight per delay interval of eight (8) milliseconds or greater without the use of seismic instrumentation.

(1) If a scaled distance of less than fifty (50) and an actual distance of more than three hundred (300) feet is used, then seismic instrumentation of each blast is required unless on at least five (5) blasts, previously conducted as hereinafter provided, instrumentation has shown that the maximum peak particle velocity of any one of three mutually perpendicular components of the ground motion in the vertical and horizontal directions at the specific location is one inch per second or less and for all future blasts the scaled distance is equal to or numerically greater than the scaled distance for the instrumented blast. Such five (5) blasts shall be conducted in accordance with a plan previously approved by the Department of Environmental Resources and the results thereof may be used as the basis for all future blasting until such time as a complaint shall have been filed with the Department of Environmental Resources. Upon the filing such complaint the Department may require the operator to conduct all future blasts at a scaled distance of fifty (50) or numerically greater, or to instrument all blasts conducted at a scaled distance of less than fifty (50) or to conduct five (5) additional test blasts as previously set forth.

(A) Plan for five (5) instrumented blasts submitted to the Department of Environmental Resources for approval shall consist of a map or plan showing the quarry property, the nearest dwelling house, public building, school, church, commercial or institutional building neither owned nor leased by the person conducting the blasting and the locations of each of the proposed five (5) instrumented blasts. These plans shall be drawn to a scale of two hundred (200) feet to the inch, shall be furnished in triplicate and shall be accompanied by a fee of \$20.00 payable to the Commonwealth of Pennsylvania.

(2) If a scaled distance of less than fifty (50) and an actual distance of less than three hundred (300) feet is used, then seismic instrumentation of each blast is required unless the person conducting the blast elects to use the following table to determine the maximum charge weight:

Actual Distance	Charge Weight
0 - 10'	1/8 pound total shot
11' - 15'	1/4 pound per delay interval of eight (8) milliseconds or greater
16' - 20'	1/2 pound per delay interval of eight (8) milliseconds or greater

Actual Distance**Charge Weight**

21' - 25'

3/4 pound per delay interval of eight (8) milliseconds or greater

26' - 30'

1 pound per delay interval of eight (8) milliseconds or greater

31' - 300'

add 1/8 pound per additional foot of distance per delay of eight (8) milliseconds or greater.

§ 211.46. Records.

A record of each blast shall be kept. All records shall be retained at least until the end of the calendar year next following the year in which the record is made and shall be available for inspection by the Department of Environmental Resources and shall contain the following minimum data:

1. Name of Company or Contractor.
2. Location, date and time of blast.
3. Name, signature and license number of blaster in charge.
4. Type of material blasted.
5. Number of holes, burden and spacing.
6. Diameter and depth of holes.
7. Types of explosives used.
8. Total amount of explosives used.
9. Maximum amount of explosives per delay period of eight (8) milliseconds or greater.
10. Method of firing and type of circuit.
11. Direction and distance in feet to nearest dwelling house, public building, school, church, commercial or institutional building neither owned nor leased by the person conducting the blasting.
12. Scaled Distance, Ds.
13. Weather conditions.
14. Direction of wind.
15. Height or length of stemming.
16. Were mats used?
17. Type of delay electric blasting caps used and delay periods used.
18. The person taking the seismograph reading shall accurately indicate exact location of seismograph is used, and shall also show the distance of seismograph from blast.
19. Seismograph records, where required:
 - a. Name and signature of person operating seismograph.
 - b. Name of person analyzing the seismograph record.
20. Maximum number of holes per delay period of eight (8) milliseconds or greater.

USE OF EXPLOSIVES**§ 211.51. General Requirements and Procedures.**

(1) Each person before he opens a magazine or keg of black powder, or box of dynamite, or other explosives, or before he approaches same, shall first place any lamp with open flame, or any lighted pipe, cigar, or cigarette, or any other thing containing open fire not less than one hundred (100) feet from such magazine, box, or keg.

(2) The use of an axe, bar, hammer, pick or other iron or steel implement to punch holes in or open containers of dynamite, black powder, blasting caps, electric

blasting caps or detonators, electric squibs or other explosives is prohibited. A wooden, rubber, rawhide, fiber, zinc or babbitt mallet and wooden wedge shall be used in opening containers of dynamite. Metal slitters may be used to open fiberboard boxes, but the slitter shall not contact the metal stitching on the box.

(3) The conduct of all blasting operations shall be under the direct control and supervision of competent and responsible persons who are blasters licensed by the Department. No person shall be permitted to fire any charge of explosives in blasting operations except the blaster designated as in charge of the blast, who shall be a blaster licensed by the Department. It shall be the responsibility of the operations management where blasting is to be accomplished, to designate for each and every blast the licensed blaster who is in charge of each blast, and the record book shall show the name and license number of this blaster. The superintendent, foreman, or person in charge of every operation where blasting is to be done shall post in a conspicuous place in proximity to the operation the name or names of individuals all of who must be licensed blasters as aforesaid, who are to handle the work of blasting.

(4) In charging holes for blasting, only wood tamping sticks shall be used. Sectional poles connected by brass fittings shall be permitted, provided only the wooden end of the pole is used for tamping purposes.

(5) Horizontal holes shall be charged only in cartridge form except where powder is used and loaded by a method approved by the Department. Such powder shall be of a character to withstand a satisfactory friction, impact and free burning test conducted by the Department. Where black powder and dynamite are used in the same hole, separate primers shall be used unless the dynamite is used to detonate the black powder or detonating cord is used. All holes shall be adequately stemmed to a depth not less than eight (8) inches, except where the hole itself is less than eight (8) inches in depth in which case the hole shall be stemmed in its full depth. Nothing in these regulations shall be construed to prohibit the slitting of dynamite cartridges nor the dividing of them into two (2) or more pieces.

(6) When holes are being charged or have been charged with explosives, no person, other than licensed blasters and no more than six (6) helpers for each licensed blaster working on the charge, shall be permitted or required to work on or near the face or near any point where he shall be in immediate danger. No equipment other than equipment necessary for loading shall be permitted to operate within fifty feet of holes loaded or being loaded with explosives.

(7) When explosives are used in primary shooting, the Department recommends that they be fired by means of detonating cord or electric current from a blasting machine, or from a power line equipped with properly wired blasting switch facilities. Nothing less than No. 6 blasting caps or electric blasting caps or detonators shall be used to fire explosives at any time. The use of fuse and caps to explode black powder charges will be accepted. The use of patent squibs or patent matches is prohibited, except squibs of Daddow or Powell type. Nothing in these regulations shall be construed to prohibit the use of fuse and blasting caps in primary shooting, mud capping, black holing or pop shooting. Each blaster or shooter using a blasting machine or blasting switch, before connecting the charge to the leading wires, shall first ensure that such wires have been disconnected from the blasting machine or the blasting switch. The practice of connecting a charge with the leading wires before placing the charge in position is prohibited. Storage and dry cell batteries shall not be used as sources of power for electrical blasting, and neither shall use be made of automobile generators, spark plugs on any kind of equipment, cap-lamp batteries, welding machines, electroplating generators, or any other inadequate source of power.

(8) All types of blasting machines not now in use and to be used in the Commonwealth of Pennsylvania shall be approved by the Department of Environmental Resources.

(9) Blasting machines must be tested at least monthly by procedures recommended by the manufacturers or supplier to ensure performance at rated capacity, and a record kept of these tests. Caps to be used in these tests shall be buried one (1) foot in the ground.

(10) Whether a blast is to be fired by a blasting machine or a power line, it

is the responsibility of the licensed blaster to determine and have available the required, adequate power for the blast.

(11) When fuse is used, its length shall be in accordance with specifications found in Paragraph (15). All blasting caps shall be crimped to the fuse with a crimper. The crimping of blasting caps by the use of a knife or the teeth is prohibited. No fuse shall be capped in or within ten (10) feet of any magazine.

(12) Prior to the firing of a charge the person in charge of such blast shall ensure that all loose black powder or dynamite around the hole has been cleared away in order to prevent a premature explosion.

(13) Prior to the firing of a blast, the person in charge of such blast shall notify all persons who may be in danger therefrom and sound a recognized whistle or siren of sufficient power to be heard in the general area. The warning of the public on a public highway shall be accomplished by a person waving a red flag and all traffic flow shall be stopped.

(14) Blasting operations shall not be conducted within 800 feet of a highway or public roadway, unless due precautionary measures are taken to safeguard the public. Trunk lines of detonating cord shall be covered.

(15) When fuse is used, the minimum length of fuse shall be thirty (30) inches.

(16) The licensed blaster loading the bore holes or responsible for the loading of the holes in any given blast shall also fire the blast. It shall also be the responsibility of the licensed blaster, after each blast, to closely inspect the blast site for any missed holes prior to muck removal, and also before any further drilling is authorized.

(17) A hole which has missed fire shall not have the charge withdrawn. Every work place in which a hole has missed fire shall remain idle for one (1) hour before reentry is made if approved fuse was used. Otherwise the waiting period shall be not less than six (6) hours. In the event that a powder squib or electric current from a blasting machine or powder line was used to explode a hole which missed fire, the waiting period shall be not less than fifteen (15) minutes, provided that the wires have been disconnected from the blasting machine or powder line. The handling of misfired holes shall be accordance with the following specifications, under the personal supervision of the blaster foreman. If the misfired hole has eighteen (18) inches or less of stemming, nothing in this rule shall be construed to prohibit the recharging of the missed hole on top of the old stemming. If the unfilled portion of the missed hole is insufficient to accommodate the new charge and stemming, or if the missed hole has been stemmed the full depth, a new hole shall be drilled or compressed air may be used to clean out the stemming in the old hole. The second hole shall be not less than two (2) feet away from the missed hole. When a well hole or tunnel shot has missed fire the owner, operator, superintendent, or blaster in charge shall immediately notify the Department of Environmental Resources by telephone or telegraph and no attempt shall be made to remove the charge or refire the hole or shot until permission has been given by the Department.

(18) Except in cases of simultaneous firing or firing with millisecond delay electric blasting caps, the total number of explosions in every blast shall be counted by the licensed blaster, or by the pit, quarry or blaster foreman. If the total number of explosions is less than the number of charges that were to be fired, a report shall be made to the pit, quarry or blaster foreman. When it is not certain that all charges have been exploded, no person shall enter the place where such charges were fired within the time limits and under the conditions enumerated in Paragraph (17).

(19) Primers shall not be made up in a magazine or near excessive quantities of explosives, nor in excess of immediate needs. The primer cartridge shall not be brought to the hole until ready to make up and place the primer in the hole. To permit the primer cartridge and/or cap to lay on the ground where they may be trod upon is prohibited. The primer shall not be slit, dropped, deformed, or carelessly handled in any way shall not be tamped.

(20) Blasting caps and electric blasting caps shall not be forced into dynamite. The cap shall be inserted into a hole made with a punch designed for the purpose.

(21) Holes loaded with black powder or pellet powder shall not be back-primed when they are to be fired with safety fuse and blasting caps.

(22) When detonating cord is used in loading holes, the cord shall be cut from the supply roll immediately after placement in the hole leaving a sufficient length at the top of the hole for connection purposes, and the supply roll immediately removed from the site.

(23) Explosives shall not be stacked in surplus near working areas during loading operations and shall not be brought to a hole in greater quantity than will be required for that hole.

(24) When bore holes have been enlarged by springing (enlarging the hole with explosives), or upon completion of drilling, the holes shall not be loaded before making certain that they are cool and do not contain any hot metal, or burning or smoldering material. Temperatures in excess of 150 F. are dangerous. It shall be prohibited to spring a bore hole near another hole loaded with explosives.

(25) Before loading a bore hole it shall be carefully checked for condition with a wooden tamping pole, a tape, a light, or a mirror. Use of magnifying mirrors shall be prohibited. Explosives shall not be forced past any obstruction in a bore hole.

(26) Electric blasting caps shall be tested for continuity of circuit before the primers are made up, after the bore hole has been loaded and stemmed, and as the final connecting of the wires progresses. These tests shall be made only with a blasters galvanometer specifically designed for the purpose. The shunts shall not be permanently removed from electric blasting cap leg wires until final connection into the circuit.

(27) The use of abrasive or sharp edges constituents in stemming material shall be avoided as the tamping operation may sever electric blasting cap leg wires and cause misfire.

(28) Electric blasting caps shall not be employed in a blast if there is any possibility of wires from the circuit being thrown against electric lines.

(29) After loading operations are completed, any wood, paper or fiber materials employed in packing explosives shall be inspected for the presence of explosives and removed to an isolated area. After the blast has fired, such materials shall be burned and no person should be nearer than 100 feet after the burning has started.

(30) No effort shall be made to reclaim deteriorated or damaged fuse, or to reclaim electric blasting caps when the leg wires have been broken off near the top of the cap.

(31) Leg wires of electric blasting caps or lengths of detonating cord shall not be spliced if the resulting splices will fall within the bore hole.

(32) Electric wires and cables of any kind shall not be permitted near electric blasting caps or other explosives except at the time and for the purpose of firing the blast.

(33) Only explosives designated for such use shall be employed in underground blasting operations.

(34) When electric blasting operations are located near highways or other public ways, signs shall be erected at least 500 feet from the blast areas reading: 'BLAST AREA - SHUT OFF ALL TWO-WAY RADIOS'. The letters of these signs shall be not less than four (4) inches in height on a contrasting background.

(35) Mudcapping in blasting operations shall be permitted only where it would endanger the safety of the workmen to drill the rock or material to be blasted. If mudcapping is necessary, no more than ten (10) pounds of explosives shall be used for each charge.

(36) When blasting to an open vertical face, the face shall be checked for loose, hanging material or other faults prior to beginning of loading operations.

(37) When a blast is being loaded, the loading of individual well drilled holes shall be followed with a blaster's logging tape and a record kept.

(38) Do not return to the scene of a blast until all smoke and/or fumes have been dissipated by natural or artificial means.

(39) All explosives remaining at the site of a blast after loading has been completed shall be returned to an approved, licensed magazine prior to firing the blast.

(40) When loose dynamite has been poured down a bore hole, the dynamite shall not be tamped, but the hole shall be stemmed.

(41) When blasting in close proximity to residences or other occupied buildings, highways, railroads or other locations where injury to persons or damage to property could occur, blasting mats or other protective means shall be used to prevent fly debris. See § 211.41.

§ 211.52. Blasting in the Vicinity of Utility Lines.

All regulations set forth in this section shall apply to underground and exposed utility lines making solid contact with the surface. The utility lines covered by these regulations shall be defined as, but not limited to gas, water and oil transmission lines, storm and sanitary sewers, electric lines and telephone lines, etc. These rules shall not be applicable to utility lines located above the surface, but in such instances safe blasting techniques shall be employed so as not to inflict damage to the supporting foundations.

(1) Utility lines located in the vicinity of any blasting operation should be shown on the plans provided by the engineer or architect and it shall be the responsibility of the contractor to verify this location. In event the provided plans show no utility lines and it is suspected that such lines are in the immediate vicinity, the contractor shall make a concentrated effort to substantiate their existence as to the horizontal distance from the closest hole of the blast and depth below the surface.

(2) When blasting in the vicinity of utility lines the blaster will endeavor to:

(A) Use a drilling pattern and blast initiation procedure that will provide the greatest relief possible in a direction away from the utility line so as to keep the resulting vibration and actual ground movement to the lowest possible level.

(B) Use a type of explosive specifically designed to be unlikely to propagate between holes.

(3) All blasting in the vicinity of utility lines shall be conducted as follows:

(A) Excavation from the surface to a depth corresponding to the elevation of the top of the buried utility line can proceed at the discretion of the blaster using accepted techniques.

(B) When the excavation has attained a depth equal to the elevation of the top of the buried utility line or if the line is exposed on, and makes solid contact with the surface, the vertical depth of subsequent blast holes will be restricted to one-half (1/2) the horizontal distance from the closest portion of the pipe line. In this instance blast hole diameter will be restricting to a maximum of three (3) inches with no more than one (1) hole being initiated per delay period.

(C) Example: Depth of top of utility line below surface = 20'. Horizontal distance of blast hole from closest portion of the utility line 10'. Ultimate depth of excavation = 30'.

There would be no limitation on the depth of blast holes for initial 20', but the last 10' of the excavation must be made in two (2) lifts not exceeding 5' each.

(4) If one or more of these regulations provide an operational or safety oriented hardship, application may be made to the Department of Environmental Resources for a waiver of the regulation or regulations in question. This waiver will be granted if, in the judgment of the Department, the alternate procedure does not endanger the utility line.

SPECIAL PRECAUTIONS RELATIVE TO AMMONIUM NITRATES

§ 211.61. Distant limitations.

The following shall apply to ammonium nitrate-fuel compositions mixed at all sites except manufacturing plants.

(1) The processing, packaging, and preparation of ammonium nitrate-fuel compositions prior to storage in magazines shall comply with 27 C.F.R. §181.200(1981).

(2) Stored ammonium nitrate shall be isolated a minimum of 300 feet from combustible fuels.

(3) Storage in magazines of ammonium nitrate-fuel composition shall comply with the Quantity and Distance Table in § 211.32 (relating to location of magazines), and not The American Table of Distances referenced in 27 C.F.R. §181.200.

Section 181.200 Table of recommended separation distances of ammonium nitrate and blasting agents from explosives or blasting agents.

Donor Weight		Minimum separation distance of receptor when barricaded ¹ (ft.)		Minimum thickness of artificial barricades ⁴ (in.)
Pounds over.	Pounds not over	Ammonium nitrate ²	Blasting agent ³	
	100	3	11	12
100	300	4	14	12
300	600	5	18	12
600	1,000	6	22	12
1,000	1,600	7	25	12
1,600	2,000	8	29	12
2,000	3,000	9	32	15
3,000	4,000	10	36	15
4,000	6,000	11	40	15
6,000	8,000	12	43	20
8,000	10,000	13	47	20
10,000	12,000	14	50	20
12,000	16,000	15	54	25
16,000	20,000	16	58	25
20,000	25,000	18	65	25
25,000	30,000	19	68	30
30,000	35,000	20	72	30
35,000	40,000	21	76	30
40,000	45,000	22	79	35
45,000	50,000	23	83	35
50,000	55,000	24	86	35
55,000	60,000	25	90	35
60,000	70,000	26	94	40
70,000	80,000	28	101	40
80,000	90,000	30	108	40
90,000	100,000	32	115	40
100,000	120,000	34	122	50
120,000	140,000	37	133	50
140,000	160,000	40	144	50
160,000	180,000	44	158	50
180,000	200,000	48	173	50
200,000	220,000	52	187	60
220,000	250,000	56	202	60
250,000	275,000	60	216	60
275,000	300,000	64	230	60

NOTE:

Recommended separation distances to prevent explosion of ammonium nitrate and ammonium nitrate-based blasting agents by propagation from nearby stores of high explosives or blasting agents referred to in the Table as the "donor." Ammonium nitrate, by itself, is not considered to be a donor when applying this Table. Ammonium nitrate, ammonium nitrate-fuel oil or combinations thereof are acceptors. If stores of ammonium nitrate are located within the sympathetic detonation distance of explosives or blasting agents, one-half the mass of the ammonium nitrate should be included in the mass of the donor.

These distances apply to the separation of stores only. The Table of Distances in accordance with Section 211.32 shall be used in determining separation distances from buildings, railways and public highways.

¹When the ammonium nitrate and/or blasting agent is not barricaded, the distances shown in the Table shall be multiplied by six. These distances allow for the possibility of high velocity metal fragments from mixers, hoppers, truck bodies, sheet metal structures, metal containers, and the like which may enclose the "donor." Where storage is in bullet-resistant magazines recommended for explosives or where the storage is protected by a bullet-resistant wall, distances and barricade thickness in excess of those prescribed in the Table of Distance in accordance with Section 211.32 are not required.

²The distances in the Table apply to ammonium nitrate that passes the insensitivity test prescribed in the definition of ammonium nitrate fertilizer promulgated by the National Plant Food Institute; and ammonium nitrate failing to pass said test shall be stored at separation distances determined by and approved by the authority having jurisdiction.

³These distances apply to nitro-carbo-nitrates and blasting agents which pass the insensitivity test prescribed in the Department of Transportation (DOT) regulations.

⁴Earth, or sand dikes, or enclosures filled with the prescribed minimum thickness of earth or sand are acceptable artificial barricades. Natural barricades, such as hills or timber of sufficient density that the surrounding exposures which require protection cannot be seen from the "donor" when the trees are bare of leaves are also acceptable.

(4) Ammonium nitrate as referred to in this section shall include fertilizer grade ammonium nitrate.

Source

The provisions of section 211.61 amended on April 20, 1982, effective October 16, 1982, 12 Pa. B. 3736.

§ 211.62. Blasting Prohibited.

Under no circumstances shall caked ammonium nitrate in bags or in bulk be loosened by blasting with explosives. Permissible explosives cannot be regarded as safe for this purpose.

§ 211.63. Building, Operation and Storage Requirement.

(1) The design and construction of the warehouse floor shall be such as to minimize open drains and piping into which molten ammonium nitrate could flow and be confined in the event of a fire.

(2) Floors in the storage area and processing plant shall be of concrete. The storage areas for processed ammonium nitrate and for raw ammonium nitrate shall be separated from the fuel storage area.

(3) A natural draft vent shall be provided.

(4) Heat shall be provided exclusively from a source located outside the building.

(5) No unusual compositions shall be attempted except under the supervision of competent personnel equipped to determine the sensitivity of the resulting compositions.

(6) A maximum of one day's production, or the limit determined by Rule 26 (a) 2 of Regulation for Plant Manufacturing or Using Explosives, if that is less, shall be tolerable within or in the immediate vicinity of the mixing and packaging point.

(7) Deleted.

(8) Where ammonium nitrate and explosives are stored in the same magazine, standard magazine construction shall be followed and the weight of explosives for determining distance limitations.

(9) Deleted.

(10) No smoking shall be tolerated near sensitized ammonium nitrates.

(11) No accumulations of ammonium nitrate bags shall be permitted in or near storage of sensitized ammonium nitrate.

(12) Broken bags of ammonium nitrate or broken cartridges of processed explosives shall immediately be cleaned up and removed.

(13) Finished explosives in bags or in cartridges shall be stacked so as to allow free circulation of air.

§ 211.64. Mobile Equipment for Mixing Prohibited.

Mobile equipment designed for mixing in transit shall be prohibited.

§ 211.65. Blasting Operations.

(1) The holes shall be primed with at least two primers of adequate size and strength, unless otherwise authorized by the Department of Environmental Resources.

(2) If a misfire occurs, the ammonium nitrate-fuel oil mixture shall be washed out with a stream of water.

(3) If undetonated explosive is suspected in the muck pile, the muck pile shall be very thoroughly wetted down with water before any digging is attempted.

(4) Fumes from the explosion of sensitized ammonium nitrate explosives shall be allowed to clear completely before the area is entered.

(5) The use of fuel-sensitized ammonium nitrate explosives shall not be permitted underground unless the use is approved by the Department of Environmental Resources.

(6) No fuel oil-ammonium nitrate explosive is a permissible explosive.

(7) When pneumatic loading devices are to be used, every precaution shall be taken to prevent an accumulation of static electricity. All loading operations shall be stopped immediately if static electricity or stray electrical currents are detected, and the condition shall be remedied before loading may be resumed.

SPECIAL PRECAUTIONS FOR THE STORAGE AND USE OF PROPELLANTS

The following regulations pertain to the storage and handling of propellants:

§ 211.71. Storage of Propellants.

Propellants shall be stored or kept as provided below:

(1) Smokeless propellants shall be stored only in United States Department of Transportation approved shipping containers.

(2) Smokeless propellants intended for personal use may be stored in residences without permits in quantities not to exceed 25 pounds. A permit will be required for storage, in a residence, of quantities over 25 pounds but not exceeding 50 pounds.

(3) Not more than 25 pounds of smokeless propellants in containers of one pound maximum capacity shall be displayed in commercial establishments.

(4) Total stocks of smokeless propellants in commercial establishments shall not exceed 200 pounds unless special precautions are taken as described in paragraph (5). The propellant shall be stored in wood boxes or cabinets having walls of at least 1 inch nominal thickness. Not more than 50 pounds shall be permitted in any one box or cabinet.

(5) Total stocks of smokeless propellants in commercial establishments exceeding 200 pounds but not more than 750 pounds may be stored in wood boxes or cabinets having walls of at least one-inch nominal thickness providing that external heat-activated deluge sprinklers or heat-activated foaming devices, acceptable to the Department, are installed. The sprinklers or foaming devices must be capable of completely inundating the storage facilities. Not more than 400 pounds of powder shall be stored in any one cabinet.

(6) Storage of smokeless propellants in residences and commercial establishments shall be located away from any flammable substance and sources of open flame, sparks or heat.

(7) Not more than six pounds of black sporting powders shall be permitted in a residence.

(8) Not more than 25 pounds of black sporting powder shall be permitted in a commercial establishment. It shall be stored in a Class C magazine which shall be mounted on wheels for easy removal in case of fire. The magazine shall be located in close proximity to an outside door.

(9) Black sporting powders shall not be displayed in commercial establishments.

(10) Black sporting powders in residences shall be stored in wood boxes or wood cabinets equipped with locks and having walls of at least one-inch nominal thickness, and shall be located away from any flammable substances and source of open flame, sparks or heat.

§ 211.72. Storehouses—Distances Limitations.

Approved magazines as described in § 211.33, "Type and Construction of Magazines," shall be provided for storage of quantities of smokeless propellants greater than 200 pounds except when provision of special precautions, as described in § 211.71(5), allows storage up to 750 pounds in commercial establishments. Such magazines shall also be provided for

quantities of black sporting powders greater than 15 pounds in locations separated from inhabited buildings, highways or railroads in accordance with the provisions of the "Quantity and Distance Table for Unbarricaded Magazines" in § 211.32, "Location of Magazines." Smokeless propellants and black sporting powder may be stored in the same magazine. Magazines of 5,000 pounds capacity and larger shall be licensed.

§ 211.73. Protection from Fire.

No fire or open flame shall be permitted in or within 50 feet of any propellants.

§ 211.74. Storehouses—Construction and Maintenance.

All storehouses shall be fire and theft resistant, well ventilated, clean, dry free of grit and rubbish.

§ 211.75. Transporting of Propellants in Vehicles.

Transportation of propellants over the public highways is regulated by the Hazardous Substances Transportation Board of the Commonwealth of Pennsylvania. All rules and regulations issued by this Board shall be complied with.

§ 211.76. Smoking Prohibited.

No person shall smoke while handling propellants or in the vicinity of quantities of propellants.

No smoking signs shall be posted in commercial establishments in the area where propellants are kept.

§ 211.77. Tools for Opening Containers.

Tools made of steel or other sparking materials shall not be used for opening containers of propellants.

§ 211.78. Permit to Sell.

All dealers in sales of propellant to consumers shall be required to obtain a permit to sell from the Department of Environmental Resources of the Commonwealth of Pennsylvania.

Appendix A

Radio Frequency Transmitters

1. Mobile radio transmitters which are less than one hundred fifty (150) feet away from electric blasting caps in other than original containers shall be de-energized and effectively locked.

2. All electric blasting operations shall be conducted at no less distance from any fixed or mobile transmitter than indicated in the following Tables 1 through 6. If these tables present distances which are operationally inconvenient to use, the supplier of the electric blasting caps shall be consulted for detailed safe procedures to be followed.

Table 1

**Recommended Table of Distances for Commercial AM
Broadcast Transmitter (0.535 to 1.605 MHz)**

	Transmitter Power (Watts)	Minimum Distance (Feet)
Up to	4,000	750
	5,000	850
	10,000	1,300
	25,000	2,000
	50,000 (1)	2,800
	100,000	3,900
	500,000	8,800

(1) 50,000 watts is the present maximum power of U. S. broadcast transmitter in this frequency range.

Table 2

**Recommended Table of Distances for HF Transmitters
Other Than AM Broadcast Worse Case Calculated at
20.8 MHz for a Loop Pickup Configuration (1)**

Transmitter Power (Watts)	Minimum Distance (Feet)
100	750
500	1,700
1,000	2,400
5,000	5,500
50,000 (2)	17,000
500,000	55,000

(1) This table should be applied to International Broadcast Transmitters in the 10-25 MHz range.

(2) Present maximum for International Broadcast

Table 3

**Recommended Table of Distances of Mobile Transmitters
Including Amateur and Citizens Radio**

MINIMUM DISTANCE (Feet)

Transmitter Power (Watts)	MF 1.6 to 3.4 MHz Industrial	HF 28 to 29.7 MHz Amateur	VHF 35 to 36 MHz Public Use 42 to 44 MHz Public Use 50 to 54 MHz Amateur	VHF 144 to 148 MHz Amateur 150.8 to 181.6 MHz Public Use	UHF 450 to 460 MHz Public Use
10	40	100	40	15	10
50	90	220	90	35	20
100	125	310	130	50	30
180 (1)				65	40
250	200	490	205	75	45
500 (2)			290		
600 (3)	300	760	315	115	70
1,000 (4)	400	980	410	150	90
10,000 (5)	1,250		1,300		

**Citizens Band Radio (Walkie-Talkie) 5 watts—Minimum Distance 5 ft.
26.96 to 27.23 MHz**

- (1) Maximum power for two-way mobile units in VHF (150.8 or 161.6 MHz range) and for two-way mobile and fixed station units in UHF (450 to 460 MHz range).
- (2) Maximum power for major VHF two-way mobile and fixed station units in 35 to 44 MHz range.
- (3) Maximum power for two-way fixed station units in VHF (150.8 to 161.6 MHz range).
- (4) Maximum power for amateur radio mobile units.
- (5) Maximum power for some base stations in 42 to 44 MHz band and 1.6 to 1.8 MHz band.

Table 4

**Recommended Table of Distances
for VHF TV and FM Broadcasting Transmitters**

Effective Radiative Power (Watts)	Minimum Distance (Feet)	
	Channels 2 to 6 and FM Channels 7 to 13	
Up to 1,000	1,000	750
10,000	1,800	1,300
100,000 (1)	3,200	2,300
316,000 (2)	4,300	3,000
1,000,000	5,800	4,000
10,000,000	10,200	7,400

- (1) Present maximum power channels 2 to 6 and FM-100,000 watts.
- (2) Present maximum power channels 7 to 13-316,000 watts.

Table 5

**Recommended Table of Distances
from UHF TV Transmitters**

Effective Radiative Power (Watts)		Minimum Distance (Feet)
Up to	10,000	600
	1,000,000	2,000
	5,000,000	3,000
	100,000,000	6,000

(1) Present maximum power channel 14 to 83-5,000 watts.

Table 6

**Recommended Table of Distances
from Maritime Radionavigational Radar**

Service	Effective Radiative Power Watts (Avg.)	Minimum Distance (Feet)
Small Pleasure Craft	500 (3 cm.)	20
Harbor Craft, River Boats, Etc.	5,000 (3 cm.)	50
Large Commerical Shipping	50,000 (3 cm. and 10 cm.)	300

The above tables should be used only if the exact nature of the radar hazard is understood. In cases where an uncertainty exists as to the nature of the radar signal as well as ground scatter and reflection of the radar signal, a recommended minimum distance of 1,000 feet should be maintained from the radar antenna.

*Effective Radiative Power = (Gain of antenna X output power of Transmitter).

Note: Acknowledge is made to the Institute of Makers of Explosives for use of Tables 1 through 6, from I M E Publication No. 20, 'Radio Frequency Energy-A Potential Hazard in the Use of Electric Blasting Caps.'

DEPARTMENT OF MINES & MINERALS
EXPLOSIVES & BLASTING DIVISION
P.O. BOX 14080
LEXINGTON, KENTUCKY 40512-4080

LAWS AND REGULATIONS
GOVERNING BLASTING
AND EXPLOSIVES

JANUARY, 1989

DIVISION OF EXPLOSIVES AND BLASTING
KENTUCKY DEPARTMENT OF MINES AND MINERALS

FROM

KI DEPARTMENT OF MINES & MINERALS
Explosives & Blasting Division
P. O. Box 14080
Lexington, Kentucky 40512-4080

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FORWARD

This publication includes the laws and regulations governing the use of explosives which are within the jurisdiction of the Kentucky Department of Mines and Minerals. It is intended to be a reference for the blaster in the field as well as for applicants studying for the Kentucky blaster's license examination.

Should you have any questions relating to these regulations, or wish additional information, contact:

Division of Explosives and Blasting
Kentucky Department of Mines and Minerals
P. O. Box 680
Lexington, Kentucky 40586

Phone: (606) 257-8818 Lexington
(606) 254-0367 Lexington
(502) 564-3019 Frankfort

In addition to the state laws and regulations, the U.S. Department of the Treasury, Bureau of Alcohol, Tobacco, and Firearms requirements on storage of explosives are also contained herein. These federal rules were adopted by this agency by reference in 805 KAR 4:090. Also printed is a recommended form for a blast report (EC-2). This form may be copied from this book and is also available in limited quantities from the Department of Mines and Minerals. However, this format is not mandatory; any form providing all information required by 805 KAR 4:050 is acceptable.

LARRY C. SCHNEIDER
Director

120 Graham Avenue
Lexington, Kentucky
October 1, 1983

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Paid for with state funds

BLASTING LAW

351.310. Definitions - As used in KRS 351.315 to 351.375 unless the context clearly indicates otherwise:

(1) "Explosives" means any chemical compound or other substance or mechanical system intended for the purpose of producing an explosion, or that contains oxidizing and combustible units or other ingredients in such proportions or quantities that ignition by detonation may produce an explosion, capable of causing injury to persons or damage to property;

(2) "Blasting operation" means the use of explosives in the blasting of stone, rock, ore or any other natural formation, or in any construction or demolition work, but shall not include its use in agricultural operations;

(3) "Blaster" means a person licensed to fire or detonate explosives in blasting operations;

(4) "Charge" means a quantity of explosive or equivalent that is to be detonated within a period of five (5) seconds;

(5) "Subcharge" means a quantity of explosive or equivalent that is to be detonated within a period of less than eight (8) milliseconds;

(6) "Detonation time" means the time at which the detonation is initiated;

(7) "Department" means the department of mines and minerals.

(8) "Commissioner" means the commissioner of mines and minerals. (Enact.Acts 1972, ch.280 ss 1; 1976, ch.143, ss 1.)

351.315. Licensing of blaster. - (1) No person shall detonate explosives in any blasting operation in which more than five (5) pounds of explosives or the equivalent are used in a single charge or in which less than five (5) pounds of explosives is used by a regular user, excluding blasting for agriculture and underground coal, unless he is licensed by the department. The department shall issue a license to use explosives to any person who:

(a) Has worked in blasting operations for at least twenty-four (24) months under the immediate supervision of an experienced blaster, and;

(b) Has passed an examination prescribed by the department which shall test the examinee's practice of blasting operations and the storage, moving, handling, and detonation of explosives.

(2) Application for license shall be in writing upon a form furnished by the department and shall be accompanied by a fee. If the applicant is successful in passing the examination, a license indicating his

competency to detonate explosives shall be issued upon the payment of an additional fee of five dollars (\$5.00).

(3) Any person who is a licensed blaster in another state where the qualifications prescribed at the time of licensing were, in the opinion of the commissioner, equal to those prescribed in the commonwealth at the date of application, and where reciprocal licensing privileges satisfactory to the department are granted to licensees of the commonwealth, may be granted a license without an examination, upon the payment of a fee.

(4) Each blaster shall be required to renew his license each year by application to the department, which application shall be accompanied by a fee.

(5) All fees provided in this section shall be set by the department by administrative regulation; provided, however, the fee for an application shall not exceed twenty dollars (\$20.00), the fee for license renewal shall not exceed ten dollars (\$10.00), and the fee for reciprocal licensing shall not exceed ten dollars (\$10.00).

(6) The commissioner may suspend any license for due cause but no license may be revoked until the licensee has been granted adequate opportunity for a hearing.

351.325. Classification of blasters. - The department may institute classifications of blasters for the purpose of insuring adequate skill in different types of blasting operations. Classification will be determined by passage of a corresponding examination. (Enact.Acts 1976, ch.143, ss 3.)

351.330. Requirements governing blasting operation. - (1) Blasting of explosives for use in the neighborhood of any public highway, stream of water, dwelling house, public building, school, church, commercial or institutional building, pipeline, or utility shall be done in accordance with the provisions of this section, and rules and regulations promulgated by the department.

(2) Where necessary in a blasting operation, the department may require that the operator submit a blasting plan to the department for approval.

(3) In all blasting operations, except as hereinafter otherwise provided, the maximum peak particle velocity of the ground motion in any direction shall not exceed two (2) inches per second at the immediate location of any dwelling house, public building, school, church, commercial or institutional building and the particle velocity at such location immediately after a period of one (1) second following the peak particle velocity produced by any charge shall

not continuously exceed one-half (1/2) inch per second.

(4) Blasting operations without instrumentation will be considered as being within the limits set forth in this subsection if such blasting operations are conducted in accordance with rules and regulations of the department establishing the maximum amount of explosives to be used in a single charge and in a single subcharge within specified distances from any location provided by subsection (1). No more than 40,000 pounds of explosives may be used in any charge except with the approval of the commissioner. Regulations promulgated by the department pursuant to this subsection shall be in such terms that compliance therewith will assure compliance with the provisions of subsection (3).

(5) No two (2) consecutive subcharges containing the maximum permitted by the department pursuant to this subsection shall have a detonation time separated by less than eight (8) milliseconds, except that if the amount of explosive used in any subcharge is less than maximum permitted by the department pursuant to subsection (4), the time delay between detonation times may be decreased in the same ratio.

(6) Any blasting operation may be conducted without reference to any maximum amount or period provided by or pursuant to subsection (4) if the operator of such blasting operation demonstrates by instrumentation that maximum particle velocity of the ground motion in any direction does not exceed the limits provided in subsection (3).

(7) Instruments for determining particle velocity as set forth in this subsection shall be limited to such specific types of devices as shall have been expressly approved by the department and the commissioner or his duly authorized agent may enter upon any premises for the purpose of conducting or supervising any necessary instrumentations provided by KRS 351.315 to 351.375.

(8) When blasting operations are contemplated which would result in ground vibrations that would have a particle velocity in any direction in excess of 2 inches per second at the immediate location of any dwelling house, public building, school, church, commercial or institutional building, blasting operations may proceed after receiving written consent from the property owner or owners affected.

(9) When blasting operations, other than those conducted at a fixed site as a part of any industry or business operated at such site, are to be conducted within the vicinity of a pipeline or public utility, the blaster or person in charge of the blasting operations shall take due precautionary measures for the protection of the pipeline or utility, and shall give adequate notice to the owner or his agent that

such blasting operations are intended. The blaster shall be subject to regulations promulgated by the department concerning such a blasting operation.

(10) Blasting operations near streams shall be prohibited in all cases where the effect of the blasting is liable to change the course or channel of any stream without first obtaining a permit from the department which has been approved by the division of water in the department for natural resources and environmental protection.

(11) Blasting operations shall not be conducted within eight hundred (800) feet of any public highway, unless due precautionary measures are taken to safeguard the public.

(12) Mudcapping in blasting operations shall be permitted only where it would endanger the safety of the workers to drill the rock or material to be blasted. If mudcapping is necessary, no more than ten (10) pounds of explosives shall be used for each charge.

(13) When the use of detonating cord would cause severe air blast the department may cause all trunk lines to be covered by 5 to 6 inches of loose earth.

(14) In blasting operations, flying rocks shall not be allowed to fall greater than one-half (1/2) the distance between the blast and a dwelling house, public building, school, church, commercial or institutional building. Protective material shall be used to insure this limit.

(15) When a blast is about to be fired, ample warning shall be given to allow all persons to retreat to a safe place, and care shall be taken to ascertain that all persons are in the clear. Each operator shall follow a definite plan of warning signals that can be clearly seen or heard by anyone in the blasting area. The operator shall inform all employees at the operation as to the established procedure.

(16) No person shall use explosives in such manner that safety to persons or property is threatened. (Enact. Acts 1972, ch. 280 ss 3; 1976, ch. 143, ss 4.)

(17) The two (2) inch per second maximum peak particle velocity as specified in subsections three (3) and eight (8) of this section shall be construed as the threshold below which blasting damage is unlikely to occur. However, the department shall promulgate regulations requiring more restrictive levels of maximum peak particle velocity when necessary to maintain consistency with federal statutes or regulations.

351.335. Rules and regulations - Authority of commissioner or his representative. - (1) The department shall have the authority for promulgating regulations concerning the manufacture, transportation,

sale, storage, or use of explosives and unassembled components of explosives including but not limited to, airblasts, pre-blast surveys, and blasting schedules, and the maintenance of such explosives which has a direct bearing on safety to life and property, and any other rules and regulations necessary to effectuate the provisions of KRS 351.315 to 351.375 or which are consistent with the provisions of the federal surface mining control and reclamation act of 1977, and amendments thereto, pertaining to blasting or explosives, or any rules or regulations promulgated thereunder pertaining to blasting or explosives. No portion of KRS 351.315 to 351.375 shall apply in any manner to the manufacture, transportation, sale, storage, possession or use of:

(a) Loaded ammunition for use in small arms or other weapons; or

(b) Propellant powders for use in small arms or other weapons; or

(c) Primers for small arms ammunition; or

(d) Any other component part of small arms ammunition; or

(e) Tools, equipment, or devices for the manufacture of small arms ammunition; or

(f) Grades of blackpowder suitable primarily for use in firearms.

(2) To promote compatible uniform and consistent laws and regulations concerning blasting, all local ordinances, rules and regulations concerning blasting and explosives promulgated by units of local government within the commonwealth shall be reviewed and approved, by the department, prior to implementation. Any not so approved shall be invalid. Any local ordinance, rules, or regulations in force on June 19, 1976, shall become invalid, null, and void 120 days after June 19, 1976, unless it is submitted to the department and is approved as being consistent with the provisions of this section.

(3) In order to carry out the purposes of KRS 351.315 to 351.375, the commissioner or his authorized representative shall have the authority:

(a) To enter without delay and advance notice any place where explosives are in use or stored or where blasting records are kept, during regular working hours and at other reasonable times in order to inspect such places, question any explosive user or seller for the purpose of ascertaining compliance or non-compliance with KRS 351.315 to 351.375.

(b) To administer oaths, take depositions, conduct hearings, take photographs, review any and all blasting records, and secure any other evidence deemed necessary to evaluate any safety hazard in KRS 351.315 to 351.375 or regulations issued pursuant thereto.

(4) If an explosive user or seller refuses such entry, then the commissioner or his authorized representative may apply to the Franklin Circuit Court or to the circuit court within the county wherein the premises to be entered are located, for an order to enforce the right of entry.

(5) If, during the course of a lawful inspection, the commissioner or his authorized representative discovers explosives stored or kept in an unlawful manner and such unlawfully stored or kept explosives constitute an imminent and substantial danger to life or property, then the commissioner or his authorized representative may, upon proper affidavit before a magistrate with authority and jurisdiction to issue search warrants, obtain a warrant authorizing seizure of such unlawfully stored or kept explosives and thereby seize and store such explosives in a lawful and safe manner.

(a) No warrant pursuant to this section shall be issued unless the commissioner or his authorized representative has made arrangements with public or private sources for the lawful and safe storage of the explosives to be seized.

(b) No warrant pursuant to this section shall be issued upon an affidavit that does not aver that an arrangement has been made between the commissioner or his authorized representative and public or private sources for the lawful and safe storage of the explosives to be seized.

(c) No warrant pursuant to this section shall be issued upon an affidavit that does not specifically state the place in which the explosives are to be stored in terms of city, county, street address, and name of person, company, or agency accepting the explosives for storage.

(d) Any owner or person entitled to lawful possession of explosive seized pursuant to this section shall be entitled to recovery of the seized explosives upon written or verbal notification to the commissioner or his authorized representative stating his capability to lawfully and safely store the seized explosives, and upon an inspection by the commissioner or his representative of his storage facilities and methods that reveals his capability to lawfully and safely store the explosives.

(e) The commissioner or his authorized representative shall make the inspection within five (5) days of receipt of said notification.

(f) If the commissioner or his authorized representative receive no communication from the owner or person entitled to lawful possession of the seized explosives within thirty (30) days after the seizure of such explosives, then the commissioner or his authorized representative may dispose of the seized explosives in a safe and lawful manner.

351.345. Revocation of license. - (1) The commissioner, before revoking any license shall set the matter down for hearing, and at least twenty (20) days prior to the date set for the hearing, he shall notify the licensee in writing, which said notice shall contain an exact statement of the charges made and the date and place of the hearing. Such written notice may be served by delivery of the same personally to the licensee or by mailing same by registered or certified mail, return receipt requested, to the last known business address of such licensee. The hearing on such charges shall be at such time and place as the commissioner shall prescribe.

(2) The licensee, in all hearings, shall have the opportunity to be heard in person and by counsel in reference thereto.

(3) No person shall blast once his license has been revoked by the department. (Enact. Acts 1976, ch. 143, ss 6.)

351.350. Citation for violation - Action against violator. - (1) If upon inspection an authorized representative of the commissioner finds that an explosive user or seller has violated any requirement of KRS 351.315 to 351.375, a citation shall be issued to the violator. Each citation shall describe the alleged violation, establish the time period permitted for correction by fixing a reasonable date by which the alleged violation shall be eliminated, if applicable, and propose the civil penalty to be paid. If within fifteen (15) working days from the receipt of the citation the explosive user or seller fails to notify the commissioner that he intends to contest the citation, then the citation shall be deemed a final order and not be subject to review by any court or agency.

(2) If the explosives user or seller notifies the commissioner that he intends to challenge a citation issued under KRS 351.315 to 351.375, then it shall be the duty of the department or the attorney general upon the request of the commissioner, to bring an action for the recovery of the penalties provided for herein.

(3) It shall be the duty of the attorney general, upon the request of the commissioner, to bring an action for a restraining order, temporary or permanent injunction against any operator or other person violating or threatening to violate any of the provisions of KRS 351.315 to 351.375. (Enact. Acts 1976, ch. 143, ss 7.)

351.355. Notification of Accident - Investigation. - Whenever serious injury, as defined in KRS 500.080 or

loss of life occurs in a blasting operation, the blaster shall immediately give notice forthwith to the department stating the particulars of the accident. To aid in making an investigation of the accident, the commissioner may compel the attendance of witnesses and administer oaths. (Enact. Acts 1976, ch. 143, ss 8.)

351.360. Records required. - A record of each blast shall be kept. All records including seismograph reports shall be retained at least five (5) years and shall be available for inspection by the department and shall contain such data as the commissioner determines. (Enact. Acts 1976, ch. 143, ss 9.)

351.365. Supplier of explosives to keep register and to register with the department. - Any person who sells, lends, or gives any explosives or blasting agents shall keep a register showing the amount sold, lent, or given, the date of the sale, loan, or gift and for what purpose it is to be used. Such person shall also be required to register with the department. (Enact. Acts 1976, ch. 143, ss 10.)

351.370. Purchase of explosives. - Any person who is a resident of this commonwealth and who uses explosive materials in the conduct of business or occupation may lawfully purchase explosive materials from a seller located or residing in a state contiguous to this commonwealth; provided, such person is properly licensed or registered under KRS 351.315 to 351.375 (Enact. Acts 1976, ch. 143, ss 11.)

351.375. Restriction of sale and use of hazardous explosives. The department may promulgate regulations restricting the sale and use of certain hazardous explosive compounds including, but not limited to, liquid nitroglycerin, fulminate of mercury, and lead azide. (Enact. Acts 1976, ch. 143 ss 12.)

351.380. Agreements with the department for natural resources and environmental protection. The department shall have the authority to enter into agreements with the department for natural resources and environmental protection for the purpose of the administration of state laws and regulations pertaining to the use of explosives in surface mining activities.

351.990. Penalties. (1) Any commissioner of the department of mines and minerals who violates any of the provisions of subsection (2) of KRS 351.020, or any of the provisions of KRS 351.070 to 351.100 or KRS 351.160 shall be fined not less than one hundred dollars (\$100) nor more than one thousand dollars (\$1,000).

(2) Any person who violates standards promulgated under KRS 351.070 shall be fined not less than one

hundred dollars (\$100) nor more than one thousand dollars (\$1,000).

(3) Any person who violates any of the provisions of KRS 351.100 to 351.120 shall be fined not less than one hundred dollars (\$100) nor more than one thousand dollars (\$1,000).

(4) Any mine inspector who violates any of the provisions contained in KRS 351.140 or 351.150 shall be fined not less than one hundred dollars (\$100) nor more than one thousand dollars (\$1,000).

(5) Any operator who violates any of the provisions of KRS 351.170 shall be fined not less than one hundred dollars (\$100) nor more than one thousand dollars (\$1,000).

(6) Any person who violates any of the provisions of subsection (1) of KRS 351.180 shall be fined not less than one hundred dollars (\$100) nor more than one thousand dollars (\$1,000).

(7) Any person who violates any of the provisions of KRS 351.315 to 351.375 or any regulation, determination, or order issued thereunder shall be subject to a civil fine not less than twenty dollars (\$20.00) nor more than one thousand dollars (\$1,000) for each violation.

(8) Any person who shall willfully violate any of the provisions of KRS 351.315 to 351.375, or any regulation, determination, or order promulgated pursuant to the sections of this KRS 351.315 to 351.375 which have become final shall be guilty of a misdemeanor and upon conviction thereof shall be punished by a fine of not less than five hundred dollars (\$500) and not more than five thousand dollars (\$5,000).

(9) Any person who violates any of the provisions of KRS 351.330 (16) shall be guilty of a Class B misdemeanor.

(10) Any person who violates any of the provisions of KRS 351.345 (3) shall be guilty of a Class D felony. (2739.49, 3766b-18: amend. Acts 1972, ch. 280, ss 18; 1976, ch. 143, ss 13.)

PUBLIC PROTECTION AND REGULATION
DEPARTMENT OF MINES AND MINERALS
Division of Explosives and Blasting
805 KAR 4:010

Section 1. Licensing of Blasters.

(1) No person shall detonate explosives in any blasting operation in which more than five (5) pounds of explosives or the equivalent are used in a single charge or in which less than five (5) pounds of explosives is used by a regular user, excluding blasting for agriculture and underground coal, unless he is licensed by the department. The department shall issue a license to use explosives to any person who:

- (a) has worked in blasting operations for at least twenty-four (24) months under the immediate supervision of an experienced blaster, and;
- (b) has passed an examination, prescribed by the department which shall test the examinee's practice of blasting operations and storage, moving, handling, and detonation of explosives.

(2) Application for license shall be in writing upon a form furnished by the department and shall be accompanied by a fee of twenty dollars (\$20.00). If the applicant is successful in passing the examination, a license to detonate explosives shall be issued upon the payment of an additional fee of five dollars (\$5.00).

(3) The department shall have two (2) classifications of blasting licenses and two (2) tests; one (1) termed "Kentucky Blasters License", and one (1) termed "Limited Kentucky Blasters License".

(4) Persons holding a Limited Kentucky Blasters License shall not conduct a blasting operation in which more than five (5) pounds of explosives are used in a single charge.

(5) Each blaster shall be required to renew his license each year by application to the department, which application shall be accompanied by a fee of ten dollars (\$10.00).

(6) A blaster who fails to renew his Kentucky Blasters License within five (5) years of the expiration date of his last valid license shall be

required to reapply for a license and retake the blaster's examination as specified in subsection (2). Blasters not falling in the above category may have their licenses renewed by paying to the department a sum equal to the annual renewal fees for the years of non-renewal.

(7) The commissioner may grant a thirty (30) day non-renewable blasters license to any person qualified under KRS 351.315 (3) upon the payment of a five dollar (\$5.00) fee.

(8) The definition of a blaster for the purpose of a license is:

(a) A blaster is a person who makes any or all of the following decisions:

1. Decides hole size, spacing, or depth;
2. Decides total quantity of explosives;
3. Decides quantity of explosives in each hole;
4. Decides timing delays to be used.

(b) He must be present when the charge is detonated and either physically detonates the charge or gives the order to detonate the charge.

(9) A licensed blaster shall not take instruction on the activities covered in subsection (8) from a person not holding a blasters license if compliance with such instruction will result in an unlawful act or unlawful effect of the blast.

(10) Anyone failing a blaster's examination may not retake the examination in less than thirty (30) days.

(11) The commissioner may suspend any license for due cause but no license may be revoked until the licensee has been granted a hearing.

(12) Persons involved in seismic exploration of the subsurface geology and detonating explosives solely for the purpose of monitoring seismic waves generated by such a detonation must hold either a Kentucky blaster's license or a Limited Kentucky blaster's license. The five (5) pound limitation in Section (4)

may be waived for the purpose of seismic exploration based upon a written request to the department.

(13) Any person who is a licensed blaster in another state where the qualifications prescribed at the time of licensing were, in the opinion of the commissioner, equal to those prescribed in the commonwealth at the date of application, and where reciprocal licensing privileges satisfactory to the department are granted to licensees of the commonwealth, may be granted a license without an examination. Application for such license shall be on a form furnished by the department and accompanied by a fee of ten dollars (\$10.00).

805 KAR 4:020

Section 1. Blasting Standards.

(1) In all blasting operations, except as hereinafter otherwise provided, the maximum peak particle velocity of the ground motion in any direction shall not exceed two inches per second at the immediate location of any dwelling house, public building, school, church, commercial or institutional building.

(2) This ground velocity limit is not construed to mean on property owned, leased, or contracted by the blaster or blaster's company or property on which the owner gives a written waiver.

(3) No two consecutive subcharges within any charge shall be separated by a delay time of less than eight milliseconds.

(4) The Department will furnish a table for determining the maximum amount of explosives to be used per delay period.*

(5) The standard table for the maximum charge per delay period shall be for distances greater than 300 feet generated by the formula:

$$W = \left(\frac{D}{50}\right)^2$$

Where W is the weight of explosive in pounds and D is the distance to the nearest dwelling house, public building, school, church, commercial or institutional building in feet. On sites where the department decides it necessary to comply with the provision of the law this formula may be altered.*

(6) For the purpose of well shooting below 100 feet, the table shall be generated by the formula:

$$W = \left(\frac{D}{50}\right)^3$$

Where W is the total weight of explosives in the hole and D is the distance from the charge to the nearest dwelling house, public building, school, church, commercial or institutional building.

(7) If on a particular site the peak ground particle velocity continuoul exceeds 1/2 inch per second after a period of one (1) second following the

*See page 15.

maximum ground particle velocity, the department shall require the total time delay of blasting operations to be less than 200 milliseconds or the charge per delay be reduced so that this limit is complied with.

(8) For distances less than 300 feet the following table will be used:

<u>Actual Distance</u> <u>in Feet</u>	<u>Pounds per Delay Interval</u> <u>milliseconds of greater</u>
5 - 10	1/8 lb.
11 - 15	1/4 lb.
16 - 20	1/2 lb.
21 - 25	3/4 lb.
26 - 30	1.0 lb.
31 - 300	1 lb. + 1/8 lb. for each ft of distance above 30 ft

Less than 5 feet, the total charge should not exceed 1/8 pound.

(9) If explosive charges of greater than 40,000 pounds are necessary, a permit must be obtained from the Department of Mines and Minerals. The department shall consider each case on its own merits in making a determination as to whether or not to grant such a permit.

TABLE TO BE USED FOR DETERMINING WEIGHT OF EXPLOSIVES TO BE USED ON A SINGLE DELAY

DISTANCE is the actual distance to the nearest house, public building, school, church, commercial or institutional building in feet.

WEIGHT is the maximum weight of explosives to be used on a single delay.

DISTANCE	WEIGHT	DISTANCE	WEIGHT
5 - 10*	1/8	350	49
11 - 15	1/4	400	64
16 - 20	1/2	500	100
21 - 25	3/4	600	144
26 - 30	1.00	700	196
40	2.25	800	256
50	3.50	900	324
60	4.75	1000	400
70	6.00	1100	484
80	7.25	1200	576
90	8.50	1300	676
100	9.75	1400	784
110	11.0	1500	900
130	13.5	1600	1024
150	16.0	1700	1156
170	18.5	1800	1296
190	21.0	1900	1444
210	23.5	2000	1600
230	26.0	2500	2500
250	28.5	3000	3600
270	31.0	3500	4900
290	33.5	4000	6400
300	34.75	4500	8100
		5000	10000

* Less than five (5) feet the total charge should not exceed 1/8 lb.

** For distances not in the table, use the formula:

$$\text{Weight} = \left(\frac{\text{Distance}}{50} \right)^2$$

Section 1. Seismograph Measurements.

(1) If a blaster decides that the table provided by the department is too conservative, he may use seismograph measurements and increase the charge per delay period, provided the velocity of two (2) inches per second limit is not violated. He must use the seismograph on every shot thereafter so long as the table is not being complied with.

(2) If a blaster considers the table too conservative for his particular area, he may upon submission of seismograph reports, petition for a modified table for blasting operation at that particular site, but in no case shall the department allow a table that would permit velocities above the two inch per second limit on structures covered by KRS 351.330.

(3) In making a seismograph determination of the velocity at a particular position, the following formula shall be used:

$$V = V_o \left(\frac{D_o}{D} \right)^{1.5}$$

Where V_o is the maximum ground particle velocity at the seismograph, D_o is the distance of the seismograph from the blast, and D is the distance from the blast to the position in questions and in the same general direction. The distance D_o may not be greater than D , and D cannot be more than five (5) times D_o . This determined velocity at the site of any dwelling house, public building, school, church, commercial or institutional building shall not exceed the two (2) inches per second limit.

(4) If the department believes that a blaster is operating illegally under the provisions of these regulations, the department may require a seismograph recording of any or all blasts.

Section 1. Instrumentation.

(1) All portable displacement seismographs currently in use will be approved until further notice by the Department of Mines and Minerals.

(2) A direct reading velocity instrument shall be approved by the Department of Mines and Minerals only if it has a frequency range of 5 cycles per second to 150 cycles per second or greater, a velocity range from zero to 2.0 in/sec. or greater, adheres to design criteria for portable seismographs as outlined in USBM RI-5708, USBM RI-6487, and meets such standards as are established from time-to-time by the Department of Mines and Minerals.

(3) Instruments of both the direct reading velocity type and the displacement type will be approved by the Department of Mines and Minerals for use as follows:

(a) Particle velocity reading may be calculated from results obtained by a displacement instrument or obtained from an approved direct reading velocity instrument in any blasting operation where all of the following conditions exist:

1. Recording distance is over 200 feet from the blast;
2. Scaled distance is numerically greater than 25
3. Frequency range is 40 cycles per second or less.

(b) A direct reading velocity instrument will be required in any blasting operation where all of the following conditions exist:

1. Recording distance is less than 200 feet from the blast;

2. Scaled distance is numerically less than 50.

(c) A direct reading velocity instrument will be required in any blasting operation where all the following conditions exist:

1. Recording distance is more than 200 feet from the blast;
2. Scaled distance is numerically less than 25.

(d) A direct reading velocity instrument will be required in any blasting operation where all of the following conditions exist:

1. Recording distance is more than 200 feet from the blast;
2. Frequency range is in excess of 40 cycles per second.

(e) Scaled distance is defined as:

$$D_s = \frac{D}{\sqrt{W}}$$

Where D is the actual distance in feet and W is the weight of explosives in pounds per delay of eight (8) milliseconds or greater.

(4) Any seismic reports submitted to this office for compliance or petition must be accompanied by the most recent calibration report on the seismograph.

(5) Beginning January 1, 1977, all velocity seismographs used for compliance or petition must have internal calibration capability.

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Section 1. Records. A record of each blast shall be kept. All records including seismograph reports shall be retained for at least five years and shall be available for inspection by the Department of Mines and Minerals and shall contain the following minimum data:

- (1) Name of Company or Contractor.
- (2) Location, date, and time of blast
- (3) Name, signature, and license number of blaster in charge.
- (4) Type of material blasted.
- (5) Number of holes, burden and spacing.
- (6) Diameter and depth of holes.
- (7) Types of explosives used.
- (8) Total amount of explosives used.
- (9) Maximum amount of explosives per delay period of eight (8) milliseconds or greater.
- (10) Method of firing and type of circuit.
- (11) Direction and distance in feet to nearest dwelling house, public building, school, church, commercial or institutional building neither owned nor leased by the person conducting the blasting.
- (12) Weather conditions
- (13) Type and height or length of stemming.
- (14) If mats or other protections were used.
- (15) Type of delay electric blasting caps used and delay periods used.
- (16) The person taking the seismograph reading shall accurately indicate exact location of seismograph if used, and shall also show the distance of seismograph from blast.
- (17) Seismograph records, where required:
 - (a) Name of person and firm analyzing the seismograph record.
 - (b) Seismograph reading.
- (18) Maximum number of holes per delay period of eight (8) milliseconds or greater.

Section 1. Blasting Safety.

(1) When blasting operations, other than those conducted at a fixed site as a part of any industry or business operated at such site, are to be conducted within two hundred feet of a pipeline, the blaster or person in charge of the blasting operations shall take due precautionary measures for the protection of the line, and shall notify the owner of the line or his agent that such blasting operations are intended.

(2) Blasting operations near streams shall be prohibited in all cases where the effect of the blasting is liable to change the course or channel of any stream without first obtaining a permit from the department which has been approved by the Division of Water, Department for Natural Resources and Environmental Protection.

(3) Mudcapping in blasting operations shall be permitted only where it would endanger the safety of the workmen to drill the rock or material to be blasted. If mudcapping is necessary, no more than ten pounds of explosives shall be used for each charge.

(4) All trunk lines of detonating cord may be covered, except that trunk lines of detonating cord must be covered if located within eight hundred feet of any public highway, dwelling house, public building, school, church, commercial or institutional building.

(5) When the use of detonating cord would cause severe concussion the Department may cause all trunk lines to be covered by 5 to 6 inches of loose earth.

(6) In blasting operations, flying rocks shall not be allowed to fall greater than one-half the distance between the blast and a dwelling house, public building, school, church, commercial or institutional building. Protective material should be used to insure this limit.

(7) When operating within 800 feet of a highway, if there is a chance of flying rock landing on the highway, traffic must be stopped at a safe distance. Blasted material shall not be thrown on a public highway in sufficient quantity to impede traffic, and any material thrown on a highway must be removed promptly.

(8) Where a blasting operation is conducted in the vicinity of an active deep mine, the blaster shall observe all procedures necessary to secure the health and safety of the deep mine workers.

(9) Blasting operations shall be conducted during daylight hours (one-half hour before sunrise to one-half hour after sunset) except by special permit issued by the Department of Mines and Minerals. Said permit to be issued on the basis of safety.

(10) If, as a result of a blast, the vibrational levels are exceeded or material is hurled through the air causing damage to homes or other property, or causing personal injury or death, or endangering public safety, health and general welfare, in violation of these regulations, the department may consider this due cause for revocation of blaster's license and evoke penalties according to KRS 351.990.

(11) The contractor or operator as well as the blaster shall be responsible for the conduct of blasting on any operation.

(12) These regulations are in no way intended to relieve the contractor or operator or other persons of responsibility and liability under any other laws.

Section 1. Definitions applicable to 805 KAR 4:070 through 805 KAR 4:150.

(1) "American Table of Distances" (also known as Quantity Distance Tables) means American Table of Distance for Storage of Explosives as revised and approved by The Institute of the Makers of Explosives, June 5, 1964.

(2) "Approved storage facility" - means a facility for the storage of explosive materials conforming to the requirements of this part and covered by a license or permit issued under authority of the Internal Revenue Service (See 27 CFR Part 55).

(3) "Blast area" - means the area in which explosives loading and blasting operations are being conducted.

(4) "Blaster" - means the person or persons authorized to use explosives for blasting purposes and meeting the qualifications contained in 805 KAR 4:010.

(5) "Blasting agent" - means any material or mixture consisting of a fuel and oxidizer used for blasting, but not classified an explosive and in which none of the ingredients is classified as an explosive provided the furnished (mixed) product cannot be detonated with a No. 8 test blasting cap when confined. A common blasting agent presently in use is a mixture of ammonium nitrate (NH₄ NO₃) and carbonaceous combustibles such as fuel oil or coal, and may either be procured, premixed and packaged from explosive companies or mixed in the field.

(6) "Blasting cap" - means a metallic tube closed at one end, containing a charge of one or more detonating compounds, and designed for and capable of detonation from the sparks or flame from a safety fuse inserted and crimped into the open end.

(7) "Block holing" - means the breaking of boulders by firing a charge of explosives that has been loaded in a drill hole.

(8) "Conveyance" - means any unit for transporting explosives or blasting agents, including but not limited to trucks, trailers, rail cars, barges, and vessels.

(9) "Detonating Cord" - means a flexible cord containing a center core of high explosives which when detonated will have sufficient strength to detonate other cap-sensitive explosives with which it is in contact.

(10) "Detonator" - means blasting caps, electric blasting caps, delay electric blasting caps, and non-electric delay blasting caps.

(11) "Electric cap" - means a blasting cap designed for and capable of detonation by means of an electric blasting current.

(12) "Electric blasting circuitry" means:

(a) Bus wire. An expendable wire, used in parallel or series, in parallel circuits, to which are connected the leg wires of electric blasting caps.

(b) Connecting wire. An insulated expendable wire used between electric blasting caps and the leading wires or between the bus wire and the leading wires.

(c) Leading wire. An insulated wire used between the electric power source and the electric blasting cap circuit.

(d) Permanent blasting wire. A permanently mounted insulated wire used between the electric power source and the electric blasting cap circuit.

(13) "Electric delay blasting caps" - means caps designed to detonate at a predetermined period of time after energy is applied to the ignition system.

(14) "Explosives" means:

(a) Any chemical compound, mixture, or device, the primary or common purpose of which is to function by explosion; that is, with substantially instantaneous release of gas and heat, unless such compound, mixture, or device is otherwise specifically classified by the U.S. Department of Transportation.

(b) All material which is classified as Class A or Class B by the U.S. Department of Transportation.

(c) Classification of Explosives by the U.S. Department of Transportation is as follows:

1. Class A Explosives. Possessing detonating hazard, such as dynamite, nitroglycerin, picric acid, lead azide, fulminate of mercury, black powder, blasting caps, and detonating primers.

2. Class B Explosives. Possessing flammable hazard, such as propellant explosives, including some smokeless propellants.

(15) "Fuse lighters" - means special devices for the purpose of igniting safety fuse.

(16) "Magazine" - means any building or structure, other than an explosives manufacturing building, used for the storage of explosives.

(17) "Misfire" - means an explosive charge which failed to detonate.

(18) "Mud-capping" - (sometimes known as bulldozing, adobe blasting, or dobying) - means the blasting of boulders by placing a quantity of explosives against a rock, boulder, or other object without confining the explosives in a drill hole.

(19) "Non-electric delay blasting cap" - means a blasting cap with an integral delay element in conjunction with and capable of being detonated by a detonation impulse or signal for miniaturized detonating cord.

(20) "Primary blasting" - means the blasting operation by which the original rock formation is dislodged from its natural location.

(21) "Primer" - means a cartridge or container of explosives into which a detonator or detonating cord is inserted or attached.

(22) "Safety fuse" - means a flexible cord containing an internal burning medium by which fire is conveyed at a continuous and uniform rate for the purpose of firing blasting caps.

(23) "Secondary blasting" - means the reduction of oversize material by the use of explosives to the

dimension required for handling, including mudcapping and blockholing.

(24) "Stemming" - means a suitable inert incombustible material or device used to confine or separate explosives in a drill hole, or to cover explosives in mudcapping.

(25) "Springing" - means the creation of a pocket in the bottom of a drill hole by the use of a moderate quantity of explosives in order that larger quantities of explosives may be inserted therein.

(26) "Water gels, or slurry explosives" - means a wide variety of materials used for blasting. They all contain substantial proportions of water and high proportions of ammonium nitrate, some of which is in solution in the water. Two broad classes of water gels are:

(a) Those which are sensitized by a material classed as an explosive such as TNT or smokeless powder, and;

(b) Those which contain no ingredient classified as an explosive; these are sensitized with metals such as aluminum at an explosives plant or mixed at the site immediately before delivery into the borehole.

Section 1. General Blasting Provisions.

(1) The employer shall permit only authorized and qualified persons to handle and use explosives.

(2) Smoking, firearms, matches, open flame lamps, and other fires, flame, or heat producing devices and sparks shall be prohibited in or near explosive magazines or while explosives are being handled, transported, or used.

(3) No person shall be allowed to handle or use explosives while under the influence of intoxicating liquors, narcotics, or other dangerous drugs.

(4) All explosives shall be accounted for at all times. Explosives not being used shall be kept in a locked magazine, unavailable to persons not authorized to handle them. The employer shall maintain an inventory and use record of all explosives. Appropriate authorities shall be notified of any loss, theft, or unauthorized entry into a magazine.

(5) No explosives or blasting agents shall be abandoned.

(6) No fire shall be fought where the fire is in imminent danger of contact with explosives. All employees shall be removed to a safe area and the fire area guarded against intruders.

(7) Original containers or Class II magazines shall be used for taking detonators and other explosives from storage magazines to the blasting area.

(8) When blasting is done in congested areas or in proximity to a structure, railway, or highway, or any other installation that may be damaged, the blaster shall take special precautions in the loading, delaying, initiation, and confinement of each blast with mats or other methods so as to control the throw of fragments, and thus prevent bodily injury to employees.

(9) Employees authorized to prepare explosive charges or conduct blasting operations shall use every reasonable precaution including, but not limited to, visual and audible warning signals, flags, or barricades, to ensure employee safety.

(10) In so far as possible, blasting operations above ground shall be conducted between sunup and sundown.*

(11) Due precautions shall be taken to prevent accidental discharge of electric blasting caps or explosives from current induced by radar, radio transmitters, lightning, adjacent power lines, dust storms, or other sources of extraneous electricity. These precautions shall include:

- (a) Detonators shall be short-circuited in holes which have been primed and shunted until wired into the blasting circuit.
- (b) The suspension of all blasting operations and removal of persons from the blasting area during the approach and progress of an electric storm.
- (c) The prominent display of adequate signs, warning against the use of mobile radio transmitters, on all roads within 1,000 feet of blasting operations. Whenever adherence to the 1,000-foot distance would create an operational handicap, this distance may be modified so long as the modification is adequately designed in compliance with 805 KAR 4:075 (11)(e) to prevent any premature firing of electric blasting caps. Specimens of signs which would meet these requirements are as follows:

Blasting	Turn Off
Zone	2-Way
1000-ft.	Radio

about 48" X 48" about 42" X 36"

Paragraph (c) shall not apply to surface mining operations.

- (d) Mobile radio transmitters which are less than 100 feet away from electric blasting caps in other than original containers, may be left "on" for receiving purposes, but may only be used to transmit if in compliance with paragraph (e) of this subsection.

*See also 805 KAR 4:060(9)

- (e) Compliance with the recommendations of The Institute of Makers of Explosives with regard to blasting in the vicinity of radio transmitters as stipulated in Radio Frequency Energy - A Potential Hazard in the Use of Electric Blasting Caps, IME Publication No. 20, March 1971.

(12) Empty boxes and paper and fiber packing materials, which have previously contained high explosives, shall not be used again for any purpose, but shall be destroyed by burning at an approved location.

(13) Explosives, blasting agents, and blasting supplies that are obviously deteriorated or damaged shall not be used.

(14) Delivery and issue of explosives shall only be made by and to authorized persons and into authorized magazines or approved temporary storage or handling areas.

(15) Blasting operations in the proximity of overhead powerlines, communication lines, utility services, or other services or structures shall not be carried on until the operators and/or owners have been notified and measures for safe control have been taken.

(16) The use of black powder shall be prohibited except when a desired result cannot be obtained with another type of explosive such as in quarrying certain types of dimension stone.

(17) All loading and firing shall be directed and supervised by competent persons thoroughly experienced in this field.

(18) All electric blasts shall be fired with an electric blasting machine or properly designed electric power source, and in accordance with the provisions of 805 KAR 4:110 (1) and (18).

(19) No one shall be permitted to carry detonators or primers of any kind on his person.

Section 1. Blaster Qualifications.

(1) A blaster shall be able to understand and give written and oral orders.

(2) A blaster should be in good physical condition and not be addicted to narcotics, intoxicants, or similar types of drugs.

(3) A blaster shall be qualified, by reason of training, knowledge or experience, in the field of transporting, storing, handling, and the use of explosives, and have a working knowledge of State and local laws and regulations which pertain to explosives.

(4) Blasters shall be required to furnish satisfactory evidence of competency in handling explosives and performing in a safe manner the type of blasting that will be required.

(5) The blaster shall be knowledgeable and competent in the use of each type of blasting method used.

Section 1. Dealer Registration.

(1) Each person intending to engage in business as an importer or a manufacturer of, or a dealer in, explosive materials shall, before commencing such business, be required annually to register with the Department of Mines and Minerals. Each person shall annually fill out the registration form (EC-12) provided by the Department.

Section 2. Record Requirements.

(1) Each person, corporation or entity engaged in the manufacture, purchase, or selling of explosives, including importers, manufacturer, manufacturer limited, or dealer, shall maintain in a permanent form, such records of importation, production, shipment, receipt, sale, or other disposition.

(2) All records shall be retained for a period of not less than five (5) years from the date the transaction occurs or until discontinuance of business or operations. All records shall be subject to inspection and examination by the Department of Mines and Minerals.

(3) The records prescribed by Title 27, part 181.121 - 181.129 of the Code of Federal Regulations of the Bureau of Alcohol, Tobacco, and Firearms shall satisfy the requirement of this section.

Section 3. Magazine Identification.

(1) All permanent, fixed, or stationary magazines shall be registered annually with the Department of Mines and Minerals. Registration forms (EC-11) will be furnished by the Department.

(2) All portable magazines shall have identification tags.

(3) The identification tags shall be approximately three (3) inches long by two (2) inches wide and shall be lettered or painted directly onto the magazine or attached such that normal use and weather will not render the tag illegible.

(4) The tags shall provide the following information:

- (a) Name of owner
- (b) Address
- (c) Person responsible for the magazine
- (d) Telephone number

Section 1. Explosives.

(1) Explosive magazines shall be posted with suitable danger signs so located that a bullet passing through the face of a sign will not strike the magazine.

(2) Containers of explosives or blasting agents shall be stacked in a stable manner, but not more than eight (8) feet high.

(3) Ammonium nitrate fuel oil blasting agents shall be physically separated from other explosives, safety fuse, or detonating cord stored in the same magazine and in such a manner that oil does not contaminate the other explosives, safety fuse or detonating cord.

(4) Special precautions shall be taken when blasting in close proximity to underground operations, and no blasting shall be done which would be hazardous to persons working underground.

(5) Only nonsparking implements shall be used to punch holes in an explosive cartridge.

(6) Delay connectors for firing detonating cord shall be treated and handled with the same safety precautions as blasting caps and electric detonators.

(7) Primers containing a detonator shall be prepared with the detonator contained securely and completely within the explosive charge or within a suitable tunnel or cap well.

(8) Explosives shall be kept separate from detonators until charging is started.

(9) When blasting electrically, a blasting galvanometer, blasting ohmmeter, or blasting multimeter designed specifically for the purpose of testing electric blasting caps and circuits containing electric blasting caps, shall be used to test:

- (a) Resistance of individual caps, series of caps, or the resistance of multiple balanced series to be connected in parallel prior to their connection to the blasting line.

(b) Continuity of blasting lines prior to the connection of electric blasting cap series, and

(c) Total blasting circuit resistance prior to connection to the power source.

(10) Ammonium nitrate and the components used for the sensitizing thereof shall be stored, mixed, transported, and used in accordance with the recommendations in Bureau of Mines Information Circular 8179, "Safety Recommendations for Sensitized Ammonium Nitrate Blasting Agents", or subsequent revisions.

Section 1. Storage of Explosives and Blasting Agents.

(1) Explosives and related materials shall be stored in approved facilities required under the applicable provisions of the Internal Revenue Service regulations contained in 27 CFR 55, Commerce in Explosives.*

(2) Blasting caps, electric blasting caps, detonating primers, and primed cartridges, shall not be stored in the same magazine with other explosives or blasting agents.

(3) Smoking and open flames shall not be permitted within fifty (50) feet of explosives and detonator storage magazines.

(4) Permanent underground magazines containing detonators shall not be located closer than twenty-five (25) feet to any magazine containing other explosives or blasting agents.

*See page 53

Section 1. Loading of explosives or blasting agents.

(1) Procedures that permit safe and efficient loading shall be established before loading is started.

(2) All drill holes shall be sufficiently large to admit freely the insertion of the cartridges of explosives.

(3) Tamping shall be done only with wood rods or plastic tamping poles without exposed metal parts, but non-sparking metal connectors may be used for jointed poles. Violent tamping shall be avoided. The primer shall never be tamped.

(4) No holes shall be loaded except those to be fired in the next round of blasting. After loading, all remaining explosives and detonators shall be immediately returned to an authorized magazine.

(5) Drilling shall not be started until all remaining butts of old holes are examined for unexploded charges, and if any are found, they shall be refired before work proceeds.

(6) No person shall be allowed to deepen drill holes which have contained explosives or blasting agents.

(7) No explosives or blasting agents shall be left unattended at the blast site.

(8) Machines and all tools not used for drilling, loading, and covering the blast shall be removed from the immediate location of holes before explosives are delivered.

(9) No activity of any nature other than that which is required for blasting shall be permitted in a blast area.

(10) Powerlines and portable electric cables for equipment being used shall be kept a safe distance from explosives or blasting agents being loaded into drill holes. Cables in the proximity of the blast area shall be deenergized and locked out by the blaster.

(11) Holes shall be checked prior to loading to determine the depth and conditions. Holes shall not be

drilled where there is a danger of intersecting a charged or misfired hole.

(12) When loading a long line of holes with more than one loading crew, the crews shall be separated by practical distances consistent with efficient operation and supervision of crews.

(13) No explosives shall be loaded or used underground in the presence of combustible gases or combustible dusts.

(14) In underground blasting, explosives in Fume Class I, as set forth by the Institute of the Makers of Explosives, shall be used; provided, however, that Fume Class I explosives are not required when ventilation adequate to dissipate all fumes is provided and the workings are abandoned for a period of time sufficient to allow dissipation of all fumes.

(15) All blast holes in open work shall be stemmed to the collar or to a point which will confine the charge.

(16) Warning signs, indicating a blast area, shall be maintained at all approaches to the blast area. The warning sign lettering shall not be less than four (4) inches in height on a contrasting background. This subsection does not apply to surface mining.

(17) A borehole shall never be sprung when it is adjacent to or near a hole that is loaded. Flashlight batteries shall not be used for springing holes.

(18) Drill holes that have been sprung or chambered, and which are not water-filled, shall be allowed to cool before explosives are loaded.

(19) No loaded holes shall be left unattended or unprotected.

(20) The blaster shall keep an accurate, up-to-date record of explosives, blasting agents, and blasting supplies used in a blast and shall keep an accurate running inventory of all explosives and blasting agents stored on the operation.

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Section 1. Surface Transportation of Explosive.

(1) Transportation of explosives, blasting agents and blasting supplies, shall meet the provisions of the Department of Transportation regulations contained in 14 CFR Part 103, Air Transportation; 46 CFR Parts 146-149, Water Carriers; 49 CFR Parts 171-179, Highways and Railways; and 49 CFR Parts 390-397, Motor Carriers. *

(2) Motor vehicles or conveyances transporting explosives shall only be driven by, and be in the charge of, a licensed driver who is physically fit. He shall be familiar with the local, state, and federal regulations governing the transportation of explosives.

(3) No person shall smoke, or carry matches or any other flame producing device, nor shall firearms or loaded cartridges be carried while in or near a motor vehicle or conveyance transporting explosives, blasting agents and blasting supplies.

(4) Explosives or blasting agents shall not be transported with other materials or cargoes in the same compartment. In no case shall flammable material be carried on the same vehicle as explosives.

(5) Explosives or blasting agents shall be transported in separate vehicles from detonators unless:

(a) the detonators are placed in a type 2 or type 3 magazine secured within the body of the truck; or

(b) the detonators and explosives are separated by four (4) inches of hardwood, and the detonators are totally enclosed or confined by the hardwood construction; or

(c) the detonators are placed in suitable containers or compartments constructed in accordance with the Institute of Makers of Explosives Safety Library Publication No. 22, entitled "IME Standard for the Safe Transportation of Electric Blasting Caps in the Same Vehicle with Other Explosives".

(6) Vehicles used for transporting explosives shall be strong enough to carry the load without difficulty, and shall be in good mechanical condition.

(7) When Class A, B, or C explosives are transported by a vehicle with an open body, a Class II magazine or original manufacturer's container shall be securely mounted within the bed to contain the cargo. No explosives shall be stacked higher than the sides or the tailgate of the vehicle. Blasting agents shall be loaded in a stable manner so that they cannot fall from the vehicle.

(8) All vehicles used for the transportation of explosives shall have tight floors and any exposed spark-producing metal on the inside of the body shall be covered with wood, or other non-sparking material, to prevent contact with containers of explosives.

(9) Every motor vehicle or conveyance used for transporting explosives shall be marked or placarded on both sides, the front and rear with either the word "explosives" in red letters, not less than four (4) inches in height, on white background, or the Department of Transportation-approved orange and black, square on point, explosives placards.

(10) Each vehicle used for transportation of explosives shall be equipped with a fully charged fire extinguisher, in good condition. An Underwriters Laboratory-approved extinguisher of not less than ten (10) ABC rating will meet the minimum requirement. The driver shall be trained in the use of the extinguisher on his vehicle.

(11) Motor vehicles or conveyances carrying explosives, blasting agents, or blasting supplies, shall not be taken inside a garage or shop for repairs or servicing.

(12) No motor vehicle transporting explosives shall be left unattended.

* NOTE: Paragraph (1) applies only to transportation moving under the jurisdiction of these agencies.

805 KAR 4:105

Section 1. Underground transportation of explosives (non-coal).

(1) All explosives or blasting agents in transit underground shall be taken to the place of use or storage without delay.

(2) The quantity of explosives or blasting agents taken to an underground loading area shall not exceed the amount estimated to be necessary for the blast.

(3) Explosives in transit shall not be left unattended.

(4) The hoist operator shall be notified before explosives or blasting agents are transported in a shaft conveyance.

(5) Trucks used for the transportation of explosives underground shall have the electrical system checked weekly to detect any failures which may constitute an electrical hazard. A written record of such inspections shall be kept on file.

(6) The installation of auxiliary lights on truck beds, which are powered by the truck's electrical system, shall be prohibited.

(7) Explosives and blasting agents shall be hoisted, lowered, or conveyed in a powder car. No other materials, supplies or equipment shall be transported in the same conveyance at the same time.

(8) No one, except the operator, his helper, and the powder man, shall be permitted to ride on a conveyance transporting explosives and blasting agents.

(9) No person shall ride in any shaft conveyance transporting explosives and blasting agents.

(10) No explosives or blasting agents shall be transported on any locomotive. At least two car lengths shall separate the locomotive from the powder car.

(11) No explosives or blasting agents shall be transported on a man haul trip.

(12) The car or conveyance containing explosives or

blasting agents shall be pulled, not pushed, whenever possible.

(13) The powder car or conveyance especially built for the purpose of transporting explosives or blasting agents shall bear a reflectorized sign on each side with the word "Explosives" in letters, not less than four (4) inches in height, upon a background of sharply contrasting color.

(14) Compartments for transporting detonators and explosives in the same car or conveyance shall be physically separated by a distance of twenty-four (24) inches or by a solid partition at least four (4) inches thick.

(15) Explosives, blasting agents, or blasting supplies shall not be transported with other materials.

(16) Explosives or blasting agents, not in original containers, shall be placed in a suitable container when transported manually.

(17) Detonators, primers, and other explosives shall be carried in separate containers when transported manually.

805 KAR 4:110

Section 1. Initiation of explosive charges - electric blasting.

(1) Electric blasting caps shall not be used where sources of extraneous electricity make the use of electric blasting caps dangerous. Blasting cap leg wires shall be kept short-circuited (shunted) until they are connected into the circuit for firing.

(2) Before adopting any system of electrical firing, the blaster shall conduct a thorough survey for extraneous currents, and all dangerous currents shall be eliminated before any holes are loaded.

(3) In any single blast using electric blasting caps, all caps shall be of the same style or function, and of the same manufacture.

(4) Electric blasting shall be carried out by using blasting circuits or power circuits in accordance with the electric blasting cap manufacturer's recommendations, or an approved contractor or his designated representative.

(5) When firing a circuit of electric blasting caps, care must be exercised to insure that an adequate quantity of delivered current is available, in accordance with the manufacturer's recommendations.

(6) Connecting wires and lead wires shall be insulated single solid wires of sufficient current-carrying capacity.

(7) Bus wires shall be solid single wires of sufficient current-carrying capacity.

(8) When firing electrically, the insulation on all firing lines shall be adequate and in good condition.

(9) A power circuit used for firing electric blasting caps shall not be grounded.

(10) In underground operations when firing from a power circuit, a safety switch shall be placed in the permanent firing line at intervals. This switch shall be made so it can be locked only in the "off" position and shall be provided with a short-circuiting arrangement of the firing lines to the cap circuit.

(11) In underground operations there shall be a "lightning" gap of at least five (5) feet in the firing system ahead of the main firing switch; that is, between this switch and the source of power. This gap shall be bridged by a flexible jumper cord just before firing the blast.

(12) When firing from a power circuit, the firing switch shall be locked in the open or "off" position at all times, except when firing. It shall be so designed that the firing lines to the cap circuit are automatically short-circuited when the switch is in the "off" position. Keys to this switch shall be entrusted only to the blaster.

(13) Blasting machines shall be in good condition and the efficiency of the machine shall be tested periodically to make certain that it can deliver power at its rated capacity.

(14) When firing with blasting machines the connections shall be made as recommended by the manufacturer of the electric blasting caps used.

(15) The number of electric blasting caps connected to a blasting machine shall not be in excess of its rated capacity. Furthermore, in primary blasting, a series circuit shall contain no more caps than the limits recommended by the manufacturer of the electric blasting caps in use.

(16) The blaster shall be in charge of the blasting machines and no other person shall connect the leading wires to the machine except under the direction of the blaster.

(17) Blasters shall test all electric blasting caps and electric blasting cap circuits by using only a blasting galvanometer, blasting ohmmeter, or blasting multimeter, designed specifically for the purpose of testing individual electric blasting caps and circuits containing electric blasting caps. Such instruments must be clearly marked as being designed for such purposes, and shall be used in accordance with the manufacturer's recommendations.

(18) Whenever the possibility exists that a leading line or blasting wire might be thrown over a live powerline by the force of an explosion, care shall be taken to see that the total length of wires are kept too short to hit the lines, or that the wires are securely anchored to the ground. If neither of these requirements can be satisfied, a non-electric system shall be used.

(19) Leading wires shall remain shorted and not be connected to the blasting machine or other source of current until the charge is to be fired.

(20) After firing an electric blast from a blasting machine, the leading wires shall be immediately disconnected from the machine and short-circuited.

(21) All blasting machines, other than rack-bar and twist type generators, shall have a normally open firing switch equipped with a spring device or other self returning mechanism that automatically returns it to the non-firing position after the shot has been detonated.

Section 1. Use of Safety Fuse.

(1) The use of a fuse that has been hammered or injured in any way shall be forbidden.

(2) The hanging of a fuse on nails or other projections which will cause a sharp bend to be formed in the fuse is prohibited.

(3) Before capping safety fuse, a short length shall be cut from the end of the supply reel so as to assure a fresh cut end in each blasting cap.

(4) Only a cap crimper of approved design shall be used for attaching blasting caps to safety fuse. Crimpers shall be kept in good repair and accessible to use.

(5) No unused cap or short capped fuse shall be placed in any hole to be blasted; such unused detonators shall be removed from the working place and destroyed. This prohibition shall not apply to surface mining operations.

(6) No fuse shall be capped or primer made up, in any magazine or near any possible source of ignition.

(7) No one shall be permitted to carry detonators or primers of any kind on his person.

(8) The minimum length of safety fuse to be used in blasting shall be as required by State law, but shall not be less than thirty (30) inches.

(9) At least two men shall be present when multiple cap and fuse blasting is done by hand lighting methods.

(10) Not more than twelve (12) fuses shall be lighted by each blaster when hand lighting devices are used. However, when two or more safety fuses in a group are lighted as one by means of igniting cord or other similar fuse lighting devices, they may be considered as one fuse.

(11) The so-called "drop fuse" method of dropping or pushing a primer or any explosive with a lighted fuse attached is forbidden.

(12) Cap and fuse shall not be used for firing

mudcap charges unless charges are separated sufficiently to prevent one charge from dislodging other shots in the blast.

(13) When blasting with safety fuses consideration shall be given to the length and burning rate of the fuse. Sufficient time, with a margin of safety, shall always be provided for the blaster to reach a place of safety.

Section 1. Use of detonating cord.

(1) Care shall be taken to select a detonating cord consistent with the type and physical condition of the borehole and stemming and the type of explosives used.

(2) Detonating cord shall be handled and used with the same respect and care given other explosives.

(3) The line of detonating cord extending out of a borehole or from a charge shall be cut from the supply spool before loading the remainder of the borehole or placing additional charges.

(4) Detonating cord shall be handled and used with care to avoid damaging or severing the cord during and after loading and hooking-up.

(5) Detonating cord connections shall be competent and positive in accordance with approved and recommended methods. Knot-type or other cord-to-cord connections shall be made only with detonating cord in which the explosive core is dry.

(6) All detonating cord trunklines and branchlines shall be free of loops, sharp kinks, or angles that direct the cord back toward the oncoming line of detonation.

(7) All detonating cord connections shall be inspected before firing the blast.

(8) When detonating cord millisecond-delay connectors or short-interval-delay electric blasting caps are used with detonating cord, the practice shall conform strictly with the manufacturer's recommendations.

(9) When connecting a blasting cap or an electric blasting cap to detonating cord, the cap shall be taped or otherwise attached securely along the side or the end of the detonating cord, with the end of the cap containing the explosive charge pointed in the direction in which the detonation is to proceed.

(10) Detonators for firing the trunkline shall not be brought to the loading area nor attached to the detonating cord until everything else is in readiness for the blast.

Section 1. Firing the blast.

(1) A code of blasting signals equivalent to Table U-1, shall be posted on one or more conspicuous places at the operations, and all employees shall be required to familiarize themselves with the code and conform to it. Danger signs shall be placed at suitable locations.

TABLE U-1

WARNING SIGNAL - A one (1) minute series of long blasts five (5) minutes prior to the blast signal.

BLAST SIGNAL - A series of short blasts one (1) minute prior to the shot.

ALL CLEAR SIGNAL - A prolonged blast following the inspection of the blast area.

(2) Before a blast is fired, a loud warning signal shall be given by the blaster in charge, who has made certain that all surplus explosives are in a safe place and all employees, vehicles, and equipment are at a safe distance, or under sufficient cover.

(3) No person shall remain in an area within the danger zone after being requested to leave by the blaster in charge or by a state explosives and blasting inspector.

(4) Flagmen shall be safely stationed on highways which pass through the danger zone so as to stop traffic during blasting operations.

(5) It shall be the duty of the blaster to fix the time of blasting.

(6) Before firing an underground blast, warning shall be given, and all possible entries into the blasting area and any entrances to any working place where a drift, raise or other opening is about to be made through, shall be carefully guarded. The blaster shall make sure that all employees are out of the blast area before firing a blast.

Section 1. Underwater blasting.

(1) A blaster shall conduct all blasting operations, and no shot shall be fired without his approval.

(2) Loading tubes and casings of dissimilar metals shall not be used because of possible electric transient currents from galvanic action of the metals and water.

(3) Only water-resistant blasting caps and detonating cords shall be used for all marine blasting. Loading shall be done through a non-sparking metal loading tube when tube is necessary.

(4) No blast shall be fired while any vessel under way is closer than 1,500 feet to the blasting area. Those on board vessels or crafts moored or anchored within 1,500 feet shall be notified before the blast is fired.

(5) No blast shall be fired while any swimming or diving operations are in progress in the vicinity of the blasting area. If such operations are in progress, signals and arrangements shall be agreed upon to assure that no blast shall be fired while any person is in the water.

(6) Blasting flags shall be displayed.

(7) The storage and handling of explosives aboard vessels used in underwater blasting operations shall be according to the provisions outlined herein on handling and storing explosives.

(8) When more than one charge is placed underwater, a float device shall be attached to an element of each charge in such a manner that it will be released by the firing. Misfires shall be handled in accordance with the requirements of 805 KAR 4:140.

Section 1. Blasting in excavation work under compressed air.

(1) Detonators and explosives shall not be stored or kept in tunnels, shafts, or caissons. Detonators and explosives for each round shall be taken directly from the magazines to the blasting zone and immediately loaded. Detonators and explosives left over after loading a round shall be removed from the working chamber before connecting wires are connected.

(2) When detonators or explosives are brought into an air lock, no employee except the powderman, blaster, lock tender and the employees necessary for carrying, shall be permitted to enter the air lock. No other materials, supplies, or equipment shall be locked through with the explosives.

(3) Detonators and explosives shall be taken separately into pressure working chambers.

(4) The blaster or powderman shall be responsible for the receipt, unloading, storage, and on site transportation of explosives and detonators.

(5) All metal pipes, rails, air locks, and steel tunnel lining shall be electrically bonded together and grounded at or near the portal or shaft, and such pipes and rails shall be cross bonded together at not less than 1,000-foot intervals throughout the length of the tunnel. In addition, each low air supply pipe shall be grounded at its delivery end.

(6) The explosives suitable for use in wet holes shall be water resistant and shall be in fume Class I.

(7) When tunnel excavation in rock face is approaching mixed face, and when tunnel excavation is in mixed face, blasting shall be performed with light charges and with light burden on each hole. Advanced drilling shall be performed as tunnel excavation in rock face approaches mixed face, to determine the general nature and extent of rock cover and the remaining distance ahead to soft ground as excavation advances.

Section 1. Misfires.

(1) If a misfire is found, the blaster shall provide proper safeguards for excluding all employees from the danger zone.

(2) No other work shall be done except that necessary to remove the hazard of the misfire and only those employees necessary to do the work shall remain in the danger zone.

(3) No attempt shall be made to extract explosives from any charged or misfired hole; a new primer shall be put in and the hole reblasted. If refiring of the misfired hole presents a hazard, the explosives may be removed by washing out with water or, where the misfire is under water, blown out with air.

(4) If there are any misfires while using cap and fuse, all employees shall remain away from the charge for at least one hour. Misfires shall be handled under the direction of the person in charge of the blasting. All wires shall be carefully traced and a search made for unexploded charges.

(5) When electric blasting caps have been used, men shall not return to misfired holes for at least fifteen (15) minutes.

(6) No drilling, digging, or picking shall be permitted until all missed holes have been detonated or the authorized representative has approved that work can proceed.

Section 1. Inspection after blasting.

(1) Immediately after the blast has been fired, the firing line shall be disconnected from the blasting machine, or where power switches are used, they shall be locked open or in the "off" position.

(2) Sufficient time shall be allowed, not less than fifteen (15) minutes in tunnels, for the smoke and fumes to leave the blasted area before returning to the shot. An inspection of the area and the surrounding rubble shall be made by the blaster to determine if all charges have been exploded before employees are allowed to return to the operation.

Section 1. Variances.

(1) The commissioner may grant variances from 805 KAR 4:070 through 805 KAR 4:150 if it can be demonstrated said variance improves safety conditions or that said variance will provide such safe conditions as those which would prevail if there was compliance with the standard.

(2) Such a variance may be modified or revoked by the Commissioner.

DEPARTMENT OF THE TREASURY
BUREAU OF ALCOHOL, TOBACCO, AND FIREARMS

SUBPART K - Storage

ss 55.201 General.

- (a) Section 842 (j) of the Act and ss 55.29 of this part require that the storage of explosive materials by any person must be in accordance with the regulations in this part. The storage standards prescribed by this subpart confer no rights or privileges to store explosive materials in a manner contrary to State or other law.
- (b) The Director may authorize alternate construction for explosives storage magazines when it is shown that the alternate magazine construction is substantially equivalent to the standards of safety and security contained in this subpart. Any alternate explosive magazine construction approved by the Director prior to August 9, 1982, will continue as approved unless notified in writing by the Director. Any person intending to use alternate magazine construction shall submit a letter application to the regional regulatory administrator for transmittal to the Director, specifically describing the proposed magazine. Explosive materials may not be stored in alternate magazines before the applicant has been notified that the application has been approved.
- (c) A licensee or permittee who intends to make changes in his magazines, or who intends to construct or acquire additional magazines, shall comply with ss 55.63.

ss 55.202 Classes of explosive materials.

For purposes of this part, there are three classes of explosive materials. These classes, together with the description of explosive materials comprising each class, are as follows:

- (a) High explosives. Explosive materials which can be caused to detonate by means of a blasting cap when unconfined. (For example, dynamite.)
- (b) Low explosives. Explosive materials which can be caused to deflagrate when confined. (For example, black powder, safety fuses; igniters; igniter cords; fuse lighters; and "special fireworks" defined as Class B explosives by the U.S. Department

of Transportation regulations in 49 CFR Part 173.)
(c) Blasting agents. [For example, ammonium nitrate-fuel oil and certain water-gels (see also ss 55.11).]

ss 55.203 Types of magazines.

For purposes of this part, there are five types of magazines. These types, together with the classes of explosive materials, as defined in ss 55.202, which will be stored in them, are as follows:

- (a) Type 1 magazines. Permanent magazines for the storage of high explosives, subject to the limitations prescribed by ss 55.206 and ss 55.213. Other classes of explosive materials may also be stored in type 1 magazines.
- ..(b) Type 2 magazines. Mobile and portable indoor and outdoor magazines for the storage of high explosives, subject to the limitations prescribed by ss 55.206, ss 55.208(b), and ss 55.213. Other classes of explosive materials may also be stored in type 2 magazines.
- (c) Type 3 magazines. Portable outdoor magazines for the temporary storage of high explosives while attended (for example a "day-box"), subject to the limitations prescribed by ss 55.206 and ss 55.213. Other classes of explosives materials may also be stored in type 3 magazines.
- (d) Type 4 magazines. Magazines for the storage of low explosives, subject to the limitations prescribed by ss 55.206(b), ss 55.210(b), and ss 55.213. Blasting agents may be stored in type 4 magazines, subject to the limitations prescribed by ss 55.206(c), ss 55.211(b), and ss 55.213. Detonators that will not mass detonate may also be stored in type 4 magazines, subject to the limitations prescribed by ss 55.206(a), ss 55.210(b), and ss 55.213.
- (e) Type 5 magazines. Magazines for the storage of blasting agents, subject to the limitations prescribed by ss 55.206 (c), ss 55.211(b), and ss 55.213.

ss 55.204 Inspection of magazines.

Any person storing explosive materials shall inspect his magazines at least every seven days. This inspection need not be an inventory, but must be sufficient to determine whether there has been unauthorized entry or attempted entry into the magazines, or unauthorized removal of the contents of the magazines.

ss 55.205 Movement of explosive materials.

All explosive materials must be kept in locked magazines meeting the standards in this subpart unless they are:

- (a) In the process of manufacture;
- (b) Being physically handled in the operating process of a licensee or user;
- (c) Being used; or
- (d) Being transported to a place of storage or use by a licensee or permittee or by a person who has lawfully acquired explosive materials under ss 55.106.

ss 55.206 Location of magazines.

- (a) Outdoor magazines in which high explosives are stored must be located no closer to inhabited buildings, passenger railways, public highways, or other magazines in which high explosives are stored, than the minimum distances specified in the table of distances for storage of explosive materials in ss 55.218.
- (b) Outdoor magazines in which low explosives are stored must be located no closer to inhabited buildings, passenger railways, public highways, or other magazines in which explosive materials are stored, than the minimum distances specified in the table of distances for storage of low explosives in ss 55.219. The distances shown in ss 55.219 may not be reduced by the presence of barricades.
- (c) (1) Outdoor magazines in which blasting agents in quantities of more than 50 pounds are stored must be located no closer to inhabited buildings, passenger railways, or public highways than the minimum distances specified in the table of distances for storage of explosive materials in ss 55.218.
- (2) Ammonium nitrate and magazines in which blasting agents are stored must be located no closer to magazines in which high explosives or other blasting agents are stored than the minimum distances specified in the table of distances for the separation of ammonium nitrate and blasting agents in ss 55.220. However, the minimum distances for magazines in which explosives and blasting agents are stored from inhabited buildings, etc., may not be less than the distances specified in the table of distances for storage of explosives

materials in ss 55.218.

ss 55.207 Construction of type 1 magazines.

A type 1 magazine is a permanent structure: a building, an igloo or "Army-type structure", a tunnel, or a dugout. It is to be bullet-resistant, fire-resistant, weather-resistant, theft-resistant, and ventilated.

(a) Buildings. All building type magazines are to be constructed of masonry, wood, metal, or a combination of these materials, and have no openings except for entrances and ventilation. The ground around building magazines must slope away for drainage or other adequate drainage provided.

- (1) Masonry wall construction. Masonry wall construction is to consist of brick, concrete, tile, cement block, or cinder block and be not less than 6 inches in thickness. Hollow masonry units used in construction must have all hollow spaces filled with well-tamped, coarse, dry sand or weak concrete (at least a mixture of one part cement and eight parts of sand with enough water to dampen the mixture while tamping in place). Interior walls are to be constructed of, or covered with, a nonsparking material.
- (2) Fabricated metal wall construction. Metal wall construction is to consist of sectional sheets of steel or aluminum not less than number 14-gauge, securely fastened to a metal framework. Metal wall construction is either lined inside with brick, solid cement blocks, hardwood not less than four inches thick, or will have at least a six inch sand fill between interior and exterior walls. Interior walls are to be constructed of, or covered with, a nonsparking material.
- (3) Wood frame wall construction. The exterior of outer wood walls is to be covered with iron or aluminum not less than number 26-gauge. An inner wall of, or covered with nonsparking material will be constructed so as to provide a space of not less than six inches between the outer and inner walls. The space is to be filled with coarse, dry sand, or weak concrete.
- (4) Floors. Floors are to be constructed of, or covered with, a nonsparking material and shall

be strong enough to bear the weight of the maximum quantity to be stored. Use of pallets covered with a nonsparking material is considered equivalent to a floor constructed of or covered with a nonsparking material.

- (5) Foundations. Foundations are to be constructed of brick, concrete, cement block, stone, or wood posts. If piers or posts are used, in lieu of a continuous foundation, the space under the buildings is to be enclosed with metal.
- (6) Roof. Except for buildings with fabricated metal roofs, the outer roof is to be covered with no less than number 26-gauge iron or aluminum, fastened to at least 7/8 inch sheathing.
- (7) Bullet-resistant ceilings or roofs. Where it is possible for a bullet to be fired directly through the roof and into the magazine at such an angle that the bullet would strike the explosives within, the magazine is to be protected by one of the following methods.
 - (i) A sand tray lined with a layer of building paper, plastic, or other non-porous material, and filled with not less than four inches of coarse, dry sand, and located at the tops of inner walls covering the entire ceiling area, except that portion necessary for ventilation.
 - (ii) A fabricated metal roof constructed of 3/16-inch plate steel lined with four inches of hardwood. (For each additional 1/16 inch of plate steel, the hardwood lining may be decreased one inch.)
- (8) Doors. All doors are to be constructed of not less than 1/4 inch plate steel and lined with at least two inches of hardwood. Hinges and hasps are to be attached to the doors by welding, riveting, or bolting (nuts on inside of door). They are to be installed in such a manner that the hinges and hasps cannot be removed when the doors are closed and locked.
- (9) Locks. Each doors is to be equipped with (i) two mortise locks; (ii) two padlocks fastened in separate hasps and staples, (iii) a combination of a mortise lock and a padlock; (iv) a mortise lock that requires two keys to

open; or (v) a three-point lock. Padlocks must have at least five tumblers and a casehardened shackle of at least 3/8 inch diameter. Padlocks must be protected with not less than 1/4 inch steel hoods constructed so as to prevent sawing or lever action on the locks, hasps, and staples. These requirements do not apply to magazine doors that are adequately secured on the inside by means of a bolt, lock, or bar that cannot be actuated from the outside.

- (10) Ventilation. Ventilation is to be provided to prevent dampness and heating of stored explosive materials. Ventilation openings must be screened to prevent the entrance of sparks. Ventilation openings in side walls and foundations must be offset or shielded for bullet-resistant purposes. Magazines having foundation and roof ventilators with the air circulating between the side walls and the floors and between the side walls and the ceiling must have a wooden lattice lining or equivalent to prevent the packages of explosive materials from being stacked against the side walls and blocking the air circulation.
- (11) Exposed metal. No sparking material is to be exposed to contact with the stored explosive materials. All ferrous metal nails in the floor and side walls, which might be exposed to contact with explosive materials, must be blind nailed, countersunk, or covered with a nonsparking lattice work or other nonsparking material.
- (b) Igloos, "Army-type structures", tunnels, and dugouts. Igloo, "Army-type structure", tunnel, and dugout magazines are to be constructed of reinforced concrete, masonry, metal, or a combination of these materials. They must have an earthmound covering of not less than 24 inches on the top, sides and rear unless the magazine meets the requirements of paragraph (a)(7) of this section. Interior walls and floors must be constructed of, or covered with, a nonsparking material. Magazines of this type are also to be constructed in conformity with the requirements of paragraph (a)(4) and paragraphs (a)(8) through (11) of this section.

ss 55.208 Construction of type 2 magazines.

A type 2 magazine is a box, trailer, semitrailer, or other mobile facility.

(a) Outdoor magazines.

(1) General. Outdoor magazines are to be bullet-resistant, fire-resistant, weather-resistant, theft-resistant, and ventilated. They are to be supported to prevent direct contact with the ground and, if less than one cubic yard in size, must be securely fastened to a fixed object. The ground around outdoor magazines must slope away for drainage or other adequate drainage provided. When unattended, vehicular magazines must have wheels removed or otherwise effectively immobilized by kingpin locking devices or other methods approved by the Director.

(2) Exterior construction. The exterior and doors are to be constructed of not less than 1/4-inch steel and lined with at least two inches of hardwood. Magazines with top openings will have lids with water-resistant seals or which overlap the sides by at least one inch when in a closed position.

(3) Hinges and hasps. Hinges and hasps are to be attached to doors by welding, riveting, or bolting (nuts on inside of door). Hinges and hasps must be installed so that they cannot be removed when the doors are closed and locked.

(4) Locks. Each door is to be equipped with (i) two mortise locks; (ii) two padlocks fastened in separate hasps and staples, (iii) a combination of a mortise lock and a padlock; (iv) a mortise lock that requires two keys to open; or (v) a three-point lock. Padlocks must have at least five tumblers and a case-hardened shackle of at least 3/8-inch diameter. Padlocks must be protected with not less than 1/4-inch steel hoods constructed so as to prevent sawing or lever action on the locks, hasps, and staples. These requirements do not apply to magazine doors that are adequately secured on the inside by means of a bolt, lock, or bar that cannot be actuated from the outside.

(b) Indoor magazines.

(1) General. Indoor magazines are to be fire-resistant and theft-resistant. They need not

be bullet-resistant and weather-resistant if the buildings in which they are stored provide protection from the weather and from bullet penetration. No indoor magazine is to be located in a residence or dwelling. The indoor storage of high explosives must not exceed a quantity of 50 pounds. More than one indoor magazine may be located in the same building if the total quantity of explosive materials stored does not exceed 50 pounds. Detonators must be stored in a separate magazine (except as provided in ss 55.213) and the total quantity of detonators must not exceed 5,000.

(2) Exterior construction. Indoor magazines are to be constructed of wood or metal according to one of the following specifications:

(i) Wood indoor magazines are to have sides, bottoms and doors constructed of at least two inches of hardwood and are to be well braced at the corners. They are to be covered with sheet metal of not less than number 26-gauge (.0179 inches). Nails exposed to the interior of magazines must be countersunk.

(ii) Metal indoor magazines are to have sides, bottoms and doors constructed of not less than number 12-gauge (.1046 inches) metal and be lined inside with a nonsparking material. Edges of metal covers must overlap sides at least one inch.

(3) Hinges and hasps. Hinges and hasps are to be attached to doors by welding, riveting, or bolting (nuts on inside of door). Hinges and hasps must be installed so that they cannot be removed when the doors are closed and locked.

(4) Locks. Each door is to be equipped with (i) two mortise locks; (ii) two padlocks fastened in separate hasps and staples; (iii) a combination of a mortise lock and padlock; (iv) a mortise lock that requires two keys to open; or (v) a three-point lock. Padlocks must have at least five tumblers and a case-hardened shackle of at least 3/8-inch diameter. Padlocks must be protected with not less than 1/4-inch steel hoods constructed so as to prevent sawing or lever action on the locks, hasps, and staples. Indoor magazines located in secure rooms that are locked as

provided in this subparagraph may have each door locked with one steel padlock (which need not be protected by a steel hood) having at least five tumblers and a case-hardened shackle of at least 3/8-inch diameter, if the door hinges and lock hasp are securely fastened to the magazine. These requirements do not apply to magazine doors that are adequately secured on the inside by means of a bolt, lock, or bar that cannot be actuated from the outside.

(c) Detonator boxes. Magazines for detonators in quantities of 100 or less are to have sides, bottoms, and doors constructed of not less than number 12-gauge (.1046 inches) metal and lined with a nonsparking material. Hinges and hasps must be attached so they cannot be removed from the outside. One steel padlock (which need not be protected by a steel hood) having at least five tumblers and a case-hardened shackle of at least 3/8-inch diameter is sufficient for locking purposes.

ss 55.209 Construction of type 3 magazines.

A type 3 magazine is a "day-box" or other portable magazine. It must be fire-resistant, weather-resistant, and theft-resistant. A type 3 magazine is to be constructed of not less than number 12-gauge (.1046 inches) steel, lined with at least either 1/2-inch plywood or 1/2-inch Masonite-type hardboard. Doors must overlap sides by at least one inch. Hinges and hasps are to be attached by welding, riveting or bolting (nuts on inside). One steel padlock (which need not be protected by a steel hood) having at least five tumblers and a case-hardened shackle of at least 3/8-inch diameter is sufficient for locking purposes. Explosive materials are not to be left unattended in type 3 magazines and must be removed to type 1 or 2 magazines for unattended storage.

ss 55.210 Construction of type 4 magazines.

A type 4 magazine is a building, igloo, or "Army-type structure", tunnel, dugout, box, trailer, or a semitrailer or other mobile magazine.

(a) Outdoor magazines.

(1) General. Outdoor magazines are to be fire-resistant, weather-resistant, and theft-resistant. The ground around outdoor magazines must slope away for drainage or other adequate

drainage be provided. When unattended, vehicular magazines must have wheels removed or otherwise be effectively immobilized by kingpin locking devices or other methods approved by the Director.

- (2) Construction. Outdoor magazines are to be constructed of masonry, metal-covered wood, fabricated metal, or a combination of these materials. Foundations are to be constructed of brick, concrete, cement block, stone, or metal or wood posts. If piers or posts are used, in lieu of a continuous foundation, the space under the building is to be enclosed with fire-resistant material. The walls and floors are to be constructed of, or covered with, a nonsparking material or lattice work. The doors must be metal or solid wood covered with metal.
- (3) Hinges and hasps. Hinges and hasps are to be attached to doors by welding, riveting, or bolting (nuts on inside of door). Hinges and hasps must be installed so that they cannot be removed when the doors are closed and locked.
- (4) Locks. Each door is to be equipped with (i) two mortise locks; (ii) two padlocks fastened in separate hasps and staples; (iii) a combination of a mortise lock and a padlock (iv) a mortise lock that requires two keys to open; or (v) a three-point lock. Padlocks must have at least five tumblers and case-hardened shackle of at least 3/8 inch diameter. Padlocks must be protected with not less than 1/4-inch steel hoods constructed so as to prevent sawing or lever action on the locks, hasps, and staples. These requirements do not apply to magazine doors that are adequately secured on the inside by means of a bolt, lock, or bar that cannot be actuated from the outside.

(b) Indoor magazine.

- (1) General. Indoor magazines are to be fire-resistant and theft-resistant. They need not be weather-resistant if the buildings in which they are stored provide protection from the weather. No indoor magazine is to be located in a residence or dwelling. The indoor storage of low explosives must not exceed a quantity of 50 pounds. More than one indoor magazine may be located in the same building

more than one indoor magazine may be located in the same building if the total quantity of explosive materials stored does not exceed 50 pounds. Detonators that will not mass detonate must be stored in a separate magazine and the total number of electric detonators must not exceed 5,000.

- (2) Construction. Indoor magazines are to be constructed of masonry, metal-covered wood, fabricated metal, or a combination of these materials. The walls and floors are to be constructed of, or covered with, a nonsparking material. The doors must be metal or solid wood covered with metal.
- (3) Hinges and hasps. Hinges and hasps are to be attached to doors by welding, riveting, or bolting (nuts on inside of door). Hinges and hasps must be installed so that they cannot be removed when the doors are closed and locked.
- (4) Locks. Each door is to be equipped with (i) two mortise locks; (ii) two padlocks fastened in separate hasps and staples; (iii) a combination of a mortise lock and padlock; (iv) a mortise lock that requires two keys to open; or (v) a three-point lock. Padlocks must have at least five tumblers and a case-hardened shackle of at least 3/8 inch diameter. Padlocks must be protected with not less than 1/4 inch steel hoods constructed so as to prevent sawing or lever action on the locks, hasps, and staples. Indoor magazines located in secure rooms that are locked as provided in this subparagraph may have each door locked with one steel padlock (which need not be protected by a steel hood) having at least five tumblers and a case-hardened shackle of at least 3/8 inch diameter, if the door hinges and lock hasps are securely fastened to the magazine. These requirements do not apply to magazine doors that are adequately secured on the inside by means of a bolt, lock, or bar that cannot be actuated from the outside.

ss 55.211 Construction of type 5 magazines.

A type 5 magazine is a building, igloo, or "Army-type structure", tunnel, dugout, bin, box, trailer, or a semitrailer or other mobile facility.

(a) Outdoor magazines.

(a) Outdoor magazines.

- (1) General. Outdoor magazines are to be weather-resistant and theft-resistant. The ground around magazines must slope away for drainage or other adequate drainage be provided. When unattended, vehicular magazines must have wheels removed or otherwise be effectively immobilized by kingpin locking devices or other methods approved by the Director.
- (2) Construction. The doors are to be constructed of solid wood or metal.
- (3) Hinges and hasps. Hinges and hasps are to be attached to doors by welding, riveting, or bolting (nuts on inside of door). Hinges and hasps must be installed so that they cannot be removed when the doors are closed and locked.
- (4) Locks. Each door is to be equipped with (i) two mortise locks; (ii) two padlocks fastened in separate hasps and staples; (iii) a combination of a mortise lock and a padlock; (iv) a mortise lock that requires two keys to open; or (v) a three-point lock. Padlocks must have at least five tumblers and a case-hardened shackle of at least 3/8 inch diameter. Padlocks must be protected with not less than 1/4-inch steel hoods constructed so as to prevent sawing or lever action on the locks, hasps, and staples. Trailers, semi-trailers, and similar vehicular magazines may, for each door, be locked with one steel padlock (which need not be protected by a steel hood) having at least five tumblers and a case-hardened shackle of at least 3/8 inch diameter, if the door hinges and lock hasps are securely fastened to the magazine and to the door frame. These requirements do not apply to magazine doors that are adequately secured on the inside by means of a bolt, lock, or bar that cannot be actuated from the outside.

(b) Indoor magazines.

- (1) General. Indoor magazines are to be theft-resistant. They need not be weather-resistant if the buildings in which they are stored provide protection from the weather. No indoor magazine is to be located in a residence or dwelling. Indoor magazines containing quantities of blasting agents in

excess of 50 pounds are subject to the requirements of ss 55.206 of this subpart.

- (2) Construction. The doors are to be constructed of wood or metal.
- (3) Hinges and hasps. Hinges and hasps are to be attached to doors by welding, riveting, or bolting (nuts on inside). Hinges and hasps must be installed so that they cannot be removed when the doors are closed and locked.
- (4) Locks. Each door is to be equipped with (i) two mortise locks; (ii) two padlocks fastened in separate hasps and staples; (iii) a combination of a mortise lock and a padlock; (iv) a mortise lock that requires two keys to open; or (v) a three-point lock. Padlocks must have at least five tumblers and a case-hardened shackle of at least 3/8 inch diameter. Padlocks must be protected with not less than 1/4 inch steel hoods constructed so as to prevent sawing or lever action on the locks, hasps, and staples. Indoor magazines located in secure rooms that are locked as provided in this subparagraph may have each door locked with one steel padlock (which need not be protected by a steel hood) having at least five tumblers and a case-hardened shackle of at least 3/8 inch diameter, if the door hinges and lock hasps are securely fastened to the magazine and to the door frame. These requirements do not apply to magazine doors that are adequately secured on the inside by means of a bolt, lock, or bar that cannot be actuated from the outside.

ss 55.212 Smoking and open flames.

Smoking, matches, open flames, and spark producing devices are not permitted:

- (a) in any magazine;
- (b) within 50 feet of any outdoor magazine; or
- (c) within any room containing an indoor magazine.

ss 55.213 Quantity and storage restrictions.

- (a) Explosive materials in excess of 300,000 pounds or detonators in excess of 20 million are not to be stored in one magazine unless approved by the Director.
- (b) Detonators are not to be stored in the same magazine with other explosive materials, except under the following circumstances:

- (1) In a type 4 magazine, detonators that will not mass detonate may be stored with electric squibs, safety fuse, igniters, and igniter cord.
- (2) In a type 1 or type 2 magazine, detonators may be stored with delay devices and any of the items listed in paragraph (b)(1) of this section.

ss 55.214 Storage within types 1,2,3, and 4 magazines

- (a) Explosive materials within a magazine are not to be placed directly against interior walls and must be stored so as not to interfere with ventilation. To prevent contact of stored explosive materials with walls, a nonsparking lattice work or other nonsparking material may be used.
- (b) Containers of explosive materials are to be stored so that marks are visible. Stocks of explosive materials are to be stored so they can be easily counted and checked upon inspection.
- (c) Except with respect to fiberboard of other nonmetal containers, containers of explosive materials are not to be unpacked or repacked inside a magazine or within 50 feet of a magazine, and must not be unpacked or repacked close to other explosive materials. Containers of explosive materials must be closed while being stored.
- (d) Tools used for opening or closing containers of explosive materials are to be of nonsparking materials, except that metal slitters may be used for opening fiberboard containers. A wood wedge and a fiber, rubber, or wooden mallet are to be used for opening or closing wood containers of explosive materials. Metal tools other than nonsparking transfer conveyors are not to be stored in any magazine containing high explosives.

ss 55.215 Housekeeping.

Magazines are to be kept clean, dry, and free of grit, paper, empty packages and containers, and rubbish. Floors are to be regularly swept. Brooms and other utensils used in the cleaning and maintenance of magazines must have no spark-producing metal parts, and

may be kept in magazines. Floors stained by leakage from explosive materials are to be cleaned according to instructions of the explosives manufacturer. When any explosive material has deteriorated it is to be destroyed in accordance with the advice or instructions of the manufacturer. The area surrounding magazines is to be kept clear of rubbish, brush, dry grass, or trees (except live trees more than 10 feet tall), for not less than 25 feet in all directions. Volatile materials are to be kept a distance of not less than 50 feet from outdoor magazines. Living foliage which is used to stabilize the earthen covering of a magazine need not be removed.

ss 55.216 Repair of magazines.

Before repairing the interior of magazines, all explosive materials are to be removed and the interior cleaned. Before repairing the exterior of magazines, all explosive materials must be removed if there exists any possibility that repairs may produce sparks or flame. Explosive materials removed from magazines under repair must be (a) placed in other magazines appropriate for the storage of those explosive materials under this subpart, or (b) placed a safe distance from the magazines under repair where they are to be properly guarded and protected until the repairs have been completed.

ss 55.217 Lighting.

- (a) Battery-activated safety lights or battery-activated safety lanterns may be used in explosives storage magazines.
- (b) Electric lighting used in any explosive storage magazine must meet the standards prescribed by the "National Electrical Code", (National Fire Protection Association, NFPA 70-81), for the conditions present in the magazine at any time. All electrical switches are to be located outside of the magazine and also meet the standards prescribed by the National Electrical Code.
- (c) Copies of invoices, work orders or similar documents which indicate the lighting complies with the National Electrical Code must be available for inspection by ATF officers.

§55.218 Table of distances for storage of explosive materials.

Quantity of explosives		Distances in feet							
From		Inhabited buildings		Public highways class A to D		Freight stations—public highways with traffic volume of more than 1,000 vehicles per day		Separation of magazines	
Over	Not over	Over	Not over	Over	Not over	Over	Not over	Over	Not over
1	5	10	140	30	60	55	100	0	12
5	10	10	140	30	60	55	100	0	12
10	20	110	220	40	70	60	110	0	12
20	30	120	230	50	80	65	120	0	12
30	40	130	240	60	90	70	130	0	12
40	50	140	250	70	100	75	140	0	12
50	60	150	260	80	110	80	150	0	12
60	70	160	270	90	120	85	160	0	12
70	80	170	280	100	130	90	170	0	12
80	90	180	290	110	140	95	180	0	12
90	100	190	300	120	150	100	190	0	12
100	110	200	310	130	160	105	200	0	12
110	120	210	320	140	170	110	210	0	12
120	130	220	330	150	180	115	220	0	12
130	140	230	340	160	190	120	230	0	12
140	150	240	350	170	200	125	240	0	12
150	160	250	360	180	210	130	250	0	12
160	170	260	370	190	220	135	260	0	12
170	180	270	380	200	230	140	270	0	12
180	190	280	390	210	240	145	280	0	12
190	200	290	400	220	250	150	290	0	12
200	210	300	410	230	260	155	300	0	12
210	220	310	420	240	270	160	310	0	12
220	230	320	430	250	280	165	320	0	12
230	240	330	440	260	290	170	330	0	12
240	250	340	450	270	300	175	340	0	12
250	260	350	460	280	310	180	350	0	12
260	270	360	470	290	320	185	360	0	12
270	280	370	480	300	330	190	370	0	12
280	290	380	490	310	340	195	380	0	12
290	300	390	500	320	350	200	390	0	12
300	310	400	510	330	360	205	400	0	12
310	320	410	520	340	370	210	410	0	12
320	330	420	530	350	380	215	420	0	12
330	340	430	540	360	390	220	430	0	12
340	350	440	550	370	400	225	440	0	12
350	360	450	560	380	410	230	450	0	12
360	370	460	570	390	420	235	460	0	12
370	380	470	580	400	430	240	470	0	12
380	390	480	590	410	440	245	480	0	12
390	400	490	600	420	450	250	490	0	12
400	410	500	610	430	460	255	500	0	12
410	420	510	620	440	470	260	510	0	12
420	430	520	630	450	480	265	520	0	12
430	440	530	640	460	490	270	530	0	12
440	450	540	650	470	500	275	540	0	12
450	460	550	660	480	510	280	550	0	12
460	470	560	670	490	520	285	560	0	12
470	480	570	680	500	530	290	570	0	12
480	490	580	690	510	540	295	580	0	12
490	500	590	700	520	550	300	590	0	12
500	510	600	710	530	560	305	600	0	12
510	520	610	720	540	570	310	610	0	12
520	530	620	730	550	580	315	620	0	12
530	540	630	740	560	590	320	630	0	12
540	550	640	750	570	600	325	640	0	12
550	560	650	760	580	610	330	650	0	12
560	570	660	770	590	620	335	660	0	12
570	580	670	780	600	630	340	670	0	12
580	590	680	790	610	640	345	680	0	12
590	600	690	800	620	650	350	690	0	12
600	610	700	810	630	660	355	700	0	12
610	620	710	820	640	670	360	710	0	12
620	630	720	830	650	680	365	720	0	12
630	640	730	840	660	690	370	730	0	12
640	650	740	850	670	700	375	740	0	12
650	660	750	860	680	710	380	750	0	12
660	670	760	870	690	720	385	760	0	12
670	680	770	880	700	730	390	770	0	12
680	690	780	890	710	740	395	780	0	12
690	700	790	900	720	750	400	790	0	12
700	710	800	910	730	760	405	800	0	12
710	720	810	920	740	770	410	810	0	12
720	730	820	930	750	780	415	820	0	12
730	740	830	940	760	790	420	830	0	12
740	750	840	950	770	800	425	840	0	12
750	760	850	960	780	810	430	850	0	12
760	770	860	970	790	820	435	860	0	12
770	780	870	980	800	830	440	870	0	12
780	790	880	990	810	840	445	880	0	12
790	800	890	1000	820	850	450	890	0	12
800	810	900	1010	830	860	455	900	0	12
810	820	910	1020	840	870	460	910	0	12
820	830	920	1030	850	880	465	920	0	12
830	840	930	1040	860	890	470	930	0	12
840	850	940	1050	870	900	475	940	0	12
850	860	950	1060	880	910	480	950	0	12
860	870	960	1070	890	920	485	960	0	12
870	880	970	1080	900	930	490	970	0	12
880	890	980	1090	910	940	495	980	0	12
890	900	990	1100	920	950	500	990	0	12
900	910	1000	1110	930	960	505	1000	0	12
910	920	1010	1120	940	970	510	1010	0	12
920	930	1020	1130	950	980	515	1020	0	12
930	940	1030	1140	960	990	520	1030	0	12
940	950	1040	1150	970	1000	525	1040	0	12
950	960	1050	1160	980	1010	530	1050	0	12
960	970	1060	1170	990	1020	535	1060	0	12
970	980	1070	1180	1000	1030	540	1070	0	12
980	990	1080	1190	1010	1040	545	1080	0	12
990	1000	1090	1200	1020	1050	550	1090	0	12
1000	1010	1100	1210	1030	1060	555	1100	0	12
1010	1020	1110	1220	1040	1070	560	1110	0	12
1020	1030	1120	1230	1050	1080	565	1120	0	12
1030	1040	1130	1240	1060	1090	570	1130	0	12
1040	1050	1140	1250	1070	1100	575	1140	0	12
1050	1060	1150	1260	1080	1110	580	1150	0	12
1060	1070	1160	1270	1090	1120	585	1160	0	12
1070	1080	1170	1280	1100	1130	590	1170	0	12
1080	1090	1180	1290	1110	1140	595	1180	0	12
1090	1100	1190	1300	1120	1150	600	1190	0	12
1100	1110	1200	1310	1130	1160	605	1200	0	12
1110	1120	1210	1320	1140	1170	610	1210	0	12
1120	1130	1220	1330	1150	1180	615	1220	0	12
1130	1140	1230	1340	1160	1190	620	1230	0	12
1140	1150	1240	1350	1170	1200	625	1240	0	12
1150	1160	1250	1360	1180	1210	630	1250	0	12
1160	1170	1260	1370	1190	1220	635	1260	0	12
1170	1180	1270	1380	1200	1230	640	1270	0	12
1180	1190	1280	1390	1210	1240	645	1280	0	12
1190	1200	1290	1400	1220	1250	650	1290	0	12
1200	1210	1300	1410	1230	1260	655	1300	0	12
1210	1220	1310	1420	1240	1270	660	1310	0	12
1220	1230	1320	1430	1250	1280	665	1320	0	12
1230	1240	1330	1440	1260	1290	670	1330	0	12
1240	1250	1340	1450	1270	1300	675	1340	0	12
1250	1260	1350	1460	1280	1310	680	1350	0	12
1260	1270	1360	1470	1290	1320	685	1360	0	12
1270	1280	1370	1480	1300	1330	690	1370	0	12
1280	1290	1380	1490	1310	1340	695	1380	0	12
1290	1300	1390	1500	1320	1350	700	1390	0	12
1300	1310	1400	1510	1330	1360	705	1400	0	12
1310	1320	1410	1520	1340	1370	710	1410	0	12
1320	1330	1420	1530	1350	1380	715	1420	0	12
1330	1340	1430	1540	1360	1390	720	1430	0	12
1340	1350	1440	1550	1370	1400	725	1440	0	12
1350	1360	1450	1560	1380	1410	730	1450	0	12
1360	1370	1460	1570	1390	1420	735	1460	0	12
1370	1380	1470	1580	1400	1430	740	1470	0	12
1380	1390	1480	1590	1410	1440	745	1480	0	12
1390	1400	1490	1600	1420	1450	750	1490	0	12
1400	1410	1500	1610	1430	1460	755	1500	0	12
1410	1420	1510	1620	1440					

nitrate, ammonium nitrate-fuel oil or combinations thereof are acceptors. If stores of ammonium nitrate are located within the sympathetic detonation distance of explosives or blasting agents, one-half the mass of the ammonium nitrate is to be included in the mass of the donor.

(2) When the ammonium nitrate and/or blasting agent is not barricaded, the distances shown in the table must be multiplied by six. These distances allow for the possibility of high velocity metal fragments from mixers, hoppers, truck bodies, sheet metal structures, metal containers, and the like which may enclose the "donor." Where explosives storage is in bullet-resistant magazines or where the storage is protected by a bullet-resistant wall, distances and barricade thicknesses in excess of those prescribed in the table in §55.218 are not required.

(3) These distances apply to ammonium nitrate that passes the insensitivity test prescribed in the definition of ammonium nitrate fertilizer issued by

the Fertilizer Institute.¹ Ammonium nitrate failing to pass the test must be stored at separation distances in accordance with the table in §55.218.

(4) These distances apply to blasting agents which pass the insensitivity test prescribed in regulations of the U.S. Department of Transportation (49 CFR Part 173).

(5) Earth or sand dikes, or enclosures filled with the prescribed minimum thickness of earth or sand are acceptable artificial barricades. Natural barricades, such as hills or timber of sufficient density that the surrounding exposures which require protection cannot be seen from the "donor" when the trees are bare of leaves, are also acceptable.

(6) For determining the distances to be maintained from inhabited buildings, passenger railways, and public highways, use the table in §55.218.

¹ Definition and Test Procedures for Ammonium Nitrate Fertilizer, Fertilizer Institute 1015-18th St. N.W. Washington, D.C. 20034.

Federal Explosives Storage Requirements

Types of Storage Facilities

Storage Type	Classes of Explosive Materials Which May Be Stored Therein
Type 1 (permanent)	High Explosives Low Explosives Blasting Agents
Type 2 (portable)	High Explosives Low Explosives Blasting Agents
Type 3 ("day-box" for temporary storage)	High Explosives Low Explosives Blasting Agents
Type 4	Low Explosives Blasting Agents *Electric Blasting Caps
Type 5	Blasting Agents

*As a result of tests with electric blasting caps, it has been determined that these blasting caps are not subject to sympathetic detonation. Therefore, a Type 4 storage facility meets the necessary requirements for storage of electric blasting caps.

Note 1. Blasting caps shall not be stored with other explosive materials in the same storage facility.

Housekeeping and Construction Requirements Common to All Types of Storage Facilities

Item	Requirements
Flags and Hoops	Shall be attached to doors by either Welding, OR Stitching, OR Sitting (none on inside of door).

Item	Requirements
Locks	Each door shall be equipped with either 2 mortise locks, OR 2 padlocks fastened in separate hoops and staples, OR A combination of a mortise lock and a padlock, OR Mortise lock requiring 2 keys to open, OR Three-point lock. Locks shall be fire-tumbler. Padlocks shall be protected with 1/2" steel caps constructed to prevent sawing or lever action on locks or hoops. Note: Outdoor-weather storage facilities with one steel, case-hardened, fire-tumbler padlock, having at least a 1/2" shackle diameter, have been determined by the Director to meet necessary requirements.
Lighting	Electric lighting used in any magazine must meet National Electrical Code standards for conditions present. All electric switches must be located outside the magazine and comply with the National Electrical Code. Battery activated safety lighting may be used in all explosive magazines.
Housekeeping	Storage facilities shall be kept clean, dry, and free of grit, paper, empty packages and containers, and rubbish. Explosive materials shall not be placed directly against interior walls of storage facility. Brooms and other cleaning utensils shall have no spark-producing metal parts. Only tools made of nonsparking materials shall be used in Types 1, 2, 3, and 4 magazines. (Metal shovels may be used for opening fiberboard containers. Metal tools other than nonsparking transfer conveyors shall not be moved in any magazine containing high explosives.) Area surrounding storage facilities shall be kept clear of rubbish, brush, dry grass, or trees for not less than 25 feet in all directions. Any other combustible materials shall be kept a distance of not less than 50 feet from outdoor storage facilities.

Type 1 Storage

A type 1 storage facility shall be a permanent structure a building, an igloo or Army-type structure, a tunnel, or a dugout, and shall be bullet-resistant, weather-resistant, theft-resistant, and well-ventilated.

Item	Requirements
Masonry Wall	Shall be constructed of either Brick, not less than 6" thick, OR Concrete, not less than 6" thick, OR Tile, not less than 6" thick, OR "Cannon block, not less than 6" thick, OR "Cinder block, not less than 6" thick. *Hollow masonry units shall have all hollow spaces filled with well-tamped coarse dry sand or weak concrete.
Metal Wall	Sectional sheets of one of the following shall be securely fastened to a metal framework: Steel, not less than 14 gauge, OR Aluminum, not less than 14 gauge. Shall be lined with either Brick, OR Solid cement blocks, OR Hardwood, not less than 4" thick, OR Shall have at least 6" sand fill between inner and outer walls.
Wood Wall	Exterior shall be covered with either Iron, not less than 24 gauge, OR Aluminum, not less than 24 gauge. Inner wall shall be constructed to provide not less than 6" between outer and inner walls, space filled with either Coarse dry sand, OR Weak concrete.
Foundations	Shall be constructed of either Brick, OR Concrete, OR Cannon block, OR Stone, OR Wood posts (If posts or piles are used, space under building shall be enclosed with metal).
Floors	Shall be constructed of nonsparking material. Shall be strong enough to bear weight of maximum quantity to be stored.

Item	Requirements
Roof	Outer roof (except fabricated metal roof) shall be covered with either 26-gauge iron, fastened to 1/2" sheathing, OR 26-gauge aluminum fastened to 1/2" sheathing. Where possible for a bullet to be fired directly through roof and into storage facility, magazine shall be protected by either A sand tray, filled with not less than 4" of coarse dry sand, covering the entire ceiling area; except that necessary for ventilation, OR Fabricated metal roof construction of 1/2" plate steel, lined with 4" hardwood (for each additional 1/2" of plate steel, hardwood may be decreased 1").
Doors	Shall be constructed of 1/4" steel. Shall be lined with 2" of hardwood.
Hinges, Hamps, and Locks	See construction requirements common to all types of facilities.
Interior	Shall be constructed of or covered with a nonsparking material. No sparking metal construction shall be exposed below top of walls in interior. All nails shall be blind-nailed or counter-sunk.
Ventilation	2" air space shall be left around ceiling and perimeter of floors, except at doorways. Foundation ventilators shall be not less than 4"x6". Vents in foundation, roof, or gables shall be screened and offset.
Ground	Ground around storage facility shall slope away for drainage.
Igloos, Army-Type Structures, Tunnels and Dugouts	Shall be constructed of reinforced concrete, masonry, metal, or a combination of these materials. Shall have an earthenwood covering of not less than 24" on the top, sides and rear. Interior walls and floors shall be covered with a nonsparking material. Floor, door, lock, ventilation, exposed metal, and lighting requirements are as stated above.
Lighting	See construction requirements common to all types of facilities.
Housekeeping	See housekeeping requirements common to all types of facilities.

Type 2 Storage

A type 2 storage facility shall be a box, a trailer, a semitrailer, or other mobile facility. It shall be bullet-resistant, fire-resistant, weather-resistant, theft-resistant and well ventilated.

Item	Requirements
Hinges, Hamps, and Locks	See construction requirements common to all types of storage facilities.
Lighting	See construction requirements common to all types of storage facilities.
Housekeeping	See housekeeping requirements common to all types of storage facilities.
Restrictions On Type 2 Outdoor Storage Facilities	
Site	Shall be at least 1 cubic yard in size, or securely fastened to fixed object.
Ground	Outdoor storage facilities shall be supported in such a manner as to prevent direct contact with the ground. Ground around storage facility shall slope away for drainage.
Construction	Sides, bottoms, tops, and covers or doors shall be constructed of 1/2" steel and lined with 2" of hardwood.
Unattended Storage	Unattended vehicular storage facilities shall have wheels removed or shall be immobilized by tongue locking device.
Restrictions On Type 2 Indoor Storage Facilities	
Location	No indoor storage facility for storage of high explosives shall be located in a residence or dwelling. More than one magazine may be located in same building. No more than a total of 50 pounds may be stored. Detonators must be stored in a separate magazine.
Item	Requirements
Quantity Restrictions	No indoor storage facility shall contain a quantity of high explosives in excess of 50 pounds or more than 5,000 blasting caps.

Item	Requirements
Construction	Shall be of either Wood (Shall have sides, bottoms, and covers or doors constructed of 2" hardwood and shall be well braced at corners. They shall be covered with sheet metal (not less than 26 gauge). Exposed nails shall be counter-sunk), OR Metal (Shall have sides, bottoms, and covers or doors constructed of 12-gauge steel and shall be lined inside with a nonsparking material. Edges of metal shall overlap sides at least 1").
Detonator Boxes	
	Storage facilities for detonators in quantity of 100 or less shall have sides, bottoms, and covers constructed of 12-gauge metal, with hinges and hamps attached by welding. One fire-tumbler lock shall be sufficient for locking purposes.

Type 3 Storage

A type 3 storage facility shall be a "day-box" or other portable facility. It shall be constructed in the same manner prescribed for type 2 outdoor storage facilities in 51.208(a), except that it may be less than 1 cubic yard in size, and shall be bullet-resistant, fire-resistant, weather-resistant, theft-resistant, and well ventilated.

Item	Requirements
Construction	Doors or covers, bottoms, and tops shall be constructed of 1/2" steel and lined with 2" of hardwood. Edges of metal covers shall overlap sides at least 1".
Hinges, Hamps, and Locks	See housekeeping and construction requirements common to all types of storage facilities.
Ground	Ground around storage facility shall slope away for drainage.
Unattended Storage	No explosive materials shall be left in storage facility if unattended. Explosive materials must be removed to types 1 or 2 storage facilities for unattended storage.
Lighting	See common requirements
Housekeeping	See common requirements

Type 4 Storage

A type 4 storage facility may be a building, an igloo or Army-type structure, a tunnel, a depot, a box, a trailer, or a semitrailer or other mobile facility; and shall be fire-resistant, weather-resistant, and theft-resistant.

Item	Requirements
Construction	Shall be of either Masonry, OR Metal-covered wood, OR Fabricated metal, OR Combinations of these materials.
Doors or Covers	Shall be constructed of either Metal, OR Solid wood covered with metal.
Foundations	Shall be constructed of either Brick, OR Concrete block, OR Concrete, OR Stone, OR Wood posts (If posts or piles are used, space under buildings shall be enclosed with mesh).
Interior	Shall be lined with nonsparking material. No sparking metal construction shall be exposed below top of walls in interior. All walls shall be blast-sealed or constructed.
Hinges, Hamps, and Locks	See common requirements
Lighting	See common requirements
Housekeeping	See common requirements
Restrictions On Type 4 Outdoor Storage Facilities	
Ground	Ground around storage facility shall slope away for drainage.

Restrictions On Type 4 Outdoor Storage Facilities	
Unattended Storage	Unattended vehicular storage facilities shall have wheels removed or shall be immobil- ized by hignpin locking device.
Restrictions On Type 4 Indoor Storage Facilities	
Location	No indoor facility for the storage of low explosives shall be located in a residence or dwelling.
Quantity Restrictions	No indoor facility shall contain a quantity of low explosives in excess of 50 pounds.

Type 5 Storage

A Type 5 storage facility may be a building, an igloo or Army-type structure, a tunnel, a depot, a box, a trailer, or a semitrailer or other mobile facility; and shall be theft-resistant.

Item	Requirements
Doors or Covers	Shall be constructed of either Solid wood, OR Metal.
Hinges, Hamps, and Locks	See construction requirements common to all types of storage facilities.
Housekeeping	See common requirements
Restrictions On Type 5 Outdoor Storage Facilities	
Ground	Ground around storage facility shall slope away for drainage.
Unattended Storage	Unattended vehicular storage facilities shall have wheels removed or shall be immobil- ized by hignpin locking device.
Restrictions On Type 5 Indoor Storage Facilities	
Location	No indoor storage facility for storing of blasting agents shall be located in a resi- dence or dwelling.

UNIFORM MUNICIPAL CODE FOR THE MANUFACTURE, TRANSPORTATION, STORAGE, AND USE OF EXPLOSIVES

RECOMMENDED BY

THE KENTUCKY DEPARTMENT OF MINES AND MINERALS

ARTICLE 1: AUTHORITY AND SCOPE

1:01 This Code shall apply to the manufacture, possession, storage, sale, transportation, and use of explosives and blasting agents.

1:02 This Code shall not apply to:

- (a) explosives or blasting agents while in the course of transportation via railroad, water, highway, or air when the explosives or blasting agents in the normal and emergency operation of State or Federal agency are moving under the jurisdiction of, and in conformity with, regulations adopted by any Federal or State department or agency.
- (b) the transportation and use of explosives or blasting agents in the normal and emergency operation of State or Federal agencies nor to municipal fire and police departments, providing they are acting in their official capacity and in the proper performance of their duties.
- (c) small arms ammunition and components thereof, which are subject to the Gun Control Act of 1968 (Title 18, Chapter 44, U.S. Code) and regulations promulgated thereunder.
- (d) blasting standards KRS 351.320, 351.330, and 351.340 and Regulations 805 KAR 4:010 through 4:060.
- (e) explosives or blasting agents being used on the site of Federal or State projects.

ARTICLE 2: STORAGE, TRANSPORTATION, AND USE

2:01 All activities within the scope of this Code shall conform to the regulations of the Kentucky

Department of Mines and Minerals 805 KAR 4:070 through 4:080 and 805 KAR 4:090 through 4:145 (ESB R900 through 914).

ARTICLE 3: BLASTING PERMITS

3:01 No person or corporation shall conduct a blasting operation without the (governmental unit's jurisdiction) without first obtaining a permit from the (authority).

3:02 The fee for a blasting permit or permit renewal shall be ().

3:03 No person or corporation shall be issued a permit to blast on public property unless the person to be in charge of the blasting holds a valid Kentucky Blasters License.

3:04 No person or corporation shall be issued a permit to blast on private property with more than five (5) pounds of explosives unless the person in charge of the blasting holds a valid Kentucky Blasters License.

3:05 The blasting permits shall specify the location of the blasting to be permitted.

3:06 In the event that a project is not completed, blasting permits must be renewed annually upon the applicant's payment of the renewal fee.

3:07 A permit allowing blasting shall be issued upon application but, on public property, shall not become valid until seven (7) days after it's issuance.

3:08 If unanticipated blasting is required, the permit may become valid as soon as the (authority) notifies all required agencies.

3:09 On any contract issued by an agency of the (governmental unit), blasting permits shall be issued by the (authority) unless otherwise specified in said contract.

3:10 False statements, made for the purpose of obtaining a permit, shall render the permit null and void from the time of issue.

3:11 Copies of the blasting permit shall be distributed by the (authority) to the following required agencies: (police, fire, municipal engineer, utilities, etc.).

ARTICLE 4: MANUFACTURE AND SALE

4:01 No person or corporation shall operate a business establishment where explosives are maintained for the sale, or manufacture for sale, of explosives in (governmental unit's jurisdiction) without first obtaining a permit from the (authority).

4:02 The fee for this permit is ().

ARTICLE 5: PENALTIES

5:01 Any person or corporation violating the procedures of this Code shall be fined not less than () nor more than (), and/or shall be imprisoned up to, but no more than () days.

CITIES HAVING ADOPTED THE UNIFORM MUNICIPAL CODE

CITY	AUTHORITY
Ashland	City Building Inspector
Crestview Hills	City Building Inspector
Crofton	City of Crofton
Frankfort	Fire Inspector
Highland Heights	City Coordinator
Lawrenceburg	Building Inspector
Madisonville	Fire Chief
Newport	Housing Code Enforcement Administrator
Paris	City Engineer
Pewee Valley	Chief of Police
Providence	City Codes Inspector
Southgate	City Building Inspector
Wilder	City Clerk

REPORT OF BLASTING OPERATION

Total No. of Holes _____ Burden and Spacing _____
 Depth of Holes _____ Diameter of Holes _____
 Depth of Stemming _____ Type of Stemming _____
 Type of Initiation: Electric () Detonating Cord () Fuse () Other _____
 Delay Types _____ Cap Types _____ Primer Types _____

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40

41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80

Seismograph Records Where Required

Number of persons in blasting crew _____

SIGNED

444

COMPOSITE REPORT OF NEARLY IDENTICAL BLASTING ON SAME DAY

DATE 10/2/54[illegible]

Blaster's Signature

License Number

This form to be kept with complete report on Form EC-2

BC-3

**LIST OF
LAWS, RULES AND PUBLICATIONS
of
Division of Workplace Standards
Office of Safety Compliance
as of October, 1985**

Law Reprints

Carnival-Amusement Rides Safety Act - N.J.S.A. 5:3-31 et seq.
Explosives Act - N.J.S.A. 21:1A-128 et seq.
Filling and Service Station Act - N.J.S.A. 34:3A-1 et seq.
Fireworks Regulation Law - N.J.S.A. 21:2-1 et seq. and 21:3-1 et seq.
High Voltage Proximity Act - N.J.S.A. 34:6-47.1 et seq.
Liquefied Petroleum Gas Act - N.J.S.A. 21:1B-1 et seq.
Mine Safety Act - N.J.S.A. 34:6-98.1 et seq.
Ski Lift Safety Act - N.J.S.A. 34:4A-1 et seq.

New Jersey Administrative Code Reprints

N.J.A.C. 12:175, Ski Lifts - 12/9/83.
N.J.A.C. 12:185, Pits and Quarries - 2/15/60.
N.J.A.C. 12:190, Explosives - 10/15/82.
N.J.A.C. 12:194, Rocket Experimentation by Amateurs - 11/1/63.
N.J.A.C. 12:195, Carnival-Amusement Rides - 10/15/81.
N.J.A.C. 12:200, Liquefied Petroleum Gases - 5/15/80.

Other Publications

Catalogue of Safety Films

Availability of Publications

There is no charge for single copy requests for each publication.

All requests should be addressed to the address indicated on the front cover of this publication.

N.J.A.C. 12:190

BLANEY

EXPLOSIVES

As amended through October 15, 1982

THOMAS H. KEAN
Governor, State of New Jersey

CHARLES SERRAINO
Commissioner, New Jersey Department of Labor



**NEW JERSEY DEPARTMENT OF LABOR
DIVISION OF WORKPLACE STANDARDS
OFFICE OF SAFETY COMPLIANCE
C N 386
TRENTON, N. J. 08625-0386**

FOREWORD

This chapter of Title 12 of the New Jersey Administrative Code replaces N.J.A.C. 12:190, Explosives Permits and Fees, effective January 15, 1962; N.J.A.C. 12:191, Transportation of Explosives, effective December 14, 1962; N.J.A.C. 12:192, Storage of Explosives, effective August 20, 1965; and N.J.A.C. 12:193, Use of Explosives, effective August 20, 1965.

This chapter updates the rules for the manufacture, sale, storage, transportation and use of explosives; reflects amendments to the New Jersey Explosives Act; and incorporates into one chapter the former four chapters on explosives listed above.

This chapter is based upon Explosive Materials, NFP/No. 495-1973; Commerce in Explosives, 27 CFR Part 55 of the Bureau of Alcohol, Tobacco and Firearms, U. S. Department of the Treasury; Hazardous Materials Regulations, 49 CFR Parts 17 through 178 and Federal Motor Carrier Safety Regulations, 49 CFR Parts 390 through 397 of the U. S. Department of Transportation and research conducted by the Division of Workplace Standards.

This chapter is promulgated by the Commissioner of Labor of the State of New Jersey, under the authority of the N.J.S.A. 21:1A-131 of the Explosives Act, N.J.S.A. 21:1A-128 et seq. and the applicable sections of the Administrative Procedure Act, N.J.S.A. 52:14B-1 et seq.

Attention is drawn to the fact that by N.J.S.A. 21:1A-130 the Commissioner of Labor is the enforcing authority for the manufacture, sale, transportation, storage, use and possession of explosives, except that the Division of State Police, Department of Law and Public Safety has concurrent enforcement power with regard to the transportation of explosives on any highway as defined by the act.

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SUBCHAPTER 1. GENERAL PROVISIONS

12:190-1.1 Title and citation

This regulation shall be known and may be cited as Chapter 190, Explosives of Title 12, N.J.A.C.

12:190-1.2 Purpose

The purpose of this chapter is to protect the public and property by establishing reasonable standards for the manufacture, sale, transportation, storage and use of explosives.

12:190-1.3 Scope

(a) This chapter shall apply to every person who manufactures, sells, transports, stores, uses or possesses explosives, except as provided in (b) below.

(b) This chapter shall not apply to:

1. The military or naval forces of the United States or its allies, nor the duly authorized militia of any state, nor to the police or fire departments of this State, providing the same are acting in their official capacity and in the performance of their public duties;

2. Transportation of explosives in interstate commerce;

3. Model rocketry;

4. Employee safety subject to the Occupational Safety and Health Act, 29 USC 651 et seq.;

5. Fireworks subject to NJSA 21:2-1 et seq. and NJSA 21:3-1 et seq.;

6. Small arms ammunition; and

7. Explosives in the forms prescribed by the official U.S. Pharmacopeia, USPC-1980, 20th edition.

12:190-1.4 Documents referred to by reference

The availability of standards and publications referred to in this chapter is explained in N.J.A.C. 12:190-12.

12:190-1.5 Validity

Should any section, paragraph, sentence or word of this chapter be declared for any reason to be invalid, such decision shall not affect the remaining portions of this chapter.

12:190-1.6 Exception

In cases of practical difficulty or unnecessary hardship the commissioner may grant an exception from this chapter provided that a request for such exception has been made in writing. The exception shall be granted when it is clearly evident that a satisfactory and safe condition is attained, and no conflict is created with requirements of the act.

12:190-1.7 Existing installations

(a) Installations that were in accordance with the applicable chapters on explosives of Title 12, N.J.A.C. prior to the effective date of this chapter may be continued in service if found by the appropriate officials of the Division of Workplace Standards to be in a safe condition.

(b) The maintenance of existing installations shall be in accordance with this chapter and any replacements thereof shall be in conformance with this chapter.

12:190-1.8 Security and safety of explosives

(a) The manufacture of any explosive material shall be prohibited unless such manufacture is authorized by Federal license, when required, and is conducted in accordance with recognized safe practices.

(b) No person shall manufacture, store, sell, transport, use, dispose of, or possess explosives in any manner that creates a recognized hazard that is causing or is likely to cause physical harm to any person or property.

(c) The commissioner may restrict the quantity of explosive materials that may be handled at any location.

(d) All explosive materials and newly developed and unclassified explosives shall meet the provisions of this chapter.

(e) Every person who manufactures, sells, transports, stores, uses or possesses explosives which are sensitive to electric charges shall take the following precautions:

1. Suspend operations at the approach of and during electrical storm;

2. Comply with Radio-Frequency Radiation Hazard IME Safety Library Publication No. 20-1978;

3. Have testing performed for extraneous electric current by a competent person using instrumentation designed for the purpose when any operation is in the vicinity of high voltage electrical lines;

4. Utilize only approved testing equipment for use in connection with electric detonators; and

5. Utilize only effective grounding methods to eliminate the buildup of static electric charges.

(f) Every person who manufactures, sells, transports, stores, uses or possesses explosives shall not permit:

1. Smoking, unguarded lights, fire, or flame producing devices, except devices specifically designed for use with explosives within 100 feet of any explosives; and

2. Any person under his control to stay in the danger zone when there is imminent danger of explosives detonating from any source of fire.

(g) Every person who manufactures, sells, transports, stores, uses or possesses explosives shall have such explosives accounted for at all times; and any such explosives shall not be abandoned, buried or covered over by any material as a means of disposal.

(h) The manufacturer's markings or labels on explosives shall not be changed or destroyed, except by detonation during use or disposal.

(i) No person, other than security or law enforcement personnel, shall carry firearms in the immediate vicinity of explosives.

(j) Any person holding a permit in accordance with N.J.A.C. 12:190-3 shall prohibit any person under the influence of alcohol, narcotics or other dangerous drugs from performing any activities associated with the explosives under his control.

12:190-1.9 Jurisdiction

The commissioner shall have jurisdiction over the manufacture, sale, transportation, storage and use of explosives in accordance with N.J.S.A. 21:1A-139 and N.J.S.A. 21:1A-141.

SUBCHAPTER 2. DEFINITIONS

12:190-2.1 Definitions

The following words and terms, when used in this chapter, shall have the following meanings, unless the context clearly indicates otherwise:

"Acceptor" means a charge of explosive or blasting agent receiving an impulse from an exploding donor charge.

"Act" means the Explosive Act, N.J.S.A. 21:1A-128 et seq.

"Air blast" means the airborne shock wave or acoustic transient generated by an explosion.

"Ammunition primer" means a device used to ignite the powder charges of ammunition.

"Approved" means acceptable to the commissioner.

"Artificial barricade" means an artificial mound or properly revetted wall of earth.

"Barricaded" means that a building containing explosives is effectively screened from a magazine, inhabited building, railway or highway, either by a natural barricade or by an artificial barricade of such height that a straight line from the top of any side wall of a building containing explosives to the eave line of any magazine or inhabited building or to a point 12 feet above the center of a railway or highway, will pass through such intervening natural or artificial barricade.

"Black powder" means a deflagrating or low explosive compound composed of an intimate mixture of sulfur, charcoal, and an earth nitrate usually potassium nitrate or sodium nitrate.

"Blast area" means the area of a blast including the area immediately adjacent, within the normal influence of flying rock missiles.

"Blaster" means a person who holds a valid permit to perform blasting operations.

"Blasting" means the breaking up of heavy masses of material by explosives.

"Blasting agent" means any material or mixture, consisting of fuel and oxidizer, intended for blasting, not otherwise classified as explosive, provided that the finished product, as mixed and packaged for use or shipment, cannot be detonated by means of a No. 8 test blasting cap when unconfined.

"Blasting cap" means a detonator.

"Blasting machine" means an electrical or electro-mechanical device which provides electrical energy for the purpose of energizing electric blasting caps.

"Blasting mat" means a mat of woven steel wire, rope, scrap tires or other suitable material or construction to cover blast hole for the purpose of preventing fly rock missiles.

"Building" See definition of Construction.

"Bulk mix delivery motor vehicle" means a motor vehicle that transports explosives, blasting agents or ingredients for explosive material in bulk form for mixing and loading directly into blast holes.

"Bullet-resistant" means magazine walls or doors of construction resistant to penetration of a bullet of 150-grain M2 ball ammunition having a nominal muzzle velocity of 2,700 feet per second fired from a 0.30 caliber rifle from a distance of 100 feet perpendicular to the wall or door. When a magazine ceiling or roof is required to be "bullet-resistant", the ceiling or roof shall be constructed of material comparable to the side walls or of other materials which will withstand penetration of the bullet above described when fired at an angle of 45 degrees from the perpendicular.

"Bullet-sensitive explosive material" means material that can be detonated by 150-grain M2 ball ammunition having a nominal muzzle velocity of 2,700 feet per second when the bullet is fired from a 0.30 caliber rifle at a distance of not more than 100 feet and the test material, at a temperature of 70 to 75 degrees F., is placed against a backing material of 1/2-inch steel plate.

"Burden" means that dimension of a medium to be blasted measured from the borehole to the face at right angles to the spacing. It means also the total amount of material to be blasted by a given hole, usually measured in cubic yards or in tons.

"Bureau of Explosives" means Bureau of Explosives of the Association of American Railroads.

3. Fireworks regulated under Manufacture, Storage and Transportation of Fireworks, N.J.S.A. 21:2-1 et seq.

"Explosive material" means an explosive.

"Explosive manufacturing building" means any building or other structure, except a magazine, in which the manufacture of explosives is carried on.

"Explosive manufacturing establishment" means all lands, and buildings situated thereon, used in connection with the manufacture of explosives.

"Fireworks" means any combustible or explosive composition, or any substance or combination of substances, or articles prepared for the purpose of producing a visible or audible effect by combustion, explosion, deflagration or detonation.

"Flammable liquid" means any liquid with a flash point less than 100 degrees F. as measured by tests specified in section 173.115 of 49 CFR Part 173, except: a flammable liquid with a vapor pressure greater than 40 psia at 100 degrees F., a liquid mixture containing one percent or less flammable components, and a water-alcohol solution containing 24 percent or less alcohol.

"Flammable solid" means any material, other than an explosive, which is liable to cause fires through friction, absorption of moisture, spontaneous chemical changes, retained heat from manufacturing or processing, or which can be ignited readily and when ignited burns so vigorously and persistently as to create a serious transportation hazard.

"Fly rock" means rock propelled from the blast area by the forces of an explosion.

"Fuel" means a substance that may react with the oxygen in the air or with the oxygen or other oxidizing material yielded by an oxidizer to produce combustion.

"Fume classification" means a classification indicating the amount of poisonous or toxic gases produced by an explosive or blasting agent.

"Hardwood" means oak, maple, ash, hickory, or other hardwood, free from loose knots, spaces, or similar defects.

"Hertz" means cycles per second.

"Demolition" means any work involving the use of explosives in the total or partial dismantling or razing of any construction.

"Detonating cord" means a flexible cord containing a center core of high explosive and used to detonate other explosives.

"Detonating fuse" means a detonating system used in the military to detonate high explosive bursting charges of projectiles, mines, bombs, torpedoes, and grenades. In addition to a powerful detonator, they may contain several ounces of a high explosive, all assembled in a heavy steel envelope.

"Detonator" means any device containing a detonating charge that is used for initiating detonation in an explosive. The term includes, but is not limited to, electric blasting caps of instantaneous and delay types, blasting caps for use with safety fuses, detonating-cord delay connectors, and non-electric instantaneous or delay blasting caps.

"Division of Workplace Standards" means the Division of Workplace Standards in the New Jersey Department of Labor, C N 054, Trenton, New Jersey 08625.

"Donor" means an exploding charge producing an impulse that impinges upon an explosive "acceptor" charge.

"Electric blasting cap" means a blasting cap designed for, and capable of, initiation by means of an electric current.

"Explosive" means any chemical compound or mixture that is commonly used or intended for the purpose of producing an explosion, that contains any oxidizing and combustible materials or other ingredients, in such proportions, quantities or packing that an ignition by fire, by friction, by concussion or by detonation of any part of the compound or mixture may cause such a sudden generation of highly heated gases that the resultant gaseous pressure is capable of producing destructive effects on contiguous objects.

(a) The term "explosive" includes, but is not limited to:

1. A commercial explosive, propellant or nitro-carbonate,
2. A high explosive or a low explosive, and
3. An explosive material, blasting agent, water gel or detonator.

(b) The term "explosive", except as specifically stated in the act, does not include:

1. Small arms ammunition,
2. An explosive in a form prescribed by the United States Pharmacopeia, or

3. Fireworks regulated under Manufacture, Storage and Transportation of Fireworks, N.J.S.A. 21:2-1 et seq.

"Explosive material" means an explosive.

"Explosive manufacturing building" means any building or other structure, except a magazine, in which the manufacture of explosives is carried on.

"Explosive manufacturing establishment" means all lands, and buildings situated thereon, used in connection with the manufacture of explosives.

"Fireworks" means any combustible or explosive composition, or any substance or combination of substances, or articles prepared for the purpose of producing a visible or audible effect by combustion, explosion, deflagration or detonation.

"Flammable liquid" means any liquid with a flash point less than 100 degrees F. as measured by tests specified in section 173.115 of 49 CFR Part 173, except: a flammable liquid with a vapor pressure greater than 40 psia at 100 degrees F., a liquid mixture containing one percent or less flammable components, and a water-alcohol solution containing 24 percent or less alcohol.

"Flammable solid" means any material, other than an explosive, which is liable to cause fires through friction, absorption of moisture, spontaneous chemical changes, retained heat from manufacturing or processing, or which can be ignited readily and when ignited burns so vigorously and persistently as to create a serious transportation hazard.

"Fly rock" means rock propelled from the blast area by the forces of an explosion.

"Fuel" means a substance that may react with the oxygen in the air or with the oxygen or other oxidizing material yielded by an oxidizer to produce combustion.

"Fume classification" means a classification indicating the amount of poisonous or toxic gases produced by an explosive or blasting agent.

"Hardwood" means oak, maple, ash, hickory, or other hardwood, free from loose knots, spaces, or similar defects.

"Hertz" means cycles per second.

"High explosive" means any explosive material which can be caused to detonate by means of a blasting cap, when unconfined.

"Highway" means any public street, road, highway, alley or part of a navigable stream which is used as a highway of commerce.

"IME" means the Institute of Makers of Explosives.

"Inhabited building" means a building regularly occupied in whole or in part as a habitation for human beings, or any church, schoolhouse, railroad station, store or other structure where people are accustomed to assemble, except any building or structure occupied in connection with the manufacture, transportation, storage or use of explosives.

"Initiating primer" means an explosive cartridge with a detonator or initiating agent inserted therein.

"Low explosive" means an explosive material which can be caused to deflagrate when confined.

"Magazine" means any building, structure or other enclosure or container, other than an explosive manufacturing building used for the storage of explosives.

"Misfire" means an explosive material charge that fails to detonate after an attempt at initiation.

"Motor vehicle" means any self propelled vehicle, truck, tractor, semi-trailer, or truck-full trailer used for the transportation of explosives.

"Natural barricade" means natural features of the ground including but not limited to hills, or timber of sufficient density so that the surrounding exposures which require protection cannot be seen from the magazine containing explosives when the trees are bare of leaves.

"NFPA" means National Fire Protection Association.

"N.J.A.C." means the New Jersey Administrative Code.

"N.J.S.A." means the New Jersey Statutes Annotated.

"Nitro-carbo-nitrate" means an explosive classified as a blasting agent.

"No. 8 test blasting cap" means a cap containing two grams of a mixture of 80 percent mercury fulminate and 20 percent potassium chlorate, or a cap of equivalent strength.

"Office of Safety Compliance" means the Office of Safety Compliance in the Division of Workplace Standards of the New Jersey Department of Labor, C N 386, Trenton, New Jersey 08625, Telephone 609-292-2096.

"Oxidizer" means a substance such as a nitrate that yields oxygen or other oxidizing substance readily to stimulate the combustion of organic matter or other fuel.

"Oxidizing material" means an oxidizer.

"Peak particle velocity" means the peak particle velocity recorded on any one of the three mutually perpendicular components of blasting vibrations in the vertical and horizontal directions.

"Permit holder" means any person who has obtained a permit to manufacture, sell, transport, store or use explosive.

"Person" means any natural person, partnership, firm, association or corporation.

"Placard" means a sign placed on a motor vehicle transporting explosives or oxidizers indicating the nature of the cargo.

"Plywood" means exterior, construction grade laminated wood.

"Propellant" means any solid chemical or solid chemical mixture which functions by rapid combustion of successive layers and includes, but is not limited to, smokeless powder for small arms, smokeless powder for cannon, smokeless powder or solid propellant for rockets, jet thrust units, or other devices.

"Public conveyance" means any transportation facility which is carrying passengers for hire.

"Railway" means and includes any steam, electric or other railroad or railway which carries passengers for hire on the particular line or branch in the vicinity where explosives storage magazines or explosives manufacturing buildings are situated, but shall not include auxiliary tracks, spurs and sidings installed and primarily used for transporting freight.

"Seismograph" means an instrument which records ground vibration by measuring and recording particle velocity, displacement, or acceleration in three mutually perpendicular directions.

"Semi-conductive hose" means a hose with an electrical resistance high enough to limit flow of stray electric currents to safe levels, yet not so high as to prevent drainage of static electric charges to ground such as those of not more than two megohms resistance over its entire length and not less than 5,000 ohms per foot.

"Sensitivity" means a physical characteristic of an explosive classifying its ability to detonate upon receiving an external impulse such as impact, shock, flame, or other influence which can cause explosive decomposition.

"Single delay" means a delay in time of nine milliseconds or more.

"Small arms ammunition" means a cartridge for shotgun, rifle, pistol, or revolver, and cartridge for propellant-actuated power devices and industrial guns. Military-type ammunition containing explosive bursting charges, or any incendiary, tracer, spotting or pyrotechnic projectile is excluded from this definition.

"Smokeless propellant" means a solid propellant, commonly called smokeless powder in the trade, used in small arms ammunition, cannon, rockets or propellant-actuated power devices.

"Softwood" means fir, pine, or other softwood free from loose knots, spaces, or other defects.

"Squib" means a firing device that burns with a flash and is used for igniting black powder or pellet powder.

"Stemming" means an inert material placed in a bore hole after the explosive and for the purpose of confining explosive materials or to separate charges of explosive material in the same bore hole.

"Stray current" means a flow of electricity outside the conductor which normally carries it.

"Type 1 magazine" See N.J.A.C. 12:190-5.2(b)1.

"Type 2 magazine" See N.J.A.C. 12:190-5.2(b)2.

"Type 3 magazine" See N.J.A.C. 12:190-5.2(b)3.

"Type 4 magazine" See N.J.A.C. 12:190-5.2(b)4.

"Type UG magazine" See N.J.A.C. 12:190-5.2(b)5.

"USC" means United States Code.

"USDOT" means United States Department of Transportation.

"Vibration" means the energy from a blast that manifests itself in earth borne vibrations which are transmitted through the earth away from the immediate blast area.

"Water gel" means any of a wide variety of materials used for blasting that contain substantial proportions of water and high proportions of ammonium nitrate, some of which is in solution in the water. Two broad classes of water gels are (a) those which are sensitized by a material classed as an explosive, such as TNT or smokeless powder, and (b) those which contain no ingredient classified as an explosive; these are sensitized with metals such as aluminum or with other fuels. Water gels may be classified as class A explosives, class B explosives or blasting agents.

SUBCHAPTER 3.

ADMINISTRATION

12:190-3:1 Scope of subchapter

This subchapter shall apply to the procedures for the issuance of permits, the payment of fees, the recordkeeping required for permit holders, and reporting procedures.

12:190-3.2 Permit restrictions

(a) No person shall manufacture, sell, transport, store or use explosives unless a permit has been issued as provided in the applicable provisions of this subchapter.

(b) No explosives shall be sold, given or delivered to any person not in possession of a permit.

(c) No permit shall be assigned or in anyway transferred.

(d) No permit holder shall manufacture, sell, transport, store or use explosives except in compliance with the limitations expressed on the permit.

(e) No permit shall be issued for the sale, transportation, storage or use of explosives which are not acceptable to the commissioner.

(f) No permit shall be issued where the commissioner concludes, after full examination of the qualifications of an applicant, that to grant a permit would be dangerous to the health, safety and welfare of the public.

12:190-3.3 Exemptions from permits

(a) No permit shall be required for the storage, transportation or use of smokeless powder which is used by private persons for the hand loading of small arms ammunition and which is not for resale. For this purpose not more than 36 pounds of smokeless powder and not more than five pounds of black powder shall be stored or transported without a permit.

(b) Persons holding, or employed by a person holding, a permit to manufacture explosives, and who is engaged in the testing of explosives incidental to the manufacture or development of explosives, shall not be required to obtain a permit to use explosives.

12:190-3.4 Application for permit

(a) An application for a permit shall be made to the commissioner on forms provided by him and shall contain all information as the commissioner may require.

(b) An applicant for a permit shall, at his own expense, furnish whatever pertinent information the commissioner may require in addition to that specified in this subchapter.

(c) Any false representation made for the purpose of procuring a permit shall be cause for revocation.

(d) Initial applications for a permit to use explosives for blasting purposes shall be accompanied by two recent photographs and two completed fingerprint cards.

(e) Applications for annual renewal of permits shall be mailed or delivered by the commissioner to the permit holder's address as shown on the previous application.

(f) If an application for renewal is filed with the commissioner before the expiration of the old permit, the renewal shall become effective when the old permit expires.

(g) Renewal permits shall not be issued more than 30 days prior to the expiration date of current permits.

12:190-3.5 Investigation of applicants for permits

(a) Upon receipt of an application for a permit to manufacture, store, sell, transport or use explosives, and before the permit is issued, the commissioner shall make or cause to be made an investigation for the purpose of ascertaining if all applicable requirements of this chapter and the act have been met.

(b) For an initial permit to manufacture, store, sell, transport or use explosives the commissioner shall make a determination of "good moral character and loyalty to the United States" referenced in N.J.A.C. 12:190-3.6. This determination is based on:

1. Acceptance of the applicant by the Bureau of Alcohol, Tobacco, and Firearms of the United States Department of the Treasury for any activity concerning explosives; or

2. Acceptance of the applicant by the State or local police department for any activity concerning explosives; or

3. Any method acceptable to the commissioner.

(c) The commissioner shall not issue a permit to manufacture, sell, store, transport or use explosives when investigation reveals that all the provisions of this chapter and the act have not been met.

12:190-3.6 Qualifications of applicants for permits

(a) An applicant for a permit to manufacture, sell, transport or use explosives shall:

1. Be at least 21 years of age;

2. Have a reasonable understanding of the English language;

3. Present satisfactory evidence of experience in the manufacture, sale, transportation, storage or use of explosives;

4. Demonstrate by written, oral or field examination, as the commissioner may direct, adequate knowledge of the safe manufacture, sale, transportation, storage or use of explosives, the provisions of this chapter, and the act;

5. Be of good moral character and must never have been disloyal to the United States; and it shall be within the sole discretion of the commissioner to determine whether an applicant who has been convicted of a crime involving moral turpitude has the good moral character necessary for a permit;

6. Be free of any physical handicap, illness, addiction to alcohol, narcotics or other dangerous drugs, or uncorrected defect in vision or hearing, that might diminish the competence of the applicant to comply with this chapter.

7. Not have been adjudicated as a mental defective or committed to any mental institution; and

8. Have physical facilities complying with the applicable provisions of this chapter.

(b) When the applicant for a permit to manufacture, sell, transport, store or use explosives is a firm, association or corporation; the applicant shall demonstrate that such activities with regard to explosives will be under the direct supervision of a person who meets the qualifications contained in this section.

12:190-3.7 Invalidation of permits

Whenever a permanent storage magazine, for which a permit has been issued is moved to a new location, or its physical surroundings are so changed that the magazine comes within the prohibited distances to a highway, railroad or inhabited building, the permit for said magazine shall become invalid and a new permit shall be required.

12:190-3.8 Revocation of permits

(a) A permit for the sale, transportation, storage or use of explosives may be revoked by the commissioner for any of the following reasons:

1. Non-compliance with any order issued by the commissioner within the time specified in such order,
2. Proof that the permit holder has been convicted of a crime punishable by imprisonment for a term exceeding one year,
3. Proof that a permit holder is disloyal to the United States,
4. Violation by the permit holder of the terms specified on the permit, or essential changes in the conditions under which the permit was issued,
5. Violation by the permit holder of any of the provisions of the act, or
6. False statements on the application for the permit.

(b) In any case where the commissioner revokes a permit, he shall notify the permit holder of the revocation. The notice shall state the specific charges upon which the revocation is based and, that upon written request, a hearing before the commissioner may be held within ten days after the date of the revocation.

(c) If the hearing is held before the commissioner, he shall

state his findings and conclusions in writing and transmit a copy the permit holder.

(d) Upon notice of the revocation of any permit, the permit holder shall immediately surrender to the commissioner the permit revoked and all copies thereof.

12:190-3.9 Availability of permits

Permits shall be readily available at all times for inspection by the commissioner, local construction official, state police or local police and fire departments, and shall be posted in accordance with the applicable provisions of N.J.A.C. 12:190-3.12.

12:190-3.10 Permit class

(a) The "permit to manufacture" shall authorize the manufacture, possession and storage of explosives in process, development of explosives and finished products. This permit covers the purchase of explosives and ingredients for the manufacture of explosives.

(b) The "permit to sell" shall authorize the purchase, possession and sale of explosives. This permit shall be required of all persons who sell explosives whether or not they physically handle, store or possess explosives. This permit is also required for nonresidents who sell explosives within the State. This permit is required for each location from which explosives are sold.

(c) The "permit to transport" shall authorize the transportation of explosives in or on an approved motor vehicle. However, a permit shall be required for:

1. Transportation in interstate commerce,
2. Transportation off-the-highways solely within the confines of explosive manufacturing establishments, mines, quarries, construction sites, and
3. Transportation of samples of explosives for examination in a laboratory only and not intended for use or demonstration where the quantity does not exceed 100 blasting caps or five pounds of other explosives.

(d) The "permit to store" shall authorize the purchase of explosives and the storage of explosives in an approved magazine within the quantities expressed on the permit. In the case of storage of explosives on agricultural lands for use by farmers, one permit may cover separate magazines for explosives and caps.

(e) The "permit to use" shall authorize the use of explosives for such purposes and under such conditions as are specified on the permit.

12:190-3.11 "Permit to use"

(a) The applicant for an initial "permit to use" explosives shall demonstrate to the satisfaction of the commissioner that he has had adequate education, training and experience in the use of explosives in any grade authorized in the applicable permit.

(b) Before a "permit to use" explosives may be issued, the applicant shall pass a qualifying examination given by the commissioner. The examination may be written, oral or by such other means as necessary to determine that the applicant is competent to conduct blasting operations and to perform the duties for the grade of permit for which the applicant is applying.

(c) Any holder of a "permit to use" explosives who is convicted of a violation of the act may be required to pass a requalifying examination as a condition to the retention of his permit.

(d) Any person whose "permit to use" explosives for blasting purposes has been revoked may be required to pass a qualifying examination before the permit is reinstated.

(e) Any person whose permit has lapsed for a period of one year or more may be required to pass a qualifying examination before renewal of the permit is granted.

(f) No person shall perform any blasting operation other than that which is specified on the permit.

(g) A Grade J "permit to use" explosives shall authorize the purchase of explosives.

(h) The "permit to use" explosives shall be subdivided into grades as listed in Table 3.11(h).

Table 3.11(h)
Classification of "Permit to Use"

Grade	Description
A	All blasting
S-1	All surface rock blasting, or demolition of structures not exceeding 25 feet in height.
S-2	All surface rock blasting, or demolition of structures under 20 feet in height, either of which is limited to blast holes four inches or less in diameter, 3,000 lbs. of explosives or less or 300 electric blasting caps or less per blast cycle.
S-3	All surface rock blasting, or demolition of structures less than 10 feet in height, either of which is limited to blast holes four inches or less in diameter, 1,500 lbs. of explosives or less, or 200 electric blasting caps or less per blast cycle.
S-4	All surface rock blasting, or structural foundations, either of which is limited to blast holes three and one half inches or less in diameter, 500 lbs. of explosives or less, or 100 electric blasting caps or less, per blast cycle.
S-5	All surface rock blasting, or demolition of structural foundations, either of which is limited to blast holes three inches or less in diameter, 50 lbs. of explosives or less, or 50 electric blasting caps or less, per blast cycle.
S-6	Restricted to loading explosives into blast holes, preparing primers, and wiring blast circuits when under the direct supervision of a holder of a "permit to use" explosives of a higher grade.
Q1 through Q6	Restricted to surface rock blasting in open pit mines and quarries. Grades as above with the same limitation except the letter Q shall be imposed instead of the letter S.
U	Underground rock blasting.
D	All demolition blasting of buildings, smokestacks, bridges, and other structures.

Table 3.11(h) (continued)

Grade	Description
G	Blasting on farms not exceeding 50 pounds per blast.
H	a. Use in a research process as a component part in the manufacture of a product. b. Seismic prospecting or well shooting. c. Test firing of devices containing explosives. d. Other special use described on the face of the permit. A Grade H permit entitles the holder only to that use described on its face.
J	Authorizes purchases of explosives when such person does not have a permit for permanent storage of explosives.

- (i) An applicant for a "permit to use" explosives in any grade shall have experience in the next lower grades as provided by Table 3.11(i).

Table 3.11(i)
Grade Experience

Grade or Equivalent	Experience in Next Lower Grade or Equivalent Grade months	Grade or Equivalent	Experience Next Lower Grade or Equivalent Grade months
A	12	Q-3	3
S-1	9	Q-4	3
S-2	6	Q-5	3
S-3	3	Q-6	none
S-4	3	U	3
S-5	3	D	*
S-6	none	G	none
Q-1	9	H	3
Q-2	6	J	none

Note to Table

* At least 12 months experience in the demolition of constructions and hold a grade S-1 permit or its equivalent.

12:190-3.12 Responsibilities of permit holder

(a) All holders of a "permit to manufacture, sell, transport, store or use" explosives shall comply with the reporting provisions of this subchapter.

(b) All holders of a "permit to manufacture, sell, transport, store or use" explosives shall post or be in possession of a permit as described in this subsection.

1. The "permit to manufacture" shall be posted in the main office of the explosive manufacturing establishment.

2. The "permit to sell" shall be posted at the location where explosives are sold, and any person who delivers explosives shall have a photocopy of the original "permit to sell" posted in the delivery vehicle.

3. The "permit to transport" shall be kept in the motor vehicle at all times.

4. The original copy of the "permit to store" shall be posted in the storage magazine, and a duplicate copy kept on file at the place of business.

5. The "permit to use" shall be in the possession of the permit holder.

6. The "permit to purchase" shall be posted at the use site.

(c) Permit holders shall take every reasonable precaution to protect their permits from loss, theft, defacement, destruction or unauthorized duplication.

(d) The loss or theft of any permit shall be immediately reported to the commissioner.

12:190-3.13 Explosives not permitted¹

(a) A "permit to sell, transport, store or use" any of the following explosives shall not be issued:

1. Liquid nitroglycerin,
2. Dynamite (except gelatin dynamite) containing over 60 percent of liquid explosive ingredient,
3. Dynamite having an unsatisfactory absorbent or one that permits leakage of a liquid explosive ingredient under any conditions liable to exist during storage,
4. Nitrocellulose in a dry uncompressed condition in a quantity greater than ten pounds net weight in one package,

5. Fulminate of mercury in a dry condition and fulminate of all other metals in any condition except as a component of manufactured articles not hereinafter forbidden,

6. Explosive compositions that ignite spontaneously or undergo marked decomposition rendering the products or their use more hazardous, when subjected for 48 consecutive hours or less to a temperature of 167 degrees F,

7. Explosives containing an ammonium salt and a chlorate.

8. New explosives until approved by the USDOT, except that a permit may be granted for transportation and possession for laboratory examination of such explosives when under development by responsible research organizations,

9. Explosives not packed or marked in accordance with the USDOT,

10. Explosives prohibited for transportation by the USDOT, and

11. Explosives prohibited by the commissioner,

12:190-3.14 Annual fees for permits

(a) After an application for a permit has been approved, the current fee shall be forwarded to the appropriate officials of the Division of Workplace Standards.

(b) The check or money order shall be made payable to the Commissioner of Labor.

(c) A permit shall not be forwarded to the applicant until the fee has been received by the commissioner.

(d) Fees shall not be refunded when a permit is revoked or abandoned.

(e) The fee for replacing a lost permit shall be \$10.00.

(f) An annual fee shall be paid for a "permit to manufacture" explosives in accordance with Table 3.14(f)

Table 3.14(f)
Fee for "Permit to Manufacture" Explosives

Explosives pounds over	Explosives pounds not over	Annual Fee dollars
0	500	100
500	5,000	200
5,000	10,000	300
10,000	and over	500

(g) An annual fee shall be paid for a "permit to sell" explosive in accordance with Table 3.14(g).

Table 3.14(g)
Fee for "Permit to Sell" Explosives

Type of Sale	Annual Fee dollars
High explosives retail	100
Low explosives retail	25
High explosives wholesale	200
Low explosives wholesale	100

(h) An annual fee shall be paid for a "permit to transport" explosives at a rate of \$20.00 per motor vehicle.

(i) An annual fee shall be paid for a "permit to store" commercial explosives other than detonators in accordance with Table 3.14(i).

Table 3.14(i)
Fee for "Permit to Store" Commercial
Explosives Other Than Detonators

Explosives pounds over	Explosives pounds not over	Annual Fee dollars
0	100	25
100	500	50
500	2,000	75
2,000	10,000	100
10,000	20,000	125
20,000	30,000	150
30,000	40,000	175
40,000	50,000	200
50,000	100,000	225
100,000	200,000	250
200,000	250,000	275
250,000	and over	300

(j) An annual fee shall be paid for a "permit to store" detonators in accordance with Table 3.14(j).

Table 3.14(j)
Fee for "Permit to Store" Detonators

Detonators number over	Detonators number not over	Annual Fee dollars
0	500	25
500	1,000	50
1,000	5,000	75
5,000	10,000	100
10,000	100,000	125
100,000	300,000	150
300,000	400,000	175
400,000	500,000	200
500,000	600,000	225
600,000	700,000	250
700,000	1,000,000	275
1,000,000	and over	300

(k) An annual fee shall be paid for a "permit to use" explosives in accordance with Table 3.14(k).

Table 3.14(k)
Fee for "Permit to Use" Explosives

Grade of Permit	Annual Fee* dollars	Grade of Permit	Annual Fee* dollars
A	100	Q-3	35
S-1	75	Q-4	30
S-2	60	Q-5	10
S-3	50	Q-6	10
S-4	40	U	25
S-5	25	D	50
S-6	10	G	10
Q-1	60	H	25
Q-2	45	J	100

Note to Table

* A person holding more than one grade of permit is only required to pay the fee for the highest grade.

(l) An annual fee shall be paid for a private individual to store transport and use smokeless powder, in the hand loading of small arms ammunition, which is for personal use and not for resale, in accordance with Table 3.14(l).

Table 3.14(l)
Fee for "Permit to Store, Transport, and Use"
Smokeless Powder

Smokeless Powder pounds over	Smokeless Powder pounds not over	Annual Fee dollars
0	36	none
36	50	2
50	60	4
60	75	6
75	100	10
Each additional 100 lbs. per year or fraction thereof		10

(m) An annual fee shall be paid for a private individual to store transport and use black powder, in the hand loading of small arms ammunition, which is for personal use and not for resale, in accordance with Table 3.14(m).

Table 3.14(m)
Fee for "Permit to Store, Transport and Use"
Black Powder

Black Powder pounds over	Black Powder pounds not over	Annual Fee dollars
0	5	none
5	10	2
10	25	5
25	100	10
Each additional 100 lbs. per year or fraction thereof		10

12:190-3.15 Recordkeeping for all permit holders

(a) Every person holding a "permit to manufacture, sell, store or use" explosives shall keep records in accordance with this section.

(b) All records required by this section shall be maintained and be open to inspection by the commissioner at all reasonable times.

(c) Where an owner is maintaining records complying with this section, his employees holding "permit to use" explosives shall not be required to maintain individual records.

(d) Where the person holding a "permit to manufacture, sell or store" explosives maintains records for the Bureau of Alcohol, Tobacco and Firearms of the U. S. Department of the Treasury, which substantially comply with this section, the permit holder shall be deemed in compliance with this section, providing the records are available for inspection by the commissioner in accordance with (b) above.

(e) At least one copy of the records required by this section shall be maintained at the address provided on the "permit to manufacture, sell, store or use".

(f) Information from the records required by this section shall be forwarded to the commissioner upon his written request.

(g) Invoices, sales slips, receipts, or similar papers representing individual transactions may be used as temporary records. Information from these records shall be recorded in a permanent record not later than one week from the date following the date of transaction.

(h) The person holding a "permit to manufacture, sell, store or use" explosives shall record the information required by this section and retain a permanent record.

1. Permanent records shall show the names of the supplier, quantities, brand and type, manufacturer's identifying marks and the dates of all invoices or transactions.

2. Permanent records shall show the exact disposition of all explosives whether used in manufacturing, sold, or used in blasting or other disposal.

3. Permanent records shall be retained at least until the end of the calendar year following the year in which the record was made.

12:190-3.16 Recordkeeping for holders of "permit to manufacture"

(a) In addition to the recordkeeping of N.J.A.C. 12:190-3.15,

holders of "permit to manufacture" shall comply with this section

(b) The permanent record of a person having a "permit to manufacture" explosives shall include the following:

1. The amount and type of explosives acquired,
2. The amount of explosives on hand,
3. The amount and destination of explosives shipped,
4. The dates of transactions, and
5. The names and addresses of suppliers and purchasers of explosives.

(c) Where the information contained in (b) above can be obtained from regular business records, a separate record need not be maintained.

12:190-3.17 Recordkeeping for holders of "permit to sell"

(a) In addition to the recordkeeping of N.J.A.C. 12:190-3.15, holders of "permit to sell" shall comply with this section.

(b) The permanent record of a person having a "permit to sell" shall include the following:

1. The amounts and kinds acquired,
2. The names and addresses of the persons from whom acquired and the dates on which acquired,
3. The amounts and kinds sold or otherwise disposed of,
4. The names, addresses and permit numbers and dates of permits of persons to whom sold or otherwise disposed of, and the dates of the sales or other dispositions,
5. The amount and kinds on hand at each location at the end of each day on which there are transactions or operations and
6. A certified list of names of representatives or agents authorized to accept explosives on behalf of any purchaser.

12:190-3.18 Recordkeeping for holders of "permit to store" or "Grade J permit to use"

(a) In addition to the recordkeeping of N.J.A.C. 12:190-3.15, holders of "permit to store, or "Grade J permit to use" shall comply with this section.

(b) The permanent record of a person having a "permit to store" or a "Grade J permit to use" shall include the following:

1. The amounts and kinds acquired,
2. The names and addresses of the persons from whom acquired and the dates on which acquired,
3. The amounts and kinds in a continuous inventory record for each magazine, and
4. The amounts and kinds used or otherwise disposed of in the conduct of the business operations.

12:190-3.19 Recordkeeping for holders of "permit to use"

(a) In addition to the recordkeeping of N.J.A.C. 12:190-3.15, holders of "permit to use" explosives shall comply with this section.

(b) The person having a "permit to use" explosives shall maintain a permanent record of each blast. At least one copy of this record shall be maintained at the plant or construction office. In the absence of a blast site office, the record shall be maintained at the principal place of business of the employer.

(c) The person having a "permit to use" explosives shall maintain a record of each blast which shall include the following:

1. Name and address of person responsible for the project,
2. Name and permit number of blaster in charge,
3. Name, address and specific locations at the address of the blasting project,
4. Identification number for each blast in sequence by project on an annual basis.
5. Date and time of the blast,
6. General type of material blasted,

7. Nature of blasting, such as bank, trench or pre-split,
8. Weather conditions, including wind speed, direction, temperature, and sky conditions,
9. Blast hole description, including hole sizes, inclinations, depths, sub-drilling, number of holes, burden spacing, and number of rows of holes.

10. Depth of stemming,
11. Depth and placement locations of decking used,
12. Kind of explosives used,
13. Total amount of explosives used,
14. Maximum amount of explosives fired on any time delay period,
15. The number of holes fired included in the maximum pounds per delay,
16. Number and brand name or type of electric blasting delay blasting cap series used and the number of individual delay periods,
17. Actual firing time where electric delay blasting caps do not fall within the manufacturer's sequence of delay time,
18. Size and total length of detonating cord, when used delay periods, and type of precaution to deaden sound effects,
19. All pertinent information on delay periods, when other than non-electric initiating systems are used,
20. A plan indicating blast hole layout and a cross-section of typical blast hole showing burden, spacing, depth of hole, sub-drilling, stemming depth, decking location, and locations of detonators and explosives,
21. The horizontal distance and direction to the nearest non-owned construction from the blast site,
22. Indicate whether the blast was designed under N.J.A.C. 12:190-7.26 (d), (e), (f), (g), or (h), and

23. Where instrumentation is used, the names of the instruments, operator and interpreter and statement of compliance with (f) below.

(d) When more than one similar blast is to be conducted in a single day, one form may be utilized for compliance with (c) above, provided the number of blasts is included and all applicable questions are answered for each blast.

(e) The person having a "permit to use" explosives shall maintain a record of all misfires which shall include the following:

1. The address and involved portion of the mine or construction site,

2. The date of misfire,

3. The number of holes involved in the misfire,

4. The cause of the misfire,

5. The method used to reblast the misfire,

6. The name of the plaster in responsible charge of handling the misfire, and

7. The signature, address and title of the person making the report.

(f) When required by N.J.A.C. 12:190-7, the person holding a "permit to use" explosives shall maintain a record of ground vibration readings or air blast effect readings or both, which shall include the following:

1. Identification of the instrument used,

2. The name of the observer,

3. The name of the interpreter,

4. The distance in feet and direction of the construction not owned or leased from the blast site,

5. The distance in feet and direction of the instrument locations from the blast site if different than (f)4 above,

6. The type of surface at the instrument location. If instrument is placed inside a construction, it should be so indicated.

7. The maximum peak particle velocity of any one of three mutually perpendicular components of the ground motion in the vertical and horizontal directions at the specific location: inches per second and the frequency range of the instrument, and

8. The sound measurement in decibels measured on a linear frequency response of the overpressure in pounds per square inch.

12:190-3.20 Reporting

(a) Any accident involving explosives which results in injury to a person or serious property damage shall be immediately reported by telephone to the appropriate officials of the Division of Workplace Standards by the permit holder for the explosion involved.

(b) Every person holding a "permit to manufacture, store, transport, store or use" explosives shall report immediately any loss by theft or otherwise of explosives in his possession to the appropriate officials of the Division of Workplace Standards.

(c) Every person holding a "permit to store or use" commercial explosives shall file monthly reports with the Office of Safety Compliance ten days after the end of each calendar month using the Monthly Explosives Use Report, Form No. ES-400, except that when an employer is maintaining and submitting such report his employees holding "permits to use" explosives shall not be required to submit individual reports.

(d) Every person holding a "permit to sell" at retail, commercial explosives shall file monthly reports with the appropriate officials of the Division of Workplace Standards ten days after the end of each calendar month using the Monthly Explosives Sales Report, Form No. ES-401.

(e) Monthly Explosive Use Report, Form No. ES-400, and Monthly Explosives Sales Report, Form No. ES-401 may be secured from the appropriate officials of the Division of Workplace Standards.

(f) When ground vibration recordings or air blast effect recordings, or both, are taken upon authorization of the mine operator or blasting contractor, a copy of the reports shall be forwarded to the commissioner upon his written request.

(g) A person intending to demolish by explosives any construction which exceeds 25 feet in height shall report such demolition to the appropriate officials of the Division of Workplace Standards in the manner prescribed by N.J.A.C. 12:190-7.24(b) and (c).

SUBCHAPTER 4. MANUFACTURE OF EXPLOSIVES

12:190-4.1 Scope of subchapter

This subchapter shall apply to explosives at explosive manufacturing establishments.

12:190-4.2 Buildings and magazines

(a) All buildings and magazines shall be approved.

(b) All buildings used for the manufacture of commercial explosives shall be located one from the other and from other buildings of the explosive manufacturing establishment in which persons are regularly employed in accordance with Table 4.2.

Table 4.2
Quantity and Distance for Commercial Explosives

Commercial Explosives		Distance	
pounds over	pounds not over	Unbarricaded feet	Barricaded feet
10*	25	40	20
25	50	60	30
50	100	80	40
100	200	100	50
200	300	120	60
300	400	130	65
400	500	140	70
500	750	160	80
750	1,000	180	90
1,000	1,500	210	105
1,500	2,000	250	115
2,000	3,000	260	130
3,000	4,000	280	140
4,000	5,000	300	150
5,000	6,000	320	160
6,000	7,000	340	170
7,000	8,000	360	180
8,000	9,000	380	190
9,000	10,000	400	200
10,000	12,500	420	210

Table 4.2 (continued)

Commercial Explosives		Distance	
pounds over	pounds not over	Unbarricaded feet	Barricaded feet
12,500	15,000	450	225
15,000	17,500	470	235
17,500	20,000	490	245
20,000	25,000	530	265
25,000	30,000	560	280
30,000	35,000	590	295
35,000	40,000	620	310
40,000	45,000	640	320
45,000	50,000	660	330
50,000	55,000	680	340
55,000	60,000	700	350
60,000	65,000	720	360
65,000	70,000	740	370
70,000	75,000	770	385
75,000	80,000	780	390
80,000	85,000	790	395
85,000	90,000	800	400
90,000	95,000	820	410
95,000	100,000	830	415
100,000	125,000	900	450
125,000	150,000	950	475
150,000	175,000	1,000	500
175,000	200,000	1,050	525
200,000	225,000	1,100	550
225,000	250,000	1,150	575
250,000	275,000	1,200	600
275,000	300,000	1,270	635

Note to Table

* Ten pounds or less may be stored in a separate building or in storage space properly separated by substantial dividing walls. Such a wall shall be designed to prevent, control, or delay propagation of explosions between quantities of explosives on opposite sides of the wall.

(c) All magazines for commercial explosives shall be located from explosive manufacturing buildings and other buildings of the explosive manufacturing establishment in which persons are regularly employed in accordance with Table 4.2.

(d) All explosive manufacturing buildings in which commercial explosives are stored shall be located from inhabited buildings, not on the premises of the explosives manufacturing buildings, railways

12:190-4.3 Plan for explosive manufacturing establishment

(a) An initial "permit to manufacture" explosives shall be issued unless a plan complying with (b) below has been submitted in triplicate to the commissioner for approval.

(b) The explosive manufacturing establishment plan shall show the location of all explosive manufacturing buildings, the distance they are located from other buildings on the premises, and from magazines. The plan shall show the distance of the explosive manufacturing buildings from inhabited buildings, railroads, and highways not on the premises of the explosive manufacturing establishment.

(c) The person holding a "permit to manufacture" explosives shall keep a copy of the explosive manufacturing plan in the office of the establishment, which shall be open to inspection by the commissioner.

12:190-4.4 Fencing

Explosive manufacturing establishments shall be enclosed with an industrial type fence at least six feet high or an equivalent enclosure when required by the commissioner.

12:190-4.5 Storage

(a) Two or more types or explosives may be stored together provided they are compatible and such storage does not increase substantially the probability of an incident or a hazard.

(b) Explosives shall not be stored in the vicinity of operations involving hazardous substances where an accident could detonate explosives.

(c) Explosives being held for the manufacturing process shall be stored in approved day boxes until needed in the process.

(d) Explosives shall not be permitted to accumulate in any quantity in the explosive manufacturing establishment in such quantity that an accidental detonation of such explosives would create a danger to the public.

(e) All magazines shall be located in accordance with N.J. 12:190-5.10 through 5.17, as applicable.

12:190-4.6 Assembly of ammunition primers and detonating fuses

(a) Manufactured explosive components used in the assembly of ammunition primers and detonating fuses shall be stored in magazines or approved day boxes until needed in the assembly line.

(b) The explosive components in day boxes shall not exceed 25 pounds.

(c) Explosive components packaged in non-mass detonating shipping packages shall be stored in a locked room or locked storage cabinet where no other items are stored.

(d) When shipping cartons containing explosive components are opened, the explosive components shall be stored in an indoor magazine until moved to the day box at the assembly line. The total weight of explosives stored in any indoor magazine shall not exceed 50 pounds.

12:190-4.7 Blasting agents

Mixing of blasting agents shall be in accordance with N.J.A.C. 12:190-9.

SUBCHAPTER 5. STORAGE OF EXPLOSIVES

12:190-5.1 Scope of subchapter

This subchapter shall apply to the storage of explosives in magazines.

12:190-5.2 Types of magazines

(a) For the purposes of this subchapter, magazines shall be grouped into five types: Type 1, Type 2, Type 3, Type 4 and Type UG magazines.

(b) The five types of magazines as listed in (a) above shall be defined as follows:

1. "Type 1 magazine" means a permanent outdoor magazine.

2. "Type 2 magazine" means an indoor magazine or an outdoor magazine that is portable or mobile, such as a skid magazine or a trailer or semi-trailer.

3. "Type 3 magazine" means a portable outdoor magazine, such as a "day-box" or a magazine on skids.

4. "Type 4 magazine" means an outdoor magazine.

5. "Type UG magazine" means a magazine for the permanent storage of explosives in underground operations. See N.J.A.C. 12:190-5.20 for construction, location, and storage of Type UG magazines.

(c) The magazines defined in (b) above may be used for the storage of explosives as follows:

1. Type 1 magazines shall be used for the storage of high explosives or other classes of explosives.

2. Type 2 magazines shall be used for the temporary storage of high explosives or other classes of explosives.

3. Type 3 magazines shall be used, while attended, for the temporary storage of high explosives or other classes of explosives.

4. Type 4 magazines shall be used for the storage of low explosives, smokeless powder, or blasting agents. Detonators that will not mass detonate may also be stored in Type 4 magazines.

5. Type UG magazines shall be used for the storage of high explosives or other classes of explosives.

6. Blasting caps or detonators shall not be stored with other explosives in the same magazine.

(d) The commissioner may authorize alternate construction for magazines for the storage of explosives when it is shown that the alternate magazine construction is substantially equivalent to the standards of safety and security contained in this subchapter.

12:190-5.3 Construction of Type 1 magazines

(a) This section shall apply to the construction of Type 1 magazines.

(b) A Type 1 magazine shall be a permanent structure, a building, an igloo, a tunnel, or a dugout. It shall be bullet-resistant, fire-resistant, weather-resistant, and theft-resistant.

(c) All Type 1 magazines shall be constructed of masonry, wood, metal, or a combination of these materials as specified in this section, and shall have no openings except for entrances and for ventilation.

(d) Walls of Type 1 magazines shall be constructed as provided in this subsection.

1. Masonry wall construction shall consist of brick, concrete, tile, cement block, or cinder block and shall not be less than six inches in thickness. Hollow masonry units shall have all hollow spaces filled with well-tamped, coarse dry sand, or weak concrete (at least a mixture of one part cement and eight parts of sand with enough water to dampen the mixture while tamping in place).

2. Fabricated metal wall construction shall consist of sectional sheets of steel or aluminum not less than No. 14 gauge, securely fastened to a metal framework. Metal wall construction shall either be lined inside with brick, solid cement blocks, hardwood not less than four inches thick, or shall have at least a six inch sand fill between interior and exterior walls.

3. In wood frame wall construction the exterior of outer wood walls shall be covered with iron or aluminum not less than No.

26 gauge. The interior wall shall be constructed so as to provide space of not less than six inches between the outer and inner wall. The space shall be filled with coarse dry sand, or weak concrete.

(e) Interior walls shall be constructed of or covered with nonsparking material.

(f) Floors shall be constructed of or covered with any suitable nonsparking material and shall be strong enough to bear the weight of the maximum quantity of explosives to be stored.

(g) Foundations shall be constructed of brick, concrete, cement block, stone, or metal or wood posts. If piers or posts are used in lieu of a continuous foundation, the spaces under the buildings shall be enclosed with fire-resistant material.

(h) Outer roofs shall be constructed of fabricated metal, tile, asbestos, concrete, or other fire-resistant material. Where it is possible for a bullet to be fired directly through the roof and into the magazine at such an angle that the bullet would strike the explosive stored within, the magazine shall be protected by one of the following methods:

1. A sand tray lined with a layer of building paper, plastic, or other nonporous material, and filled with not less than four inches of coarse, dry sand located at the tops of inner walls covering the entire ceiling area, except that portion necessary for ventilation, or

2. A fabricated metal roof constructed of 3/16 inch plate steel lined with four inches of hardwood. For each additional 1/16 inch of plate steel, the hardwood lining may be decreased one inch.

(i) Doors shall be constructed of 1/4 inch plate steel and lined with two inches of hardwood.

(j) Hinges and hasps shall be attached to the doors by welding, riveting, or bolting with nuts on inside of door. The hinges and hasps shall be installed in such a manner that they cannot be removed when the doors are closed and locked.

(k) Each door shall be equipped with one or more of the following:

1. Two mortise locks,

2. Two padlocks fastened in separate hasps and staples,

3. A combination of a mortise lock and padlock,

4. A mortise lock that requires two keys to open,

5. A three-point lock, or

6. A bolt, lock or bar which cannot be actuated from the outside.

(l) Padlocks shall have at least five tumblers and a case-hardened shackle of at least 3/8 inch diameter.

(m) Outdoor padlocks shall be protected with 1/4 inch steel hoods constructed so as to prevent sawing or lever action on the locks or hasps.

(n) No sparking material shall be exposed to contact with stored explosive materials. All ferrous nails in the floor and side walls which might be exposed to contact with explosive materials shall be blind nailed or countersunk on the floor and side walls covered with a nonsparking lattice work or other nonsparking material.

(o) Igloo, tunnel, and dugout magazines shall be constructed of reinforced concrete, masonry, metal or a combination of these materials. They shall have an earth mound covering of not less than 24 inches on top, sides, and rear unless the magazine complies with (h) above. Magazines of this type shall comply with (f) and (i) through (n) above.

12:190-5.4 Construction of Type 2 outdoor magazines

(a) This section shall apply to the construction of Type 2 outdoor magazines.

(b) A Type 2 outdoor magazine shall be a box, trailer, semi-trailer, or other mobile facility.

(c) Type 2 outdoor magazines shall be bullet-resistant, fire-resistant, weather-resistant, and theft-resistant. They shall be supported in such a manner so as to prevent direct contact with the ground and, if less than one cubic yard in size, shall be securely fastened to a fixed object to prevent theft of the entire magazine.

(d) The exterior and covers or doors shall be constructed of 1/4 inch steel and shall be lined with two inches of hardwood. Magazines with top openings shall have lids with water-resistant seals or the lids shall overlap the sides by at least one inch when in a closed position.

(e) Hinges and hasps, locks, padlocks, padlock protection, and sparking material shall comply with N.J.A.C. 12:190-5.3 (j), (k), (l), (m), and (n) respectively.

12:190-5.5 Construction of Type 2 indoor magazines

(a) This section shall apply to the construction of Type 2 indoor magazines.

(b) Type 2 indoor magazines shall be fire-resistant and theft-resistant. They need not be bullet-resistant and weather-resistant; the buildings in which they are stored provide protection from the weather and from bullet penetration.

(c) Type 2 indoor magazines shall be constructed of wood or metal in accordance with c(1), c(2), or c(3) below.

1. Wood magazines shall have sides, bottoms and covers or doors constructed of two inches of hardwood and shall be well braced at corners. They shall be covered with sheet metal of not less than number 20 gauge. Nails exposed to the interior of magazines shall be countersunk.

2. Metal magazines shall have sides, bottoms, and covers or doors constructed of number 12 gauge metal and shall be lined inside with a nonsparking material. Edges of metal covers shall overlap sides at least one inch.

3. Magazines for blasting caps (cap boxes) in quantities of 100 or less shall have sides, bottoms, and covers or doors constructed of number 12 gauge metal and lined with a nonsparking material.

(d) Hinges and hasps, locks, padlocks, padlock protection, and sparking material shall comply with N.J.A.C. 12:190-5.3 (j), (k), (l), (m), and (n) respectively; except that only one padlock shall be required on a Type 2 indoor magazine that is located in a room that is also secured by a lock.

12:190-5.6 Construction of Type 3 magazines

(a) This section shall apply to the construction of Type 3 magazines.

(b) A Type 3 magazine shall be a "day-box" or other portable magazine. It shall be fire-resistant, weather-resistant and theft-resistant.

(c) A Type 3 magazine shall be constructed of not less than 12 gauge steel lined with at least 1/2 inch plywood or 1/2 inch Masonite-type hardboard.

(d) No sparking material shall be exposed to contact with stored explosive materials.

(e) Doors or covers shall overlap sides of Type 3 magazines by not less than one inch.

(f) Hinges and hasps shall be attached by welding, riveting or bolting with nuts on the inside.

(g) One steel padlock (which need not be protected by a steel hood) having at least five tumblers and a case hardened shackle of not less than 3/8 inch diameter shall be provided for locking purposes.

12:190-5.7 Construction of Type 4 outdoor magazines

(a) This section shall apply to the construction of Type 4 outdoor magazines.

(b) A Type 4 outdoor magazine shall be a building, igloo, tunnel, dugout, box, trailer, semi-trailer or other mobile magazine.

(c) Type 4 outdoor magazines shall be fire-resistant, weather-resistant, and theft-resistant.

(d) Type 4 outdoor magazines shall be constructed of masonry, metal-covered wood, fabricated metal, or a combination of these materials.

(e) The walls and floors shall be constructed of, or covered with, a nonsparking material, or lattice work.

(f) Foundations shall be constructed of brick, concrete, cement block, stone, or metal or wood posts. If piers or posts are used, in lieu of a continuous foundation, the spaces under the buildings shall be enclosed with fire-resistant material.

(g) The doors or covers shall be metal or solid wood covered with metal.

(h) Hinges and hasps, locks, padlocks, padlock protection, and sparking material shall comply with N.J.A.C. 12:190-5.3 (j), (k), (l), (m), and (n) respectively.

12:190-5.8 Construction of Type 4 indoor magazines

(a) This section shall apply to the construction of Type 4 indoor magazines.

(b) Type 4 indoor magazines shall be fire-resistant and theft resistant. They need not be bullet-resistant and weather-resistant if the buildings in which they are stored provide protection from the weather and from bullet penetration.

(c) Type 4 indoor magazines shall be constructed in accordance with (c)1 or (c)2 below.

1. Wood magazines shall have sides, bottoms, and covers or doors constructed of one inch of hardwood and shall be well braced at corners. They shall be covered with sheet metal of not less than number 26 gauge. Ferrous nails exposed to the interior of magazines shall be countersunk.

2. Metal magazines shall have sides, bottoms, and covers or doors constructed of not less than 16 gauge metal and shall be lined inside with a nonsparking material.

(d) Hinges and hasps, locks, padlocks, padlock protection, and nonsparking material shall comply with N.J.A.C. 12:190-5.3 (j), (k), (l), (m) and (n) respectively; except that only one padlock shall be required on a Type 4 indoor magazine that is located in a room that is also secured by a lock.

12:190-5.9 Construction of services for magazines

(a) Magazines shall not be provided with artificial heat.

(b) No lighting shall be placed or used in a storage facility of Type 1, 2, 3, or 4 magazines except approved battery activated safety lights or battery activated safety lanterns.

(c) Magazines shall be ventilated to prevent dampness or heating of stored explosive materials adversely affected by lack of ventilation. Vents in the foundation, roof, or gables shall be offset or shielded and screened to prevent the entrance of sparks.

(d) The ground around all outdoor magazines shall slope away for drainage or other adequate drainage shall be provided.

(e) Unattended vehicular magazines shall have wheels removed or shall be effectively immobilized by kingpin locking devices or other approved methods.

12:190-5.10 Location of Type 1 magazines and Type 2 outdoor magazines

(a) Type 1 magazines and Type 2 outdoor magazines shall be located outside of buildings.

(b) Type 1 magazines and Type 2 outdoor magazines in which high explosives are stored shall be located no closer to inhabited buildings, passenger railways, public highways, or other magazines in which high explosives are stored, than the distances specified in Table 5.10.

Table 5.10
High Explosives

Quantity of Explosives		DISTANCES IN FEET							
		Inhabited Buildings		Public Highways With Traffic Volume of 3,000 or less Vehicles/Day		Passenger Railways- Public Highways with Traffic Volume of more than 3,000 Vehicles/Day		Separation of Magazines	
		Barricaded	Unbarricaded	Barricaded	Unbarricaded	Barricaded	Unbarricaded	Barricaded	Unbarricaded
3	5	70	140	30	60	31	102	6	12
5	10	90	180	35	70	64	128	8	16
10	20	110	220	45	90	81	162	10	20
20	30	125	250	50	100	93	186	11	22
30	40	140	280	55	110	103	206	12	24
40	50	150	300	60	120	110	220	14	28
50	75	170	340	70	140	127	254	15	30
75	100	190	380	75	150	139	278	16	32
100	125	200	400	80	160	150	300	18	36
125	150	215	430	85	170	159	318	19	38
150	200	235	470	95	190	175	350	21	42
200	250	255	510	105	210	189	378	23	46
250	300	270	540	110	220	201	402	24	48
300	400	295	590	120	240	221	442	27	54
400	500	320	640	130	260	238	476	29	58
500	600	340	680	135	270	251	504	31	62
600	700	355	710	145	290	264	532	32	64
700	800	375	750	150	300	278	556	33	66
800	900	390	780	155	310	289	578	35	70
900	1,000	400	800	160	320	300	600	36	72
1,000	1,200	425	850	165	330	318	636	39	78
1,200	1,400	450	900	170	340	334	672	41	82
1,400	1,600	470	940	175	350	351	702	43	86
1,600	1,800	490	980	180	360	364	732	44	88
1,800	2,000	505	1,010	185	370	378	756	45	90
2,000	2,500	545	1,090	190	380	408	816	49	98
2,500	3,000	580	1,160	195	390	432	864	52	104
3,000	4,000	635	1,270	210	420	474	948	58	116
4,000	5,000	685	1,370	225	450	513	1,026	61	122
5,000	6,000	730	1,460	235	470	546	1,092	65	130
6,000	7,000	770	1,540	245	490	573	1,146	68	136
7,000	8,000	800	1,600	250	500	600	1,200	72	144
8,000	9,000	835	1,670	255	510	634	1,248	75	150
9,000	10,000	865	1,730	260	520	645	1,290	78	156
10,000	12,000	875	1,750	270	540	687	1,374	82	164
12,000	14,000	885	1,770	275	550	723	1,444	87	174
14,000	16,000	900	1,800	280	560	754	1,512	90	180
16,000	18,000	940	1,880	285	570	786	1,572	94	188
18,000	20,000	975	1,950	290	580	813	1,626	98	196
20,000	25,000	1,055	2,000	315	620	878	1,752	105	210
25,000	30,000	1,130	2,000	340	660	933	1,866	112	224
30,000	35,000	1,205	2,000	360	720	981	1,962	119	238
35,000	40,000	1,275	2,000	380	760	1,028	2,000	124	248
40,000	45,000	1,340	2,000	400	800	1,068	2,000	129	258
45,000	50,000	1,400	2,000	420	840	1,104	2,000	135	270
50,000	55,000	1,440	2,000	440	880	1,140	2,000	140	280
55,000	60,000	1,515	2,000	455	910	1,173	2,000	145	290
60,000	65,000	1,545	2,000	470	940	1,206	2,000	150	300
65,000	70,000	1,610	2,000	485	970	1,236	2,000	155	310
70,000	75,000	1,655	2,000	500	1,000	1,263	2,000	160	320
75,000	80,000	1,695	2,000	510	1,030	1,293	2,000	165	330
80,000	85,000	1,730	2,000	520	1,040	1,317	2,000	170	340
85,000	90,000	1,760	2,000	530	1,060	1,344	2,000	175	350
90,000	95,000	1,790	2,000	540	1,080	1,368	2,000	180	360
95,000	100,000	1,815	2,000	545	1,090	1,393	2,000	185	370
100,000	110,000	1,835	2,000	550	1,100	1,417	2,000	190	380
110,000	120,000	1,855	2,000	555	1,110	1,439	2,000	200	410
120,000	130,000	1,875	2,000	560	1,120	1,461	2,000	210	430
130,000	140,000	1,890	2,000	565	1,130	1,487	2,000	220	450
140,000	150,000	1,900	2,000	570	1,140	1,503	2,000	225	470
150,000	160,000	1,915	2,000	580	1,160	1,529	2,000	245	490
160,000	170,000	1,965	2,000	590	1,180	1,562	2,000	255	510
170,000	180,000	1,990	2,000	600	1,200	1,593	2,000	265	530
180,000	190,000	2,010	2,010	605	1,210	1,625	2,000	275	550
190,000	200,000	2,030	2,030	610	1,220	1,655	2,000	285	570
200,000	210,000	2,055	2,055	620	1,240	1,685	2,000	295	590
210,000	220,000	2,100	2,100	635	1,270	1,826	2,000	315	630
220,000	230,000	2,155	2,155	650	1,300	1,890	2,000	335	670
230,000	240,000	2,215	2,215	670	1,340	1,950	2,000	360	720
240,000	250,000	2,275	2,275	690	1,380	2,000	2,000	385	770

Note to Table

* "Barricaded" means a natural barricade or an artificial barricade

12:190-5.11 Location of Type 2 indoor magazines

(a) Type 2 indoor magazines shall be located on a floor near the ground level in a warehouse or in a wholesale or retail establishment which has an entrance or ramp to exterior grade level. Such magazines shall be located not more than ten feet from such an entrance.

(b) Two magazines may be located in the same building when one magazine is used for detonators not exceeding 5,000 detonators and when a distance of ten feet is maintained between magazines.

12:190-5.12 Location of Type 3 magazines

(a) Type 3 magazines shall be located as far away as practicable from neighboring inhabited buildings, railways, highways, and any other magazine.

(b) Type 3 magazines may be located outside of buildings or inside of buildings.

(c) When in its use location, a Type 3 magazine shall be closely attended.

12:190-5.13 Location of Type 4 outdoor magazines

(a) Type 4 outdoor magazines shall be located outside of buildings.

(b) Type 4 outdoor magazines in which low explosives are stored shall be located not closer to inhabited buildings, passenger railways, public highways, or other magazines in which explosives are stored, than the distances of Table 5.13.

(c) The distances shown in Table 5.13 shall not be reduced by the presence of barricades.

**Table 5.13
Low Explosives**

Low Explosives		Distance in Feet from		
pounds over	pounds not over	Inhabited Building	Public Railroad and Highway	Above-ground Magazine
0	1,000	75	75	50
1,000	5,000	115	115	75
5,000	10,000	150	150	100
10,000	20,000	190	190	125
20,000	30,000	215	215	145
30,000	40,000	235	235	155
40,000	50,000	250	250	165
50,000	60,000	260	260	175
60,000	70,000	270	270	185
70,000	80,000	280	280	190
80,000	90,000	295	295	195
90,000	100,000	300	300	200
100,000	200,000	375	375	250
200,000	300,000	450	450	300

12:190-5.14 Location of Type 4 indoor magazines

Type 4 indoor magazines shall be located as provided for Type 2 indoor magazines in N.J.A.C. 12:190-5.11.

12:190-5.15 Location of two or more outdoor magazines on same property

(a) This section shall apply to the location of two or more Type 1 or Type 2 outdoor magazines on the same property.

(b) When two or more Type 1 or Type 2 magazines are located on the same property, each magazine shall be separated from each other by the distance specified in Table 5.10 and shall comply with the distances specified in Table 5.10 from inhabited buildings, railways and highways.

(c) If any two or more Type 1 or Type 2 magazines are separated from each other by less than the distances specified in the column reading "Separation of Magazines" of Table 5.10, then the two or

more magazines, as a group, shall be considered as one magazine. The total quantity of explosives stored in that group shall then be treated as if stored in a single magazine and shall comply with the distance from other magazines, inhabited buildings, railways or highways of Table 5.10.

(d) All types of blasting caps in strengths through No. 8 caps shall be rated at one and one half pounds of explosives per 1,000 caps. For strengths higher than No. 8 caps, consult the manufacturer.

(e) For quantity and distance purposes, detonating cord of 5 to 60 grains shall be calculated as equivalent to nine pounds of high explosives per 1,000 feet. Heavier or lighter core loads shall be rated proportionately.

12:190-5.16 Location of ammonium nitrate and blasting agents from high explosives or blasting agents

(a) Ammonium nitrate and ammonium nitrate-based blasting agents shall be separated from nearby stores of high explosives or blasting agents referred to as the "donor" by distances as provided in Table 5.16.

**Table 5.16
Location of Ammonium Nitrate and Blasting Agents
From High Explosives or Blasting Agents**

Donor* Weight		Minimum Separation Distance of Acceptor** When Barricaded		Minimum Thickness of Artificial Barricades inches
pounds over	pounds Not over	Ammonium Nitrate	Blasting Agent	
0	100	3	11	12
100	300	4	14	12
300	600	5	18	12
600	1,000	6	22	12
1,000	1,600	7	25	12
1,600	2,000	8	29	12
2,000	3,000	9	32	15
3,000	4,000	10	36	15
4,000	6,000	11	40	15
6,000	8,000	12	43	20
8,000	10,000	13	47	20
10,000	12,000	14	50	20
12,000	16,000	15	54	25
16,000	20,000	16	58	25
20,000	25,000	18	65	25

Table 5.16 (continued)

Donor* Weight		Minimum Separation Distance of Acceptor** When Barricaded		Minimum Thickness of Artificial Barricades inches
pounds over	pounds not over	Ammonium Nitrate	Blasting Agent	
25,000	30,000	19	68	30
30,000	35,000	20	72	30
35,000	40,000	21	76	30
40,000	45,000	22	79	35
45,000	50,000	23	83	35
50,000	55,000	24	86	35
55,000	60,000	25	90	35
60,000	70,000	26	94	40
70,000	80,000	28	101	40
80,000	90,000	30	108	40
90,000	100,000	32	115	40
100,000	120,000	34	122	50
120,000	140,000	37	133	50
140,000	160,000	40	144	50
160,000	180,000	44	158	50
180,000	200,000	48	173	50
200,000	220,000	52	187	60
220,000	250,000	56	202	60
250,000	275,000	60	216	60
275,000	300,000	64	230	60

Notes to Table

* High explosives and blasting agents are donors. Ammonium nitrate, by itself, is not considered to be a donor.

** Ammonium nitrate and blasting agents are acceptors.

(b) If storage of ammonium nitrate is located within the sympathetic detonation distance of explosives or blasting agents, one-half the mass of the ammonium nitrate shall be included in the mass of the donor when calculating separation distances.

(c) When ammonium nitrate or a blasting agent or both is not barricaded, the distances shown in Table 5.16 shall be multiplied by six. These distances allow for the possibility of high velocity

metal fragments from mixers, hoppers, truck bodies, sheet metal structures, metal containers, and the like which may enclose the "donor". Where storage is in bullet-resistant magazines recommended for explosives or where the storage is protected by a bullet-resistant wall, the distances and barricade thicknesses need not exceed those prescribed in Table 5.10.

(d) Table 5.16 shall apply to the blasting agents which pass the insensitivity test prescribed in the definition of blasting agent of N.J.A.C. 12:190-2.1.

(e) Earthen dikes, sand dikes, or enclosures filled with the required minimum thickness of earth or sand shall be acceptable artificial barricades. Hills or timber of sufficient density shall be acceptable natural barricades.

(f) For determining the distances to be kept from inhabited buildings, passenger railways, and public highways, Table 5.10 shall apply. Ammonium nitrate, when stored with blasting agents or explosives, may be counted at one half its actual weight.

12:190-5.17 Storage in general

(a) All explosive materials shall be kept in locked magazines as prescribed by this subchapter unless they are:

1. In the process of manufacture,
2. Being physically handled in the operating process of a permit holder or user,
3. Being used, or
4. Being transported to a place of storage or used by a permit holder.

(b) No explosives shall be stored in a residence, except when approved by the commissioner.

(c) No person shall store any explosive material in a manner not in conformance with this subchapter. The storage standards prescribed by this subchapter confer no rights or privileges to store explosive materials in a manner contrary to 27 CFR Part 55.

(d) More than one Type 4 indoor magazine may be located in any one building provided the total quantity of explosives stored does not exceed 50 pounds. Two or more indoor magazines within the same building shall be separated by a distance of not less than

ten feet or an approved wall having a fire resistance rating of not less than one hour.

(e) Detonators shall not be stored in the same magazine with other explosives, except as follows:

1. In a Type 4 magazine, detonators that will not mass detonate may be stored with electric squibs, safety fuses, igniters and igniter cords; and

2. In a Type 1 or Type 2 magazine, detonators may be stored with delay devices, electric squibs, safety fuses, igniters and igniter cords.

(f) Combustible material shall not be permitted within 50 feet of outdoor magazines and 25 feet of indoor magazines.

(g) Flammable liquids shall not be located within 50 feet of outdoor magazines.

12:190-5.18 Storage within magazines

(a) All magazines shall be in the charge of competent person at least 21 years of age.

(b) Explosives shall not be stored in any amount exceeding the quantity stated on the storage permit.

(c) Explosives may be stored unattended in Types 1,2, and 4 magazines.

(d) High explosives in excess of 50 pounds or more than 5,000 blasting caps shall not be stored in a Type 2 indoor magazine.

(e) Explosives shall not be stored unattended in Type 3 magazines.

(f) Low explosives in excess of 50 pounds shall not be stored in a Type 4 indoor magazine. This quantity limit shall not apply to smokeless powder which is covered in N.J.A.C. 12:190-10.2.

(g) Any person storing explosive materials shall open and inspect his magazines at least every seven days. This inspection need not be an inventory, but shall be sufficient to determine whether there has been unauthorized removal of their contents.

(h) A permittee who intends to make modifications to or changes in a magazine, shall report such intention to the appropriate

officials of the Division of Workplace Standards, prior to modifying the magazine.

(i) Acquired additional magazines shall not be utilized without obtaining a valid permit for such magazine.

(j) Plans shall be submitted for approval, when required by the commissioner, before magazines are constructed and used.

(k) Explosive materials within Type 1, 2, or 4 magazines shall not be placed directly against interior walls and shall be stored so as not to interfere with ventilation. To prevent contact of stored explosive materials with walls, a nonsparking lattice work or other non-sparking material shall be used.

(l) Containers of explosive materials shall be stored by being laid flat with top sides up. Corresponding classes as defined in 49 CFR Part 173, grades, and brands of explosives shall be stored together within a magazine in such a manner that grade, brand, and USDOT class marks are easily visible upon inspection. Stocks of explosive materials shall be stored so as to be easily counted and checked.

(m) Except with respect to fiberboard or other nonmetal containers, containers of explosive materials shall not be unpacked or repacked inside a magazine or within 50 feet of a magazine, and shall not be unpacked or repacked near other explosive materials. Containers of explosive materials shall be securely closed while being stored.

(n) Tools used for opening or closing containers of explosive materials shall be of nonsparking materials, except that metal slitters may be used for opening fiberboard containers. A wood wedge and a fiber, rubber, or wooden mallet shall be used for opening or closing wood containers of explosive materials. Metal tools other than non-sparking transfer conveyors shall not be stored in any magazine containing high explosives.

12:190-5.19 Storage in tunnels

(a) Explosives shall not be stored in tunnels where persons are located, unless such storage is approved.

(b) Immediately after the completion of explosive loading operations, all unused explosives in tunnels shall be removed to magazines complying with this subchapter.

12:190-5.20 Storage for underground mines

(a) This section shall apply to storage of explosives for underground mining operations.

(b) This section shall also apply to the construction and location of Type UG magazines.

(c) A magazine for explosives shall not be permitted underground, until the underground workings are developed to a point where the magazine:

1. Is at least 300 feet from any shaft,
2. Is at least 15 feet from any haulage way or travel way,
3. Has a travel way to the nearest means of egress with at least two sharp turns,
4. Could not impede evacuation of all persons in the event of accidental detonation of the explosives in the magazine, and
5. Is at least 50 feet from any magazine containing blasting caps.

(d) A Type UG magazine shall be used for the storage of explosives underground.

(e) The amount of explosives stored underground in a mine in a magazine shall not exceed 5,000 pounds.

(f) Any explosive in excess of the amount required for one day's underground mining operations when stored underground in a mine shall be stored in a Type UG approved magazine constructed in accordance with (i) below.

(g) Daily supplies of explosives within a mine at any working place shall be kept in approved containers constructed in accordance with (j) below.

(h) Prior to closing any part of a mine, all explosive containers therein shall be removed.

(i) A Type UG magazine shall be constructed:

1. In solid rock with the front opening constructed in accordance with Table 5.3 of N.J.A.C. 12:190-5.3;

2. With doors of two inches of hardwood covered with 26 gauge sheet metal or the equivalent;

3. With hinges and hasps complying with N.J.A.C. 12:190-5.3 (j), (k), (l), (m) and (n);

4. With one padlock complying with N.J.A.C. 12:190-5.3 (k) and (l);

5. So that water will drain away;

6. With a floor that is wood lined or covered with wooden slats;

7. With doors having at least 16 gauge metal outer covering or equivalent fire resistive protection and lined with at least two inches of hardwood;

8. With no artificial heat;

9. With internal lighting by approved electric safety battery lamps or approved electric lights, wiring and equipment of a type designed for the hazardous location;

10. With adequate ventilation; and

11. With a conspicuous marking reading: "EXPLOSIVES".

(j) Containers shall be substantially constructed of plywood or equivalent at least one inch thick, painted red, and marked "Explosives" in letters of at least three inches in height on a contrasting background.

12:190-5.21 Housekeeping in magazines

(a) Magazines shall be kept clean, dry, and free of grit, paper, empty packages and containers, and rubbish. Floors shall be regularly swept.

(b) Brooms and other utensils used in the cleaning and maintenance of magazines shall have no spark-producing metal parts, and may be kept in magazines.

(c) Floors of magazines stained by leakage from explosive materials shall be cleaned according to instructions of the explosives manufacturer.

(d) When any explosive material has deteriorated, it shall be destroyed in accordance with the advice and instructions of the manufacturer of the explosive.

12:190-5.22 Smoking and open flames

(a) Smoking, open flames, matches, and other sources of ignition shall not be permitted:

1. In any magazine;
2. Within 100 feet of any outdoor magazine; or
3. Within any room containing an indoor magazine.

12:190-5.23 Repair of magazines

(a) Magazines shall be maintained in good repair.

(b) Before repairing the interior of magazines, all explosive materials shall be removed and the interior shall be cleaned.

(c) Before repairing the exterior of magazines, all explosive materials shall be removed if there exists any possibility that repairs may produce sparks or flame.

(d) Explosive materials removed from magazines under repair shall be:

1. Placed in other magazines appropriate for the storage of those explosive materials under this subchapter, or
2. Placed a safe distance from the magazines under repair where they shall be properly guarded and protected until the repairs have been completed.

12:190-5.24 Signs

(a) On the premises where a Type 1 magazine, a Type 2 outdoor magazine or a Type 4 outdoor magazine is located, the holder of a "permit to store" explosives shall post a conspicuous warning sign which shall:

1. Read "EXPLOSIVES - KEEP OFF,"

2. Have lettering at least three inches in height on a contrasting background, and

3. Be so located that a bullet passing through the face of the sign will not strike the magazine.

(b) Type 2 indoor magazines and Type 4 indoor magazines shall be labeled "EXPLOSIVES - KEEP FIRE AWAY".

(c) All Type 3 magazines shall bear the word "EXPLOSIVES" in letters at least three inches in height and legible on a contrasting background.

(d) The provisions in (a) above shall not apply when it is deemed by the commissioner that a warning sign would have counter productive results.

12:190-5.25 Notification to municipality

(a) The holder of a "permit to store" explosives shall keep the construction official informed of:

1. The location of all magazines,
2. The maximum amount of explosives being stored,
3. The type and class of explosives being stored, and
4. Any consequential changes in the location of magazines, amount, type or class of explosives being stored.

SUBCHAPTER 6.

TRANSPORTATION OF EXPLOSIVES

12:190-6.1 Scope of subchapter

This subchapter shall apply to the transportation of explosives in intrastate commerce, off-the-highway, underground and manually.

12:190-6.2 Transportation of explosives in intrastate commerce

(a) This section shall apply to the intrastate transportation of explosives.

(b) The regulations contained in 49 CFR Parts 171 through 178 and 49 CFR Parts 390 through 397, are adopted as safety standards under this subchapter and shall apply according to the provisions thereof.

(c) Each person engaged in the intrastate transportation of explosives shall protect the public by complying with the standards prescribed in (b) above.

(d) "Only technical standards relating to public safety are adopted by any incorporation by reference as prescribed in (b) above. Other standards relating to administration and reporting shall be achieved by communication with the appropriate officials of the Division of Workplace Standards.

(e) Where any conflict occurs between the standards prescribed in (b) above and these rules, these rules shall prevail.

(f) Explosives shall not be transported through any prohibited vehicular tunnel, or subway, or over any prohibited bridge, roadway, or elevated highway.

(g) No person shall smoke, or carry matches or any other flame producing device while in, on, or near a motor vehicle transporting explosives.

(h) No matches, firearms, electric storage batteries, flammable substances, acids, oxidizing materials or corrosive compounds shall be carried in the body of any motor vehicle transporting explosives, except as permitted by the standards referenced in N.J.A.C. 12:190-6.2(b).

(i) Tools for the repair of the motor vehicle and tools required to conduct blasting operations when carried in a vehicle transporting

explosives shall be so segregated or secured in place in or on the vehicle and separated by bulkheads or other suitable means as to prevent damage to the explosives.

(j) Explosives shall not be carried or transported in or upon a public conveyance or vehicle carrying passengers for hire.

(k) Explosives shall not be transferred from one motor vehicle to another on any public highway, street, or road within any municipality without informing the police and fire departments thereof. In the event of a breakdown or collision, the police and fire departments shall be promptly notified of the location of such breakdown or collision and the type of cargo being carried. Explosives shall be transferred from the disabled motor vehicle to another motor vehicle only under proper and qualified supervision.

(l) Detonators may be transported with other explosives in the same motor vehicle only in accordance with the standards referenced in N.J.A.C. 12:190-6.2(b).

12:190-6.3 Motor vehicles in intrastate commerce

(a) This section shall apply to motor vehicles in intrastate commerce.

(b) Motor vehicles used for transporting explosives shall be strong enough to carry the load and shall be in good mechanical condition.

(c) When explosives are transported in an open-bodied vehicle, they shall be in a Type 3 magazine and such magazine shall be securely fastened to the truck bed.

(d) All motor vehicles used for the transportation of explosives shall have tight floors and any exposed spark-producing metal on the inside of the body, portable magazine, or closed container, shall be covered with wood or other nonsparking material to prevent contact with the explosives, except that exposed spark-producing metal need not be covered in vehicles transporting blasting agents or oxidizing materials.

(e) Motor vehicles, when used for transporting any quantity of explosives, shall display the placards required by N.J.A.C. 12:190-6.2(b).

(f) Each motor vehicle used for transporting explosives shall be equipped with the fire extinguishers as follows:

1. Motor vehicles of less than 14,000 pounds gross vehicle weight with at least two extinguishers having a total rating of at least 4-A:20-B:C, and

2. Motor vehicles of 14,000 pounds gross vehicle weight or more and tractor semi-trailer units with at least two or more extinguishers with total rating of at least 4-A:70-B:C.

(g) Only extinguishers listed by a nationally recognized testing agency shall be used on vehicles carrying explosives. They shall be equipped with a device permitting visual determination of charged condition.

(h) Extinguishers shall be located where they will be accessible for immediate use.

(i) Extinguishers shall be examined and recharged periodically in accordance with the manufacturer's recommendation.

(j) Where motor vehicles are operated in temperatures at or below 32 degrees F, dry powder extinguishers shall be pressurized with nitrogen gas.

(k) A motor vehicle used for transporting explosives shall be inspected each day before use to determine that it is in proper condition for safe transportation. The inspection shall insure that:

1. The fire extinguishers are fully charged and ready for use,
2. All electrical wiring is protected and fastened to prevent short-circuiting,
3. Chassis, motor, pan and underside of body are reasonably clean and free of excessive oil and grease,
4. Fuel tanks, feed lines, and cross-over lines are secure and have no leaks,
5. Brakes, lights, horns, windshield wipers, defrosters, and steering apparatus are functioning properly, and
6. Tires have proper inflation and are free of defects.

12:190-6.4 Operation of motor vehicles in intrastate commerce

(a) This section shall apply to the operation of motor vehicles in intrastate commerce.

(b) Motor vehicles transporting explosives shall be driven by and be in the charge of a properly licensed driver not less than 21 years of age. The driver shall be physically fit, careful, capable, reliable, and able to read and write the English language. The driver shall not be an unlawful user of, or addicted to, alcohol, narcotics, or other dangerous drugs. The driver shall be familiar with applicable state and federal laws and regulations governing the transportation of explosives.

(c) Except under emergency conditions, no motor vehicle transporting explosives shall be parked before reaching its destination even though attended, on any highway adjacent to or in proximity to any bridge, tunnel, dwelling, building, or place where people work, congregate, or assemble.

(d) Every motor vehicle transporting any quantity of explosives shall, at all times, be attended by a driver or other person employed by the motor carrier.

(e) The attendant described in N.J.A.C. 12:190-6.4 (d) shall be:

1. Made aware of the class of explosives in the motor vehicle and of its inherent dangers,
2. Instructed in the measures and procedures to be followed in order to protect the public from such inherent dangers,
3. Familiarized with the motor vehicle he is assigned to attend, and
4. Trained, authorized, and licensed to move the motor vehicle, when required.

(f) For the purpose of (d) above, a motor vehicle shall be deemed "attended" only when:

1. The attendant is physically on or in the motor vehicle, or has the motor vehicle within his field of vision and can reach the motor vehicle quickly without any interference; and
2. The attendant is awake and alert and not engaged in other duties or activities which divert his attention from the motor vehicle, provided however;
3. A single attendant is absent from the motor vehicle for a brief period:

i. For necessary communication with the public officers, or representatives of the carrier, shipper or consignee or

ii. When necessary to provide for physical comfort;
or

4. The attendant leaves a laden motor vehicle unattended in an approved parking area.

(g) Tires shall be checked for proper inflation and general condition after each two hours or 100 miles of travel, whichever occurs first, and at every rest stop. Flat or overheated tires shall be removed from the motor vehicle immediately. After removal the tire shall be placed far enough from the motor vehicle so that a spontaneous ignition of the tire will not endanger the motor vehicle or its cargo. The tire shall not be replaced on the motor vehicle until it has been cooled below the danger of ignition nor shall the tire be used until corrective action has been taken.

(h) No spark-producing metal tools, oils, matches, firearms, electric storage batteries, flammable substances, acids, oxidizing materials or corrosive compounds shall be carried in the body of any motor vehicle transporting explosives, except as permitted by the standards referenced in N.J.A.C. 12:190-6.2(b).

(i) The driver of a motor vehicle transporting explosives shall avoid congested areas and heavy traffic, where practicable.

(j) Delivery shall only be made to authorized persons and into authorized magazines or approved temporary storage or handling areas.

(k) Motor vehicles transporting explosives shall come to a full stop before crossing any railway track or main highway, and shall not proceed until the driver determines that the way is clear.

(l) Only authorized persons or passengers are permitted on any motor vehicle transporting explosives.

12:190-6.5 Transportation of explosives off-the-highway

(a) This section shall apply to the transportation off-the-highway of explosives that are not intrastate commerce.

(b) Explosives transported in off-the-highway service in an open-bodied motor vehicle shall be in approved cargo space.

(c) The transportation of explosives off-the-highway shall comply with provisions of intrastate transportation, except for N.J.A.C. 12:190-6.4(f)2.

(d) Motor vehicles at the blasting site and within the vision of the blasting crew shall be deemed "attended" for the purpose of compliance.

12:190-6.6 Transport of explosives in underground operations.

(a) This section shall apply to the transportation of explosives from the surface to underground operations.

(b) Explosives in small amounts shall be transported in a substantially constructed transport box with lid of plywood at least one inch thickness or equivalent. The transport box shall be painted red, with a conspicuous marking reading: "EXPLOSIVES".

(c) Explosives exceeding 100 pounds shall be transported in a powder car of sound construction with an interior and lid of non-sparking material.

(d) The hoist operator shall be notified before transporting explosives in a shaft.

(e) Explosives shall be moved from the surface to the underground destination without any delay enroute.

(f) Detonators and other explosives shall not be transported together in the same transport box, in any shaft conveyance, or in the same cargo space of a powder car. Explosives shall not be transported in any conveyance containing other material.

(g) A person shall not ride in any shaft conveyance transporting explosives.

(h) Explosives transported underground by railroad shall be:

1. In a powder car or, if in small amounts, in a clean empty railroad car,

2. Pulled by a locomotive, if a locomotive is used,

3. Separated by at least one empty railroad car between the locomotive and the explosive car.

(i) When a trolley locomotive is used to pull a car carrying explosives; at least two empty cars shall be placed between the explosives car and the locomotive, and an electrically insulated coupling or drawbar shall be used between the locomotive and the explosives car.

(j) When a railroad car carrying explosives is pulled by a locomotive, no person other than the train crew and powder man shall be on the train.

(k) The powder car or conveyance carrying explosives shall bear a reflectorized sign on each side with the word "EXPLOSIVES" in letters not less than four inches in height, upon a background of sharply contrasting color.

(l) The amount of explosives taken to any working area shall not exceed the amount estimated needed for the next blast.

(m) Transport boxes shall not be used to store explosives, unless the following shift is to continue loading explosives for the same blast.

12:190-6.7 Manual transportation of explosives

(a) This section shall apply to transportation of explosives by a person manually.

(b) Explosives shall not be carried in personal clothing.

(c) When it is necessary to carry explosives which are not in the original outside container, they shall be carried in a suitable bag or container.

(d) Blasting caps shall not be transported in the same bag or container with other explosives.

SUBCHAPTER 7. USE OF EXPLOSIVES

12:190-7.1 Scope of subchapter

This subchapter shall apply to the use of explosives.

12:190-7.2 Compliance

(a) Every mine operator employing the service of a blaster shall use every reasonable precaution to provide for the safety of his employees, all persons at the blast site, and the public in the vicinity of the blast site. Such operator shall comply with this subchapter.

(b) Every contractor and other persons employing the services of a blaster shall use every reasonable precaution to provide for the safety of all persons at the blast site and the public in the vicinity of the blast site. Such contractor and other person shall comply with this subchapter.

(c) Any of the following shall be jointly responsible for compliance with this chapter when involved in any way with blasting operations:

1. Any mine operator,
2. Any contractor,
3. Any sales individual, company, firm or corporation providing the services of a blaster,
4. Any other employer of a blaster, and
5. Any blaster.

(d) Where a sales company supplies the services of a blaster to a customer, the sales company, the blaster and the customer shall be jointly responsible for compliance with this subchapter.

(e) Where blasting operations are conducted, all employers shall instruct all their employees associated with such operations in the provisions of this subchapter as they relate to employees.

(f) Where blasting operations are conducted, all employees shall comply with the provisions of this subchapter as they relate to the employees.

(g) No person utilizing the services of a blaster shall prevent compliance by the blaster, or encourage noncompliance by the blaster, with this chapter.

(h) All blasters, prior to and during the use of any explosives, shall comply with this subchapter and shall take all reasonable precautions not specifically set forth in this subchapter to prevent endangerment of the public and property.

(i) Any person who uses explosives in research, metal cutting or forming, seismic testing, actuating devices or other use shall comply with the applicable provisions of this subchapter and provide additional safeguards when the nature of the use indicates that it is necessary in order to assure safety for persons and property.

12:190-7.3 Notification

(a) Any person intending to initiate a blasting operation shall notify the construction official prior to conducting any blasting operations. Where there is no full time construction official in the municipality, or in the absence of the construction official, the police department shall be notified. Notification shall include:

1. The specific location of the blasting, and
2. The intended time of the blasting.

(b) Any person intending to conduct a blasting operation that is a continuous project, such as a quarry operation or a construction project shall be required to give only a single notice of intention to blast. A continuous project means blasting for more than one day and blasting at least once a month. Such single notice shall constitute compliance with (a) above.

(c) Any person intending to conduct a blasting operation having an explosive charge per delay in excess of 80 percent of the weight of explosives of Table 7.26(d) for a given distance shall notify the appropriate officials of the Division of Workplace Standards of such intention when the conditions of (c)1 or (c)2 below apply. Such notification shall reach the Division at least 24 hours prior to the beginning of the blasting operation:

1. When 400 pounds of explosives are to be used in a single day, or
2. When the blasting is to be conducted over a period of five or more days.

12:190-7.4 Documentation at the blasting site

Any person conducting blasting operations shall have at the blasting site a current permit to use explosives and evidence of insurance required by N.J.A.C. 12:190-7.5.

12:190-7.5 Insurance

(a) Any self employed person in possession of a valid permit to use explosives for blasting purposes shall have an insurance coverage for blasting damage not less than \$50,000 for property damage including explosion, collapse, and underground utility damage and \$100,000 to \$300,000 personal injury. This requirement shall not apply to any person who possesses a Grade G or H permit.

(b) Any person in possession of a valid permit to use explosives for blasting purposes who is working for any person, shall not use explosives for such person, unless the employer has a valid insurance policy for blasting damage not less than \$50,000 for property damage including explosion, collapse, and underground utility damage and \$100,000 to \$300,000 personal injury.

(c) Proof of the possession of a valid insurance policy covering blasting damage shall be readily available for inspection at the site.

(d) Nothing in (a) and (b) above shall be construed as preventing greater insurance coverage for damage from blasting where requested by any person for whom blasting is being done.

12:190-7.6 Time of blasting operations

(a) Surface blasting, except during unusual conditions as when approved by the commissioner, shall be conducted only during daylight hours, but shall not be conducted before 8:00 a.m. or after 6:00 p.m. on the day of blasting.

(b) Surface blasting shall not be conducted on Sundays except as approved by the commissioner. Surface blasting on State holidays shall not exceed 100 pounds of explosives in any single blast, except as approved by the commissioner.

(c) Loading of explosives into surface blast holes shall not be performed in other than daylight hours on the day of blasting, except as approved by the commissioner.

(d) Where loading of surface blast holes has occurred and blasting cannot be safely accomplished within the limits prescribed by (a) and (c) above, the blast holes shall be attended until the

explosives have been disposed of, and the person conducting the blasting operations shall notify the appropriate officials of the Division of Workplace Standards.

12:190-7.7 Blasting in the vicinity of utility lines

(a) This section shall apply to:

1. Blasting operations in the vicinity of underground utility lines or exposed utility lines making contact with the earth's surface, which are, but not limited to, any of the following: gas, water, hydrocarbon, sewer, electric or telephone lines, and

2. Supporting foundations of utility lines when such utility lines are located above the earth's surface and the supporting foundations are in the vicinity of blasting operations.

(b) This section shall not apply to utility lines located above the earth's surface.

(c) The person conducting blasting operations shall make every reasonable effort to verify the exact location of utility lines located in the vicinity of such operations.

(d) When any person conducting blasting operations has no verification of the location of utility lines in the vicinity of such operations, but it is reasonable to assume that there are utility lines, the person conducting the blasting operations shall make a concentrated effort to locate the lines with regard to their horizontal distance from the nearest blast hole and their depth below the earth's surface.

(e) The commissioner may approve alternate procedures to those contained in this section when such alternate procedures are requested in writing and approval would create no additional hazard to the public or property.

(f) Whenever blasting is being conducted within 50 feet of electric, water, sewer, fire alarm, telephone, telegraph or steam utilities, the person conducting the blasting operations shall notify the appropriate representatives of such utilities at least 24 hours in advance of such blasting. Verbal notice shall be confirmed with written notice.

(g) Whenever blasting is being conducted within 200 feet of a railroad, the person conducting the blasting operations shall notify the appropriate representative of the railroad 24 hours in advance of such blasting. Verbal notice shall be confirmed with written notice.

(h) Whenever blasting is being conducted within 200 feet of a pipe distributing liquefied petroleum, manufactured, mixed or natural gas, the person conducting blasting operations shall notify the utility company having control of such gas at least three full workdays (excluding Sundays or holidays) prior to blasting. Such notice shall be in writing and served personally or by registered mail.

(i) Whenever blasting is conducted on a single project for a period longer than one day, a single notice of intention shall constitute compliance with (f), (g) and (h) above.

(j) Any person conducting blasting operations in the vicinity of utility lines shall use:

1. A blast hole drilling pattern and blast initiating procedure that will provide the greatest relief possible in the direction away from the utility line, and

2. A type of explosive specifically designed to prevent propagation between blast holes.

(k) All blasting operations in the vicinity of underground utility lines shall be conducted as follows.

1. The blast hole depth in the initial excavation shall be limited to the elevation of the top of the utility line plus one-half the distance from the nearest blast hole to the utility line.

2. Subsequent excavations shall be limited to one-half the horizontal distance from the nearest blast hole to the utility line.

3. Under the conditions described in (k)1 and (k)2 above, the diameter of the blast hole shall not exceed three inches, and only one blast hole may be fired per delay period.

(4) When a free face has been established to the final depth of the trench, the provisions described in (k)1 and (k)2 above shall not apply.

12:190-7.8 Proximity to highways

(a) Before blasting within the right of way of a highway where the bank or unpredictable rock conditions are liable to cause rockfall, the police authority having jurisdiction over the highway shall be notified of intent of the blaster to stop traffic.

(b) When blasting under the conditions of (a) above, a sufficient number of persons, each with a red flag not less than two feet square

attached to a short shaft, shall be designated to prevent any vehicular traffic from entering the danger area.

12:190-7.9 Warning signs and signals

(a) A sign indicating blasting warning signals shall be posted at one or more conspicuous places where blasting operations are being conducted. The blaster shall set adequate time sequences between warning signals to give the public sufficient time to take cover. The lettering on such signs shall be not less than four inches high on a contrasting background. The asterisk on the sign example indicates the time fixed by the blaster. The sign shall read as follows or express an equivalent:

BLASTING WARNING SIGNALS

**2 LONG SIGNALS – 1st WARNING
* MINUTES TO BLASTING**

**1 LONG SIGNAL – FINAL WARNING
1 MINUTE TO BLASTING**

2 SHORT SIGNALS – ALL CLEAR

(b) Warning signs shall be posted on all approaches open to the public within 1,000 feet of any blasting area. The lettering on such signs shall be not less than four inches high on a contrasting background, and the signs shall read as follows or express an equivalent:

**DANGER
BLASTING ZONE
KEEP OUT**

(c) Warning signs shall be placed on the right shoulder of all public vehicular approaches at least 350 feet from blasting sites, utilizing electric blasting caps. The lettering on such signs shall be not less than four inches high on contrasting background, and the signs shall read as follows or express an equivalent:

**BLAST AREA
TURN OFF TWO WAY RADIO**

(d) The person conducting blasting operations shall fix the time of blasting, check the blast area, post guards to keep all unauthorized persons out of the blast area, and sound the warning signals utilizing an effective warning device.

(e) When a warning device has been sounded, all persons authorized to be in the blast area shall leave or take cover and return until the all clear signal has been sounded.

12:190-7.10 Drilling blast holes

(a) The written diagram or field layout of all blast holes shall be prepared by the blaster and given to the driller when the blaster is not going to be present during the drilling.

(b) The surface shall be carefully examined to detect the possible presence of unfired explosive materials, and drilling shall not be performed in blast holes that have contained explosive materials.

(c) When a blast hole has been loaded, no drilling shall be performed within a distance less than the depth of the hole, but in no case less than 25 feet from the loaded blast hole. Drilling may be performed to free an obstructed blast hole not containing explosives when all explosives in the vicinity have been located at a safe distance. Such drilling operations shall be under the direct supervision of the blaster.

(d) All blast holes shall be of sufficient diameter so that cartridges of explosive materials can be inserted to the bottom of the hole without excessive force.

(e) Any person drilling blast holes shall inform the blaster of any unusual conditions, such as voids or mud seams. Where the blaster is not in close contact with the drilling, unusual conditions shall be recorded in writing and sent to the blaster.

12:190-7.11 Planning and preparation for blasts

(a) The blaster shall plan each blast taking special precaution in loading, delaying, initiation and confinement so as to control the throw of fragments, ground vibration, and air blast effects.

(b) This section shall apply to the planning of any blasting where the electric blasting caps are to be hooked up in two or more series in parallel or 1,000 or more pounds of explosives are to be used.

(c) In planning a blast, careful consideration shall be given to the initiating system of the explosive charges. The recommendation of the manufacturer of the explosive device to be used shall be followed.

(d) When blasting is to be conducted near a property line where the adjacent property owner is not a party of the blasting operations, the blaster shall take precautions to prevent rock slides, sloughing or back break from extending into the adjoining property. These precautions shall include; angle drilling, reduced blast hole size, reduced blast hole depth, reduced explosive charges, or any other recognized method of controlled blasting.

(e) Sufficient, suitable stemming or tamping material shall be placed at the blast holes prior to delivery of explosives into the loading area. All equipment and tools not used for loading explosives into blast holes shall be removed from the loading area prior to delivery of explosives into the blast area. There shall be no activity in the loading area, other than loading of blast holes.

(f) Mobile equipment shall not be operated within 25 feet of loaded blast holes or within the normal throw of blasted material in front of a face being loaded, except as provided in N.J.A.C. 12:190-7.10(c) or when approved by the commissioner. This provision shall not apply to mobile equipment placing blasting mats or vehicles used in bulk loading.

(g) Only tools and equipment of nonsparking type shall be used to load blast holes. When loading blast holes underground or in other dark locations, only approved flood lamps, electric cap lamps or flashlights shall be used as illumination.

(h) Blast holes, prior to loading, shall be examined for alignment, water, blockage or other defects.

(i) All loaded holes shall be included in the next blast unless there is at least 100 feet separation between the loaded holes of the next blast and the holes being loaded for a subsequent blast.

(j) All warning signs shall be posted.

12:190-7.12 Initiation with electric detonators

(a) Precautions shall be taken to prevent accidental discharge of electric blasting caps from current induced by radar, radio transmitters, lighting, adjacent power lines, dust storms or other sources of extraneous electricity.

1. All blasting operations shall be suspended and all persons shall be removed from the blasting area during the approach and progress of an electric storm.

2. Signs warning against the use of mobile radio transmitters shall be posted on all roads within 350 feet of the blasting operations.

3. The blaster shall comply with the Radio Frequency Radiation Hazards, IME No. 20-1978.

4. Before commencing blasting operations under high voltage electric power lines or in other areas suspected of having extraneous electric currents, the area shall be tested for extraneous electric current by a competent person using an instrument designed for this purpose. Where extraneous electric currents exceeding 0.1 ampere are found, the use of electric blasting is prohibited.

5. When electric equipment and energized power distribution circuits are within a horizontal distance of 25 feet of the blast holes, the area shall be tested for extraneous electric current by a competent person using an instrument designed for the purpose. Testing need not be performed where the possible source of extraneous electric current is removed or turned off. This provision shall not apply to overhead electric lines, when the utility company gives approval to use electric blasting caps.

6. The leg wires of the electric blasting caps shall be kept shunted unless being tested or wired into the blasting circuit.

7. The firing line shall be kept shunted until immediately prior to the time of hook-up to the blasting machine or firing switch.

(b) Where electric blasting caps are used under electric power lines, the firing line shall be weighted down to prevent the line from coming in contact with the electric power lines.

(c) Due precautions shall be taken to ensure that the electric system will function properly.

1. All electric blasting caps used in a single blast shall be of the same type, same function, and of the same manufacture.

2. Care shall be exercised to ensure that an adequate quantity of delivered current is available in accordance with the manufacturer's recommendations.

3. The insulation on all electric lines to be used shall be adequate and in good condition and kept from the contact with an electric conductor outside the electric blasting circuitry.

4. The firing line shall be a solid wire and have sufficient capacity to carry the firing current and have a current carrying capacity of not less than No. 14 American Wire Gage copper wire.

5. Electric blasting caps shall be tested for continuity after the blast hole has been loaded and before the stemming is added.

(d) Precautions shall be taken in the sequence of wiring the blasting circuitry.

1. The wiring of the blasting circuitry shall not commence until the work can proceed to completion without interruption.

2. The electric blasting cap leg wires shall be connected and tested for continuity.

3. The leg wires shall be connected to the connecting wires or bus wires and tested for continuity.

4. The connection wires shall be connected to the firing line and tested for continuity. The firing line shall be re-shunted.

5. All testing shall be done by a blasting ohmmeter designed for the purpose. The ohmmeter shall be kept in good condition and be periodically tested. A malfunctioning ohmmeter shall be repaired by the manufacturer or the manufacturer's assigned representative when used for this purpose.

(e) When blasting with a blasting machine, the blasting machine shall be:

1. Designed specifically for this purpose,

2. The rated capacity needed,

3. In good working condition,

4. Tested at least once a month by procedures recommended by the manufacturer,

5. Repaired only by the manufacturer or a competent person, and

6. Protected from damage.

(f) Precautions shall be taken when firing from a power line source.

1. The firing circuitry shall not be grounded or placed where it can pick up extraneous electric current.

2. The firing line shall be a solid wire and have sufficient capacity to carry the firing current and have a current carrying capacity of not less than No. 14 American Wire Gage copper wire.

3. The insulation on all firing lines shall be in good condition.

4. When in a tunnel or other narrow passage, the firing line shall be placed on insulators on the wall opposite other electric power lines.

5. There shall be a safety switch on each branch firing line.

6. The main permanent firing line shall be arranged to have a safety switch, at least a five foot lightning gap, and a power switch.

7. All switches for power circuits shall be the proper capacity, enclosed, capable of being locked in the "off" or "open" position, and be distinctively labeled.

8. The power source shall not exceed 550 volts.

9. All switches shall be kept locked unless firing a blast. The keys shall be entrusted only to the blaster.

12:190-7.13 Initiation with safety fuse and cap

(a) The safety fuse shall be in good condition. It shall not be kinked, bent sharply or handled roughly.

(b) Each spool of safety fuse shall be test burned to determine the burning rate. The burning rate shall be posted to assure that all persons using the fuse will know the burning rate.

(c) Blasting caps shall be crimped to the fuse only with a tool designed for that specific purpose. This work shall be performed at a safe location.

(d) Fuses shall be at least 48 inches long.

(e) Fuses shall be ignited with hot-wire lighter, lead spitters, ignitor cord, or other such devices designed for this purpose.

(f) Timing shall be such that the fuse in the last blast hole to fire is burning within the hole before the first blast hole fires.

(g) When more than five fuses are to be lighted, two individuals shall be present. No individual shall light more than 15 individual fires.

12:190-7.14 Initiation with detonating cord

(a) Detonating cord shall be in good condition, and have the proper core load and construction type for the work scheduled. It shall be kept free of kinks and sharp bends.

(b) Detonating cord down lines in blast holes shall be attached to a cap sensitive primer charge. Where the core load is light, the detonating cord shall be attached to a blasting cap recommended by the manufacturer for this purpose which is to be inserted in the primer charge.

(c) Delayed connectors and blasting caps, used with detonating cords shall be handled with the same safety precautions as other detonators.

(d) Detonating cord down lines shall be cut free from the spool when the primer charge is in place.

(e) Splices in main or trunk lines shall be tight square knots. Down lines shall be connected to the trunk lines by tight clove hitch knots at right angles to the trunk lines. Approved manufacturer's connecting devices may be used in place of cord-to-cord knots.

(f) When firing the detonating cord system with electric blasting caps, the caps shall be taped or fastened securely to the trunk line with the closed end of the cap pointing in the same direction the detonating cord is to fire. The cap shall not be attached until just before firing time.

(g) In areas where blast noise could be a problem, all detonating cord on the surface shall be covered with at least one foot of earth, sand or stone chips.

12:190-7.15 Initiation with other detonating systems

Detonating systems not specifically addressed in this subchapter shall be utilized in accordance with the manufacturer's recommendations.

12:190-7.16 Explosives at blasting site

(a) The amount of explosives taken into the blasting area shall not exceed the amount estimated by the blaster as necessary for a day's blasting.

(b) Damaged or deteriorated explosives shall not be delivered to the blast site.

(c) Only commercially manufactured explosive materials acceptable to the commissioner shall be used for blasting operations.

(d) Explosives may be piled near blast holes at the blast site where the public is prohibited.

(e) The explosives shall be kept in small separate piles so as to prevent propagation of an explosion in the event of a premature explosion at any portion of a blast site.

(f) At blasting sites in close proximity to the public, all explosive materials shall be stored in Type 3 magazines until immediately before being loaded into blast holes.

(g) Blasting caps at the blast site shall be stored at a safe distance from all other explosive materials at blasting sites.

(h) Explosive materials for a subsequent blast shall be kept in an approved magazine or shall be placed on the vehicle transporting explosives at a blasting site parked in accordance with Table 5.1 and attended.

(i) No explosives other than those in Fume Class 1 shall be used in underground mines, except explosives complying with Fume Class 2 or Fume Class 3 may be used, if adequate ventilation has been provided. The fume classification shall comply with Table 7.16(i).

Table 7.16(i)
Fume Classification

Fume Class	Poisonous Gases per (1 1/4" x 8") Cartridge of Explosives* cubic feet
1	less than 0.16
2	0.16 to 0.33
3	0.33 to 0.67

Note to Table

* The U.S. Bureau of Mines limits poisonous or toxic gases to 2 cubic feet per pound of permissible explosive.

(j) Explosives at a blast site shall not be left unattended.

(k) Explosives shall not be abandoned, buried or covered over by any materials as a means of disposal.

(l) All empty explosives packages, packaged linings and other rubbish from explosives containers left after the blast shall not be used again but disposed of in a safe manner.

12:190-7.17 Blast hole loading

(a) Blasting operations shall be under the direct supervision of a blaster holding the proper grade permit to use explosives.

(b) Only persons authorized by the blaster and authorized government personnel shall be allowed in the blast area.

(c) The blast hole loading crew shall be limited to four helpers for each blaster holding a permit to use explosives. When two or more blasting crews are used, the crews shall be separated by a practical distance consistent with efficient operation and supervision of crews.

(d) No intoxicating liquors or drugs shall be allowed in the blast area. No persons under the influence of intoxicating liquors or drugs shall be allowed in the blast area.

(e) No smoking or open flame devices shall be allowed within 100 feet of the blast area except for devices used in the lighting of safety fuse.

(f) All handling and use of static sensitive explosive materials shall be immediately discontinued upon the approach of a thunderstorm and all persons in the area shall immediately seek a safe place.

(g) When preparing initiating primers, the work shall be performed adjacent to the blast hole just prior to using the primer. A nonsparking punch shall be used for the making of the hole in the explosive cartridge so that the detonator can be completely encased in the cartridge freely.

(h) Primer cartridges shall not be split, dropped, forced, tamped, or abused in any way when inserting them in the blast hole.

(i) The loading of the blast holes shall be as close to scheduled firing time as possible. When there is a delay, the loaded blast holes shall be under the observation of a guard stationed in the area.

(j) No explosive materials shall be loaded into a blast hole and left overnight without the approval of the commissioner.

(k) During the loading operation, the blaster shall have a helper or the blaster shall be under the direct observation of another person capable of assisting in emergencies.

12:190-7.18 Firing the blast holes

(a) Before firing a blast which could cause injury to persons or damage to property from fly-rock, the material to be blasted shall be properly covered with blasting mats.

(b) The blaster shall fix the time of blasting.

(c) Prior to connecting the firing line to the blasting machine or permanent firing line, the blaster shall be certain that all persons have been cleared from the blast area, all approaches to the blast area are guarded, the traffic stopped when blasting in proximity to highways, and the proper warning signals sounded.

(d) The blaster shall designate a competent person to operate the blasting machine when duties associated with the blasting operation require the blaster's attention in operational area of the blast.

12:190-7.19 Inspection after blasting

(a) Immediately after a blast has been fired, the firing line shall be disconnected from the blasting machine and all blasting lines shall be shunted. When firing from an electric power source in underground blasting, the switches shall be locked in an "Off" or "Open" position and the lightning gap shall be open.

(b) No person shall enter an underground blast area until at least 15 minutes has elapsed after a blast.

(c) The blast site shall be inspected to determine if all charges have been fired before work is resumed.

(d) If explosives or blasting agents are suspected of burning in a blast hole, all persons in the blast area shall move to a safe location and no person shall return to the blast area for at least one hour.

12:190-7.20 Misfires

(a) When a misfire is discovered, the blaster shall provide proper safeguards and notify his employer.

(b) No work shall be done except that necessary to remove the hazard of the misfire and only those employees necessary to do the work shall remain in the danger zone.

(c) When broken wires, faulty connections or short circuits are determined to be the cause of a misfire, proper repairs shall be made and the charge refired, provided the burden has not been dangerously weakened.

(d) When the blast hole cannot be refired, the stemming may be removed from the misfired blast hole by the use of compressed-air, water, or other suitable means. A new priming charge may be added, the hole restemmed, and fired providing there is no danger of fly-rock or other hazards. The use of the drill to remove stemming shall be prohibited.

(e) When unfired explosives are found in a muck pile all loading work shall be stopped. The pieces of explosives and broken rock shall be carefully removed by hand until the unfired hole is exposed. If there is no danger of fly-rock from weakened burdens, the blaster may reprime the hole and fire. If there is a danger of fly-rock, the unfired explosives in the hole shall be washed out with water.

(f) If conditions preclude the procedure described in (e) above, the blaster in charge shall safeguard the area and notify the appropriate officials of the Division of Workplace Standards. All work in the danger area shall cease pending a joint investigation by the blaster and the appropriate officials of the Division of Workplace Standards.

12:190-7.21 Breaking boulders

(a) While loading block holes, other work shall not be allowed in the immediate area.

(b) Block holes shall contain at least 85 percent stemming material.

12:190-7.22 Bulk loading

(a) No person shall drive a vehicle or equipment over electric blasting caps, leg wires, connecting wires, detonating cord, or other explosive materials.

(b) Liners shall not be used in blast holes, unless proper precautions are taken to prevent the accumulation of static electricity.

(c) Only truck mounted or portable units for mixing or loading blasting agents shall be used.

(d) The mixing and loading of blasting agents at the blast site for immediate use may be permitted under the following conditions;

1. When under the direct supervision of a licensed blaster

2. When in a reasonably safe location, considering the quantities involved;

3. When using equipment, materials and methods approved by the commissioner as adequate to provide for proper and safe mixture without frictional heating, compaction or confinement and

4. When in quantities at locations which are appropriate for storage, handling and transportation of blasting agents.

(e) Loading equipment shall be removed from the blast site promptly after the loading of the boreholes is completed.

12:190-7.23 Pneumatic loading of explosives

(a) Pneumatic loading equipment shall be constructed of materials compatible with the type of explosive materials to be used

(b) Pneumatic loading equipment shall be used according to the recommendation of its manufacturer.

(c) A positive ground device shall be used to prevent the accumulation of static electricity in the system. The ground shall be separated from any water line, air line, rail or permanent electrical grounding system.

(d) The air supply hose shall be nonconductive.

(e) The discharge hose shall be semi-conductive.

(f) All systems shall be evaluated by a competent person to insure that they will adequately dissipate static under potential field conditions.

(g) The compressed air supply shall be free of solid particles greater than 20 mesh size.

(h) The air pressure to the pneumatic loader shall not exceed the recommendations of the manufacturer. If necessary, the supply shall be controlled by a pressure regulating valve in the air supply line. A pressure relief valve set at 10 percent above the loader's

operating pressure shall be placed in the line ahead of the regulating valve.

(i) The temperature of the air supplied to the pneumatic loader shall not exceed 150 degrees F.

(j) When electric detonators are used, the leg wires shall be placed outside the discharge hose and kept away from the metal parts of the loader.

(k) The pneumatic loader shall not be used to place stemming in the blast hole.

12:190-7.24 Demolition

(a) Any person responsible for demolition by explosives shall comply with all applicable provisions of this chapter.

(b) A person intending to demolish by explosives any construction which exceeds 25 feet in height shall notify the appropriate officials of the Division of Workplace Standards at least 14 days in advance of the demolition.

(c) Where a construction is to be demolished by explosives which is within 200 feet of a public way or another construction not included in the demolition project, the notification required by (b) above shall be in writing and provide the following information:

1. Name, address and owner of the construction to be demolished,
2. Name of the general contractor at the demolition site,
3. Name of the blasting contractor at the demolition site,
4. Height and type of construction to be demolished,
5. A control map on a scale sufficient to show all constructions, streets, utilities and other pertinent objects within 300 feet of the demolition site,
6. Name and address of the police official responsible for traffic safety in the vicinity of the demolition site, and
7. Name and address of the construction official at the demolition site.

(d) A person intending to demolish a construction over feet in height in a congested area shall prepare a blast plan show the placement of explosives and initiation sequence of the explosive charges. Such a plan shall be prepared at least three days before blast and shall be kept at the demolition site for approval by the commissioner.

(e) The commissioner may require a test blast to determine the feasibility of the blast plan described in (d) above before the blast plan is approved.

(f) Upon approval of the plan by the commissioner, the person in charge of the demolition project shall cooperate with the construction official in providing for traffic and crowd control in the vicinity of the demolition site up to and at the time of firing of the blast. Where there is no full time construction official in the municipality, the person in charge of the demolition project shall cooperate with the police department. The person in charge of the demolition project shall arrange a meeting with the appropriate officials of the Division of Workplace Standards, the construction official, and himself to finalize all plans at least 20 hours before the firing time.

(g) Explosives for the demolition shall not be brought into the demolition site, until all salvage, pre-weakening testing, and similar activities are completed.

(h) All explosives at the demolition site shall be stored in Type 2 or Type 3 magazine and shall be attended at all times up to the time of firing in the manner approved by the commissioner and the construction official, or in the absence of the construction official the police department shall approve.

(i) At least 18 hours shall be provided between the completion of salvage and other work and the firing time to allow for the placement of explosive charges and the preparations of the precautions necessary to prevent flying materials which could cause injury to persons or property damage.

(j) Unconfined explosive charges such as detonating cord, shape charges and kickers shall be covered with energy absorbing materials which will reduce the air blast effects from the detonation of the explosives.

(k) Only explosives commercially designed for the type of demolition being conducted shall be used unless the commissioner approves the use of substitutes.

(l) Prior to the detonation of the explosives, a two way communication system shall be established between the police official

maintaining crowd control and traffic safety and the blaster firing the blast.

(m) The police official in charge of crowd control and traffic safety at the demolition site shall notify the blaster firing the blast prior to the final blast warning signal if the designed safety area surrounding the demolition site is not clear.

12:190-7.25 Air blast effects

(a) This section shall apply to air blast effects on constructions that are neither owned nor leased by the person conducting or contracting for the blasting operation.

(b) The maximum allowable air blast at any inhabited building resulting from blasting operations shall not exceed 130 decibels peak when measured by an instrument having a flat frequency response (± 3 decibels) over the range of at least 6 to 200 Hertz.

(c) The maximum allowable air blast at any building not inhabited resulting from blasting operations shall not exceed 140 decibels peak when measured by an instrument having a flat response (± 3 decibels) over the range of at least 6 to 200 Hertz.

(d) When blasting is of a continuing nature, 124 to 130 decibels shall be the caution range. When air blast effects are consistently within the caution range, the blast shall be examined, and if found necessary, shall be changed so as to reduce air blast effects on subsequent blasts.

(e) For determining compliance with this section, an approved instrument that is operated by a competent person shall be used. An approved instrument shall include the concept that the instrument has been calibrated in accordance with the manufacturer's recommendations.

12:190-7.26 Ground vibration

(a) This section shall apply to ground vibration at constructions that are neither owned nor leased by the person conducting or contracting for the blasting operation.

(b) In planning any blast, precautions shall be taken to protect constructions from damage.

(c) The limits for ground vibration when blasting shall be in accordance with (c)1 or (c)2 below. In no case shall the peak particle velocity at a construction exceed two inches per second except when permitted by N.J.A.C. 12:190-1.6.

1. Blasting near buildings shall be in accordance with (d) (e), (f) or (g) below.

2. Blasting near structures shall be in accordance with (l) below.

(d) This subsection shall apply to ground vibration limits for blasting operations near a building conducted without measuring each blast with approved seismic instrumentation, when the amount of explosives per delay does not exceed 520 pounds, and the delay period is eight milliseconds or greater.

1. The maximum amount of explosives detonated shall not exceed the limits shown in Table 7.26(d).

Table 7.26(d)
Distance Versus Weight of Explosives Method*

Distance to a Building			Weight of Explosive per Delay pounds	Distance to a Building			Weight of Explosive per Delay pounds
feet over		feet not over		feet over		feet not over	
0	to	5	1/4	250	to	260	45
5	to	10	1/2	260	to	280	49
10	to	15	3/4	280	to	300	55
15	to	60	**	300	to	325	61
60	to	70	6	325	to	350	69
70	to	80	7 1/4	350	to	375	79
80	to	90	9	375	to	400	85
90	to	100	10 1/2	400	to	450	98
100	to	110	12	450	to	500	115
110	to	120	13 3/4	500	to	550	135
120	to	130	15 1/2	550	to	600	155
130	to	140	17 1/2	600	to	650	175
140	to	150	19 1/2	650	to	700	195
150	to	160	21 1/2	700	to	750	220
160	to	170	23 1/4	750	to	800	240
170	to	180	25	800	to	850	263
180	to	190	28	850	to	900	288
190	to	200	30 1/2	900	to	950	313
200	to	220	34	950	to	1000	340
220	to	240	39	1000	to	1100	375
240	to	250	42	1100	to	1200	435
				1200	to	1300	493

Note to Table

* This table over 60 feet is based upon the formula $W = \frac{D^{1.5}}{90}$

** One tenth of a pound of explosive per foot of distance to a building.

2. When the maximum amount of explosives to be detonated on any single delay period exceeds 520 pounds, the ground vibration limits for buildings shall comply with (e), (f) or (g) below.

3. If the ground vibrations are not within the blasting criteria of (f) below due to either blast design or geological conditions, the commissioner may require a modified vibration control method for the blast site.

(e) This subsection shall apply to ground vibration limits for blasting operations near a building when it is elected to monitor each blast with an approved peak particle velocity recorder.

1. The blasting shall be conducted so that the peak particle velocity on any one component of an instrument measuring three component motion does not exceed the limits of Table 7.26(e).

Table 7.26(e)
Distance Versus Peak Particle Velocity Method

Distance			Peak Particle Velocity of Any One Component* inches per second
feet over		feet not over	
0	to	100	2.0
100	to	200	1.75
200	to	500	1.5
500	to	1000	1.0
		over 1000	0.75

Note to Table

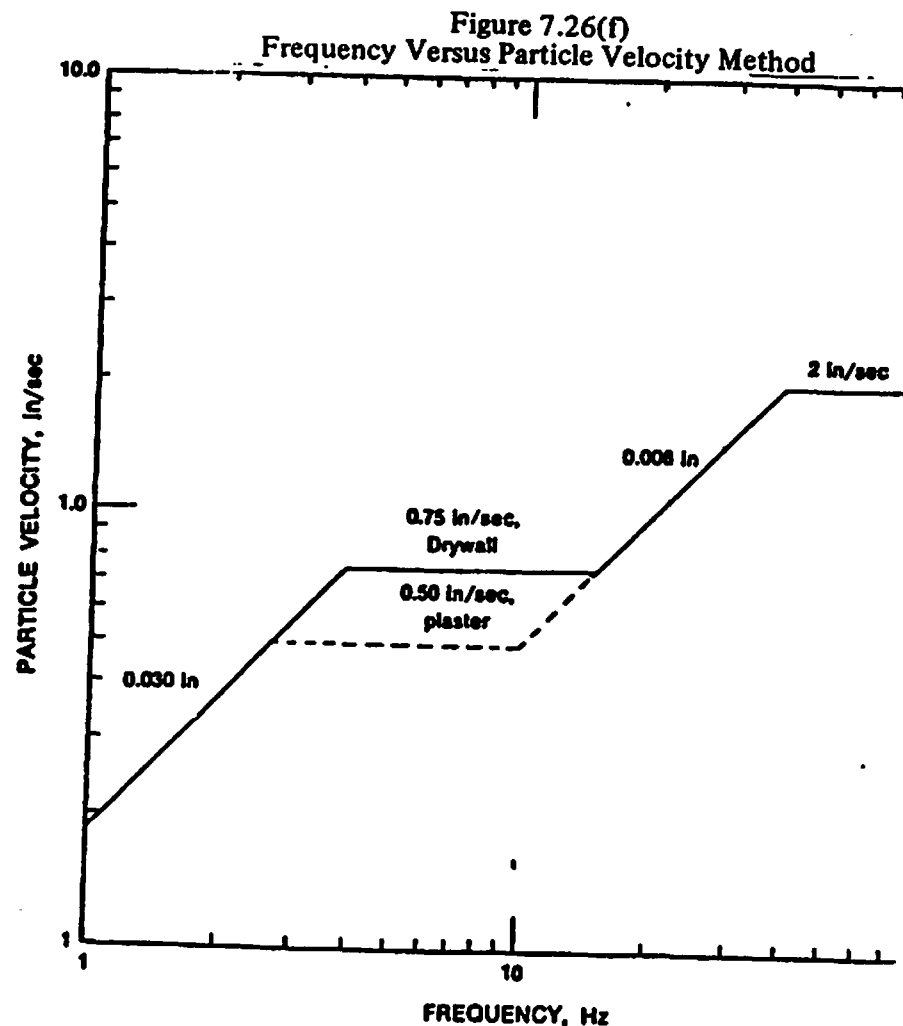
* The instrument's transducer shall be firmly coupled to the ground.

2. When starting to monitor a new blasting operation with instrumentation, the first blast design shall be close to the limits established in Table 7.26(d). From this starting point, the blast design may be increased to a point which will keep the ground vibration within the limits of Table 7.26(e).

3. If the ground vibrations are not within the blasting criteria of (f) below due to either blast design or geological conditions, the commissioner may require a modified control method for the blast site.

(f) This subsection shall apply to ground vibration limits for blasting operations in the vicinity of a building that is being monitored by a seismic instrument or system of instrumentation approved by the commissioner.

1. The blasting shall be conducted so that the low frequency ground vibration does not exceed the limits of Figure 7.26(f)



Note to Figure

* Figure from U.S. Bureau of Mines, Report of Investigation 8:

(g) This subsection shall apply to ground vibration limits blasting operations utilizing a modified scaled distance established petition.

1. At any site where blasting is of a continuing nature with the blast design unchanged and geological conditions unchanging, the commissioner may be petitioned to set a modified scaled distance equation which would be less restrictive than (d) or (e) above.

2. The petition shall include:

i. A written statement of the reasons for the request,

ii. A map showing residences within a radius of 3,000 feet of the blast site,

iii. A proposed method of establishing a modified scaled distance,

iv. An outline of the test procedures including monitoring of at least three blasts with approved instrumentation,

v. A map showing the exact placement of one instrument at the nearest building, the placement of one instrument at a distance of 2,000 feet from the blast, and the placement of a third instrument at some distance between the first two instruments,

vi. A proposed schedule for the test runs which shall be observed by the commissioner.

3. The instrumentation data shall be interpreted by a competent person. The modified scaled distance equation shall be based on the criteria established in (f) above. The modified scaled distance equation shall be prepared by a competent person and submitted to the commissioner for approval.

4. Upon approval by the commissioner, the modified scaled distance equation may be used at the specific blast site in place of (d), (e) or (f) above provided:

i. The conditions under which the testing was performed do not change,

ii. The procedure established is verified every six months,

iii. The modified scaled distance equation is not willfully disregarded.

(h) This subsection shall apply to ground vibration limits on structures.

1. The limits for ground vibration when blasting near structures shall not exceed a peak particle velocity of two inches per second.

(i) Instrumentation used in this section shall comply with (i)1, (i)2, and (i)3 below.

1. All instruments and instrumentation systems shall be approved.

2. Unless field seismic instruments have internal calibration capability, the instruments shall be calibrated according to the manufacturer's instructions at least once a year by a competent person.

3. All instruments used shall be operated by a competent person, and the recordings shall be interpreted by a competent person.

SUBCHAPTER 8.
EXPLOSIVES AT PIERS, RAILWAY, TRUCK AND
AIR TERMINALS

12:190-8.1 Scope of subchapter

This subchapter shall apply to explosives at piers, railways, truck and air terminals.

12:190-8.2 General

(a) Except in an emergency and when approved by the commissioner, no person shall have or keep explosives in a railway car unless said car and contents and methods of loading are in accordance with N.J.A.C. 12:190-6.

(b) No person shall deliver any explosive to any carrier unless such explosive conforms in all respects, including marking and packing, to N.J.A.C. 12:190-6.

(c) Every railway car containing explosives which has reached its destination, or is stopped in transit so as no longer to be in interstate commerce, shall remain placarded in accordance with N.J.A.C. 12:190-6.

(d) Any explosive at a railway facility, truck terminal pier, wharf, harbor facility or airport terminal, whether for delivery to a consignee, or forwarded to some other destination, shall be kept in a safe place, isolated as far as practicable and in such manner that the explosive can be easily and quickly removed.

(e) Truck terminals for explosive vehicles shall be in accordance with Explosives Motor Vehicle Terminals, NFPA No. 498-1976.

12:190-8.3 Notification

A consignee, having been notified that a shipment of explosives in the hands of any carrier, shall remove the explosives within 48 hours, Saturdays, Sundays and holidays excluded, after receiving such notification, to some place meeting the provisions of this chapter.

12:190-8.4 Trailer-on-flatcar, container-on-flatcar facilities

(a) Railway shipments of explosives by trailer-on-flatcar (TOFC) or container-on-flatcar (COFC) shall comply with this section.

(b) Shipments of explosives by TOFC or COFC shall not be unloaded at a nonagency station unless the consignee is there to receive them or unless properly locked and secured storage facilities are provided at that point for their protection. If delivery cannot be made, the shipment shall be taken to the next or nearest agency station for delivery.

(c) Carriers shall require the consignee to remove TOFC or COFC shipments from the carriers' property within 48 hours after a notice of arrival has been sent or given. Saturdays, Sundays, and holidays are not included. If the trailers or containers are not removed, the carrier shall immediately dispose of the shipment, by storage, by disposal or, when necessary to safety, by destruction, under supervision of a competent person.

(d) If storage is required to comply with (c) above, storage shall be in an interchange lot similar to that prescribed in Chapter 3 or 3 in Explosives Motor Vehicle Terminals, NFPA No. 498-1976 in a place that will provide safety to the public.

(e) When local conditions make the acceptance, transportation, or delivery of explosives unusually hazardous, local restrictions shall be imposed by the carrier.

(f) For shipment of Class A explosives, when practicable, any point, regular days shall be assigned for receiving trailers and containers for shipment.

(g) To enable the carrier to provide proper flatcars for shipment of Class A explosives, the shipper shall give to the carrier less than 24 hours notice of his intention to offer such shipments and state their destinations. When regular days have been appointed to receive trailers and containers for shipment, this notice may be waived by the carrier, but the explosive shipment shall be delivered on such days in time to permit proper inspection, billing, and loading on such days.

(h) Carriers shall forward shipments promptly and within 48 hours, Saturdays, Sundays, and State holidays excluded, after acceptance at the originating point or receipt at any yard transfer station or interchange point, except that where biweekly or weekly service is performed, shipments shall be forwarded on the first available train.

(i) Cars loaded with explosive materials shall be placed so that they will be safe from all probable danger from fire. They shall not be placed under bridges or overhead highway crossings, or in close proximity of passenger sheds or stations, except for loading or unloading purposes.

12:190-8.5 Designation of facilities

The commissioner may designate the location for, and limit the quantity of explosives which may be loaded, unloaded, reloaded, or temporarily retained at any facility.

SUBCHAPTER 9. BLASTING AGENTS

12:190-9.1 Scope of subchapter

(a) This subchapter shall apply to the storage, handling and mixing of blasting agents.

(b) Unless otherwise set forth in this chapter, blasting agents shall be stored in the same manner as other explosives.

(c) The construction and operation of motor vehicles for the bulk delivery and mixing of blasting agents in intrastate commerce or in transportation off-the-highway shall comply with the applicable sections of N.J.A.C. 12:190-6.

12:190-9.2 Location of mixing facilities

(a) Buildings or other facilities used for mixing blasting agents shall be located, with respect to inhabited buildings, passenger railroads and public highways in accordance with N.J.A.C. 12:190-5.

(b) In determining the distance separating highways, railroads and inhabited buildings from mixing facilities, the sum of all masses which may propagate from either individual or combined donor masses shall be included in the calculations. However, when ammonium nitrate must be included only 50 percent of its weight shall be used.

12:190-9.3 Mixing buildings

(a) Buildings used for the mixing of blasting agents shall conform to this section, unless otherwise specifically approved by the commissioner.

(b) Buildings shall be of noncombustible construction or sheathed metal on wood studs.

(c) Floors in a mixing building shall be of concrete or of other nonabsorbent materials.

(d) All fuel oil storage facilities shall be separated from the mixing building and located in such a manner that in case of tank rupture, the oil will drain away from the mixing plant building.

(e) The building shall be well ventilated.

(f) Heating units which do not depend on combustion processes, when properly designed and located, may be used in the building. All direct sources of heat shall be provided exclusively from units located outside the mixing building.

(g) All internal-combustion engines used for electric power generation shall be located outside the mixing building, or shall be properly ventilated and isolated by a firewall. The exhaust system on all such engines shall be located so that any spark emission cannot be a hazard to any material in or adjacent to the building.

(h) All electrical switches, controls, motors, and lights located in the mixing room of the mixing building shall conform to the National Electrical Code, NFPA 70-1981, for Class II, Division 2 locations. The frame of the mixer and all other equipment that may be used shall be electrically bonded and be provided with a continuous path to the ground.

12:190-9.4 Equipment used in mixing

(a) Equipment used for mixing blasting agents shall conform to this section.

(b) The design of the mixer shall minimize the possibility of frictional heat, compaction, and especially confinement. All bearings and drive assemblies shall be mounted outside the mixer and be protected against accumulations of dust. All surfaces shall be accessible for cleaning.

(c) Mixing and packaging equipment shall be constructed of materials compatible with the fuel-ammonium nitrate composition.

(d) Suitable means shall be provided to prevent the flow of fuel oil to the mixer. In gravity flow systems, an automatic spring-loaded shutoff valve with fusible link shall be installed.

12:190-9.5 Compositions

(a) The provisions of this section shall be considered when determining blasting agent compositions.

(b) The sensitivity of the blasting agent shall be determined by means of a No. 8 test blasting cap at regular intervals after every change in formulation, or as may be required by the commissioner.

(c) Oxidizers of small particle size, such as crushed ammonium nitrate pills or fines, may be more sensitive than coarser products and shall be handled with greater care.

(d) No hydrocarbon liquid fuel with flash point lower than that of No. 2 fuel oil (125 degrees F minimum or legal) shall be used.

(e) Crude oil and crankcase oil shall not be used because they may contain light ends that offer increased vapor-explosion hazards or gritty particles that tend to sensitize the resulting blasting agent.

(f) Peroxides and chlorates shall not be used.

(g) Metal powders, such as aluminum, shall be kept dry and shall be stored in containers or bins which are moisture-resistant or weather-tight. Solid fuels shall be used to minimize dust explosion hazards.

(h) The provisions of (d), (e) and (f) above shall not apply to compositions made under the supervision of a qualified person engaged in research and development capable of determining the overall hazard of the resulting product in its manufacturing, storage, or use.

12:190-9.6 Precautions at mixing plants

(a) Precautions at mixing plants shall include the following as provided by this section.

(b) Floors shall be constructed so as to eliminate floor drains and piping into which molten materials could flow and be confined in case of fire.

(c) The floors and equipment of the mixing and packaging room shall be cleaned regularly and thoroughly to prevent accumulation of oxidizers, fuels, or other sensitizers.

(d) The entire mixing and packaging building shall be cleaned regularly and thoroughly to prevent excessive accumulation of dust.

(e) Casual sources of ignition and firearms (except firearms carried by guards when authorized by police authorities) shall not be permitted inside of or within 50 feet of any building or facility used for the mixing of blasting agents.

(f) The land surrounding the mixing building shall be kept clear of brush, dried grass, leaves and other combustible materials for a distance of at least 25 feet.

(g) Empty ammonium nitrate bags shall be disposed of in a safe manner daily.

(h) No welding shall be permitted or open flames used in or around the mixing or storage area of the plant unless the equipment or area has been completely washed down and all oxidizing material removed.

(i) Before welding or repairs to hollow shafts, all oxidizing material shall be removed from the outside and inside of the shaft and the shaft vented with a minimum one half inch diameter opening.

(j) Explosives shall not be stored inside of or within 50 feet of any building or facility used for the mixing of blasting agents.

12:190-9.7 Pneumatic unloading from bulk mix delivery motor vehicles

(a) Pneumatic loading from bulk mix delivery motor vehicles into blast holes primed with electric blasting caps or other static-sensitive systems shall conform to this section.

(b) A positive grounding device shall be used to prevent the accumulation of static electricity.

(c) A discharge hose shall be used that has a resistance range that will prevent conducting stray currents, but that is conductive enough to bleed off static buildup.

(d) A qualified person shall evaluate all systems to determine if they will adequately dissipate static under potential field conditions.

12:190-9.8 Bulk storage bins

(a) The bin shall be a Type 4 magazine and shall be waterproof.

(b) The bin, including supports, shall be constructed of compatible materials, and adequately supported and braced to withstand the combination of all loads, including impact forces arising from product movement within the bin and accidental vehicle contact with the support legs.

(c) The bin discharge gate shall be designed to provide a closure tight enough to prevent leakage of the stored product. Provision shall also be made so that the gate can be locked.

(d) Bin loading manways or access hatches shall be hinged or otherwise attached to the bin and be designed to permit locking.

(e) Any electrically driven conveyors for loading or unloading bins shall conform to the National Electrical Code, NFPA No 70-1981. They shall be designed to minimize damage from corrosion.

(f) Bins containing blasting agents shall be located in accordance with Table 5.10 of N.J.A.C. 12:190-5.

(g) Bins containing ammonium nitrate shall be separated from blasting agent storage and other explosives storage in accordance with Table 5.10 of N.J.A.C. 12:190-5.

(h) Good housekeeping practices shall be maintained around any bin containing ammonium nitrate or blasting agents. This includes keeping weeds and other combustible materials clear within 25 feet of such bin. Accumulation of spilled product on the ground shall be prevented.

12:190-9.9 Storage of blasting agents and supplies

(a) This section shall apply to the storage of blasting agents and oxidizers used for mixing of blasting agents.

(b) Blasting agents or ammonium nitrate, when stored in conjunction with explosives, shall be stored as provided in N.J.A.C. 12:190-5. The mass of blasting agents and one-half the mass of ammonium nitrate shall be included when computing the total quantity of explosive materials for determining distance.

(c) Blasting agents, when stored entirely separate from explosives, shall be stored in a Type 4 magazine or a magazine of high classification (lower number).

(d) Magazines in which blasting agents are stored shall be constructed so as to eliminate open floor drains and piping into which molten materials could flow and be confined in case of fire.

(e) Semi-trailers or full-trailers used for highway or on-site transportation of the blasting agents may be used for temporary storing these materials, provided they are located in accordance with N.J.A.C. 12:190-5. Trailers shall be provided with substantial means for locking, and the trailer doors shall be kept locked, except during the time of placement and removal of stocks of blasting agents.

(f) Piles of ammonium nitrate and warehouses containing ammonium nitrate shall be separated adequately from readily combustible fuels.

3. Cabinets separated from flammable liquids, flammable solids and oxidizing materials by a wall having a fire resistance rating of not less than one hour or by a distance of 25 feet.

(e) Smokeless powder exceeding 400 pounds shall be stored in accordance with N.J.A.C. 12:190-5.

12:190-10.3 Black powder

(a) Black powder not exceeding 50 pounds may be stored in a residence. Black powder not exceeding five pounds stored in a residence shall be in approved USDOT shipping containers. Black powder exceeding five pounds but not exceeding 50 pounds in a residence shall be in a Type 4 magazine.

(b) Black powder not exceeding 50 pounds intended for resale may be stored in any building and shall be in a Type 4 indoor magazine.

(c) Black powder exceeding 50 pounds shall be stored in a Type 4 outdoor magazine, outside of buildings.

12:190-10.4 Smokeless powder and black powder

If smokeless powder is stored in the same magazine with black powder, the total quantity of explosives so stored shall not exceed that permitted for black powder.

12:190-10.5 Conditions for sale

No person shall sell, give or deliver any smokeless powder or black powder to any person for any use unless such person has a valid permit for such use, except that smokeless powder in the amounts not to exceed 36 pounds and black powder not to exceed five pounds may be sold to private persons for use in reloading small arms ammunition for personal use and not resale.

SUBCHAPTER 11. SALE OF EXPLOSIVES

12:190-11.1 Scope of subchapter

(a) This subchapter shall apply to the sale of commercial explosives, except as provided in (b) below.

(b) This subchapter shall not apply to the sale of explosives under contract to the U.S. Government nor to the sale of explosives from one manufacturer to another manufacturer.

12:190-11.2 Prohibitions

(a) No person shall sell, display or expose for sale any commercial explosives on any highway, street, sidewalk, public way or public place.

(b) Before a product line of explosives is offered for sale, the seller shall file a complete description of the explosives in such line and their packaging with the appropriate officials of the Division of Workplace Standards. A sales publication with a complete description of the explosives and packaging may be used to comply with this provision.

(c) No person shall sell, give or deliver explosives to any person not in possession of a valid permit to sell, transport, store or use explosives. This provision shall not apply to an authorized representative of a valid permit holder who is on a certified list by the permit holder.

(d) No person shall sell, deliver or transfer explosives to any person whose possession of such explosives would constitute a violation of this chapter.

(e) No person shall load explosives onto a buyer's vehicle which readily can be observed to be not in compliance with N.J.A.C. 12:190-6.

(g) Caked oxidizers, either in bags or in bulk, shall not be loosened by blasting.

(h) Every magazine used for the storage of blasting agents shall be under the supervision of a competent person who shall be not less than 21 years of age.

SUBCHAPTER 10.

SMOKELESS POWDER AND BLACK POWDER

12:190-10.1 Scope of subchapter

(a) This subchapter shall apply to:

1. The storage of smokeless powder and black powder for the reloading of small arms ammunition, and

2. The channels of distribution for the users of smokeless powder and black powder.

(b) This subchapter shall not apply to the storage or processing of smokeless powder and black powder during the manufacturing process.

12:190-10.2 Smokeless powder

(a) A cabinet for smokeless powder shall have walls at least one inch thick, with an interior of nonsparking material. Shelves shall not exceed a three feet separation. The cabinet shall have at least one lock and hinges and hasps that cannot be removed when the door is closed and locked.

(b) Smokeless powder not exceeding 100 pounds intended for personal use may be stored in a residence. Smokeless powder not exceeding 36 pounds stored in residences shall be in approved USDOT shipping containers. Smokeless powder exceeding 36 pounds but not exceeding 100 pounds stored in a residence shall be in a cabinet, and not more than one cabinet shall be used.

(c) Smokeless powder not exceeding 400 pounds intended for resale shall be stored in a warehouse or storage room which is not accessible to unauthorized personnel, or as provided in (d) below.

(d) Smokeless powder not exceeding 400 pounds intended for resale shall be stored in non-portable storage cabinets as follows:

1. Not more than two cabinets in a building and not more than 200 pounds of smokeless powder in a single cabinet,

2. Cabinets located against walls of the warehouse or storage room with a minimum separation of 10 feet between cabinets,

SUBCHAPTER 12.
STANDARDS AND PUBLICATIONS REFERRED TO
IN THIS CHAPTER

12:190-12.1 Documents referred to by reference

(a) The full title and edition of each of the standards or publications referred to in this chapter are as follows:

1. 27 CFR Part 55, Commerce in Explosives;
2. 49 CFR Parts 171 through 178, Hazardous Materials Regulations;
3. 49 CFR Parts 390 through 397, Federal Motor Carrier Safety Regulations;
4. IME Safety Library Publications No. 20-1978, Radio Frequency Radiation Hazards;
5. NFPA No. 70-1981, National Electric Code;
6. NFPA No. 498-1976, Explosives Motor Vehicle Terminals;
7. NJAC 5:23, Uniform Construction Code;
8. NJSA 21:1A-128 et seq., Explosives Act;
9. NJSA 21:2-1 et seq., Manufacture, Storage and Transportation of Fireworks;
10. NJSA 21:3-1 et seq., Sale and Public Display of Fireworks;
11. 18 USC Chapter 44, Gun Control Act of 1968;
12. 29 USC 651 et seq., Occupational Safety and Health Act; and
13. USPC-1980-20th Edition, United States Pharmacopeia.

12:190-12.2 Availability of documents for inspection

A copy of each of the standards and publications referred to in this chapter is on file and may be inspected at the following office of the Division of Workplace Standards between the hours of 9:00 A.M. and 4:00 P.M. on normal working days:

New Jersey Department of Labor
Division of Workplace Standards
Labor and Industry Building, Room 1103C
Trenton, New Jersey

12:190-12.3 Availability of documents from issuing organization

Copies of the standards and publications referred to in this chapter may be obtained from the organizations listed below. The abbreviations preceding these standards and publications have the

following meaning and are the organizations issuing the standards and publications listed in NJAC 12:190-12.1.

CFR	—	Code of Federal Regulations Copies available from: Superintendent of Documents Government Printing Office Washington, D.C. 20402
IME	—	Institute of Makers of Explosives 1575 Eye Street, N.W. Suite 550 Washington, D.C. 20005
NFPA	—	National Fire Protection Association Batterymarch Park Quincy, MA 02269
NJAC	—	New Jersey Administrative Code Copies available from: Construction Code Enforcement Section Department of Community Affairs 363 West State Street Trenton, NJ 08608
NJSA	—	New Jersey Statutes Annotated Copies available from: Office of Safety Compliance New Jersey Department of Labor CN 386 Trenton, NJ 08625
18 USC	—	United States Code Copies available from: Bureau of Alcohol, Tobacco and Firearms U.S. Department of Treasury 2 Penn Center Plaza, Room 360 Philadelphia, PA 19102
29 USC	—	United States Code Copies available from: Occupational Safety & Health Administration U.S. Department of Labor 1515 Broadway New York, NY 10036
USPC	—	United States Pharmacopeial Convention, Inc. 12601 Twinbrook Parkway Rockville, MD 20852