

FIRE SAFETY

FIRE SUPPRESSION & DETECTION EQUIPMENT

Inspection & Testing Guidelines Go Beyond the "Code of Federal Regulations"

BY ERWIN E. "ED" BATES

Mine operators must comply with numerous requirements for inspection, testing, and maintenance of fire suppression and detection equipment. Title 30 of the Code of Federal Regulations (30 CFR) contains requirements and references to national consensus standards. The national standards have changed considerably over a long period of years reflecting current best practices for fire suppression and detection systems. The federal requirements have not kept pace with the evolving national standards and best practices. As an example, there are still references back to 1961, and in that case, the document has been replaced.

30 CFR covers a broad range of requirements, including evaluation and approval of mining products, personnel safety, record keeping, fire protection and detection. Through its outreach programs, the Mine Safety and Health Administration (MSHA) provides guidance to mine operators in developing safety programs on how to operate a mine, meet minimal regulations, and codes.

Mine operators have typically adhered to the specific written sections of 30 CFR when dealing with the inspection and testing of mine fire protection and detection systems, including first aid fire fight-

ing equipment. Mine personnel may not be aware that other codes and standards are referenced in 30 CFR. In some cases, the external standards are incorporated by reference and the requirements of the standards are mandatory requirements of 30 CFR. In other cases, 30 CFR references national consensus standards for informational purposes without requirements for compliance.

Moreover, personnel who have completed inspections of mining operations have not always made mine management aware of these referenced codes. Thus, inspections, tests and calibration of equipment have not been completed in accordance with the more stringent codes and regulations with documented results. The lack of routine inspections have caused product of combustion smoke detectors not to be replaced; pre-action and wet automatic sprinkler systems to be shut-off and sprinkler systems protecting transformer vaults to become impaired because of plugged sprinkler openings or removed sprinkler heads.

MATERIAL APPROVED FOR INCORPORATION BY REFERENCE

"Incorporation by reference was established by statute and allows Federal agencies to

meet the requirement to publish regulations in the Federal Register by referring to materials already published elsewhere. For an incorporation to be valid, the Director of the Federal Register must approve it. The legal effect of incorporation by reference is that the material is treated as if it were published in full in the Federal Register (5 U.S.C. 552(a)). This material, like any other regulation, has the force of law".²

The Director of the Federal Register will approve an incorporation by reference only when the requirements of 1 CFR part 51 are met. Some of the requirements on which approval is based are:

- the incorporation will substantially reduce the volume of material published in the Federal Register;
- the matter incorporated is in fact available to the extent necessary to afford fairness and uniformity in the administrative process; and
- the incorporating document is drafted and submitted for publication in accordance with 1 CFR part 51.

Table 1 indicates the National Fire Protection Association (NFPA) standards that are referenced by MSHA in 30 CFR.

The regulations suggests that mine operators seeking further information in the



The lack of routine inspections have caused product of combustion smoke detectors (left) not to be replaced; pre-action and wet automatic sprinkler systems to be shut-off (center); and sprinkler systems protecting transformer vaults (right) to become impaired because of plugged sprinkler openings or removed sprinkler heads.

FIRE SAFETY CONTINUED

area of fire prevention and control may consult a specific list of national consensus standards. Specific editions of the NFPA Standards are not identified in 30 CFR Parts 56 and 57 as non-mandatory references but include the following:

- NFPA 10, Portable Fire Extinguishers
- NFPA 11, Low Expansion Foam
- NFPA 11A, High Expansion Foam
- NFPA 12, Carbon Dioxide Extinguishing Systems
- NFPA 12A, Halon 1301 Extinguishing Systems
- NFPA 13, Water Sprinkler Systems
- NFPA 14, Standpipe and Hose Systems
- NFPA 15, Water Spray Fixed Systems
- NFPA 16, Foam Water Spray Systems
- NFPA 17, Dry Chemical Extinguishing Systems
- NFPA 121, Mobile Surface Mining Equipment
- NFPA 291, Testing and Marking of Hydrants
- NFPA 1962, Care, Use, and Maintenance of Fire Hose

Some of the standards listed in Tables 1 and 2 have had their identification changed versus what is noted above. Parts 75 and 77 make specific edition references to NFPA Standards, many of which have been superseded by newer versions. The edition dates cited in 30

CFR are mandatory. Later editions may be consulted for current best practices but should be used with caution to assure compliance with 30 CFR. The following are examples of these changes:

1. NFPA 11-1970, Low Expansion Foam and Combined Agent Systems has changed to Standard for Low, Medium and High-Expansion Foam, NFPA 11-2002.
2. NFPA 11A-1970, High Expansion Foam Systems has changed to Standard for Medium and High-Expansion Foam Systems, NFPA 11A-1999.
3. NFPA 13A-1971, Care and Maintenance of Sprinkler Systems was withdrawn, but information was incorporated into a new document, NFPA 25-2002, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.
4. NFPA 198-1969, Care of Fire Hose has been incorporated into a new document, NFPA 1962-2003 Standard for the Inspection, Care, and Use of Fire Hose, Couplings, and Nozzles and the Service Testing of Fire Hose.
5. NFPA 72A-1967, Local Protective Signaling Systems has been withdrawn. NFPA 72-2002 National Fire Alarm Code is now the appropriate Standard.
6. NFPA 60-1961, Installation and Operation of Pulverized Fuel Systems has

been replaced by NFPA 85-2001, Boiler and Combustion Systems Hazard Code.

MISSING STANDARDS & REFERENCES

30 CFR does not include reference to several other key NFPA Standards, which include NFPA 20, Standard for the Installation of Stationary Pumps for Fire Protection; NFPA 25, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems; NFPA 122, Standard for Fire Prevention and Control in Underground Metal/Nonmetal Mining and Metal Mineral Processing Facilities; and NFPA 120, Standard for Fire Prevention and Control in Coal Mines.

NFPA 120 has consolidated NFPA 121, Standard on Fire Protection for Self-Propelled and Mobile Surface Mining Equipment and NFPA 123, Standard for Fire Prevention and Control in Underground Bituminous Coal Mines.

NFPA 121 and 123 have been removed from the Code. Operators should be aware of these Standards' information and guidance concerning improvements in installations, acceptance testing, operational reliability and ongoing maintenance of fire protection equipment and systems. However, operators must comply with all requirements of 30 CFR mandatory references.

As an example, NFPA 25 requires annual full flow testing of a diesel driven fire pump (See photos, next page). Fire pump testing is an important aspect of having an adequate fire suppression system, which is not addressed by 30 CFR.

Since the NFPA Standards have received numerous incorporations and elimination revisions of various sections of the National Fire Codes over many years, mine operators wishing to reference the incorporated 30 CFR regulations would have difficulty since the outdated publications are not available as current editions.

Mine operators would have to go to some length to find these outdated Standards. NFPA and the National Archives and Records Administration would have to be contacted and used as a source for the older versions of the NFPA Standards.

The NFPA Standards that are currently and specifically referenced by 30 CFR are the only ones to be used.

Table 1—NFPA Documents Referenced by 30 CFR

30 CFR MSHA Section	NFPA Documents
56.12045, 56.12048, 57.12045, 7.12048, 75.513-1, 75.518-1, 77.503-1, 77.506-1, 77.516, 77.901, 57.4201, 57.4261, 57.4262	NFPA 70-1968 National Electrical Code
75.1107-16	NFPA 11A-1970, High Expansion Foam Systems
75.1101-7	NFPA 13-1968-1969, Installation of Sprinkler Systems
75.1107-16	NFPA 13A-1971, Care and Maintenance of Sprinkler Systems
75.1107-16	NFPA 15-1969, Water Spray Fixed Systems for Fire Protection
75.1107-16	NFPA 17-1969, Dry Chemical Extinguishing Systems
75.1107-3, 75.1107-13	NFPA 22-1971, Water Tanks for Private Fire Protection (Incorporated in part, sections pertaining to pressure vessels only.)
77.301	NFPA 60-1961, Installation and Operation of Pulverized Fuel Systems (Incorporated only with respect to dryers)
75.1103-2, 75.1107-4, 75.1107-16	NFPA 72A-1967, Local Protective Signaling Systems
75.1107-16	NFPA 198-1969, Care of Fire Hose
77.1109	NFPA Fire Protection Handbook, 12th Edition (1962)

FIRE SAFETY CONTINUED

Referenced Codes and Standards

The National Fire Protection Association (NFPA) Codes and Standards are referenced in several Subchapters of 30 CFR. They include the following:

1. Subchapter K - Metal and Nonmetal Mine Safety and Health

Part 56 - Safety and Health Standards Surface Metal and Nonmetal Mines

Subpart C - Fire Prevention and Control

Appendix I to Subpart C of Part 56 - National Consensus Standards

(In this instance, the consensus standards are referenced without a date of revision and are referenced for information, only.)

2. Subchapter K - Metal and Nonmetal Mine Safety and Health

Part 57 - Safety and Health Standards - Underground Metal and Nonmetal Mines

Subpart C - Fire Prevention and Control

Appendix I to Subpart C of Part 57 - National Consensus Standards

(In this instance, the consensus standards are referenced without a date of revision and are referenced for information, only.)

3. Subchapter O - Coal Mine Safety and Health

Part 75 - Mandatory Safety Standards - Underground Coal Mines

Subpart L - Fire Protection

a. 75.1101-7 Installation of water sprinkler system

Requirements: The section references NFPA 13, Installation of Sprinkler Systems, 1969-69 Edition and components and parts shall be approved by UL (Underwriters Laboratory) and FM (Factory Mutual Research Corp.)

b. 75.1103-2 Automatic fire sensors

Approved components; Installation requirements
The section references NFPA 72A, Local Protective Signaling Systems, 1967 Edition. NFPA 72A is hereby incorporated by reference and made a part hereof.

c. 75.1107-16 Inspection of fire suppression devices

- (a) All fire suppression devices shall be visually inspected at least once each week by a person qualified to make such inspections.
- (b) Each fire suppression device shall be tested and maintained in accordance with the requirements specified in the appropriate National Fire Code listed as follows for the type and kind of device used:

Under 75.1107-17, the NFPA Codes referenced in 75.1107-1 through 75.1107-16 are incorporated and made a mandatory part of 30 CFR for fire suppression devices. The incorporated NFPA standards are limited to those standards and revision dates listed in Table 2.

Table 2-NFPA Standards Incorporated by Reference in 30 CFR

NFC Codes and Standards
NFC 11A, High Expansion Foam Systems (NFPA 11A-1970)
NFC 13A, Care and Maintenance of Sprinkler Systems (NFPA 13A-1971)
NFC 15, Water Spray Fixed Systems For Fire Protection (NFPA 15-1969)
NFC 17, Dry Chemical Extinguishing Systems (NFPA 17-1969)
NFC 72, Local Protective Signaling Systems (NFPA 72-1967)
NFC 198, Care of Fire Hose (NFPA 198-1969)

4. Subchapter O - Coal Mine Safety and Health

Part 77 - Mandatory Safety Standards, Surface Coal Mines and Surface Work Areas of

Underground Coal Mines Subpart L - Fire Protection

a. 77.1109 Quantity and location of fire-fighting equipment

- (3)(f) Vehicles transporting explosives and blasting agents shall be equipped with fire protection as recommended in NFPA 495, Section 20, NFPA Handbook, 12th Edition, 1962.

Changing of the incorporated reference standards is considered as revising the regulations in 30 CFR, and this action would require going through the formal change process with public review and comment as required by the Mine Act. For this reason, federal regulations are sometimes a number of versions behind the current published standards.

MSHA recognizes the difficulties in compliance that are raised by referencing outdated consensus standards. In these cases, MSHA has endeavored to address the issues by policy or internal directives to its inspectors. Sometimes, if necessary, the situation may need to be addressed through rulemaking. If this situation arises; the mine operator should feel free to contact MSHA for guidance.

30 CFR does make reference that mine operators seeking further information in the area of fire prevention and control may consult the national consensus standards (NFPA National Fire Codes and Standards). The listing of identified standards are not specific to dates, thus mine operators can use the current editions for reference, only.

NFPA STANDARD DEVELOPMENT PROCESS

The National Fire Codes are annual compilations of the Codes, Standards, Recommended Practices, and Guides prepared by Technical Committees organized under NFPA sponsorship in accordance with the published procedures of the Association and the American National Standards Institute (ANSI). Only those current documents, which have been adopted by the association, are included in the National Fire Codes.

The NFPA's purpose is to promote the science and improve the methods of fire protection and prevention, electrical safety, and other related safety goals; to obtain and circulate information on these subjects; and to secure the cooperation of its members and the public in establishing proper safeguards against loss of life and property. Its membership is comprised of national and regional societies, and associations and thousands of individuals, corporations and organizations.

The board of directors of the association appoints persons from those vitally interested, qualified, and active in the areas with which the Committees are

Table 3—Inspection and Testing Frequency Highlights Summary

30 CFR MSHA

56.4201 (a)(5) 57.4201 (a)(5) Fire suppression systems shall be inspected at least once every twelve months

75.1101-11 Inspection of Water Sprinkler Systems
Weekly examination and an annual functional test

75.1103-11 Tests of fire hydrants and fire hose; record of tests:
Annual test by opening to insure operation and each fire hose shall be tested, at intervals not exceeding 1 year

75.1107-16 Inspection of fire suppression devices
(a) At least once each week by a qualified person.
(b) Devices shall be tested and maintained in accordance with NFPA Codes (1968-1969 Editions).

77.1110 Fire suppression systems shall be inspected at least every 12 months

56.4201 (a)(4)
57.4201 (a)(4)
Visual inspection of water pipes, valves, outlets, hydrants and hoses every 3 months and use tested at least annually

56.4201& 57.4201 Inspection (Monthly)

75.1100-3 Condition and examination of firefighting equipment:
Chemical extinguishers shall be examined every 6 months

77.1110 Examination and maintenance of fire fight equipment: Fire extinguishers shall be examined at least once every 6 months

75.1107-16 Inspection of fire suppression devices
(a) At least once each week by a qualified person.
(b) Devices shall be tested and maintained in accordance with NFPA Codes (1970 Edition).

National Fire Codes - Current Editions

NFPA 25-2002, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems (not referenced by 30 CFR)

Table 5.1 Summary of Sprinkler System Inspection, Testing and Maintenance
Valves - Weekly or Monthly
Alarm Devices - Quarterly
Sprinkler System - Annually
Main Drain - Annual

Table 7.1 Summary of Private Fire Service Main Inspection, Testing, and Maintenance

Table 8.1 Summary of Fire Pump Inspection, Testing, and Maintenance

Inspection: Fire Pump System
(Weekly)

Test: Fire Pump(s) Diesel or Electric
(Weekly) No Flow Condition
Diesel, minimum 30 minutes
Electric, minimum 10 minutes
(Annual) Flow Condition

Table 8.5.3 Summary of Fire Pump Inspection, Testing, and Maintenance

Table 12.1 Summary of Valves, Valve Components, and Trim Inspection, Testing, and Maintenance

Visual Inspection: Preaction/Deluge Valves
(Monthly) Dry Pipe Valves
Alarm Valves

Hose Racks: Quarterly

Testing: Main Drains
(Annual) Control Valves
Alarm Valves
Preaction/Deluge Valves (full flow)
Dry Pipe Valves (full flow every 3 years)
Hydrants (full flow)

Testing: Water Flow Alarms (quarterly)

NFPA 10-2002, Standard for Portable Fire Extinguishers
(non-mandatory reference in 30 CFR)
Monthly visual with documentation

NFPA 11-2002, Standard for Low, Medium, and High-Expansion Foam
(non-mandatory reference in 30 CFR)

NFPA 11A-1999, Standard for Medium and High-Expansion Foam Systems (1970 edition referenced in 30 CFR)

Periodic Inspection - At least annually, all foam systems shall be thoroughly inspected and checked for proper operation. Reference Table 11.1 Summary of Foam-Water Sprinkler System Inspection, Testing and Maintenance in NFPA 25

NFPA 12-2000, Standard on Carbon Dioxide Extinguishing Systems (non-mandatory reference in 30 CFR)

FIRE SAFETY CONTINUED

Table 3—Inspection and Testing Frequency Highlights Summary Continued...

<p>57.4201(a)(4) Visual inspection of water pipes, valves, outlets, hydrants and hoses every 3 months and use tested at least annually</p>	<p>Inspection & Maintenance - (1) At least every 30 days, an inspection shall be conducted to assess the system's operational condition (2) Between the regular service contract maintenance or tests, the system shall be inspected visually or otherwise by approved or competent personnel who follow an approved schedule (3) At least semiannually, all high-pressure cylinders shall be weighed and the date of the last hydrostatic test noted. *Testing of heat, smoke and flame detectors shall be in accordance with Chapter 7 of NFPA 72, National Fire Alarm Code.</p>
<p>75.1107-16 Inspection of fire suppression devices (a) At least once each week by a qualified person. (b) Devices shall be tested and maintained in accordance with NFPA Codes (1969 Edition).</p>	<p>NFPA 14-2003, Standard for the Installation of Standpipe and Hose Systems (non-mandatory reference in 30 CFR) Reference NFPA 25 Table 6.1 Summary of Standpipe and Hose Systems Inspection, Testing, and Maintenance (Not referenced in 30 CFR)</p>
<p>75.1101-22 (a) Each dry powder chemical system shall be examined weekly and at least annually, a function test of the complete system 75.1107-16 Inspection of fire suppression devices (a) At least once each week by a qualified person. (b) Devices shall be tested and maintained in accordance with NFPA Codes (1969 Editions).</p>	<p>NFPA 15-2001, Standard for Water Spray Fixed Systems for Fire Protection (1969 edition referenced in 30 CFR) Reference NFPA 15, NFPA 25 & NFPA 72 for inspection and testing requirements. Table 10.1 Summary of Water Spray Fixed System Inspection, Testing, and Maintenance in NFPA 25 NFPA 16-2003, Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems (non-mandatory reference in 30 CFR) Reference NFPA 16, NFPA 25 & NFPA 72 for inspection and testing requirements.</p>
<p>75.1103-8 Automatic fire sensor and warning device systems; inspection and test requirements: shall be inspected weekly and a functional test completed at least annually with documented results</p>	<p>NFPA 17-2002, Standard for Dry Chemical Extinguishing Systems (1969 edition referenced in 30 CFR) (1) Monthly basis, inspection shall be conducted in accordance with the manufacturer's listed installation and maintenance manual or owner's manual (2) At least semiannually, maintenance shall be conducted in accordance with the manufacturer's listed installation and maintenance manual. NFPA 22-2003, Standard for Water Tanks for Private Fire Protection (non-mandatory reference in 30 CFR) Table 9.1 Summary of Water Storage Tank Inspection, Testing, and Maintenance Inspection: Valves (weekly or monthly) Tank (quarterly) Tests Level Indicators (semiannual)</p>
<p>75.1107-16 Inspection of fire suppression devices (a) At least once each week by a qualified person. (b) Devices shall be tested and maintained in accordance with NFPA Codes (1970 Editions). 75.1107-16 Inspection of fire suppression devices (a) At least once each week by a qualified person. (b) Devices shall be tested and maintained in accordance with NFPA Codes (1970 Editions).</p>	<p>NFPA 72-2002, National Fire Alarm Code (1967 edition referenced in 30 CFR) 1. Visual Inspection of Initiating Devices - Semiannual 2. Testing Initiating Devices - Annual Additional system components should be inspected and tested per Tables 10.3.1 Visual Inspection and 10.4.3 Testing Frequencies</p>
<p>75.1107-16 Inspection of fire suppression devices (a) At least once each week by a qualified person. (b) Devices shall be tested and maintained in accordance with NFPA Codes (1970 Editions).</p>	<p>NFPA 1962-2003, Standard for the Inspection, Care, and Use of Fire Hose, Couplings, and Nozzles and the Service Testing of Fire Hose (non-mandatory reference in 30 CFR) Fire Hose for Occupant Use should be service tested at least every 3 years. The hose shall be un-racked, visually inspected and re-racked in a different position annually. Reference Table 6.1 Summary of Standpipe and Hose Systems Inspection, Testing, and Maintenance in NFPA 25</p>

FIRE SAFETY CONTINUED



Annual full flow testing of a diesel driven firepump, as required by NFPA 25.



concerned so as to achieve a fair balance of affected interests. Membership on the various committees is made up from an equitable number of personnel from the following categories: Manufacturer, User, Installer/ Maintainer, Labor, Applied Research/ Testing Laboratory, Enforcing Authority, Insurance, Consumer and Special Expert. This is done to balance the committee, thus preventing any one group or special interest from having a majority.

Prior to adoption of revised, updated or new documents, the material is made available to all interested parties to review and submit their comments about the proposal. All interested parties can become involved in the development and implementation of the NFPA Codes.

The system provides an avenue for regulatory agencies and industry to voice their concerns about proposals or changes, which could affect their organizations or jurisdictions. NFPA's focus on true consensus has helped the NFPA's code development process earn accreditation from the American National Standards Institute (ANSI).

The revised NFPA Codes have seen major changes over the past 30 plus years. New technology through testing and analysis has presented beneficial changes to reduce the potential for severe losses to life and property.

MSHA regulations in some cases exceed the NFPA minimum recommended visual inspections of suppression systems, but only then require annual inspections and mechanical/electrical testing of the system components. Hoses and fire hydrants, as an example are only service tested through operation versus hydrostatically testing the hoses and flushing and flow testing of the fire hydrants.

Fire extinguishers per NFPA 10-2002, Standard for Portable Fire Extinguishers, are visually inspected monthly whereas 30 CFR has two different frequencies. 30 CFR makes reference to 56.4201 and 57.4201 Inspection (Monthly) and 75.1100-3, Condition and Examination of Firefighting Equipment. Also, the reference to portable chemical fire extinguishers in 77.1110, Examination and Maintenance of Firefighting Equipment states that they shall be examined every six months.

30 CFR regulations and NFPA Standards are similar in the areas of inspection and testing frequencies of the fire protection and sup-

port equipment, but the NFPA Standards are updated on a scheduled frequency, whereas, the Code of Federal Regulations are only changed through a lengthy legal process, which can take years.

Mining operators are required to meet the regulations included in 30 CFR. It makes references to specifically published and dated NFPA Standards of which several do not exist today. Additionally, several important NFPA Standards have not been incorporated in the regulations, thus the mining operators do not have to follow them unless specified by their underwriters.

Broadening the list of incorporated national consensus standards would bring into law the latest technology in the prevention of loss to life, property and have the backing of 30 CFR and NFPA standards.

The equipment used and installed would have to be approved by a nationally recognized testing laboratory (note: the standards do not provide approvals), designed, installed, and acceptance tested per national standards, and the equipment would be maintained, inspected and tested per current regulations and standards. This would improve the operational reliability of the fire protection and detection equipment to operate in a fire situation, thus reducing the severity of property loss.

References

1. "Standard" connotes code, standard, recommended practice, or guide. (National Fire Codes)
2. 30 CFR: Code of Federal Regulations (Revised as of July 1, 2002)

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