



NATIONAL FIRE PROTECTION ASSOCIATION

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FIRST DRAFT AGENDA

NFPA Technical Committee on Mining Facilities (MIN-AAA) NFPA 120/122 First Draft Meeting (F2027)

January 21-22, 2026
11:00 a.m. – 4:00 p.m. (ET)

Web/ Teleconference

To join the meeting, please contact Sarah Caldwell (scaldwell@nfpa.org).

- 1. Call to order.** Mario Orozco.
- 2. Introductions.** See committee roster attached.
- 3. Chair report.** Mario Orozco.
- 4. Staff liaison report.** Sarah Frey.
- 5. Previous meeting minutes.** April 19th and 20th, 2022, Web/ Teleconference . See attached.
- 6. NFPA 120/122 First Draft.**
 - a. **Public Inputs.** Attached.
 - b. **Task group report(s).**
 - i. **Task Group on Anthracite Coal Mines.** Don Vickers.
 - ii. **Task Group on Autonomous Equipment/Mobile Equipment Fire Suppression.** Jason Schurtz.
 - iii. **Hot Work Incidents in Mining Facilities.** Matthew Paine.
- 7. Other Business.**
- 8. Future meetings.**
- 9. Adjournment.**

Address List No Phone

01/07/2026

Sarah Frey

MIN-AAA

Mining Facilities

Mario G. Orozco	I 1/10/2002	David G. Aden	E 3/1/2011
Chair	MIN-AAA	Principal	MIN-AAA
International Mining Insurance Underwriters(IMIU)		State of Alaska Department of Public Safety	
100 South Emerson Street		Division of Fire & Life Safety	
Unit 214		1979 Peger Road	
Mount Prospect, IL 60056		Fairbanks, AK 99709	
Hocine Ait Mohamed	SE 4/2/2020	Michael Bednar	M 04/14/2021
Principal	MIN-AAA	Principal	MIN-AAA
Paragon Risk Engineering		United Safety	
769 Montee De L'eglise		3047 Main Street	
Montreal, QC H9C 1H2 Canada		Slatington, PA 18080	
Michael Breneman	U 08/17/2017	Matthew J. Bujewski	I 4/1/1993
Principal	MIN-AAA	Principal	MIN-AAA
Peabody Energy		Aon- Commercial Risk Consultants	
701 Market Street		9437 Caddyshack Circle	
St Louis, MO 63101		St. Louis, MO 63127	
		Alternate: Nick Burghardt	
John D. Campbell	M 04/04/2017	Joseph J. Chrobak, Sr.	E 11/30/2016
Principal	MIN-AAA	Principal	MIN-AAA
NV5		William Penn Fire Company	
732 Spring Crest Court		23 Blue Ridge Drive	
Fenton, MO 63026-3920		Levittown, PA 19057	
Hidrosistemas Baja			
Robert Clementi	I 04/14/2021	Jack Douglas Conaway	U 3/4/2009
Principal	MIN-AAA	Principal	MIN-AAA
AXA XL Risk Consulting/Global Asset Protection Services, LLC.		Arch Coal, Inc.	
13449 Lincoln Way		One CityPlace Drive, Suite 300	
North Huntingdon, PA 15642		St. Louis, MO 63141	
Global Asset Protection Services, LLC		Alternate: Eric Metheny	
Paolo De Rosa	I 08/17/2018	Rickard P. Hansen	SE 08/03/2016
Principal	MIN-AAA	Principal	MIN-AAA
Marsh Canada		The University of Queensland	
120 Bremner Boulevard		St Lucia QLD 4072	
Suite 800		St. Lucia, QL 4072 Australia	
Toronto, ON M5S0A8 Canada			
Alternate: Christopher Quinn			
Jason Wallace Jeffe	U 08/17/2018	William Paul Jolbert	M 11/29/2023
Principal	MIN-AAA	Principal	MIN-AAA
Murray Energy Corporation		Amerex Corporation	
543 Potomac Drive		4235 Williams Road	
Washington, PA 15301		Ransomville, NY 14131	
		Alternate: Alan Fulton	

Address List No Phone

01/07/2026

Sarah Frey

MIN-AAA

Mining Facilities

Matthew Kohl	IM 04/17/2024	Ryan LaPointe	M 04/09/2025
Principal Cintas Fire 404 Shannon Avenue Energy, IL 62933 National Association of Fire Equipment Distributors Alternate: Carroll Wesley Wollard	MIN-AAA	Principal Johnson Controls Inc. 2700 Industrial Pkwy South Marinette, WI 54143 Alternate: Kristin Ryczek	MIN-AAA
Scott Matthews	M 04/03/2019	Erick Mondragon	I 08/03/2016
Principal AFEX Fire Suppression Systems 6031 Oak Forest Drive Raleigh, NC 27616 Alternate: Matt Brian Huenink	MIN-AAA	Principal Swiss Reinsurance Company (Swiss Re) 1450 Brickell Avenue Suite 1750 Miami, FL 33131	MIN-AAA
Matthew Paine	I 04/11/2018	Matthew Payne	SE 04/09/2025
Principal FM 270 Central Avenue Johnston, RI 02919	MIN-AAA	Principal Hindsight Risk Engineering P.O. Box 1231 Carindale, QUEENSLAND 4152 Australia	MIN-AAA
Robrecht Schmitz	M 04/12/2022	Jason Schurtz	I 04/14/2021
Principal Sibelco D Gmbh Saelzerstr. 20 56235 Baumbach, RANSBACH 56235 Germany	MIN-AAA	Principal Cincinnati Insurance 6917 Ardelle Drive Reynoldsburg, OH 43068 Alternate: Patrick Marcotte	MIN-AAA
Steven A. Sheldon	SE 08/09/2012	Rudi Suardi	U 12/04/2024
Principal Fisher Engineering, Inc. 3707 East Southern Avenue Mesa, AZ 85206 Alternate: Shaun Thomas Ryan	MIN-AAA	Principal PT Adaro Energy Indonesia Tbk Gedung Cyber 2 Lantai 23 Jl Rasuna Said Blok X-5 No.13 Jakarta Selatan, DKI JAKARTA 12940 India	MIN-AAA
Robert D. Taylor	U 12/06/2017	William B. Till, Jr.	SE 12/08/2015
Principal Coal Users Group 4294 Martha Court Newburgh, IN 47630-0002	MIN-AAA	Principal Bernie Till & Associates LLC 197 Till Hill Road Orangeburg, SC 29115-8744	MIN-AAA
Pierre M. Tousignant	U 04/11/2018	Daniel P. Wake	M 08/11/2014
Principal Sherritt Metals 1768 Chemin Des Patriotes Sainte-Victoire, QC J0G 1T0 Canada	MIN-AAA	Principal Victaulic Company of America 4901 Kesslersville Road PO Box 31 Easton, PA 18040-6714 National Fire Sprinkler Association Alternate: Tracy Bollig	MIN-AAA

Address List No Phone

01/07/2026

Sarah Frey

MIN-AAA

Mining Facilities

Chris Yoder	M 03/07/2013	Liming Yuan	RT 08/03/2016
Principal Pillar Innovations 32 Corporate Drive Grantsville, MD 21536-1259 Alternate: Barry Wayne Maust	MIN-AAA	Principal National Institute for Occupational Safety & Health (NIOSH) 626 Cochrans Mill Road Pittsburgh, PA 15236	MIN-AAA
Tracy Bollig	M 08/17/2018	Nick Burghardt	I 12/04/2024
Alternate American Fire Sprinkler Corporation 6750 West 47th Terrace Mission, KS 66203 National Fire Sprinkler Association Principal: Daniel P. Wake	MIN-AAA	Alternate Aon 20 Bay Street Toronto, ON M6J2N8 Canada Principal: Matthew J. Bujewski	MIN-AAA
Alan Fulton	M 11/29/2023	Matt Brian Huenink	M 04/09/2025
Alternate Amerex Corporation 7595 Gadsden Highway Trussville, AL 35173 Principal: William Paul Jolbert	MIN-AAA	Alternate AFEX Fire Suppression Systems 6031 Oak Forest Drive Raleigh, NC 27616 Principal: Scott Matthews	MIN-AAA
Patrick Marcotte	I 08/23/2023	Barry Wayne Maust	M 04/14/2021
Alternate Cincinnati Insurance 206 Allies Way Jasper, GA 30143 Principal: Jason Schurtz	MIN-AAA	Alternate Pillar Innovations LLC. 92 Corporate Drive Grantsville, MD 21536 Principal: Chris Yoder	MIN-AAA
Eric Metheny	U 10/23/2013	Christopher Quinn	I 08/11/2020
Alternate Arch Coal Sentinel Complex 21550 Barbour County Highway Philippi, WV 26416 Principal: Jack Douglas Conaway	MIN-AAA	Alternate Marsh Canada 6454 Clark Montreal, QC H2S 3E6 Canada Principal: Paolo De Rosa	MIN-AAA
Shaun Thomas Ryan	SE 04/14/2021	Kristin Ryczek	M 12/03/2025
Alternate Fisher Engineering 1208 E. Broadway Road Suite 201 Tempe, AZ 85282 Principal: Steven A. Sheldon	MIN-AAA	Alternate Johnson Controls 2700 Industrial Parkway South Marinette, WI 54143 Principal: Ryan LaPointe	MIN-AAA

Address List No Phone

01/07/2026

Sarah Frey

MIN-AAA

Mining Facilities

Carroll Wesley Wollard	IM	12/07/2022	Sarah Frey	5/30/2025
Alternate		MIN-AAA	Staff Liaison	MIN-AAA
Fire X Sales & Service Corp			National Fire Protection Association	
1011 Mccauley Court			1 Batterymarch Park	
Hagerstown, MD 21740			Quincy, MA 02169-7471	
National Association of Fire Equipment Distributors				
Principal: Matthew Kohl				



NATIONAL FIRE PROTECTION ASSOCIATION

The leading information and knowledge resource on fire, electrical and related hazards

MEETING MINUTES

NFPA Technical Committee on Mining Facilities (MIN-AAA) NFPA 120/122 Second Draft Meeting (F2022)

April 19th and 20th, 2022
12:00 p.m. – 4:00 p.m. (ET)

Web/Teleconference

1. **Call to order.** Mario Orozco, chair, called the meeting to order at 12:00 p.m. on April 19th, 2022.
2. **Introductions.** Attendees introduced themselves and identified their affiliation. NFPA staff took attendance.
3. **Chair report.** Mario Orozco welcomed attendees and provided an overview of the meeting.
4. **Staff liaison report.** Matt Barker provided an overview of the standards development process and the revision cycle schedule.
5. **Previous meeting minutes.** The minutes from March 24th, 25th, 29th, and 31st, 2021 Web/Teleconference were approved without revision.
6. **NFPA 120/122 Second Draft.**
 - a. **Review of Public Comments and Committee Inputs.** The Technical Committee reviewed the Public Comments on NFPA 120 and developed responses as necessary. These will be available in the Second Draft Report at www.nfpa.org/120. No Public Comments were received for NFPA 122.
 - b. **Task group report(s).** The following task groups provided their reports and recommendations.
 - i. **Task Group on Anthracite Coal Mines.** TG Chair: Don Vickers. Members: Bob Taylor. The task group provided a report and did not recommend any revisions at this time. The task group was reconstituted to continue work to prepare possible public inputs for the next revision cycle.
 - ii. **Task Group on Autonomous Equipment/Mobile Equipment Fire Suppression.** Task Group Chair: Chad Ryzek. Members: Paolo DeRosa, Jason Schurtz, Robert Clementi, Bob Taylor, Rickard Hansen, Alden Spencer, Scott Matthews, Christopher Quinn. The task group provided a report, no recommendations for revisions were made. However, the task group was reconstituted to continue work to prepare a formal request to bring NFPA 121 *Standard on Fire Protection for Self-Propelled and Mobile Surface Mining Equipment* back to print. Task group will continue to work on identifying requirements from NFPA 121 that could be added to existing chapters in NFPA 120

and NFPA 122 if NFPA 121 is not brought back to print. Task group will also consider the addition of references in NFPA 120 and NFPA 122 to other applicable standards and will explore outreach opportunities with other technical committees that may be dealing autonomous equipment fire hazards.

- c. **New task group.** The following task group was appointed to work subsequent to the meeting:

- i. **Task Group on Hot Work Incidents in Mining Facilities.** TG Chair: Matthew Paine. Members: Erick Mondragon, Bob Taylor, Pierre Tousignant. Task Group was created to research past hot work incidents in mining facilities and consider possible updates to requirements in both NFPA 120 and NFPA 122 to prevent similar incidents in the future.

7. **Other Business.** Second revisions were made in both NFPA 120 and NFPA 122 to update edition years of publications with extracted material in mandatory sections.
8. **Future meetings.** This was the final meeting of this committee for the revision cycle. Public Inputs for the next edition are expected to close January 2024. The committee is considering the possibility of holding a Pre-First Draft Meeting sometime in the Spring of 2023. A meeting notification will be posted at www.nfpa.org/120next or www.nfpa.org/122next when the next meeting is scheduled.
9. **Adjournment.** The meeting was adjourned at 2:35 p.m. on April 20th, 2022.

Attendees

Committee Members:

X	Orozco, Mario	Chair	Zurich Insurance
	Aden, David	Principal	State of Alaska Department of Public
	Ait Mohamed, Hocine	Principal	Rio Tinto
	Bednar, Michael	Principal	United Safety
X	Behrens, Steven	Principal	Global Asset Protection Services, LLC
	Breneman, Michael	Principal	Peabody Energy
X	Bujewski, Matthew	Principal	Aon- Commercial Risk Consultants
	Campbell, John	Principal	Hidrosistemas Baja
	Chrobak, Joseph	Principal	William Penn Fire Company
	Conaway, Jack	Principal	Arch Coal, Inc.
	Corcoran, Brian	Principal	Wolverine Fire Protection
X	De Rosa, Paolo	Principal	Marsh USA Inc.
X	Hansen, Rickard	Principal	The University of Queensland

	Jeffe, Jason	Principal	Murray Energy Corporation
X	Kirk, L. Harvey	Principal	US Department of Labor
X	Kohl, James	Principal	National Association of Fire Equipment
X	Matthews, Scott	Principal	AFEX Fire Suppression Systems
X	Mondragon, Erick	Principal	Swiss Reinsurance Company (Swiss Re)
X	Paine, Matthew	Principal	FM Global
	Pate, Kendall	Principal	Amerex Corporation
X	Ryczek, Chad	Principal	Johnson Controls
	Schmitz, Robrecht	Principal	Sibelco
X	Schurtz, Jason	Principal	Cincinnati Insurance
X	Sheldon, Steven	Principal	Fisher Engineering, Inc.
X	Taylor, Robert	Principal	PRB Coal Users' Group
	Thompson, Spencer	Principal	North American Coal
X	Till, William	Principal	Bernie Till & Associates LLC
X	Tousignant, Pierre	Principal	Sherritt Metals
	Wake, Daniel	Principal	National Fire Sprinkler Association
X	Yoder, Chris	Principal	Pillar Innovations
X	Yuan, Liming	Principal	National Institute for Occupational Safety &
X	Bolig, Tracy	Alternate	National Fire Sprinkler Association
X	Clementi, Robert	Alternate	Global Asset Protection Services, LLC
	Johnsey, Jacob	Alternate	Amerex Corporation
	Maust, Barry	Alternate	Pillar Innovations LLC.
	Metheny, Eric	Alternate	Arch Coal
	Quinn, Christopher	Alternate	Marsh USA Inc.
	Ryan, Shaun	Alternate	Fisher Engineering
	Spencer, Alden	Alternate	Johnson Controls
	Vickers, Don	Alternate	Mine Safety & Health Administration
X	Barker, Matthew	Staff Liaison	National Fire Protection Association

Guests:

Bill Jolbert Amerex

Respectfully submitted by:

Mario Orozco – Chair

Matt Barker – NFPA Staff Liaison



Public Input No. 29-NFPA 120-2026 [Global Input]

Public Input Statement:

New technologies are being introduced into both the mining and construction industries. Mining and material handling equipment is being developed that incorporates new technologies such as Lithium-Ion batteries, Autonomous vehicles, AI, and also more emphasis on the use of Natural Gas to power equipment. NFPA 121 was withdrawn in 2001 and incorporated into 120 and 122, before most of this technology started to appear within the construction and mining industries.

Lithium Ion: L-Ion battery power is being used to a much higher degree in the construction and mining industries than ever before. That being said, L-ion poses significant Fire and Life Safety risks to personnel and equipment, especially underground due to the inherent volatility of the battery technology. Thermal Runaway of batteries is a very hot and smoky event, off gassing flammable and toxic gases that include Hydrogen and Carbon Monoxide. Underground Life Safety is a significant item that needs to be addressed as more Li-Ion batteries and charging stations are being installed and utilized.

Autonomous Vehicles and Haulage Systems are becoming increasingly prevalent in both the mining, quarrying and construction industries. In many cases you might have one remote operator monitoring several vehicles. The operator must receive notifications of alarm and suppression troubles or activation, and be able to bring all equipment to a halted state. Autonomous equipment installed underground will have to have intrinsically safe electrical equipment that is designed to operate in confined spaces in close proximity to combustible dust exposures. It should be noted that some new autonomous equipment will also be powered by L-Ion batteries.

All of these new technologies are going to require advanced detection, monitoring and suppression technologies.

Our task group is presenting the idea of reinstating 121 given these further developments with Lithium Ion, AI, autonomous vehicle, protection systems etc. and the repetition within the 120 and 122 standards but also having applicability beyond mining. For the standards that need updating, and the depth of this new technology, it would be best to have the information in one place and refer to it as needed.

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Statement of Problem and Substantiation for Public Input

There is a great deal of new technology that is in place and needs to be addressed. For the standards that need updating, and the depth of this new technology, it would be best to have the information in one place and refer to it as needed.

Submitter Information Verification

Submitter Full Name: Jason Schurtz

Organization: Cincinnati Insurance

Street Address:

City:

State:

Zip:

Submittal Date: Wed Jan 07 08:46:48 EST 2026

Committee: MIN-AAA



Section/Annex Reference:

Annex A (Informational), add new A.x.x

Proposed Annex Text:

A.x.x Autonomous Multidomain Safety Systems for Mining Environments.

In addition to prescriptive requirements for fire prevention and control in coal mines, facilities may adopt autonomous multidisciplinary safety architectures such as AIMSAFEGURD™. These systems integrate fiber-optic sensors for gas detection, oxygen displacement, pressure transients, vibration, and thermal anomalies, combined with AI-driven predictive analysis.

AIMSAFEGURD™ can identify precursor hazards such as methane buildup, abnormal vibration in conveyors, smoldering coal, oxygen depletion, or arc-flash risks in electrical substations. The system is capable of **triple-point isolation (MV/LV/DC)** for mine power distribution, conveyor drives, and ventilation systems, and can also autonomously close dampers or shut down fans to compartmentalize airflow during hazardous events.

While not required, these systems may be considered as supplemental measures to improve worker safety, protect critical infrastructure, and prevent catastrophic fire or explosion events in underground and surface coal mining operations.

Statement of Problem and Substantiation:

NFPA 120 focuses on established fire prevention practices but does not reference **autonomous predictive systems** capable of acting in real time without operator or SCADA delays.

AIMSAFEGURD™ advantages:

- **Pre-Ignition Hazard Detection:** methane, carbon monoxide, and thermal rise in coal handling areas.
- **Sub-Cycle Isolation:** rapid simultaneous shutdown of MV/LV/DC systems before arc-flash or ignition.
- **Cross-Domain Monitoring:** mechanical (vibration, friction), electrical (fault energy), and environmental (gas, oxygen) risks.
- **Fiber-Optic Infrastructure:** eliminates ignition hazards from copper control lines.
- **UPS-Backed Autonomy:** continuous protection during blackouts or cascading events.
- **Cross-Standard Alignment:** complements NFPA 70 (NEC), NFPA 77 (static electricity), NFPA 85 (boilers/combustion hazards), and NFPA 122 (metal/nonmetal mining).

By including this Annex note, NFPA 120 would modernize its approach, recognizing autonomous safety systems that prevent fire and explosion incidents **before ignition**, and aligning with the broader NFPA framework.

Additional Proposed Changes

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
AIMSAFEGURD_WHITE_PAPER_Optimized.pdf	AIMSAFEGURD™, an integrated safety and mitigation multi-level architecture that unifies electrical, mechanical, civil, structural, biological and rescue domains under a single supervisory framework.	

Statement of Problem and Substantiation for Public Input

NFPA 120 focuses on established fire prevention practices but does not reference autonomous predictive systems capable of acting in real time without operator or SCADA delays.

AIMSAFEGURD™ advantages:

Pre-Ignition Hazard Detection: methane, carbon monoxide, and thermal rise in coal handling areas.

Sub-Cycle Isolation: rapid simultaneous shutdown of MV/LV/DC systems before arc-flash or ignition.

Cross-Domain Monitoring: mechanical (vibration, friction), electrical (fault energy), and environmental (gas, oxygen) risks.

Fiber-Optic Infrastructure: eliminates ignition hazards from copper control lines.

UPS-Backed Autonomy: continuous protection during blackouts or cascading events.

Cross-Standard Alignment: complements NFPA 70 (NEC), NFPA 77 (static electricity), NFPA 85 (boilers/combustion hazards), and NFPA 122 (metal/nonmetal mining).

By including this Annex note, NFPA 120 would modernize its approach, recognizing autonomous safety systems that prevent fire and explosion incidents before ignition, and aligning with the broader NFPA framework.

Submitter Information Verification

Submitter Full Name: Oleg Tsyganok

Organization: AIM-SAFENET

Affiliation: NFPA Member #1114021697

Street Address:

City:

State:

Zip:

Submittal Date: Fri Sep 26 15:58:58 EDT 2025

Committee: MIN-AAA



Public Input No. 2-NFPA 120-2025 [Section No. 1.5 [Excluding any Sub-Sections]]

Nothing in this standard ~~is intended to prevent~~ shall prevent the use of systems, methods, or devices of equivalent or superior quality, strength, fire resistance, effectiveness, durability, and safety over those prescribed by this standard.

Statement of Problem and Substantiation for Public Input

Enforceable code language is "shall", the 'intent' is not relevant.
Equivalency is required to sustain/cultivate technological innovation.
Evidence of equivalency (or superiority) needs to be submitted to the AHJ, for approval.
In the last revision to NFPA 13, it was agreed to change "is intended to" to "shall" with justification it made the language enforceable, more closely following that required in the Manual of Style; the change was unanimously agreed.

Submitter Information Verification

Submitter Full Name: Chris Downing

Organization: Johnson Controls

Street Address:

City:

State:

Zip:

Submittal Date: Mon Jan 06 06:58:28 EST 2025

Committee: MIN-AAA



Public Input No. 30-NFPA 120-2026 [Section No. 2.3.3]

2.3.3 ASTM Publications.

ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.

ASTM D5/D5M, *Standard Test Method for Penetration of Bituminous Materials*, 2020.

ASTM D323, *Standard Test Method for Vapor Pressure of Petroleum Products (Reid Method)*, 2020a.

ASTM D4359, *Standard Test Method for Determining Whether a Material is a Liquid or a Solid*, 1990, reapproved 2019.

ASTM E72, *Standard Methods of Conducting Strength Tests of Panels for Building Construction*, 2015.

ASTM E136, *Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C*, ~~2019~~ 2024c.

ASTM E162, *Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source*, ~~2016~~ 2025a.

ASTM E2652, *Standard Test Method for Assessing Combustibility of Materials Using a Tube Furnace with a Cone-shaped Airflow Stabilizer, at 750°C*, ~~2018~~ 2022.

Statement of Problem and Substantiation for Public Input

date updates

Submitter Information Verification

Submitter Full Name: Marcelo Hirschler

Organization: GBH International

Street Address:

City:

State:

Zip:

Submittal Date: Wed Jan 07 15:13:53 EST 2026

Committee: MIN-AAA



Public Input No. 9-NFPA 120-2025 [Section No. 3.3]

3.3 General Definitions.

3.3.1 Adequate Ventilation.

Air volume and velocity that is sufficient to dilute, render harmless, and carry away flammable or explosive concentrations of dusts and vapors.

3.3.2 Atmospheric Tank.

A storage tank that has been designed to operate at pressures from 760 mm Hg through 812 mm Hg (atmospheric through 1.0 psig) measured at the top of the tank.

3.3.3 Boiling Point.

The temperature at which the vapor pressure of a liquid equals the surrounding atmospheric pressure. [30, 2021]

3.3.4 Closed Container.

A container as herein defined, so sealed by means of a lid or other device that neither liquid nor vapor will escape from it at ordinary temperatures. [30, 2021]

3.3.5 Coal Preparation.

The separation, crushing, screening, washing, drying, storage, and loadout of coal to make ready for market.

3.3.6 Combustible.

Capable of undergoing combustion.

3.3.7 Combustible Liquid.

Any liquid that has a closed-cup flash point at or above 37.8°C (100°F), as determined by the test procedures and apparatus set forth in Section 4.4 of NFPA 30. Combustible liquids are classified according to Section 4.3 of NFPA 30.

3.3.8 Combustible Liquid Storage Area — Fixed.

An area used for storage of Class II and Class III combustible liquids that is infrequently moved, and where the aggregate quantity present shall not exceed 18,925 L (5000 gal). Handling of liquids incidental to transfer can take place within a storage area.

3.3.9 Combustible Liquid Storage Area — Mobile.

Self-propelled or mobile equipment fitted with suitable containers or tanks and other related fixtures used for the storage, transport, and dispensing of Class II and Class III combustible liquids. The aggregate quantity of combustible liquid carried on such equipment does not exceed 3785 L (1000 gal).

3.3.10 Combustible Liquid Storage Area — Portable.

An area used for storage of Class II and Class III combustible liquids that is periodically moved, and where the aggregate quantity present does not exceed 3785 L (1000 gal). Handling of liquids incidental to transfer can take place within a storage area.

3.3.11 Combustion.

A chemical process of oxidation that occurs at a rate fast enough to produce heat and usually light in the form of either a glow or flame. [5000, 2021]

3.3.12 Container.

Any vessel of 450 L (119 gal) or less capacity used for transporting or storing liquids.

3.3.13 Diesel-Powered Equipment.

Any device powered by a diesel engine. [122, 2023]

3.3.14 Dry Pipe Sprinkler System.

A sprinkler system employing automatic sprinklers that are attached to a piping system containing air or nitrogen under pressure, the release of which (as from the opening of a sprinkler) permits the water pressure to open a valve known as a dry pipe valve, and the water then flows into the piping system and out the opened sprinklers. [13, 2022]

3.3.15 Emergency Egress.

An egress from a compartment or work station in emergencies when the normal egress is unusable.

3.3.16 Equipment Operator.

The authorized person who starts, controls, or stops mining equipment.

3.3.17 Fire Detector.

An automatic device designed to detect the presence of fire and initiate action. [122, 2023]

3.3.18 Fire-Resistant Construction.

Masonry walls or equivalent having at least a 1-hour fire rating, including compressible materials having an equivalent fire resistance capability.

3.3.19 Fire-Resistant Enclosure.

An enclosure that is constructed of fire-resistant construction.

3.3.20 Fire Risk Assessment.

The evaluation of the relative danger of the start and spread of fire; the generation of smoke, gases, or toxic fumes; and the possibility of explosion or other occurrence endangering the lives and safety of personnel or causing significant damage to property. [122, 2023]

3.3.21 Fixed Fire-Suppression System.

An engineered or pre-engineered total flooding or local application system consisting of a fixed supply of extinguishing agent permanently connected for fixed agent distribution to fixed nozzles that are arranged to discharge an extinguishing agent into an enclosure (total flooding), directly onto a hazard (local application), or a combination of both; or an automatic sprinkler system. [122, 2023]

3.3.21.1 Engineered Systems.

Engineered systems are those systems requiring individual calculation and design to determine the flow rates, nozzle pressures, pipe size, area, or volume protected by each nozzle, quantity of suppression agent, number and types of nozzles and their placement in a specific system.

3.3.21.2 Pre-Engineered Systems.

Those systems having predetermined flow rates, nozzle pressures, and quantities of extinguishing agent and having specific pipe size, maximum and minimum pipe lengths, flexible-hose specifications, number of fittings, and number and types of nozzles. [17, 2021]

3.3.22 Flammable Liquid.

Any liquid that has a closed-cup flash point below 37.8°C (100°F), as determined by the test procedures and apparatus set forth in Section 4.4 of NFPA 30, and a Reid vapor pressure that does not exceed an absolute pressure of 276 kPa (40 psi) at 37.8°C (100°F), as determined by ASTM D323, *Standard Test Method for Vapor Pressure of Petroleum Products (Reid Method)*. Flammable liquids are classified according to Section 4.3 of NFPA 30.

3.3.23 Flammable Liquid Storage Area.

Area used for storage of Class I liquids.

3.3.24 Flash Point.

The minimum temperature of a liquid at which sufficient vapor is given off to form an ignitable mixture with the air, near the surface of the liquid or within the vessel used, as determined by the appropriate test procedure and apparatus specified in Section 4.4 of NFPA 30. [30, 2021]

3.3.25 Hand Hose Line System.

A hose and nozzle assembly connected by fixed piping or connected directly to a supply of extinguishing agent. [122, 2023]

3.3.26 Hydrant.

A valved hose connection.

3.3.27 Important Structures.

A structure that is considered not expendable in an exposure fire.

3.3.28 Inby.

A mining term that means in the direction of the face of the mine or further into the mine.

3.3.29 Intrinsically Safe.

As applied to equipment and wiring, equipment and wiring that are incapable of releasing sufficient electrical energy under normal or abnormal conditions to cause ignition of a specific hazardous atmospheric mixture. [99, 2021]

3.3.30 Liquid.

Any material that (1) has a fluidity greater than that of 300 penetration asphalt when tested in accordance with ASTM D5/D5M, *Standard Test Method for Penetration of Bituminous Materials*, or (2) is a viscous substance for which a specific melting point cannot be determined but that is determined to be a liquid in accordance ASTM D4359, *Standard Test Method for Determining Whether a Material is a Liquid or a Solid*. [30, 2021]

3.3.31 Low Pressure Tank.

A storage tank designed to withstand an internal pressure above 3.5 kPa (0.5 psig) but not more than 102.4 kPa (15 psig).

3.3.32 Mine Operator.

Any owner, lessee, or other person who operates, controls, or supervises a mine. [122, 2023]

3.3.33* Mobile Equipment.

Wheeled, skid-mounted, track-mounted, or rail-mounted equipment capable of moving or being moved.

3.3.34 Noncombustible Material.

See 4.2.14.

3.3.35 Normal Operation.

The regular performance of those functions for which a machine or accessory is designed.

3.3.36 (adding 1 to subsequent) Nominal.

A designated or theoretical value that may vary from the actual, used to represent an accepted incremental range or standard size.

3.3.36 Operating Area.

An area where mining of coal is taking place or area where construction is underway.

3.3.37 Outby.

A mining term that means in the direction away from the face of the mine or toward the outside of the mine; opposite of inby.

3.3.38 Permissible Equipment.

A completely assembled machine or accessory for which formal approval has been issued, allowing operation in a potentially explosive methane and air-mixture environment.

3.3.39 Pipeline System.

An arrangement of piping, valves, connections, and allied equipment installed in a mine for the purpose of transporting, transferring, or dispensing ignitable (flammable or combustible) liquids. [122, 2023]

3.3.40 Portable Extinguisher.

An extinguisher of the hand-held or wheeled type that is capable of being carried or moved about, or a transportable system consisting of a hose reel or rack, hose, and discharge nozzle assembly connected to a supply of suppressant.

3.3.41 Portable Tank.

Any vessel having a liquid capacity over 230 L (60 gal) intended for storing liquids and not intended for fixed installation. [30, 2021]

3.3.42 Pressure Vessel.

A container or other component designed in accordance with the ASME *Boiler and Pressure Vessel Code*. [52, 2019]

3.3.43 Rock Dust.

Crushed limestone applied on surfaces in mines to make coal dust incombustible in the event of a gas explosion.

3.3.44 Safety Can.

A listed container of not more than 20 L (5.3 gal) capacity having a screen or strainer in each fill and pour opening and having a spring-closing lid and spout cover designed to safely relieve internal pressure when exposed to fire. [30, 2021]

3.3.45 Self-Closing Doors.

Doors that, when opened and released, return to the closed position. [80, 2022]

3.3.46 Self-Propelled Equipment.

Any unit that contains a motive power train as an integral part of the unit.

3.3.47 Suitable.

That which is appropriate and has the qualities or qualifications to meet a given purpose, occasion, condition, function, or circumstance. [122, 2023]

3.3.48 Tank.

A closed vessel having a liquid capacity in excess of 227 L (60 gal). [122, 2023]

3.3.49 Task Trained.

Instructed in the safety and health aspects and safe work procedures of the task prior to performing such tasks.

3.3.50 Unattended.

Any machine or device that is not regularly operated by a miner or not in direct line of sight of a miner that is assigned within 152.4 m (500 ft) of the equipment during each production shift.

Statement of Problem and Substantiation for Public Input

The term “nominal” is used inconsistently throughout NFPA Standards, particularly in reference to portable fire extinguisher capacities. This inconsistency can lead to confusion regarding compliance and performance expectations.

Adding a formal definition of “nominal” will clarify its intended use and ensure consistent application throughout the standards. The proposed definition aligns with established usage in other NFPA documents, including:

- NFPA 70 (National Electrical Code) – “nominal voltage”
- NFPA 5000 – “nominal dimensions” and “nominal size” (e.g., of timbers)
- NFPA 13 – “nominal diameters” of pipe

The definition is also consistent with Merriam-Webster’s meanings:

- “existing or being something in name or form only”
- “of, being, or relating to a designated or theoretical size that may vary from the actual: approximate”

Example from NFPA 120 / NFPA 122: Subsection 7.6.8.5 of NFPA 120 (2023) and 9.5.5 of NFPA 122 (2023) require a portable extinguisher rated at 4-A:60-B:C. A listed FORAY extinguisher rated 6-A:60-B:C, charged with 7.7 kg (17 lb), exceeds the required rating despite being slightly below the nominal capacity of 9.1 kg (20 lb).

This demonstrates that superior extinguishing agents can achieve higher ratings with less actual mass, yet still fall within the nominal range defined by standard capacity increments (e.g., 5 lb, 10 lb, 20 lb, 30 lb).

Additionally, the storage density of extinguishing agents can vary. As a result, the actual mass of the charge may be adjusted to maintain consistent fill levels, flow characteristics, and discharge performance. In such cases, referencing the nominal size of the extinguisher - rather than the precise mass - is more appropriate and reflective of practical design and listing conventions.

By defining and consistently applying the term “nominal”, the standard will better reflect real-world engineering practices and reduce ambiguity in interpretation and enforcement.

Submitter Information Verification

Submitter Full Name: Chris Downing

Organization: Johnson Controls

Street Address:

City:

State:

Zip:

Submission Date: Wed Nov 05 06:32:08 EST 2025

Committee: MIN-AAA



Public Input No. 3-NFPA 120-2025 [New Section after 3.3.2]

Automatically Operated Self-Targeting Monitor Systems

A monitor assembly designed to operate automatically that consists of a flame detector, a monitor equipped with electric motors & an image-based flame detector equipped with a pair of cameras (either visual or infrared), and a central control unit or remote control station.

Statement of Problem and Substantiation for Public Input

This adds a definition in line with FM standard 1421 that is referenced in other public inputs in chapters 4, 5, and 6.

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
<u>Public Input No. 4-NFPA 120-2025 [New Section after 4.3.4.6.3]</u>	
<u>Public Input No. 5-NFPA 120-2025 [New Section after 5.3.7.1]</u>	
<u>Public Input No. 6-NFPA 120-2025 [New Section after 6.3.2.6.3.2]</u>	

Submitter Information Verification

Submitter Full Name: James Lynch

Organization: The Fire Solutions Group

Affiliation: Fire Rover

Street Address:

City:

State:

Zip:

Submittal Date: Tue Jan 07 11:51:33 EST 2025

Committee: MIN-AAA



Public Input No. 31-NFPA 120-2026 [Section No. 4.2.14]

4.2.14* – Noncombustible Material.

4.2.14.1

A material that complies with any of the following shall be considered a noncombustible material:

- (1) * A material that, in the form in which it is used and under the conditions anticipated, will not ignite, burn, support combustion, or release flammable vapors when subjected to fire or heat
- (2) A material that is reported as passing ASTM E136, *Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C*
- (3) A material that is reported as complying with the pass/fail criteria of ASTM E136 when tested in accordance with the test method and procedure in ASTM E2652, *Standard Test Method for Assessing Combustibility of Materials Using a Tube Furnace with a Cone-shaped Airflow Stabilizer, at 750°C* [5000:7.1.4.1.1]

{ ~~101~~: 4-6-13

4.2.14.2

The following materials shall not be required to be tested to be acceptable as noncombustible materials, provided they do not contain any combustible components:

- (1) Glass
- (2) Steel
- (3) 3xxx, 5xxx, and 6xxx series aluminum alloys
- (4) Concrete
- (5) Masonry

[5000 : 7.1.4.1.3]

Statement of Problem and Substantiation for Public Input

NFPA 5000 is the correct reference for this extract, since NFPA 101 extracts from NFPA 5000. SR 8116 of NFPA 5000 updated this information by adding materials that do not need to be tested to be acceptable as noncombustible materials, replacing the vague 9and unenforceable) annex section referring to "inherently noncombustible materials.

NFPA 5000 must be added to the list of extracts documents.

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
Public Input No. 32-NFPA 120-2026 [Sections A.4.2.14, A.4.2.14(1)]	
Public Input No. 32-NFPA 120-2026 [Sections A.4.2.14, A.4.2.14(1)]	

Submitter Information Verification

Submitter Full Name: Marcelo Hirschler

Organization: GBH International

Street Address:

City:

State:

Zip:

Submittal Date: Wed Jan 07 15:16:33 EST 2026

Committee: MIN-AAA



Public Input No. 4-NFPA 120-2025 [New Section after 4.3.4.6.3]

4.3.4.7 Automatically Operated Self-Targeting Monitor Systems

Automatically Operated Self-Targeting Monitor Systems should be used in areas requiring automatic detection and suppression where electronically supervised automatic sprinklers are not suitable.

Statement of Problem and Substantiation for Public Input

Certain areas within mining operations present challenges for fire detection and suppression due to their inability to be effectively protected by traditional automatic sprinkler systems. These areas often encompass large open spaces or zones designated for combustible material storage. Automatic fire monitors offer a viable solution to address these challenges. Including provisions for this technology within the relevant NFPA code would help clarify that its use should—rather than shall—be considered as an alternative fire protection measure in such scenarios.

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
<u>Public Input No. 3-NFPA 120-2025 [New Section after 3.3.2]</u>	definition

Submitter Information Verification

Submitter Full Name: James Lynch

Organization: The Fire Solutions Group

Affiliation: Fire Rover

Street Address:

City:

State:

Zip:

Submittal Date: Tue Jan 07 11:57:25 EST 2025

Committee: MIN-AAA



Public Input No. 20-NFPA 120-2025 [Section No. 5.1]

5.1 General.

This chapter shall cover surface bituminous- ~~and subbituminous coal and lignite mining~~ , sub-bituminous, anthracite, and lignite coal mining operations.

Additional Proposed Changes

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
NFPA120_PC1.pdf	NFPA120_PC1	

Statement of Problem and Substantiation for Public Input

NOTE: This Public Input appeared as "Reject but Hold" in Public Comment No. 1 of the (F2022) Second Draft Report for NFPA 120 and per the Regs. at 4.4.8.3.1 and needs to be reconsidered by the TC for the next edition of the document.

missing Anthracite for coal mining operations. Also subbituminous should be "sub-bituminous". I rewrote the sentence to flow a bit better.

Submitter Information Verification

Submitter Full Name: NFPA Holds

Organization: Holds

Street Address:

City:

State:

Zip:

Submittal Date: Fri Nov 21 10:59:54 EST 2025

Committee: MIN-AAA



Public Comment No. 1-NFPA 120-2022 [Section No. 5.1]

5.1 General.

This chapter shall cover surface bituminous- and subbituminous coal and lignite- , sub-bituminous, anthracite, and lignite coal mining operations.

Statement of Problem and Substantiation for Public Comment

missing Anthracite for coal mining operations. Also subbituminous should be "sub-bituminous". I re-wrote the sentence to flow a bit better.

Related Item

- <https://en.wikipedia.org/wiki/Anthracite>

Submitter Information Verification

Submitter Full Name: Jason Schurtz

Organization: Cincinnati Insurance

Street Address:

City:

State:

Zip:

Submittal Date: Mon Jan 03 16:14:10 EST 2022

Committee: MIN-AAA

Committee Statement

Committee Action: Rejected but held

Resolution: The Task Group on Anthracite Coal Mines was created to review anthracite mines and it was determined that there was not enough information to adequately address the fire exposures or controls for anthracite mines at this time. The committee will continue the work of the Task Group on Anthracite Coal Mines to further research this area.



Public Input No. 23-NFPA 120-2025 [New Section after 5.3.3.2]

If water supply is derived from an equipment mounted tank, there should be a means of heating the tank, along with tank monitoring of water level and temperature.

Additional Proposed Changes

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
NFPA120_PC6.pdf	NFPA120_PC6	

Statement of Problem and Substantiation for Public Input

NOTE: This Public Input appeared as "Reject but Hold" in Public Comment No. 6 of the (F2022) Second Draft Report for NFPA 120 and per the Regs. at 4.4.8.3.1 and needs to be reconsidered by the TC for the next edition of the document.

FM data sheet 7-40 Heavy Duty Mobile Equipment allows for sprinkler protection for draglines. This would only be possible with a mounted tank. A water tank mounted to a dragline or other piece of equipment is another source of water supply. Controls should be in place to make sure tank water level and temperatures are maintained to make sure the water will be available in the event of freezing (or drought) conditions.

Submitter Information Verification

Submitter Full Name: NFPA Holds

Organization: Holds

Street Address:

City:

State:

Zip:

Submittal Date: Fri Nov 21 11:16:49 EST 2025

Committee: MIN-AAA



Public Comment No. 6-NFPA 120-2022 [New Section after 5.3.3.2]

TITLE OF NEW CONTENT

If water supply is derived from an equipment mounted tank, there should be a means of heating the tank, along with tank monitoring of water level and temperature.

Statement of Problem and Substantiation for Public Comment

FM data sheet 7-40 Heavy Duty Mobile Equipment allows for sprinkler protection for draglines. This would only be possible with a mounted tank. A water tank mounted to a dragline or other piece of equipment is another source of water supply. Controls should be in place to make sure tank water level and temperatures are maintained to make sure the water will be available in the event of freezing (or drought) conditions.

Related Item

- Dragline Fire Suppression

Submitter Information Verification

Submitter Full Name: Jason Schurtz

Organization: Cincinnati Insurance

Street Address:

City:

State:

Zip:

Submittal Date: Tue Jan 04 10:01:21 EST 2022

Committee: MIN-AAA

Committee Statement

Committee Action: Rejected but held

Resolution: Public comment introduces a concept that has not had public review by being included in a related input or first revision as shown in the first draft report. As this is considered new material, this public comment was rejected, but held so that it can be reviewed at the next first draft meeting.



Public Input No. 24-NFPA 120-2025 [New Section after 5.3.3.2]

Fire Pumps for mounted suction tanks shall follow NFPA-20 for setup, and NFPA-25 for inspection, testing and maintenance.

Additional Proposed Changes

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
NFPA120_PC7.pdf	NFPA120_PC7	

Statement of Problem and Substantiation for Public Input

NOTE: This Public Input appeared as "Reject but Hold" in Public Comment No. 7 of the (F2022) Second Draft Report for NFPA 120 and per the Regs. at 4.4.8.3.1 and needs to be reconsidered by the TC for the next edition of the document.

Draglines with mounted water tanks will likely need an electric or diesel powered pump, depending on pressure needed that is not compensated by elevation. These pumps should follow NFPA-20 for system design and setup, and NFPA-25 for ITM.

Submitter Information Verification

Submitter Full Name: NFPA Holds

Organization: Holds

Street Address:

City:

State:

Zip:

Submittal Date: Fri Nov 21 11:18:51 EST 2025

Committee: MIN-AAA



Public Comment No. 7-NFPA 120-2022 [New Section after 5.3.3.2]

TITLE OF NEW CONTENT

Fire Pumps for mounted suction tanks shall follow NFPA-20 for setup, and NFPA-25 for inspection, testing and maintenance.

Statement of Problem and Substantiation for Public Comment

Draglines with mounted water tanks will likely need an electric or diesel powered pump, depending on pressure needed that is not compensated by elevation. These pumps should follow NFPA-20 for system design and setup, and NFPA-25 for ITM.

Related Item

- Dragline Fire Suppression

Submitter Information Verification

Submitter Full Name: Jason Schurtz

Organization: Cincinnati Insurance

Street Address:

City:

State:

Zip:

Submittal Date: Tue Jan 04 10:10:40 EST 2022

Committee: MIN-AAA

Committee Statement

Committee Action: Rejected but held

Resolution: Public comment introduces a concept that has not had public review by being included in a related input or first revision as shown in the first draft report. As this is considered new material, this public comment was rejected, but held so that it can be reviewed at the next first draft meeting.



Public Input No. 22-NFPA 120-2025 [Section No. 5.3.3.2]

5.3.3.2 Water Supplies.

Fire suppression water supply shall be of sufficient quantity to extinguish the largest anticipated fire. This shall be accomplished with water trucks in pit areas- ~~or fire~~ , fire hydrants in coal processing areas, or equipment mounted water tanks .

Additional Proposed Changes

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
NFPA120_PC5.pdf	NFPA120_PC5	

Statement of Problem and Substantiation for Public Input

NOTE: This Public Input appeared as "Reject but Hold" in Public Comment No. 5 of the (F2022) Second Draft Report for NFPA 120 and per the Regs. at 4.4.8.3.1 and needs to be reconsidered by the TC for the next edition of the document.

FM data sheet 7-40 Heavy Duty Mobile Equipment allows for sprinkler protection for draglines. This would only be possible with a mounted water storage tank with pump.

Submitter Information Verification

Submitter Full Name: NFPA Holds

Organization: Holds

Street Address:

City:

State:

Zip:

Submittal Date: Fri Nov 21 11:13:22 EST 2025

Committee: MIN-AAA



Public Comment No. 5-NFPA 120-2022 [Section No. 5.3.3.2]

5.3.3.2 Water Supplies.

Fire suppression water supply shall be of sufficient quantity to extinguish the largest anticipated fire. This shall be accomplished with water trucks in pit areas- ~~or~~ , fire hydrants in coal processing areas, or equipment mounted water tanks .

Statement of Problem and Substantiation for Public Comment

FM data sheet 7-40 Heavy Duty Mobile Equipment allows for sprinkler protection for draglines. This would only be possible with a mounted water storage tank with pump.

Related Item

- Dragline Fire Suppression

Submitter Information Verification

Submitter Full Name: Jason Schurtz

Organization: Cincinnati Insurance

Street Address:

City:

State:

Zip:

Submittal Date: Tue Jan 04 09:57:13 EST 2022

Committee: MIN-AAA

Committee Statement

Committee Action: Rejected but held

Resolution: The committee has reviewed the additional recommended material. As this is considered new material, this public comment was rejected, but held so that it can be reviewed at the next first draft meeting.



Public Input No. 10-NFPA 120-2025 [Section No. 5.3.4.1]

5.3.4.1*

A ~~fully charged and operable ABC-type fire extinguisher having a nominal capacity of~~ 9.1 kg (20 lb)- ~~ABC-~~
~~type fire extinguisher shall~~ shall be provided at intervals not to exceed 15.2 m (50 ft) travel distance,
including the lower frame areas of draglines.

Statement of Problem and Substantiation for Public Input

There are many powder extinguishants which have efficacy beyond the legacy powders.
Elsewhere in the standard “having a nominal capacity of” is used and it should be the same here too.
This would keep language consistent.

Submitter Information Verification

Submitter Full Name: Chris Downing

Organization: Johnson Controls

Street Address:

City:

State:

Zip:

Submittal Date: Wed Nov 05 06:35:34 EST 2025

Committee: MIN-AAA



Public Input No. 21-NFPA 120-2025 [New Section after 5.3.5.1.1]

If sprinkler protection is used as the automatic fire suppression system, the system should have a minimum density of .15 gal/min/f2 over the protected area. Mounted tank water supply should last for a minimum of 10 minutes.

Additional Proposed Changes

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
NFPA120_PC3.pdf	NFPA120_PC3	

Statement of Problem and Substantiation for Public Input

NOTE: This Public Input appeared as "Reject but Hold" in Public Comment No. 3 of the (F2022) Second Draft Report for NFPA 120 and per the Regs. at 4.4.8.3.1 and needs to be reconsidered by the TC for the next edition of the document.

FM Global Data Sheet 7-40 Heavy Duty Mobile Equipment asks for automatic sprinkler protection and gives a .15 density with a 10 minute water supply requirement. I know it would be very rare for someone to install a sprinkler system in a dragline, but I like the fact that FM has a specific density and water supply time. FM states that the sprinkler system would be preferred over other suppression such as dry chem or CO2.. FM states that gaseous extinguishing systems are not recommended for the ring-gear area.

Submitter Information Verification

Submitter Full Name: NFPA Holds

Organization: Holds

Street Address:

City:

State:

Zip:

Submittal Date: Fri Nov 21 11:08:01 EST 2025

Committee: MIN-AAA



Public Comment No. 3-NFPA 120-2022 [New Section after 5.3.5.1.1]

TITLE OF NEW CONTENT

If sprinkler protection is used as the automatic fire suppression system, the system should have a minimum density of .15 gal/min/f² over the protected area. Mounted tank water supply should last for a minimum of 10 minutes.

Statement of Problem and Substantiation for Public Comment

FM Global Data Sheet 7-40 Heavy Duty Mobile Equipment asks for automatic sprinkler protection and gives a .15 density with a 10 minute water supply requirement. I know it would be very rare for someone to install a sprinkler system in a dragline, but I like the fact that FM has a specific density and water supply time. FM states that the sprinkler system would be preferred over other suppression such as dry chem or CO₂. FM states that gaseous extinguishing systems are not recommended for the ring-gear area.

Related Item

- Dragline Fire Suppression

Submitter Information Verification

Submitter Full Name: Jason Schurtz

Organization: Cincinnati Insurance

Street Address:

City:

State:

Zip:

Submittal Date: Mon Jan 03 16:52:31 EST 2022

Committee: MIN-AAA

Committee Statement

Committee Action: Rejected but held

Resolution: Public comment introduces a concept that has not had public review by being included in a related input or first revision as shown in the first draft report. The substantiation of the sprinkler density would need to be verified by fire testing. As this is considered new material, this public comment was rejected, but held so that it can be reviewed at the next first draft meeting.



Public Input No. 25-NFPA 120-2025 [New Section after 5.3.5.2.1]

If sprinkler protection is used as the automatic fire suppression system, the system should have a minimum density of .15 gal/min/f2 over the protected area. Mounted tank water supply should last for a minimum of 10 minutes.

Additional Proposed Changes

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
NFPA120_PC8.pdf	NFPA120_PC8	

Statement of Problem and Substantiation for Public Input

NOTE: This Public Input appeared as "Reject but Hold" in Public Comment No. 8 of the (F2022) Second Draft Report for NFPA 120 and per the Regs. at 4.4.8.3.1 and needs to be reconsidered by the TC for the next edition of the document.

FM Global Data Sheet 7-40 Heavy Duty Mobile Equipment asks for automatic sprinkler protection and gives a .15 density with a 10 minute water supply requirement. I know it would be very rare for someone to install a sprinkler system in a dragline, but I like the fact that FM has a specific density and water supply time. FM states that the sprinkler system would be preferred over other suppression such as dry chem or CO2.

Submitter Information Verification

Submitter Full Name: NFPA Holds

Organization: Holds

Street Address:

City:

State:

Zip:

Submittal Date: Fri Nov 21 11:26:36 EST 2025

Committee: MIN-AAA



Public Comment No. 8-NFPA 120-2022 [New Section after 5.3.5.2.1]

TITLE OF NEW CONTENT

If sprinkler protection is used as the automatic fire suppression system, the system should have a minimum density of .15 gal/min/f2 over the protected area. Mounted tank water supply should last for a minimum of 10 minutes. ..

Statement of Problem and Substantiation for Public Comment

FM Global Data Sheet 7-40 Heavy Duty Mobile Equipment asks for automatic sprinkler protection and gives a .15 density with a 10 minute water supply requirement. I know it would be very rare for someone to install a sprinkler system in a dragline, but I like the fact that FM has a specific density and water supply time. FM states that the sprinkler system would be preferred over other suppression such as dry chem or CO2..

Related Item

- Dragline Fire Suppression

Submitter Information Verification

Submitter Full Name: Jason Schurtz

Organization: Cincinnati Insurance

Street Address:

City:

State:

Zip:

Submittal Date: Tue Jan 04 10:21:37 EST 2022

Committee: MIN-AAA

Committee Statement

Committee Action: Rejected but held

Resolution: Public comment introduces a concept that has not had public review by being included in a related input or first revision as shown in the first draft report. The substantiation of the sprinkler density would need to be verified by fire testing. As this is considered new material, this public comment was rejected, but held so that it can be reviewed at the next first draft meeting.



Public Input No. 26-NFPA 120-2025 [New Section after 5.3.5.3.1]

If sprinkler protection is used as the automatic fire suppression system, the system should have a minimum density of .15 gal/min/f2 over the protected area. Mounted tank water supply should last for a minimum of 10 minutes.

Additional Proposed Changes

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
NFPA120_PC10.pdf	NFPA120_PC10	

Statement of Problem and Substantiation for Public Input

NOTE: This Public Input appeared as "Reject but Hold" in Public Comment No. 10 of the (F2022) Second Draft Report for NFPA 120 and per the Regs. at 4.4.8.3.1 and needs to be reconsidered by the TC for the next edition of the document.

FM Global Data Sheet 7-40 Heavy Duty Mobile Equipment asks for automatic sprinkler protection and gives a .15 density with a 10 minute water supply requirement. I know it would be very rare for someone to install a sprinkler system in a dragline, but I like the fact that FM has a specific density and water supply time. FM states that the sprinkler system would be preferred over other suppression such as dry chem or CO2.

Submitter Information Verification

Submitter Full Name: NFPA Holds

Organization: Holds

Street Address:

City:

State:

Zip:

Submittal Date: Fri Nov 21 11:28:54 EST 2025

Committee: MIN-AAA



Public Comment No. 10-NFPA 120-2022 [New Section after 5.3.5.3.1]

TITLE OF NEW CONTENT

If sprinkler protection is used as the automatic fire suppression system, the system should have a minimum density of .15 gal/min/f2 over the protected area. Mounted tank water supply should last for a minimum of 10 minutes. ..

Statement of Problem and Substantiation for Public Comment

FM Global Data Sheet 7-40 Heavy Duty Mobile Equipment asks for automatic sprinkler protection and gives a .15 density with a 10 minute water supply requirement. I know it would be very rare for someone to install a sprinkler system in a dragline, but I like the fact that FM has a specific density and water supply time. FM states that the sprinkler system would be preferred over other suppression such as dry chem or CO2..

Related Item

- Dragline Fire Suppression

Submitter Information Verification

Submitter Full Name: Jason Schurtz

Organization: Cincinnati Insurance

Street Address:

City:

State:

Zip:

Submittal Date: Tue Jan 04 10:26:55 EST 2022

Committee: MIN-AAA

Committee Statement

Committee Action: Rejected but held

Resolution: Public comment introduces a concept that has not had public review by being included in a related input or first revision as shown in the first draft report. The substantiation of the sprinkler density would need to be verified by fire testing. As this is considered new material, this public comment was rejected, but held so that it can be reviewed at the next first draft meeting.



Public Input No. 27-NFPA 120-2025 [New Section after 5.3.5.4]

If sprinkler protection is used as the automatic fire suppression system, the system should have a minimum density of .15 gal/min/f² over the protected area. Mounted tank water supply should last for a minimum of 10 minutes.

Additional Proposed Changes

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
NFPA120_PC12.pdf	NFPA120_PC12	

Statement of Problem and Substantiation for Public Input

NOTE: This Public Input appeared as "Reject but Hold" in Public Comment No. 12 of the (F2022) Second Draft Report for NFPA 120 and per the Regs. at 4.4.8.3.1 and needs to be reconsidered by the TC for the next edition of the document.

FM Global Data Sheet 7-40 Heavy Duty Mobile Equipment asks for automatic sprinkler protection and gives a .15 density with a 10 minute water supply requirement. I know it would be very rare for someone to install a sprinkler system in a dragline, but I like the fact that FM has a specific density and water supply time. FM states that the sprinkler system would be preferred over other suppression such as dry chem or CO₂. FM states that gaseous extinguishing systems are not recommended for the ring-gear area.

Submitter Information Verification

Submitter Full Name: NFPA Holds

Organization: Holds

Street Address:

City:

State:

Zip:

Submittal Date: Fri Nov 21 11:37:40 EST 2025

Committee: MIN-AAA



Public Comment No. 12-NFPA 120-2022 [New Section after 5.3.5.4]

TITLE OF NEW CONTENT

If sprinkler protection is used as the automatic fire suppression system, the system should have a minimum density of .15 gal/min/f² over the protected area. Mounted tank water supply should last for a minimum of 10 minutes.

..

Statement of Problem and Substantiation for Public Comment

FM Global Data Sheet 7-40 Heavy Duty Mobile Equipment asks for automatic sprinkler protection and gives a .15 density with a 10 minute water supply requirement. I know it would be very rare for someone to install a sprinkler system in a dragline, but I like the fact that FM has a specific density and water supply time. FM states that the sprinkler system would be preferred over other suppression such as dry chem or CO₂. FM states that gaseous extinguishing systems are not recommended for the ring-gear area.

Related Item

- Dragline Fire Suppression

Submitter Information Verification

Submitter Full Name: Jason Schurtz

Organization: Cincinnati Insurance

Street Address:

City:

State:

Zip:

Submittal Date: Tue Jan 04 10:32:12 EST 2022

Committee: MIN-AAA

Committee Statement

Committee Action: Rejected but held

Resolution: Public comment introduces a concept that has not had public review by being included in a related input or first revision as shown in the first draft report. The substantiation of the sprinkler density would need to be verified by fire testing. As this is considered new material, this public comment was rejected, but held so that it can be reviewed at the next first draft meeting.



5.3.5.5.3.1* (add annex)

The system shall be installed in accordance with NFPA 2001 or other applicable NFPA standards.

Statement of Problem and Substantiation for Public Input

Annex 5.3.5.5.3.1 of NFPA 120

and

and 12.3.5.5.3.1 of NFPA 122

Re: application of NFPA 2001 to Small Enclosures in Mining Equipment

Annex wording:

Clean agent extinguishing systems should be installed in accordance with NFPA 2001 or other applicable NFPA standards. While NFPA 2001 provides comprehensive guidance for total flooding and local application systems, its design assumptions are typically based on larger enclosures such as rooms or occupiable spaces.

In mining applications, fire hazards may be present within small, non-occupiable enclosures such as electrical cabinets, hydraulic compartments, or control boxes on mobile equipment and plant. These enclosures often present geometric constraints that challenge the application of total flooding principles, particularly with respect to agent retention and hold time and even the possibility of proving such (integrity testing).

NFPA 2001 does not preclude the protection of small enclosures. Chapter 8 of NFPA 2001 provides requirements for local application systems, which may be appropriate where the enclosure does not conform to total flooding criteria. Additionally, extended discharge provisions (e.g., Section 7.5.2) may be applicable where prolonged agent delivery is necessary due to leakage or access limitations.

Designers should consider the following when applying NFPA 2001 requirements to small enclosures:

- Likely Fire Size: The likely fire size in such a volume is likely small.
- Discharge Dynamics: Rapid discharge to achieve extinguishing concentration, combined with thermodynamic cooling from agent delivery (pressure and/or phase change), may reduce the likelihood of reignition.
- Agent Selection: Use of inert gases such as nitrogen (IG-100) may offer favorable retention characteristics due to density compared to air.
- Enclosure Geometry: Small enclosures have a higher surface-to-volume ratio, increasing the impact of leakage and reducing hold time.
- Retention Time / Integrity Testing: Integrity testing is likely impossible and, where possible, the accuracy of the model at such small scale is not proven. Agent retention should not be presumed and subject to the application may not be possible.
- Extended Discharge: Where proving retention is not feasible but a duration of protection a requirement, an extended discharge may provide continued suppression and protection.
- In very small enclosures the thermodynamics of the discharge may negate the need for a retention period, which itself would not be possible to prove or achieve.

International standards such as ISO 14520-1 have similarly focused on total flooding systems. Recognizing the limitations of applying these principles to small enclosures, a new ISO standard (ISO 20862-x) is under development to address fire suppression in small volumes (e.g., <3 m³). This reflects a growing consensus that alternative design approaches are necessary for such applications.

Systems such as ANSUL N-101, which uses pure nitrogen (IG-100), is engineered to protect small enclosures in mining environments, delivering an extinguishing concentration rapidly. The system design should account for leakage, thermodynamic effects, and the specific hazard scenario, demonstrating a practical application of NFPA 2001 principles to constrained volumes and could be viable in such applications.

Problem Statement & Substantiation:

The current references to NFPA 2001 in NFPA 120 and NFPA 122 assume application to enclosures capable of retaining agent for a defined hold time, typically large rooms. In mining, many hazards exist in small enclosures where these assumptions do not hold, making compliance with NFPA 2001 impractical or unverifiable.

- NFPA 2001 evolved from NFPA 12A, which focused on room protection using halon. Its structure and terminology imply large, occupiable enclosures.
- NFPA 2001 does not preclude small enclosures, and includes provisions for local application and extended discharge, but these are not well understood or consistently applied in mining contexts.
- ISO 14520-1 similarly focuses on total flooding, and a new ISO standard (ISO 20862-x) is being developed to address small enclosures (e.g., <2 m³).
- In very small enclosures the thermodynamics of the discharge may negate the need for a retention period, which itself would not be possible to prove or achieve.
- Systems like ANSUL N-101 use IG-100 to achieve extinguishing concentration in small volumes, with favorable retention (due to density compared to air) and cooling characteristics (from pressure change of discharge).

- Without guidance, AHJs and designers may misinterpret NFPA 2001, leading to overdesign or rejection of effective systems.
- An annex would clarify intent, support performance-based design, and promote consistent application of NFPA 2001 in mining environments.

Submitter Information Verification

Submitter Full Name: Chris Downing

Organization: Johnson Controls

Street Address:

City:

State:

Zip:

Submittal Date: Wed Nov 05 06:41:14 EST 2025

Committee: MIN-AAA



5.3.6.1.1

~~For hydraulic-~~ Hydraulic systems above 567.8 L (150 gal) in the lines, shall be provided with one of the following:

1) a dual - agent fire suppression system

~~shall be provided.~~

2) an approved liquid-only fire suppression system

Statement of Problem and Substantiation for Public Input

The current requirement for dual-agent fire suppression systems on self-propelled equipment with hydraulic systems exceeding 568 L (150 gal) was originally intended to prevent the use of dry chemical (powder) alone, not to prohibit the use of liquid-only systems. The clause was introduced at a time when dry chemical was the primary protection method, and the mandatory addition of a liquid agent was meant to address the need for cooling superheated surfaces and preventing re-ignition. However, the present wording unintentionally excludes modern, listed liquid-only suppression systems that have demonstrated equal or superior performance to dual-agent systems. This outdated requirement can lead to unnecessary complexity, increased cost and maintenance, and, in certain applications, may even impair the system's firefighting efficacy.

Substantiation:

1. Historical Intent and Current Practice:

The dual-agent clause was introduced to ensure that dry chemical alone would not be used, as it cannot provide the necessary cooling for superheated surfaces and may allow re-ignition of flammable liquids. The intent was to require a liquid agent for its cooling and reflash prevention properties, not to mandate the continued use of dry chemical where liquid-only systems are proven effective.

2. Technological Advancements in Liquid Agents:

OEMs have made significant improvements in liquid-only agent formulations. Ansul's LVS NF-40 non-fluorinated liquid suppression agent, as evidenced in the Johnson Controls White Paper (F-2022044-00, 2022), demonstrates superior performance compared to both legacy dual-agent systems and previous liquid agents. Testing shows that LVS NF-40 extinguishes fires faster, cools superheated surfaces more effectively, and secures fuel pools against reflash, all as a stand-alone agent.

The dry chemical component in dual-agent systems can actually hinder the suppression effect of the liquid agent by isolating heat and preventing efficient cooling.

3. Alignment with FM 5970 and Industry Standards:

FM 5970 is representative of real-world scenarios for heavy-duty mobile equipment. The standard was designed to replicate the harsh conditions and fire hazards found in mining, forestry, and construction vehicles, and effectively supports the use of liquid-only systems, which are increasingly preferred for their efficacy, cooling and environmental benefits.

4. Environmental and Operational Benefits:

Modern liquid-only agents such as LVS NF-40 are non-fluorinated and environmentally responsible. Their use supports sustainability goals and reduces environmental impact compared to legacy agents.

Liquid-only systems reduce cost compared to dual-agent systems, simplify installation and maintenance, and eliminate the operational challenges associated with other approaches.

5. Performance-Based Fire Protection:

The latest generation of liquid-only agents meets or exceeds the performance requirements for fire suppression, cooling, and reflash prevention in heavy-duty equipment. Allowing approved liquid-only systems aligns with NFPA's performance-based approach and ensures fire protection solutions remain effective and adaptable to technological progress.

Submitter Information Verification

Submitter Full Name: Chris Downing

Organization: Johnson Controls

Street Address:

City:

State:

Zip:

Submittal Date: Wed Nov 05 07:36:41 EST 2025

Committee: MIN-AAA



Public Input No. 5-NFPA 120-2025 [New Section after 5.3.7.1]

5.3.8 Automatically Operated Self-Targeting Monitor Systems

Automatically Operated Self-Targeting Monitor Systems should be used to protect outdoor fire hazards.

Statement of Problem and Substantiation for Public Input

Outdoor areas within mining operations present challenges for fire detection and suppression due to their inability to be effectively protected by traditional automatic sprinkler systems. These areas often encompass large open spaces or zones designated for combustible material storage. Automatic fire monitors offer a viable solution to address these challenges. Including provisions for this technology within the relevant NFPA code would help clarify that its use should—rather than shall—be considered as an alternative fire protection measure in such scenarios.

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
<u>Public Input No. 3-NFPA 120-2025 [New Section after 3.3.2]</u>	Definition

Submitter Information Verification

Submitter Full Name: James Lynch

Organization: The Fire Solutions Group

Affiliation: Fire Rover

Street Address:

City:

State:

Zip:

Submittal Date: Tue Jan 07 12:03:58 EST 2025

Committee: MIN-AAA



Public Input No. 7-NFPA 120-2025 [Section No. 5.3.8.3.3]

5.3.8.3.3

Self-propelled equipment with a hydraulic system that exceeds 568 L (150 gal) in the lines shall be provided ~~with~~ with one of the following:

1) a dual-agent fire suppression system

-

2) an approved liquid-only fire suppression system

Statement of Problem and Substantiation for Public Input

The current requirement for dual-agent fire suppression systems on self-propelled equipment with hydraulic systems exceeding 568 L (150 gal) was originally intended to prevent the use of dry chemical (powder) alone, not to prohibit the use of liquid-only systems. The clause was introduced at a time when dry chemical was the primary protection method, and the mandatory addition of a liquid agent was meant to address the need for cooling superheated surfaces and preventing re-ignition. However, the present wording unintentionally excludes modern, listed liquid-only suppression systems that have demonstrated equal or superior performance to dual-agent systems. This outdated requirement can lead to unnecessary complexity, increased cost and maintenance, and, in certain applications, may even impair the system's firefighting efficacy.

Substantiation:

1. Historical Intent and Current Practice:

The dual-agent clause was introduced to ensure that dry chemical alone would not be used, as it cannot provide the necessary cooling for superheated surfaces and may allow re-ignition of flammable liquids. The intent was to require a liquid agent for its cooling and reflash prevention properties, not to mandate the continued use of dry chemical where liquid-only systems are proven effective.

2. Technological Advancements in Liquid Agents:

OEMs have made significant improvements in liquid-only agent formulations. Ansul's LVS NF-40 non-fluorinated liquid suppression agent, as evidenced in the Johnson Controls White Paper (F-2022044-00, 2022), demonstrates superior performance compared to both legacy dual-agent systems and previous liquid agents. Testing shows that LVS NF-40 extinguishes fires faster, cools superheated surfaces more effectively, and secures fuel pools against reflash, all as a stand-alone agent.

The dry chemical component in dual-agent systems can actually hinder the suppression effect of the liquid agent by isolating heat and preventing efficient cooling.

3. Alignment with FM 5970 and Industry Standards:

FM 5970 is representative of real-world scenarios for heavy-duty mobile equipment. The standard was designed to replicate the harsh conditions and fire hazards found in mining, forestry, and construction vehicles, and effectively supports the use of liquid-only systems, which are increasingly preferred for their efficacy, cooling and environmental benefits.

4. Environmental and Operational Benefits:

Modern liquid-only agents such as LVS NF-40 are non-fluorinated and environmentally responsible. Their use supports sustainability goals and reduces environmental impact compared to legacy agents.

Liquid-only systems reduce cost compared to dual-agent systems, simplify installation and maintenance, and eliminate the operational challenges associated with other approaches.

5. Performance-Based Fire Protection:

The latest generation of liquid-only agents meets or exceeds the performance requirements for fire suppression, cooling, and reflash prevention in heavy-duty equipment. Allowing approved liquid-only systems aligns with NFPA's performance-based approach and ensures fire protection solutions remain effective and adaptable to technological progress.

Submitter Information Verification

Submitter Full Name: Chris Downing

Organization: Johnson Controls

Street Address:

City:

State:

Zip:

Submittal Date: Wed Sep 17 08:02:11 EDT 2025

Committee: MIN-AAA



Public Input No. 6-NFPA 120-2025 [New Section after 6.3.2.6.3.2]

6.3.2.7 Automatically Operated Self-Targeting Monitor Systems

Automatically Operated Self-Targeting Monitor Systems should be used to protect outdoor coal piles and fulfill the surveillance requirement of section 6.3.2.6 and or requiring automatic detection and suppression.

Statement of Problem and Substantiation for Public Input

Coal handling and pile areas within mining operations present challenges for fire detection and suppression due to their inability to be effectively protected by traditional automatic sprinkler systems. Automatic fire monitors offer a viable solution to address these challenges and monitoring of piled coal. Including provisions for this technology within the relevant NFPA code would help clarify that its use should—rather than shall—be considered as an alternative fire protection measure in such scenarios.

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
<u>Public Input No. 3-NFPA 120-2025 [New Section after 3.3.2]</u>	definition

Submitter Information Verification

Submitter Full Name: James Lynch

Organization: The Fire Solutions Group

Affiliation: Fire Rover

Street Address:

City:

State:

Zip:

Submittal Date: Tue Jan 07 12:06:40 EST 2025

Committee: MIN-AAA



Public Input No. 15-NFPA 120-2025 [Section No. 7.3.8]

7.3.8 Fire Extinguishers.

Two fully charged and operable fire extinguisher having a nominal capacity of 9.1 kg (20 lb) ~~extinguishers~~ with minimum ratings of 4-A:40-B:C shall be provided within 9.1 m (30 ft) of the tank or pump.

Statement of Problem and Substantiation for Public Input

There are many powder extinguishants which have efficacy beyond the legacy powders. Elsewhere in the standard the preface to the rating states the weight as “having a nominal capacity of” and should be the same here too. This would keep language consistent. E.g. a 7.7kg (17 lb) Foray portable can achieve 6-A:60-B:C.

Submitter Information Verification

Submitter Full Name: Chris Downing

Organization: Johnson Controls

Street Address:

City:

State:

Zip:

Submittal Date: Wed Nov 05 06:53:41 EST 2025

Committee: MIN-AAA



Public Input No. 1-NFPA 120-2023 [Section No. 8.4.2]

8.4.2

The quantity of flammable liquids and aerosols stored outside a flammable liquids storage cabinet shall not exceed 94.6 L (~~25 gal~~ 30 gal).

Statement of Problem and Substantiation for Public Input

Not sure where the 25 gallon value came from. NFPA-30 2021 Table 9.6.1 states that the MAQ (Maximum Allowable Quantity) of a 1A flammable is 30 gallons. 1B flammables (like gasoline) are allowed up to 120 gallons. If we are trying to go with the most strict scenario (1A liquids), then 30gallons would be more appropriate than 25.

Submitter Information Verification

Submitter Full Name: Jason Schurtz

Organization: Cincinnati Insurance

Street Address:

City:

State:

Zip:

Submittal Date: Tue Oct 03 10:27:45 EDT 2023

Committee: MIN-AAA



Public Input No. 16-NFPA 120-2025 [Section No. 9.4.7.12]

9.4.7.12

Two fully charged and operable dry chemical fire extinguisher having a nominal capacity of 9.1 kg (20 lb) ~~dry chemical extinguishers shall~~ shall be located at the drive areas.

Statement of Problem and Substantiation for Public Input

There are many powder extinguishants which have efficacy beyond the legacy powders. Elsewhere in the standard “having a nominal capacity of” is used and it should be the same here too. This would keep language consistent.

Submitter Information Verification

Submitter Full Name: Chris Downing

Organization: Johnson Controls

Street Address:

City:

State:

Zip:

Submittal Date: Wed Nov 05 06:56:49 EST 2025

Committee: MIN-AAA



Annex A Explanatory Material

Annex A is not a part of the requirements of this NFPA document but is included for informational purposes only. This annex contains explanatory material, numbered to correspond with the applicable text paragraphs.

A.1.1.1



In the development of this document, the data in NIOSH Information Circular 9470, "Analysis of Mine Fires for All Underground and Surface Coal Mining Categories: 1990–1999," were examined. Table A.1.1.1(a) shows the number of fires for underground coal mines; surface fires at underground coal mines, at surface coal mines, and at coal preparation plants; as well as the number of fire injuries and coal production for the time period from 1990 to 1999. Table A.1.1.1(b) provides the number of coal mines and preparation plant fires, injuries due to fire, and coal production from 2001 to 2016.

Table A.1.1.1(a) Number of Coal Mine and Preparation Plant Fires, Injuries Due to Fire, and Coal Production from 1990 to 1999

		<u>Number of Fires*</u>				
<u>Years</u>	<u>Underground Coal Mines</u>	<u>Surface at Underground Coal Mines</u>	<u>Surface Coal Mines</u>	<u>Coal Preparation Plants</u>	<u>Number of Fire Injuries*</u>	<u>Coal Production† (10⁶ short tons)</u>
1990–1991	25	17	67	23	59	2,004
1992–1993	18	14	37	22	29	1,928
1994–1995	23	16	47	18	39	2,059
1996–1997	6	7	40	8	19	2,155
1998–1999	15	11	24	20	18	2,218
Total	87	65	215	91	164	10,364

*Derived from MSHA "Fire Accident Abstract" and "Fire Accident Report" publications.

†Derived from MSHA "Injury Experience in Coal Mining" publications.

Analysis of the data shows a general decrease in the number of fires over the 10-year period, particularly from 1996 to 1999, while coal production increased slightly. The largest number of fires over the 10-year period, as well as for each 2-year time period, occurred at surface coal mines. There were 164 injuries due to fire during the 10-year period, with the number decreasing significantly over the last 4 years. There were two fatalities in 1991.

Table A.1.1.1(b) Number of Coal Mine and Preparation Plant Fires, Injuries Due to Fire, and Coal Production from 2001 to 2016

		<u>Number of Fires*</u>				
<u>Years</u>	<u>Underground Coal Mines</u>	<u>Surface at Underground Coal Mines</u>	<u>Surface Coal Mines</u>	<u>Coal Preparation Plants</u>	<u>Number of Fire Injuries*</u>	<u>Coal Production† (10⁶ short tons)</u>
2001–2002	9	7	22	10	48	2,221
2003–2004	12	6	17	15	24	2,184
2005–2006	11	6	41	13	25	2,294
2007–2008	14	9	31	14	24	2,318
2009–2010	11	9	31	18	15	2,159
2011–2012	5	3	40	7	20	2,112
2013–2014	7	13	42	7	15	1,985
2015–2016	3	4	26	13	15	1,625
Total	72	57	250	97	186	16,898

*Derived from MSHA Datasets.

†Derived from the US Energy Information Administration, *Annual Coal Report*, 2017.

There are four classes of coal, each with characteristics that might differ from mine to mine. ASTM D388, *Standard Classification of Coals by Rank*, is a recognized method for classifying coals. Table A.1.1.1(c) provides a relationship between fixed carbon, volatile matter, and calorific value (Btu/lb)/(Mj/kg) and the classes and grouping of coals.

Table A.1.1.1(c) Coal Classification

Class	Group	Dry %	Fixed Carbon			Volatile Matter		Energy
			Moist %	Dry %	Moist %	Dry (Btu/lb)	Moist (Mj/kg)	
Anthracite	Met. Anthracite	>98	>92	<2	<2	13,500	31.4	
	- Anthracite	92–98	89–85	2–8	2–8	2–8	15,300	35.5
	- Semi-Anthracite	86–92	81–89	8–14	8–15	8–15	14,900	34.6
Bituminous	Low-volatile	78–86	73–81	14–22	13–21	15,400	35.8	
	- Medium volatile		69–78	65–73	21–31	21–29	14,900	34.6
	- High-volatile A		<69	58–65	>31	>30	>14,000	>32.5
	- High-volatile B		57	53	57	40	13,000–14,000	30.2–32.5
Sub-bituminous	High-volatile C	54	45	54	40	10,500–13,000	24.4–30.2	
	- A		55	45	55	38	10,500–11,500	24.4–26.7
	- B		56	43	56	35	9,500–10,500	22.1–24.4
	- C		53	37	53	36	8,300–9,500	19.3–22.1
	-	-	-	-	-	-	-	
Lignite (brown coal)	Lignite A	52	32	35	38	6,300–8,300	14.7–19.3	
	- Lignite B		52	26	32	50	<6,300	<14.

Source: ASTM D388, *Standard Classification of Coals by Rank*.

A.1.3

Because of the uniqueness of coal mining, provisions in this standard can differ from commonly accepted fire protection standards and guides for other types of occupancies.

A.3.2.1 Approved.

The National Fire Protection Association does not approve, inspect, or certify any installations, procedures, equipment, or materials nor does it approve or evaluate testing laboratories. In determining the acceptability of installations or procedures, equipment, or materials, the “authority having jurisdiction” may base acceptance on compliance with NFPA or other appropriate standards. In the absence of such standards, said authority may require evidence of proper installation, procedure, or use. The “authority having jurisdiction” may also refer to the listings or labeling practices of an organization that is concerned with product evaluations and is thus in a position to determine compliance with appropriate standards for the current production of listed items.

A.3.2.2 Authority Having Jurisdiction (AHJ).

The phrase “authority having jurisdiction,” or its acronym AHJ, is used in NFPA standards in a broad manner because jurisdictions and approval agencies vary, as do their responsibilities. Where public safety is primary, the authority having jurisdiction may be a federal, state, local, or other regional department or individual such as a fire chief; fire marshal; chief of a fire prevention bureau, labor department, or health department; building official; electrical inspector; or others having statutory authority. For insurance purposes, an insurance inspection department, rating bureau, or other insurance company representative may be the authority having jurisdiction. In many circumstances, the property owner or his or her designated agent assumes the role of the authority having jurisdiction; at government installations, the commanding officer or departmental official may be the authority having jurisdiction.

A.3.2.4 Listed.

The means for identifying listed equipment may vary for each organization concerned with product evaluation; some organizations do not recognize equipment as listed unless it is also labeled. The authority having jurisdiction should utilize the system employed by the listing organization to identify a listed product.

A.3.3.33 Mobile Equipment.

Mobile equipment includes, but is not limited to, wheeled, skid-mounted, track-mounted, or rail-mounted equipment capable of moving or being moved.

A.4.2

Potential sources of ignition include, but are not limited to, the following:

- (1) Smoking
- (2) Open flames
- (3) Cutting and welding
- (4) Hot surfaces
- (5) Frictional heat
- (6) Static, electrical, and mechanical sparks
- (7) Spontaneous ignition, including heat-producing chemical reactions
- (8) Radiant heat

A.4.2.5.1

Automatic-closing doors provide a higher level of fire protection and are therefore recommended.

A.4.2.6

Belt fires originating away from the drive area usually have been caused by idlers with defective or stuck bearings. Tests have shown that such idlers can become moderately hot [93.3°C to 149°C (200°F to 300°F)]. The coal task group has been unable to find reliable evidence that idlers can become hot enough to ignite fire-retardant belting directly.

It appears that a warm or hot idler can cause fine coal dust accumulated around the idler to ignite. Then, when the belt has been stopped, coal burning beneath the belt ignites the belting.

The key to avoiding belt fires is to prevent the accumulation of fine coal dust around idlers. If a metal deck is provided between the carrying strand and the return strand of the belt, coal dust accumulates around the troughing idlers. Where possible, return idlers should be supported at a substantial height above the bottom so that coal dust is not likely to build up around return idlers. With proper clearance beneath these idlers, accumulations of coal dust can be cleaned up more easily.

Slat-type, self-cleaning tail pulleys are recommended. Coal dust discharged by such pulleys should be cleaned up frequently. Both good maintenance and good fire prevention necessitate that noisy bearings, which might indicate probable failure, be changed promptly before they become hot.

Conveyor belt fires have been caused by belts that lose proper alignment, with the edge of the moving belt then contacting combustible material. Loss of alignment can result from a number of factors, including displacement of idlers or pulleys and movement of supporting structure, spillage of conveyed material, and failure of a bearing (typically on a pulley). Where alignment is affected significantly, the edge of the belt can rub abrasively on the structure and objects near the edge of the belt. If the object on which the belt rubs is metal, the metal can become worn and heated. The edge of the belt can be damaged extensively, but the belt probably will not ignite because a point on the edge of the moving belt is in contact with the metal for only a very short period and will cool before it returns to the point of contact. The metal can become quite warm, but because it is a good conductor of heat, it will not become hot enough to ignite the belt if the belt stops. Nevertheless, if the material contacted is wood or another combustible, the combustible material could be heated by the friction of the edge of the moving belt until it ignites. Keeping combustible material away from the edge of the belt and use of alignment switches should prevent such fires.

A.4.2.11

Spontaneous combustion potential of coal depends on a number of factors, including mining practices, mining conditions, geology, and reactivity of the coal. The contributions of these factors can be determined by using a number of methods, including a NIOSH computer program named SPONCOM, which is available from the NIOSH web page.

A.4.2.11.2

Means to reduce the risk of spontaneous combustion include but are not limited to monitoring and trending of combustible gases, sealing, inerting, and using ventilation controls.

A.4.2.12.1

Transformers with mineral oil or other combustible coolants create an unnecessary risk in underground coal mines. Air-cooled transformers, nitrogen-cooled transformers, and transformers with approved less-flammable coolants are acceptable alternatives to mineral oil-filled transformers. If less-flammable oil transformers are used, they should be FM approved.

A.4.2.13

ASTM E1934, *Standard Guide for Examining Electrical and Mechanical Equipment with Infrared Thermography*, can be used as a guideline when performing thermographic scanning.

A.4.2.14

The provisions of 4.2.14 do not require inherently noncombustible materials to be tested in order to be classified as noncombustible materials. [101:A.4.6.13]

A.4.2.14(1)

Examples of such materials include steel, concrete, masonry, and glass. [101:A.4.6.13.1(1)]

A.4.3

For further information see NIOSH Information Circular 9452, "An Underground Coal Mine Fire Preparedness and Response Checklist: The Instrument."

A.4.3.1.1.1

Routing of water lines has caused severe problems in fighting fires at some large mines. These mines had multiple intake shafts spaced apart at considerable distances. Such ventilation can create a neutral point between the shafts, with fresh air moving from each shaft toward the neutral point. At the original opening of one mine, a water source was established and the water line was extended as the mining developed farther away from the original opening. With the water line extended to each new intake shaft and passing through each neutral point, a condition of opposite direction of flow of air and water existed beyond each neutral point.

If a fire occurs in an area of opposite flow, the fire has to be approached in the same direction as the airflow, but the water flow is moving through the fire area. Usually water lines in a fire area are damaged or broken by falling sections of burning roof. When a water line breaks in such a situation, the firefighters are without water, and direct firefighting is no longer possible. The fire then can be controlled only by sealing. At least one large coal mining company now provides an additional water source at each new intake shaft to ensure the ability to fight such fires.

The likelihood of this problem appears to be increasing as more mines are ventilating belt entries with air moving outby, while the water flow is inby. In some cases, mine management has recognized the problem and has developed procedures to change the direction of airflow in the event of a fire. Reversing the airflow should be done at a point close to and outby the fire to avoid pushing smoke-laden air back onto the fire. After the belt entry outby the fire has been cleared of smoke, the airflow can be reversed for the full length of the entry if desired.

Mines that obtain their water supply from an underground source also can have this problem of opposite directions of air flow and water flow. Usually there is no sure solution except to provide an alternative source of water or a large storage of water on the surface. If the power for the pumps is fed from the high-voltage system that feeds the mine and the fire damages the high-voltage cable anywhere on the system, the power can trip the entire system and shut down the pumps. Coordination of the electrical protective equipment or even a separate power supply might be needed to ensure that the pumps continue to supply water for firefighting.

Even in situations where air and water are flowing in the same direction, management must recognize that water lines or hydrants in a burning entry are likely to be broken by the falling sections of burning roof. In such situations, a planned shutdown of the water line should be undertaken as soon as possible so a multiple hydrant can be installed in the water line at a convenient location close to the fire. With the multiple hydrant in place, at least three fire hose can be served effectively from the water line.

Because of the many factors that should guide the choice of location of water lines and hydrants, management should be properly qualified to select these locations, but management also should be able to justify its choice. Reliability of the water supply and ability of fire hose streams to reach a fire at any location or entry served by the water line should be the criteria by which the location is chosen.

A.4.3.1.1.9

Shutoff valve intervals of 305 m (1000 ft) are recommended. Indicator-type shutoff valves with labels specifying the normal operating position are recommended.

A.4.3.1.2.1

Water distribution lines generally cannot meet the capacity requirements of 4.3.1.2.1 unless 127 mm (5 in.) or 152.4 mm (6 in.) pipe is used for main water lines and 101.6 mm (4 in.) pipe is used for branch lines to producing areas. Higher nozzle pressures are recommended.

A.4.3.1.2.2

The required hose stream water demand equals a minimum supply of 817,650 L (216,000 gal).

A.4.3.1.3.1

Hydrants in a coal mine normally are only a valve screwed onto a tee that is installed on the water line. For the female coupling of a fire hose to be connected to a male thread, a pipe nipple usually is screwed into the discharge side of the valve. Because the threads of steel pipe nipples generally corrode if left exposed, brass nipples often are used instead of steel nipples. Many mines have begun to use Schedule 80 plastic nipples instead of steel. Regardless of the nipple material, the threads of the nipple should be protected against physical damage.

A properly designed system of hydrants and fire hose should make a good connection of fire hose lines to the hydrants without the need for tools.

The choice of locations for hydrants should be made to ensure that fire hose lines can be laid quickly from hydrants located on the water line through crosscuts to a fire located in any parallel entry or crosscut, rather than to provide convenience for use in the entry where the water line is located.

A.4.3.1.3.2

Hydrants should preferably be located in crosscuts, and stoppings in such crosscuts should be fitted with a man door.

A.4.3.2

Automatic detection systems and automatic sprinkler systems in mining facilities need to be specifically addressed for the following reasons:

- (1) The contents of a mine occupancy are continually changing. Most items are not fixed and are designed to be moved with the mining operation. A mine operates as a heavy-duty excavation construction site and, thus, has the same transitory nature as a construction site.
- (2) Unlike aboveground industrial occupancies, great distances are not unusual within an underground mine. Mines covering 64.75 km² (25 mi²) or more are common.
- (3) Mines have extremely harsh and unusual environments compared to aboveground industrial occupancies. Heavy concentrations of combustible dusts, the presence of explosive gases, temperature extremes, saturated humidity conditions, standing water, unstable strata, roof-to-floor heights that vary from 710 mm to 6.1 m (28 in. to 20 ft), and complex ventilation systems are all commonplace. The possibility of abuse from heavy machinery is a common hazard.
- (4) Mining occupancies exhibit unique physical characteristics not found in any other type of occupancy. One example is the extreme pressures that can occur in a water line.
- (5) Mines employ specialized facilities, equipment, and production processes not utilized in other industries. Fire protection efforts that fail to consider the unusual operating characteristics and fire protection requirements of underground coal mining systems could result in nonoptimal protection or the inadvertent introduction of hazards.

30 CFR 75.1103-4 provides requirements for installing fire detection systems in underground coal mines in the United States.

A.4.3.2.1.1

An automatic fire detector is a device designed to detect the presence of fire and initiate action. For the purpose of this standard, automatic fire detectors are classified as follows:

- (1) *Heat detector*: a device that detects an abnormally high temperature or rate of temperature rise
- (2) *Smoke detector*: a device that detects the visible or invisible particles of combustion
- (3) *Flame detector*: a device that detects the infrared, ultraviolet, or visible radiation produced by a fire
- (4) *Fire-gas detector*: a device that detects gases produced by a fire
- (5) *Other fire detectors*: devices that detect a phenomenon other than heat, smoke, flame, or gases produced by a fire

Fire detectors should be installed as follows:

- (1) *Vertical Placement*. Because the hot gases from a fire will rise owing to buoyancy forces, combustion products initially will be stratified near the roof of an entry. As the stratified gas layer moves away from the fire, the resultant cooling and dilution eventually will produce a well-mixed flow of combustion products. Data from full-scale fires indicate that some degree of stratification can exist at distances of hundreds of feet from the source of the fire. Because of this effect, fire detectors should be located at a vertical distance from the entry roof that does not exceed 25 percent of the average entry height. For example, in an entry with a height of 1.8 m (6 ft), the maximum distance from the roof at which a sensor should be located is 0.5 m (1½ ft). The maximum distance refers to the location of the actual sampling intake of the detector used.
- (2) *Lateral Placement*. In general, the point of origin of a fire is unpredictable. It can occur along the floor, ribs, or roof of the entry. To provide optimum protection, it is recommended that the fire detectors be located within 0.6 m (2 ft) of the approximate midpoint of the entry. For entries in which the point of origin of the fire can be better estimated (such as a belt entry), the detectors should be located in such a manner that they provide for the estimated best coverage of that entry.

A.4.3.2.1.3

Batteries charged by the mine power system should indicate the condition of the batteries upon either manual or automatic activation of a battery check circuit.

For further information see *NFPA 72*.

A.4.3.2.1.4

Electrical equipment classified as “permissible” or “intrinsically safe” is certified as meeting the requirements of Chapter 1 of 30 CFR 18.

A.4.3.2.2.1

Based on US Bureau of Mines Report of Investigation 9570, “Hazards of Conveyor Belt Fires,” CO and smoke detectors provide a significant improvement over point type heat detectors in warning of a potential fire on conveyor belts.

A.4.3.2.2.2

US Bureau of Mines Report of Investigation 9380, “Fire Detection for Conveyor Belt Entries,” provides information on smoke and CO sensor alarm levels and sensor spacing as a function of belt entry cross-sectional area and belt entry air velocity.

A.4.3.2.2.10

A motor control center (MCC) is one example of the type of building described in 4.3.2.2.10.

A.4.3.3.1.1(3)

Depending on the size of the equipment, additional manual actuators could be needed to provide quick access for activation of the system.

A.4.3.3.1.1(4)

For further information on flame resistance, see 30 CFR 18.65.

A.4.3.3.1.1(6)

Open-head deluge and water spray systems can be kept free of blockage by regular flow of water through the system. For example, fire suppression on continuous miners can be flowed once per shift to keep the nozzles clean. Deluge water spray systems at belt drives can be flowed weekly to keep the nozzles clean.

A.4.3.3.1.4

For criteria of equivalent protection, see 30 CFR 75.1107-13.

A.4.3.3.2.1

Wet-pipe automatic sprinkler systems have been found to be the preferred fire suppression systems for underground coal mines for the following reasons:

- (1) They are the simplest systems available.
- (2) They are the most reliable systems available.
- (3) They provide selective operation, because only sprinklers close to the fire operate.
- (4) They have the best performance record, especially on fires of Class A materials and of Class IIIB combustible liquids.
- (5) They need minimal maintenance.
- (6) They are nonelectrical.
- (7) They use a limited quantity of water.
- (8) The initial investment is low.

The major problem associated with automatic sprinkler systems in underground coal mines is the possibility of exposure to freezing conditions during cold weather. Another problem that can exist in very deep mines is that some of the listed components for automatic sprinkler systems might be unable to withstand the very high water pressure encountered (see US Bureau of Mines Report of Investigation 9451, "Effect of Pressure on Leakage of Automatic Sprinklers"). It is not uncommon to encounter pressures above a gauge pressure of 3448 kPa (500 psi). The committee recommends testing sprinkler system components under anticipated maximum pressures. If sprinkler components are found to be unable to withstand the maximum pressure of the water line, the use of pressure regulators might be necessary. Experience has shown that pressure regulators can require considerable maintenance. Also, if the pressure regulating valve should leak, it might be necessary to provide a small relief valve on the discharge side of the regulating valve to prevent overpressure.

A.4.3.3.2.1.1(1)

Under Report No. H0122086, "Suppression of Fires on Underground Coal Mine Conveyor Belts," the Department of the Interior, US Bureau of Mines (USBM), conducted a series of full-scale fire tests.

The tests demonstrated that standard, 12.7 mm (½ in.) orifice, nominal 100°C (212°F) automatic sprinklers, located over the belt on 3 m (10 ft) centers, effectively controlled every test fire while opening only two sprinklers, with residual pressure held to a constant gauge pressure of 69 kPa (10 psi).

From the time that the USBM tests were conducted, underground belts have tended to become wider to carry increased tonnage; therefore, belt fire suppression systems should be designed to supply more sprinklers than indicated by these tests. Because many conveyor belts stretch a long distance in a straight line, a fire scenario would involve only a portion of the belt, regardless of the overall length of the belt. Because the actual incidence of belt fires is low in underground coal mines, and most of those are in the area of the belt drive and the belt takeup, protection of only the area from the discharge pulley to the end of the takeup is needed. If the belt structure contains a deck between upper and lower strands of the belt, automatic sprinklers should be located beneath the deck, virtually doubling the size of the sprinkler system.

If the sprinkler system is extended to cover a distance greater than 30.5 m (100 ft) in one direction from the point where the pipe holding the automatic sprinklers along the roof is fed, then a hydraulic calculation of the system is recommended. Long runs of pipe should be flow tested as required by 4.3.3.5.5.1, with the eight open sprinklers installed at the distant end of the pipe run. Branch piping intended to protect limited areas should be piped with adequately sized pipe to carry the required water flow. Table A.4.3.3.2.1.1(1) should be used to determine the minimum size of pipe.

Table A.4.3.3.2.1.1(1) Minimum Pipe Sizes per Number of Sprinklers

Pipe Size		Maximum Number of Sprinklers on Pipe
1 in.	2	
1¼ in.	3	
1½ in.	5	
2 in.	10	
2½ in.	20	
3 in.	40	
3½ in.	65	
4 in.	100	

For SI units, 1 in. = 25.4 mm.

Larger systems should be separately flow tested as required by 4.3.3.5.5.1.

A.4.3.3.2.2

Because many air compressors are moved frequently, the fire suppression system needs to be equally portable. Some compressors that have a deck or lid over the compressor have been fitted with piping and sprinklers attached to the underside of the deck. Other compressors without a deck have suitable piping with at least two sprinklers 3 m (10 ft) apart. The piping is made to be attached to roof bolts or otherwise suitably supported over the centerline of the compressor. The piping needs to be equipped with a pressure switch that prevents the operation of the compressor unless the piping is under pressure and with a flow switch that shuts the compressor down if water flows. If a fire hose is used to connect the piping to a water line, the connection point of the hose to the sprinkler piping should be located so that a fire on the compressor will not damage the fire hose.

A.4.3.3.3.1

NFPA 13 requires a minimum 140 kPa (20 psi) residual pressure for ordinary hazard pipe schedule sprinkler systems.

A.4.3.3.3.2.1

Pipe and fittings that permit limited motion of the pipe are recommended, as they allow the pipe to be held closer to the roof. If threaded fittings are used, steel pipe with extra-strength threaded fittings is recommended. Copper, aluminum, or other approved materials could be permitted if they are adequate for the pressure.

A number of mines use aluminum pipe or tubing with groove-type couplings and fittings. Where water pressure does not exceed 3448 kPa (500 psi), grooved couplings that have a 12.7 mm (½ in.) female national pipe thread (FNPT) outlet are used to provide connections for sprinklers. Piping put together in this manner can be located closer to an undulating roof, especially if the pipe lengths are short enough to put the couplings (and the automatic sprinklers) on 3 m (10 ft) centers. Mines that use groove-type couplings can have most of the piping precut and grooved in the shop, which simplifies installation underground. Rolled grooves are recommended because they do not reduce the strength of the pipe as much as the cut grooves do. If cut grooves are used, Schedule 40 or heavier pipe should be used.

A.4.3.3.3.2.5

Some automatic sprinklers might not withstand the water pressure that can be encountered in deep mines. Information on the effect of high water pressure on automatic sprinklers can be found in US Bureau of Mines Report of Investigation 9451, "Effect of Pressure on Leakage of Automatic Sprinklers."

Under US Bureau of Mines Report of Investigation 9538, "Performance of Automatic Sprinkler Systems for Extinguishing Incipient and Propagating Conveyor Belt Fires Under Ventilated Conditions," NIOSH conducted a series of full-scale fire tests under ventilated conditions of 1.1 and 4.0 m/s (225 and 800 ft/min) for fires up to 10.8 MW. The tests demonstrated that pendent and horizontal sidewall types were both able to extinguish incipient belt fires. Directional sprinklers showed a slightly improved performance in terms of maximum heat release rate at the lower airflow. Both pendent and horizontal sidewall sprinkler types were able to extinguish propagating fires. Horizontal sidewall sprinklers showed an increased effectiveness compared to the pendent sprinklers because of the increased upstream coverage area of the water discharge in terms of maximum heat release rate.

A.4.3.3.3.2.6

The restrictions on sprinkler spacing apply to sprinklers on the same line and those located between sprinklers on adjacent lines.

A.4.3.3.3.2.7

Where sprinkler positioning is such that full coverage can be impaired, such as where a single line of sprinklers protects a belt conveyor with little clearance, a flow test should be conducted to determine if adequate wetting of surface areas is achieved. Additional sprinklers should be provided in the event that adequate coverage is not achieved, or alternative arrangements such as rotated lines or sidewall sprinklers should be considered. Consideration also should be given to the need for noncombustible baffles to protect sprinklers from the discharge of adjacent sprinklers located within 1.8 m (6 ft).

A.4.3.3.3.5

Dry-pipe automatic sprinkler systems are more complex and more difficult to design and install than wet-pipe systems. The committee recommends that all systems be designed and installed by skilled and experienced personnel.

A pressure relief valve, set to relieve at a pressure below the maximum pressure rating of the dry-pipe valve, should be installed between the pressure regulating valve and the dry-pipe valve. The reclosing pressure of the relief valve should be higher than the set pressure of the regulating valve.

A.4.3.3.3.6.1

Underground shaft mines that use diesel-powered equipment generally employ underground diesel fuel storage areas to facilitate equipment refueling. Adit-type mines in the western United States might initially locate diesel fuel storage and refueling facilities on the surface; however, as the active mine workings progress farther from the adit portal(s), these facilities will likely be moved underground.

A common means of fire protection in many underground diesel fuel storage areas is the use of fixed water sprinkler systems. However, this situation represents a significant safety hazard. According to NFPA's *Fire Protection Handbook*, water sprinklers can be permitted to be used on diesel fuel for control but not for extinguishment.

In "The Health and Safety Implications of the Use of Diesel-Powered Equipment in Underground Mines," a report by an interagency task group prepared for MSHA in 1985, the simple conclusion was that "water spray or fog usually will not extinguish diesel fuel fires."

In an underground coal mine, fire control is not sufficient; fire extinguishment is essential for the following reasons:

- (1) Unlike an underground metal or nonmetal mine, the mineral in a coal mine is combustible. All fire prevention and protection provisions in an underground coal mine are aimed at preventing the ignition of the coal. In a metal or nonmetal mine, if fire control efforts are unsuccessful in extinguishing a fire on a piece of diesel equipment or a diesel fuel fire, personnel can be evacuated and the fire can be allowed to consume all available fuel materials, thereby self-extinguishing. In an underground coal mine, this practice would almost certainly result in the ignition of the coal and the consequent loss of part or all of the mine.
- (2) Even if a fire does not grow in intensity or spread to the coal, toxic smoke and fire gases are produced as long as it burns, which can endanger persons within the mine.
- (3) According to NFPA's *Fire Protection Handbook*, overpressure failure of containers exposed to fire is considered the principal hazard of closed-container ignitable (flammable and combustible) liquid storage.
- (4) Even a "controlled" fire can cause such container failure, producing a fire so intense that the sprinkler system is unable to control it, much less extinguish it.
- (5) Water sprays are not effective in extinguishing pressure fires, running fuel fires, and obstructed spill fires, all of which could occur in a diesel refueling area.
- (6) Water supplies are limited in many underground mines. Fire "control" should be considered temporary, because when the water supply is depleted, the fire will grow immediately to the maximum intensity.
- (7) The vapor pressure of diesel fuel increases with elevation, due to reduced barometric pressure. As a result, even fuels without flash point-reducing additives can become flammable, depending on the altitude at which they are used. This reduction in flash point can result in reclassification of the diesel fuel to a Class IC flammable liquid. There is no clear consensus in the literature and industry practice as to the effectiveness of fixed water sprays in controlling and extinguishing fires involving Class IC flammable liquids. Although industry practice strongly favors fixed water sprays for such applications, the literature and available research results clearly indicate the ineffectiveness of fixed sprays on Class IC liquids, especially in the case of pressure fires, running fuel fires, and obstructed spill fires.

Therefore, water sprinkler systems installed for the protection of diesel fuel storage areas are considered inadequate; foam-water systems should be utilized. See the applicable sections of NFPA 11.

A.4.3.3.3.6.2

The alarm system that serves sprinklers protecting the drive area of a belt conveyor also should be permitted to serve as the fire detection system installed over that portion of the belt conveyor.

A.4.3.3.4.3.3

The clapper of a differential-type dry-pipe valve should be held off its seat during any test in excess of 345 kPa (50 psi), to prevent damaging the valve.

A.4.3.3.5.4

The special suppression system manufacturer is a good source for training regarding their equipment. Other acceptable training resources can be available.

A.4.3.3.5.5.2

The system could have several end-of-line drains if parts of the system dead end.

A.4.3.3.5.5.3

Deluge sprinklers might need to be flowed more frequently than monthly to keep the sprinkler systems clean. If caps are not used on water spray systems, they also might need to be flowed more frequently than monthly to keep the nozzles clean.

A.4.3.3.6.1

The actuation of a fire suppression system on self-propelled equipment should cause shutdown of the protected equipment.

A.4.3.3.6.1(11)

Because exposure to some agents or their decomposition products could be hazardous to personnel, it is recommended that the appropriate NFPA standard for the agent under consideration be consulted to determine the agent's use and limitations, recognizing that the mine environment can make prompt evacuation difficult.

A.4.3.3.6.1(12)

Wet and dry chemical systems should be inspected every 6 months in accordance with applicable NFPA standards.

A.4.3.3.6.2

Pipe or hose supplying open spray nozzles should be sized to avoid excessive pressure loss. Open nozzles provide a good spray pattern with 6.9 kPa to 137.9 kPa (10 psi to 20 psi) of water pressure at the nozzles. If nozzle pressure exceeds 172.4 kPa (25 psi), additional or larger orifice nozzles can be permitted to be used to increase the water flow. If nozzle pressure is less than 137.9 Pa (20 psi), smaller orifice nozzles should be used to increase the pressure. The objective is to obtain the maximum flow of water at a pressure high enough to provide a reasonable spray pattern.

The water spray should be directed upward to wet the roof over the machine. This prevents the fire from spreading to the coal, which should be the primary objective of the fire protection system. Also, water will fall back down onto the machine, cooling and possibly extinguishing the flames. Alternatively, the nozzles can be directed at the fire hazard areas of the machine. The risk of this method is that the fire could be in an area not covered by the sprays and could spread to the coal.

A.4.3.4.1.1.1

Larger capacity extinguishers that provide more agent and longer discharge time are recommended.

A.4.3.4.1.2.3

It is not the intent of 4.3.4.1.2.3 to allow two lower rated fire extinguishers to be used to achieve a higher overall rating.

A.4.3.4.1.3.2

Visual inspections require documentation only at 6-month intervals.

A.4.3.4.2.1.1

Hydrants should be located to ensure that fire hose can be laid quickly from hydrants, which are located on the water line in any of the entries, through crosscuts to a fire located in parallel entries or crosscuts, rather than being located for convenient use in the entry where the water line is located.

A.4.3.4.2.1.4

Fire hose should be purchased as an entire unit that consists of the hose and couplings. The pressure rating should include both the hose and the couplings.

A.4.3.4.2.1.6

These threads are also referred to as National Pipe Straight Hose (NPSH). National Hose (NH) is also known as National Standard Thread (NST) and National Standard (NS).

Threads of 38 mm (1½ in.) or 50 mm (2 in.) hose couplings should be straight, iron pipe thread, now labeled NPSH. While it is always preferable to use fire hose adapters, NPSH couplings can be attached to standard male pipe threads. This is especially important because of the large number of hydrants needed on water lines.

Where the gasket of a fire hose coupling is in good condition, the coupling should be tightened with bare-hand pressure only. It usually will not leak. Hose wrenches are needed to uncouple hose only. Overtightening couplings with hose wrenches harms the gaskets.

Rocker lug couplings are preferred to pin-type couplings.

Most mines use NPSH threads because the couplings will attach to male pipe threads of the same size.

A.4.3.4.2.1.9

In many fires, fire hose has to be carried to the fire. If manual transport is necessary, the hose should be coiled into “bundles” or “doughnuts,” with the male coupling at the center. In this manner, the hose is in proper orientation for use, and the exposed threads of the male coupling are protected. Hose lengths should be limited to 30.5 m (100 ft) or less, because greater lengths make the hose bundle too large and heavy.

It is sometimes preferable to coil bundles or doughnuts of fire hose starting with the approximate center point of the hose at the center of the bundle. A coil made in this manner positions the hose couplings on the outside so the hose can be laid starting at the hydrant moving toward the nozzle or from the nozzle back to the hydrant with equal efficiency.

Where high pressures are a concern, pressure relief devices can be used. The devices can be stored with the hose cache.

A.4.3.4.2.1.11

Consideration should be given to providing caches at intervals of less than 1524 m (5000 ft) where conditions warrant. A single hose cache might satisfy more than one of the required locations.

A.4.3.4.2.2

Fire hose requires special consideration at coal mines. Cotton- or linen-jacketed hose should not be used, as it is subject to mildew attack. Even mildew-treated hose does not endure. Rubber-lined and rubber-jacketed hose resists mildew attack, but this type of hose is heavy, stiff, and expensive. Neoprene-lined, polyester hose with rocker lug couplings is probably the best hose for mine use. The use of pin-type couplings should be avoided because the pins are easily broken or knocked off.

In low coal and where the water supply can deliver about 3.2 L/sec (50 gpm) at proper pressure, 38 mm (1½ in.) hose should be used. Where the water supply is able to provide 378 L/min to 460 L/min (100 gpm to 120 gpm) at proper pressure, 50 mm (2 in.) hose is preferable. Hose of 64 mm (2½ in.) has no advantage over 50 mm (2 in.) hose, and the extra weight and cost of 64 mm (2½ in.) hose is considerable.

Many mines have standardized on 38 mm (1½ in.) fire hose, even though their water lines can supply substantially more water than is required to get proper discharge from a 38 mm (1½ in.) hose nozzle. Some of these mines provide at least two valved connections (hydrants) in operating areas so that more than a single 38 mm (1½ in.) hose line can be used if needed. In some cases, short lengths of pipe with two or more hydrants are available for use at other points along the water lines. These multiple hydrants can be put in the line at joints where the water line is joined with grooved couplings.

While the total water flow of two 38 mm (1½ in.) hose lines is about the same as one 50 mm (2 in.) hose line, in the opinion of many experienced mine firefighters, two 38 mm (1½ in.) hose lines provide greater flexibility during a firefighting operation.

A.4.3.4.6

While regulatory agencies have legal powers and responsibilities in a mine fire situation, the mine operator should have a preplanned organization capable of managing an effective firefighting effort. This organization has to be prepared, resolute, and capable. As part of periodic training, the organization should conduct fire drills that involve all levels of mine management. The regulatory agencies also should be invited to participate in fire drills. Training develops management capability and promotes cooperation between concerned agencies and mine management.

A.4.4.7.2

For purposes of this section, a set of mining equipment includes a single loading machine, a single continuous mining machine, or a single longwall or shortwall mining machine.

A.4.4.7.3

Second mining is intentional retreat mining where pillars have been wholly or partially removed, regardless of the amount of recovery obtained.

A.4.4.8.4.1

Materials that are suitable for the construction of overcasts, undercasts, shaft partitions, permanent stoppings, and regulators include concrete, concrete block, brick, cinder block, tile, or steel.

A.4.4.10.4.2

The authority having jurisdiction can approve exceptions with specific conditions. These include requiring the operator to continuously monitor atmospheric conditions in the sealed area during welding or burning, the monitoring of airflow conditions in and around the work area, the application of rock dust and water, requiring the availability of fire extinguishers on hand, the procedures to maintain safe conditions, and other relevant factors.

A.4.4.11.2.2

The operator can request that the authority having jurisdiction approve different sampling locations and frequencies, provided at least one sample is taken at each set of seals at least every 7 days.

The operator can request that the authority having jurisdiction approve different sampling locations and frequencies in the ventilation plan after a minimum of 14 days and after the seal design strength is reached, provided at least one sample is taken at each set of seals at least every 7 days.

A.4.4.14.5.4(1)

In longwall mining systems, the sensor should be located upwind in the belt entry at a distance no greater than 45.7 m (150 ft) from the mixing point where intake air is mixed with the belt air at or near the tailpiece.

A.4.4.14.5.4(3)

In areas along each belt entry where air velocities are less than 15.2 m (50 ft/m), the sensor spacing should not exceed 106.7 m (350 ft).

A.4.4.14.5.4(4)

If the belt drive, tailpiece, or take-up for a single transfer point are installed together in the same air course they could be monitored with one sensor located not more than 30.5 m (100 ft) downwind of the last component.

A.4.4.14.6(2)

Reduced alert and alarm settings approved by the authority having jurisdiction can be required for carbon monoxide sensors identified in the mine ventilation plan.

A.4.4.15

The term *too wet* means that sufficient natural moisture is retained by the dust that when a ball of finely divided material is squeezed in the hands water is exuded.

A.5.2

Fires adversely affect all types of self-propelled and mobile surface mining equipment, including, but not limited to, trucks, front-end loaders, crawlers, drills, shovels, and draglines. Most fires occur on or near engine exhaust systems, high-speed drive lines, malfunctioning high-pressure–high-temperature hydraulic systems, or faulty electrical components.

Total elimination of fire hazards is impossible, because sources of ignition and fuel for fires are inherent in the basic equipment design. The problem is further complicated by the collection of environmental debris. Therefore, efforts to reduce fire losses must be aimed at fire prevention and fire suppression.

To improve fire protection and prevention on surface mining equipment, some manufacturers of mining equipment emphasize the reduction of the fire potential of specific items in the original design of their equipment. Such items include turbochargers, exhaust manifolds and exhaust pipe shielding and insulation, location of ignitable (flammable and combustible) liquid reservoirs, and hydraulic and fuel-line routing.

Most surface mining equipment is required to have at least one hand-portable extinguisher mounted in a readily accessible location. Extinguishers are most effective when used by trained operators. However, considering the size and configuration of machines found at a mine, fires can be difficult or impossible to fight with a hand-held extinguisher. For this reason, fire suppression systems have been developed to aid in suppressing those fires that are hard to access and thereby to reduce “off-road” equipment fire losses.

The key to operator protection is early detection of fires to provide a warning to the operator, fuel shutoff to minimize fuel for the fire, and fire suppression during its earliest stages. Specialized systems to perform these functions can be required to protect the operator and the machines. To be totally effective, however, system operation must be fully understood by owners and operators, and provisions must be made for periodic inspection and maintenance.

Fire suppression systems, including hand-portable extinguishers, offer the mining industry a cost-effective tool by which personnel and investments in mining equipment can be protected.

A.5.3.2

According to NFPA 17A, wet chemical fire-extinguishing systems discharge wet chemical from fixed nozzles and piping by means of expellant gas.

A.5.3.4.1

This paragraph is not intended to include the boom of a dragline or shovel.

A.5.3.4.8(8)

The same record tag or label can also indicate if recharging was performed.

A.5.3.5.2.2

Smoke detectors are not recommended because of the harsh environment.

A.5.3.5.3.1

Automatic systems are not necessary if the area is easily accessible for manual firefighting.

A.5.3.5.4.2

Carbon dioxide would not be the best choice for fighting this type of fire due to the potential for the gas to be dispersed before the oxygen concentration is reduced enough to affect the fire.

For transformers over 5000 kVA, a fixed fire suppression system is recommended.

A.5.3.5.5. 3.1

Clean agent extinguishing systems should be installed in accordance with NFPA 2001 or other applicable NFPA standards. While NFPA 2001 provides comprehensive guidance for total flooding and local application systems, its design assumptions are typically based on larger enclosures such as rooms or occupiable spaces.

In mining applications, fire hazards may be present within small, non-occupiable enclosures such as electrical cabinets, hydraulic compartments, or control boxes on mobile equipment and plant. These enclosures often present geometric constraints that challenge the application of total flooding principles, particularly with respect to agent retention and hold time and even the possibility of proving such (integrity testing).

NFPA 2001 does not preclude the protection of small enclosures. Chapter 8 of NFPA 2001 provides requirements for local application systems, which may be appropriate where the enclosure does not conform to total flooding criteria. Additionally, extended discharge provisions (e.g., Section 7.5.2) may be applicable where prolonged agent delivery is necessary due to leakage or access limitations.

Designers should consider the following when applying NFPA 2001 requirements to small enclosures:

- Likely Fire Size: The likely fire size in such a volume is likely small.
- Discharge Dynamics: Rapid discharge to achieve extinguishing concentration, combined with thermodynamic cooling from agent delivery (pressure and/or phase change), may reduce the likelihood of re-ignition.
- Agent Selection: Use of inert gases such as nitrogen (IG-100) may offer favorable retention characteristics due to density compared to air.
- Enclosure Geometry: Small enclosures have a higher surface-to-volume ratio, increasing the impact of leakage and reducing hold time.
- Retention Time / Integrity Testing: Integrity testing is likely impossible and, where possible, the accuracy of the model at such small scale is not proven. Agent retention should not be presumed and subject to the application may not be possible.
- Extended Discharge: Where proving retention is not feasible but a duration of protection a requirement, an extended discharge may provide continued suppression and protection.
- In very small enclosures the thermodynamics of the discharge may negate the need for a retention period, which itself would not be possible to prove or achieve.

International standards such as ISO 14520-1 have similarly focused on total flooding systems. Recognizing the limitations of applying these principles to small enclosures, a new ISO standard (ISO 20862-x) is under development to address fire suppression in small volumes (e.g., <3 m³). This reflects a growing consensus that alternative design approaches are necessary for such applications.

Systems such as ANSUL N-101, which uses pure nitrogen (IG-100), is engineered to protect small enclosures in mining environments, delivering an extinguishing concentration rapidly. The system design should accounts for leakage, thermodynamic effects, and the specific hazard scenario, demonstrating a practical application of NFPA 2001 principles to constrained volumes and could be viable in such applications.

A.5.3.5.5. 4

Based on the condition of the equipment, a higher frequency than annual scanning might be needed.

A.5.3.6.6

Equipment in this category is generally a vehicle weight of 90,720 kg (200,000 lb) or more and the size of a Hitachi 1800, Caterpillar 5230, Komatsu PC1000-6, Liebherr R984, DeMag H95, and Hitachi 1100.

A.5.3.8.1.1

Depending on the size of the vehicle and size of the fire, a 9.1 kg (20 lb) fire extinguisher could be more effective.

A.5.3.8.2.5

NFPA and manufacturers require 6-month inspections.

A.5.3.8.3.2

The following are examples of large equipment:

- (1) Track dozer of 300 horsepower or more or 31,752 kg (70,000 lb) weight or more (e.g., Caterpillar D8R)
- (2) Front-end loader of 400 horsepower or more and vehicle weight of 45,360 kg (100,000 lb) (e.g., Caterpillar 988)
- (3) Wheel dozer of 300 horsepower or more and vehicle weight of 27,216 kg (60,000 lb) or more (e.g., Caterpillar 824G)
- (4) Grader of 275 horsepower or more and vehicle weight of 24,948 kg (55,000 lb) or more (e.g., Caterpillar 16H)
- (5) Pull-type scraper of 450 horsepower or more and vehicle weight of 44,453 kg (98,000 lb) or more (e.g., Caterpillar 631E)
- (6) Scraper with push/pull twin engine of 450 horsepower and 490 horsepower or more and vehicle weight of 51,257 kg (113,000 lb) or more (e.g., Caterpillar 637E)
- (7) Blast hole drill of 360 horsepower or more and weight of 30,845 kg (68,000 lb) or more (e.g., Ingersoll-Rand DM-30)

A.5.3.8.3.4(4)

Depending on the size of the equipment, additional ground-level manual actuators could be needed to provide quick access for manual activation of the system.

A.5.3.8.3.8

Six months is required by NFPA standards and manufacturers. The fire suppression system manufacturer is a good source for proper training regarding their equipment. Other acceptable training resources might be available.

A.6.1.2.2

Pneumatic coal-cleaning systems employ low-pressure air, usually pulsed, to effect a separation between relatively dry coal and mechanically associated impurities. The coal is usually 19 mm ($\frac{3}{4}$ in.) and smaller, with up to 4 percent surface moisture. The pickup of fines from the feed coal in the process air stream creates a potentially explosive mixture. However, approximately 2 m/sec (400 ft/min) air velocity dissipates methane from the coal and, in practice, reduces explosion and fire hazards to very low proportions inside the equipment. Nonetheless, in the area surrounding the equipment, a potential fire hazard exists from unintentionally vented fine coal, and the potential for all hazards increases where the cleaners are preceded by thermal dryers.

A.6.2.1.4

Electrical components of ventilation equipment installed in the open and separated from the ventilation air being pulled from the hazardous area can be permitted to be considered nonhazardous.

A.6.2.1.4.1

Electrical equipment classified as "permissible" is certified as meeting the requirements of Chapter 1 of 30 CFR 18.

A.6.2.1.6

Approved, intrinsically safe electrical equipment can be permitted to be used in any areas classified as "hazardous."

A.6.2.1.7

The intent of this requirement is the avoidance of arcing ignition sources resulting from differing electrical potentials between metal structural elements or between any such element and ground. The metal building elements might include the building frame (beams, columns, etc.), roof panels, building or control room panels, building utilities such as piping, ducts, or conduit, or other items. The objective of connecting metal parts to a ground is recognized as the best means of avoiding arcing between building elements or between those elements and ground or other grounded items. Any arrangement that provides both a good ground and a system of metal continuity from the ground to all metal elements achieves the intent. Where construction provides solid, secure metal-to-metal contact, the necessary continuity normally is provided. In cases where grounding is in question, resistance measurements should be made between the most remote elements or the most suspected elements or both and ground. If tests show less than 0.1 ohm resistance to ground, the arrangement can be permitted to be considered satisfactory. Testing should be done during dry weather when ground moisture is at a minimum. If lightning protection is provided, additional bonding of major building members to lightning system conductors might be required. Such bonding, however, can be permitted to serve the grounding needs covered by this requirement.

A.6.2.2.3.1

For further information, see NFPA 68.

A.6.2.2.5

Round ducts should be used wherever possible. All ducts should limit the number of bends and irregularities that could interfere with free airflow. Rectangular ducts should be used only where clearance prevents the use of round ducts. Rectangular ducts should be made as nearly square as possible to minimize the deposit of combustible materials.

A.6.2.3.1

Provision of 0.1 m^2 (1 ft^2) of building vent for each 2.3 m^3 (80 ft^3) of volume or space in which an explosion might occur generally is considered adequate for coal preparation plants, although the amount of venting needed to minimize structural damage that might be caused by a dust explosion varies according to the strength of the building, extent of the hazard, location and distribution of vents, properties of the coal dust, and other factors. Reference should be made to NFPA 68 in the sizing of explosion vents.

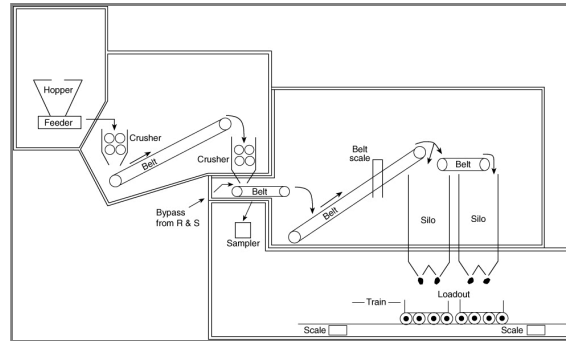
A.6.2.4

Bulk storage of Class II combustible liquids should be located outside the preparation plant and should be appropriate for the nature of the liquids and the quantities being stored. Tanks within the preparation plant should be of limited size, holding no more than the quantities needed for one and one-half shifts of operation. Each tank should be fitted with an overflow pipe of ample size to return the full volume of the transfer pump to the bulk storage tank. Tanks within the preparation plant should be isolated from the rest of the plant. The isolated area containing the tanks should be protected with an automatic sprinkler system that can provide a density of 6.1 L/min/m^2 (0.15 gpm/ft^2) over the entire area with all sprinklers flowing. The floors beneath these tanks should have curbs, adequate slope, and floor drains able to handle the liquid from the tanks as well as the discharge from all automatic sprinklers.

A.6.3

A typical coal preparation plant process begins with raw coal entering a breaker where coal and undesirables, such as rocks, are separated. From the breaker, the coal is crushed and screened to size and then transferred, usually by belt conveyor, to the washing process. During the washing process, the dirty coal is separated from clay and rock by water washing or by chemical flotation. From the washing process, the clean, wet coal is conveyed to a drying process whereby surface moisture is reduced. A variety of dryers can be used, such as centrifugal, fluidized bed, or thermal disk processors. From the drying process, the clean, dry coal is conveyed to storage facilities, such as bins, silos, and coal barns, and then loaded out for transport or shipment by rail, surface, or conveyor for downstream use. (See Figure A.6.3.)

Figure A.6.3 Typical Coal Preparation Plant.



A.6.3.1.10

Phosphorescent exit signs can be used to identify building exits.

A.6.3.1.12.1

Refer to NFPA 850 for guidance on spacing transformers from buildings.

A.6.3.1.12.2

NFPA 70 requires a 3-hour fire-rated room for transformers with combustible oil. This can be decreased to a 1-hour rated room if automatic fire suppression is provided.

A.6.3.1.12.3

In existing facilities, a combustible oil-filled transformer located on the roof of the preparation plant should be provided with a fire barrier and spill containment to limit fire damage to the building. Refer to NFPA 850 for guidance on fire barriers and spill containment for transformers.

A.6.3.2.2.1

Examples of where fixed protection might be needed in coal preparation include conveyor belts, galleries, tunnels, beneath bins, transfer houses, silo head houses, dust collectors, rotary compressors, and other areas such as switch gear rooms, control rooms, change houses, and ignitable (flammable and combustible) liquids storage or process areas. These areas should be considered ordinary hazards. Areas with noncombustible construction or noncombustible contents are areas where fixed protection might not be needed.

A.6.3.2.3.1

Standpipes should be located in exterior stairways. Where exterior stairways are not provided, standpipes should be located as close to stairways as practicable. This arrangement will provide firefighters with ready access to firefighting water. Ideally, plants should have exterior stairways with standpipes on opposite ends of the plant. These stairways will provide firefighters with two angles of attack.

When applying water, firefighters should exercise care to avoid the use of solid hose streams in locations where the streams could create explosions by disturbing dust deposits.

Fire hose should not be used for washdown purposes.

In plants where the vibration anticipated is sufficient to cause movement of the fire protection system resulting in the wear of water piping at the hangers, it might be necessary to install vibration absorbers.

A.6.3.2.3.5

Wash-down and fire suppression water should be separate systems, but when they are a common system, the capacity of each water supply, pump, and water main should be considered to ensure simultaneous operations. An adequate amount of fire water should be maintained in a tank, pond, or other storage vessel so that the use of wash-down water does not diminish the fire protection capabilities.

Drains should be capable of removing water used for wash-down and during fire suppression system activation.

A.6.3.2.4.1

A readily available supply can include a dedicated fire protection water supply, a pond or other large body of water, an industrial process water system, or large water trucks (tankers). If water trucks (tankers) are used, they should be of a capacity and quantity to deliver a continuous source of water for the duration of the firefighting effort. Personnel should be trained in emergency vehicle operation and mobile water supply shuttle procedures. If an impounded body of water is provided, it should be close and accessible enough to the protected property to allow firefighters a quick response.

A.6.3.2.4.4

Chapter 8 and Annex G of NFPA 1142 outline suggested methods for determining the estimated water supply (fire flow) that can be necessary for firefighting purposes.

A.6.3.2.6.3

A gaseous fire suppression system can also be considered for important motor control center (MCC) rooms or for rooms that contain input/output (I/O) cabinets. A gaseous fire suppression system or smoke detector system can also be considered for the preparation plant control room.

A.6.4.1

Thermal coal dryers can be of any type that conforms to the requirements of Section 6.4, including rotary dryers, continuous carrier dryers, vertical tray and cascade dryers, multilouver dryers, suspension or flash dryers, and fluidized bed dryers. These direct-fired convection-type dryers constitute the majority of currently operational units. Almost all these units utilize special direct-fired air heater-type furnaces, usually coal fired by stokers or by pulverized fuel systems.

A.6.4.2.5

For further information, see NFPA 68.

A.6.4.2.7

Thermal oil systems are used in coal preparation plants to indirectly dry coal in thermal disk processors. Severe losses have occurred due to lack of inadequate sprinkler protection, poor siting and confinement of expansion and storage tanks and heaters, improper piping arrangement, and inadequate interlocks and controls. Even though the woodworking industry has unique equipment that needs hot oil applications, the hot oil heating and distribution systems are similar, and the concepts provided in NFPA 664 can be utilized for the coal preparation industry.

Chapter 8 of NFPA 664 is the primary reference in NFPA standards for thermal oil systems used in industrial processes. While NFPA 664 addresses loss prevention in a specified occupancy (wood products), other standards might be applicable to any industrial process featuring thermal oil systems.

A.6.4.5

Guidance for design of vent ducts is provided in NFPA 68.

A.6.7.1

Combustible loading in coal preparation plants has increased gradually as plastic equipment has replaced equipment that historically was constructed of steel. This equipment includes piping, spirals, cyclones, and screens. Combustible spirals normally are installed above ground in either open air or enclosed process buildings. Spirals typically are constructed of fiberglass, polyurethane, or other unexpanded Group A plastic as defined by NFPA 13. Although normal operations wet the spirals on one side as well as create a high-humidity atmosphere, spiral plants are susceptible to very large fires, particularly when hot work is conducted during outages and water to the spirals might be locked out. Water-based fire suppression systems should be considered for spiral installations, where necessary for protection of important assets with large business interruption potential as determined by a fire risk assessment.

A.7.1

Gas and electric welding or cutting procedures should be in accordance with NFPA 51B.

A.7.1.2.1

For additional information, see NFPA 326 and AWS F4.1, *Safe Practices for the Preparation of Containers and Piping for Welding, Cutting, and Allied Processes*.

A.7.1.2.5

If the coal is susceptible to spontaneous combustion, water should not be used to wet down the area. Rock dust should be used.

A.7.1.4.1

For information on labeling of compressed and liquefied gas cylinders, see CGA C-7, *Guide to Classification and Labeling of Compressed Gases*.

A.7.1.5.9

For information on labeling of compressed and liquefied gas cylinders, see CGA C-7, *Guide to Classification and Labeling of Compressed Gases*.

A.7.3.1

Buried tanks do not create a fire hazard but preferably should be at least 1.5 m (5 ft) from all buildings.

A.7.3.1.2

Information on the design and construction of atmospheric tanks can be found in API STD 650, *Welded Steel Tanks for Oil Storage*; UL 142, *Steel Aboveground Tanks for Flammable and Combustible Liquids*; or UL 80, *Steel Tanks for Oil-Burner Fuels and Other Combustible Liquids*.

Low pressure tanks and pressure vessels can be permitted to be used as atmospheric tanks.

A.7.3.2

This can be accomplished by diking or drainage with remote impounding. (See Section 22.11 of NFPA 30 for additional details.)

A.7.3.3.4

For additional information see Annex B of NFPA 30.

A.7.3.3.6

For additional information see Section 27.8 of NFPA 30.

A.7.4.5

Combustible liquid storage in drums or totes preferably should be stored outside.

A.7.5.1.1

Electrical equipment classified as “permissible” is certified as meeting the requirements of Chapter 1 of 30 CFR 18.

A.7.6.2.2

Containers and portable tanks for combustible liquids authorized by the US Department of Transportation should be acceptable as storage containers.

A.7.6.2.10

Information on the design and construction of pressure vessels can be found in the ASME *Boiler and Pressure Vessel Code*.

A.7.6.2.13

Information on venting can be found in API STD 2000, *Venting Atmospheric and Low-Pressure Storage Tanks*.

A.7.6.3

The terms *transfer* and *transport* are used synonymously to mean movement of combustible liquid in closed containers, tanks, safety cans, or pipelines between underground locations.

A.7.6.3.10

The greatest risk of fire involving substantial quantities of combustible liquids exists when rail supply cars are being moved, especially on a trolley wire-powered rail system. In contrast, cars parked where trolley and feed wire are absent or de-energized represent a distinctly lower risk. Limiting the storage of lubricants in operating areas to a 3-day rather than a 1-day supply reduces the frequency of transport and, as a result, the overall risk of fire.

A.7.6.3.12

Where pressurized pipeline systems are used for combustible liquid transfer, consideration should be given to providing a pressure-sensing interlock downstream of the transfer pump discharge. This interlock should be suitable for Class I, Division 2 locations and should be arranged to shut down the pump immediately upon loss of line pressure.

A.7.6.5

The principal Class II combustible liquid used in a coal mine is diesel fuel.

A.7.6.5.2.7

There are no listed doors for storage areas in underground mines.

A.7.6.5.2.10

Information on tank foundations can be found in Appendix E of API STD 650, *Welded Steel Tanks for Oil Storage*, and Appendix B of API STD 620, *Design and Construction of Large, Welded, Low-Pressure Storage Tanks*.

A.7.6.8

No requirements for bonding or grounding to dissipate static electricity are included in NFPA 30, which does not require bonding or grounding for combustible liquids handled at temperatures below their flash points.

It is recognized, however, that certain conditions can exist that could necessitate bonding or grounding, such as those of temperature and altitude, which can reduce the flash point of diesel fuel.

For additional information on static electricity, see NFPA 77.

A.8.5

A manifold system should be considered for all new installations in shop buildings.

A.8.6.2

Automatic sprinkler protection provides the most affordable fire protection. Where water supplies are adequate, sprinkler protection should be strongly considered for office and warehouse occupancies.

A.8.6.3

If an adequate water supply is available, a fire hydrant should be installed within 15.2 m (50 ft) of the warehouse, shop, and office building.

A.8.6.6

For office buildings, a minimum of one 4.6 kg (10 lb) extinguisher should be provided for every 279 m² (3000 ft²) of building area. Travel distance from any point to the nearest extinguisher should not exceed 22.9 m (75 ft). For shop and warehouse areas, a minimum 9.1 kg (20 lb) extinguisher should be provided for every 22.9 m (75 ft) travel distance within the building.

Large-wheeled, wet or dry chemical or foam extinguishers should be considered for shop and warehouse areas. The type of fires that can occur in these areas can be too large to be handled by a handheld extinguisher.

A.9.1

Unless the conveyor is very long, burning coal on a moving belt is not likely to ignite the belt. Also, if the belt should ignite, the burning of the belt is likely to be extinguished after the burning coal has been discharged and the belt continues to run. No reports of running conveyor belts in and around preparation plants that have caught fire and burned have been located. Every reported case of belts catching fire and burning has occurred after the belts have been stopped.

Some preparation plants use the froth flotation process to separate impurities from fine coal. The agents typically used in froth flotation are Class II combustible liquids. The coal recovered from the froth cells is coated minimally with these agents. It has been found that frothed coal carried on conveyor belts will coat the belting with the agents, causing the coated belting to ignite easily and the flame spread to become significantly more rapid than usual. It is recommended that belts that carry frothed coal be protected with automatic sprinklers. While the froth flotation process operates as a water slurry and presents no risk of fire, the reagents normally used are No. 2 fuel oil and methyl isobutyl carbinol (MIBC), which are Class II combustible liquids.

Fortunately, evidence of heating is easy to detect. During the early stage of heating, the odor is unmistakable. When heating is more advanced, smoke and steam also might be apparent. If the hot coal is in an exposed storage pile, the hot material can be dug out and wetted. If the hot material has to be loaded onto a conveyor belt, the loading areas should be hosed down, and water should be applied to the hot material before or as it is loaded onto the belt.

Tunnels under silos or storage piles should be ventilated adequately and should be protected with a system of automatic sprinklers. Separate hose for firefighting should be provided. The main tunnel should have exit routes at opposite ends of the tunnel.

A.9.1.1

The US Mine Safety and Health Administration standards found in 30 CFR for fire-retardant conveyor belt materials should be used as a guide. Fire-retardant belt materials will burn and, therefore, might require additional fire protection.

Stockpile conveyors, reclaim conveyors, and conveyors going to loadout silos or bins should be fire-resistant belt.

Rip detection also can be considered for long runs or critical belt systems. Critical factors to be considered should be the impact on production if the belt is lost, the cost of the belt itself, availability of spare belting, length of time to repair the belt, and alternatives to bypass the belt if it is lost.

Chute plug interlocks should be provided for transfer chutes.

Primary and secondary belt cleaners at the head pulley should be considered.

A.9.1.2

A steel deck, which often is placed between the top and bottom strands of a belt conveyor, should not be used. It is recommended that existing decks be removed.

The accumulation of combustible dust in enclosed areas can be reduced by designing structural members so their shape or method of installation minimizes the horizontal surface area where dust can settle. Installing structural members exterior to the enclosure should be considered. Access should be provided to facilitate cleaning of all areas.

Belt galleries that use supporting trusses with substantial length of span should be set entirely beneath the belt so that, in the event of a fire, the loaded structural members of the truss are not seriously exposed to the heat of the burning belt. The supports for the troughing and return idlers should not be structural parts of the truss. The covering for the belt should be partially open on the walkway side, allowing access to the belt and to the belt idlers for maintenance and firefighting.

Belts that are located entirely within relatively long-span supporting trusses should be protected by a fixed fire protection system.

Provision for removing burning coal to a safe area using conveyors should be considered. These conveyors might require manual water spray to cool smoldering coal. Flanged openings can be used for removing burning coal if adequate planning and equipment have been provided.

A.9.3.6.3

If the primary exit is impaired by fires originating in underground conveyors and spreading within the tunnel, a secondary emergency escape path provides firefighters or facility fire brigade members safe access into the area for rescue and firefighting.

A.9.4.3

To minimize potential frictional ignition, alignment switches can be permitted to be provided at intervals sufficient to prevent the belt from contacting such materials.

A.9.4.6.3.1.3

The flexible hose should be attached at a point where it is least exposed to a fire ignition source, such as the drive rollers.

A.9.4.6.3.2(8)

Pipe hangers should be designed to support five times the weight of the water-filled pipe plus 114 kg (250 lb) at each point of piping support. Hanger rods should be at least 9.5 mm ($\frac{3}{8}$ in.) thick for pipe up to 102 mm (4 in.). U hooks should be at least 8 mm ($\frac{5}{16}$ in.) thick for pipes up to 50.8 mm (2 in.). Eye rods should be at least 9.5 mm ($\frac{3}{8}$ in.) thick for pipe up to 102 mm (4 in.). This information is taken from Section 9.1 of NFPA 13.

A.9.4.7.4

Adjustable fog nozzles should be provided for all hoses.

A.9.4.8

Transfer points can also require dust suppression.

A.9.5

The key concept in coal storage is to prevent spontaneous combustion. Preventing spontaneous combustion requires all of the following:

- (1) Eliminating air entrainment in the coal
- (2) Eliminating heat sources near the storage
- (3) Preventing moisture in the coal

A.9.5.3

A stacker-reclaimer presents unique fire protection concerns. Protection of the equipment and personnel safety are made more difficult due to the movement-in-place capabilities of the equipment and its mobility and movement along a fixed rail system.

Provision of hydrants in the area might not be sufficient protection primarily because of the extreme delay in response to a fire emergency and the difficulty in reaching all areas involved in a fire with handheld hose equipment.

Fire protection waterlines should be installed parallel to the entire length of the stacker-reclaimer rail system and equipped with fire taps with valves at 91.4 m (300 ft) intervals.

A dry standpipe should extend from ground level to the uppermost walking/working surface of the stacker-reclaimer with fire hose stations at each walking/working surface level. The fire department connection supplying the dry standpipe should be positioned so it is free from damage during movement of the stacker-reclaimer during normal operation.

A fixed water spray system, in compliance with NFPA 15, should be considered for protection of the top belt, its contents, and the bottom return belt and buckets. A retractable hose reel connects the fixed water spray system to the fire protection waterlines.

In addition to protecting the top belt, its contents, and the bottom return belt and buckets, installation of an automatic water spray system in the striker plate areas within the stacker-reclaimer should be considered. Water could be supplied from a 11,355 L to 18,925 L (3000 gal to 5000 gal) capacity pressure tank located on board. To provide an adequate water supply during down or repair periods, a fire department pumper connection should be provided so connection can be made to the fire hydrants in the area.

A.10.1

A ship-barge unloader presents unique fire protection concerns. Protection of the equipment and personnel safety are made more difficult due to the movement-in-place capabilities of the equipment and its mobility and movement along a fixed rail system.

Provision of hydrants in the area might not be sufficient protection primarily because of the extreme delay in response to a fire emergency and the difficulty in reaching all areas involved in a fire with handheld hose equipment.

Fire protection waterlines should be installed parallel to the entire length of the ship-barge unloader rail system and equipped with fire taps with valves at 91.4 m (300 ft) intervals.

A dry standpipe should extend from ground level to the uppermost walking/working surface of the ship-barge unloader with fire hose stations at each walking/working surface level. The fire department connection supplying the dry standpipe should be positioned so it is free from damage during movement of the ship-barge unloader during normal operation.

A fixed water spray system, in compliance with NFPA 15, should be considered for protection of the top belt, its contents, and the bottom return belt and buckets. A retractable hose reel connects the fixed water spray system to the fire protection waterlines.

In addition to protecting the top belt, its contents, and bottom return belt and buckets, installation of an automatic water spray system in the striker plate areas within the ship-barge unloader should be considered. Water could be supplied from a 11,355 L to 18,925 L (3000 gal to 5000 gal) capacity pressure tank located on board. To provide an adequate water supply during down or repair periods, a fire department pumper connection should be provided so connection can be made to the fire hydrants in the area.

A.10.2.2

This process can be accomplished by pressurization, sealing the room, or air filtration. Housekeeping and coal-wetting agents also can be used to reduce the coal dust in the room. Coal dust should not be allowed to accumulate inside electrical cabinets.

A.10.4.2

CO₂ systems are not recommended for occupied areas. If a CO₂ system is used, it should have a maintenance lockout.

A.10.5.1

If the building has a standpipe system, a fire hose can be used as a substitute for a fire extinguisher as detailed in NFPA 10.

A.11.1

For mines where the response time of the public fire department is in excess of 30 minutes, an emergency organization that is trained in basic firefighting techniques should be developed. Training should consist of the use of large extinguishers and small hose streams 38 mm (1½ in.) to provide immediate firefighting efforts until the local fire department arrives. This training would also include procedures for using fire hose off a water truck or any other nearby sources of water. A crew consisting of at least five members for each shift should be trained in firefighting operations. Detailed firefighting procedures should be developed for each type of potential fire, for example, dragline, shovel, mobile equipment, warehouse, and office. Training should be conducted based on those scenarios.

A.11.2.5.1

Two portable water cars, readily available, can be used in place of the water lines prescribed in 11.2.5.1.

A.11.2.5.5

A multiple hydrant is a short length of 76.2 mm (3 in.) or 102 mm (4 in.) pipe, usually with three valved outlets (hydrants) to which fire hose lines can be connected. If the mine is equipped with a foam generator for fighting fires, there should be an additional outlet to feed the generator. An alternative is to assemble the hydrants from grooved pipe fittings that also have threaded tee connections to which the valved outlets are connected. The multiple hydrants should have adapters that allow them to be connected to any of the pipe sizes in use at the mine.

A.11.3.1

Surface firefighting teams should be trained and equipped in accordance with 11.2.2.

Statement of Problem and Substantiation for Public Input

The current references to NFPA 2001 in NFPA 120 and NFPA 122 assume application to enclosures capable of retaining agent for a defined hold time, typically large rooms. In mining, many hazards exist in small enclosures where these assumptions do not hold, making compliance with NFPA 2001 impractical or unverifiable.

- NFPA 2001 evolved from NFPA 12A, which focused on room protection using halon. Its structure and terminology imply large, occupiable enclosures.
- NFPA 2001 does not preclude small enclosures, and includes provisions for local application and extended discharge, but these are not well understood or consistently applied in mining contexts.
- ISO 14520-1 similarly focuses on total flooding, and a new ISO standard (ISO 20862-x) is being developed to address small enclosures (e.g. <3 m³).
- Systems like ANSUL N-101 use IG-100 to achieve extinguishing concentration in small volumes, with favorable retention (due to density compared to air) and cooling characteristics (from pressure change of discharge).
- In very small enclosures the thermodynamics of the discharge may negate the need for a retention period, which itself would not be possible to prove or achieve.
- Without guidance, AHJs and designers may misinterpret NFPA 2001, leading to overdesign or rejection of effective systems.
- An annex would clarify intent, support performance-based design, and promote consistent application of NFPA 2001 in mining environments.

Submitter Information Verification

Submitter Full Name: Chris Downing

Organization: Johnson Controls

Street Address:

City:

State:

Zip:

Submittal Date: Wed Nov 05 06:46:31 EST 2025

Committee: MIN-AAA



Public Input No. 32-NFPA 120-2026 [Sections A.4.2.14, A.4.2.14(1)]

Sections ~~A.4.2.14~~, ~~A.4.2.14(1)~~

~~A.4.2.14~~ —

The provisions of ~~4.2.14~~ do not require inherently noncombustible materials to be tested in order to be classified as noncombustible materials. [~~101: A.4.6.13~~]

~~A.4.2.14(1)~~ —

Examples of such materials include steel, concrete, masonry, and glass. [~~101: A.4.6.13.1(1)~~]

Statement of Problem and Substantiation for Public Input

This is a companion to the information added in PI 31 that is enforceable and not vague.

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
<u>Public Input No. 31-NFPA 120-2026 [Section No. 4.2.14]</u>	
<u>Public Input No. 31-NFPA 120-2026 [Section No. 4.2.14]</u>	

Submitter Information Verification

Submitter Full Name: Marcelo Hirschler

Organization: GBH International

Street Address:

City:

State:

Zip:

Submittal Date: Wed Jan 07 15:22:34 EST 2026

Committee: MIN-AAA



Public Input No. 17-NFPA 120-2025 [Section No. A.5.3.8.1.1]

A.5.3.8.1.1



Depending on the size of the vehicle and size of the fire, a larger fire extinguisher having a nominal capacity of 9.1 kg (20 lb)- fire extinguisher could could be more effective.

Statement of Problem and Substantiation for Public Input

There are many powder extinguishants which have efficacy beyond the legacy powders. Elsewhere in the standard “having a nominal capacity of” is used and it should be the same here too. This would keep language consistent.

Submitter Information Verification

Submitter Full Name: Chris Downing

Organization: Johnson Controls

Street Address:

City:

State:

Zip:

Submittal Date: Wed Nov 05 06:59:13 EST 2025

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Public Input No. 18-NFPA 120-2025 [Section No. A.8.6.6]

A.8.6.6



For office buildings, a minimum of one fully charged and operable fire extinguisher having a nominal capacity of 4.6 kg (10 lb) ~~extinguisher~~ should be provided for every 279 m² (3000 ft²) of building area. Travel distance from any point to the nearest extinguisher should not exceed 22.9 m (75 ft). For shop and warehouse areas, a minimum of one fully charged and operable fire extinguisher having a nominal capacity of 9.1 kg (20 lb) ~~extinguisher should~~ should be provided for every 22.9 m (75 ft) travel distance within the building.

Large-wheeled, wet or dry chemical or foam extinguishers should be considered for shop and warehouse areas. The type of fires that can occur in these areas can be too large to be handled by a handheld extinguisher.

Statement of Problem and Substantiation for Public Input

There are many powder extinguishants which have efficacy beyond the legacy powders.

Elsewhere in the standard the preface to the rating states the weight as "having a nominal capacity of" and should be the same here too.

This would keep language consistent.

E.g. a 7.7kg (17 lb) Foray portable can achieve 6-A:60-B:C an 8.2 kg (18 lb) Purple-K can have 80-B:C

Submitter Information Verification

Submitter Full Name: Chris Downing

Organization: Johnson Controls

Street Address:

City:

State:

Zip:

Submittal Date: Wed Nov 05 07:01:34 EST 2025

Committee: MIN-AAA



Public Input No. 28-NFPA 120-2026 [Section No. B.1.2.8]

B.1.2.8 UL Publications.

Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

UL 80, *Steel Tanks for Oil-Burner Fuels and Other Combustible Liquids*, ~~2019~~ 2024 .

UL 142, *Steel Aboveground Tanks for Flammable and Combustible Liquids*, ~~2019~~ 2025 .

Statement of Problem and Substantiation for Public Input

Update to most recent edition and revision.

Submitter Information Verification

Submitter Full Name: Kelly Nicoello

Organization: UL Solutions

Street Address:

City:

State:

Zip:

Submittal Date: Tue Jan 06 14:11:55 EST 2026

Committee: MIN-AAA



Section/Annex Reference:

Annex A, add new A.x.x

Proposed Annex Text:

A.x.x Autonomous Multidomain Safety Systems.

Mining and mineral processing facilities may benefit from autonomous multidisciplinary safety architectures such as AIMSAREGURD™, which provide continuous monitoring across civil, mechanical, electrical, structural, and biological domains. These systems integrate sensors for gas concentration, oxygen levels, pressure, corrosion, vibration, and intrusion with autonomous isolation capabilities. Their purpose is to detect early anomalies such as combustible gas buildup, mechanical degradation, or electrical faults, and initiate mitigation actions.

In addition, AIMSAREGURD™ can be applied to monitor the integrity of water-based fire protection infrastructure within mining facilities. Sensors for pressure, flow, corrosion, and leakage in water pipes and pumping systems provide real-time assurance that fire protection water supplies remain reliable and available during emergency conditions.

A unique feature of AIMSAREGURD™ is its ability to perform **triple-layer autonomous simultaneous disconnection across medium voltage (MV), low voltage (LV), and direct current (DC) systems**. This capability ensures rapid isolation of electrical energy in the event of arc flash, short circuit, or equipment fault, thereby reducing escalation and improving personnel safety in mining operations. While not required, such systems may be considered as supplemental measures to enhance reliability, life safety, and environmental protection in mining operations.

Statement of Problem and Substantiation:

NFPA 122 establishes requirements for fire prevention and control in mining and mineral processing operations but does not reference autonomous multidisciplinary safety architectures. Mining facilities face hazards from combustible gases, fuel systems, electrical distribution faults, and fire water supply failures. AIMSAREGURD™ enhances existing provisions by:

- monitoring cross-domain parameters (gas, oxygen, pressure, corrosion, vibration),
- ensuring water-based fire protection systems remain reliable,
- and introducing **autonomous simultaneous triple disconnection (MV/LV/DC)** to reduce electrical hazards and arc flash risks.

This integration addresses multiple hazard layers simultaneously, offering a modernized approach to mining safety. Including annex text would raise awareness of these emerging technologies without imposing mandatory requirements.

Additional Proposed Changes

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
AIMSAREGURD_WHITE_PAPER_Optimized.pdf	AIMSAREGURD™, an integrated safety and mitigation multi-level architecture that unifies electrical, mechanical, civil, structural, biological and rescue domains under a single supervisory framework.	

Statement of Problem and Substantiation for Public Input

NFPA 122 establishes requirements for fire prevention and control in mining and mineral processing operations but does not reference autonomous multidisciplinary safety architectures. Mining facilities face hazards from combustible gases, fuel systems, electrical distribution faults, and fire water supply failures. AIMSAFEGURD™ enhances existing provisions by:

monitoring cross-domain parameters (gas, oxygen, pressure, corrosion, vibration),

ensuring water-based fire protection systems remain reliable,

and introducing autonomous triple simultaneous disconnection (MV/LV/DC) to reduce electrical hazards and arc flash risks.

This integration addresses multiple hazard layers simultaneously, offering a modernized approach to mining safety. Including annex text would raise awareness of these emerging technologies without imposing mandatory requirements.

Submitter Information Verification

Submitter Full Name: Oleg Tsyganok

Organization: AIM-SAFENET

Affiliation: NFPA Member #1114021697

Street Address:

City:

State:

Zip:

Submittal Date: Fri Sep 26 16:08:50 EDT 2025

Committee: MIN-AAA



Chapter 1 Administration

1.1* Scope.

1.1.1

This standard covers minimum requirements for safeguarding life and property against fire and related hazards associated with metal and nonmetal underground and surface mining and metal mineral processing plants.

1.1.2

As applies to underground mining, this standard shall cover only the following:

- (1) Diesel-powered equipment
- (2) Storage and handling of ignitable (flammable and combustible) liquids

1.1.3

As applies to underground mining, this standard shall not cover ignitable (flammable and combustible) liquids produced in underground mines, such as shale oil mines.

1.1.4

As applies to surface mining, this standard shall cover only the following:

- (1) Mobile equipment in use without its own motive power train and normally moved by self-propelled equipment
- (2) Self-propelled equipment that contains a motive power train as an integral part of the unit and is not rail-mounted

1.1.5

This standard shall not cover buildings or employee housing and support facilities for a mining operation, or preparation or use of explosives.

1.1.6*

As applies to metal mineral processing, this standard shall cover fire and related hazards associated with metal mineral processing plants — whether underground or on the surface — including but not limited to conveying, crushing, fine milling, beneficiation, flotation, hydro-metallurgical solvent extraction, drying, filtering, ore and concentrate storage, and support facilities for the mineral processing activity.

1.1.7*

As applies to surface metal mineral processing plants, this standard shall not cover the following:

- (1) Solvent extraction plants
- (2) Pressure-leaching processes
- (3) Alumina refineries
- (4) Nonmetal mineral processing plants
- (5) Metal smelters including roasting, sintering, and calcining
- (6) Metal refineries such as electrowinning or electro-refining processes
- (7) Gas, liquid, or solid waste handling or storage systems

1.1.8

Nothing in this standard is intended to prohibit the use of new methods or devices, provided sufficient technical data are submitted to the authority having jurisdiction to demonstrate that the new method or device is equivalent in quality, effectiveness, durability, and safety to that specified by this standard.

1.2 Purpose.

This standard shall be intended for use by those charged with fire prevention and fire protection or with responsibility for purchasing, designing, installing, testing, inspecting, approving, listing, operating, or maintaining the following:

- (1) Facilities and equipment for the storage and handling of ignitable (flammable and combustible) liquids within underground metal and nonmetal mines
- (2) Diesel-powered equipment in underground metal and nonmetal mines, mobile and self-propelled surface mining equipment in metal and nonmetal mines, and metal mineral processing plants

1.3 Application.

Only those skilled in fire protection shall be permitted to design and supervise the installation of fire protection systems.

1.4 Retroactivity.

The provisions of this standard reflect a consensus of what is necessary to provide an acceptable degree of protection from the hazards addressed in this standard at the time the standard was issued.

1.4.1

Unless otherwise specified, the provisions of this standard shall not apply to facilities, equipment, structures, or installations that existed or were approved for construction or installation prior to the effective date of the standard. Where specified, the provisions of this standard shall be retroactive.

1.4.2

In those cases where the authority having jurisdiction determines that the existing situation presents an unacceptable degree of risk, the authority having jurisdiction shall be permitted to apply retroactively any portions of this standard deemed appropriate.

1.4.3

The retroactive requirements of this standard shall be permitted to be modified if their application clearly would be impractical in the judgment of the authority having jurisdiction, and only where it is clearly evident that a reasonable degree of safety is provided.

1.5 Equivalency.

Nothing in this standard shall prevent the use of systems, methods, or devices of equivalent or superior quality, strength, fire resistance, effectiveness, durability, and safety over those prescribed by this standard.

1.5.1

Technical documentation shall be submitted to the authority having jurisdiction to demonstrate equivalency.

1.5.2

The system, method, or device shall be approved for the intended purpose by the authority having jurisdiction.

Statement of Problem and Substantiation for Public Input

Permitting equivalency is essential; this stimulates innovation and technological development, allowing the adoption of such.

The Equivalency clause should be added in its entirety.

In the last revision to NFPA 13, it was agreed to change "is intended to" to "shall" with justification it made the language enforceable, more closely following that required in the Manual of Style; the change was unanimously agreed.

Submitter Information Verification

Submitter Full Name: Chris Downing

Organization: Johnson Controls

Street Address:

City:

State:

Zip:

Submission Date: Wed Nov 05 07:05:57 EST 2025

Committee: MIN-AAA



Public Input No. 17-NFPA 122-2026 [Section No. 2.3.2]

2.3.2 ASTM Publications.

ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.

ASTM D323, *Standard Test Method for Vapor Pressure of Petroleum Products (Reid Method)*, 2020a.

ASTM E136, *Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C*, ~~2019~~ 2024c.

ASTM E2652, *Standard Test Method for Assessing Combustibility of Materials Using a Tube Furnace with a Cone-shaped Airflow Stabilizer, at 750°C*, ~~2018~~ 2022.

Statement of Problem and Substantiation for Public Input

date updates

Submitter Information Verification

Submitter Full Name: Marcelo Hirschler

Organization: GBH International

Street Address:

City:

State:

Zip:

Submittal Date: Wed Jan 07 17:57:22 EST 2026

Committee: MIN-AAA



Public Input No. 7-NFPA 122-2025 [Section No. 3.3]

3.3 General Definitions.

3.3.1 Boiling Point.

The temperature at which the vapor pressure of a liquid equals the surrounding atmospheric pressure. [30, 2021]

3.3.2 Closed Container.

A container as herein defined, so sealed by means of a lid or other device that neither liquid nor vapor will escape from it at ordinary temperatures. [30, 2021]

3.3.3 Combustible.

Capable of undergoing combustion.

3.3.4 Combustible Liquid Storage Area.

3.3.4.1 Combustible Liquid Storage Area — Fixed.

An area used for storage of Class II and Class III combustible liquids that is infrequently moved, and where the aggregate quantity present shall not exceed 18,925 L (5000 gal). Handling of liquids incidental to transfer can take place within a storage area. [120, 2023]

3.3.4.2 Small Combustible Liquid Storage Area — Portable.

An area used for storage of Class II and Class III combustible liquids that is periodically moved, and where the aggregate quantity present does not exceed 3785 L (1000 gal). Handling of liquids incidental to transfer can take place within a storage area. [120, 2023]

3.3.5 Combustion.

A chemical process of oxidation that occurs at a rate fast enough to produce heat and usually light in the form of either a glow or flame. [5000, 2021]

3.3.6 Container.

Any vessel of 450 L (119 gal) or less capacity used for transporting or storing liquids.

3.3.7 Cutoff Room.

A room within a building and having at least one exterior wall.

3.3.8 Diesel-Powered Equipment.

Any device powered by a diesel engine.

3.3.9* Emergency Egress.

An egress from a compartment or work station in emergencies when the normal egress is unusable. [120, 2023]

3.3.10 Equipment Operator.

The authorized person who starts, controls, or stops mining equipment.

3.3.11 Fire Detector.

An automatic device designed to detect the presence of fire and initiate action.

3.3.12 Fire Risk Assessment.

The evaluation of the relative danger of the start and spread of fire; the generation of smoke, gases, or toxic fumes; and the possibility of explosion or other occurrence endangering the lives and safety of personnel or causing significant damage to property.

3.3.13 Fixed Diesel Fuel Storage Area.

A designated location used to facilitate fuel dispensing for the storage of diesel fuel in containers, tanks, or both, exceeding an aggregate quantity of 2498 L (660 gal), from which tanks or containers are not moved or transported within the mine.

3.3.14 Fixed Fire-Suppression System.

An engineered or pre-engineered total flooding or local application system consisting of a fixed supply of extinguishing agent permanently connected for fixed agent distribution to fixed nozzles that are arranged to discharge an extinguishing agent into an enclosure (total flooding), directly onto a hazard (local application), or a combination of both; or an automatic sprinkler system.

3.3.14.1 Engineered Systems.

Those systems requiring individual calculation and design to determine the flow rates, nozzle pressures, pipe size, area, volume protected by each nozzle, quantity of suppression agent, number and types of nozzles, and their placement in a specific system.

3.3.14.2 Pre-Engineered Systems.

Those systems having predetermined flow rates, nozzle pressures, and quantities of extinguishing agent and having specific pipe size, maximum and minimum pipe lengths, flexible-hose specifications, number of fittings, and number and types of nozzles. [17, 2021]

3.3.15 Flammable Liquid Storage Area.

Area used for storage of Class I liquids. [120, 2023]

3.3.15.1 Large Flammable Liquid Storage Area.

An area used for storage of Class I liquids where the aggregate quantity present is greater than 37.8 L (10 gal).

3.3.15.2 Small Flammable Liquid Storage Area.

An area used for storage of Class I liquids where the aggregate quantity present is 37.8 L (10 gal) or less.

3.3.16* Flash Point.

The minimum temperature of a liquid at which sufficient vapor is given off to form an ignitable mixture with the air, near the surface of the liquid or within the vessel used, as determined by the appropriate test procedure and apparatus specified in Section 4.4 of NFPA 30. [30, 2021]

3.3.17 Hand Hose Line System.

A hose and nozzle assembly connected by fixed piping or connected directly to a supply of extinguishing agent.

3.3.18 Hot Work.

Work involving burning, welding, or a similar operation that is capable of initiating fires or explosions. [51B, 2019]

3.3.19 Inherent Safety.

A protection layer that relies on the reduction or elimination of hazardous conditions, materials, or processes through changes in the chemistry, physics, and physical design of a process.

3.3.20 Liquid.

3.3.20.1 Combustible Liquid.

Any liquid that has a closed-cup flash point at or above 37.8°C (100°F), as determined by the test procedures and apparatus set forth in Section 4.4 of NFPA 30. Combustible liquids are classified according to Section 4.3 of NFPA 30.

3.3.20.2 Flammable Liquid.

Any liquid that has a closed-cup flash point below 37.8°C (100°F), as determined by the test procedures and apparatus set forth in Section 4.4 of NFPA 30, and a Reid vapor pressure that does not exceed an absolute pressure of 276 kPa (40 psi) at 37.8°C (100°F), as determined by ASTM D323, *Standard Test Method for Vapor Pressure of Petroleum Products (Reid Method)*. Flammable liquids are classified according to Section 4.3 of NFPA 30.

3.3.21 Metal and Nonmetal.

Minerals other than coal.

3.3.22 Metal Mineral.

Belonging to the class of inorganic metal compounds occurring in the earth's crust that are transformed into pure metals by metallurgical refining, including gold, silver, lead, zinc, nickel, and copper.

3.3.23* Metal Mineral Processing Plant.

A surface processing facility used to size, separate, and concentrate valuable metals from raw ore.

3.3.24 Mine Operator.

Any owner, lessee, or other person who operates, controls, or supervises a mine.

3.3.25* Mineral.

A naturally formed inorganic substance occurring in the earth's crust and having a consistent and distinct set of physical properties and a composition that can be expressed by a chemical formula.

3.3.26 Mobile Equipment.

Wheeled, skid-mounted, track-mounted, or rail-mounted equipment capable of moving or being moved.

3.3.27 Nominal. (adding 1 to each subsequent)

A designated or theoretical value that may vary from the actual, used to represent an accepted incremental range or standard size.

3.3.27 Noncombustible Material.

See Section 4.10.

3.3.28 Nonmetal Mineral.

Belonging to the class of inorganic structural and industrial minerals that do not become metals through metallurgical refining, such as potash, asbestos, sulfur, granite, and rock aggregates.

3.3.29 Ore.

A mixture of valuable metal mineral and waste rock.

3.3.30 Pipeline System.

An arrangement of piping, valves, connections, and allied equipment installed in a mine for the purpose of transporting, transferring, or dispensing ignitable (flammable or combustible) liquids.

3.3.31 Portable Extinguisher.

An extinguisher of the hand-held or wheeled type that is capable of being carried or moved about; or a transportable system consisting of a hose reel or rack, hose, and discharge nozzle assembly connected to a supply of suppressant.

3.3.32 Pressure Vessel.

A container or other component designed in accordance with the ASME *Boiler and Pressure Vessel Code*. [52, 2019]

3.3.33* Safe Area.

An area where hot work such as cutting and welding, burning, or grinding is done routinely and frequently and has been identified, inspected, and designated as being safe for hot work operations.

3.3.34 Safety Can.

A listed container of not more than 20 L (5.3 gal) capacity having a screen or strainer in each fill and pour opening and having a spring-closing lid and spout cover designed to safely relieve internal pressure when exposed to fire. [30, 2021]

3.3.35 Self-Closing Doors.

Doors that, when opened and released, return to the closed position. [80, 2022]

3.3.36 Self-Igniting Ore.

See 3.3.37, Self-Igniting Rock.

3.3.37* Self-Igniting Rock.

Rock containing minerals prone to self-heating and ignition due to chemical oxidation and spontaneous combustion, if such minerals are present in sufficient amounts and occur in a form known to present a spontaneous combustion hazard.

3.3.38 Self-Propelled Equipment.

Any unit that contains a motive power train as an integral part of the unit.

3.3.39* Solvent Extraction (SX) Facility.

Within this standard, a solvent extraction (SX) facility is a hydro-metallurgical processing facility associated with a mining or mineral refining facility that uses organic or alcohol-based solvents to extract desirable metals.

3.3.40 Suitable.

That which is appropriate and has the qualities or qualifications to meet a given purpose, occasion, condition, function, or circumstance.

3.3.41 Tank.

A closed vessel having a liquid capacity in excess of 227 L (60 US gal).

3.3.41.1 Atmospheric Tank.

A storage tank that has been designed to operate at pressures from atmospheric through a gauge pressure of 6.9 kPa (1.0 psi) (i.e., 760 mm Hg through 812 mm Hg) measured at the top of the tank. [30, 2021]

3.3.41.2 Low Pressure Tank.

A storage tank designed to withstand an internal gauge pressure above 3.5 kPa (0.5 psi) but not more than 103.4 kPa (15 psi).

3.3.41.3 Portable Tank.

Any closed vessel having a liquid capacity over 230 L (60 gal) intended for storing liquids and not intended for fixed installation. [30, 2021]

Statement of Problem and Substantiation for Public Input

The term “nominal” is used inconsistently throughout NFPA Standards, particularly in reference to portable fire extinguisher capacities. This inconsistency can lead to confusion regarding compliance and performance expectations.

Adding a formal definition of “nominal” will clarify its intended use and ensure consistent application throughout the standards. The proposed definition aligns with established usage in other NFPA documents, including:

- NFPA 70 (National Electrical Code) – “nominal voltage”
- NFPA 5000 – “nominal dimensions” and “nominal size” (e.g., of timbers)
- NFPA 13 – “nominal diameters” of pipe

The definition is also consistent with Merriam-Webster’s meanings:

- “existing or being something in name or form only”
- “of, being, or relating to a designated or theoretical size that may vary from the actual: approximate”

Example from NFPA 120 / NFPA 122: Subsection 7.6.8.5 of NFPA 120 (2023) and 9.5.5 of NFPA 122 (2023) require a portable extinguisher rated at 4-A:60-B:C. A listed FORAY extinguisher rated 6-A:60-B:C, charged with 7.7 kg (17 lb), exceeds the required rating despite being slightly below the nominal capacity of 9.1 kg (20 lb).

This demonstrates that superior extinguishing agents can achieve higher ratings with less actual mass, yet still fall within the nominal range defined by standard capacity increments (e.g., 5 lb, 10 lb, 20 lb, 30 lb).

Additionally, the storage density of extinguishing agents can vary. As a result, the actual mass of the charge may be adjusted to maintain consistent fill levels, flow characteristics, and discharge performance. In such cases, referencing the nominal size of the extinguisher - rather than the precise mass - is more appropriate and reflective of practical design and listing conventions.

By defining and consistently applying the term “nominal”, the standard will better reflect real-world engineering practices and reduce ambiguity in interpretation and enforcement.

Submitter Information Verification

Submitter Full Name: Chris Downing

Organization: Johnson Controls

Street Address:

City:

State:

Zip:

Submittal Date: Wed Nov 05 07:08:11 EST 2025

Committee: MIN-AAA



Public Input No. 19-NFPA 122-2026 [Section No. 4.10]

4.10* – Noncombustible Material.

4.10.1

A material that complies with any of the following shall be considered a noncombustible material:

- (1) * A material that, in the form in which it is used and under the conditions anticipated, will not ignite, burn, support combustion, or release flammable vapors when subjected to fire or heat
- (2) A material that is reported as passing ASTM E136, *Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C*
- (3) A material that is reported as complying with the pass/fail criteria of ASTM E136 when tested in accordance with the test method and procedure in ASTM E2652, *Standard Test Method for Assessing Combustibility of Materials Using a Tube Furnace with a Cone-shaped Airflow Stabilizer, at 750°C* [5000:7.4.1.1]

{ ~~101~~: 4-6-13

4.10.2

The following materials shall not be required to be tested to be acceptable as noncombustible materials, provided they do not contain any combustible components:

- (1) Glass
- (2) Steel
- (3) 3xxx, 5xxx, and 6xxx series aluminum alloys
- (4) Concrete
- (5) Masonry

[5000 : 7.1.4.1.3]

Statement of Problem and Substantiation for Public Input

NFPA 5000 is the correct reference for this extract, since NFPA 101 extracts from NFPA 5000. SR 8116 of NFPA 5000 updated this information by adding materials that do not need to be tested to be acceptable as noncombustible materials, replacing the vague 9and unenforceable) annex section referring to "inherently noncombustible materials.

NFPA 5000 must be added to the list of extracts documents.

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
Public Input No. 20-NFPA 122-2026 [Sections A.4.10, A.4.10(1)]	
Public Input No. 20-NFPA 122-2026 [Sections A.4.10, A.4.10(1)]	

Submitter Information Verification

Submitter Full Name: Marcelo Hirschler

Organization: GBH International

Street Address:

City:

State:

Zip:

Submittal Date: Wed Jan 07 18:03:48 EST 2026

Committee: MIN-AAA



12.3.5.5.3.1* (add annex)

The system shall be installed in accordance with NFPA 2001.

Statement of Problem and Substantiation for Public Input

Annex 12.3.5.5.3.1 of NFPA 122

Re: application of NFPA 2001 to Small Enclosures in Mining Equipment

Annex wording:

Clean agent extinguishing systems should be installed in accordance with NFPA 2001 or other applicable NFPA standards. While NFPA 2001 provides comprehensive guidance for total flooding and local application systems, its design assumptions are typically based on larger enclosures such as rooms or occupiable spaces.

In mining applications, fire hazards may be present within small, non-occupiable enclosures such as electrical cabinets, hydraulic compartments, or control boxes on mobile equipment and plant. These enclosures often present geometric constraints that challenge the application of total flooding principles, particularly with respect to agent retention and hold time and even the possibility of proving such (integrity testing).

NFPA 2001 does not preclude the protection of small enclosures. Chapter 8 of NFPA 2001 provides requirements for local application systems, which may be appropriate where the enclosure does not conform to total flooding criteria. Additionally, extended discharge provisions (e.g., Section 7.5.2) may be applicable where prolonged agent delivery is necessary due to leakage or access limitations.

Designers should consider the following when applying NFPA 2001 requirements to small enclosures:

- Likely Fire Size: The likely fire size in such a volume is likely small.
- Discharge Dynamics: Rapid discharge to achieve extinguishing concentration, combined with thermodynamic cooling from agent delivery (pressure and/or phase change), may reduce the likelihood of reignition.
- Agent Selection: Use of inert gases such as nitrogen (IG-100) may offer favorable retention characteristics due to density compared to air. Agent retention should not be presumed and, subject to the application, may not be possible.
- Enclosure Geometry: Small enclosures have a higher surface-to-volume ratio, increasing the impact of leakage and reducing hold time.
- Retention Time / Integrity Testing: Integrity testing is likely impossible and, where possible, the accuracy of the model at such small scale is not proven.
- Extended Discharge: Where proving retention is not feasible but a duration of protection a requirement, an extended discharge may provide continued suppression and protection.
- In very small enclosures the thermodynamics of the discharge may negate the need for a retention period, which itself would not be possible to prove or achieve.

International standards such as ISO 14520-1 have similarly focused on total flooding systems.

Recognizing the limitations of applying these principles to small enclosures, a new ISO standard (ISO 20862-x) is under development to address fire suppression in small volumes (e.g., $<3 \text{ m}^3$). This reflects a growing consensus that alternative design approaches are necessary for such applications.

Systems such as ANSUL N-101, which uses pure nitrogen (IG-100), is engineered to protect small enclosures in mining environments, delivering an extinguishing concentration rapidly. The system design should account for leakage, thermodynamic effects, and the specific hazard scenario, demonstrating a practical application of NFPA 2001 principles to constrained volumes and could be viable in such applications.

Problem Statement & Substantiation:

The current references to NFPA 2001 in NFPA 120 and NFPA 122 assume application to enclosures capable of retaining agent for a defined hold time, typically large rooms. In mining, many hazards exist in small enclosures where these assumptions do not hold, making compliance with NFPA 2001 impractical or unverifiable.

- NFPA 2001 evolved from NFPA 12A, which focused on room protection using halon. Its structure and terminology imply large, occupiable enclosures.
- NFPA 2001 does not preclude small enclosures, and includes provisions for local application and extended discharge, but these are not well understood or consistently applied in mining contexts.
- ISO 14520-1 similarly focuses on total flooding, and a new ISO standard (ISO 20862-x) is being developed to address small enclosures (e.g. $<3 \text{ m}^3$).
- Systems like ANSUL N-101 use IG-100 to achieve extinguishing concentration in small volumes, with favorable retention (due to density compared to air) and cooling characteristics (from pressure change of discharge).
- In very small enclosures the thermodynamics of the discharge may negate the need for a retention period, which itself would not be possible to prove or achieve.
- Without guidance, AHJs and designers may misinterpret NFPA 2001, leading to overdesign or rejection of effective systems.

- An annex would clarify intent, support performance-based design, and promote consistent application of NFPA 2001 in mining environments.

Submitter Information Verification

Submitter Full Name: Chris Downing

Organization: Johnson Controls

Street Address:

City:

State:

Zip:

Submittal Date: Wed Nov 05 07:13:57 EST 2025

Committee: MIN-AAA



Public Input No. 14-NFPA 122-2025 [Section No. 12.3.6.1.1]

12.3.6.1.1*

For diesel-powered generators with hydraulic systems containing more than 567.8 L (150 gal) in the lines, shall be provided with one of the following:

1) a dual - agent fire suppression system

~~shall be provided.~~

2) an approved liquid-only fire suppression system

Statement of Problem and Substantiation for Public Input

The current requirement for dual-agent fire suppression systems on self-propelled equipment with hydraulic systems exceeding 568 L (150 gal) was originally intended to prevent the use of dry chemical (powder) alone, not to prohibit the use of liquid-only systems. The clause was introduced at a time when dry chemical was the primary protection method, and the mandatory addition of a liquid agent was meant to address the need for cooling superheated surfaces and preventing re-ignition. However, the present wording unintentionally excludes modern, listed liquid-only suppression systems that have demonstrated equal or superior performance to dual-agent systems. This outdated requirement can lead to unnecessary complexity, increased cost and maintenance, and, in certain applications, may even impair the system's firefighting efficacy.

Substantiation:

1. Historical Intent and Current Practice:

The dual-agent clause was introduced to ensure that dry chemical alone would not be used, as it cannot provide the necessary cooling for superheated surfaces and may allow re-ignition of flammable liquids. The intent was to require a liquid agent for its cooling and reflash prevention properties, not to mandate the continued use of dry chemical where liquid-only systems are proven effective.

2. Technological Advancements in Liquid Agents:

OEMs have made significant improvements in liquid-only agent formulations. Ansul's LVS NF-40 non-fluorinated liquid suppression agent, as evidenced in the Johnson Controls White Paper (F-2022044-00, 2022), demonstrates superior performance compared to both legacy dual-agent systems and previous liquid agents. Testing shows that LVS NF-40 extinguishes fires faster, cools superheated surfaces more effectively, and secures fuel pools against reflash, all as a stand-alone agent.

The dry chemical component in dual-agent systems can actually hinder the suppression effect of the liquid agent by isolating heat and preventing efficient cooling.

3. Alignment with FM 5970 and Industry Standards:

FM 5970 is representative of real-world scenarios for heavy-duty mobile equipment. The standard was designed to replicate the harsh conditions and fire hazards found in mining, forestry, and construction vehicles, and effectively supports the use of liquid-only systems, which are increasingly preferred for their efficacy, cooling and environmental benefits.

4. Environmental and Operational Benefits:

Modern liquid-only agents such as LVS NF-40 are non-fluorinated and environmentally responsible. Their use supports sustainability goals and reduces environmental impact compared to legacy agents.

Liquid-only systems reduce cost compared to dual-agent systems, simplify installation and maintenance, and eliminate the operational challenges associated with other approaches.

5. Performance-Based Fire Protection:

The latest generation of liquid-only agents meets or exceeds the performance requirements for fire suppression, cooling, and reflash prevention in heavy-duty equipment. Allowing approved liquid-only systems aligns with NFPA's performance-based approach and ensures fire protection solutions remain effective and adaptable to technological progress.

Submitter Information Verification

Submitter Full Name: Chris Downing

Organization: Johnson Controls

Street Address:

City:

State:

Zip:

Submittal Date: Wed Nov 05 07:47:23 EST 2025

Committee: MIN-AAA



Public Input No. 4-NFPA 122-2025 [Section No. 12.3.6.1.1]

12.3.6.1.1*

For diesel-powered generators with hydraulic systems containing more than 567.8 L (150 gal) in the lines, a dual agent system shall be provided.

I would like to have the definition of the hydraulic systems added in the general definitions. some people that are not mechanic do not seem to grasp the fact that it includes steering, transmission cooling and hoist systems.

Statement of Problem and Substantiation for Public Input

Because of the lack of the definition, some people calculate the amount of hydraulic fluids within the lines as individual quantities per each separate and thus never reach the limit required for a dual agent system.

Some fire suppression supplier even go on to say that a single agent system could be used on Ultra- and Mega-class equipment.

Submitter Information Verification

Submitter Full Name: Etienne Anderson Larocque

Organization: AMEM

Street Address:

City:

State:

Zip:

Submittal Date: Thu Apr 24 08:13:11 EDT 2025

Committee: MIN-AAA



Public Input No. 15-NFPA 122-2025 [Section No. 12.3.8.3.3]

12.3.8.3.3

Self-propelled equipment with a hydraulic system that exceeds 568 L (150 gal) in the lines shall be provided ~~with~~ with one of the following:

1) a dual-agent fire suppression system

-

2) an approved liquid-only fire suppression system

Statement of Problem and Substantiation for Public Input

The current requirement for dual-agent fire suppression systems on self-propelled equipment with hydraulic systems exceeding 568 L (150 gal) was originally intended to prevent the use of dry chemical (powder) alone, not to prohibit the use of liquid-only systems. The clause was introduced at a time when dry chemical was the primary protection method, and the mandatory addition of a liquid agent was meant to address the need for cooling superheated surfaces and preventing re-ignition. However, the present wording unintentionally excludes modern, listed liquid-only suppression systems that have demonstrated equal or superior performance to dual-agent systems. This outdated requirement can lead to unnecessary complexity, increased cost and maintenance, and, in certain applications, may even impair the system's firefighting efficacy.

Substantiation:

1. Historical Intent and Current Practice:

The dual-agent clause was introduced to ensure that dry chemical alone would not be used, as it cannot provide the necessary cooling for superheated surfaces and may allow re-ignition of flammable liquids. The intent was to require a liquid agent for its cooling and reflash prevention properties, not to mandate the continued use of dry chemical where liquid-only systems are proven effective.

2. Technological Advancements in Liquid Agents:

OEMs have made significant improvements in liquid-only agent formulations. Ansul's LVS NF-40 non-fluorinated liquid suppression agent, as evidenced in the Johnson Controls White Paper (F-2022044-00, 2022), demonstrates superior performance compared to both legacy dual-agent systems and previous liquid agents. Testing shows that LVS NF-40 extinguishes fires faster, cools superheated surfaces more effectively, and secures fuel pools against reflash, all as a stand-alone agent.

The dry chemical component in dual-agent systems can actually hinder the suppression effect of the liquid agent by isolating heat and preventing efficient cooling.

3. Alignment with FM 5970 and Industry Standards:

FM 5970 is representative of real-world scenarios for heavy-duty mobile equipment. The standard was designed to replicate the harsh conditions and fire hazards found in mining, forestry, and construction vehicles, and effectively supports the use of liquid-only systems, which are increasingly preferred for their efficacy, cooling and environmental benefits.

4. Environmental and Operational Benefits:

Modern liquid-only agents such as LVS NF-40 are non-fluorinated and environmentally responsible. Their use supports sustainability goals and reduces environmental impact compared to legacy agents.

Liquid-only systems reduce cost compared to dual-agent systems, simplify installation and maintenance, and eliminate the operational challenges associated with other approaches.

5. Performance-Based Fire Protection:

The latest generation of liquid-only agents meets or exceeds the performance requirements for fire suppression, cooling, and reflash prevention in heavy-duty equipment. Allowing approved liquid-only systems aligns with NFPA's performance-based approach and ensures fire protection solutions remain effective and adaptable to technological progress.

Submitter Information Verification

Submitter Full Name: Chris Downing

Organization: Johnson Controls

Street Address:

City:

State:

Zip:

Submittal Date: Wed Nov 05 07:49:26 EST 2025

Committee: MIN-AAA



Public Input No. 11-NFPA 122-2025 [Chapter A]

Annex A Explanatory Material

Annex A is not a part of the requirements of this NFPA document but is included for informational purposes only. This annex contains explanatory material, numbered to correspond with the applicable text paragraphs.

A.1.1

Because of the uniqueness and often remoteness of metal and nonmetal mines and ore processing facilities, provisions in this standard could differ from commonly accepted fire protection standards and guides devised for other types of occupancies. The provisions of this document are considered necessary to provide a reasonable level of protection from loss of life and property from fire and explosions. They reflect situations and the state of the art at the time the standard was issued.

As of 2001, there were 12,479 metal/nonmetal mining and processing operation in the United States. In the most recent 12-year period, approximately 515 fires of all types were reported.

Fires and explosions in mines and mineral processing plants have caused major loss of property, production equipment, buildings, and business interruption. In the five-year period from 1994 to 1998, mines and quarries of all types averaged \$12.3 million a year in direct damage in fires reported to US local fire departments. In the same period, nonmetallic mineral processing and product manufacturing facilities averaged \$16.1 million a year in direct damage in fires reported to US local fire departments. *(For more information, see Section 9.16 of the 2008 edition of NFPA's Fire Protection Handbook.)*

Fires adversely affect all areas of mining and mineral processing operations, including underground and surface self-propelled and mobile mining equipment, underground fuel storage areas, surface ore concentrating and processing buildings and equipment, and support facilities associated with these activities.

Fire and related hazards in metal ore processing facilities include but are not limited to conveyor belts; rubber lined equipment; combustible and flammable reagents; gaseous, liquid, or solid fuels; mineral extraction solvents and carriers; dielectric, thermal, and lubricating oils; hydraulic fluids; grouped plastic electric cables; and combustible construction. Significant fire and explosions have occurred in concentrator mills due to these hazards.

Ignition sources for these hazards are present and cannot always be controlled. The most common ignition source in this industry is uncontrolled hot work.

Control and awareness of combustible loading, including "hidden" combustibles like rubber or plastic lined equipment, is important to understanding these hazards. Automatic fire suppression systems coupled with effective emergency response have been effective in limiting fire damage in processing facilities.

Most fires involving mobile or self-propelled mining equipment — whether underground or surface — occur on or near engine exhaust systems, high-speed drive lines, malfunctioning high-pressure–high-temperature hydraulic systems, or faulty electrical components. Total elimination of fire hazards on equipment is impossible since sources of ignition and fuel for fires are inherent in the basic equipment design. The fire problem is further complicated by the collection of environmental debris. Therefore, efforts to reduce fire losses on mobile equipment must be aimed at fire prevention and fire suppression.

To improve fire protection and prevention on mining equipment, some manufacturers of mining equipment have placed emphasis on the reduction of the fire potential of specific items in the original design of their equipment. Such items include turbochargers, exhaust manifolds and exhaust pipe shielding and insulation, location of ignitable (flammable and combustible) liquid reservoirs, and hydraulic and fuel line routing.

Most mining equipment is required to have at least one hand-portable extinguisher mounted in a readily accessible location. Extinguishers are most effective where used by trained operators. However, considering the size and configuration of machines found at a mine, fires can be difficult or impossible to fight with a hand-held extinguisher. For this reason, fire suppression systems have been developed to aid in suppressing those fires that are hard to access and thereby to reduce "off-road" equipment fire losses.

The key to operator protection is early detection of fires to provide a warning to the operator, fuel shutoff to minimize fuel for the fire, and fire suppression during its earliest stages. Specialized systems to perform these functions can be required to protect the operator and the machines. To be totally effective, however, system operation must be fully understood by owners and operators, and provisions must be made for periodic inspection and maintenance.

Fire suppression systems, including hand-portable extinguishers, offer the mining industry a cost-effective tool by which personnel and investments in mining equipment can be protected.

It could be necessary for those charged with purchasing, testing, approving, and maintaining fire protection equipment for the mining industry to consult an experienced fire protection specialist.

A.1.1.6

A typical metal mineral processing plant — also called a concentrating or dressing mill — is physically separated from the mining operation, although it can be connected by conveyor systems. Typical metals produced using concentrator plants are gold, silver, platinum, nickel, zinc, lead, molybdenum, and copper. Essentially any metal can be concentrated in this manner. Some concentrating mills are located on floating dredges, such as those used in titanium mining.

The general purpose of the processing plant is to receive crushed ore, further reduce it in size by additional crushing, milling, and screening, and separate waste materials (gangue) from desirable metal mineral values. Most metal mineral mills are similar in that they have large semi-autogenous, ball, or roll mills for fine grinding the ore into a pulp or slurry. Once ground, the slurry is processed by flotation or beneficiation using reagents. After flotation, the concentrate — which can be in the 20 percent to 30 percent metals value range — is filtered or thermally dried and stored. Some metals, like molybdenum, feature combustible thermal oils in the drying process. Concentrate is sent to metallurgical refineries to recover the final pure product. The refinery might be adjacent to the mill but is usually separate.

By-products produced in a typical metal concentrator mill include tailings, which consist of waste gangue and entrained water and process chemicals. This waste is sent to a tailings disposal facility.

A.1.1.7

There are number of processes associated with concentration or refining of metal ores that are not applicable to this standard but deserve mention due to their hazards and integration with the concentration process. These include solvent extraction–electrowinning (SX–EW); pressure leaching processes (using high-pressure autoclave reactors); alumina refineries; metal smelters, including flash furnaces; roasting, sintering, calcining, and electro-refining processes; and gas, liquid, or solid waste handling systems. There are also nonmetal mineral processing plants such as those used for recovering phosphates, nitrates, potash, and soda ash. All of these processes are chemical in nature, and all have serious fire and explosion hazards.

Of particular mention and importance from a potential fire hazard standpoint are solvent extraction (SX) plants, which are covered in Section 13.20 (for new and existing facilities) and Section 13.21 (for new facilities).

An SX plant is a separations process using combustible solvents like kerosene or alcohol for separating valuable metal minerals. An SX process facility often features thousands of gallons of solvent in plastic tanks using plastic piping and can be located outdoors or inside buildings. SX plants are common at copper mines where the oxide content of the ore body allows acid leaching in heaps. They are also common for uranium, nickel, and cobalt.

While kerosene is usually a Class II combustible liquid and in a cold state is relatively difficult to ignite, once ignited it burns similar to other lower flash point hydrocarbons. At high elevations, the flash point can render the material a Class I flammable liquid. In very hot climates, the material can be above its flash point and the potential for heating is increased when the solution is carried in black plastic piping subject to solar heating.

Protection of SX plants needs to consider response time of firefighters and types of firefighting appliances and suppression agents. Because of the large quantities of combustible liquids and use of plastic piping and process systems — which can fail prematurely due to fire impingement and rapidly release additional combustible liquids — a well-developed and large area fire could occur in minutes, and responding firefighters could be faced with protecting exposures rather than suppression of the incipient event. For this reason the use of fast-acting automatic detection and suppression systems is advised. Foam-water systems have proven effective in suppressing combustible liquid fires. If used, consideration needs to be given to providing protection over and under mixer-settlers and tanks, in tunnels with plastic piping, under pipe racks, over pumps, and inside mixer-settlers.

Provision of drainage, confinement, control of static electricity by bonding and grounding, and selection of stout piping systems, such as stainless steel or structural fiberglass reinforced plastic instead of less robust polyethylene, is advised.

A mineral SX plant should not be confused with an agricultural SX plant that uses low flash point flammable solvents, like hexane, for recovering oils from soybeans, canola, and corn, and that has a higher hazard. NFPA 36 applies to protection of agricultural solvent extraction plants but does not apply to protection of mineral solvent extraction plants. There currently are no NFPA standards on mineral SX plants.

A.3.2.1 Approved.

The National Fire Protection Association does not approve, inspect, or certify any installations, procedures, equipment, or materials nor does it approve or evaluate testing laboratories. In determining the acceptability of installations or procedures, equipment, or materials, the “authority having jurisdiction” may base acceptance on compliance with NFPA or other appropriate standards. In the absence of such standards, said authority may require evidence of proper installation, procedure, or use. The “authority having jurisdiction” may also refer to the listings or labeling practices of an organization that is concerned with product evaluations and is thus in a position to determine compliance with appropriate standards for the current production of listed items.

A.3.2.2 Authority Having Jurisdiction (AHJ).

The phrase “authority having jurisdiction,” or its acronym AHJ, is used in NFPA standards in a broad manner because jurisdictions and approval agencies vary, as do their responsibilities. Where public safety is primary, the authority having jurisdiction may be a federal, state, local, or other regional department or individual such as a fire chief; fire marshal; chief of a fire prevention bureau, labor department, or health department; building official; electrical inspector; or others having statutory authority. For insurance purposes, an insurance inspection department, rating bureau, or other insurance company representative may be the authority having jurisdiction. In many circumstances, the property owner or his or her designated agent assumes the role of the authority having jurisdiction; at government installations, the commanding officer or departmental official may be the authority having jurisdiction.

A.3.2.4 Listed.

The means for identifying listed equipment may vary for each organization concerned with product evaluation; some organizations do not recognize equipment as listed unless it is also labeled. The authority having jurisdiction should utilize the system employed by the listing organization to identify a listed product.

A.3.3.9 Emergency Egress.

See NFPA 101 for the use of the term.

A.3.3.16 Flash Point.

The flash point of a liquid having a viscosity less than 45 SUS at 37.8°C (100°F) or a flash point of 93.4°C (200°F) or higher should be determined in accordance with ASTM D56, *Standard Test Method for Flash Point by Tag Closed Cup Tester*.

The flash point of a liquid having a viscosity of 45 SUS or more at 37.8°C (100°F) or a flash point of 93.4°C (200°F) or higher should be determined in accordance with ASTM D93, *Standard Test Methods for Flash Point by Pensky-Martens Closed Cup Tester*.

As an alternative, ASTM D3278, *Standard Test Methods for Flash Point of Liquids by Small Scale Closed-Cup Apparatus*, should be permitted to be used for paints, enamels, lacquers, varnishes, and related products and their components having flash points between 0°C to 110°C (32°F to 230°F), and having a viscosity lower than 150 stokes at 25°C (77°F).

A.3.3.23 Metal Mineral Processing Plant.

A mineral processing plant, also called a concentrator mill or a dressing plant, can have crushers; grinding mills; fuel-fired dryers; separation circuits featuring flammable, combustible, or toxic liquid reagents in flotation cells; and possibly special hazard circuits using thermal oils and solvent extraction. A mineral processing plant is usually located close to the mine due to cost of shipping raw ore long distances.

A.3.3.25 Mineral.

Mineral in this document refers only to metal or nonmetal ores and not to coal.

A.3.3.33 Safe Area.

Examples are designated welding shops.

A.3.3.37 Self-Igniting Rock.

In metal/nonmetal mines this usually pertains to sulfide ores or coal deposits.

A.3.3.39 Solvent Extraction (SX) Facility.

A hydro-metallurgical solvent extraction facility is not to be confused with an agricultural solvent extraction plant that uses hexane or other low flash point ignitable (flammable or combustible) liquid to recover edible oils such as soy, palm, or corn oil. Agricultural solvent extraction plants are covered by NFPA 36. NFPA 36 is not to be used for protection requirements of hydro-metallurgical solvent extraction facilities.

A.4.4.22

For additional information, see NFPA 326 and AWS F4.1, *Safe Practices for the Preparation of Containers and Piping for Welding, Cutting, and Allied Processes*.

A.4.10

The provisions of Section 4.10 do not require inherently noncombustible materials to be tested in order to be classified as noncombustible materials. [**101**:A.4.6.13]

A.4.10(1)

Examples of such materials include steel, concrete, masonry, and glass. [**101**:A.4.6.13.1(1)]

A.5.1

See Annex B for suggested procedure to conduct a fire risk assessment.

A.5.1.2

Examples of persons qualified to conduct fire risk assessments could include fire protection professionals, or those that can demonstrate qualification based on education, experience, and skills to adequately evaluate the fire risks associated with the equipment or areas.

A.5.1.4

Examples of where fixed protection might be needed in mineral processing plants include conveyor belts, galleries, tunnels, over rubber and plastic constructed or lined equipment, switch gear rooms, control rooms, change houses, and ignitable (flammable and combustible) liquids storage or process areas. Areas with noncombustible construction or noncombustible contents are areas where fixed protection might not be needed.

A.7.1.1

Some examples of equipment modifications that can favorably reduce risk of fire include physical barrier between fuel and ignition sources, thermal shields over hot surfaces, hydraulic hose and electrical wiring harness rerouting, and power shutoffs.

A.7.1.2

Modifications could affect the life expectancy and certification of diesel-powered equipment and diesel-powered equipment components. It is possible that such a modified machine would not be covered by the manufacturer's warranty or certification. Questions concerning the effect of a proposed modification should be discussed with the diesel-powered equipment manufacturer or the manufacturer's representative.

A.7.4(3)

Depending upon the size of the equipment, additional ground-level manual actuators could be needed to provide quick access for manual activation of the system.

A.8.3.4

Where pressurized pipeline systems are used for combustible liquid transfer, consideration should be given to providing a pressure-sensing interlock downstream of the transfer pump discharge. This interlock should be suitable for Class I, Division 2 locations and should be arranged to shut down the pump immediately upon loss of line pressure.

A.9.1

Because of the inherent hazards associated with flammable liquids, the underground storage of flammable liquids should be avoided.

A.9.1.1

Electrical equipment classified as “permissible” is certified as meeting the requirements of Chapter 1 of 18 CFR.

A.9.4.2.1

Electrical equipment classified as “permissible” is certified as meeting the requirements of Chapter 1 of 18 CFR.

A.10.3

Atmospheric tanks should be built in accordance with good engineering practices.

Information on the design and construction of tanks can be found in API STD 650, *Welded Tanks for Oil Storage*; UL 80, *Steel Tanks for Oil-Burner Fuels and Other Combustible Liquids*; or UL 142, *Steel Aboveground Tanks for Flammable and Combustible Liquids*.

Low-pressure tanks and pressure vessels can be permitted to be used as atmospheric tanks.

A.10.4

Low-pressure tanks should be built in accordance with good engineering practices.

A.10.5

Pressure vessels should be built in accordance with good engineering practices.

Information on the design and construction of pressure vessels can be found in the ASME *Boiler and Pressure Vessel Code*.

A.10.6.2.1

Information on venting can be found in API STD 2000, *Venting Atmospheric and Low-Pressure Storage Tanks*.

A.10.9.15

Information on tank foundations can be found in Appendix B of API STD 620, *Design and Construction of Large, Welded, Low-Pressure Storage Tanks*, and in Appendix E of API STD 650, *Welded Tanks for Oil Storage*.

A.10.10

No requirements for bonding or grounding to dissipate static electricity are included in this standard for combustible liquids, based upon the fact that NFPA 30 does not require bonding or grounding for combustible liquids handled at temperatures below their flash points.

However, it is recognized that certain conditions can exist that could necessitate bonding or grounding, such as temperature and altitude, which can reduce the flash point of diesel fuel.

For additional information on static electricity, see NFPA 77.

A.11.3.1

Underground shaft mines that use diesel-powered equipment generally employ underground diesel fuel storage areas to facilitate equipment refueling. Adit-type mines in the western United States can initially locate diesel fuel storage and refueling facilities on the surface; however, as the active mine workings progress further from the adit portal(s), these facilities usually are moved underground.

A common means of fire protection currently found in many underground diesel fuel storage areas is a fixed water sprinkler system. The federal Mine Safety and Health Administration (MSHA) currently approves such systems for this application. The consensus of the committee is that this situation represents a significant safety hazard. According to NFPA's *Fire Protection Handbook*, water sprinklers can be used on diesel fuel for control but not for extinguishment.

"The Health and Safety Implications of the Use of Diesel-Powered Equipment in Underground Mines," a report by an interagency task group prepared for MSHA in 1985, concludes that "water spray or fog usually will not extinguish diesel fuel fires."

In an underground mine, fire control is not sufficient; fire extinguishment is essential for the following reasons:

- (1) As long as a fire burns, even if it does not grow in intensity or area and appears to be responsive to fire control, toxic smoke and fire gases are produced that can endanger persons in the mine.
- (2) According to NFPA's *Fire Protection Handbook*, overpressure failure of containers when exposed to fire is considered the principal hazard of closed-container ignitable (flammable and combustible) liquid storage.
- (3) Even a "controlled" fire can cause container failure, producing a fire so intense that the sprinkler system is unable to control it, much less extinguish it.
- (4) Water sprays are not effective in extinguishing pressure fires, running fuel fires, and obstructed spill fires, all of which can occur in a diesel refueling area.
- (5) Water supplies are limited in many underground mines. Fire control, therefore, should be considered temporary, because the fire will grow immediately to maximum intensity when the water supply is depleted.
- (6) The vapor pressure of diesel fuel increases with elevation due to reduced barometric pressure. As a result, even fuels without flash point-reducing additives can become flammable, depending on the altitude at which they are used. This reduction in flash point could result in reclassification of the diesel fuel to a Class IC flammable liquid. There is no clear consensus in the literature and industry practice as to the effectiveness of fixed water sprays in controlling and extinguishing fires involving Class IC flammable liquids. Although industry practice strongly favors fixed water sprays for such applications, the literature and available research results clearly indicate the ineffectiveness of fixed sprays on Class IC liquids, especially on pressure fires, running fuel fires, and obstructed spill fires.

Water sprinkler systems installed for the protection of diesel fuel storage areas might not be effective in suppression even though they do provide good control through cooling; foam-water systems can provide suppression.

For further information on foam-water systems, see NFPA 11.

A.12.2

Fires adversely affect all types of self-propelled and mobile surface mining equipment, including, but not limited to, trucks, front-end loaders, crawlers, drills, shovels, and draglines. Most fires occur on or near engine exhaust systems, high-speed drive lines, malfunctioning high-pressure-high-temperature hydraulic systems, or faulty electrical components.

Total elimination of fire hazards is impossible, because sources of ignition and fuel for fires are inherent in the basic equipment design. The problem is further complicated by the collection of environmental debris. Therefore, efforts to reduce fire losses must be aimed at fire prevention and fire suppression.

To improve fire protection and prevention on surface mining equipment, some manufacturers of mining equipment emphasize the reduction of the fire potential of specific items in the original design of their equipment. Such items include turbochargers, exhaust manifolds and exhaust pipe shielding and insulation, location of ignitable (flammable and combustible) liquid reservoirs, and hydraulic and fuel-line routing.

Most surface mining equipment is required to have at least one hand-portable extinguisher mounted in a readily accessible location. Extinguishers are most effective when used by trained operators. However, considering the size and configuration of machines found at a mine, fires can be difficult or impossible to fight with a hand-held extinguisher. For this reason, fire suppression systems have been developed to aid in suppressing those fires that are hard to access and thereby to reduce "off-road" equipment fire losses.

The key to operator protection is early detection of fires to provide a warning to the operator, fuel shutoff to minimize fuel for the fire, and fire suppression during its earliest stages. Specialized systems to perform these functions can be required to protect the operator and the machines. To be totally effective, however, system operation must be fully understood by owners and operators, and provisions must be made for periodic inspection and maintenance.

Fire suppression systems, including hand-portable extinguishers, offer the mining industry a cost-effective tool by which personnel and investments in mining equipment can be protected.

A.12.2.5

UG mining vehicle manufacturers are developing battery electric vehicles powered by lithium-ion batteries as an alternative to diesel-powered vehicles. Despite the benefits, the introduction of new technology can create consequences that if left uncontrolled can cause fire hazards.

A.12.3.4.1

Depending on the size of the vehicle and size of the fire, a 9.1 kg (20 lb) fire extinguisher could be more effective.

A.12.3.4.9(8)

The same record tag or label can also indicate if recharging was performed.

A.12.3.5.2.2

Smoke detectors are not recommended because of the harsh environment.

A.12.3.5.3.1

Automatic systems are not necessary if the area is easily accessible for manual firefighting.

A.12.3.5.4.2

Carbon dioxide would not be the best choice for fighting this type of fire due to the potential for the gas to be dispersed before the oxygen concentration is reduced enough to affect the fire.

For transformers over 5000 kVA, a fixed fire suppression system is recommended.

A.12.3. 5.5.3.1

Clean agent extinguishing systems should be installed in accordance with NFPA 2001 or other applicable NFPA standards. While NFPA 2001 provides comprehensive guidance for total flooding and local application systems, its design assumptions are typically based on larger enclosures such as rooms or occupiable spaces. In mining applications, fire hazards may be present within small, non-occupiable enclosures such as electrical cabinets, hydraulic compartments, or control boxes on mobile equipment and plant. These enclosures often present geometric constraints that challenge the application of total flooding principles, particularly with respect to agent retention and hold time and even the possibility of proving such (integrity testing). NFPA 2001 does not preclude the protection of small enclosures. Chapter 8 of NFPA 2001 provides requirements for local application systems, which may be appropriate where the enclosure does not conform to total flooding criteria. Additionally, extended discharge provisions (e.g., Section 7.5.2) may be applicable where prolonged agent delivery is necessary due to leakage or access limitations. Designers should consider the following when applying NFPA 2001 requirements to small enclosures:

- Likely Fire Size: The likely fire size in such a volume is likely small.

- Discharge Dynamics: Rapid discharge to achieve extinguishing concentration, combined with thermodynamic cooling from agent delivery (pressure and/or phase change), may reduce the likelihood of re-ignition.

- Agent Selection: Use of inert gases such as nitrogen (IG-100) may offer favorable retention characteristics due to density compared to air.

- Enclosure Geometry: Small enclosures have a higher surface-to-volume ratio, increasing the impact of leakage and reducing hold time.

- Retention Time / Integrity Testing: Integrity testing is likely impossible and, where possible, the accuracy of the model at such small scale is not proven. Agent retention should not be presumed and, subject to the application, may not be possible.

- Extended Discharge: Where proving retention is not feasible but a duration of protection a requirement, an extended discharge may provide continued suppression and protection.

. In very small enclosures the thermodynamics of the discharge may negate the need for a retention period, which itself would not be possible to prove or achieve.

International standards such as ISO 14520-1 have similarly focused on total flooding systems. Recognizing the limitations of applying these principles to small enclosures, a new ISO standard (ISO 20862-x) is under development to address fire suppression in small volumes (e.g., <3 m³). This reflects a growing consensus that alternative design approaches are necessary for such applications. Systems such as ANSUL N-101, which uses pure nitrogen (IG-100), is engineered to protect small enclosures in mining environments, delivering an extinguishing concentration rapidly. The system design should account for leakage, thermodynamic effects, and the specific hazard scenario, demonstrating a practical application of NFPA 2001 principles to constrained volumes and could be viable in such applications.

A.12.3. 6.1.1

Equipment in this category is generally a vehicle weight of 90,720 kg (200,000 lb) or more and the size of a Hitachi 1800, Caterpillar 5230, Komatsu PC1000-6, Liebherr R984, DeMag H95, and Hitachi 1100.

A.12.3.8.1.1

Depending on the size of the vehicle and size of the fire, a 9.1 kg (20 lb) fire extinguisher could be more effective.

A.12.3.8.2.5

NFPA and manufacturers require 6-month inspections.

A.12.3.8.3.2

The following are examples of large equipment:

- (1) Track dozer of 300 horsepower or more or 31,750 kg (70,000 lb) weight or more (e.g., Caterpillar D8R)
- (2) Front-end loader of 400 horsepower or more and vehicle weight of 45,400 kg (100,000 lb) (e.g., Caterpillar 988)
- (3) Wheel bulldozer of 300 horsepower or more and vehicle weight of 27,200 kg (60,000 lb) or more (e.g., Caterpillar 824G)
- (4) Grader of 275 horsepower or more and vehicle weight of 25,000 kg (55,000 lb) or more (e.g., Caterpillar 16H)
- (5) Pull-type scraper of 450 horsepower or more and vehicle weight of 44,450 kg (98,000 lb) or more (Caterpillar 631E)
- (6) Scraper with push/pull twin engine of 450 horsepower and 490 horsepower or more and vehicle weight of 51,260 kg (113,000 lb) or more (e.g., Caterpillar 637E)
- (7) Blast hole drill of 360 horsepower or more and weight of 30,845 kg (68,000 lb) or more (e.g., Ingersol-Rand DM-30)

A.12.3.8.3.4(4)

Depending on the size of the equipment, additional ground-level manual actuators could be needed to provide quick access for manual activation of the system.

A.12.3.8.3.8

Periodic maintenance is required by NFPA standards and by manufacturers. Although other training resources are available, the fire suppression system manufacturer is the best source for proper training regarding their equipment.

A.13.7

A readily available supply can include a dedicated fire protection water supply, a pond or other large body of water, an industrial process water system, or large water trucks (tankers). If water trucks (tankers) are used, they should be of a capacity and quantity to deliver a continuous source of water for the duration of the firefighting effort. Personnel should be trained in emergency vehicle operation and mobile water supply shuttle procedures. If an impounded body of water is provided, it should be close and accessible enough to the protected property to allow fire fighters a quick response.

A.13.7.3

Refer to Chapter 5 for production buildings, outdoor equipment, and process structures as well as Annex G of NFPA 1142 for ancillary nonproduction buildings when estimating water supply (fire flow) that can be necessary for firefighting purposes.

A.13.8.1

Reagents used in mineral concentrators can be ignitable (flammable or combustible) liquids.

A.13.9

Examples of relevant NFPA standards include 51, 55, and 58.

A.13.10

Reagents used in mineral concentrators can be oxidizers.

A.13.11.4

The following should be considered when conducting a fire risk assessment on a conveyor system:

- (1) Belt fire retardancy
- (2) Size and speed
- (3) Degree of confinement
- (4) Accessibility for manual firefighting

Automatic sprinklers have been effective in limiting damage in conveyor systems.

A.13.11.6

Conveyor belt ignition sources include friction points, hot bearings, tracking, frame damage, electrical, combustible storage, hot work, and spontaneous combustion of spilled fuels. Acceptable protection systems for conveyors should include automatic sprinklers, water spray systems, foam water systems, smoke and heat detection systems, dry chemical systems, pre-engineered dry chemical or wet chemical systems, portable extinguishers, and hand hose lines.

A.13.12.1

The following should be considered when conducting a fire risk assessment on rubber- and plastic-lined equipment:

Frequency

- (1) Many fires occur annually inside rubber-lined equipment in concentrator plants.
- (2) Many rubber-lined equipment fires are quickly controlled and not reported.
- (3) Rubber- or plastic-lined equipment fires are usually caused by hot work. During normal operation, rubber- or plastic-lined equipment is immersed in water or an otherwise very wet environment. However, when the plant is down for maintenance or other outage, the systems become dry, significantly changing the fire risk. Coincidentally, outages producing dry lining conditions are when hot work is most likely to occur. Hot work fires can occur on dry-lined equipment while heating or welding on the outside of steel-lined equipment with heat passing into the interior lining with internal ignition. Fires can also occur during hot work over open-topped tanks and vessels as sparks or slag fall onto lined equipment. Hot work on, over, or generally near plastic- or rubber-lined vessels should be minimized, and alternative cold work methods exhausted prior to permitting hot work. If hot work is performed, additional precautions should be taken to limit the potential for hot work ignition sources from contacting combustible linings (e.g., tarping, boxing, continuous wet-down or flooding, physically isolating exposed lined equipment from upstream and downstream equipment using a barrier or gap, or use of periodic thermographic scanning to monitor external temperatures of equipment exposed by hot work ignition sources).

Consequence

- (1) Similar to cooling towers, normally wet rubber- and plastic-lined equipment present a limited fire exposure while in operation. However, when allowed to dry, the fire hazard posed by the linings and their exposure changes. Within lined equipment, concentrations of dry plastic or rubber surface area combined with often vertical surface orientations can result in rapid fire spread and severe fire intensity.
- (2) If not detected by an early indication (e.g., smoke or heat) and not promptly extinguished, lining fires can spread rapidly when dry, especially with vertically oriented surfaces and openings that allow oxygen and flames to enter. Once developed, a fire can spread unchecked through interconnected plastic- or rubber-lined equipment and threaten to spread to nearby circuits and equipment as well.
- (3) Firefighting access is extremely difficult to impossible once the fire has spread through a portion of a circuit. Additionally, fire hoses might not extend high enough to cool adjacent fuel packages or structural members, especially when hampered by wind.
- (4) If located in a building, the dense smoke and toxic fumes typical of plastic and rubber fires will likely impede any internal firefighting efforts.
- (5) If located in a building or exposing steel supporting a process structure, a fully developed uncontrolled fire could cause thermal damage to the building and structural elements.
- (6) Not only are the linings consumed or damaged, requiring replacement, but often the metallic equipment can suffer significant thermal damage requiring repairs or replacement. Recovery time and subsequent business interruption following the fire can be significant.

A.13.12.1(1)

Examples of methods to eliminate or reduce fire hazard include minimizing the use of rubber or plastic linings.

A.13.12.1(2)

Examples of methods to eliminate or control ignitions include hot work management to use alternative cold work methods or additional required precautions where hot work is permitted.

A.13.12.9

Flooding a circuit with process water is a good suppression technique as long as the responding emergency team knows which valves to open and has planned for this contingency.

A.13.12.10

Fixed water-based fire protection at openings in lined circuits can control flames emanating from open equipment, cool equipment, or structural members, or possibly prevent fire spread to adjacent equipment or into other exposed openings in lined equipment circuits. An example of such an arrangement of lined equipment with openings is a screen deck with lined hopper beneath and ore chute above.

Refer to A.13.13.10 for additional discussion and design guidance.

A.13.13.1

The following should be considered when conducting a fire risk assessment on plastic constructed equipment. Also, refer to A.13.12.1 for additional discussion on fire scenario considerations and fire protection options.

- (1) Similar to rubber- or plastic-lined equipment, new equipment constructed entirely of plastic is now more prevalent, including process equipment such as screens, hydrocyclones, and filter presses; piping; and even building interior features such as plastic open grating and handrails.
- (2) Refer to the frequency and consequence guidance in A.13.12.1 on lined equipment for conducting a risk assessment and evaluating protection options
- (3) The use of fixed water-based fire protection systems over large concentrations of plastic equipment has been effective.

A.13.13.1(1)

Examples of methods to eliminate or reduce fire hazard include minimizing the use of rubber or plastic linings.

A.13.13.1(2)

Examples of methods to eliminate or control ignitions include hot work management to use alternative cold work methods or additional required precautions where hot work is permitted.

A.13.13.10

Plastic equipment could include but is not limited to screen decks, hydrocyclones, filter presses, and concentration of plastic piping such as underneath or atop spirals.

Combustible loading in plants using mineral concentrators has increased gradually as rubber- or plastic-lined equipment or plastic equipment has replaced equipment that historically was constructed of steel, such as piping, cyclones, and screens. This equipment is normally installed aboveground in either open process structures or enclosed process buildings and constructed of or lined with rubber, fiberglass, polyurethane, or other unexpanded Group A plastic as defined by NFPA 13. Although normal operations wet interior combustible surfaces, the fire hazard changes as interior surfaces are allowed to dry during outages when hot work is likely to be conducted and process water might be locked out. Fixed water-based fire protection systems should be considered at openings to lined equipment circuits or over plastic equipment when determined by a fire risk assessment to protect important assets with significant business interruption potential. Fixed water-based fire protection systems can control flames, cool equipment or structural members, and possibly prevent fire spread.

While no fire test data is available at this time, it is anticipated that lined equipment or plastic equipment can be protected with fixed water-based fire protection systems intended for the protection of nonexpanded Group A plastics in manufacturing occupancies such as the types described in NFPA 13 Extra Hazard Group 1 or Extra Hazard Group 2, where greater concentrations of plastic or in cases where sprinkler/nozzle clearances to the combustible surfaces [e.g., typically around 9 m (30 ft)] become significant. Design approaches to be considered include wet, dry, deluge, or water spray systems.

A.13.14.1(1)

Consider minimizing the use of plastic equipment to reduce fire hazards.

A.13.14.1(2)

Consider hot work management such as alternative cold work or additional required precautions when hot work is authorized.

A.13.14.1(3)

Consider the possible fire propagation through the grinding circuit or spread through a portion of the concentrator.

A.13.14.3

Combustible loading in gravimetric ore concentration plants using spiral concentrators has increased gradually as plastic equipment has replaced equipment that historically was constructed of steel. This equipment includes piping, spirals, cyclones, and screens. Combustible spirals normally are installed above ground in either open air or enclosed process buildings. Spirals typically are constructed of fiberglass, polyurethane, or other nonexpanded Group A plastic as defined by NFPA 13. Although normal operations wet the spirals on one side as well as create a high-humidity atmosphere, spiral plants are susceptible to very large fires, particularly during outages when hot work is conducted and water to the spirals could be locked out. Fixed water-based fire protection systems should be considered for spiral installations where necessary for protection of important assets with large business interruption potential, as determined by a fire risk assessment.

While no fire test data is available at this time, it is anticipated that combustible spirals can be protected with water-based protection systems intended for the protection of nonexpanded Group A plastics. (Spiral installations, with the steel framework they are installed in, closely approximate a storage rack full of plastic materials.) Design approaches to be considered include wet, dry, deluge, or water spray systems.

Intermediate-level sprinklers or spray nozzles might be required for multilevel open floor spiral installations because of the significant underside area of the spirals that cannot be fully protected only by overhead sprinklers.

Automatic sprinkler protection designed to NFPA 13 should be provided above and 6.1 m (20 ft) beyond combustible spiral installations.

Small installations where sprinklers are not warranted will benefit from fixed monitor nozzles fed from existing hydrants.

A.13.15.1

Hydraulic or lubrication oil systems can be found in headhouses serving hoists, crushers, or concentrators serving grinding circuits or filter presses.

The following should be considered when conducting a fire risk assessment on a hydraulic or lubricating oil system:

- (1) Individual and aggregate quantity of fluid or oil
- (2) System location
- (3) System design
- (4) Type and fire hazard of fluid or oil
- (5) Pressures
- (6) Temperatures
- (7) Presence of ignition sources
- (8) Importance
- (9) Attended or not
- (10) Presence of personnel in area

Hydraulic fluid and lubrication oil tanks and pumps should be located to not expose concentrated power cabling, rubber or plastic equipment, or other critical equipment to fire damage.

Acceptable protection systems should include automatic sprinklers, water spray systems, dry chemical systems, pre-engineered dry chemical or wet chemical systems, portable hand hose lines and extinguishers, and detection.

A.13.16

Thermal oil heating systems are used in some mineral processing plants, such as molybdenum concentrator mills, for drying ore.

NFPA 87 is the primary reference in NFPA standards for thermal oil heaters, while NFPA 664 contains additional guidance on thermal oil heating systems used in industrial processes. Even though the woodworking industry has unique equipment, the hot oil heating and distribution systems are similar, and the concepts provided in this standard can be used for the mineral processing industry.

A.13.16.1

As determined by the fire risk assessment, additional fire protection might be needed to fully protect thermal oil systems.

The following should be considered when conducting a fire risk assessment on a thermal oil system:

- (1) Additional or back-up fixed fire protection system
- (2) Locating the heater, pumps and tanks outdoors or in detached buildings
- (3) Proper location and confinement of expansion and storage tanks, pumps and heaters
- (4) Proper piping arrangement
- (5) Process interlocks and controls
- (6) Explosion protection
- (7) Damage limiting construction from an oil mist explosion

A.13.16.1(1)

Heat exchangers or other appliances using thermal oil to dry the ore can be located in the general production area.

A.13.18

Positive pressure should be maintained in equipment rooms containing switchgear, motor control centers, concentration of power cabling, transformers, bus bars, and control equipment to prevent the entry of fugitive dust that can cause overheating or short circuits.

Thermographic scanning can be performed on transformers, switchgear, and motor starters on an annual basis.

A.13.18.1

For example, stacked cable trays can be used to concentrate power cabling.

A.13.20



See Table A.13.20 for fire experience data justifying the addition of the requirements in Section 13.20.

Table A.13.20 Example Global Fire Losses Involving Hydro-Metallurgical Solvent Extraction Plants¹

<u>Location</u>	<u>Date</u>	<u>Process</u>	<u>Protection</u>	<u>Incident</u>	<u>Cause</u>	<u>Results</u>
Norway (Ref: 2)	1972	Cobalt-nickel SX using kerosene; glass piping; indoor process	Manual response with water hoses	Solvent spill into pit below M-S; glass piping failed under fire exposure	Hot work	Three fatalities; plant destroyed; \$75 M damage; six months production outage
US (Ref: Private files)	1975	Rhenium-tungsten SX using mineral spirits and perchloric acid; plastic piping (FRP); indoor process	Automatic sprinklers over process area; manual response with water hoses	Small solvent spill spread into M-S cells and through plant; additional solvent fed by failed plastic pipes	Perchloric acid reaction	Plant destroyed; >\$10 M damage; six months production outage
Namibia (Ref: Private files)	1978	Uranium SX using kerosene; outdoor process; plastic piping	Manual response with water hoses	Solvent leaked from plastic pipe; additional solvent fed by failed plastic pipes	Electrical	Total plant damage; >\$50 M damage; four months production outage
Australia (Ref: 3, 4)	1999	Uranium-copper SX using kerosene; outdoor process; plastic (HDPE) piping	Partial foam-water sprinklers; manual response with foam-monitor nozzles	Solvent release at plastic pipe; fire spread throughout local area; additional solvent fed by failed plastic pipes	Not reported	Partial plant damage; >\$40 M damage; nine months production outage
Australia (Ref: 3, 4)	2001	Uranium-copper SX using kerosene; outdoor process; plastic (HDPE) piping	Partial foam-water sprinklers; manual response with foam-monitor nozzles	Solvent release at plastic pipe; fire spread throughout wide area; additional solvent fed by failed plastic pipes	Possible static ignition inside nonconductive plastic pipe	Widespread plant severe damage; >\$100 M damage; two years production outage
US (Ref: 4, 5)	2003	Copper SX using kerosene solvent; outdoor process	Unknown	Solvent fire involving M-S cells	Unknown	Four M-S cells partially damaged; \$5–10 M damage reported by AP
Mexico (Ref: Internet news services)	2003	Copper SX using kerosene solvent; outdoor process	Unknown	Solvent fire involving M-S cells	Not reported	Not reported

Note: Financial loss estimates are indexed to 2005 US currency.

References for Table A.13.20

1. Moore, L., "Using Principles of Inherent Safety for Design of Hydrometallurgical Solvent Extraction Plants," Society of Mining and Exploration (SME) 2006 Annual Meeting, St. Louis, MO, April 2006.
2. Hoy-Peterson, R., *Fire Prevention in Solvent Extraction Plants*, Proceedings of the 1st International Loss Prevention Symposium, The Hague/Delft, the Netherlands, May 1974.
3. Rizzuto, F., "Fire Protection for Solvent Extraction Plants, What We Can Learn from Olympic Dam," *Plumbing Engineer*, 2002, pp. 43–49.
4. *Mining Journal* (various 1999–2004), Albert House, 1 Slinger Street, London, UK, Published by Mining Communications Ltd.

5. Associated Press, *Fire deals big hit to Phelps Dodge*, Oct. 21, 2003.

The design intent within this standard for protection of hydro-metallurgical solvent extraction (SX) facilities is to limit a fire to a single train rather than to a single cell. A typical SX facility will have multiple (three or more) mixer-settler cells composing a single train. The distance between cells within a single train might be only a few meters (several feet), usually the width of a walkway. Parallel trains of multiple cells might also be present and these are usually separated from adjacent trains by 7.6 m to 15.24 m (25 ft to 50 ft), usually the width of a roadway.

Should the design intent be to limit the fire to a single cell, then additional fire protection might be required. The risk assessment should define the level of tolerable risk. The actions taken might then focus more on spatial separation, barriers, construction, and so forth.

Mining companies use SX processes to separate valuable base metal minerals. This technology is common with copper, uranium, nickel, cobalt, and many specialty metals. A typical hydro-metallurgical SX facility features thousands if not hundreds of thousands of cubic meters (gallons) of ignitable (flammable or combustible) liquids and is commonly located at a remote mining site near the ore body being mined. Larger SX facilities — notably copper and uranium — are located outdoors but might be located indoors for nickel, cobalt, lithium, iodine, and other metals.

A hydro-metallurgical SX facility should not be confused with an agricultural SX facility that uses low flash point flammable solvents like hexane for recovering edible oils from soybeans, canola, and corn and that has a higher hazard. NFPA 36 applies to the protection of agricultural SX plants but does not apply to and should not be applied for the protection of hydro-metallurgical SX facilities.

Severe fire hazards exist with mineral SX facilities due to large volumes of ignitable (flammable or combustible) liquids, often in large open pools. Because SX solvents are normally cold (that is, at ambient temperatures well below their boiling points), severe explosion hazards generally do not exist. Most large copper-uranium-type SX facilities use a grade of high purity kerosene, but some more refined metals like lithium feature lower flash point alcohols. Fires are generally two-dimensional pool fires rather than three-dimensional fires. Rarely will a pressurized jet spray occur. SX operations at elevated temperatures also affect the flash point of the solvent (*refer to A.13.20.5*).

Historically, losses in hydro-metallurgical SX facilities have been infrequent but severe. Two significantly large SX fires occurred within 6 months at one Australian copper-uranium mine. The primary conclusions from the two Australian fires are the following:

- (1) Thermoplastic high density polyethylene (HDPE) pipes fail prematurely under fire conditions and rapidly release solvents.
- (2) Plastic pipes can allow fire spread internally within the pipes.
- (3) Stainless steel piping is preferable to plastic but can be attacked by chlorides and might not be suitable for all SX facility services.
- (4) While combustible, structural fiber reinforced plastic (FRP) piping is better than HDPE because it does not soften or fail as fast.
- (5) Electrical static charge buildup can occur in both metal and plastic due to the movement of flammable or combustible solvents.
- (6) Static charge can potentially ignite solvent mists inside pipes.
- (7) Static charge can be minimized by the following measures:
 - (8) Conductive lining inside pipes
 - (9) Improved grounding and bonding
 - (10) Control of free-falling liquids and mist generation by submerging pipes in the solution
- (11) High-speed fire detection systems are preferable.
- (12) Fireproofing of control system cabling is needed.
- (13) Larger capacity fire protection/suppression systems are needed as follows:
 - (14) High-capacity fire water pumping systems
 - (15) Foam-water systems on pipe racks
 - (16) Foam-water systems for all diked areas
 - (17) Deluge (open-head) protection on solvent feed pumps
- (18) Foam-water suppression systems are preferable to water-based systems.
- (19) High-capacity drainage systems are needed.

- (20) Diversion systems for spilled solvents might be needed.
- (21) Improved dike design is needed to minimize solvent pooling.
- (22) Separation of equipment and financial assets.

The fires demonstrated that more rigorous and comprehensive fire protection standards are needed for SX facilities. They also demonstrated the need for process safety management (PSM) oversight and the need for better inherent safety (IS) practices in SX facility design.

The need for fixed automatic fire protection systems actuated by high-speed detection systems is readily apparent. A number of suppression systems — such as closed-head sprinkler or deluge water-spray, foam-water delivered by nozzles or foam chambers, dry chemical, or high pressure water mist — might be applicable and suitable, depending on local conditions. Drainage, isolation, and confinement are also important protection measures.

Some protection solutions and options are as follows:

- (1) Where possible, avoid belowgrade spaces for tank farms and process equipment. Where possible, site all facilities at the same grade.
- (2) Where lower grade tank farms are present and where solvents can flow from upper level processes, provide a barrier to flow. Where plastic pipes penetrate a barrier, the use of steel spools on both sides of the barrier should be considered. The steel spool pieces can help prevent internal fire spread within the plastic pipes. A 3 m (10 ft) long steel spool has proven effective.
- (3) Where pipes enter a lower grade tank farm, provide automatic shutoff valves to prevent continued flow of organic solvents or drainage into a fire area.
- (4) Avoid use of subgrade trenches for solvent piping systems. Where possible, locate pipes above grade. Where trenches are required, subdivide trenches with dikes or curbs and do not drain into lower grade areas such as tank farms.
- (5) Provide dikes and curbs around tanks, pumps, and process vessels.
- (6) Avoid or minimize the use of combustible (plastic) and frangible (glass) piping systems and vessels. Avoid the use of thermoplastics such as HDPE, medium density polyethylene (MDPE), and polypropylene (PP) for piping systems.
- (7) Avoid the use of rubber couplings on solvent lines, especially on pump suction lines.
- (8) Substitute steel or concrete for plastic where possible for vessels and piping.
- (9) Where use of steel piping is not possible due to corrosive effects, substitute a structural (thermoset) plastic such as FRP or polyvinyl chloride (PVC).
- (10) Consider drainage patterns during design. Where practical, provide emergency drainage to a remote catch basin or pond from all diked areas and pipe trenches.
- (11) Provide emergency dump capability from all tanks and vessels that actuate either manually or upon fire detection with drainage to remote catch basins or ponds.
- (12) Space mixer-settler tanks and storage tanks as far apart as possible.
- (13) Lower roofs and covers on tanks and process vessels to minimize vapor collection space above liquid surfaces.
- (14) Consider ignition sources in design as follows:
 - (15) Where nonconductive solvents [conductivity of 250 picosiemens per meter (pS/m) or greater] are used with plastic piping systems, provide a conductive internal pipe liner (i.e., carbon) to dissipate static charges generated by liquid flow. Bond and ground the system, including at flanges.
 - (16) Submerge or lower solvent feed pipes where they enter solvent pools (i.e., inside mixer-settler and tank discharge) to minimize static discharge from free-falling flammable liquids and to minimize solvent mist development.
 - (17) Inspect piping for jarosite or other nonconductive inorganic coating that might compromise conductive liners.
 - (18) Provide electrically classified electrical equipment in solvent handling areas. Base the classification on types and hazards of solvents in process. In some cases, explosionproof equipment might be needed.
- (19) Provide fixed water, foam-water, or dry chemical fire protection systems as follows:
 - (20) Interior of mixer-settler vessels

- (21) Over the surface of open mixer-settler tanks
 - (22) Along launders and open solvent weirs outside of mixer-settler vessels
 - (23) Inside subgrade pipe trenches carrying solvents where drainage is missing or poor and liquids can accumulate
 - (24) Inside solvent storage tanks
 - (25) Inside dikes enclosing solvent storage tanks
 - (26) Over solvent pumps
 - (27) Along the exterior sides of tanks and mixer-settlers if spaced closer than 15 m (50 ft) from each other
 - (28) Over elevated pipe racks carrying flammable solvents in plastic pipes
 - (29) Over other critical equipment (like transformers) or outside along important building walls [e.g., motor control center (MCC) rooms] that are within 15 m (50 ft) of a solvent fire area
- (30) Conduct a process hazard analysis (PHA) [such as a hazard and operability study (HAZOP)] on all new and existing SX facilities. Conduct revalidation PHA every 5 years and during major changes.
- (31) Operate facility under a PSM system with emphasis on management of change.

The use of IS principles in design and operation of SX facilities is advised.

The mining industry has designed and constructed facilities with an emphasis on personnel safety, production efficiency, and cost effectiveness. The use of IS to eliminate or minimize property fire exposures in the mining industry has not seen widespread practice. Lessons learned from the mainstream chemical processing industries (CPI) appear not to have been well-communicated or well-applied.

As an example, most copper SX facilities in use today have been designed to use some form of a subgrade processing area (tank farm) and one-way gravity flow as a cost- and production-effective solution for transferring liquids and minerals through the process. This has resulted in SX facilities constructed with process equipment at different grade levels so that solutions can flow “downhill” and accumulate. Because of the use of large quantities of ignitable (flammable or combustible) liquids and the potential for these liquids — if released — to flow unimpeded into other areas, gravity SX processes represent severe inherent fire consequences unless costly barriers, drainage, and channeling are also provided.

While this layout is used to ensure a cost-effective operation, it has resulted in significant exposures to high value production and equipment. The use of subgrade production units is a generally inherently unsafe layout where flammable liquids are used.

Gravity-assist layout is only one example where copper SX facilities have been designed and constructed without IS consideration. The use of combustible and frangible corrosion-resistant materials — such as glass, wood, and plastic — for flammable/combustible liquid storage, processing, and piping systems has significantly increased the fire hazards of these facilities. These construction materials are not of sufficient strength and durability to prevent fire spread and can rapidly fail under fire conditions, releasing flammable contents.

Another example of inherently unsafe layout is the widespread use of subgrade trenches to carry solvent pipe systems. Access to trenches for fire fighting is usually limited and the trenches often drain directly into the lower grade tank farm areas. Trenches usually encircle solvent-filled cells and have open grated coverings; therefore they represent severe fire risk to production equipment such as mixer-settlers. Trenches also offer low spots for vapors or liquids to accumulate and might require mechanical ventilation systems to prevent flammable vapor accumulation. The use of plastic piping in trenches further increases the hazard. The CPI long ago discontinued the use of subgrade trenches for transporting combustible/flammable materials, replaced with elevated, easily accessible, and well-ventilated pipe racks.

The classical and common approach to loss prevention for industrial facilities has been to accept a hazard and to protect against it. This approach usually requires expensive and sophisticated retrofitted protection systems, which are subject to failure during the life of the plant. An inherently safer plant eliminates or reduces the hazard to where protection systems might not be needed or can be reduced, saving initial installation cost, lifetime maintenance and testing, and potential loss costs should systems fail.

The “hypothetical” ideal IS approach would be to completely change the technology or process chemistry of SX facilities. The extent to which this could be technically or economically achieved is not known, but some ideas are the following:

- (1) Develop and use a nonflammable organic solvent.

- (2) Develop and use a less flammable organic solvent.
- (3) Find an additive that lowers the resistance coefficient of the solvent to eliminate the potential for static electricity generation.
- (4) Develop a new process to extract minerals by significant reduction in quantities and flow of solvent and eliminate large open pools of flammable liquids.

Given that the basic science and technology of a well-established process cannot always be economically changed and that combustible solvents will likely continue to be used in large quantities, potential IS opportunities should focus on changes to design and layout concepts. Some ideas are the following:

- (1) Stop or reduce the practice of gravity flow in the SX process.
- (2) Install equipment and processes at the same grade level rather than using lower grade tank farms.
- (3) Eliminate the use of subgrade trenches for piping; place piping on elevated pipe racks located away from solvent storage or drainage discharge areas.
- (4) Separate buildings, vessels, and process areas based on a risk assessment that includes the impact of radiant heat, wind effects, and drainage patterns.
- (5) Lower mixer-settler roofs to rest on or near the top of the liquid layer to minimize or eliminate space for flammable vapor accumulation.
- (6) Provide liquid barriers such as walls, curbs, and dikes between buildings, vessels, and process areas.
- (7) Provide high-capacity drainage systems for spilled solvents, with discharge to a safe, remote area.
- (8) Provide high-capacity emergency dump systems for mixer-settler cells and other vessels that contain large quantities of solvents, with discharge to a safe, remote area.
- (9) Locate solvent pumps outside of dikes or subgrade areas that enclose solvent tanks and other equipment.
- (10) Separate process control and safety interlock instrumentation from power cables.
- (11) Use robust, fire-resistant, conductive materials (like stainless steel) for piping and vessels rather than combustible, frangible, or nonconductive materials (like thermoplastics or glass). When steel cannot be used, consider use of a more durable and fire-resistant structural thermoset plastic such as FRP or glass reinforced plastic (GRP) with a conductive lining.
- (12) Eliminate polymeric materials such as rubber for flexible connections on piping and pumps.
- (13) Use seal-less or double sealed pumps for solvents.
- (14) Use cooling water jackets around pump seals and bearings.
- (15) Find methods to reduce static or mist/aerosol generation in solvent systems, such as submerging in-feed nozzles, minimizing bends and restrictions in piping, reducing solvent flow velocities, and using low-turbulence pumps.
- (16) Provide high-capacity emergency dump systems for mixer-settler cells and other vessels containing large quantities of solvents, with discharge to a safe, remote area.

A.13.20.5

Because some SX facilities are located at high altitudes, flash point assignment can be critical to the risk assessment. Flash points, when tested, are calibrated and reported based on mean sea level in accordance with ASTM D56, *Standard Test Method for Flash Point by Tag Closed Cup Tester*. Due to partial pressure effects, flash points decrease as altitude increases. For example, a combustible liquid with a flash point of 41°C (105°F) at sea level has a flash point of 33°C (91°F) at 3,048 m (10,000 ft) and 30°C (86°F) at 4,268 m (14,000 ft).

A.13.20.8

Because mineral solvents are usually organic, they are heavier than air, and suction for ventilation systems, when provided, should be near floor level.

A.13.20.9

Suppressing a fire in flammable solvents depends to a great extent on speed of detection. UV/IR detection systems have proven suitable for enclosed mixer-settler cells. Electrical resistance wires have proven effective in pipe trenches and along pipe racks. Other more conventional heat and flame detection systems are also suitable if properly located, spaced, and calibrated.

A.13.20.10

Pregnant liquor solution (PLS) feed is a non-combustible acidic feedstock solution feeding the facility. This is usually gravity-fed from a PLS holding pond above the SX facility. Should a fire occur and PLS solution be allowed to continue to flow into the SX facility, mixer-settler cells might overflow and spread burning and/or high-acid concentration solvents throughout the facility. It is necessary to have control over this feed system in an emergency from both a fire perspective and an environmental perspective. Either manual or automatic valves are suitable. When manual valves are used, the emergency response plan should include provisions to shut off the PLS valve.

A.13.21

See Table A.13.20 for fire experience data justifying the addition of the requirements in Section 13.21.

A.13.21.1

Although water-only deluge, foam-water, and dry chemical systems might be effective in controlling or suppressing SX facility fires, there might be use for more than one application in a given facility. Manual response has been ineffective in recent losses, and automatic suppression is advised for both existing and new facilities.

While water spray can be effective, due to potentially high flow requirements a mixer-settler cell might overflow during the suppression process. This might create additional concerns with drainage and fire spread.

Foam has been shown to be an effective suppressant medium for SX fires. However, environmental aspects, potential contamination of process liquids (particularly associated with accidental system initiation), and the difficulty or inability to conduct system flow tests on a periodic basis are negative points in the selection of foam.

High pressure water mist or fog might prove to be a potentially effective suppressant medium and might not create the contamination, environmental, and testing obstacles that accompany foam or the large volumes that accompany conventional high density water deluge systems. Currently, there are no public domain tests conducted on mist systems for pool fires of the size involved in a large SX settler; thus, actual suppressibility under all fire conditions has not been demonstrated.

A.13.21.1.2

The following best practices design guidance for automatic fire suppression systems is advised:

For settler tanks or cells, use either Type 1 foam chambers or open head deluge sprinklers with foam discharge. When using foam chambers, provide a 3 percent aqueous film-forming foam (AFFF) foam discharge, in accordance with NFPA 11, with a density of 4.1 L/min/m^2 (0.10 gpm/ft^2) over the entire settler area. When using open head deluge sprinklers, provide a 3 percent AFFF foam discharge, in accordance with NFPA 11, with a density of 6.5 L/min/m^2 (0.16 gpm/ft^2). Design for a 20-minute discharge period.

For mixers, launders, drainage sumps, and piping trenches, use open head deluge sprinklers and provide a 3 percent AFFF foam discharge, in accordance with NFPA 11, with a density of 6.5 L/min/m^2 (0.16 gpm/ft^2) and a 20-minute foam discharge period.

For the interior of tank farm vessels containing ignitable (flammable or combustible) liquids such as loaded organic tanks, coalescers, crud treatment tanks, and diluent tanks use a Type 1 foam chamber and provide a 3 percent automatic AFFF foam discharge, in accordance with NFPA 11, into each of the tanks with a density of 4.1 L/min/m^2 (0.10 gpm/ft^2) and a 20-minute foam discharge period.

For the exterior surfaces of tank farm equipment containing ignitable (flammable or combustible) liquids such as loaded organic tanks, coalescers, crud treatment tanks, diluent tanks, crud treatment filters, centrifuges, pumps, and pipe racks, provide automatic open head (water only) deluge sprinklers based on a discharge density of 10.2 L/min/m^2 (0.25 gpm/ft^2).

A.13.21.1.3

Actuation of automatic fire suppression systems can be done using ultraviolet/infrared (UV/IR) dual spectrum detectors, heat detection cable, rate-of-rise heat detectors, or standard air pilot sprinklers. High-speed detection is considered advisable to suppress a solvent fire in its incipient stages.

A.14.4.6

The secondary emergency escape path additionally should provide firefighters or facility fire brigade members safe access into the area for the purpose of rescue and firefighting. Fires originating in underground conveyors can spread within the enclosed tunnel rapidly, impairing use of the primary exit for those in the area and access for firefighting without having a secondary pathway.

A.15.1

An evaluation of the potential atmospheric hazards in the underground mine that can exist from either the material being mined, blasting operations, or associated process equipment, which could impact the atmospheric hazards within the mine, should be considered in the development of the ventilation plan.

A.15.1.2(9)

Permanent locations are those intended to exist for one year or more.

A.15.2.1

This provision is not applicable during scheduled production-cycle shutdowns or planned or scheduled fan maintenance or fan adjustments where air quality is maintained and all persons underground in the affected areas are advised in advance of such scheduled or planned fan shutdowns, maintenance, or adjustments.

A.15.6

Under this standard, *shaft mine* means a mine in which any designated escapeway includes a mechanical hoisting device or a ladder ascent.

A.16.1

An emergency preparedness and response plan is an effective way to prepare for an emergency. It should include identifying any specialized firefighting equipment and providing specialized training to the emergency responders who might be members of the facility fire brigade (see *NFPA 600 and NFPA 1081*) and the public fire department or other external emergency responders where the methods to control and extinguish a fire can be outside their normal arena of traditional firefighting.

A.16.1.1

Even though this section focuses on fire and explosion hazards, it also encourages preparation and planning for other emergencies. These can include medical, technical rescue, and hazardous materials emergencies.

A.16.1.2

In consideration of hazards associated with mining, the plan can include the following:

- (1) Communications (including redundancy)
- (2) Ventilation plan
- (3) Primary and alternate attack routes
- (4) Listing of key resources, including external resources with contact details and estimated time of arrival upon initiating request
- (5) Location of critical areas such as personnel refuge stations, compartmentation and partitions, water supply (fire protection), and energy (electrical, gas) supply isolation locations

A.16.2

Means of emergency notification could include an odorant in ventilation systems for underground mines, alarms, or radio communications.

A.16.3

The operator of the mine has the responsibility to develop and execute an emergency preparedness and response plan and to train employees, contractors, and visitors. Consult with the local authority having jurisdiction (applicable national, provincial, state, territorial, and local) for additional requirements. Potential types of emergencies should be defined in advance and included in the plan. This can include the following:

- (1) Provisions for performing rescue activities, including qualified personnel, equipment, and methods — commonly known as *mine rescue*
- (2) Description of emergency response equipment and its location
- (3) Identification of qualified personnel to perform assigned tasks
- (4) Incident management system (IMS)
- (5) Mutual aid (mine rescue) agreement — identifying external responders who could be from nearby mines or other responders
- (6) Ventilation plan so that personnel and equipment are available to support adequate ventilation of the affected underground area for the safety and health of occupants and those performing the rescue
- (7) Communications equipment
- (8) Firefighting and rescue equipment

A.16.3.1(3)

Examples of certain tasks might include restoring ventilation and checking air quality after a fire or heavy blasting or gases.

A.16.4

The emergency preparedness and response plan should be reviewed and exercises or drills carried out at least annually. Some jurisdictions might require more frequent reviews and exercises or drills. Consult with your authority having jurisdiction.

Statement of Problem and Substantiation for Public Input

The current references to NFPA 2001 in NFPA 120 and NFPA 122 assume application to enclosures capable of retaining agent for a defined hold time, typically large rooms. In mining, many hazards exist in small enclosures where these assumptions do not hold, making compliance with NFPA 2001 impractical or unverifiable.

- NFPA 2001 evolved from NFPA 12A, which focused on room protection using halon. Its structure and terminology

imply large, occupiable enclosures.

- NFPA 2001 does not preclude small enclosures, and includes provisions for local application and extended discharge, but these are not well understood or consistently applied in mining contexts.
- ISO 14520-1 similarly focuses on total flooding, and a new ISO standard (ISO 20862-x) is being developed to address small enclosures (e.g. <3 m³).
- In very small enclosures the thermodynamics of the discharge may negate the need for a retention period, which itself would not be possible to prove or achieve.
- Systems like ANSUL N-101 use IG-100 to achieve extinguishing concentration in small volumes, with favorable retention (due to density compared to air) and cooling characteristics (from pressure change of discharge).
- Without guidance, AHJs and designers may misinterpret NFPA 2001, leading to overdesign or rejection of effective systems.
- An annex would clarify intent, support performance-based design, and promote consistent application of NFPA 2001 in mining environments

Submitter Information Verification

Submitter Full Name: Chris Downing

Organization: Johnson Controls

Street Address:

City:

State:

Zip:

Submittal Date: Wed Nov 05 07:23:17 EST 2025

Committee: MIN-AAA



Public Input No. 20-NFPA 122-2026 [Sections A.4.10, A.4.10(1)]

~~Sections A.4.10, A.4.10(1)~~

~~A.4.10~~ — [🔗](#)

~~The provisions of Section 4.10 do not require inherently noncombustible materials to be tested in order to be classified as noncombustible materials. [~~101: A.4.6.13~~]~~

~~A.4.10(1)~~ — [🔗](#)

~~Examples of such materials include steel, concrete, masonry, and glass. [~~101: A.4.6.13.1(1)~~]~~

Statement of Problem and Substantiation for Public Input

The action by NFPA 5000 to add the correct noncombustible materials into the mandatory sections of the document make this, which is vague and unenforceable, unnecessary.

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
Public Input No. 19-NFPA 122-2026 [Section No. 4.10]	
Public Input No. 19-NFPA 122-2026 [Section No. 4.10]	

Submitter Information Verification

Submitter Full Name: Marcelo Hirschler

Organization: GBH International

Street Address:

City:

State:

Zip:

Submittal Date: Wed Jan 07 18:06:04 EST 2026

Committee: MIN-AAA



Public Input No. 12-NFPA 122-2025 [Section No. A.12.3.4.1]

A.12.3.4.1

Depending on the size of the vehicle and size of the fire, a larger fire extinguisher having a nominal capacity of 9.1 kg (20 lb) fire extinguisher could be more effective.

Statement of Problem and Substantiation for Public Input

There are many powder extinguishants which have efficacy beyond the legacy powders. Elsewhere in the standard “having a nominal capacity of” is used and it should be the same here too. This would keep language consistent.

Submitter Information Verification

Submitter Full Name: Chris Downing

Organization: Johnson Controls

Street Address:

City:

State:

Zip:

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Public Input No. 13-NFPA 122-2025 [Section No. A.12.3.8.1.1]

A.12.3.8.1.1



Depending on the size of the vehicle and size of the fire, a larger fire extinguisher having a nominal capacity of 9.1 kg (20 lb)- fire extinguisher could could be more effective.

Statement of Problem and Substantiation for Public Input

There are many powder extinguishants which have efficacy beyond the legacy powders. Elsewhere in the standard “having a nominal capacity of” is used and it should be the same here too. This would keep language consistent.

Submitter Information Verification

Submitter Full Name: Chris Downing

Organization: Johnson Controls

Street Address:

City:

State:

Zip:

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Public Input No. 18-NFPA 122-2026 [Section No. C.1.2.3]

C.1.2.3 ASTM Publications.

ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.

ASTM D56, *Standard Test Method for Flash Point by Tag Closed Cup Tester*, ~~2016~~ 2022 .

ASTM D93, *Standard Test Methods for Flash Point by Pensky-Martens Closed Cup Tester*, ~~2020~~ 2025 .

ASTM D3278, *Standard Test Methods for Flash Point of Liquids by Small Scale Closed-Cup Apparatus*, ~~2020~~ 2021 .

Statement of Problem and Substantiation for Public Input

date updates

Submitter Information Verification

Submitter Full Name: Marcelo Hirschler

Organization: GBH International

Street Address:

City:

State:

Zip:

Submittal Date: Wed Jan 07 18:01:15 EST 2026

Committee: MIN-AAA



Public Input No. 16-NFPA 122-2026 [Section No. C.1.2.6]

C.1.2.6 UL Publications.

Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

UL 80, *Steel Tanks for Oil-Burner Fuels and Other Combustible Liquids*, 2007, revised ~~2019~~ 2024 .

UL 142, *Steel Aboveground Tanks for Flammable and Combustible Liquids*, 2006, revised ~~2019~~ 2025 .

Statement of Problem and Substantiation for Public Input

Update to most recent edition and revision.

Submitter Information Verification

Submitter Full Name: Kelly Nicoello

Organization: UL Solutions

Street Address:

City:

State:

Zip:

Submittal Date: Tue Jan 06 14:14:46 EST 2026

Committee: MIN-AAA