



Second Revision No. 52-NFPA 850-2019 [Global Comment]

Chapter 20 Compressed Air ~~Generation~~Energy Storage (CAES) ~~(Reserved)~~

20.1 General.

20.1.1

Chapter 20 identifies fire and explosion hazards of compressed air energy storage (CAES) systems and associated equipment and specifies recommended protection criteria.

20.1.2

CAES systems are power generation systems that store compressed air in large reservoirs, typically underground caverns such as salt domes, and use the compressed air as an energy source to drive a turbine-generator to produce power for peaking purposes.

20.1.2.1

The generator is typically a dual function motor-generator unit that can be reversed to drive the compressors during the nonpeak power periods and then returned to the generator mode to produce power when using the compressed air to drive the turbine unit.

20.1.2.2

During operation the compressed air is released from the reservoir where the air temperature is increased by heat exchangers and fuel-fired heaters.

20.2 Application of Chapters 4 Through 10.

The recommendations contained in Chapters 4 through 10 can apply to CAES system facilities. The Fire Protection Design Basis Document should determine which recommendations apply to any specific CAES system facility. This determination is done by evaluating the specific hazards that exist in the facility and evaluating the level of acceptable risk for the facility. For CAES system facilities, it is expected that most of these recommendations will apply.

20.3 Design and Equipment Arrangement.

Site-specific considerations or a manufacturer's typical layout will govern CAES system facility design. If on-site heaters are used to heat the air prior to compression, there are other considerations that might need to be addressed based on how the air is heated. If fuel-fired heaters are used, other NFPA codes and standards relative to the fuel used should apply.

20.4 Risk Consideration.

Adequate separation and containment should be provided as determined by the Fire Protection Design Basis Document. Areas that should be addressed include the following:

- (1) Flammable and combustible liquids storage and containment
- (2) Adjacent structures or exposures, including transformers
- (3) Adjacent properties, including aboveground pipelines, tank farms, other generation units or natural gas, or other fuel facilities that could present an exposure hazard

20.5 Hazard Protection.

20.5.1

The need for automatic fixed fire protection within a CAES unit should be based on the Fire Protection Design Basis Document. Areas recommended for fire suppression and/or detection systems include the following:

- [\(1\) Rotating equipment lubricating oil systems above and below the operating floor](#)
- [\(2\) Lubricating oil storage tanks or room enclosures with oil storage tanks](#)
- [\(3\) Motor/generator or turbine bearings](#)
- [\(4\) Hydraulic control systems](#)
- [\(5\) Control, computer, and communications rooms](#)
- [\(6\) Cable spreading rooms and cable tunnels](#)
- [\(7\) Grouped electrical cables — cable trays](#)
- [\(8\) Switchgear and relay rooms](#)
- [\(9\) Battery rooms](#)
- [\(10\) Maintenance equipment shop](#)
- [\(11\) Warehouse storage locations](#)

20.5.2

[Discharge rates and duration should be such that cooling and shutdown occur to prevent re-ignition of the fire. Densities should be in accordance with Chapter 7.](#)

Submitter Information Verification

Committee:

Submittal Date: Tue Apr 16 13:07:36 EDT 2019

Committee Statement

Committee The committee adds this new chapter on compressed air energy storage to address the
Statement: common hazards between CAES and power generating facilities.

Response SR-52-NFPA 850-2019

Message:



Second Revision No. 53-NFPA 850-2019 [Global Comment]

Chapter 19 Flywheel ~~Generation~~Energy Systems(Reserved)

19.1 General.

19.1.1*

Chapter 19 identifies fire and explosion hazards of flywheel energy systems and associated equipment and specifies recommended protection criteria.

A.19.1.1

Flywheel energy systems are energy systems composed of a spinning mass referred to as a rotor, rotor bearings, a motor-generator to convert the mechanical energy to electrical energy, a power conversion system to convert the electrical energy to a form usable by the grid, and a protective housing to contain the rotating portions of the system. They are also known as synchronous condensers. There are other balance-of-plant components, including controls and monitoring equipment, a vacuum system to reduce effects of friction on the rotor, and cooling systems to reduce the heat that develops from the operation of the rotor. There are primarily two types of rotor constructions: solid metal mass design and composite fiber design. The rotor stresses, rotor-dynamic behavior, and operating conditions are dependent on a combination of parameters. These parameters include rotor construction and the speed of rotation and must be engineered to ensure safe and reliable operation. There are also several different types of bearing constructions: a mechanical bearing design, a magnetic bearing design, and a hybrid mechanical/magnetic bearing design. The magnetic bearings can use passive-type magnets or an active type that relies on a controlled magnetic field that can be varied depending on the forces acting on the rotor.

Flywheel energy facilities consist of a number of flywheel energy systems with electrical outputs tied together with the electrical power voltage stepped up to match grid voltage. The particular design of the flywheel energy systems can vary as noted, as will that of the configuration of the power output circuitry and components. Therefore, some recommendations might be more suitable for one type of flywheel energy system facility than another. Many of the specific guidelines herein might require modification after due consideration of all local factors involved.

Vacuum or inert gas systems are often used to reduce friction on moving parts, and coolant systems can be employed to reject the heat from high-speed rotating parts, motor/generators, and power converters.

19.1.2

The emphasis of this guideline is on prevention of fire by design with the addition of fire suppression equipment to be guided by the Fire Protection Design Basis Document as well as a cost-benefit analysis to determine the extent to which fire protection is justified.

19.2 Application of Chapters 4 Through 10.

The recommendations contained in Chapters 4 through 10 can apply to flywheel energy system facilities. The Fire Protection Design Basis Document should determine which recommendations apply to any specific flywheel energy system or facility. This determination is done by evaluating the specific hazards that exist in the facility and evaluating the level of acceptable risk for the facility. For flywheel energy facilities, it is expected that most of the recommendations will apply, although there could be particular flywheel energy systems and output circuit designs for which some of the recommendations will not apply since the hazards described might not exist (e.g., no transformer in the flywheel systems).

19.3* Design and Equipment Arrangement.

A.19.3

For additional guidance on flywheel design and safety considerations refer to Sandia Report SAND2015-10759, *Recommended Practices for the Safe Design and Operation of Flywheels*.

19.3.1*

Site-specific considerations or a manufacturer's typical layout should govern flywheel energy system facility design. This should include the flywheel energy system design and containment system, power output, and load control circuitry. This should dictate how many separate structures or enclosures will be provided.

A.19.3.1

The flywheel energy units and associated equipment can be installed outdoors or within buildings.

19.3.2

Flywheel energy systems should be provided with a means for containment of the rotating mass to prevent access to the rotating parts and to contain debris that might result from abnormal operating conditions.

19.3.3

Special-purpose electrical heaters can be used in flywheel energy systems to provide for oil sump and space heating. These heaters should be listed for the type of use for which they are employed.

19.3.4*

The rotor housing should be designed to isolate any potential sparks from combustible equipment components and locations where leaked combustible fluids can accumulate.

A.19.3.4

High-speed rotating masses and their support bearings can create a large quantity of sparks if there is damage leading to abnormal friction from moving parts.

19.3.5

Particular care should be practiced with respect to spatial separation and protection from wildland fires as well as the control of vegetation where flywheel energy systems and associated equipment might be located. Guidance regarding vegetation clearance, separation distance, and emergency planning can be found in NFPA 1143 and 1144.

19.4 Risk Consideration.

19.4.1

Adequate separation should be provided between the following, as determined by the Fire Protection Design Basis Document:

- (1) Adjacent flywheel energy units consistent with land and wind topography constraints
- (2) Adjacent structures or exposures, including transformers
- (3) Adjacent properties (e.g., aboveground pipelines, tank farms, or natural gas facilities that could present a severe exposure)

19.4.2

In the event of a problem with a flywheel energy system, automatic shutdowns or idling to bring the system to a safe state should be provided that result in slowing/stopping of shaft rotation and/or isolation of electrical power to or from the motor/generator as dependent on the system design. Different methods of equipment shutdown and isolation, operating

independently, should be provided. These can include speed control as well as power isolation in concert with electronic control termination.

19.4.3

Vacuum or inert gas systems employed to lower friction losses of rotating parts as well as cooling systems to prevent overheating of the flywheel motor/generators and their power converters should be monitored and produce an orderly shutdown (i.e., spin down of the rotor) should these systems not be operating properly or fail.

19.4.4

Determination of the need for fire detection/suppression and associated flywheel energy system safe shutdown sequence for flywheel energy system facilities should be based on the facility design and layout, including specific equipment and components used in producing power within the facility. The approach can vary also depending on whether the flywheel energy system is located outdoors or indoors. This should be addressed in the Fire Protection Design Basis Document with regard to the flywheel energy units as well as power delivery and control circuits. In addition, consideration should be given to the consequences of failure of a flywheel energy unit or multiple units as well as the vulnerability of adjacent structures and equipment to damage.

19.4.4.1

If the Fire Protection Design Basis Document indicated in Chapter 4 determines a need for a fire detection system(s), the system(s) should be arranged to activate alarms at a constantly attended location or via the provision of remote operator circuits. This applies to flywheel energy units, electrical equipment enclosures, and buildings.

19.4.4.2

For remote location of flywheel energy facilities where there is a lack of abundant water supplies, the use of water-based fire protection systems is unlikely. If the design of a particular facility does, however, permit the use of water suppression systems, these systems should follow the general recommendations in Chapter 7. If the Fire Protection Design Basis Document indicates a need for fire-fighting capability using water, NFPA 1142 should be consulted.

19.5 Hazard Protection.

19.5.1

In general, the principles outlined in NFPA 30 should be applied to gearboxes and lubricating or coolant oil sumps, pumps, coolers, filters, and associated piping. As a minimum, piping systems supplying flammable and combustible liquids should be designed to minimize hydraulic and lubricating oil piping failures as follows:

- (1) If rigid metal piping is used, it should be designed with freedom to deflect with the gearbox, in any direction, at the interface with the gearbox. This recommendation also should apply to hydraulic lines that are connected to accessory gearboxes or actuators mounted directly in the nacelle. Properly designed metallic hose is an alternative for hydraulic and lube oil lines in high vibration areas to allow relative motion between rigid pipe supply lines and manifolds and at the points of entry at the gearbox and system interfaces.
- (2) Rigid piping connected directly to the gearbox should be supported such that failures will not occur due to the natural frequency of the piping coinciding with the rotational speed of the gearbox, drive shaft and hub, and flywheel energy system. Care should be taken in the design of pipe supports to avoid vibrations induced by other equipment that can excite its natural frequency.
- (3) Welded pipe joints are preferred. Threaded couplings and flange bolts in oil piping should be assembled using a torque wrench and torqued to the manufacturer's

requirements. Threaded fittings should have a positive locking device to prevent unscrewing.

- (4) Instrumentation tubing, piping, and gauges should be protected from accidental mechanical damage. Sight glasses should be listed.
- (5) Lubricating oil lines should use “guarded” pipe construction with the pressure feed line located inside the return line. Where guarded pipe construction is not used, piping sleeves should be used to reduce the possibility of oil atomization. All mechanical connections should be guarded.
- (6) Containment and drainage should be provided so as to minimize the spread of oil within the flywheel energy system or externally, which poses a risk to equipment.
- (7) All fluid piping should be routed below all electrical equipment to preclude leaked fluid dripping on the equipment.

19.5.2*

Flywheel energy systems are to be provided with a means of containment for the rotating portion of the system to prevent exposure to sparks, projectiles, and so forth, in the event of a mechanical failure of the rotor and/or bearing assembly. In addition, the analysis of the flywheel system should document that the rotor assembly has a sufficient margin of safety factor between the strength of the rotor assembly design and the stresses to the system that occur under maximum normal operating conditions.

A.19.5.2

A known scenario for mechanical failure that can lead to sparking and fire is rotor bearing failure resulting in a misplaced rotor in contact with nonmoving parts such as the rotor shaft or the housing.

19.5.3

For flywheel energy systems, monitors and/or trip functions should be provided to monitor and control the operation of flywheel energy systems safely and initiate a safe state (e.g., spin down, idling condition) dependent on the system design, for abnormal operating conditions or parameters as noted in the following list:

- (1) Grid disturbance
- (2) Abnormal condition (e.g., locking up, breakage, bearing damage) of rotor and/or bearings
- (3) Abnormal vibration
- (4) Loss of vacuum
- (5) Loss of cooling
- (6) Overheating of rotor assembly
- (7) Overspeed
- (8) Temperature faults (of critical components)
- (9) Loss of/faulted magnetic field for magnetic bearings
- (10) Oil condition (gearbox/lubrication and hydraulic)
- (11) Motor-generator protection
- (12) Loss of communication between flywheel energy units of a system or with control center

(13) Battery status

(14) Activation of smoke or heat detectors or sensors detecting abnormal conditions within the flywheel energy system

19.5.4

Electrical power delivery and control systems as well as communications systems, including cabling, wiring, insulation, fans/motors, and cabinetry, should meet the applicable industry design standards for the use intended and duty cycle specified. Such standards should be applied to systems within the flywheel energy unit as well as those associated with moving power from the flywheel energy units to the grid. As such, this includes power cables and lines, transformers, and power conditioning systems and/or components. Electrical equipment faults are the most likely source of ignition for combustible materials. Electrical equipment should consist of listed arc-resistant switchgear.

19.5.5

Materials of construction should be noncombustible whenever possible. Such principles should be applied to flywheel energy unit enclosures, O&M/control buildings, and other support structures such as relay houses, switchyard control buildings, and power conditioning buildings.

Supplemental Information

File Name	Description	Approved
Draft_Flywheel_Section_Final_April_2019_Meeting_DraftV2.docx	Task Group report that created this chapter. For staff use.	

Submitter Information Verification

Committee:

Submittal Date: Tue Apr 16 13:13:33 EDT 2019

Committee Statement

Committee Statement: The committee adds this new chapter to address hazards associated with flywheels used in power generating facilities.

Response Message: SR-53-NFPA 850-2019



Second Revision No. 63-NFPA 850-2019 [Global Comment]

Throughout the document where ever the terms “Fire Risk Assessment” or “Risk Assessment” are used they should be replaced with "Fire Protection DBD".

Submitter Information Verification

Committee:

Submittal Date: Tue Apr 16 13:36:35 EDT 2019

Committee Statement

Committee This change should make the document more consistent and relate any risk assessment to
Statement: the process described in Chapter 4.

Response SR-63-NFPA 850-2019

Message:

**Second Revision No. 73-NFPA 850-2019 [Global Comment]**

See attached document for changes to Chapters 9 and 10, including reorganization for better navigation of the standard.

Supplemental Information

File Name	Description	Approved
Chapters_9_and_10_Reorg_-_Tracked_Changes.docx	This file contains chapters 9 & 10 reorganized in tracked changes. For staff use.	
Chapters_9_and_10_reorganization_-_CLEAN..DOCX	For ballot	

Submitter Information Verification

Committee:

Submittal Date: Thu May 09 15:42:53 EDT 2019

Committee Statement

Committee Statement: This change is part of the document-wide reorganization effort. This change will help users be able to better navigate the standard and have a better overall organization of the document.

Response SR-73-NFPA 850-2019

Message:

[Public Comment No. 23-NFPA 850-2018 \[New Section after 10.3.6.3\]](#)

[Public Comment No. 7-NFPA 850-2018 \[New Section after 10.1.2\]](#)

[Public Comment No. 21-NFPA 850-2018 \[New Section after 10.4.2\]](#)

[Public Comment No. 12-NFPA 850-2018 \[Section No. 10.3.1.4\]](#)

[Public Comment No. 11-NFPA 850-2018 \[Section No. 10.3.1.3\]](#)

[Public Comment No. 8-NFPA 850-2018 \[Section No. 10.2\]](#)

[Public Comment No. 19-NFPA 850-2018 \[Section No. 10.3.4\]](#)

[Public Comment No. 18-NFPA 850-2018 \[Section No. 10.3.3.3\]](#)

[Public Comment No. 24-NFPA 850-2018 \[Section No. 10.1.4\]](#)

[Public Comment No. 15-NFPA 850-2018 \[Section No. 10.3.3\]](#)

[Public Comment No. 4-NFPA 850-2018 \[Section No. 9.8\]](#)

[Public Comment No. 22-NFPA 850-2018 \[Section No. 10.3.6\]](#)

[Public Comment No. 20-NFPA 850-2018 \[Section No. 10.4.2\]](#)

[Public Comment No. 13-NFPA 850-2018 \[Section No. 10.3.2\]](#)

[Public Comment No. 6-NFPA 850-2018 \[Section No. 10.1.1\]](#)

[Public Comment No. 3-NFPA 850-2018 \[Section No. 9.6\]](#)

[Public Comment No. 17-NFPA 850-2018 \[Section No. 10.3.7\]](#)

[Public Comment No. 25-NFPA 850-2018 \[Section No. 10.1.3\]](#)

[Public Comment No. 16-NFPA 850-2018 \[Section No. 10.3.5\]](#)

[Public Comment No. 10-NFPA 850-2018 \[Section No. 10.3.1.2\]](#)

Chapter 9 Fuels, Common Equipment and Protection

9.1 General.

The identification and selection of fire protection systems should be based on the Fire Protection Design Basis Document. This chapter identifies fire and explosion hazards in fossil fueled electric generating stations and specifies the recommended protection criteria unless the Fire Protection Design Basis Document indicates otherwise.

9.2 Flammable Gases.

9.3 Combustible Liquids

9.4 Flammable Liquids.

9.5 Solid Fuels

9.6 Turbine-Generator.

Completely incorporated into Chapter 10

9.6 Hydraulic Control System.

9.8 Lubricating Oil Systems.

Completely incorporated into Chapter 10

9.7 Electrical Equipment.

9.9.11 Emergency Generators moved to Chapter 10

9.8 Storage Rooms, Offices, and Shops.

9.9 Oil Storage Areas.

9.10 Warehouses.

9.11 Fire Pumps.

9.12 Cooling Towers.

9.13 Auxiliary Boilers.

9.14 Vehicle Repair Facilities

9.15 Air Compressors.

Chapter 10 Turbines, Generators and Internal Combustion Engines

10.1 General.

10.1.1

Chapter 10 identifies fire and explosion hazards of combustion turbine (CT) Steam turbine (ST) and internal combustion engine (ICE) electric generating units and specifies recommended protection criteria.

10.1.2

It should be recognized that some CT generating facilities consist of manufactured modules wherein construction consists of siting these modules, providing fuel supply, essential services, and interconnections to the electric system, while other facilities consist of buildings specifically designed and built or modified for the CT generator and its auxiliaries. Therefore, some recommendations might be more suitable for one type of plant than another.

10.1.3

ST generating facilities consist of turbine assemblies and auxiliary equipment wherein construction consists of incorporating these items into a boiler or HRSG steam system. Although the typical installation is in an open area within a dedicated turbine hall, outdoor installations with weather enclosures for the turbine are known and acoustic enclosures may be incorporated for indoor units. Similar to CT installations, some recommendations might be more suitable for one type of plant than another.

~~10.1.3*~~ 10.1.4*

Modern ICE generating equipment is typically provided as a complete package requiring only a fuel source and electrical connections to the system to be powered. The installations should be either fixed/permanent or installed as a portable/temporary power source. The recommendations of this chapter should be applied to fixed nonresidential installations only.

~~10.1.4~~ 10.1.5

Compressors and regulating stations installed on-site should be protected in accordance with the recommendations of Chapter 10.

10.2 Application of Chapters 4 through 9.

The recommendations contained in Chapters 4 through 9 can apply to ~~combustion~~ turbine electric generating units. The Fire Protection Design Basis Document will determine which recommendations apply to any specific CT, ST and ICE electric generating units. This determination is done by evaluating the specific hazards that exist in the facility and evaluating the level of acceptable risk for the facility. For large CT or ST units, or combined cycle plants, it is expected that most of the recommendations will apply, but for individually packaged CT and

ICE units, many of the recommendations will not apply since the hazards described might not exist (e.g., small units might not have a cable spreading room or a warehouse).

10.3 ~~Combustion~~-Turbine and Internal Combustion Engine Generators.

10.3.1 General.

10.3.1.1

The installation and operation of CT and ICE generators should be in accordance with this chapter and NFPA 37.

10.3.1.2

Site-specific design considerations or manufacturer's typical design will govern what equipment has enclosures or how many separate enclosures will be provided for the CTs, STs or ~~the~~ ICEs. The CT generator is frequently supplied as a complete power plant package with equipment mounted on skids or pads and provided with metal enclosures forming an all-weather housing. In addition to being weathertight, the enclosures are designed to provide thermal and acoustical insulation. ST generators are typically supplied as components that are incorporated into the power plant design and installed in an open room or hall. Metal acoustic enclosures are available as options for some ST generators. Smaller ICE plants might involve enclosures for equipment, but more commonly engine generators are installed in a row in an open room or hall.

10.3.1.3*

The fire and explosion hazards associated with CT, ST and ICE electric generator units are as follows:

- (1) Flammable and combustible fuels
- (2) Hydraulic and lubricating oils
- (3) Electrical and control equipment
- (4) Filter media
- (5) Combustible enclosure insulation
- (6) Internal explosions in CTs
- (7) Crankcase explosions in ICEs

~~10.3.3~~ 10.3.1.4 Prevention of External Fires.

~~10.3.3.4~~ 10.3.1.4.1*

Annex material from 9.8.6 now tagged here

Piping systems supplying flammable and combustible liquids and gases should be designed to minimize oil and fuel piping failures as follows:

(1) If rigid metal piping is used, it should be designed with freedom to deflect with the unit, in any direction. This recommendation also should apply to hydraulic lines that are connected to accessory gearboxes or actuators mounted directly on the unit. Properly designed metallic hose is an alternative for fuel, hydraulic, and lube oil lines in high vibration areas, between rigid pipe supply lines and manifolds in and at the points of entry at the engine interface.

(2) Rigid piping connected directly to the unit should be supported such that failures will not occur due to the natural frequency of the piping coinciding with the rotational speed of the machine. Care should be taken in the design of pipe supports to avoid vibrations induced by other equipment that can excite its natural frequency.

(3) ~~Welded pipe joints~~ should be used where practical. Threaded couplings and flange bolts in fuel and oil piping should be assembled using a torque wrench and torqued to the manufacturer's requirements. Couplings should have a positive locking device to prevent unscrewing.

Covers 9.8.6(1)

(4) Instrumentation tubing, piping, and gauges should be protected from accidental mechanical damage. Liquid level indicators should be listed and protected from impact.

(5) Where practical, lubricating oil lines should use guarded pipe construction with the pressure feed line located inside the return line or in a separate shield pipe drained to the oil reservoir and sized to handle the flow from all oil pumps operating at the same time. ~~If this is not practical,~~ Noncombustible coverings (e.g., piping sleeves and/or tubing and flange guards) should be used to reduce the possibility of oil atomization and contact with hot surfaces with subsequent spray fires.

From
9.8.6(2)

From
9.8.6(5)

(6) If practical, fluid piping should ~~not~~ be clear of, shielded from or routed ~~above~~ below steam piping, hot metal parts, electrical equipment or other sources of ignition to preclude leaked fluid dripping on the equipment.

From
9.8.6(3)

(7) Insulation with impervious lagging for steam piping or hot metal parts under or near oil piping or turbine bearing points

From
9.8.6(4)

~~9.6.2.1*~~ 10.3.1.4.2*

Annex material from 9.6.2.1 now tagged here

All areas beneath the turbine-generator operating floor that are subject to oil flow, oil spray, or oil accumulation should be protected by an automatic sprinkler or foam-water sprinkler system. This coverage normally includes all areas beneath the operating floor in the turbine building. The sprinkler system beneath the turbine-generator should take into consideration obstructions from structural members and piping and should be designed to a density of 0.30 gpm/ft² (12.2 mm/min) over a minimum application of 5000 ft² (464 m²).

~~9.6.2.2~~ 10.3.1.4.3

Lubricating oil lines above the turbine operating floor should be protected with an automatic sprinkler system covering those areas subject to oil accumulation including the area within the

turbine lagging (skirt). The automatic sprinkler system should be designed to a density of 0.30 gpm/ft² (12.2 mm/min).

~~9.6.2.3*~~ 10.3.1.4.4*

Annex material from 9.6.2.3 now tagged here

Protection for pedestal-mounted turbine generators with no operating floor can be provided by recommendations 9.6.2 and by containing and drainage of oil spills and providing local automatic protection systems for the containment areas. In this type of layout, spray fires from lube oil and hydrogen seal oil conditioning equipment and from control oil systems using mineral oil, if released, could expose building steel or critical generating equipment. Additional protection such as enclosing the hazard, installing a noncombustible barrier between the hazard and critical equipment, or use of a water spray system over the hazard should be considered.

~~9.6.2.4*~~ 10.3.1.4.5*

Annex material from 9.6.2.4 now tagged here

Foam-water sprinkler systems installed in place of automatic sprinklers should be designed in accordance with NFPA 16, including the design densities specified in Chapter 9

~~9.6.2.5~~ 10.3.1.4.6

Electrical equipment in the area covered by a water or foam-water system should be of the enclosed type or otherwise protected to minimize water damage in the event of system operation.

~~10.3.3.2*~~ 10.3.1.4.7*

In many units the lubricating oil is used for both lubrication and hydraulic control. For combined systems, a listed fire-resistant fluid should be considered. If separate systems are used, the hydraulic control system should use a listed fire-resistive hydraulic fluid, and a listed fire-resistant fluid should be considered for the lubricating system.

~~10.3.3.4~~ 10.3.1.4.8

For recommendations regarding containment and drainage of liquids, see Section 6.5.

~~10.3.3.5~~ 10.3.1.4.9

In order to prevent conditions that could cause a fire while the unit is operating, control packages should include the parameter monitoring and shutdown capabilities described in Chapter 9 of NFPA 37.

~~9.8~~ 10.3.1.5 Lubricating Oil Systems.

~~9.8.1*~~ 10.3.1.5.1*

Use of a listed fire resistant (i.e., less hazardous or less flammable) lubricating oil should be considered. The use of a listed fire-resistant fluid as a turbine-generator lubricating oil (~~see 7.8.2~~) could eliminate the need for fire protection beneath the operating floor, at lubricating oil lines, lubricating oil reservoir, and turbine-generator bearings to mitigate the hazard posed

solely by pool and three-dimensional fires involving lubrication oil. Protection against pool and three-dimensional fires in accordance with 7.13.4.1 should be installed if the hydrogen seal oil system does not use listed fire-resistant fluids. Generator bearings for seal oil systems not using listed fire-resistant fluids should be protected in accordance with ~~9.6.2.6~~ 10.3.1.4.4.

Stakeholders should be involved in the decision making process before eliminating fire protection for the turbine lubrication oil hazard.

~~9.8.2~~ 10.3.1.5.2

Lubricating oil storage, pumping facilities, and associated piping should comply with NFPA 30.

~~9.8.3~~ 10.3.1.5.3

Lubricating oil reservoirs should be provided with a vapor extractor, vented to a safe outside location.

~~9.8.4~~ 10.3.1.5.4

Curbing or drainage or both should be provided for the lubricating oil reservoir in accordance with Section 6.5.

~~9.8.5~~ 10.3.1.5.5

All oil piping serving the turbine- ~~ICE or~~ generator should be designed and installed to minimize the possibility of an oil fire in the event of severe turbine vibration. (See NFPA 30.)

~~9.8.6*~~

Piping design and installation should consider the following protective measures:

- ~~(1) Welded construction~~
- ~~(2) Guard pipe construction with the pressure feed line located inside the return line separate shield pipe drained to the oil reservoir and sized to handle the flow from all oil pumps operating at the same time~~
- ~~(3) Route oil piping so as to be clear of, shielded from, or below steam piping, hot metal parts, electrical equipment or other sources of ignition.~~
- ~~(4) Insulation with impervious lagging for steam piping or hot metal parts under or near oil piping or turbine bearing points~~
- ~~(5) Noncombustible coverings (e.g., flange guards) around the flange to reduce the possibility of oil spraying onto a hot surface~~

**Incorporated into
10.3.1.4.1 above,
left this here for
transparency of
the move.**

~~9.8.7~~ 10.3.1.5.6

Remote operation from the control room of the condenser vacuum break valve and shutdown of the lubricating oil pumps should be provided. Breaking the condenser vacuum markedly

reduces the rundown time for the machine and thus limits oil discharge in the event of a leak. See the discussion in 5.4.6.1 on fire emergency planning involving turbine lubricating oil fires.

~~9.8.8~~ 10.3.1.5.7

Cable for operation of lube oil pumps should be protected from fire exposure. Protection can consist of separation of cable for ac and dc oil pumps or 1-hour fire resistive coating (derating of cable should be considered).

~~9.8.9~~ 10.3.1.5.8 Fire Protection.

~~9.8.9.1*~~ 10.3.1.5.8.1*

Annex material from 9.8.9.1 now tagged here

Lubricating oil reservoirs and handling equipment should be protected in accordance with ~~9.6.2.4~~ 10.3.1.4.2. If the lubricating oil equipment is in a separate room enclosure, protection can be provided by a total flooding gaseous extinguishing system or a hybrid fire extinguishing system.

~~10.3.5~~ 10.3.1.5 Inlet Air System.

~~10.3.5.1*~~ 10.3.1.5.1*

Air filters and evaporative cooling media should be constructed from less flammable materials whenever practical. ANSI/UL 900, *Standard for Safety Test Performance of Air Filters*, can be used as guidance.

~~10.3.5.2~~ 10.3.1.5.2

Manual fire-fighting equipment should be available to personnel performing maintenance on air filters.

~~10.3.5.3~~ 10.3.1.5.3

Access doors or hatches should be provided for manual fire fighting on large air filter structures.

~~10.3.7~~ 10.3.1.6 Starting Equipment for CTs.

Where ICEs or torque converters are used, fire protection should be provided based on consideration of the factors in 10.3.4.1.

10.3.2 Combustion Turbines

~~10.3.3.3~~ 10.3.2.1

Combustible gas detector(s) should be considered for the CT ~~and ICE~~ enclosures.

~~10.3.4~~ 10.3.2.2 Fire Protection ~~for Combustion Turbines and Internal Combustion Electrical Generators.~~

~~10.3.4.4~~ 10.3.2.2.1

Determination of the need for fire suppression for the combustion turbine should be based on consideration of the value of the unit, consequences of loss of the unit, and vulnerability of adjacent structures and equipment to damage. [See Chapter 7 for general fire protection methods guidance](#)

~~10.3.4.1.1~~ [10.3.2.2.2](#)

Fire system operation should be arranged to close the fuel valves ~~except for ICE emergency power supply systems (e.g., hospital emergency power).~~

~~10.3.2~~ [10.3.2.3](#) Prevention of Internal Explosions in Combustion Turbines.

~~10.3.2.1*~~ [10.3.2.3.1*](#)

Combustion turbines should have a proof-of-flame detection system in the combustion section to detect flameout during operation or ignition failure during startup. In the case of flameout, the fuel should be rapidly shut off. If ignition is not achieved within a normal startup time, then the control system should abort the startup and close the fuel valves.

~~10.3.2.2~~ [10.3.2.3.2](#)

Two safety shutoff valves in series on the main fuel line should be used to minimize the likelihood of fuel leaking into the engine. On gas systems an automatic vent to the outside atmosphere should be provided between the two valves.

~~10.4.2~~ [10.3.3](#) Steam Turbines.

Steam turbines, ~~generators~~, and their associated hazards should be designed and protected in accordance with [Section 9.6 an appropriate method selected from Section 7.6 and considering the guidance provided in 10.3.1.4.2 through 10.3.1.4.8.](#)

~~9.6.2.6*~~ [10.3.3.1*](#) Turbine-Generator Bearings.

Annex material from 9.6.2.6 now tagged here

~~9.6.2.6.1*~~ [10.3.3.1.2*](#)

Annex material from 9.6.2.6.1 now tagged here

Turbine-generator bearings should be protected with an automatic closed-head sprinkler system utilizing directional nozzles or water spray or water mist systems. Automatic actuation is more reliable than manual action. Water spray and sprinkler systems for turbine-generator bearings should be designed for a density of 0.25 gpm/ft² (10.2 mm/min) over the protected area of all bearings.

~~9.6.2.6.2~~ [10.3.3.1.2](#)

Where enclosures are provided, compressed air foam systems and hybrid fire-extinguishing systems can be considered.

~~9.6.2.6.3*~~ [10.3.3.1.3*](#)

Annex material from 9.6.2.6.3 now tagged here

Accidental water discharge on bearing points and hot turbine parts should be considered. If necessary, these areas can be permitted to be protected by shields and encasing insulation with metal covers.

10.3.4 Internal Combustion Engines

~~10.3.3.3~~ 10.3.4.1

Combustible gas detector(s) should be considered for the ~~CT and~~ ICE enclosures.

~~10.3.4~~ 10.3.4.2 Fire Protection ~~for Combustion Turbines and Internal Combustion Electrical Generators.~~

~~10.3.4.1~~ 10.3.4.2.1

Determination of the need for fire suppression for the ~~combustion turbine~~ internal combustion engine should be based on consideration of the value of the unit, consequences of loss of the unit, and vulnerability of adjacent structures and equipment to damage. See Chapter 7 for general fire protection methods guidance.

~~10.3.4.1.1~~ 10.3.4.3

Fire system operation should be arranged to close the fuel valves except for ICE emergency power supply systems (e.g., hospital emergency power).

~~10.3.1.4~~ 10.3.4.4

In the event of a problem with older ICEs, shutdown might be difficult. Several different methods, operating independently, should be provided. These methods can include centrifugally tripped (overspeed condition) spring-operated fuel rack closure, governor fuel rack closure, electropneumatic fuel rack closure, or air inlet guillotine-type air shutoff.

~~10.3.6~~ 10.3.5 Generators.

~~10.3.6.1~~

~~Hydrogen systems should comply with recommendations in 9.6.1 and 9.6.2.8.~~

~~9.6.1~~-10.3.5.1 Hydrogen ~~System~~ Cooled Generators.

~~9.6.1.1*~~ General.

~~9.6.1.1.1~~-10.3.5.1.1*

Annex material from 9.6.1.1 now tagged here

Bulk hydrogen systems supplying one or more generators should have automatic valves located at the supply and operable either by “dead man” type controls at the generator fill point(s) or operable from the control room. This would minimize the potential for a major discharge of hydrogen in the event of a leak from piping inside the plant. Alternatively, vented guard piping can be used in the building to protect runs of hydrogen piping.

Made a conscious decision to be a bit repetitive here in the name of readability and organization

~~9.6.1.1.2~~ 10.3.5.1.2

Routing of hydrogen piping should avoid hazardous areas and areas containing critical equipment.

~~9.6.1.1.3~~ 10.3.5.1.3

Hydrogen cylinders and generator hydrogen fill and purge manifold should be located remote from the turbine generator.

~~9.6.1.1.4~~ 10.3.5.1.4

For electrical equipment in the vicinity of the hydrogen handling equipment, see Article 500 of NFPA 70 and Section 127 of IEEE C2, *National Electrical Safety Code*.

~~9.6.1.2~~ 10.3.5.2 Hydrogen Seal Oil ~~Pumps~~ System.

~~9.6.1.2.1~~ 10.3.5.2.1

Redundant hydrogen seal oil pumps with separate power supplies should be provided for adequate reliability of seal oil supply.

~~9.6.1.2.2~~ 10.3.5.2.2

Where feasible, electrical circuits to redundant pumps should be run in buried conduit or provided with fire-retardant coating if exposed in the area of the turbine generator to minimize possibility of loss of both pumps as a result of a turbine generator fire.

~~9.6.2.8~~ 10.3.5.2.3 ~~Hydrogen Seal Oil.~~

Hydrogen seal oil units should be protected in accordance with 9.6.2 an appropriate method selected from section 7.6 and considering the guidance provided in 10.3.1.4.2 through 10.3.1.4.6.

~~9.6.1.3~~ 10.3.5.3

Curbing or drainage or both should be provided for the hydrogen seal oil unit in accordance with Section 6.5.

~~9.6.1.4~~ 10.3.5.4

A flanged spool piece or equivalent arrangement should be provided to facilitate the separation of hydrogen supply where the generator is opened for maintenance.

~~9.6.1.5~~ 10.3.5.5

For electrical equipment in the vicinity of the hydrogen handling equipment, including detrainning equipment, seal oil pumps, valves, and so forth, see Article 500 of NFPA 70 and Section 127 of IEEE C2, *National Electrical Safety Code*.

~~9.6.1.6~~ 10.3.5.6

Control room alarms should be provided to indicate abnormal gas pressure, temperature, and percentage of hydrogen in the generator.

~~9.6.1.7~~ 10.3.5.7

Hydrogen lines should not be piped into the control room.

~~9.6.1.8~~ 10.3.5.8

The generator hydrogen dump valve and hydrogen detrainning equipment should be arranged to vent directly to a safe outside location. The dump valve should be remotely operable from the control room or an area accessible during a machine fire.

~~10.3.6.2~~ 10.3.5.9

Fire protection should be provided in accordance with an appropriate method selected from Section 7.6 and considering the guidance provided in 40.3.4 10.3.3.1 for ~~generator~~ turbine bearings and 10.3.1.4.2 through 10.3.1.4.5 for oil piping or any area where oil can flow, accumulate, or spray.

~~9.6.2.7~~ 10.3.5.9.1

Exciter. The area inside a directly connected exciter housing should be protected with a total flooding automatic carbon dioxide system.

~~10.3.6.3*~~ 10.3.5.10*

Air-cooled generators should be tightly sealed against the ingress of moisture in the event of discharge (accidental or otherwise) of a water spray system. Sealing should be positive, such as by a gasket or grouting, all around the generator housing.

~~9.9.11~~ 10.3.6 Emergency Generators.

~~9.9.11.1~~ 10.3.6.1

The installation and operation of emergency generators should be in accordance with NFPA 37.

~~9.9.11.2~~ 10.3.6.2 Fire Protection.

~~9.9.11.2.1~~ 10.3.6.2.1

Emergency generators located within main plant structures should be protected in accordance with NFPA 37.

~~9.9.11.2.2~~ 10.3.6.2.2

Where gaseous suppression systems are used on combustion engines that can be required to operate during the system discharges, consideration should be given to the supply of engine combustion air and outside air for equipment cooling.

10.4 Combined Cycle Units.

10.4.1 Heat Recovery Steam Generators.

Heat recovery steam generators using supplemental firing should be designed and protected in accordance with ~~Section 7.5~~12.3.1. (See *NFPA 85* for additional requirements.)

NOTE regarding Annex material: No “text” changes were made to the Annex items, only associated changes to the reference paragraph numbers.



Second Revision No. 28-NFPA 850-2019 [Detail]

The title of section 10.3 currently reads " 10.3 Combustion Turbine and Internal Combustion Engine Generators."

The first word, Combustion, should be removed from the title so that it reads "10.3 Turbine and Internal Combustion Engine Generators."

Submitter Information Verification

Committee:

Submission Date: Tue Apr 16 10:41:45 EDT 2019

Committee Statement

Committee Modifying the title to reflect the incorporation of Steam Turbine information in to chapter 10.

Statement: This is a follow-on reorganization in the spirit of the First Revision 12 effort.

Response SR-28-NFPA 850-2019

Message:

[Public Comment No. 9-NFPA 850-2018 \[Section No. 10.3\]](#)



Second Revision No. 22-NFPA 850-2019 [Section No. 1.1]

1.1 Scope.

This document provides recommendations for fire prevention and fire protection for electric generating plants and high voltage direct current converter stations, except as follows: Nuclear Advanced light water reactor electric generating plants are addressed in NFPA 804 ; nuclear power plants are addressed in NFPA 805; and fuel cells are addressed in NFPA 853.

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Wed Apr 03 15:06:06 EDT 2019

Committee Statement

Committee Statement: Adding NFPA 804 content to the list of information that is not covered by NFPA 850.

Response Message: SR-22-NFPA 850-2019



Second Revision No. 2-NFPA 850-2019 [Section No. 2.3]

2.3 Other Publications.

2.3.1 API Publications.

American Petroleum Institute, 1220 L Street, NW, Washington, DC 20005-4070.

API 500, *Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Division I and Division II*, 2012.

API 505, *Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Zone 0 and Zone 2*, 2002 2018 .

API 537, *Flare Details for ~~General Refinery and~~ Petroleum, Petrochemical Service, and Natural Gas Industries* , 2008 2017 .

API 2218, *Fireproofing Practices in Petroleum and Petrochemical Processing Plants*, 2010 2013 .

API RP 521, *Guide for Pressure Relieving and Depressurizing Systems*, 2007.

API RP 941, *Steels for Hydrogen Service at Elevated Temperatures and Pressures in Petroleum Refineries and Petrochemical Plants*, 2008 2016 .

2.3.2 ASME Publications.

American Society of Mechanical Engineers, Two Park Avenue, New York, NY 10016-5990.

ASME B31.1, *Power Piping*, 2012 2018 .

ASME B31.3, *Process Piping*, 2012 2018 .

2.3.3 ASTM Publications.

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

ASTM D92, *Standard Test Method for Flash and Fire Points by Cleveland Open Cup Tester*, 2012b 2018 .

ASTM D448, *Standard Classification for Sizes of Aggregate for Road and Bridge Construction*, 2012 2017 .

ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, 2012e 2019a .

ASTM E108, *Standard Test Methods for Fire Tests of Roof Coverings*, 2011 2017 .

ASTM E119, *Standard Test Methods for Fire Tests of Building Construction and Materials*, 2012 2018ce1 .

ASTM E136, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C*, 2012 2019 .

ASTM E814, *Standard Test Method for Fire Tests of Penetration Firestop Systems*, 2011 2017 .

ASTM E1248, *Standard Practice for Shredder Explosion Protection*, 2009 2017 .

ASTM E1725, *Standard Test Methods for Fire Tests of Fire-Resistive Barrier Systems for Electrical System Components*, 2014 2014e1 .

ASTM SI10, *American National Standard for ~~Metric Practice~~ Use of the International System of Units (SI): The Modern Metric System* , 2010 2016 .

2.3.4 IEC Publications.

International Electrotechnical Commission, 3, rue de Varembé, P.O. Box 131, CH-1211 Geneva 20, Switzerland.

IEC 62305, *Protection Against Lightning*, 2003 2010 .

2.3.5 IEEE Publications.

IEEE, Three Park Avenue, 17th Floor, New York, NY 10016-5997.

IEEE C2, *National Electric ~~Electrical~~ Safety Code*, 2017.

IEEE C37.20.7, *Guide for Testing Metal-Enclosed Switchgear Rated Up to 38 kV for Internal Arcing Faults*, 2007.

IEEE 484, *Recommended Practice for Installation Design and Installation of Vented Lead-Acid Batteries for Stationary Applications*, 2002.

IEEE 634, *Standard for Cable-Penetration Fire Stop Qualification Test*, 2004.

IEEE 979, *Guide for Substation Fire Protection*, 2012.

IEEE 980, *Guide for Containment and Control of Oil Spills in Substations*, 2013.

IEEE 1202, *Standard for Flame-Propagation Testing of Wire and Cable*, 2006.

2.3.6 SFPE Publications.

Society of Fire Protection Engineers, 9711 Washingtonian Blvd, Suite 380, Gaithersburg, MD 20878.

Engineering Guide to Fire Risk Assessment, 2006.

SFPE Handbook of Fire Protection Engineering, 2008, ~~4th edition~~ 5th edition, 2015 .

2.3.7 UL Publications.

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

UL 263, *Standard for Fire Tests of Building Construction and Materials*, 2011, revised 2015 2018 .

UL 723, *Test for Surface Burning Characteristics of Building Materials*, 2008, revised 2013 2018 .

UL 790, *Tests for Fire Resistance of Roof Covering Materials* 2004, revised 2014.

UL 900, *Standard for Safety Test Performance of Air Filters*, 2004, revised 2015.

UL 1479, *Standard for Fire Tests of Through-Penetration Firestops*, 2003, revised 2015.

UL 1709, *Standard for Rapid Rise Fire Tests of Protection Materials for Structural Steel*, 2017.

2.3.8 U.S. ~~US~~ Government Publications.

~~U.S. Government Printing Office, Washington, DC 20402~~ US Government Publishing Office, 732 North Capitol Street, NW, Washington, DC 20401-0001 .

OSHA 29 CFR 1910.146, "Permit Required Confined Space Standard," U.S. Department of Labor, 2010.

Title 29, CFR, Part 1910.156, "Fire Brigades," 2008.

2.3.9 Other Publications.

Merriam-Webster's Collegiate Dictionary, 11th edition, Merriam-Webster, Inc., Springfield, MA, 2003.

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Tue Apr 02 16:39:04 EDT 2019

Committee Statement

Committee Updating to newest edition reference standards to have the most up to date information in
Statement: the document.

Response Message: SR-2-NFPA 850-2019

**Second Revision No. 74-NFPA 850-2019 [Section No. 2.4]****2.4** References for Extracts in Recommendations Sections.

NFPA 30, *Flammable and Combustible Liquids Code*, 2018 edition.

NFPA 101[®], *Life Safety Code*[®], 2018 edition.

NFPA 801, *Standard for Fire Protection for Facilities Handling Radioactive Materials*, 2019 2020 edition.

NFPA 5000[®], *Building Construction and Safety Code*[®], 2018 edition.

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Mon Jun 03 17:34:32 EDT 2019

Committee Statement

Committee Statement: update to current edition.

Response Message: SR-74-NFPA 850-2019



Second Revision No. 72-NFPA 850-2019 [New Section after 3.3.19]

3.3.20 Idling.

A condition of the flywheel energy system where the flywheel is rotating but not providing energy to external loads.

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Wed May 08 10:54:06 EDT 2019

Committee Statement

Committee Statement: New definition provided to help users understand the new chapter on flywheels.

Response Message: SR-72-NFPA 850-2019

**Second Revision No. 75-NFPA 850-2019 [Section No. 3.3.21]****3.3.22 Limited Combustible.**

A building construction material not complying with the definition of noncombustible material that, in the form in which it is used, has a potential heat value not exceeding 3500 Btu/lb (8141 kJ/kg ~~(3500 Btu/lb)~~), where tested in accordance with NFPA 259 and complies with (a) or (b): (a) materials having a structural base of noncombustible material, with a surfacing not exceeding a thickness of ~~3.2 mm~~ (0.127 in. (3.2 mm)) that has a flame spread index not greater than 50; and (b) materials, in the form and thickness used, other than as described in (a), having neither a flame spread index greater than 25 nor evidence of continued progressive combustion and of such composition that surfaces that would be exposed by cutting through the material on any plane would have neither a flame spread index greater than 25 nor evidence of continued progressive combustion. (Materials subject to increase in combustibility or flame spread index beyond the limits herein established through the effects of age, moisture, or other atmospheric condition are considered combustible.)

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Mon Jun 03 17:36:02 EDT 2019

Committee Statement

Committee Statement: Fixing the units for consistency with the rest of the document.

Response Message: SR-75-NFPA 850-2019



Second Revision No. 71-NFPA 850-2019 [New Section after 3.3.27]

3.3.29* Spin Down.

Shutdown condition of the flywheel energy system, where energy is being dissipated and the flywheel rotor is slowing down to a stop.

A.3.3.29 Spin Down.

A complete stop of the flywheel rotor cannot occur instantaneously because of the high kinetic energy of the rotor, but rather occurs over time due to a gradual slowdown to a stop as a result of friction forces acting on the rotor.

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Wed May 08 10:52:38 EDT 2019

Committee Statement

Committee Statement: Definition is provided to help users better understand the new chapter on flywheels.

Response Message: SR-71-NFPA 850-2019

**Second Revision No. 3-NFPA 850-2019 [Section No. 7.6.1]****7.6.1**

Fire suppression systems and equipment should be provided in all areas of the plant as identified in ~~Chapters 9 through 48~~ subsequent chapters or as determined by the Fire Protection Design Basis Document. Fixed suppression systems should be listed and sized for the application and designed, installed, and commissioned in accordance with the manufacturer's recommendations and the following codes and standards unless specifically noted otherwise:

- (1) NFPA 11
- (2) NFPA 12
- (3) NFPA 13
- (4) NFPA 15
- (5) NFPA 16
- (6) NFPA 17
- (7) NFPA 18A
- (8) NFPA 20
- (9) NFPA 24
- (10) NFPA 25
- (11) NFPA 214
- (12) NFPA 750
NFPA 853
- (13) NFPA 2001
- (14) NFPA 2010

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Wed Apr 03 09:24:44 EDT 2019

Committee Statement

Committee Statement: NFPA 853 does not belong in this list it's not an installation standard for fire protection systems.

Response Message: SR-3-NFPA 850-2019



Second Revision No. 4-NFPA 850-2019 [Section No. 7.7.4]

7.7.4

~~Given the plant size and hazards, annunciation~~ Annunciation of fire-signaling systems to a constantly attended locations location is critical for emergency response. The location and design of fire-signaling systems, including emergency shutdown stations and their interfaces with ~~EGC~~ facility control and information systems, should be considered.

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Wed Apr 03 09:34:35 EDT 2019

Committee Statement

Committee Section was revised to make the recommendation more general so it can be applied to a

Statement: wider range of facilities with similar hazards.

Response SR-4-NFPA 850-2019

Message:

**Second Revision No. 5-NFPA 850-2019 [Section No. 9.5.1.1]****9.5.1.1**

The ~~initial biomass fuel~~ receiving and storage areas , whether indoors or outdoors, should be designed in accordance with the following:

(1) NFPA 1 (*see Section 10.15 and Chapter 33*)

~~NFPA 61~~

(2) NFPA 80A

(3) NFPA 652

~~NFPA 664~~

(4) NFPA 1144

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Wed Apr 03 10:16:47 EDT 2019

Committee Statement

Committee Biomass has been removed to make the section more general to be in alignment with the
Statement: reorganization of the standard and NFPA 652 provides direction to incorporate NFPA 61 and NFPA 664.

Response SR-5-NFPA 850-2019

Message:

**Second Revision No. 6-NFPA 850-2019 [Section No. 9.5.1.3]****9.5.1.3**

For fuels subject to spontaneous ignition, there are measures that should be taken to lessen the likelihood of storage pile fires. These measures are dependent on the type ~~and rank~~ of fuel. Among the more important are the following:

- (1) Short duration, active, or "live" storage piles should be worked to prevent dead pockets, a potential source of spontaneous heating.
- (2) Storage piles should not be located above sources of heat, such as steam lines, or sources of air, such as manholes.
- (3) Fuel placed in long-term storage should be piled in layers, appropriately spread, and compacted prior to the addition of subsequent layers to reduce air movement and to minimize water infiltration into the pile.
- (4) Different types of fuel that are not chemically compatible should not be stored in long-term storage piles.
- (5) Access to storage piles should be provided for fire-fighting operations and for pulling out hot pockets. Where storage barns or domes are used to enclose storage piles, the design of the structure should include dedicated space to allow small vehicles to access all areas of the fuel pile. The design should prevent stored fuel from encroaching on the dedicated space.

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Wed Apr 03 10:28:50 EDT 2019

Committee Statement

Committee Statement: The term rank is specific to coal and so it has been removed to make the section more broadly applicable.

Response Message: SR-6-NFPA 850-2019



Second Revision No. 7-NFPA 850-2019 [Section No. 9.5.1.4]

9.5.1.4

Specific hot-load unloading areas should be designated and separated from other areas (preferably outdoors) so that loads containing smoldering or other suspect constituents can be segregated. Such areas should be properly monitored and equipped to promptly extinguish incipient fires before recombining. ~~with other MSW and RDF.~~

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Wed Apr 03 10:31:50 EDT 2019

Committee Statement

Committee MSW and RDF have been removed to make the section more broadly applicable in alignment

Statement: with the reorganization of the standard.

Response SR-7-NFPA 850-2019

Message:



Second Revision No. 8-NFPA 850-2019 [Section No. 9.5.2 [Excluding any Sub-Sections]

]

The recommendations of 9.5.2 should be considered to reduce the probability of serious fire. (See NFPA 85 ↗)

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Wed Apr 03 10:35:58 EDT 2019

Committee Statement

Committee Statement: This statement doesn't contain valuable information or recommendations.

Response Message: SR-8-NFPA 850-2019

**Second Revision No. 9-NFPA 850-2019 [Section No. 9.5.2.6]****9.5.2.6* Bin, Bunker, or Silo Fires.****9.5.2.6.1**

If fire occurs ~~in a silo~~, manual actions for suppression and extinguishment should be initiated. The following fire-fighting strategies have been successfully employed (depending on the specific circumstances and type of fuel used):

- (1) Use of fire-fighting additives such as Class A foams, penetrants, or wetting agents and water additives
- (2) Injection of inert gas
- (3) Emptying the ~~silo through the feeder pipe~~ bin, bunker, or silo to a safe location (inside or outside the powerhouse) and ~~trucking away removing~~ the debris

9.5.2.6.2

The following fire-fighting strategies should be taken into consideration:

- (1) Water has been used successfully to control ~~bunker and silo~~ fires. However, the possibility of an explosion exists under certain circumstances if the water reaches the fuel in a hot spot. Therefore, water is not a recommended fire-fighting strategy for these types of fire events. The amount of water delivered ~~to a silo~~ in a stream can create structural support problems. However, use of fire-fighting additives with water can be highly effective for fuel fires, especially sub-bituminous coal fires and, potentially, fires involving other type of fuels. This use of fire-fighting additives typically results in significantly less water being delivered ~~into the silo~~ due to the enhanced fire suppression properties of the agent and subsequent shorter delivery period.
- (2) Steam-smothering has also been used to control ~~bunker and silo~~ fires on marine vessels. All openings need to be sealed prior to the introduction of steam, which is rarely possible at electric generating plants due to the relatively porous nature of the equipment. The use of steam introduces high temperature and moisture that could increase the possibility of spontaneous combustion; therefore, this strategy is not recommended.
- (3) Locating ~~silo~~ hot spots and extinguishing them before the fuel leaves the bin, bunker, or silo is an accepted practice. The fuel hot spots are detected and extinguished. If, additional hot spots are detected as the fuel drops down, ~~through the silo, additional hot spots are detected,~~ fuel flow should be stopped and the hot spots extinguished. If the hot spots are exposed during the lowering of the fuel, potential for dust explosions is increased.

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Wed Apr 03 10:49:09 EDT 2019

Committee Statement

Committee Statement: Changed language to make this section generic to bins bunkers and silos.

Response Message: SR-9-NFPA 850-2019



Second Revision No. 11-NFPA 850-2019 [Sections 9.5.2.8, 9.5.2.9]

9.5.2.8

Dusttight barriers should be provided between the boiler house and the areas of the ~~coal~~ fuel handling system above the bin, bunker, or silo.

9.5.2.9

It might not be practical to install explosion vents on a ~~coal~~ bin, bunker, and ~~or~~ silo. Typical ~~silo~~ designs do not have sufficient area above the ~~coal~~ fuel level for properly designed explosion vents. Vents would present an exposure hazard to any personnel in adjacent areas (see *NFPA 654* 652). If explosion vents are considered, they should be designed in accordance with NFPA 68.

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Wed Apr 03 11:06:24 EDT 2019

Committee Statement

Committee Statement: The terms coal and silo have been removed from this section to make it more generic and broadly applicable.

Response Message: SR-11-NFPA 850-2019

**Second Revision No. 12-NFPA 850-2019 [Section No. 9.5.3.1]****9.5.3.1***

Dust generated due to fuel handling can constitute a fire and explosion hazard that should be identified and, if needed, controlled by one or more of the following methods:

- (1) A dust collection system
- (2) A dust suppression system
- (3) An open-air construction
- (4) Passive design features of the conveyor chutes and dust hoods to minimize generation of dust and spillage of fuel at the transfer points
- (5) Routine cleaning of fuel handling areas

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Wed Apr 03 11:10:48 EDT 2019

Committee Statement

Committee Statement: Inserted the term "fuel" so that the section makes sense.

Response Message: SR-12-NFPA 850-2019



Second Revision No. 10-NFPA 850-2019 [Section No. 9.5.3.5]

9.5.3.5

Dust collectors should be located outside. For dust collection systems provided for handling combustible dusts, see NFPA 652, NFPA 654, and NFPA 664 as appropriate. Other recommendations for reducing the probability of explosion and fire from coal combustible dust are as follows:

- (1) Fans for dust collectors should be installed downstream of the collectors so that they handle only clean air.
- (2) For dust collectors vented to the outside, see NFPA 68. Explosion suppression systems are permitted to be provided for dust collection systems that cannot be safely vented to the outside. (See NFPA 69.)
- (3) Dust collection hoppers should be emptied prior to shutting down dust removal systems to reduce the likelihood of collector fires originating from spontaneous heating in the dust hopper.
- (4) Dust collectors should not discharge into inactive coal fuel storage bins, bunkers, or silos.
- (5) High-level detection with an annunciator alarm should be provided for the dust hoppers.
- (6) Monitoring and trending for carbon monoxide should be provided for dust collectors to detect spontaneous combustion.
- (7) Dust collected in a dust collection system, baghouse, or cyclone should be discharged downstream of the collection system, back to the conveying system, or back to the residue or waste stream.

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Wed Apr 03 11:01:03 EDT 2019

Committee Statement

Committee Removed the term coal to allow these recommendations to be more broadly applicable to all
Statement: combustible dusts since their hazards are similar.

Response SR-10-NFPA 850-2019

Message:

**Second Revision No. 66-NFPA 850-2019 [Section No. 9.9.11]****10.3.6** Emergency Generators.**10.3.6.1**

The installation and operation of emergency generators should be in accordance with NFPA 37.

10.3.6.2 Fire Protection.**10.3.6.2.1**

Emergency generators located within main plant structures should be protected in accordance with NFPA 37.

10.3.6.2.2

Where gaseous suppression systems are used on combustion engines that can be required to operate during the system discharges, consideration should be given to the supply of engine combustion air and outside air for equipment cooling.

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Wed Apr 17 13:31:07 EDT 2019

Committee Statement

Committee The Section 9.9.11 text is being incorporated to chapter 10 so as to consolidate guidance related to
Statement: Internal Combustion Engines (ICEs) thereby providing a single location of the information applicable to this class of equipment. This eliminates duplication / cross referencing of information that was previously located in two separate chapters. This is a follow-on reorganization in the spirit of the First Revision 12 effort.

Response SR-66-NFPA 850-2019

Message:

[Public Comment No. 5-NFPA 850-2018 \[Section No. 9.9.11\]](#)



Second Revision No. 54-NFPA 850-2019 [Section No. 11.1 [Excluding any Sub-Sections]]

Chapter 11 identifies fire and explosion hazards of alternative-fuel-fired electric generating plants and specifies recommended protection criteria common to all such plants regardless of the fuel-used .

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Tue Apr 16 13:18:35 EDT 2019

Committee Statement

Committee Statement: The word "used" is not necessary in this recommendation.

Response Message: SR-54-NFPA 850-2019



Second Revision No. 55-NFPA 850-2019 [Section No. 11.1.2]

11.1.2

~~Fire areas should be separated from each other by approved means. In addition to the applicable recommendations in 6.1.1.2 and 6.1.1.3, it is recommended that, as a minimum, fire area boundaries be provided to separate initial fuel receiving, processing, and storage areas.~~

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Tue Apr 16 13:19:42 EDT 2019

Committee Statement

Committee Statement: This section is repeated in 11.3.1 and so it should be removed here to avoid duplication.

Response Message: SR-55-NFPA 850-2019

**Second Revision No. 56-NFPA 850-2019 [Section No. 11.2]****11.2 Application of Chapters 4 through 9 Through 10 .**

The recommendations contained in Chapters 4 through 10 can apply to alternative-fuel facilities. The Fire Protection Design Basis Document should determine which recommendations apply to any specific alternative fuel facility. This determination is done by evaluating the specific hazards that exist in the facility and evaluating the level of acceptable risk for the facility. For most alternative-fuel facilities, it is expected that most of the recommendations will apply, although there could be particular recommendations will not apply because the hazards described might not exist.

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Tue Apr 16 13:20:30 EDT 2019

Committee Statement

Committee Statement: The recommendations in Chapters 4-10 can all apply to alternative fuel plants.

Response Message: SR-56-NFPA 850-2019



Second Revision No. 57-NFPA 850-2019 [Section No. 11.3.1]

11.3.1

Fire areas should be separated from each other by approved means. In addition to the applicable recommendations in 6.1.1.2 and 6.1.1.3, it is recommended that, as a minimum, fire area boundaries be provided to separate the following: initial fuel receiving, processing, and storage areas.

~~Tipping floor, including the municipal solid waste (MSW) storage~~

~~Processing area~~

~~Refuse derived fuel (RDF) storage~~

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Tue Apr 16 13:21:56 EDT 2019

Committee Statement

Committee Statement: This section has been changed to make it more widely applicable for this chapter and not to be specific to a certain fuel since it can apply to all alternative fuels covered in this chapter.

Response: SR-57-NFPA 850-2019

Message:

**Second Revision No. 58-NFPA 850-2019 [Section No. 11.4]****11.4 Risk Considerations for ~~Mass-Burn-Fuels~~ MSW .****11.4.1 General.**

~~Section- 14.4~~ This section identifies fire and explosion hazards that are unique to the use of MSW as a boiler fuel by means of a process that includes the hauling of MSW directly to a tipping floor or storage pit and burning without any special processing. MSW is municipal solid waste consisting of commonly occurring residential and light commercial waste.

11.4.2 Fire Protection.**11.4.2.1* General.**

The tipping/receiving building should be provided with automatic sprinkler protection throughout. Systems should be designed for a minimum of 0.25 gpm/ft² (10.2 mm/min) over the most remote 3000 ft² (279 m²) (increase by 30 percent for dry pipe systems) of floor area with the protection area per sprinkler not to exceed 130 ft² (12 m²). High-temperature sprinklers [250°F to 300°F (121°C to 149°C)] should be used. If the tipping/receiving floor is to be used as the charging storage area, additional protection should be provided in accordance with 11.4.2.2.2.

11.4.2.2* The MSW Storage Pit, Charging Floor, and Grapple Laydown Areas.**11.4.2.2.1**

Automatic sprinkler protection should be provided throughout the refuse enclosure to protect the entire roof area against structural damage. Systems should be designed for a minimum of 0.20 gpm/ft² (8.1 mm/min) over the most remote 3000 ft² (279 m²) (increase by 30 percent for dry pipe systems) of pit/floor area with the protection area per sprinkler not to exceed 100 ft² (9.3 m²). High-temperature sprinklers [250°F to 300°F (121°C to 149°C)] should be used. Exposed steel column protection, where provided, should be designed in accordance with NFPA 15 and can be connected to the overhead sprinkler system. Due to the distance between the bottom of the refuse pit and the sprinkler system, manual hoses and monitor nozzles should be considered as the primary means of fighting a MSW storage pit fire.

11.4.2.2.2

In addition to sprinkler protection, the storage pit should be provided with monitor nozzle protection designed to furnish a minimum of 250 gpm (946 L/min) at 100 psi (689 kPa) at the tip. Monitors should be located so as to allow for coverage of all pit areas with at least two streams operating simultaneously. Due to frequency of use and potential for operator fire exposure, oscillating monitor nozzles with manual override should be provided.

11.4.2.3 Harsh Environments.

Particular care should be taken in the selection of fire detection devices in consideration of harsh and dusty environments and high air flows.

11.4.2.4 Explosion Suppression.

~~Mass-burn~~ MSW facilities utilizing hammermills and flailmills for processing of oversize bulky waste should follow the recommendations of 11.5.3 .

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Tue Apr 16 13:23:59 EDT 2019

Committee Statement

Committee Statement: This section was made more general to apply to Municipal Solid Waste.

Response Message: SR-58-NFPA 850-2019



Second Revision No. 59-NFPA 850-2019 [Section No. 11.5]

11.5 Risk Considerations for RDF.

11.5.1

~~Section 14.5~~ This section identifies fire and explosion hazards that are unique to the processing of MSW into RDF. RDF is a boiler fuel manufactured by means of a process that includes storing, shredding, classifying, and conveying the waste to a fuel storage area. It is then conveyed to the boiler through a metering device.

11.5.2

There is a potential fire and explosion hazard with the use of hammermills and flailmills and associated dust collection equipment. During the size-reduction process, flammable or explosive materials in the waste stream can be ignited.

11.5.2.1 Shredder Location.

11.5.2.1.1

The primary shredder ~~and associated dust collectors~~ should be located within an enclosure of damage-limiting construction. It is preferable that the enclosure be detached from the main building. Other alternatives include the following:

- (1) Outside of, but sharing a common wall with, the main building
- (2) Inside of the main building, along an outside wall

~~Within the main building~~

11.5.2.1.2

In view of the difficulties in preventing and controlling all types of shredder explosions, it is important to isolate the shredder and surrounding enclosure from vulnerable equipment and occupied areas in the plant. Consideration should be given to the protection of operating personnel or visitors from the potential blast zone.

11.5.2.2

Secondary shredders do not exhibit as significant a fire and explosion potential as primary shredders. Where specific designs do not eliminate the potential for explosions in the secondary shredder, the recommendations in 11.5.3 should be referenced.

11.5.2.3*

Shredders, shredder enclosures, and openings into the enclosure should be designed so that, by a combination of venting and wall strength, they will resist a postulated worst-credible-case explosion. Consideration should be given to a substantial increase in explosive pressure as a result of venting of shredders into a combustible vapor-air mixture within the enclosure. It is recommended that designers ~~seek guidance from those having~~ have specialized experience in the analysis of such hazards, including specifying and constructing of explosion venting and shredder enclosures.

11.5.2.4

Platforms at intermediate elevations should be of open grating to reduce obstructions to the effective vent area.

11.5.2.5

Electrical equipment located inside the shredder enclosure should be rated for use in both hazardous vapor and dust atmospheres in accordance with Articles 500 and 501 of *NFPA 70*.

11.5.2.6

Service panels or controls for the shredder should be located so as not to expose operating personnel to the blast zone.

11.5.2.7

Explosion venting should be sized using the properties based on hydrogen nomographs as described in NFPA 68. Where ducts are used to vent explosions to the outside, consideration should also be given to increased pressure caused by the length of the vent duct. If the vent area available is inadequate for sufficient explosion venting because of the height of the vent stack or other factors, an explosion suppression system in the shredder should be used to augment the venting arrangement. (See 11.5.5.)

11.5.2.8

Where access door assemblies are provided for primary shredder enclosure, they should be kept secured to prevent unauthorized access when the equipment is operating. The access door assemblies should have the same pressure rating as the enclosure.

11.5.3 Prevention of Fires and Explosions in RDF Units.**11.5.3.1**

The process should be designed to minimize the production of dust. Dust collected in a dust collection system, baghouse, or cyclone should be discharged downstream of the collection system, back to the conveying system, or back to the residue or waste stream. (For additional guidance, see 7.4.3.4 9.5.3.)

11.5.3.2*

Radiation imaging equipment (e.g., x-ray) should be considered as a means to detect tanks or containers that could contain flammable materials. The detection equipment should be arranged to monitor waste on the conveyor before it enters the shredder. An image of what is seen in the waste is transmitted to an operator. If a tank-shaped object is observed, the conveyor should be stopped and the tank removed.

11.5.3.3

A combustible gas detection system should be considered as a supplemental explosion protection measure. Anticipated flammable vapors can include a wide variety of flammable materials and the selected gas detection device should take this into consideration.

11.5.3.3.1

The location of sensors or sampling lines should be based on site-specific conditions, including air flow rates through the shredder and associated components located upstream and downstream of the shredder.

11.5.3.3.2

The combustible gas detection system should be arranged with alarm annunciation at 25 percent of the calibrated lower explosive limit (LEL) and interlocks at 50 percent of the LEL. Interlocks that should be considered include area evacuation; shutdown of shredder, associated conveyors, and dust collection systems; and operation of fire or explosion suppression systems.

11.5.4 Fire Protection.**11.5.4.1***

The actuation of a fire suppression system should cause equipment it protects to shut down. With the shutdown of the equipment, the upstream feed conveyors should also shut down to stop feeding combustible material to the fire, while downstream conveyors should be stopped to prevent the spread of the fire. A manual override should be provided.

11.5.4.2

Classifiers/trommels, such as rotating screens, should be provided with water spray protection to prevent fire from propagating downstream through the screen. Systems should be designed for a minimum of 0.25 gpm/ft² (10.2 mm/min) of the entire screen area with nozzles no more than 10 ft (3.0 m) on center. Consideration should be given to avoiding physical damage from mobile equipment operation in the area and from the material being processed.

11.5.4.3*

The tipping/receiving building should be provided with automatic sprinkler protection throughout. Systems should be designed for a minimum of 0.25 gpm/ft² (10.2 mm/min) over the most remote 3000 ft² (279 m²) (increase by 30 percent for dry pipe systems) of floor area, with the protection area per sprinkler not to exceed 130 ft² (12.0 m²). High-temperature sprinklers [250°F to 300°F (121°C to 149°C)] should be used.

11.5.4.4*

The processing building should be provided with automatic sprinkler protection throughout. Systems should be designed for a minimum of 0.25 gpm/ft² (10.2 mm/min) over the most remote 3000 ft² (279 m²) (increase by 30 percent for dry pipe systems) of floor area, with the protection area per sprinkler not to exceed 130 ft² (12.0 m²).

11.5.4.5

Where an RDF plant has a tipping floor and pit, it should be protected with monitor nozzle coverage that aligns with the recommendations of 11.3.2.2.2 11.4.2.2.2.

11.5.4.6

The RDF storage building should be provided with automatic sprinkler protection throughout. Systems should be designed for a minimum of 0.35 gpm/ft² (14.3 mm/min) over the most remote 3000 ft² (279 m²) (increase by 30 percent for dry pipe systems) of floor area, with the protection area per sprinkler not to exceed 100 ft² (9.3 m²). High-temperature sprinklers [250°F to 300°F (121°C to 149°C)] should be used. Storage heights in excess of 20 ft (6.1 m) will require higher design densities.

11.5.4.7

The RDF boiler feed system area, including bins, hoppers, chutes, conveyors, and so forth, should be considered for automatic sprinkler protection. Where provided, the systems should be designed for a minimum of 0.20 gpm/ft² (8.1 mm/min) over the most remote 2000 ft² (186 m²) (increase by 30 percent for dry pipe systems) of floor area, with the protection area per sprinkler not to exceed 130 ft² (12.0 m²). Internal, as well as external, protection also should be considered depending upon specific equipment design, ceiling heights, and accessibility for manual firefighting.

11.5.4.8

Shredder enclosures should be provided with automatic sprinkler or water spray protection. Systems should be designed for a minimum of 0.25 gpm/ft² (10.2 mm/min) over the most remote 3000 ft² (279 m²) (increase by 30 percent for dry pipe systems) of floor area, with the protection area per sprinkler not to exceed 100 ft² (9.3 m²). Water spray protection should also be provided within the shredder housings at intake and discharge chutes and within vent shafts.

11.5.4.9

The environment should be considered in selecting detection devices. Heat detection is most reliable under conditions encountered in process areas. Smoke detection should not be used in process areas. If flame detectors are used, an air sweep of the lens should be provided.

11.5.5 Explosion Suppression.**11.5.5.1**

Explosion suppression systems should be considered for protection of shredders. If such systems are selected, they should be designed and installed by qualified individuals using listed components. (See *NFPA 69* and *ASTM E1248, Standard Practice for Shredder Explosion Protection*.)

11.5.5.2

Explosion suppression system detectors and agent distribution should cover the entire shredder volume and all contiguous areas, including inlet and discharge conveyors, reject chutes, and dust collection systems.

11.5.5.3*

The explosion suppression system equipment and associated mountings should be inspected periodically. Extinguisher and detector ports should be cleaned frequently to ensure successful operation.

11.5.5.4

Pressure sensors should be located in areas of the shredder where they will not be plugged. If there is a delay in operation of the suppression system, there could be an increase in pressure above what would be expected in an unsuppressed explosion.

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Tue Apr 16 13:25:55 EDT 2019

Committee Statement

Committee Statement: The title has been changed to more appropriately describe the section. 11.5.2.3 was changed so that the document recommends the designer have experience rather than just seek guidance from someone who has experience. Other language has been changed to be more easily understood.

Response Message: SR-59-NFPA 850-2019

**Second Revision No. 60-NFPA 850-2019 [Section No. 11.6]****11.6** Risk Considerations for Biomass Fuels.**11.6.1**

~~Section 11.6~~ This section identifies fire and explosion hazards that are unique to the processing of forest and agricultural by-products (e.g., wood chips, rice hulls, sugar cane) into boiler fuel manufactured by means of a process that can include, but is not limited to, storing, shredding, classifying, and conveying the biomass to a fuel storage area and conveying it from the storage area to feed the boiler through a metering device. In general, biomass fuels are such that fires of low to moderate intensity would be expected. There can be cases, however, where fuel type and processing will present a greater fire hazard and so require a higher level of protection.

11.6.2

Where process or handling equipment involves biomass materials with particle size less than 80 mesh and with moisture content less than 30 percent by volume, a potential explosion hazard exists. (*See NFPA 68, NFPA 69, and NFPA 664.*)

11.6.3

Biomass units utilizing equipment capable of producing explosive concentrations of gases or dusts as described in 11.6.2 should be provided with explosion venting or explosion suppression systems. (*For further guidance, see NFPA 68, NFPA 69, and NFPA 664.*)

11.6.4*

Biomass storage buildings should be provided with automatic sprinklers throughout. Systems should be designed for a minimum of 0.25 gpm/ft² (10.2 mm/min) over the most remote 3000 ft² (279 m²) (increase by 30 percent for dry pipe systems) of floor area, with the protection area per sprinkler not to exceed 130 ft² (12.0 m²).

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Tue Apr 16 13:30:20 EDT 2019

Committee Statement

Committee Statement: Changed title to make it more descriptive and accurate.

Response Message: SR-60-NFPA 850-2019

**Second Revision No. 61-NFPA 850-2019 [Section No. 11.7]****11.7 Rubber Tires Risk Considerations for Tire Derived Fuels .****11.7.1 General.****11.7.1.1***

~~Section 11.7~~ This section identifies fire and explosion hazards that are unique to the processing of rubber tires as a primary or secondary boiler fuel by means of a process that can include, but is not limited to, storing, shredding, and conveying the rubber tires to a fuel storage area (and conveying it from the storage area to fuel the boiler).

11.7.1.2

There are several inherent fire hazards associated with scrap tires, whether outside or inside a building. Once tires are ignited, the fire develops rapidly, and it is difficult to extinguish. The tires will generate a large amount of black smoke. In addition, as the tires burn they generate oil that can spread and increase the size of the fire.

11.7.1.3

For tire plant processes that generate dust explosion potential, refer to NFPA 68, NFPA 69, and NFPA 652, ~~and individuals having specialized experience.~~

11.7.2 Fire Protection.**11.7.2.1**

For the water supply and fire protection requirements of outdoor storage of scrap rubber tires, see Chapter 33 of NFPA 1.

11.7.2.2

The scrap rubber tire pit should be provided with water additive or foam-water spray protection throughout. The system(s) should be designed for a minimum of 0.24 gpm/ft² (9.8 mm/min) over the entire pit area, with the protection area per nozzle not to exceed 100 ft² (9.3 m²). Due to the extreme hazard, clearance between the top of storage and foam water spray systems should be minimized.

11.7.2.3

In addition to the water additive or foam water spray protection, the storage pit should be provided with monitor nozzle protection designed to furnish a minimum of 250 gpm (946 L/min) at 100 psi (689 kPa) at the tip. Monitors should be located so as to allow for coverage of all pit areas with at least two streams operating simultaneously. Due to the potential for operator fire exposure, oscillating monitor nozzles with manual override should be provided.

11.7.2.4

For protection and storage of scrap rubber tires indoors, Section 34.8 of NFPA 1 should be referenced.

11.7.2.5

The boiler's tire feed system, including bins, hoppers, and chutes, should be considered for automatic water additive or foam-water protection. Where provided, the system should be designed for a minimum of 0.30 gpm/ft² (12.2 mm/min) over the most remote 2500 ft² (232 m²).

11.7.2.6

All water spray systems should be capable of remote actuation from the control room or other constantly attended areas. Additionally, local actuation stations should be placed adjacent to the fire areas along lines of egress and in consideration of operator safety and protection from damage due to equipment.

11.7.2.7

Scrap rubber tire units utilizing equipment capable of producing explosive concentrations of gases or dusts should be provided with explosion venting or explosion suppression systems. *(For further guidance, see NFPA 68 and NFPA 69.)*

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Tue Apr 16 13:31:16 EDT 2019

Committee Statement

Committee Individuals having experience is vague and can be misinterpreted to be a way to work around
Statement: the recommendations of this document. The title was also changed to be more accurate.

Response SR-61-NFPA 850-2019

Message:



Second Revision No. 62-NFPA 850-2019 [Section No. 11.8]

11.8 Other Alternative Fuels and Processes.

Other alternative fuels (e.g., culm, peat, gob) are used as boiler fuels. Also, other technologies exist for the utilization and processing of alternative fuels as boiler fuels. Designers should ~~seek guidance from those having specialized experience to~~ understand the unique characteristics of any particular fuel or technology to properly apply the appropriate portions of this and other applicable documents.

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Tue Apr 16 13:33:38 EDT 2019

Committee Statement

Committee Designers should understand the material themselves instead of just seeking guidance from
Statement: someone who has that knowledge.

Response SR-62-NFPA 850-2019

Message:



Second Revision No. 21-NFPA 850-2019 [Section No. 12.1 [Excluding any Sub-Sections]]

~~Chapter 12~~ This chapter identifies fire and explosion hazards of ~~coal and alternative fuel-fired~~ associated with electric generating plants utilizing power boilers and specifies recommended protection criteria ~~that are common to all plants~~ regardless of the fuel used.

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Wed Apr 03 14:57:12 EDT 2019

Committee Statement

Committee This section was previously copy and pasted out of the alternate fuels section without being
Statement: customized for the new chapter it is currently located in.

Response SR-21-NFPA 850-2019

Message:



Second Revision No. 13-NFPA 850-2019 [Section No. 12.2]

12.2 Application of Chapters 4 through 10 Through 11 .

The recommendations contained in Chapters 4 through 10 ~~11~~ can apply to ~~alternative fuel-fired~~ electric generating ~~station units~~ stations utilizing power boilers . The Fire Protection Design Basis Document will determine which recommendations apply to ~~any specific alternative fuel-fired unit~~ . This is done by evaluating the specific hazards that exist in the facility and determining the level of acceptable risk for the facility. It is expected that most of the recommendations will apply to all units, except as follows:

- (1) Where size and specific design eliminate certain hazards (e.g., H₂ seal oil units, cable spreading rooms, or warehouses)
- (2) Where the Fire Protection Design Basis Document indicates a single source of water (e.g., a single tank) is considered adequate and reliable

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Wed Apr 03 11:32:31 EDT 2019

Committee Statement

Committee Statement: Correcting the referenced sections.

Response Message: SR-13-NFPA 850-2019

**Second Revision No. 14-NFPA 850-2019 [Section No. 13.2]****13.2 Application of Chapters 4 through Through 10.**

The recommendations contained in Chapters 4 through ~~43~~ 10 can apply to wind generating facilities. The Fire Protection Design Basis Document should determine which recommendations apply to any specific wind generating facility. This determination is done by evaluating the specific hazards that exist in the facility and evaluating the level of acceptable risk for the facility. For most wind generating facilities, it is expected that most of the recommendations will apply, although there could be particular wind turbines and output circuit designs for which some of the recommendations will not apply since the hazards described might not exist (e.g., no transformer in the wind turbine nacelle).

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Wed Apr 03 11:34:06 EDT 2019

Committee Statement

Committee Statement: Correcting referenced sections.

Response Message: SR-14-NFPA 850-2019

**Second Revision No. 15-NFPA 850-2019 [Section No. 14.2]****14.2 Application of Chapters 4 through Through 10.**

The recommendations contained in Chapters 4 through ~~43~~ 10 apply. The Fire Protection Design Basis Document should determine which recommendations apply to any specific facility. This determination is done by evaluating the specific hazards that exist in the facility and evaluating the level of acceptable risk for the facility. The remaining paragraphs in this chapter provide recommendations that are beyond the scope of other chapters in this recommended practice.

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Wed Apr 03 11:34:56 EDT 2019

Committee Statement

Committee Statement: Correcting references.

Response Message: SR-15-NFPA 850-2019

**Second Revision No. 16-NFPA 850-2019 [Section No. 15.2]****15.2*** Application of Chapters 4 through Through 10.

The recommendations contained in Chapters 4 through ~~43~~ 10 apply to all geothermal power plants (direct steam, flash steam, and binary). The Fire Protection Design Basis Document should determine which recommendations apply to any specific facility. This determination is done by evaluating the specific hazards that exist in the facility and evaluating the level of acceptable risk for the facility. The remainder of this chapter provides recommendations that are not included in other chapters in this recommended practice.

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Wed Apr 03 11:35:47 EDT 2019

Committee Statement

Committee Statement: Correcting references.

Response Message: SR-16-NFPA 850-2019

**Second Revision No. 17-NFPA 850-2019 [Section No. 16.2]****16.2** Application of Chapters 4 through Through 10.

The recommendations contained in Chapters 4 through ~~43~~ 10 readily apply to IGCC facilities. With the addition of the different technologies involved in syngas production and the differences in syngas with respect to natural gas, the Fire Protection Design Basis Document should determine which recommendations apply to any specific IGCC facility. This determination is done by evaluating the specific hazards that exist in the facility and evaluating the level of acceptable risk for the facility. For IGCC facilities, it is expected that most of the recommendations will apply, although there could be particular plants for which some of the recommendations will not apply since the hazards described might not exist (e.g., no air separation unit). The user is responsible for determining the properties of the materials used or generated in the facility (vapor density, ignition temperature, LFL, etc.). It is recommended that designers seek guidance from those having specialized experience to understand the unique characteristics of any particular fuel or technology in order to properly apply the appropriate portions of this and other applicable documents.

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Wed Apr 03 11:36:50 EDT 2019

Committee Statement

Committee Statement: Correcting references.

Response Message: SR-17-NFPA 850-2019

**Second Revision No. 76-NFPA 850-2019 [Section No. 16.4.2.2]****16.4.2.2**

Electrical classification of equipment should be in accordance with one of the following: NFPA 497; API 500, *Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Division I and Division II*; or API 505, *Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Zone 0, and Zone 2*.

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Tue Jun 04 09:27:23 EDT 2019

Committee Statement

Committee Statement: language added to clarify the intent of this section.

Response Message: SR-76-NFPA 850-2019



Second Revision No. 18-NFPA 850-2019 [Section No. 17.2]

17.2 Application of Chapters 4 through Through 10.

The recommendations contained in Chapters 4 through ~~43~~ 10 can apply to hydroelectric generating stations. The Fire Protection Design Basis Document will determine which recommendations apply to any specific hydroelectric generating station. This determination is done by evaluating the specific hazards that exist in the facility and determining the level of acceptable risk for the facility. It is expected that most recommendations will apply to all hydroelectric generating stations.

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Wed Apr 03 11:37:41 EDT 2019

Committee Statement

Committee Statement: Correcting References.

Response Message: SR-18-NFPA 850-2019

**Second Revision No. 19-NFPA 850-2019 [Section No. 18.2]****18.2 Application of Chapters 4 through 10 Through 9 .**

The recommendations contained in Chapters 4 through 10 can apply to HVDC converter stations and SVC/SVG. The Fire Protection Design Basis Document will determine which recommendations apply to any specific HVDC or SVC/SVG facility. This determination is done by evaluating the specific hazards that exist in the facility and determining the level of acceptable risk for the facility. It is expected that most recommendations will apply to all HVDC, SVC/SVG, and VFT facilities.

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Wed Apr 03 11:38:52 EDT 2019

Committee Statement

Committee Statement: Correcting reference.

Response Message: SR-19-NFPA 850-2019

**Second Revision No. 20-NFPA 850-2019 [Section No. 18.4.1]****18.4.1**

~~Section 18.4~~ This section identifies fire hazards that are associated with the operation of HVDC and AC converter stations, SVC/SVG facilities, and VFTs. Conditions that could cause a fire in high-voltage equipment include the following:

- (1) Loose electrical connections
- (2) Electrical insulation or resistance breakdowns
- (3) Overheated components
- (4) Water leakage or intrusion (e.g., cooling system malfunction, roof leak)
- (5) Foreign objects (e.g., tools, metal scrap, rubbish, vermin)

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Wed Apr 03 14:48:19 EDT 2019

Committee Statement

Committee Statement: Correcting reference.

Response Message: SR-20-NFPA 850-2019

**Second Revision No. 1-NFPA 850-2019 [Section No. A.6.1.4.2(9)]****A.6.1.4.2(9)**

Oil-filled transformer explosions and fires can be prevented in some cases by the installation of a passive mechanical system designed to depressurize the transformer a few milliseconds after the occurrence of an electrical fault. An example is provided in D.2.14. This fast depressurization can be achieved by a quick oil evacuation triggered by the dynamic transient pressure peak generated by the short circuit. The protection technology activates within milliseconds before static pressure increases, therefore preventing transformer explosion and subsequent fire. However, because these devices do not eliminate a fire potential resulting from all forms of transformer failure (e.g., transformer bushing failure), they should be considered as a possible supplement to passive protection features such as physical barriers or spatial separation, not as an alternative to these features. The systems can include outflow devices that are located directly on the high-risk areas of the bushing turrets and oil-bushing cable boxes.

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Tue Apr 02 15:19:30 EDT 2019

Committee Statement

Committee Dynamic pressure is a vague terminology. Replacing it with the term "transient" would help the **Statement:** reader understand and interpret the standard better.

Response SR-1-NFPA 850-2019

Message:

Public Comment No. 2-NFPA 850-2018 [Section No. A.6.1.4.2(9)]

**Second Revision No. 37-NFPA 850-2019 [Section No. A.9.6.1.1]****A.10.3.5.1**

For hydrogen storage systems, see NFPA 2.

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Tue Apr 16 10:49:58 EDT 2019

Committee Statement

Committee Annex material moved from Chapter 9 to follow the source reference material as part of the follow-
Statement: on reorganization effort that combines Steam Turbine and Generator information from Chapter 9 into Chapter 10. This reorganization is in the spirit of the First Revision 12 effort.

Response SR-37-NFPA 850-2019

Message:

[Public Comment No. 39-NFPA 850-2018 \[Section No. A.9.6.1.1\]](#)

**Second Revision No. 38-NFPA 850-2019 [Section No. A.9.6.2.1]****A.10.3.1.4.2**

To avoid water application to hot parts or other water sensitive areas and to provide adequate coverage, designs that incorporate items such as fusible element operated directional spray nozzles can be necessary.

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Tue Apr 16 10:50:11 EDT 2019

Committee Statement

Committee Annex material moved from Chapter 9 to follow the source reference material as part of the follow-
Statement: on reorganization effort that combines Steam Turbine and Generator information from Chapter 9 into Chapter 10. This reorganization is in the spirit of the First Revision 12 effort.

Response SR-38-NFPA 850-2019

Message:

[Public Comment No. 28-NFPA 850-2018 \[Section No. A.9.6.2.1\]](#)

**Second Revision No. 39-NFPA 850-2019 [Section No. A.9.6.2.3]****A.10.3.1.4.4**

Above the operating floor, ceiling level sprinkler systems might not be effective to protect floor level equipment and components from oil fires because of the high ceilings [typically in excess of 40 ft (12 m)].

A spray fire can blow past conventional automatic sprinkler protection without operating the system and can expose structural steel or critical components of the turbine generator. The concern is that fire exposure to the roof for the rundown time of the turbine could bring down building steel and result in damage to long lead time equipment critical to operation of the turbine or that the fire could directly expose critical equipment such as the generator. Where possible, one of the following protection measures should be used:

- (1) *Enclosure of the hazard.* An example would be location within a room of noncombustible construction protected with automatic sprinkler protection.
- (2) *Use of a barrier.* A metal barrier could be installed between the hazard and critical equipment or the roof of the building with automatic sprinklers installed under the barrier.
- (3) *Water spray protection.* Tests have shown that deluge sprinklers over the hazard can reduce the size of an oil spray fire. The tests were conducted with pendant sprinklers spaced 5 ft × 5 ft (1.5 m × 1.5 m) apart, with an orifice coefficient of K-8.0 (115) and an end head pressure of 50 psi (3.9 bar) located 6 ft (1.8 m) over the hazard. The system should be automatically activated by a listed line type heat detection or flame detection system.

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Tue Apr 16 10:50:23 EDT 2019

Committee Statement

Committee Annex material moved from Chapter 9 to follow the source reference material as part of the follow-
Statement: on reorganization effort that combines Steam Turbine and Generator information from Chapter 9 into Chapter 10. This reorganization is in the spirit of the First Revision 12 effort.

Response SR-39-NFPA 850-2019

Message:

Public Comment No. 29-NFPA 850-2018 [Section No. A.9.6.2.3]

**Second Revision No. 40-NFPA 850-2019 [Section No. A.9.6.2.4]****A.10.3.1.4.5**

Protein and aqueous film-forming foams (AFFF) are effective in control of flammable liquid pool fires in high bay buildings. FM Global conducted tests for the Air Force at the Test Campus in 1975. Flammable liquid pool fires 900 ft² (83.6 m²) in area were used. Foam was applied from nozzles at ceiling level 60 ft (18.3 m) above the floor. Foam reduced the fire area by 90 percent less than 5 minutes after application started. It is effective on high flashpoint liquid fires such as mineral oil. Tests have also been conducted using foam for the protection of chemical process structures. The tests involved a three-dimensional spill of flammable liquid from a process vessel 20 ft (6.1 m) above the floor onto grade level. The process structure was 40 ft (12.2 m) high. Foam protection was provided at each floor elevation. Foam limited the size of the pool fire but had no effect on the three-dimensional spill fire.

Micelle-encapsulating agents can enhance open head water spray systems for pool fires. Research has been conducted for use of this agent on some hydrocarbon pool fires, although turbine lubricating oil has not been tested. In addition, testing has not been performed for three-dimensional fire scenarios that can occur during a turbine lubricating oil spray fire. See A.9.5.2.6 for additional information on micelle-encapsulating agents.

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Tue Apr 16 10:51:56 EDT 2019

Committee Statement

Committee Statement: Annex material moved from Chapter 9 to follow the source reference material as part of the follow-up reorganization effort that combines Steam Turbine and Generator information from Chapter 9 into Chapter 10. This reorganization is in the spirit of the First Revision 12 effort.

Response SR-40-NFPA 850-2019

Message:

[Public Comment No. 30-NFPA 850-2018 \[Section No. A.9.6.2.4\]](#)



Second Revision No. 41-NFPA 850-2019 [Section No. A.9.6.2.6]

A.10.3.3.1

Additional information concerning turbine-generator fire protection can be found in EPRI Research Project 1843-2 report, *Turbine Generator Fire Protection by Sprinkler System*.

In February 1997 the National Institute of Standards and Technology published NIST Report Technical Note 1423, "Analysis of High Bay Hanger Hanger Facilities for Fire Detector Sensitivity and Placement." This report provides design recommendations for sprinkler and detection systems (protecting fuel pool fires) at those facilities, which can provide some design guidance if sprinkler systems are installed at the ceiling level of the turbine building.

However, turbine building hazards include pool fires and three-dimensional and spray fires. Without further testing, such systems should not be considered to provide equivalent protection to the turbine building systems recommended in the body of NFPA 850. If used in addition to those recommended systems, a properly designed ceiling level sprinkler system can provide additional protection for the turbine building roof if exposure to a large fire on the operating floor is a concern.

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Tue Apr 16 10:52:12 EDT 2019

Committee Statement

Committee Annex material moved from Chapter 9 to follow the source reference material as part of the follow-
Statement: on reorganization effort that combines Steam Turbine and Generator information from Chapter 9 into Chapter 10. This reorganization is in the spirit of the First Revision 12 effort.

Response SR-41-NFPA 850-2019

Message:

[Public Comment No. 35-NFPA 850-2018 \[Section No. A.9.6.2.6\]](#)

**Second Revision No. 42-NFPA 850-2019 [Section No. A.9.6.2.6.1]****A.10.3.3.1.1**

Automatically actuated systems have proven to actuate properly under fire conditions and are not prone to spurious actuation. If a manually operated water system is installed, consideration should be given to a supplemental automatic gaseous fire extinguishing system.

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Tue Apr 16 10:52:48 EDT 2019

Committee Statement

Committee Annex material moved from Chapter 9 to follow the source reference material as part of the follow-
Statement: on reorganization effort that combines Steam Turbine and Generator information from Chapter 9 into Chapter 10. This reorganization is in the spirit of the First Revision 12 effort.

Response SR-42-NFPA 850-2019

Message:

[Public Comment No. 36-NFPA 850-2018 \[Section No. A.9.6.2.6.1\]](#)

**Second Revision No. 43-NFPA 850-2019 [Section No. A.9.6.2.6.3]****A.10.3.3.1.3**

The 2000 edition of NFPA 850 allowed manual operation of bearing protection systems. In most incidents involving bearing oil releases this would be adequate. In some types of release, such as seal oil failures, that might not allow the operator time to activate the system. There are some turbine buildings where the control room is not located in the turbine building, which would also delay response.

If turbine-generator bearings are protected with a manually operated sprinkler system, the following should be provided:

- (1) Manual activation should be from the control room or a readily accessible location not exposing the operator to the fire condition. Staffing of plant should be sufficient to promptly handle this function as well as other responsibilities during an emergency of this nature.
- (2) Automatic fire detection should be provided over the area of each bearing and within the skirting of the turbine where a potential for oil to pool can alert operators to a fire condition.
- (3) Documented procedures should be in place with authorized approval given to operators to activate the system if necessary in a fire condition.
- (4) Periodic training should be given to operators regarding the need for prompt operation of the system.

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Tue Apr 16 10:52:59 EDT 2019

Committee Statement

Committee Annex material moved from Chapter 9 to follow the source reference material as part of the follow-
Statement: on reorganization effort that combines Steam Turbine and Generator information from Chapter 9 into Chapter 10. This reorganization is in the spirit of the First Revision 12 effort.

Response SR-43-NFPA 850-2019

Message:

Public Comment No. 37-NFPA 850-2018 [Section No. A.9.6.2.6.3]

**Second Revision No. 44-NFPA 850-2019 [Section No. A.9.8.1]****A.10.3.1.5.1**

There is limited information available detailing industry experience with fire-resistant fluids as turbine lubrication oils or in seal oil systems. The use of fire-resistant fluids in hydraulic systems is common in the utility industry. Literature is available documenting use of these fluids in Europe. Information detailing operational experience using fire-resistant fluids on lubrication oil systems on turbine-generators in North America is limited.

Utilizing a listed fire-resistant turbine lubricating oil potentially reduces the hazard associated with the lubricating oil system, but the remaining hazards still need to be addressed in determining the appropriate suppression systems and design densities needed in these areas (i.e., grouped cables and other mineral oil-based lubricating systems).

Given the fact that fire-resistant fluid still has the ability to burn, care should be exercised in selecting the fluid. When selecting the fluid, consideration should be given to the fluid's heat release rate, fire point, and ability to sustain a spray or cascading fire once the ignition source is removed. The autoignition temperature of the fluid used should be sufficient to minimize the potential for a fire based on common ignition and heat sources located in the turbine generator area.

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Tue Apr 16 10:53:13 EDT 2019

Committee Statement

Committee Statement: Annex material moved from Chapter 9 to follow the source reference material as part of the follow-up reorganization effort that combines Steam Turbine and Generator information from Chapter 9 into Chapter 10. This reorganization is in the spirit of the First Revision 12 effort.

Response: SR-44-NFPA 850-2019

Message:

[Public Comment No. 32-NFPA 850-2018 \[Section No. A.9.8.1\]](#)

**Second Revision No. 45-NFPA 850-2019 [Section No. A.9.8.6]****A.10.3.1.4.1**

On some turbine-generators employing the guard pipe principle, the guard piping arrangement terminates under the machine housing where feed and return piping run to pairs of bearings. Such locations are vulnerable to breakage with attendant release of oil in the event of excessive machine vibration and should be protected.

Lubricating oil system designs should reflect a design objective to minimize the amount of oil needed and the amount of piping and associated components necessary.

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Tue Apr 16 10:53:24 EDT 2019

Committee Statement

Committee Annex material moved from Chapter 9 to follow the source reference material as part of the follow-
Statement: on reorganization effort that combines Steam Turbine and Generator information from Chapter 9 into Chapter 10. This reorganization is in the spirit of the First Revision 12 effort.

Response SR-45-NFPA 850-2019

Message:

[Public Comment No. 40-NFPA 850-2018 \[Section No. A.9.8.6\]](#)

**Second Revision No. 46-NFPA 850-2019 [Section No. A.9.8.9.1]****A.10.3.1.5.8.1**

If the lubricating oil reservoir is elevated, sprinkler protection should be extended to protect the area beneath the reservoir.

If the lubricating oil reservoirs and handling equipment are located on the turbine operating floor and not enclosed in a separate fire area, then all areas subject to oil flow or oil accumulation should be protected by an automatic sprinkler or deluge system.

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Tue Apr 16 10:53:35 EDT 2019

Committee Statement

Committee Annex material moved from Chapter 9 to follow the source reference material as part of the follow-
Statement: on reorganization effort that combines Steam Turbine and Generator information from Chapter 9 into Chapter 10. This reorganization is in the spirit of the First Revision 12 effort.

Response SR-46-NFPA 850-2019

Message:

[Public Comment No. 33-NFPA 850-2018 \[Section No. A.9.8.9.1\]](#)

**Second Revision No. 47-NFPA 850-2019 [Section No. A.10.1.3]****A.10.1.4**

Although it is intended that these recommendations are to be applied to fixed, non-residential ICEs only, larger portable units (often trailer mounted) can include fire detection and suppression systems to limit damage from fire. The recommendations of this chapter can be used as guidance for these units as well.

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Tue Apr 16 10:53:49 EDT 2019

Committee Statement

Committee Annex material changed as part of the follow-on reorganization effort that combines Steam

Statement: Turbine and Generator information from Chapter 9 into Chapter 10 which moved the reference material location. This reorganization is in the spirit of the First Revision 12 effort.

Response SR-47-NFPA 850-2019

Message:

[Public Comment No. 26-NFPA 850-2018 \[Section No. A.10.1.3\]](#)



Second Revision No. 48-NFPA 850-2019 [Section No. A.10.3.2.1]

A.10.3.2.3.1

When a flameout occurs, fuel valves should close as rapidly as possible to preclude the accumulation of unburned fuel in the combustion chamber. Loss experience documents that fires or explosions have occurred in systems where the fuel isolation was not achieved within 3 seconds.

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Tue Apr 16 10:54:04 EDT 2019

Committee Statement

Committee Complimentary change to Public Comment 13 that modified the location of the primary text.

Statement: This is a follow-on reorganization in the spirit of the First Revision 12 effort.

Response SR-48-NFPA 850-2019

Message:

[Public Comment No. 14-NFPA 850-2018 \[Section No. A.10.3.2.1\]](#)

**Second Revision No. 49-NFPA 850-2019 [Section No. A.10.3.3.2]****A.10.3.1.4.7**

Internal combustion engines do not normally have any hydraulic systems.

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Tue Apr 16 10:54:20 EDT 2019

Committee Statement

Committee Annex material location changed as part of the follow-on reorganization effort that combines
Statement: Steam Turbine and Generator information from Chapter 9 into Chapter 10 which moved the
reference material location. This reorganization is in the spirit of the First Revision 12 effort.

Response SR-49-NFPA 850-2019

Message:

[Public Comment No. 31-NFPA 850-2018 \[Section No. A.10.3.3.2\]](#)



Second Revision No. 50-NFPA 850-2019 [Section No. A.10.3.5.1]

A.10.3.1.6.1

The use of less flammable filter or media in the CT air inlet is recommended where not constrained by other engineering needs (such as pressure loss across the elements) and cost considerations associated with UL 900 Class I (do not contribute fuel) versus Class II fire-resistant elements.

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Tue Apr 16 10:54:32 EDT 2019

Committee Statement

Committee Annex material location changed as part of the follow-on reorganization effort that combines

Statement: Steam Turbine and Generator information from Chapter 9 into Chapter 10 which moved the reference material location. This reorganization is in the spirit of the First Revision 12 effort.

Response SR-50-NFPA 850-2019

Message:

[Public Comment No. 34-NFPA 850-2018 \[Section No. A.10.3.5.1\]](#)

**Second Revision No. 51-NFPA 850-2019 [Section No. A.10.3.6.3]****A.10.3.5.10**

ICE-powered generators are normally provided with an open drip-proof enclosure. Shielding might be needed when a water-based fire protection system is used.

Submitter Information Verification

Committee: ECG-AAA

Submittal Date: Tue Apr 16 10:54:45 EDT 2019

Committee Statement

Committee Annex material location changed as part of the follow-on reorganization effort that combines
Statement: Steam Turbine and Generator information from Chapter 9 into Chapter 10 which moved the
reference material location. This reorganization is in the spirit of the First Revision 12 effort.

Response SR-51-NFPA 850-2019

Message:

[Public Comment No. 38-NFPA 850-2018 \[Section No. A.10.3.6.3\]](#)