



TECHNICAL BULLETIN CEA 4001-TB-001-Recycling Plants

CEA 4001 - Sprinkler systems - Planning and installation

Protection concepts for Waste Recycling plants

September 2022

This technical bulletin is intended to be used in combination with CEA 4001. It supplements the CEA 4001 rule by providing specific requirement for waste recycling plants, waste sorting plants (Material Recovery Facility) with or without energy recovery.

Typical processes in a waste recycling plant that are covered in this technical bulletin are indoor receiving area, refuse/waste holding pit, shredder, sorting area and conveyors.

Unless specified differently in this technical bulletin, all the provisions of CEA 4001 shall be fulfilled.

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1. Scope

Typical processes in a waste recycling plant that are covered in this technical bulletin are:

- **Indoor receiving area or Tipping floor:** area where the waste is delivered before being processed.



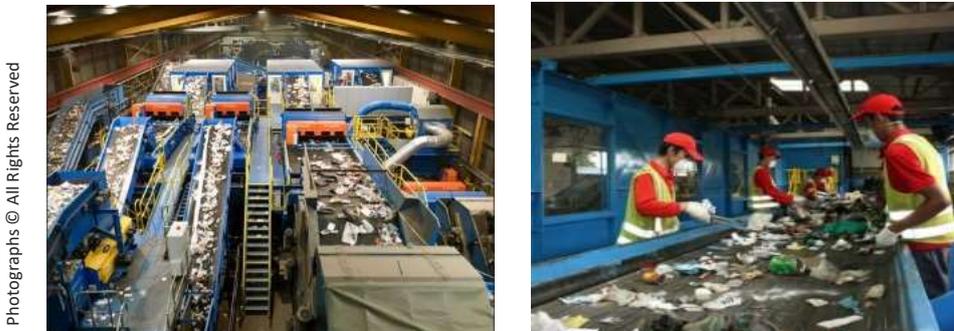
- **Refuse / waste holding pit:** usually deep pit equipped with crane.



- **Shredder:** where the wastes are crushed.



- **Sorting area**



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- **Conveyor:** transfer of wastes between the different phases of treatment.



2. Indoor receiving area and waste holding pit

2.1 Sprinkler and deluge protection

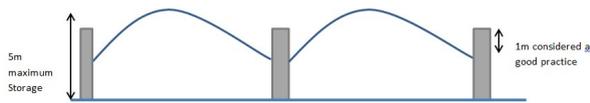


Figure F 2.1a: typical separation between waste piles.



Figure F 2.1b: typical separation between bale storage.

Table T 2.1a: sprinkler and deluge (waterspray) design for indoor receiving area or tipping floor

Building / activity	Activity	Type of protection	Maximum Ceiling / roof height in m	Classification	Storage type / maximum permitted storage	Required sprinkler protection			Comment
						Type of spk	Density in mm/min	Area of operation in m ² (See note 3)	
Indoor receiving area or Tipping floor	Waste is discharged directly from truck on the ground (balled or bulk storage)	Sprinkler (Dry unless no risk of frost)	9	Mixed material considered as HHS3 (see note 1). Storage is considered as ST1	5m for bulk storage and 4m for bale storage. Block storage area shall be limited to 300m ² and separated by physical barriers such as brick walls, concrete blocks, concrete walls	Spray sprinkler K160 quick or standard response T° 68°C or 93°C	17,5	325	Waste is usually discharged directly from truck on the ground (balled or bulk storage) Flammable liquids wastes and hazardous wastes are not covered in this table.
		Sprinkler (Dry unless no risk of frost)	12				20	375	
		Sprinkler (Dry unless no risk of frost)	13,7				25	375	
		Deluge installation triggered by adequate and reliable fire alarm system (particular attention to be paid to dust, height of building, air movements and maintenance) see note 1	All				Spray nozzle K160	15	2 adjacent deluge zones to be calculated simultaneously
	Ceiling sprinkler (Dry unless no risk of frost), in combination with automatic monitors	All		Spray sprinkler K115 standard response T° 68°C or 93°C	10	325	Applicable ceiling protection in combination with monitor protection		

Note 1: detection system shall be chosen considering the environment of the waste recycling plant. Experience has shown that pilot line (sprinkler), flame detectors (triple IR), ASD, thermal cameras with adequate software or heat of rise detectors are more suitable to this environment than other type of smoke detectors.

Table T 2.1b: sprinkler and deluge (water spray) design for Refuse / waste holding pit

Building / activity	Activity	Type of protection	Maximum ceiling / roof height in m	Classification	Storage type / maximum permitted storage	Required sprinkler protection			Comment
						Type of spk	Density in mm/min	Area of operation in m ²	
Refuse / waste holding pit	<p>The refuse/waste pit is Typically enclosed on all 4 sides up to the charging level. A feed crane is usually used to transfer the waste to charging level to feed chute or conveyor</p> <p>Typically the area of the pit can vary from 200m² to 1 000m²</p>	Sprinkler (Dry unless no risk of frost)	9 m	Mixed material considered as HHS3 (see note 1). Storage is considered as ST1	5m (depth of the pit)	Spray sprinkler K160 standard response T° 68°C or 93°C	17,5	325	
		Deluge	All		10m (depth of the pit)	Spray nozzle K160	12,5	1 deluge installation that covers the entire surface of the pit. If > 500m ² , it is permitted to divide the area in 3 deluge zones and consider 2 adjacent deluge zones in simultaneous operation	
		Ceiling sprinkler (Dry unless no risk of frost) in combination with monitors	All			Spray sprinkler K115 standard response T° 68°C or 93°C	10	325	Applicable ceiling protection in combination with monitor protection
Control room window	Windows Located above the pit to manipulate the crane	Deluge installation	NA	NA	NA	Window type nozzle	10	Surface of window	
<p>Note 1: Where significant (above 30% - refer to Annex B2 of CEA 4001) amount of plastic is present, one of the following additional measure shall be taken:</p> <ul style="list-style-type: none"> - e.g- foam additive applied to ceiling protection). - Increase design density by 25% without revising the area of operation. 									

2.2 Automatic monitor systems

Where the waste storage is protected by dedicated automatic monitor system, the sprinkler protection of building can be reduced to 10mm/min over 325 m² (dry system) independent of building height.

The automatic monitor system shall be designed as follow:

- Activation of monitors shall be based on a fire alarm system accepted by the authorities;
- Where detection system is out of the scope of EN 54, such as thermal camera, particular attention shall be paid to:
 - permanent power supply,
 - sensitivity of camera (resolution, number of camera/surface...),
 - automatic cleaning system for camera lens,
 - adequate fire recognition software (false alarm, confirmation...),
 - maintenance and cleaning,
 - commissioning and testing,
- No less than 2 monitors shall be installed, although it is not required that any point can be reached by 2 monitors;
- Automatic oscillating monitors are required:
 - automatic oscillating system shall be either mechanical or electrical, providing the energy supply has a backup with emergency electrical supply,
 - manual operation shall be possible and be conducted from a safe area with view on the fire area;
- Water supply shall be sized to simultaneously supply sprinkler system and 2 monitors. Each monitor delivering a flow corresponding to 10mm/min over 150 m² or area covered by the monitor in fire condition whichever is greater;
- Where significant (above 30 % - refer to Annex B2 of CEA 4001) amount of plastic is present, one of the following additional measure shall be taken:
 - e.g. foam additive applied to monitors (not required in this case for ceiling protection),
 - increase monitor water design density to 12,5mm/min without revising the area of operation.

2.3 Cranes

Sprinkler ceiling protection is also designed to protect the crane with Grab-hook and its associated cables, nevertheless

they could be exposed to fire and as a consequence, consideration shall be given to additional mechanical exposure protection.

The cranes should automatically be parked in a safe position where they don't obstruct the extinguishing system.

3. Protection, shredders, conveyors, other waste treatment processes

3.1 Sprinkler and deluge protection

Table T 3.1a: sprinkler protection design for shredder, conveyors and other waste treatment processes

Building / activity	Activity	Type of protection	Maximum Ceiling / roof height in m	Classification	Storage type / maximum permitted storage	Required sprinkler / deluge protection			Comment
						Type of spk	Density in mm/min	Area of operation in m ²	
Shredder	Shredder is usually enclosed in tunnels or fitted with protective cover	Deluge installation triggered by adequate and reliable fire detection system or multiple jet control (maximum 6 nozzles)	NA	Special hazard	NA	Spray nozzle (deluge) K80 minimum	7,5	Top surface of shredder	<p>Provide automatic triggering system that shall stop the shredder system upon activation of deluge installation</p> <p>Particular attention to be paid to dust, height of building, air movements and maintenance (see note 2)</p> <p>Deluge system shall be equipped with a manual bypass that can be activated from a safe area in case of fire.</p>
Conveyors	Conveyors are usually enclosed in tunnels or fitted with protective cover	Deluge	NA	Special hazard	NA	Spray sprinkler K80 quick response T° 68°C or according to maximum ambient temperature) spray nozzle (deluge)	7,5	Top surface of conveyor (top belt)	<p>Provide automatic triggering system that shall stop the conveyors (upstream and downstream) upon activation of deluge installation</p> <p>Deluge : automatic and manual activation system. Attention shall be paid to angle of nozzle or discharge pattern to ensure that the actual delivery density on the conveyor is no less than 7,5 mm/min. Additional sprinkler protection under conveyors shall be considered each time they create an obstruction to discharge pattern as defined in clause 3.2 below.</p>
Other Waste treatment processes	Classical Waste treatment processes such as sorting, waste compactors...	Dry unless no risk of frost	See CEA 4001 - annex K10	HHP1	Limited to ongoing storage	Protect as per CEA 4001 for HHP1 risk.	7,5	325	Particular attention shall be paid to protection under platforms, noise protection and other type of obstructions.

Note 1: according to maximum ambient temperature
Note 2: detection system shall be chosen considering the environment of the waste recycling plant. Experience has shown that pilot line (sprinkler), flame detectors (triple IR), ASD, thermal cameras with adequate software or heat of rise detectors are more suitable to this environment than other type of smoke detectors.

3.2 Rule for protection under obstruction

11.4.9 of CEA 4001 defines the general rules for obstructions and in addition to these rules, the following shall apply where two or more obstructions are next to each other:

A sprinkler protection under the group of obstruction shall be provided where the free space between 2 adjacent obstructions is less than 70% of the width of the largest obstruction, even if one of the obstruction is smaller than the limit given in 11.4.9 of CEA 4001.

This applies even if the obstructions are not on the same horizontal level.

- 11.4.9 Sprinklers shall be provided under platforms, ducts, heating panels, galleries, walkways etc. which are:
- a) rectangular, more than 0.8 m wide and less than 0.15 m from adjacent walls or partitions;
 - b) rectangular and more than 1.0 m wide;
 - c) circular, more than 1.0 m in diameter and less than 0.15 m from adjacent walls or partitions;
 - d) circular and more than 1.2 m in diameter.



Figure F 3.2a: typical conveyor layout in waste treatment plant that requires protection under conveyors and platforms as well as protection under covered area, in addition to the ceiling protection.



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Figure F 3.2b: typical conveyor layout in waste treatment plant with 2 adjacent obstructions located at different horizontal level, that requires protection underneath the conveyor