Fire Safety Guideline
Rubber Tyre Storage

MFS Fire Safety Guideline for Rubber Tyre Storage

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GLOSSARY

AS	Australian Standard
BCA	Building Code of Australia
BES	MFS Built Environment Section
CCTV	closed-circuit television
EPA	Environmental Protection Authority
FRL	fire resistance level (refer Definitions)
MFS	South Australian Metropolitan Fire Service
NCC	National Construction Code

REFERENCED DOCUMENTS

The following documents are referred to in this Guideline:

AS 1851	Australian Standard 1851 – *Maintenance of fire protection systems and equipment*
AS 2118.1	Australian Standard 2118 – *Automatic fire sprinkler systems, Part 1: General systems*
AS 2118.2	Australian Standard 2118 – *Automatic fire sprinkler systems, Part 2: Drencher systems*
AS 2419.1	Australian Standard 2419 – *Fire hydrant installations, Part 1: System design, installation and commissioning*
AS 2441	Australian Standard 2441 – *Installation of fire hose reels*
FM 8-3	Factory Mutual Global, Data Sheet 8-3 – *Rubber tire storage*
NFPA 101	National Fire Protection Association 101 – *Life Safety Code*

Australian Building Codes Board, *National Construction Code, Volume One, Building Code of Australia,* (Edition applicable at the time of Development Approval), Australian Building Codes Board, Canberra.

Environment Protection (Air Quality) Policy 2016 (SA).

Environmental Protection Authority 2001, *Waste tyres – EPA guidelines*, EPA, Adelaide.

Environmental Protection Authority 2003, *Burning in the open – EPA guidelines*, EPA, Adelaide.

Federal Emergency Management Agency, *Report on tire fires*, FEMA, Maryland, United States of America.

Minister for Planning and Local Government, Ministerial Building Standard MBS 002 *Maintaining the performance of essential safety provisions*, Government of South Australia.

Rubber Manufacturers Association 1993, *Guidelines for the prevention and management of scrap tire fires*, Scrap Tire Management Council, RMA, United States of America.

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South Australian Fire Authorities, *Equipment Specification 001, Storz couplings, adaptors & reducers*, South Australian Metropolitan Fire Service and South Australian Country Fire Service.

Work Health and Safety Regulations 2012 (SA).

DEFINITIONS

Fire resistance levels (FRL) has the meaning as defined in the National Construction Code.

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1 PURPOSE

This Guideline has been developed to assist businesses that store tyres on site (indoors and outdoors).

Tyre fires present significant challenges in terms of firefighting and environmental and community impact. Each of these areas must be addressed when considering tyre storage on site.

2 GENERAL

This Guideline is applicable to sites storing more than 100 individual tyres or 10 tonnes of tyre product (whichever is the lesser).

Note that the South Australian Environmental Protection Agency (EPA) requires that premises handling in excess of 500 tyres or five (5) tonnes of waste tyres (or tyre pieces) per annum require licencing (environmental authorisation) (EPA, 2001).

Where the requirements of this Guidelines do not fit site-specific circumstances, advice should be sought from the South Australian Metropolitan Fire Service (MFS) Built Environment Section (BES), Community Safety and Resilience Department, phone (08) 8204 3611.

2.1 Overview of Tyre Fires

Tyre fires produce very high heat outputs and produce large volumes of thick, black, toxic smoke. Tyre piles are very difficult to penetrate with firefighting water and/or foam. The nature and behaviour of burning tyres limits the effectiveness of direct firefighting operations when compared to most other combustible goods.

Large quantities of water are required to extinguish tyre fires due to many factors, including the rubber tyre surface repelling water and the burning inner surface of a tyre being shielded from the water spray. A significant portion of the water applied provides only a limited cooling effect and does not wet the ignited surface of the tyre casing.

Type piles provide an open, porous and well-vented fire mass providing a fast rate of fire growth that also extends downwards into the pile. Over time, the pile will deform and compress, with a risk of flaming tyres rolling off the pile and spreading the fire to surrounding exposures. In this compression phase, the effects of pyrolysis include the rendering of rubber into oil, creating pool fire burning characteristics.

The environmental impacts are very significant and include airborne pollution, soil contamination and large volumes of contaminated run-off water.

As a result, emphasis must be placed upon:

1. Adequate separation distance from site boundaries and buildings to restrict the spread of fire,
2. Limiting pile sizes with access between piles to restrict fire size and facilitate effective firefighting operations,
3. Maintaining access between piles to facilitate effective firefighting operations
4. Effective fire prevention practices to minimise the risk of a fire outbreak,
5. Protection of the environment from damage in case of a fire.

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2.2 Site Selection and Access

Select a level site with impervious soil, remote from surface watercourses and human habitation. Avoid sites with streams, rivers or dams on the property or close-by.

Ensure the site is large enough for the business operation, including allowances for future expansion. Take into account the limits placed on pile sizes and the required separation distances from buildings, boundaries and individual piles.

Each facility should have two (2) separate access points that shall provide not less than four (4) metres clearance to allow access for larger fire appliances. Site access roads should be of hardstanding, all-weather material and designed for fire appliance weight limits.

For major sites, specific advice should be sought from the BES.

3 OUTDOOR STORAGE SITES

3.1 General

Outdoor tyre storage must be arranged as piles of tyres or contained in metal cages, in rows not exceeding the dimensions set out below.

The separation distance of tyre storage from allotment boundaries is considered to be a critical factor in reducing the likelihood of fire spread between properties.

The intent of these requirements is to limit fire size and restrict spread, thus reducing the potential impact of a fire.

3.2 Piles Sizes

Storage heights should be determined by the stability of the pile and must not exceed three (3) metres high (as per NFPA 101) due to the potential for instability.

It is considered that “on-flat” or “laced” tyre storage will be employed for all outdoor tyre piles.

Tyre piles shall be arranged in “thin” rows to assist firefighting operations and shall be no more than 6 metres wide. Tyre pile rows shall be no more than 20 metres in length to limit the total volume of tyres contained in a pile to a maximum of 360m^3.

3.3 Separation Distances

3.3.1 Between Piles

Tyre piles shall be arranged to provide suitable aisle separation in order to reduce the risk of fire spread between piles and afford safe travel of fire appliances through the site.

These aisles must remain clear at all times, be free from combustible materials and tyre scraps and shall have a minimum width of 20 metres.

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3.3.2 Allotment Boundaries

Tyre piles shall be set-back from allotment boundaries as follows:-

1. Where the pile narrow ends face the boundary – 12 metres; and
2. Where the pile long sides face the boundary – 20 metres.

Where the allotment boundary adjoins a public road affording perimeter fire appliance access, the total applicable set-back distance may include the far boundary of the roadway. However, in this instance, the set-back off the perimeter fence line should be not less than three (3) metres.

Where the allotment boundary is of fire resisting construction to a minimum height of three (3) metres (above the finished ground level of the site) and has a minimum fire resistance level (FRL) of -/60/60, the boundary set-back distance may be reduced to a minimum of 6 metres.

3.3.3 Buildings On Site

Separation distances of tyre piles from buildings on the same allotment shall be 12 or 20 metres (as applicable from above) where the building's exposed façade is not protected.

Where the building's exposed façade is protected with an automatic fire sprinkler system in accordance with AS 2118.1 or a wall wetting sprinkler system in accordance with AS 2118.2, the separation distance may be reduced to 10 metres.

4 FIRE HYDRANTS FOR OUTDOOR STORAGE FACILITIES

A fire hydrant system complying with AS 2419.1 shall be installed to provide firefighting water supplies to tyre storage facilities.

Fire hydrant system design shall be in accordance with AS2419.1 Clause 3.3 for Open Yard Protection, with the exception that the minimum number of hydrants flowing simultaneously shall be as follows:

4.1 Small Storage Facilities

Notwithstanding the requirements of AS 2419.1, where the total storage volume on site is less than or equal to 750m^3 (up to two piles as defined in Section 2.2 above), the facility shall have a hydrant system capable of providing simultaneous hydrant flows of two (2) outlets (10 L/s each).

4.2 Large Storage Facilities

Where the total tyre storage volume on site is greater than 750m^3, the facility shall have a hydrant system capable of providing minimum simultaneous hydrant flows of three (3) outlets (10 L/s each).

Where the facility is of a size that AS 2419.1 requires additional heads to flow (with respect to total yard areas), then the requirements of AS 2419.1 takes precedence.

5 INDOOR STORAGE FACILITIES

5.1 General

Tyre storage fires within an enclosed structure present very significant hazards to firefighters, due to the heat and excessive smoke being contained within the space.

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Under the Building Code of Australia (BCA), the MFS will require that Clauses E1.10 and E2.3 are reviewed and addressed appropriately.

It is considered that incorporation of the systems and recommendations outlined in Section 5 meet the above BCA Clauses.

5.2 Tyre storage systems and arrangement

Storage of tyres within premises shall be within open framed fixed or portable racking systems or palletised and shall be arranged to prevent tyres from becoming dislodged and falling/rolling from the storage system.

"On-flat" or laced tyre storage allows water penetration into the piles. "On-edge" storage is generally not supported by the MFS as the tight spacing and vertical alignment reduces water penetration between individual tyres and into the internal casing.

"On-edge" stored tyres shall be adequately restrained to prevent roll-away.

5.3 Classification of Occupancy Hazards

The MFS recommends that buildings of greater than 500m^2 floor area used as tyre storage facilities be provided with the following fixed fire suppression and/or smoke hazard management provisions in addition to any other fire and life safety measures required by the BCA.

5.3.1 Tyre Storage >10 tonnes or 1,000 tyres (whichever is the lesser)

Shall be provided with;

1. permanent natural ventilation as per BCA Table 2.2a; or
2. automatic smoke hazard management systems designed in accordance with BCA Specification E2.2b; or
3. automatic smoke and heat vents designed in accordance with BCA Specification E2.2c.

5.3.2 Tyre Storage >20 tonnes or 2,000 tyres (whichever is the lesser)

Shall be provided with;

1. automatic fire sprinkler protection in accordance with BCA E1.5; and

shall also be provided with;

2. automatic smoke hazard management systems designed in accordance with BCA Specification E2.2b; or
3. automatic smoke and heat vents designed in accordance with BCA Specification E2.2c.

5.4 Automatic Fire Sprinkler Protection Design Criteria

The MFS supports the design of automatic fire sprinkler protection in accordance with FM Global Data Sheet 8-3 and AS 2118.1.

5.5 Internal Steel Column Protection

The MFS recommends that internal steel columns be protected in accordance with NFPA 101 Clause 34.8.2.1 to reduce the likelihood of premature building collapse from the intense heat from a tyre fire.

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6 FIREFIGHTING WATER CONTAINMENT

6.1 General

This section is applicable to both indoor and outdoor tyre storage facilities.

Bund walls, sealed kerbing and blind sumps/catchment pits should be provided to contain water run-off from the site during firefighting activities.

The rate at which water can be applied to a fire is often limited by the rate at which the contaminated waste fire water run-off can be contained, treated and/or removed from site.

The proposed site containment systems shall also meet EPA SA licensing conditions.

6.2 Non-Sprinkler Protected Premises

The bunded capacity shall be designed to cater for a run-off of not less than 30 litres a second (fire hydrant flows) for 90 minutes, which equates to 162,000 litres (162kL).

6.3 Sprinkler Protected Premises

The bunded capacity shall be designed to cater for a run-off of not less than the combined volume of 20 litres a second (fire hydrant flows) for 90 minutes (108kL) AND the design sprinkler system flow rate for 20 minutes.

7 FIREFIGHTING EQUIPMENT

7.1 Fire Hydrant Systems

Refer Section 4 above for specific flow rate and design requirements for outdoor tyre storage facilities.

As noted in Section 5 above, indoor tyre storage shall be provided with fire hydrant systems in accordance with the requirements of the BCA.

Note that as of 2014, all new premises' on-site hydrant valves shall be Storz fittings in accordance with the *South Australian Fire Authorities Equipment Specification 001*, which is available online:
https://www.mfs.sa.gov.au/community/building-and-commercial-fire-safety/guidelines-and-information

Location of on-site hydrants, boosters and primary fire brigade access points should be presented to the BES for review during the design phase for new tyre storage facilities.

7.2 First Attack Firefighting Equipment

It is considered that effective first attack fire suppression may be achievable within the first five (5) minutes of a tyre fire, during its ignition and propagation phase (RMA, 1993). Adequate first attack firefighting equipment should be available for staff use.

Fire hose reels provided in accordance with AS 2441 that reach all parts of the site are considered necessary first attack firefighting equipment.

Consideration should be given to the provision of Class A foam fire hose reels (with nozzle compatibility) as this medium has been found to provide improved fire suppression performance in this early stage due to the wetting agent actions of the foam (FEMA, 1998).

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It is also recommended that all fuel-powered vehicles be fitted with a dry chemical powder extinguisher with a minimum rating of 4A:60B(E). Dry chemical powder extinguishers are considered to provide an effective initial suppression measure as the powder penetrates into the tyre pile void spaces and provides chemical suppression actions.

All fire protection equipment on the site must be maintained and regularly tested in accordance with Ministerial Building Standard MBS 002 and AS 1851 as applicable.

7.3 Staff Training

Optimum fire safety standards cannot be attained unless staff are conversant with basic fire prevention methods and the operational use of installed fire equipment.

Division 4, Regulation 43 of the *Work Health and Safety Regulations 2012* requires that staff be informed, trained and instructed in the implementation of emergency procedures.

8 SITE EMERGENCY PLAN

A responsible staff member should be appointed as Site Safety Officer to ensure that fire prevention standards are maintained on the site.

Prepare an emergency plan for the property (displayed in a prominent position), which includes:

1. Emergency service telephone numbers;
2. After hours contact telephone numbers for a minimum of three staff members;
3. Site evacuation procedures;
4. Control strategy for all fire-fighting water run-off; and
5. Tactical fire plan for the site showing:
    a. Locations of all fire hydrants, fire plugs, booster connections;
    b. Locations of all first aid firefighting equipment;
    c. Locations of all access points to the site;
    d. Locations of all drains; and
    e. Locations of all hazardous materials stored on the site.

9 FIRE PREVENTION REQUIREMENTS

9.1 Housekeeping

It is important that sound housekeeping practices are maintained across the entire tyre storage facility.

Vegetation and combustible rubbish must be routinely cleared and removed from the site.

Perimeter clearances between piles and site boundaries must be clear of vegetation to prevent fire spread to adjacent allotments.

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Any required combustibles must be adequately separated away from stored tyres. For example, empty wood pallets should be stored in a separate designated area, with clearances as specified in Section 3.3.

9.2 Site Security

The site should be fenced to ensure security and prevent unwanted persons entering the premises, particularly after hours. Additional security measures may be required including CCTV, perimeter lighting and proximity alarms.

9.3 Eliminate Potential Ignition Sources

Adequate fire safety precautions must be in place to eliminate unwanted fires, which should include:

1. All hot work activities, such as oxy cutting, welding and grinding, shall be controlled via a "Hot Works" permit system and appropriate safety measures employed, such as a fire spotter (with extinguisher/s).
2. Inspection of electrical equipment, machinery and vehicles on a regular basis in relation to potential fires and sparking.
3. Restriction of smoking to designated safe areas. "No Smoking" signs should be appropriately displayed.
4. No open fires, in accordance with EPA guidelines (EPA, 2003) and the *Environment Protection (Air Quality) Policy 2016*.
5. No storage of flammable or combustible liquids, hazardous waste, or other easily ignitable materials within 30 metres of any tyre storage.

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10 BIBLIOGRAPHY

Department of Communities and Local Government (CLG), *59/1994: Storage of rubber tyres*, CLG, London, United Kingdom.

Fire and Rescue New South Wales (FRNSW) 2009, *Policy No. 2: Guidelines for the bulk storage of rubber tyres*, Version 02, FRNSW Structural Fire Safety Unit, Greenacre, NSW Australia.

Metropolitan Fire and Emergency Services Board (MFB) 2014, *Guideline No: GL-02 – Outdoor storage of scrap tyres*, Version 1, MFB Fire Safety Policy Group, Burnley, Victoria, Australia.

Waste Authority Western Australia (WA), *Tyres legislation*, viewed April 2014, http://wasteauthority.wa.gov.au/publications/tyres-legislation.

Motor Trade Association of SA, *Environmental fact sheet – Waste tyres*, MTA SA, downloaded from: http://greenstampplus.com.au/downloads/GPG/SA/Fact Sheet - Waste tyres.pdf.

Motor Trade Association of ACT, *Standard 7 – Storage and disposal of waste tyres – Environmental guidance note*, downloaded from: http://www.mtaact.com.au/f.ashx.Government/Environmental/ Standard 7 – Storage and Disposal of Waste Tyres – Environmental Guidance Note.

Waste and Resources Action Programme (WRAP) 2006, *UK waste tyre management best practice: Handling of post-consumer tyres – Collection and storage*, Oxon, United Kingdom.

Viking Group Inc. 2006, *Technical Article – Protection of rubber tyre storage using open high challenge nozzle*, Viking Group Incorporated, United States.

Standards Australia 2004, *The storage and handling of flammable and combustible liquids*, AS 1940-2004, Standards Australia, NSW.

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