6 July 2026

Dear Industry Stakeholder

Request for Consultation and Feedback

Draft Fire Safety Guideline GL-53 – Data Centre Design Guidance

Fire Rescue Victoria (FRV) is pleased to release the draft **Fire Safety Guideline GL-53: Data Centre Design Guidance** for industry consultation.

The guideline outlines FRV's position on key fire safety design considerations relevant to the planning, design, construction and operation of data centres within the FRV Fire District. It reflects FRV's experience reviewing data centre developments, current industry practices, and insights from other fire authority jurisdictions.

FRV values industry input to ensure the guideline is practical, effective and aligned with current challenges and practices. We invite your organisation to review the attached draft and provide feedback on:

- Clarity and usability
- Practicality of the proposed recommendations
- Potential impacts on industry operations and compliance activities
- Areas where additional guidance or clarification may be beneficial.

Please submit written feedback to **BSR.Admin@frv.vic.gov.au** by **close of business, 28 August 2026**. Supporting information or examples may be included where relevant.

All submissions will be carefully considered in developing the final guideline. While not all suggestions may be adopted, stakeholder feedback will play an important role in informing the final document.

FRV appreciates your time and contribution to this consultation process.

For enquiries regarding the draft guideline or consultation process, please contact:

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Yours faithfully,

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Director Fire Safety

Data Centre Design Guideline

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Authorised by: Director, Fire Safety

1 PURPOSE

The purpose of this guideline is to inform industry, government agencies, and fire safety practitioners of the key fire safety design considerations that Fire Rescue Victoria (FRV) considers relevant in the planning, design, construction, and operation of Data Centres.

This guideline establishes FRV's requirements for fire safety systems, dangerous goods management, emergency preparedness, and stakeholder engagement.

It is intended to support designers, developer and Data Centre facility operators in meeting their obligations under relevant legislation and to enable early, effective collaboration with FRV.

This guideline should be read in conjunction with—

- FRV Guideline *GL-54 Fire Safety Study* [1];
- FRV Guideline *GL-55 Battery Energy Storage Systems* [2];
- WorkSafe Victoria *Land Use Planning: Data Centres Clarification* (March 2025) [3];
- Fire and Rescue NSW *Position Statement Summary: Lithium-ion Batteries and Diesel Generators in Data Centres* (June 2026) [4]; and
- EPA Victoria *Application Technical Information Requirements for Data Centres* (June 2026) [5].

2 SCOPE

This guideline applies to all Data Centre developments that are proposed to be situated within the FRV Fire District.

It provides guidance for—

- Designers, including fire safety engineers and risk engineers who prepare Fire Safety Studies (FSS), risk assessment reports or other performance-based briefs or fire engineering reports;
- Developers and facility operators managing dangerous goods, fire protection systems, and emergency planning; and
- Government agencies and planning authorities assessing planning permit applications involving Data Centre developments.

Specifically, this guideline applies to Data Centres that incorporate—

- Lithium-ion battery (LiB) systems, including Uninterruptible Power Supply (UPS) units and Battery Energy Storage Systems (BESS);
- Class 1 (C1) combustible liquids, principally diesel fuel for standby power generation;
- High-voltage electrical infrastructure including substations and transformers; and
- Other types of stored dangerous goods, as defined under the Dangerous Goods (Storage and Handling) Regulations 2022 (Vic) [6].

3 DEFINITIONS

The following definitions and abbreviations apply to this document:

Authority Having Jurisdiction (AHJ) – The statutory authority or regulator responsible for enforcing applicable dangerous goods legislation and compliance requirements.

Application for Written Advice (AWA) – A formal submission to FRV seeking written advice on fire protection system design.

Battery Energy Storage System (BESS) – A system that stores electrical energy using battery technology, typically at commercial or utility scale.

C1 Combustible Liquid – A combustible liquid with a flash point at or above 61°C, commonly diesel fuel used in standby generators.

Data Centre – A facility housing computer systems, servers, networking equipment, and associated infrastructure, including power and cooling systems.

Deterministic Analysis – The process of evaluating a specific scenario (e.g., worst-case fire) using fixed inputs to compare outcomes (e.g., heat release, toxic gas) against defined safety criteria.

Emergency Information Book (EIB) – A document providing emergency responders with critical hazard and safety information for a facility.

Emergency Information Container (EIC) – A designated, accessible container, typically identified as a red box, which is situated at the facility entrance and housing the EIB and other related documents.

Emergency Liaison Officer (ELO) – A facility representative who attends the site during an emergency incident to liaise with FRV.

Emergency Response Plan (ERP) – A documented plan outlining procedures for responding to emergencies at a facility.

Fire Safety Study (FSS) – A systematic analysis to identify and mitigate fire hazards, ensuring fire prevention, detection, and protection measures are adequate.

FRV Fire District – Has the same meaning as Section 4 of the *Fire Rescue Victoria Act 1958* (Vic) [7].

Habitable Structure – A structure legally occupied for residential, commercial, industrial, or public use.

Lithium-ion Battery (LiB) – A rechargeable battery technology used in UPS systems, BESS, and IT equipment within Data Centres.

Major Hazard Facility (MHF) – A facility subject to the Occupational Health and Safety (Major Hazard Facilities) Regulations 2017 (Vic) [9].

National Construction Code (NCC) – Australian Building Codes Board 2025, *National Construction Code 2025, Volume One*, Australian Building Codes Board, Canberra [9].

NSW HIPAP 2 – NSW Government, Department of Planning, Hazardous Industry Planning Advisory Paper No. 2 – Fire Safety Study Guidelines, January 2011 [10].

NSW HIPAP 6 – NSW Government, Department of Planning, Hazardous Industry Planning Advisory Paper No. 6 – Hazard Analysis, January 2011 [11].

Preliminary Hazard Analysis (PHA) – A systematic process conducted at early project stages to identify and evaluate potential hazards.

Pre-Incident Plan (PIP) – An operational document providing FRV firefighters with essential information to manage incidents safely.

Protected Place – A facility where individuals are employed or gather, including offices, warehouses, schools, childcare centres, hospitals, and event centres.

Qualitative Risk Assessment – A risk evaluation approach that evaluates risk using descriptive scales, i.e., Low/Medium/High or Insignificant/Minor/Major/Catastrophic), rather than numerical values.

Quantitative Risk Assessment – A data-driven assessment methodology using statistical analysis, probability calculations, and modelling to measure risk numerically.

Semi-Quantitative Risk Assessment – A risk assessment methodology combining qualitative judgment with numerical scoring or consequence modelling, i.e., thermal radiation, toxic dispersion modelling.

Thermal Runaway – A self-accelerating chemical reaction within a battery cell where heat generation exceeds heat dissipation, potentially leading to fire, explosion, and toxic gas release.

Uninterruptible Power Supply (UPS) – A device providing emergency power to critical loads when the main power source fails, often incorporating LiB technology.

4 BACKGROUND

4.1 The Growth of Data Centres and Associated Hazards

Data Centres are critical components of modern digital infrastructure, supporting cloud computing, telecommunications, financial systems, and government services. The rapid expansion of this sector in Victoria has resulted in large-scale facilities being developed in both established urban precincts and greenfield locations.

Contemporary Data Centres are typically characterised by—

- High electrical load density requiring substantial standby power generation capacity, typically using diesel-fuelled generators;
- Large volumes of C1 combustible liquid (diesel) stored on-site to fuel standby generators, often in basement or sub-grade tank installations;
- Significant LiB installations in UPS systems and BESS, providing short-duration backup power and power conditioning;
- High-voltage electrical infrastructure, including substations, transformers, and switchgear; and

- Complex mechanical systems, including cooling infrastructure using glycol-based heat transfer fluids.

These characteristics present a unique and complex fire hazard profile that differs significantly from conventional industrial or commercial occupancies.

The co-location of large LiB installations with substantial volumes of diesel fuel, sometimes in enclosed environments, creates scenarios that demand rigorous fire safety analysis and robust protection measures.

4.2 Key Hazard Drivers

FRV has identified the following key hazard drivers as primary fire safety concerns for Data Centre developments.

a) Thermal runaway in LiB systems, which can generate flammable and toxic gases, high heat flux, and potential for explosive atmosphere formation.

b) Large-scale C1 combustible liquid storage, particularly where fuel is stored in basements or sub-grade locations where effective firefighting is inherently more difficult.

c) High-voltage electrical hazards, including transformer oil fires, switchgear arcing, and the persistence of high voltages in battery systems even when partially discharged.

d) Toxic gas and combustion product exposure affecting both facility occupants and responding emergency personnel.

e) Contaminated firewater runoff that presents an environmental hazard if not appropriately contained.

4.3 Alignment with Regulatory Context

FRV's position on Data Centre fire safety has been developed in consultation with key regulatory partners and stakeholders, which affirm—

- Compliance with AS 1940-2017, *The Storage and Handling of Flammable and Combustible Liquids* [12] is expected, but the sole consideration of this standard is not sufficient to meet all fire protection requirements for these complex facilities;
- FRV's requirements, including the mandatory preparation of a Fire Safety Study, compliance with FM Global Data Sheets 5-32 [13] and 5-33 [14], and enhanced sprinkler and hydrant provisions, are appropriate conditions to apply through the planning permit process;
- Data Centre proposals that exceed the Fire Protection Quantities for dangerous goods, including LiB and diesel, as specified in Schedule 2 of the Dangerous Goods (Storage and Handling) Regulations 2022, will be referred to an AHJ under Section 55 of the *Planning and Environment Act 1987* (Vic) [15] for advice on matters within its statutory jurisdiction;
- EPA Victoria has also identified Data Centres as requiring early engagement with FRV, noting in its Application Technical Information Requirements for Data Centres (June 2026);

> *"It is EPA's expectation that applicants consult with the relevant fire agency, i.e. FRV or CFA, from early-stage design so that fire hazards are identified and fire safety controls are incorporated into the design from an early stage."*

4.4 Lessons from Incident Experience and Peer Agency Guidance

FRV has considered lessons from domestic and international incidents involving LiB systems and diesel fuel storage in developing this guideline. Peer agency guidance has also been considered, including the Fire and Rescue NSW *Position Statement Summary: Lithium-ion Batteries and Diesel Generators in Data Centres* (June 2026), which articulates comparable positions on—

a) The requirement for fire-rated construction bounding battery storage rooms, with Fire and Rescue NSW's preference being a fire resistance level (FRL) of 240/240/240 for load-bearing elements and -/240/240 for non-load-bearing elements;

b) The limitations of UL 9540A, *Standard Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems* [16] cell and unit level tests in representing credible fire scenarios within compartments;

c) The need for sprinkler system design to be validated against representative large-scale fire test data for BESS groups exceeding 50 kWh capacity; and

d) The recognition that detached structures containing stacked diesel generators and fuel tanks, present a fire load more closely resembling a Class 8 process-type building use than a Class 10 non-habitable garage or shed structure, when classified under the NCC.

FRV endorses the principles articulated in the FRNSW position statement and expects these considerations to be addressed within Fire Safety Studies prepared for Victorian Data Centre developments.

5 FIRE RESCUE VICTORIA'S ROLE

5.1 Statutory Functions

FRV is a statutory authority established under the *Fire Rescue Victoria Act 1958* (Vic). FRV may be consulted by state and local government agencies under relevant planning, dangerous goods, and fire safety legislation in connection with Data Centre developments. Similarly, FRV's Fire Rescue Commissioner is also a reporting authority in respect of an application for a building permit or an application for an occupancy, under the Building Regulations 2018 (Vic.) [17].

FRV's involvement in Data Centre planning may arise through—

- Planning referrals under Section 55 of the *Planning and Environment Act 1987* (Vic.), where FRV is a referral authority;
- Dangerous goods written advice requirements under Regulations 52 and 53 of the Dangerous Goods (Storage and Handling) Regulations 2022 (Vic.);
- Stakeholder consultation under Clause A2G2(4)(a) of the NCC 2025; or
- Voluntary engagement by designers, developers, or operators seeking FRV's written advice on fire safety design during the conceptual or design development phase of a Data Centre's existence.

5.2 Mandatory Written Advice Requirements

Operators of Data Centres that store or handle dangerous goods, including LiB (Class 9 Miscellaneous Dangerous Goods) and C1 combustible liquids, have a legal obligation under

Regulations 52 and 53 of the Dangerous Goods (Storage and Handling) Regulations 2022 to seek written advice from FRV.

5.3 FRV's Expectation of Early Engagement

FRV has observed that design team members and developers frequently engage too late in the project's development cycle, which significantly limits FRV's ability to influence site layout and facility design, to incorporate necessary fire protection measures and the broader consideration of fire brigade intervention.

It is FRV's firm expectation that engagement occurs—

- At the conceptual design phase to inform site selection, building layout, technology choices and fire brigade appliance access;
- At the design development phase to review and endorse the FSS prior to construction. FRV notes that concurrent engagement should occur where a performance-based design solution is developed, and a subsequent statutory report and consent is required to be obtained under the Building Regulations 2018 (Vic.); and
- At the commissioning phase to verify fire protection system and Emergency Response Plan adequacy and fire brigade appliance before the facility becomes operational.

5.4 Fees and Charges

All submissions requesting FRV's written advice must be accompanied by a completed Application for Written Advice (AWA) form and will incur fees and charges as provided by Regulation 21 of the Fire Rescue Victoria (General) Regulations 2020 [18].

Current fee schedules are available on the FRV website.

6 SEEKING WRITTEN ADVICE FROM FRV

FRV requires written advice to be sought in two distinct stages, aligned with the project development lifecycle.

6.1 Stage 1 Application for Written Advice (Design Phase)

During the design phase, Section 24.1(a) of the Victorian Code of Practice for the Storage and Handling of Dangerous Goods [19] and Regulation 52 of the Dangerous Goods (Storage and Handling) Regulations 2022, requires FRV's written advice to be obtained regarding the initial design of the fire protection system.

FRV expects the Stage 1 AWA to be submitted with adequate lead time, ideally at least three (3) months prior to the commencement of construction, excluding preliminary works outside the scope of the FSS.

The project should only proceed upon receipt of FRV's endorsement of the FSS.

The documents forming the Stage 1 application must include, but are not limited to—

- A completed AWA application form, including the name and contact details of the project developer, occupier, or main contractor;
- The proposed facility's Dangerous Goods Manifest, as required by Schedule 3 of the Dangerous Goods (Storage and Handling) Regulations 2022;
- A Dangerous Goods design compliance report; and

- The Fire Safety Study (FSS).

FRV conducts the Stage 1 AWA assessment as a desktop review. This requirement also applies to any extension or alteration to an existing Data Centre.

6.2 Stage 2 Application for Written Advice (Pre-Commissioning)

At least 30 days prior to the Data Centre and its fire protection systems being commissioned, in accordance with Regulation 53 of the Dangerous Goods (Storage and Handling) Regulations 2022, the applicant must submit a Stage 2 AWA to FRV.

The Stage 2 submission must be emailed to dgadmin@frv.vic.gov.au and be accompanied by—

- A completed AWA application form;
- The facility's final Dangerous Goods Manifest;
- The Emergency Response Plan (ERP);
- The Emergency Information Book (EIB); and
- The Pre-Incident Plan (PIP).

This stage includes an on-site inspection by delegates of FRV's Fire Rescue Commissioner, to verify the adequacy of fire protection systems, the site is accessible to FRV's firefighting appliances and demonstrates a degree of operational readiness, before the Data Centre becomes active and is occupied.

7 RISK ASSESSMENT

7.1 General Principles

FRV expects risk assessments to be developed proportionate to the scale, complexity, and hazard profile of the proposed Data Centre. Risk assessments may be qualitative, semi-quantitative, or quantitative in nature, depending on the size of the installation, the battery technology employed, and the potential for off-site consequences.

Risk assessments support the development of a case-specific, hazard-based design that ensures fire protection systems, emergency response provisions, and operational controls are adequate to minimise the likelihood of fire initiation, fire propagation, and incident escalation.

The risk assessment, whether undertaken as a Preliminary Hazard Analysis (PHA), Fire Safety Study (FSS), or Dangerous Goods compliance assessment, must be based on the specific battery type, configuration, and associated equipment proposed for the development, as well as the presence of all other dangerous goods on site.

7.2 Preliminary Hazard Analysis (PHA)

Where a proposed Data Centre is to be located in a high-density urban area, in close proximity to a Major Hazard Facility (MHF), or adjacent to sensitive establishments such as schools, hospitals, aged care facilities, or childcare centres, FRV expects a Preliminary Hazard Analysis (PHA) to be undertaken at the earliest stage of project development.

At a minimum, the PHA must address—

a) LiB hazards, including thermal runaway, fire, toxic gas exposure, and explosion;

b) Hazards associated with the storage and handling of dangerous goods, combustible liquids, and hazardous materials;

c) Substation and transformer hazards, including transformer oil fires and gas explosion scenarios;

d) Electrical hazards;

e) Off-site impacts from nearby facilities, including high-pressure gas pipelines and Major Hazard Facilities; and

f) Natural hazards, including earth tremors, adverse weather, and bushfire.

The PHA should be developed using a well-recognised methodology such as the NSW HIPAP 6 guidelines. It is expected that the PHA includes adequate consequence modelling and quantitative analysis to justify risk acceptability.

The outcomes of the PHA may influence technology selection or site development decisions and will serve as an input to later stages of project development.

7.3 Fire Safety Study (FSS)

A Fire Safety Study is mandatory for all Data Centre developments within the FRV fire district. The FSS must meet FRV's operational requirements to achieve an adequate level of on-site fire and life safety independence.

The FSS must be prepared in accordance with FRV Guideline GL-54 Fire Safety Study, which includes references to the NSW HIPAP 2 guidelines. Additional requirements specific to Data Centres are detailed in Section 8 of this guideline.

7.4 Hazards to Firefighters and Emergency Responders

Any risk assessment prepared for a Data Centre must explicitly address hazards to firefighters and emergency responders.

These hazards may include, but are not limited to:

- Fires or explosions in UPS systems and battery installations
- Fires or explosions in high-voltage transformers or switchgear, with potential for escalation
- Electrical arcing or fires in substations and distribution boards
- Direct contact with live electrical components or conductors
- Indeterminate state of charge in affected battery systems
- Persistence of high voltages even when batteries appear discharged
- Stranded energy within affected equipment
- Inability to isolate power inputs or outputs if controls are damaged by heat
- Degradation of ingress protection (IP) ratings due to heat exposure
- Potential for secondary incidents, including re-ignition following thermal runaway.

In situations where there is a significant risk to firefighter safety, FRV's incident controller may adapt firefighting tactics, prioritising the protection of adjoining exposures and the environment over offensive intervention.

8 DESIGN CONSIDERATIONS FOR DATA CENTRES

8.1 General Requirements

The FSS must be tailored to the specific battery chemistries, dangerous goods, and infrastructure proposed for the Data Centre.

FRV will not endorse an FSS nor any elements of its fire protection design, in the absence of detailed facility information. As a minimum, this information must include—

- LiB battery details, including type, chemistry, and energy capacity;
- Rack configuration and cell, module, and unit numbers;
- UPS specifications;
- Fire compartment layout and fire resistance levels;
- Fuel storage details, including generator fuel volumes and locations;
- On-site substation and transformer details, including location, specifications, and insulating medium.

8.2 Hazard Identification and Consequence Assessment

The FSS must identify fire, explosion, and toxicity hazards and analyse the consequences of credible incidents, following the methodology outlined in Sections 2.2 to 2.4 of NSW HIPAP 2.

The FSS must address all fire effects, including—

- Flame impingement and radiant heat;
- Explosion overpressure;
- Toxic gas emissions resulting from thermal runaway;
- Toxic combustion products; and
- Contaminated firewater runoff.

8.3 Credible Fire Scenarios

At a minimum, the FSS must assess the following credible scenarios.

a) LiB fault, thermal runaway, and fire in a data hall;

b) LiB fault, thermal runaway, and fire in a battery storage room;

c) LiB fault, thermal runaway, and fire in a containerised LiB installation, such as a power train unit;

d) LiB fault, thermal runaway, and fire in any other battery storage room;

e) LiB thermal runaway with flammable gas release and explosive atmosphere formation in a data hall;

f) LiB thermal runaway with flammable gas release and explosive atmosphere formation in a battery storage room;

g) LiB thermal runaway with flammable gas release and explosive atmosphere formation in a containerised LiB installation;

h) Uncontrolled data hall fire with ventilation and sprinkler failure leading to escalation;

i) LiB thermal runaway with toxic gas release and personnel exposure in a data hall;

j) Toxic gas release from a battery room affecting the nearest population;

k) Uncontrolled LiB fire in a data hall with toxic exposure to personnel and emergency responders;

l) Thermal runaway with personnel present in the data hall;

m) Transformer oil bund pool fire or gas transformer explosion;

n) C1 combustible liquid storage loss of containment and pool fire;

o) Generator belly tanks and return tanks, including single and multiple generator fire scenarios;

p) The appropriateness of the fire-resistant elements that the LiB is contained within, i.e., the wall or other enclosing elements achieving an FRL of 120/120/120, using quantitative approaches and methodologies.

8.4 Flammable Gas Accumulation and Ventilation Assessment

During thermal runaway, LiB systems can release hydrogen, carbon monoxide, methane, and other hydrocarbons.

The authors of the FSS must—

- Estimate maximum flammable gas accumulation under credible scenarios;
- Detail ventilation measures to maintain gas concentrations below 10 percent of the Lower Explosive Limit (LEL), in accordance with AS 2865:2009, *Confined Spaces* [20] and FM Global DS 5-32; and
- Conduct a sensitivity analysis to determine the number of battery failures that could generate an explosive atmosphere in the event of simultaneous ventilation and sprinkler failure.

8.5 Fire Resistant Construction for Battery Storage Rooms

FRV's position on fire rated construction for battery storage rooms is informed by the Fire and Rescue NSW Position Statement Summary: Lithium-ion Batteries and Diesel Generators in Data Centres (June 2026).

Battery storage rooms designed to house lithium-ion battery units and systems that provide uninterrupted power supply to the data centre should be appropriately separated from the remainder of the building with fire rated construction. FRV does not support a reduction in the fire resistance levels for such rooms.

FRV's expectation, is that the bounding construction of battery storage rooms achieves an FRL of 240/240/240 for load-bearing elements and an FRL of -/240/240 for non-load-bearing elements.

FRV notes that temperatures generated during LiB fires may exceed those represented by the AS 1530.4 [21] standard fire curve. As a result, the performance of conventionally rated fire resisting construction under LiB fire conditions is relatively unknown.

This uncertainty reinforces the need for the adoption of conservative fire resistance levels.

8.6 Sprinkler System Design

FRV's requirements for sprinkler system design are informed by the latest edition of NFPA 855. [20]

Key requirements include, but are not limited to—

- The provision of a sprinkler system in data halls, battery storage rooms, diesel tank chambers, and generator rooms;
- For data halls, a minimum water application density of 8 mm per minute or 12 mm per minute, as determined by the FSS;
- For diesel tank chambers and generator rooms, sprinkler design must comply with AS 2118.1-2017 [21] at a minimum density of 5 mm per minute;
- For Energy Storage System groups exceeding 50 kWh, sprinkler system design criteria and separation distances must be validated against representative large-scale fire test data, such as UL 9540A large scale testing or equivalent;
- Where large-scale fire test data is unavailable, relevant international standards or guidelines applicable to the battery chemistry, capacity, configuration, and installation conditions should be used;
- Where AS 2118.1-2017 does not provide a suitable classification for LiB installations, recognised international standards such as FM Global DS 5-32 must be used.

Within the FSS, FRV expects that a sprinkler system redundancy assessment is carried out and documented, which includes—

- The assessment of whether the proposed on-site water storage duration is adequate for the worst-case credible scenario;
- The determination of whether additional sprinkler booster inlets are required beyond AS 2118.1-2017 requirements;
- The provision of infill capability to allow FRV pumping appliances to supplement water to on-site storage tanks and extend sprinkler operation;
- Preference being given to the selection and specification of fire pumps with a proven design, demonstrated long-term reliability, and an established record of sustained operational performance;
- Fuel supply arrangements that allow sprinkler pumps to be safely refuelled while operating;
- The elimination of single points of failure between the water supply and sprinkler control assemblies
- The assessment of whether firewater runoff from upper-level suppression activities poses a structural or firefighter safety risk.

8.7 Hydrant System Design

Data Centres should be provided with a fire hydrant system that supports FRV operational firefighting activities and assists in controlling fire within the site and preventing fire spread to adjacent properties. The design of a fire hydrant system must comply with AS 2419.1-2021, *Fire Hydrant Installations – System Design, Installation and Commissioning* [23], with firm consideration of the special hazard considerations contained within Appendix E of that standard.

Factors that should be considered by the fire hydrant system designer and referenced in the FSS, which include, but are not limit to, are the provision of—

- Simultaneous flow of at least three hydrant streams at 30 litres per second;
- Simultaneous flow of two fire hydrant streams at 20 litres per second within sprinkler protected data halls and battery storage rooms;
- Accessible fire hydrant outlet and fire brigade booster connections, which carefully consider their proximity to the Data Centre fire risk, the hardstand and emergency vehicle access road; and/or
- Fire hydrant outlets, whether internal or external, being positioned outside a 3 kW/m² radiant heat contour.

8.8 Detection System Design

Data Centres should be provided with an appropriate fire detection and alarm system that warns occupants of a fire or a life-threatening situation associated with thermal runaway, with accompanying infrastructure that has the capacity to promptly notify FRV of such an incident.

Factors that should be considered by the fire detection and alarm system designer and referenced in the FSS, which include, but are not limit to, are the provision of—

- Off-gas detection must be installed in all battery storage rooms;
- Sophisticated smoke detection technology, such as aspirating smoke detection, within data halls;
- A red visual alarm device (VAD), i.e., a strobe light, conforming to AS 7240.23:2021, *Fire Detection and Alarm Systems – Part 23: Visual Alarm Devices* [25], which is installed at or near the entrance to each occupiable enclosure containing LiB and interfaced to the fire detection and alarm system and/or Battery Management System (BMS), which flashes when toxic gases are detected;
- The provision of a warning sign, adjacent to the VAD, which indicates “BATTERY ROOM: TOXIC GASES DETECTED” in in letters not less than 50 mm high and of a colour which contrasts with that of the background.

8.9 Design Considerations for Transformer and Substation Hazards

FRV expects that the FSS considers and assesses the consequences associated with transformer insulating oil and gas hazards, which include scenarios associated with transformer oil bund pool fires and gas transformer explosions. The FSS should also consider whether transformer fires could induce thermal runaway in adjacent LiB installations.

The spatial separation requirements of AS 2067:2016, *Substations and High Voltage Installations Exceeding 1 kV a.c.* [26] must be validated through consequence modelling within the FSS compilation process.

8.10 Design Considerations for Diesel Generator and Fuel Storage Structures

FRV considers that the use and fire load presented by these structures containing vertically stacked diesel generators and or diesel tanks is beyond that typically associated with a Class 10 non-habitable garage or shed structure and more closely resembles a Class 8 process-type building.

Consequently, FRV expects that—

- Detached structures housing vertically stacked diesel generators and or diesel tanks are designed and assessed as Class 8 process-type buildings, with appropriate fire safety measures;
- The FSS assesses loss of containment and pool fire scenarios involving C1 combustible liquid storage, including basement and sub-grade fuel storage;
- Sprinkler protection is provided in diesel tank chambers and generator rooms;
- Mechanical ventilation is provided for diesel storage areas in accordance with AS 1940-2017; and
- Diesel tank chambers and generator rooms are situated within appropriately fire-rated walls and other bounding construction elements.

8.11 Provision for Firewater Containment

Firewater runoff containment capacity must be determined for the worst-case credible fire scenario.

The assessment must follow the EPA Victoria requirements for firewater retention capacity calculations and design concepts as part of EPA development licence applications.

Consequently, FRV expects that—

- On-site retention infrastructure capacity to contain total firewater volumes from the worst-case scenario;
- Isolation of the stormwater network to prevent contaminated firewater from entering waterways or municipal drainage systems; and
- Post incident recovery and disposal pathways for contaminated firewater.

Additional guidance is also provided by the NSW Environment Protection Authority's *Best Practice Guidelines for Contaminated Water Retention and Treatment Systems* [27].

8.12 Provision for Emergency Vehicle Access, Firefighter Pedestrian Access and Emergency Refuge

Ensuring access for firefighting purposes is a critical design consideration that ensures that an incident involving a Data Centre can be managed safely and efficiently.

The provision of clear, unobstructed pedestrian access routes to and around the Data Centre, must be provided to allow firefighters to safely reach all critical areas of the facility, with the protection of charged hose lines, to conduct rescue, containment and extinguishment operations, in the event of an emergency.

Depending on the size, complexity and surroundings of the Data Centre, the provision of a perimeter vehicular access road, which is complimented by no fewer than 2 points of access, is strongly encouraged. The perimeter vehicular access road must be appropriately dimensioned and of appropriate loadbearing capacity, which supports the establishment of multiple staging areas and the ability of firefighting appliances to pass each other. The provision of hardstand areas at strategic locations around the Data Centre that are near fire hydrant system infrastructure, is also strongly encouraged. The provision of multiple hard stand areas typically accounts for varying wind directions and potential obstructions, which in turn reduces firefighters' exposure to toxic gases and fumes during an incident.

A design that typically adheres to the prescriptive vehicular access provisions of Clause C3D5 of the NCC, is considered to address FRV's emergency vehicle access requirements.

Alternative emergency vehicle road designs, which may also contain fewer than 2 emergency vehicle access points, will require a degree of stakeholder consultation under Clause A2G2 of the NCC and may also require concurrent consideration under Regulations 52 and 53 of the Dangerous Goods (Storage and Handling) Regulations 2022 and Regulation 129 of the Building Regulations 2018.

8.13 Specific Approaches to Site-Based Consequence Modelling

FRV expects that any consequence modelling that is undertaken for LiB and other hazardous materials, is specifically informed by site specific hazard data. An FSS or a PHA that solely relies on battery test data and UL 9540A off-gas release rates, which are derived from laboratory scale tests, is not accurately reflective of actual site-based conditions.

8.14 Hazardous Materials in Cooling Systems

Hazardous materials used in cooling systems, including glycol-based heat transfer fluids and water treatment chemicals, should also be included in the FSS hazard assessment.

9 COMMISSIONING

The commissioning of the installed fire protection systems that are provided at a Data Centre is an essential activity before a building is occupied, as it verifies that every fire protection system performs to its design intent. The commissioning process ensures that fire protection equipment provided at a Data Centre, such as fire detection and alarm systems, sprinklers, smoke control and fire hydrant systems, operate reliably and in an integrated manner. Without this process, undetected faults, incorrect installations, or incomplete interfaces between systems can compromise the Data Centre's ability to concurrently protect occupants during an emergency incident and support the operational response activities of FRV's attending firefighters.

The commissioning of the installed fire protection systems also confirms compliance with legislative requirements and technical standards, including any performance-based design outcomes. It provides assurance to FRV, the building owner, the occupiers/operators of the Data Centre, the Data Centre's insurers and other AHJs, that the fire protection systems will function correctly from day one, reducing risk to life, property, and business continuity.

9.1 Notification to FRV

FRV's Dangerous Goods Unit must be notified no fewer than thirty (30) days before commissioning of the Data Centre. Please refer to the notification requirements contained within Clause 6.2 of this guideline.

9.2 Emergency Information Book (EIB)

An Emergency Information Book (EIB) must be prepared for every Data Centre and located within the site's Emergency Information Container (EIC) at the facility entrance.

The EIB provides emergency responders with critical hazard and safety information.

For guidance on preparing an EIB, refer to FRV's *Emergency Information Book* [28] publication available on the FRV website.

9.3 Emergency Response Plan (ERP)

An Emergency Response Plan (ERP) must be prepared for every Data Centre.

The ERP must—

a) Be developed with consideration of the specific hazards posed by the site;

b) Meet FRV's operational requirements; and

c) Incorporate all the recommendations of the endorsed FSS.

In addition to standard considerations of an ERP, the ERP must also provide for or identify—

d) The procedures for alerting the owner or operator to abnormal operations, faults, or hazards;

e) The procedures for notifying FRV. It is FRV's preference is for automatic notification to be provided upon detection of a fire by the installed fire detection and alarm system;

f) The method of communication with the remote operator's representative during an incident;

g) Arrangements for the attendance of an Emergency Liaison Officer (ELO) at the Data Centre facility during any incident;

h) Clear procedures for communicating critical operational information to emergency services, the relevant local government authority and neighbouring communities, which include but are not limited to the battery status, fuel system status, and power isolation procedures.

9.4 Pre Incident Plans

In accordance with FRV Guideline GL-52 *Pre Incident Plans* [29], Data Centres storing or handling dangerous goods, including significant volumes of C1 combustible fuel or LiB infrastructure, must prepare and maintain a site-specific Pre Incident Plan (PIP).

The PIP must—

a) Provide responding FRV firefighters with essential information to manage incidents safely and effectively;

b) Give particular attention to high voltage electrical hazards, battery energy storage risks, C1 combustible storage, and potential toxic or flammable gas release;

c) Be situated within Section 5 of the Emergency Information Book and held within the Emergency Information Container (red box) at the entrance to the Data Centre facility; and

d) Be kept current to reflect any alterations to the Data Centre facility's design, dangerous goods inventory, or fire protection systems.

10 STAKEHOLDER ENGAGEMENT

FRV strongly encourages design team members, the developer and future operator of the Data Centre, to engage with all relevant regulatory agencies at the earliest possible stages of a Data Centre's existence, as indicated in this guideline.

The review of FSS, PHA, design or commissioning documentation that is provided FRV during any of the statutory or voluntary consultation phases of a Data Centres development, including

the conduction of any site visits or pre-occupation inspections, is broadly utilised by FRV to inform its operational pre-incident response plan.

10.1 FRV and WorkSafe Victoria

WorkSafe Victoria acts as a determining referral authority for Data Centre planning permit applications where dangerous goods exceed Fire Protection Quantities under Schedule 2 of the Dangerous Goods (Storage and Handling) Regulations 2022.

WorkSafe Victoria has confirmed that FRV requirements, which include the preparation of a Fire Safety Study, compliance with FM Global Data Sheets 5-32 and 5-33, and enhanced fire protection measures, are appropriate conditions to be applied through the planning permit process.

Design team members, the developer and future operator, should engage with both WorkSafe Victoria and FRV concurrently and ensure that FRV's written advice is incorporated into the dangerous goods compliance documentation provided to WorkSafe.

10.2 FRV and EPA Victoria

EPA Victoria requires applicants to provide evidence of consultation with FRV, including FRV requirements and how those requirements have been incorporated into the facility design, as part of any EPA development licence application.

FRV's written advice, including the FSS endorsement are therefore relevant to EPA's assessment process.

EPA requirements for firewater retention infrastructure are consistent with FRV requirements under this guideline.

Proponents should ensure that firewater containment design satisfies both FRV operational requirements and EPA environmental protection requirements.

10.3 FRV's Role in the Building Approval Process

During the conceptual design phase of a Data Centre's development, FRV must be consulted in respect of the development of a performance-based design brief (PBDB) under Clause A2G2(4)(a) of the NCC where any aspect of the NCC's performance requirements requires the consideration of fire brigade intervention.

FRV's Fire Rescue Commissioner is a reporting authority pursuant to the Building Regulations 2018. Relevantly, where a Data Centre is proposed to be constructed or if an existing building is to be repurposed or fitted out as a Data Centre, a building permit must be obtained. Consequently, where any of the prescribed fire matters outlined within Regulation 129 of the Building Regulations 2018 does not meet the deemed-to-satisfy requirements of the NCC, the report and consent of the Fire Rescue Commissioner must be obtained prior to the commencement of any building work.

In circumstances where the Fire Rescue Commissioner has provided a report and consent under Regulation 129 for the Data Centre, there is a corresponding requirement under Regulation 187(1)(a) for a report and consent to be obtained in association with an application for an occupancy permit. Where a direct fire alarm connection is proposed to be provided for the Data Centre, a similar obligation exists under Regulation 187(1)(b) for a report and consent to be obtained.

11 REFERENCES

[1] Fire Rescue Victoria 2024, *Fire Safety Guideline GL-54: Fire Safety Study*, Fire Rescue Victoria, East Melbourne.

[2] Fire Rescue Victoria 2025, *Fire Safety Guideline GL-55: Battery Energy Storage Systems*, Fire Rescue Victoria, East Melbourne.

[3] WorkSafe Victoria 2025, *Land Use Planning – WorkSafe Victoria as Determining Authority: Data Centres Clarification*, WorkSafe Victoria, Geelong.

[4] Fire and Rescue NSW, *Position Statement Summary: Lithium-ion Batteries and Diesel Generators in Data Centres* (Ver. 01) (June 2026).

[5] EPA Victoria, *Application Technical Information Requirements for Data Centres* (June 2026).

[6] Dangerous Goods (Storage and Handling) Regulations 2022 (Vic).

[7] Fire Rescue Victoria Act 1958 (Vic).

[8] Occupational Health and Safety Regulations 2017 (Vic).

[9] Australian Building Codes Board 2025, *National Construction Code 2025*, Australian Building Codes Board, Canberra.

[10] NSW Department of Planning 2011, *Hazardous Industry Planning Advisory Paper No. 2: Fire Safety Study Guidelines*, NSW Department of Planning, Sydney.

[11] NSW Department of Planning 2011, *Hazardous Industry Planning Advisory Paper No. 6: Hazard Analysis*, NSW Department of Planning, Sydney.

[12] Standards Australia 2017, *AS 1940:2017 The Storage and Handling of Flammable and Combustible Liquids*, Standards Australia, Sydney.

[13] FM Global 2023, *Property Loss Prevention Data Sheet 5-32: Data Centres and Related Facilities*, FM Global.

[14] FM Global 2023, *Property Loss Prevention Data Sheet 5-33: Electrical Energy Storage Systems*, FM Global.

[15] *Planning and Environment Act 1987* (Vic).

[16] Underwriters Laboratories 2025, UL 9540A: *Standard Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems*, UL Standards & Engagement, Northbrook, IL, USA.

[17] Building Regulations 2018 (Vic).

[18] Fire Rescue Victoria (General) Regulations 2020 (Vic).

[19] WorkSafe Victoria 2013, *Code of Practice for the Storage and Handling of Dangerous Goods*, WorkSafe Victoria, Geelong.

[20] Standards Australia 2009, AS 2865:2009 Confined Spaces, Standards Australia, Sydney.

[21] Standards Australia 2014, *AS 1530.4:2014 Methods for fire tests on building materials, components and structures. Part 4: Fire-resistance tests for elements of construction*, Standards Australia, Sydney.

[22] National Fire Protection Association 2026, *NFPA 855: Standard for the Installation of Stationary Energy Storage Systems*, National Fire Protection Association, Quincy, MA, USA.

[23] Standards Australia 2017, *AS 2118.1:2017 Automatic Fire Sprinkler Systems – Part 1: General Systems*, Standards Australia, Sydney.

[24] Standards Australia 2021, *AS 2419.1: Fire Hydrant Installations – System Design, Installation and Commissioning*, Standards Australia, Sydney.

[25] Standards Australia 2021, *AS 7240.23:2021 Fire Detection and Alarm Systems – Part 23: Visual Alarm Devices*, Standards Australia, Sydney.

[26] Standards Australia 2016, *AS 2067:2016 Substations and High Voltage Installations Exceeding 1 kV a.c.*, Standards Australia, Sydney.

[27] NSW Environment Protection Authority 1994, *Best Practice Guidelines for Contaminated Water Retention and Treatment Systems*, Hazardous Materials Policy Co-ordinating Committee, Sydney.

[28] Fire Rescue Victoria 2021, *Emergency Information Book*, Fire Rescue Victoria, East Melbourne.

[29] Fire Rescue Victoria 2024, *Guideline GL-52: The development of pre-incident plans for major hazard facilities and dangerous goods sites*, Fire Rescue Victoria, East Melbourne.

Appendix A: FRV's Identified documentation and consultation stages

	Stage 1 Data Centre AWA		Stage 2 Data Centre AWA
Pre-Planning Permit	Located close to sensitive establishment or high-density built-up area	Located in a low-density built-up area	Not Applicable
	• Preliminary Hazard Analysis (PHA) • AWA form • Expected DG Manifest • Site layout drawing(s) • NCC Clause A2G2 stakeholder consultation	• AWA form • Expected DG Manifest • Site layout drawing(s) • NCC Clause A2G2 stakeholder consultation	Not Applicable
Pre-Construction	• Fire Safety Study (FSS) • DG compliance report • Bushfire Attack Level (BAL) Ω assessment report • Building Regulation 129 report and consent Ω	• Fire Safety Study (FSS) • DG compliance report • Bushfire Attack Level (BAL) Ω assessment report • Building Regulation 129 report and consent Ω	Not Applicable
Pre-Operation	Not Applicable		• AWA form • Final DG Manifest • Emergency Response Plan (ERP) • Emergency Information Book (EIB) • Pre-incident Plans (PIPs) • Building Regulation 187 report and consent Ω

Ω As applicable