Government of **Western Australia**
Department of **Mines, Industry Regulation and Safety**
Building and Energy

Guideline for activities using fuel gas to produce theatrical or other special effects

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Contents

Summary

Building and Energy, a division of the Department of Mines, Industry Regulation and Safety (DMIRS) regulates safety in the fuel gas industry in Western Australia (WA) under the *Gas Standards Act 1972* (the Act).

An activity involving the use of fuel gas to produce theatrical or other special effects is regulated under the Act and Gas Standards (Gasfitting and Consumer Gas Installations) Regulations 1999 (GSR1999). These appliances are prescribed as Type B appliances and the activity of producing theatrical or other special effects must be conducted under a safety management system.

In WA, all gas appliances and gas fittings must be approved by the Director Energy Safety, or a person or body approved by the Director. A Type B appliance and its installation both require approval. This includes situations where a theatrical appliance is being proposed to be used at various locations.

Purpose

This guideline has been developed to assist appliance designers, gas fitters and Type B inspectors in the design and approval of gas fuelled theatrical or other special effects to ensure compliance and minimise risks. It should be noted this guide should only be used if the gas appliance is excluded from the scope of Australian Standard AS 3814 - Industrial and Commercial Gas Fired Appliances and may not be appropriate for every gas fuelled theatrical or other special effect activity.

Activity description

Activities involving the use of fuel gas to produce theatrical or other special effects include, but are not limited to:

- simulating fire, flames and/or explosions as part of a theme park thrill ride or show;
- simulating fire, smoke, or emergency incidents for training purposes;
- producing explosions and flames as part of a music event or theatrical production; and
- producing celebratory flares/flames such as at sporting events.

The activity can be further subdivided into gas devices and equipment that is:

- fixed (installed), meaning they are connected to a permanent gas supply; or
- portable, meaning they have a self-contained fuel gas supply, or they are connected to a liquid petroleum (LP) gas cylinder by a hose assembly and are moved from location to location.

The definition of an 'activity' using fuel gas to produce theatrical or other special effects includes:

- device and equipment design, construction, installation and use;
- handling and storage of the associated fuel gas;
- equipment operation and maintenance;
- operator and staff training and competence;
- separation distances and exclusion zone determination; and
- emergency and incident preparedness.

The term 'installation' is defined in the Act as any appliance, pipes, fittings, or other apparatus installed or to be installed for or for purposes incidental to the conveyance, control, supply or use of gas.

Safety management system

The safety management system (SMS) for the operating appliance must meet the safety requirements of the Act and the WA Occupational Safety and Health (OSH) requirements. The SMS must:

- contain all information relevant to the gas system and the activity being undertaken;
- identify relevant hazards, assess and manage risks;
- identify exclusion zones, emergency equipment and evacuation routes;
- detail operating procedures for the activity including emergency management; and
- specify any roles, responsibilities, and training requirements.

The SMS for the activity may form part of the broader SMS developed by the individual or corporation for their business or undertaking, provided there is sufficient detail to effectively manage the safe operation of the appliance as required under the Act.

An SMS is a comprehensive and integrated system for managing health and safety risks and should conform with AS/NZS ISO 45001:2018 - Occupational health and safety management systems –Requirements with guidance for use.

The SMS must be relevant to the operating appliance installation (e.g. a specific site) and each stage of the plant (commissioning, operation, maintenance or modification, or decommissioning).

Statutory positions

As part of an effective SMS, there are certain statutory positions and obligations which must be fulfilled. The statutory positions and their obligations include:

- ***Executive safety manager:*** this is the individual or senior executive of a corporation responsible for the management and safe operation of the appliance installation. The executive safety manager must:
    - appoint an appropriately qualified person as the operator;
    - ensure the operator has developed and implemented an SMS; and
    - approve the SMS before it is implemented.
- ***Operator:*** is the individual who has overall responsibility for the management and safe operation of the appliance. In the case of an activity using fuel gas to create theatrical or other special effects, this is usually a manager or supervisor but could be the person operating the device. The operator of the appliance must:
    - appoint an appropriately qualified person as the site safety manager for the plant;
    - ensure a Class I Gasfitter has submitted a Notice of Completion (NOC) for the installation and commissioning of the appliance and ensure the Type B Designated Inspector has certified the appliance. The installation of the appliance

shall also be inspected by the gas supplier prior to operating the appliance in WA. Refer to Building and Energy's publication *Approval of Type B Gas Appliances*; and

- develop and implement an SMS for the plant.

- ***Site safety manager:*** if no one has been appointed as the site safety manager, the operator is the site safety manager by default. The site safety manager must ensure:
  - an appropriate induction is given to each person who interacts with the appliance;
  - each person complies with the requirements of the SMS;
  - each person performs their functions safely and follows standard operating procedures;
  - necessary first aid, safety and other related equipment is available and maintained; and
  - staff are suitably trained in first aid, emergency, and other general safety procedures.

Commissioning notice

The permission of the gas supplier is required for the provision of gas for commissioning purposes. The gas fitter who is carrying out the commissioning of the appliance is responsible for applying to the gas supplier for commencement of gas. To satisfy the gas supplier's requirement, the request needs to be endorsed by a Designated Type B Gas Appliance Inspector.

Refer to Building and Energy's publication *Approval of Type B Gas Appliances*.

Reporting incidents

Any incident relating to gas must be reported to Building and Energy's Chief Inspector Gas or his delegate as required by the GSR1999 Regulation 42.

Gas system design, approval, and installation

Device design

The person designing, constructing, or importing gas fuelled devices, plant or equipment that produce theatrical and other special effects should make all attempts to ensure compliance with the relevant Australian Standards. These include:

- AS 3814 - Industrial and commercial gas-fired appliances;
- AS 1375 - Industrial fuel fired appliances;
- AS 3645 - Essential requirements for gas equipment;
- AS 60079 - Explosive atmospheres (all relevant parts); and
- AS 61508 - Functional safety of electrical / electronic / programmable electronic safety related equipment (all relevant parts).

The person should consider and reference where appropriate the following overseas standards:

- NFPA 160 - Standard for the Use of Flame Effects Before an Audience;
- NFPA 1126 – Standard for the Use of Pyrotechnics Before a Proximate Audience; and
- NFPA 1402 – Standard on Facilities for Fire Training and Associated Props (provides guidance for building fire service training centres).

Whether the appliance is being constructed here in Australia or imported, once the design and construction details have been established, all technical and other relevant information should be documented in a Technical Submission (Submission) to the Designated Type B Inspector. The technical contents of the Submission should include as a minimum:

- appliance design information, specifications and calculations as listed in Appendix A of AS 3814;
- appliance installation, ventilation and fluing information with references to AS/NZS 5601;

- any LP gas storage and supply information with references to AS/NZS 1596;
- Original Equipment Manufacture specifications for component parts;
- operating instructions of the device; and
- maintenance instructions for the device.

In addition to the technical information, the Submission should be accompanied by all relevant information from the SMS. This additional information should include, but is not limited to the following:

- a risk assessment, documenting the appropriateness of the SMS;
- qualifications and experience of persons installing, operating, and maintaining the device;
- required exclusion zones around device for operation (staff and public); and
- information related to the device design, construction, or proposed installation.

When complete, the Submission should be provided to a Designated Type B Inspector.

Portable gas devices

Where the gas device is portable in nature, and is relocated from one event to another, any related LP gas cylinder shall be considered to be an integral part of the device. Information in the Submission must detail the appropriate physical size and capacity of the cylinder. Quantities should be kept to a minimum, lessening the adverse effect of an unforeseen event. In addition, storage and handling considerations that protect the device when in transit should be included in the Submission.

Device approval

In Western Australia, all gas devices and gas fittings must be approved prior to the supply, installation or use. Designated Type B Inspectors are approved by the Director of Energy Safety to undertake the certification of Type B gas appliances.

Gas appliances utilised for the production of a theatrical or other special effect are not exempt from the Type B approval process. However, due to the complexity and diversity of device design the contributing factors and the assessment process may differ from the norm.

The process should involve the development of a Submission during the design stage, or when the operator first takes possession of an imported device. The Submission should include all technical specifications in relation to gas firing matters. This may include information about gas storage and piping, gas isolation and safety shut off valves, flame ignition systems, flame supervision systems, surface, and radiated temperatures. Where possible efforts should be made to ensure these comply with the appropriate safety requirement as listed in the appliance design section of this document.

In addition to the technical content of the Submission the Designated Type B Inspector will need to have an understanding of the appropriateness of the applicable SMS.

The approval of gas appliances that produce a theatrical or other special effect may rely on the supporting information form the SMS concerning who operates them, where they are operated and when they are operated.

For a portable certified appliance, specific approval may be given for situations including sporting event flame effects where moving to different events is included in the SMS as part of the submission. If specific approval is given a NOC from a gasfitter may not be required, depending on the certification.

For more information on the Type B approval process refer to Building and Energy's publication *Approval of Type B Gas Appliances*.

Alternative means of compliance for the appliance design

It is acknowledged that in a number of cases, direct compliance with the deemed to conform clauses in AS 3814 will not be possible. In these instances, an alternative means of compliance must be applied in accordance with AS 3814 clause 1.2.7 and Appendix O that ensures the level of risk **is at least the same** or less than would be achieved by complying with the deemed to conform clauses. The Submission must include:

- details of the non-compliance with the deemed to conform clauses;
- a statement that there is evidence of an equal or lesser level of risk (a report setting out a risk assessment carried by a competent person); and
- an acknowledgement that the evidence will be made available to an inspector if requested.

It should be noted that the process cannot be used to justify non-compliance after the fact.

Fixed gas installation

A fixed gas system refers to the gas system from the gas supply point (meter, tank, or cylinder) to the theatrical or other special effect device isolation valve. This type of gas system is considered to be part of the gas supply installation and should be designed, installed and commissioned by an appropriately licensed gas fitter.

The gas fitter should ensure the design and installation complies with AS/NZS 5601.1 Gas installations Part 1 General Installations. On completion, the installer should issue a NOC to the gas appliance owner and the gas supplier. The gas fitter should also affix a Gas Compliance Plate for the gas system as required by the GSR1999 Regulation 28(2).

Alternative means of compliance for the installation of the appliance

In general terms, it should be within the scope of AS/NZS 5601 to design and install a compliant gas system. However, in cases where it is not possible to comply, an alternative means of compliance must be applied that ensures the level of risk **is at least the same or** less than would be achieved by complying with the standard. In these cases, the gas fitter/designer shall submit a Performance Based Solution proposal to the Director in writing prior to installation and commissioning.

The Submission must include:

- details of the non-compliance;
- a statement that there is evidence of an equal or lesser level of risk (a report setting out a risk assessment carried by a competent person); and
- an acknowledgement that the evidence will be made available to an inspector if requested.

It should be noted that the process cannot be used to justify non-compliance after the fact.

Further information

If you would like more information, please contact Building and Energy.

It must be remembered that the Director Energy Safety regulates the activity of using a fuel gas to produce theatrical or other special effects. Companies and organisations will have obligations under other agencies and legislation such as DMIRS Dangerous Goods (www.dmp.wa.gov.au/Dangerous-Goods/Dangerous-Goods-258.aspx) and DMIRS Worksafe (www.commerce.wa.gov.au/worksafe).

Appendix 1 - Frequently asked questions

Why is an activity that uses fuel gas to produce a theatrical or other special effect considered a high risk operation?

Gas appliances and equipment designed, constructed and operated to produce theatrical or other special effects or to simulate fire for training purposes present an elevated level of risk due to the interaction of operators, trainees and/or the proximity to the public.

Why do I need a safety management system?

Defining the activity of using a fuel gas to produce a theatrical or other special effect requires the operator to develop, implement and maintain an appropriate safety management system that identifies related hazards and effectively manages the associated risks.

What is a safety management system?

A safety management system is a document that identifies the details of an operating appliance to the extent that they are appropriate to the appliance installation. In the case of an activity that uses fuel gas to produce theatrical or other special effects, the safety management system may be part of the larger organisational safety management system. The SMS must:

- contain all information relevant to the gas system and the activity being undertaken;
- identify relevant hazards, assess and manage risks;
- identify exclusion zones, emergency equipment and evacuation routes;
- detail operating procedures for the activity including emergency management; and
- specify any roles, responsibilities, and training requirements.

Who is the executive safety manager?

The executive safety manager is the operator, if the operator is an individual, or the senior managing officer of the corporation or organisation responsible for the management and safe operation of the appliance.

Who is the operator?

The operator is the person who has overall responsibility for the management and safe operation of the appliance. In the case of a theatrical or special effect this may not be the person physically charged with operating the appliance, it is more likely to be the company owner or manager.

Who is the site safety manager?

The operator must appoint a suitably qualified and experienced person as the operator. If no-one has been appointed as the site safety manager for a site at an operating plant, the operator of the appliance is the site safety manager for the site.

Does the appliance need to be installed and commissioned by a licensed gas fitter each time a portable device is relocated prior to it being used?

Yes, for a portable certified appliance an NOC should be submitted every time the appliance is installed at an event by a gas fitter for commissioning, unless specific approval is given for appliances that are moved to different events, this shall be included in the SMS as part of the approval

Does a gas appliance designed for a theatrical or special effect require Type B approval in WA?

Yes, in WA all gas appliances and gas fittings must be approved before supply, installation and use. The approval can only be undertaken by the Director Energy Safety, or a person approved by the Director.

The *Gas Standards Act 1972* defines a gas appliance as any appliance that consumes gas.

Type A gas appliances are prescribed in GSR1999 Regulation 42B.

Type B gas appliance means a gas appliance that has a maximum hourly input rate exceeding 10 megajoules that is neither a Type A gas appliance nor a gas fuelled engine that:

(a) is mounted in or on any vehicle, craft, or portable appliance; and

(b) is supplied by fuel from a cylinder or tank mounted on or in the vehicle, craft, or portable appliance.

All theatrical or special effect gas appliances are Type B appliances, refer to Building and Energy's publication *Approval of Type B gas appliances*.

Does a portable gas appliance need to be re-approved each time it is used/moved?

Yes, unless the approval of the appliances allows for the appliance to be used at different locations and the SMS clearly describes how it can be safely used at different locations. An individual risk assessment should be included for all new locations. If the appliance or SMS is altered or modified the appliance will need to be recertified,

Who can install, maintain, or repair a gas fuelled theatrical or other special effect?

As this type of gas appliance is a Type B appliance, this work can only be undertaken by a Class I Gasfitter.

Government of Western Australia

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