



Consumer, Building and
Occupational Services

Gas Standards and Safety

Guidance Note

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GAS INSTALLATIONS SUPPLIED FROM BIOGAS FACILITIES - ACCEPTANCE REQUIREMENTS

GAS ACT 2000

A guide to assist in the design of biogas facilities, where biogas is collected or conditioned.

SCOPE

This guide is to assist those designing biogas or Bio Methane facilities, where biogas is collected or conditioned. It also covers the installation of any flare or appliance, and control systems when making application to the Director of Gas Safety (Director) for acceptance of the gas installation downstream of the gas supply point.

While this document primarily provides guidance for biogas installations downstream from the gas supply point, Appendix A also provides some additional guidance regarding biogas collection and generation matters.

Infrastructure both upstream and downstream of the gas supply point will form part of a Gas Safety Management System (GSMS) to be provided to the Director as required in Section 77 of the *Gas Act 2000* and Regulations 46(3) (f & g) of the *Gas (Safety) Regulations 2014*.

The documented Gas Safety Management System must provide sufficient evidence that the owner/operator of the biogas infrastructure has systems in place to ensure the biogas installation will be designed, installed, maintained and operated safely.

For further 'safety management system' and 'application for acceptance' instructions, refer to *Guidelines for the Preparation of a Submission for the Acceptance of Gas Installations (Major) Safety Management Plan*, available from the Building Standards and Occupational Licensing Gas Standards and Safety team – contact details below.

DEFINITIONS

For the purposes of this guideline the following definitions apply:

- **Gas** – as per the *Gas Act 2000* means:
 - natural gas; or
 - liquefied petroleum gas; or
 - any other gaseous fuel, being a gaseous fuel that is not declared by the regulations to be excluded from the operation of this Act.
- **Biogas** – as per the AS/NZS 5601.1 Gas installations, means:

A mixture of gases produced by anaerobic microbial decomposition of organic matter and principally comprising methane and carbon dioxide together with lesser amounts of hydrogen sulphide, water vapour or other gases.

- **Gas Supply Point**

The Director has determined that the gas supply point for a biogas installation is the outlet of an anaerobic digester for digester type installations, or the inlet of the gas conditioning plant for collection type facilities such as landfill sites.

SYSTEM DESIGN

Each installation will have its special features. These will be unique to the operation of plant and relate to the use of the gases generated and collected. However, there are a number of safety features that are considered minimum requirements to ensure the safe and reliable operation of gas-fired appliances or flares, and the associated gas supply installation and facility.

Before the system is designed there must be clear identification of the risks and hazards associated with the operation of the facility. A HAZID and HAZOP must form part of the design process considering, but not limited to, the following areas:

1. Site selection and layout including risks to neighbouring properties. During any conceivable incident the radiant heat should not exceed 4.7 kW/m² at any boundary.
2. Provision of automatic isolation.
3. Risks associated with odourless gas.
4. The clear identification of all biogas pipework to prevent accidental damage by a third party – both underground and aboveground.
5. Separation of biogas pipework from other services.
6. Location of extraction system hardware related to end-use devices such as gas flares and power or steam generation systems.
7. Construction materials used in gas conditioning systems must be compatible with the biogas and associated leachate or condensates including problems associated with stress corrosion cracking.

8. Any pressure vessel that is part of a gas conditioning system, such as a knockout pot, accumulator or chilled water moisture separator will need to be assessed and installed according to the relevant standards. It must also be registered if required by the Workplace Health and Safety Act.
9. Flame arresters compatible with the gas must be installed at the inlet of appliances and flares where there is a likelihood that an air gas mixture may be present within the system or negative pressures may induce an air gas mixture into the system at the appliance.
10. Gas conditioning system interlocks, not limited to the following, to ensure safe system operating conditions:
 - The monitoring of the methane content to alarm at concentrations less than 30% and trip at 25%. Gases with less than 20 % are not flammable and will result in flame failure and system unreliability.
 - Appliance flame supervision lockout on flame failure.
 - Low gas pressure monitoring to ensure adequate supply for the maintenance of acceptable combustion characteristics.
 - High gas pressure monitoring to ensure maintenance of acceptable combustion characteristics and the limitation of component exposure to higher than safe working pressures.
 - Flame arrestors with provision for fusible link or a temperature sensor to initiate a shutdown if there is the presence of flame at the arrester.
11. The electrical installation must be compliant with AS/NZS 3000 Electrical Installations.

ACCEPTANCE OF A BIOGAS CONDITIONING FACILITY DOWNSTREAM OF THE GAS SUPPLY POINT BY THE DIRECTOR

The design, construction and installation of the complex gas installation requires acceptance by the Director pursuant to section 77 of the *Gas Act 2000* and must be designed, manufactured and installed in accordance with Australian standard AS/NZS 5601.1 Gas installations or any other standard acceptable to the Director.

A Section 77 application for acceptance provided to the Director in accordance with the Act must include;

- Detail of the gas collection, compression, pressure reduction infrastructure and control systems
- Determination by the Director of the bio gas supply point to the gas installation
- Detail and P&ID of the gas installation and appliances.

Any appliance that is not certified to an Australian appliance standard (Type B appliance) will be subject to a separate acceptance and the requirements of AS 3814 - Industrial and commercial gas-fired appliances, or any other standard prescribed by the Director.

Work on downstream biogas installations including appliances must be undertaken by suitably licensed certifying gas fitters.

If the biogas system is wholly located on private property and the gas is for use solely by the owner/operator in a gas installation then the biogas collection and conditioning systems will be subject to a Gas Safety Management Plan as part of the gas installation as required by Regulation 46(3) of the Gas (Safety) Regulations 2014.

Where the routing of biogas pipework passes through public property or is used to supply gas by reticulation to consumer's please contact the Director in respect to additional requirements for gas distribution and reticulation systems.

Requirements will vary between installations. All submissions will be reviewed and conditions on an acceptance may be imposed.

The Director may require independent design and/or component certification as part of any acceptance.

The Director may also require a test and commission plan prior to commissioning.

Details should be discussed with the Office of the Director prior to submission.

TYPE B APPLIANCES INCLUDING FLARE SYSTEM

The design of type B appliances and flare burner management system is required to comply with AS 3814 - Industrial and commercial gas-fired appliances or any other standard prescribed by the Director.

The following list must be considered as a minimum requirement, and information provided in the application for acceptance for any appliance:

1. Demonstration of the suitability of gas appliances, including flares or work engines to operate on biogas from the original equipment manufacturer.
2. The location of the appliance must be such that in the event of unburnt gas being vented it will not cause a hazard.
3. During normal operation the radiant heat will not exceed 1.6kW/m² at any boundary.
4. Separation distance from flammable goods, hazardous chemicals and other plant shall be required for the Directors assessment.
5. The separation distances from sources of ignition must comply with AS/NZS 60079.10.1 Classification of hazardous areas.
6. In the case of an enclosed appliance the operating temperature shall be considered and limits set to ensure adherence to local environmental protection policy for in-stack emission concentrations and proper destruction of trace toxic chemicals.
7. The extraction system must have some form of pressure control – specifically for appliances associated with covered lagoons or sewage treatment system operating under negative

pressure – to ensure that oxygen is not introduced into the gas production or gathering system.

OPERATING AND MAINTENANCE

Operating and maintenance instructions are to be included in the draft GSMS for assessment by the Director.

The plan must include testing, maintenance, servicing, training, isolation, safety and system control frequency for the biogas plant. Where practical the owner/operator of the system should receive the settings of all interlocks and acceptable operating ranges along with frequency of maintenance. If there are no specific recommendations by the manufacturers or suppliers of gas components, equipment and piping the Director recommends that Appendix B of AS1375 be used as a guide for maintenance frequency of the burner and gas systems.

A maintenance schedule should include, but not be limited to, the annual testing and inspection of gas water/condensation traps and safety shut off valves and inspection of flame arrestors.

APPENDIX A

GUIDANCE FOR BIOGAS COLLECTION AND DIGESTER FACILITIES

BIOGAS COLLECTION SYSTEMS

Management of biogas collection and production systems must be included in the GSMS for the entire plant including gas conditioning and utilisation systems.

The GSMS is to include confirmation of the biogas combustion quality, composition and supply adequacy, and where applicable, detail of physical or chemical conditioning processes intended to be used for the conditioning of the biogas to render it suitable for combustion in gas appliances or work engines.

This information may require independent certification by an approved chemist or engineer before the Director assesses or accepts the gas installation design downstream of the gas supply point. For further information refer to fact sheet *Acceptance Requirements for Composition of Fuel Gas to Be Used in a Biogas or Industrial Off Gas Process Supplying a Gas Installation*, available from Building Standards and Occupational Licensing Gas Standards and Safety team – contact details below.

Materials for the construction of the reticulated landfill biogas extraction system shall comply with AS 4130 or other applicable standard acceptable to the Director.

The reticulated biogas extraction systems must be underground unless the site is fenced off and on private property.

The potential for fire damage should be considered for plastic piping and isolation that is above ground or shallow that may be vulnerable to accidental damage. Particular attention should be paid to piping upstream of any extraction blower where isolation is not possible.

All system components, such as blowers, and valves must be compatible with the biogas and other impurities and be safe for use, for example non-sparking.

The monitoring of the oxygen content within the systems is recommended to alleviate concerns of conveying gas that is within the flammable range. Alarm and trip at levels exceeding 1% to 5% respectfully is suggested. Alternative alarm and trip levels should be satisfactorily demonstrated by risk assessment.

Explosion relief and flame arrestors should be considered especially those not being monitored for oxygen.

Management of biogas collection and digester must be included in the Gas Safety Management System for the entire system including gas conditioning and utilisation plant.

FURTHER INFORMATION

For more information contact the Gas Standards and Safety team at Building Standards and Occupational Licensing

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