# TSSA DIGESTER, LANDFILL & BIOGAS APPROVAL CODE TSSA-DLB-2012 December 2012



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# TSSA TSSA DIGESTER, LANDFILL & BIOGAS APPROVAL CODE TSSA –DLB-2012 December 2012

Issued by: TECHNICAL STANDARDS AND SAFETY AUTHORITY

# **FOREWORD**

The Gaseous Fuels Code Amendment Document is hereby amended by the Director of Ontario Regulation 212/01 (Gaseous Fuels) pursuant to section 6 of Ontario Regulation 223/01 (Codes and Standards Adopted by Reference), by adopting this Code.

Definitions in this Code have the same meaning as those contained in the relevant regulations made under the *Technical Standards and Safety Act*.

This document adopts either in whole or in part:

- § the CSA B149.6-11 Code for digester gas and landfill gas installations published in 2011; and
- § the SPE-149 Interim Code Requirements for Anaerobic Digesters for Renewable Energy

This document was developed in consultation with the TSSA Gaseous Fuels Advisory Council and the TSSA Digester, Landfill and Biogas Risk Reduction Group.

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# Foreword

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# 1. General

# 1.1 Scope and Application

#### 1.1.1

This document establishes the requirements for the approval of water pollution control plants, landfill sites and biogas facilities. It covers the safe handling and operation of systems where gas may be captured, stored, transmitted or utilized

# 1.1.2

TSSA Approval is required for systems at new operations and facilities or at existing facilities where such facilities have been modified, upgraded or expanded.

#### 1.1.3

Approval under this Code concerns the safe handling of gas. It does not include the performance of any appliances or equipment nor does it cover the handling of any waste material.

#### 1.1.4

In the event of a conflict between this Code and other Codes and standards, this Code shall prevail.

#### 1.1.5

In the event of a conflict between this Code and Ontario Regulation 212/01 (Gaseous Fuels), the Regulation shall prevail.

#### 1.1.6

Where appliances require approval, such approval shall be obtained before the appliance is operated. Approval may be in the form of a certification or field approval by TSSA.

#### 1.1.7

Where a deviation from this Code is required, the party responsible must make a separate application for a variance. Approval of a variance may be obtained from the Statutory Director in accordance with the applicable provisions of the Technical Standards and Safety Act, 2000, S.O. 2000, and shall be obtained prior to its implementation or operation.

#### 1.1.8

The Approval process shall include but is not necessarily limited to: submitting the required documentation to the TSSA, a Technical Review and Site Verification and Testing

# 1.2 Required Documentation

**1.2.1** An application for digester, landfill and biogas approval shall be made to the TSSA Statutory Director and shall include:

One set of:

- (a) A Completed Application;
- (b) An description of the Scope of Work Being Conducted;
- (c) Engineering Drawings;
- (d) A List of Fuel Burning Appliances;
- (e) Specifications for Valves, Controls and Components; and

#### (f) Bill of materials

Note: If larger than 11" x 17" two sets are required

#### 1.2.2

Notwithstanding 1.2.1, an applicant may be required to provide additional information or documentation as may be required by the Director or an inspector.

# **1.3 Approval Process – Technical Review**

#### 1.3.1

The purpose of the technical review is:

- (a) To verify that the design complies with this Code and the Regulations;
- (b) To resolve any conflicts or deviations from this Code or the Regulations; and
- (c) To ensure the documentation is complete.

#### 1.3.2

Upon completion of the technical review, a design review report will be issued to the applicant/owner, invoicee and the technical contact.

# 1.4 Approval Process - Site Verification and Testing

# 1.4.1

The purpose of the site verification and testing is to confirm that:

- (i) The facility is constructed according to the reviewed documentation;
- (ii) Any appliances and/or equipment installed are done so in accordance with the applicable Code; and
- (iii) The facility performs the required safety functions and is installed in accordance with the applicable Code/standard.

### 1.4.2

The applicant/owner of the facility shall perform or shall cause to be performed, when requested to do so by an Inspector, tests deemed necessary by the Inspector, to verify proper operation of the equipment, appliances or components. The applicant/owner shall have the necessary test equipment available at the time of the test

#### 1.4.3

The inspector may require the person who possesses the required knowledge and is familiar with the facility and installation to be present during the site verification.

# 1.5 Closure and Fees

#### 1.5.1

Upon successful completion of the approval process, including technical review and site verification and testing, TSSA shall issue a written confirmation of Approval. Such Approval will be limited to the scope of the project included in the technical review and site verification process.

#### 1.5.2

The fees payable by the invoicee to the TSSA under this program shall be applied in accordance with the TSSA fee schedule in effect at the time the required activity takes place.

#### 1.5.3

All reports shall be issued to the applicant (owner of the facility), invoicee and the technical contact.

# 2. Construction, Installation and Control

#### 2.1

The CSA-B149.6-11 entitled "Code for digester and landfill gas installations" prepared by the Canadian Standards Association, is hereby adopted with the following amendments:

#### 2.1.1

Clause 1.1.1 is revoked and the following is substituted for it:

1.1.1 This Code applies to the installation of systems for the production, handling, storage, and utilization of *digester gas* in newly constructed wastewater treatment plants, as well as additions to, and the upgrading of, existing systems, so long as the pressure in the piping is not high pressure piping which is piping that exceeds 125 psig (860 kPa) in piping systems installed outdoors, or 66 psig (450) kPa) for piping systems installed indoor l. For applications which include high pressure piping, additional requirements and considerations may apply

## 2.1.2

Clause 1.1.2 is revoked and the following is substituted for it:

1.1.2 This Code applies to the installation of systems for the production, handling, and utilization of *landfill gas* in newly constructed *landfill gas* systems, as well as additions to, and the upgrading of, existing systems and temporary systems, so long as the pressure in the piping is not high pressure piping which is piping that exceeds 125 psig (860 kPa) in piping systems installed outdoors, or 66 psig (450) kPa) for piping systems installed indoor l. For applications which include high pressure piping, additional requirements and considerations may apply

#### 2.1.3

Section 3 is amended adding the following definitions:

**Biogas -** A gas produced in a digester at a location other than a Water Pollution Control Plant. It is generally composed of approximately one-half to two-thirds methane and approximately one-third carbon dioxide that is produced from organic residues with a heating value averaging approximately 590 to 700 Btu/ft<sup>3</sup> (22 to 26 MJ/m<sup>3</sup>). By the nature of the biological process under anaerobic conditions its production and constituents are considered flammable, corrosive, and potentially hazardous. It may contain traces of water, hydrogen sulphide gas and dissolved ammonium and bicarbonate ions.

Waste Gas - waste gas is defined as digester, landfill or biogas.

**Temporary Landfill Gas Collection System** - A system used for the production, handling, and utilization of landfill gas for the purpose of resource investigation and/or evaluation, temporary landfill gas collection, and/or environmental mitigation.

#### 2.1.4

Clause 4.7.6 is revoked and the following is substituted for it:

4.7.6 For all pressure vessels, they shall comply with Ontario Regulation 220/01 (Boiler and Pressure Vessels) and its referenced codes.

#### 2.1.5

Clause 5.3.2 is revoked and the following is substituted for it:

5.3.2 A *boiler*, *compressor*, stationary gas engine, or *incinerator* shall be installed with a minimum service clearance as specified by the manufacturer or 24 in (600 mm), whichever is greatest, to any side, top, or bottom where service is required to be performed.

#### 2.1.6

Clause 6.2.2.2 is revoked and the following is substituted for it:

6.2.2.2 The compressor shall be equipped with a manual local start switch which has visual indication of the trip position (compressor stopped). The restarting of the compressor shall be done locally. No remote or automatic restarting of the compressor is permitted.

#### 2.1.7

Clause 6.3.3 is revoked and the following is substituted for it:

6.3.3 For boiler valve train requirements, refer to the TSSA Field Approval Code – TSSA-FA-2012.

#### 2.1.8

Clauses 6.3.3.1 through 6.3.3.17 are revoked.

# 2.1.9

Clause 6.5.2.1 is revoked and the following is substituted for it:

6.5.2.1 The *test firing valve* shall be of the type that is **approved** to CGA 3.11 or CGA 3.16. It shall be installed upstream of the engine and downstream of the automatic *safety shut-off valves*.

#### 2.1.10

Clause 6.5.2.5 is revoked and the following is substituted for it:

6.5.2.5 An automatic **safety shut-off valve certified** to ANSI Z21.21/CSA 6.5 and marked C/I shall be required and be suitable for use with digester gas. When the input exceeds 400,000 Btu/hr (120 kW), two *valves* piped in series and wired in parallel shall be installed downstream of the main gas *pressure regulator*. The *valve* or *valves* shall be installed so that the *valve invert(s)* do not allow accumulation of moisture and debris.

#### 2.1.11

Clause 8.3.1.3(a) is revoked and the following is substituted for it:

- 8.3.1.3 Stainless steel pipe, tubing, and fittings that are not buried shall be fabricated as follows:
  - (a) Pipe in sizes ½ to 30 NPS (12.7 to 762 mm) shall be a minimum of schedule 10S, welded or seamless, that complies with ANSI/ASME B36.19M. The fittings shall be of a schedule matching the adjoining pipe and of an IPS butt-welding type that complies with ANSI/ASME B16.9 and MSS SP-43. The flanges shall be ANSI 150 lb stainless steel, slip-on, lap-joint, or welding-neck type, with flat or raised faces that comply with ASME B16.5. The joining of a raised and flat face is prohibited.

#### 2.1.12

Clause 8.3.2.2 is revoked and the following is substituted for it:

8.3.2.2 The minimum wall thickness of polyethylene piping shall conform to SDR26 of ASTM F714.

#### 2.1.13

Clause 8.5.1 is revoked and the following is substituted for it:

8.5.1 When piping passes through walls and partitions, it shall be fabricated from 316 stainless steel and shall be water and gas tight where required and shall not restrain the longitudinal movement of the pipe.

#### 2.1.14

Clause 8.5.2 is revoked and the following is substituted for it:

8.5.2 When a metal sleeve is used to protect piping which passes through an inside wall or partition, the metal used shall be of a material resistant to corrosion action from the construction material used in the wall or partition and shall be water and gas tight where required.

#### 2.1.15

Clause 8.5.3 is revoked and the following is substituted for it:

8.5.3 When piping passes through an exterior wall of masonry or concrete, the pipe material shall be 316 stainless steel and a watertight seal shall be provided using a welded water stop fin.

# 2.1.16

Clause 8.5.4 is revoked and the following is substituted for it:

8.5.4 Transition to a buried plastic pipe shall be made on the outside of the wall.

#### 2.1.17

Clause 8.8.4 is revoked and the following is substituted for it:

8.8.4 *Lubricated plug valves* shall be **approved** to CGA 3.11.

#### 2.1.18

Clause 8.8.5 is revoked and the following is substituted for it:

8.8.5 Non-lubricated *valves* shall be **approved** to CGA 3.16.

#### 2.1.19

Clause 8.8.6 is revoked and the following is substituted for it:

8.8.6 *High-performance butterfly valves* shall be **approved** to CGA 3.16 and be

- (a) corrosion resistant;
- (b) suitable for the gas composition;
- (c) suitable for the temperatures of service; and
- (d) of full lug design or flanged ends.

When used as *burner test firing valves* or as isolation *valves* on *waste gas burners*, *high-performance butterfly valves* shall also comply with API 607.

#### 2.1.20

Clause 8.10.2 is revoked and the following is substituted for it:

8.10.2 A manometer or other suitable vacuum/pressure device which does not require external power shall be provided on low-pressure gas lines generally up to 30 in W.C (760 mm water column) to indicate the pressure.

- (a) in each digester;
- (b) to the waste gas burner upstream of the overpressure control valve; and
- (c) to the boilers upstream of the backpressure control device (if provided).

#### 2.1.21

Clause 8.11.2 is revoked and the following is substituted for it:

8.11.2 A **check valve** where used, shall be made from corrosion resistant low copper aluminum and shall be suitable for the operating pressure. Valves shall be regular body, full opening swing check type with aluminum flapper for low pressure loss. Hinge pin and trim shall be stainless steel. Valves shall have ANSI 125 flat face flanges or NPT connections.

#### 2.1.22

Clause 9.10.1 is revoked:

#### 2.1.23

Clause 9.10.2 is revoked:

#### 2.1.24

Clause 13.2.2 is revoked and the following is substituted for it:

13.2.2 To maintain surveillance over any internal corrosion of a *digester gas* system, periodic internal inspections of the system shall be conducted. The inspection spools and other means of pipe inspection that are provided shall be opened for examination of the inside of the piping. This requirement is not applicable for systems that use type 316 or 316L stainless steel piping.

#### 2.1.25

Clause 15.3.2 is revoked and the following is substituted for it:

15.3.2 A *boiler*, *compressor*, stationary gas engine, or *incinerator* shall be installed with a minimum service clearance as specified by the manufacturer or 24 in (600 mm), whichever is greatest, to any side, top, or bottom where service is required to be performed.

#### 2.1.26

The following new clauses shall be added to section 16.1

16.1.4 An automatic safety shut-off valve certified to ANSI Z21.21/CSA 6.5 and marked C/I and suitable for use with landfill gas shall be provided to shut off the supply of gas to the landfill gas system on loss of power or system shutdown. The valve shall be installed so that the invert does not allow accumulation of moisture and debris and shall be:

- (a) Installed between the blowers and the collection system wellfield;
- (b) Interlocked with the blowers;
- (c) Equipped with a visual valve position indicator; and
- (d) Equipped with a mandatory manual reset function to open.

16.1.5 Valves larger than 8 NPS (200mm) shall be in accordance with 18.8.6 and safety specified in CGA-3.11 OR CSA-6.5.

#### 2.1.27

Clause 16.2.1.1 is revoked and the following is substituted for it:

16.2.1.1 When gas blowers are installed indoors in other than *hazardous areas* (e.g., *boiler* rooms), they shall be of the *sealed type*. When open type blowers are installed they shall be at least 3 meters from any source of ignition or flammable vapors.

#### 2.1.28

Clause 16.2.2.1 is revoked and the following is substituted for it:

16.2.2.1 An automatic safety shut-off valve certified to ANSI Z21.21/CSA 6.5 and marked C/I and suitable for use with landfill gas shall be provided to shut off the gas supply to the appliance when the pressure drops below the setting of the low-gas-pressure safety cut-off switch. The valve shall be installed so that the invert does not allow accumulation of moisture and debris and shall be:

- (a) Installed upstream of the appliance;
- (b) Interlocked with the blower, if the blower is dedicated to the appliance;
- (c) Equipped with a visual valve position indicator;
- (d) Equipped with a mandatory manual rest function to open

#### 2.1.29

Clause 16.3.3 is revoked and the following is substituted for it:

16.3.3 For boiler valve train requirements, refer to the TSSA Field Approval Code – TSSA-FA-2012.

#### 2.1.30

Clauses 16.3.3.1 through 16.3.3.17 are revoked.

### 2.1.31

Clause 16.4.2.2 is revoked and the following is substituted for it:

16.4.2.2 A manual shut-off *valve* complying with Clause 18.8.1 shall be installed immediately upstream of the *flash-back* (*flame*) *arrester*.

#### 2.1.32

Clause 16.5.2.1 is revoked and the following is substituted for it:

16.5.2.1 The *test firing valve* shall be of the type that is **approved** to CGA 3.11 or CGA 3.16. It shall be installed upstream of the engine and downstream of the automatic *safety shut-off valves* 

# 2.1.33

Clause 16.5.2.5 is revoked and the following is substituted for it:

16.5.2.5 An automatic *safety shut-off valve certified* to ANSI Z21.21/CSA 6.5 and marked C/I shall be required and be suitable for use with landfill gas. When the input exceeds 400,000 Btu/hr (120 kW), two *valves* piped in series and wired in parallel shall be installed downstream of the main gas *pressure regulator*. The *valve* or *valves* shall be installed so that the *valve invert(s)* do not allow accumulation of moisture and debris.

#### 2.1.34

Clause 18.1.3 is revoked and the following is substituted for it:

18.1.3a Landfill gas piping systems may be installed having slope not less than 0.5% when the condensate and gas flow is in a concurrent direction and the pipe is not buried and not installed on disturbed ground.

18.3.1b Landfill gas piping systems may be installed having slope not less than 1.0% when the condensate and gas flow are in counter flow directions and the pipe is not buried and not installed on disturbed ground.

#### 2.1.35

Clause 18.3.1.2 is revoked and the following is substituted for it:

18.3.1.2. When stainless steel flanged joints are installed, the bolts shall be finished, hexagon-type, with suitable nuts, and made of Type 304 stainless steel complying with ANSI/ASME B18.2.1, or hot-dipped galvanized.

**Note:** A suitable anti-galling compound should be applied to the mating threads of the bolts and nuts.

#### 2.1.36

Clause 18.3.1.3(a) is revoked and the following is substituted for it:

18.3.1.3 Stainless steel pipe, tubing, and fittings that are not buried shall be fabricated as follows:

(a) Pipe in sizes ½ to 30 NPS (12.7 to 762 mm) shall be a minimum of schedule 10S, welded or seamless, that complies with ANSI/ASME B36.19M. The fittings shall be of a schedule matching the adjoining pipe and of an IPS butt-welding type that complies with ANSI/ASME B16.9 and MSS SP-43. The flanges shall be ANSI 150 lb stainless steel, slip-on, lap-joint, or welding-neck type, with flat or raised faces that comply with ASME B16.5. The joining of a raised and flat face is prohibited.

#### 2.1.37

Clause 18.3.2.1 is revoked and the following is substituted for it:

18.3.2.1 Plastic pipe and fittings shall be made of polyethylene or glass fibre reinforced thermosetting resin or polyvinyl chloride (PVC) and be approved to the CAN/CSA-B137.3 or CAN/CSA-B137.4, or comply with API 15LE and ASTM D2996. The use of PVC and API 15LE pipes and fittings are restricted as follows:

- (a) PVC pipes and fittings If it is to be installed above ground inside the landfill area and upstream, on the vacuum side of the LFG system, the TSSA must be notified by way of a letter from a Professional Engineer. The letter must identify the type of piping used, state that such piping is suitable to transport landfill gas under the temperatures and pressures to which it will be exposed and certify that it is resistant to ultraviolet degradation;
- (b) API 15LE pipes and fittings If it is to be installed upstream, on the vacuum side of the LFG system, the TSSA must be notified by way of a letter from a Professional Engineer. The letter must identify the type of piping used, the SDR, and state that it is suitable to transport landfill gas under all temperatures and pressures to which it will be exposed.

# 2.1.38

Clause 18.3.2.2 is revoked and the following is substituted for it:

18.3.2.2 The minimum wall thickness of polyethylene piping shall conform to SDR26 of ASTM F714.

#### 2.1.39

Clause 18.3.2.7 is revoked and the following is substituted for it:

18.3.2.7 Plastic pipe that is adversely affected by the sun's rays must be effectively shielded from the sun's rays. Such shielding may include the use of ultraviolet-resistant additives in the plastic materials of the pipe.

#### 2.1.40

Clause 18.4.3 is revoked and the following is substituted for it:

18.4.3 Except as noted in Clause 18.4.4, landfill gas piping shall be purged of air before being put into service and shall be purged of landfill gas before being removed for inspection, repair, or replacement. Purging shall be done using carbon dioxide or nitrogen gas at a maximum positive pressure of 3.0 psig (20 kPa).

#### 2.1.41

The following new clause shall be added to section 18.4

18.4.6 Wellfield piping up to the main inlet valve on the vacuum side of the blower is exempt from the requirements in Clause 18.4.3 and 18.4.4.

#### 2.1.42

Clause 18.7.2 is revoked and the following is substituted for it:

18.7.2 All gas piping, tubing, fittings, and controls shall be painted or color coded with high-visibility yellow-orange paint. Each system of piping shall be labeled, at least every linear 10 ft (3 m), and at every change in direction, with the name of the gas being transported and the direction of flow.

# 2.1.43

Clause 18.8.3 is revoked and the following is substituted for it:

18.8.3 Lubricated plug valves shall be approved to CGA 3.11.

#### 2.1.44

Clause 18.8.4 is revoked and the following is substituted for it:

18.8.4 Non-lubricated *valves* up to 6 NPS (152 mm) in diameter shall be **approved** to CGA 3.16. Larger *valves* shall be gear operated.

#### 2.1.45

Clause 18.8.5 is revoked and the following is substituted for it:

18.8.5 High-performance butterfly valves shall comply be approved to CGA 3.16 and be

- (a) corrosion resistant;
- (b) suitable for the gas composition;
- (c) suitable for the temperatures of service; and
- (d) of full lug design, flanged ends or wafer-style

When used as *burner test firing valves* or as isolation *valves* on *waste gas burners*, *high-performance butterfly valves* shall also comply with API 607.

#### 2.1.46

Clause 18.8.5(d) is revoked and the following is substituted for it:

(d) of full lug design, flanged ends or wafer-style.

#### 2.1.47

Clause 18.10.3 is revoked and the following is substituted for it:

18.10.3 A vented pressure indicator of the manometer or Bourdon-tube (dial) type shall be provided.

#### 2.1.48

Clause 18.11.2 is revoked and the following is substituted for it:

18.11.2 A **check valve** where used, shall be made from corrosion resistant low copper aluminum and shall be suitable for the operating pressure. Valves shall be regular body, full opening swing check type with aluminum flapper for low pressure loss. Hinge pin and trim shall be stainless steel. Valves shall have ANSI 125 flat face flanges or NPT connections.

#### 2.1.49

Clause 18.14.1 is revoked and the following is substituted for it:

18.14.1 Gas pressure regulators shall be:

- (a) Corrosion resistant;
- (b) Suitable for the gas composition;
- (c) Suitable for the temperatures and pressures of service; and
- (d) Protected from the weather

The selection of the pressure regulator for the above criteria shall endorsed by a Professional Engineer.

# 2.2

The SPE-149 entitled "Interim Code Requirements for Anaerobic Digesters for Renewable Energy" prepared by the Canadian Standards Association, is hereby adopted in its entirety.