

**LNG Safety Workshop
Montreal, 6th January 2005**

**OVERVIEW OF CSA Z276
LNG – PRODUCTION, STORAGE, AND HANDLING**

- **Introduction**
- **Scope**
- **Evolution of Z276**
- **Membership**
- **Key Issues**

CSA Z276

MEMBERSHIP MATRIX

(Revised January 2, 2005)

	GI General Interest	GR Government Regulatory	OP Owner/Operator Producer	SF Supplier/Fabricator Contractor
1 Bull Brunt	◇			
2 Peter Bryce	◇			
3 Robin Charlwood	◇			
4 Jim Lewis	◇			
5 Zohar Meratia	◇			
6 Norm Trusler	◇			
7 To Be Announced		◇		
8 Rob Porter		◇		
9 Henri Simoneau		◇		
10 Doug Alexander			◇	
11 Pierre Andre Blais			◇	
12 Bill Forbes			◇	
13 John Logan			◇	
14 John Van der Pat			◇	
15 To Be Announced			◇	
16 Brian Eisentrout				◇
17 Anker Gran				◇
18 Nick Legatos				◇
TOTAL	6	3	6	3

APPROVED MATRIX

3 to 6	3 to 6	3 to 6	3 to 6
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Gail Atkinson	Carleton University	National Building Code / Seismic
Charles Bergevin	Gaz Metro	Plant Operations
Larry Gales	TSB	General Interest
Dwight Hein	Duke / Union	Plant Operations
Dick Hoffmann	Hoffmann & Feige	Chair of NFPA 59A Technical Committee
Ted Lemoff	NFPA	Manager Responsible for NFPA 59A
Jim Stannard	Stannard & Co	LNG Consultant

**CSA Z276
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(Revised September, 2004)

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(Clauses 1, 2, 3 and 4)

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Members	Brian Eisentrout Anker Gram John Van der Put

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**Subcommittee on Transfer of LNG
and Refrigerants**
(Clauses 10 and Appendix B)

Chairman	Anker Gram
Members	Norm Trusler

**Subcommittee on Operations,
Maintenance & Personnel Training**
(Clause 12)

Chairman	Stan Ballance
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CSA Standard

Z276-01

***Liquefied Natural Gas (LNG) —
Production, Storage, and Handling***



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*Published in November 2001 by Canadian Standards Association
A not-for-profit private sector organization
178 Rexdale Boulevard, Toronto, Ontario, Canada M9W 1R3
1-800-463-6727 • 416-747-4044*

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Preface

This is the seventh edition of CSA Standard Z276, *Liquefied Natural Gas (LNG) — Production, Storage, and Handling*. It supersedes the previous editions published in 1994, 1989, 1981 (with a major supplement in 1986), 1978, 1973, and 1972.

The CSA Technical Committee on Liquefied Natural Gas has had a continued liaison with the US National Fire Protection Association's Committee on Liquefied Natural Gas in reviewing and making recommendations for changes to the current edition. In the first two editions of this Standard, the Committee chose to formally adopt the then-current editions of NFPA Standard 59A. For the third edition of the Standard, the 1975 edition of NFPA Standard No. 59A was prepared in CSA format and published as a new CSA Standard in order to facilitate its use by Canadian regulatory authorities. The fourth edition was the first edition written entirely in metric (SI) units.

The fifth edition included a new and important clause on operating, maintenance, and personnel training, and a major revision of Clause 10 on the transfer of LNG and flammable refrigerants and the transportation of LNG by highway tank.

The sixth edition contained such major changes as improved requirements for primary and secondary electrical seals; improved wording of seismic design requirements to apply to concrete LNG containers; rewording of the requirements for a vapour dispersion model to recognize continuing development in this field; and provisions for calculating heat flux from a fire over an irregular area.

For the current edition, the CSA and NFPA Technical Committees attempted to harmonize their standards. However, the two standards were modified to meet their respective countries' regulatory requirements.

This edition contains the following major changes:

- (a) improved wording of seismic design requirements in Clause 6.1.3 to apply to stationary LNG containers and of information on seismic design of LNG plants in Appendix A; and
- (b) minor editorial changes to several clauses to bring the Standard closer to NFPA Standard 59A while maintaining Canadian regulatory requirements.

This Standard contains basic reference data relating to design, supplemented by specific requirements, where necessary, to obtain a uniform interpretation of the design requirements.

This Standard was prepared by the Technical Committee on Liquefied Natural Gas, under the jurisdiction of the Strategic Steering Committee on Oil and Gas Industry Systems and Materials, and has been formally approved by the Technical Committee.

November 2001

Notes:

- (1) Use of the singular does not exclude the plural (and vice versa) when the sense allows.
- (2) Although the intended primary application of this Standard is stated in its Scope, it is important to note that it remains the responsibility of the users of the Standard to judge its suitability for their particular purpose.
- (3) This publication was developed by consensus, which is defined by CSA Policy governing standardization — Code of good practice for standardization as "substantial agreement". Consensus implies much more than a simple majority, but not necessarily unanimity. It is consistent with this definition that a member may be included in the Technical Committee list and yet not be in full agreement with all clauses of this publication.
- (4) CSA Standards are subject to periodic review, and suggestions for their improvement will be referred to the appropriate committee.
- (5) All enquiries regarding this Standard, including requests for interpretation, should be addressed to Canadian Standards Association, 178 Rexdale Boulevard, Toronto, Ontario, Canada M9W 1R3.

Requests for interpretation should

- (a) define the problem, making reference to the specific clause, and, where appropriate, include an illustrative sketch;
- (b) provide an explanation of circumstances surrounding the actual field condition; and
- (c) be phrased where possible to permit a specific "yes" or "no" answer.

Committee interpretations are processed in accordance with the CSA Directives and guidelines governing standardization and are published in CSA's periodical Info Update. For subscription details, write to CSA Sales Promotion, Info Update, at the address given above.

Z276-01

Liquefied Natural Gas (LNG) — Production, Storage, and Handling

0. Introduction

This Standard establishes essential requirements and minimum standards for the design, installation, and safe operation of liquefied natural gas (LNG) facilities. It is not a design handbook, and competent engineering judgment is necessary for its proper use.

1. Scope

1.1

This Standard applies to the

- (a) design;
- (b) location;
- (c) construction;
- (d) operation; and
- (e) maintenance

of facilities at any location for the liquefaction of natural gas and for the storage, vaporization, transfer, handling, and truck transport of liquefied natural gas (LNG), as well as the training of personnel involved.

1.2

This Standard applies to all containers for the storage of LNG, including those with insulation systems applying a vacuum.

1.3

This Standard does not apply to frozen ground containers.

1.4

This Standard includes non-mandatory guidelines for small LNG facilities (see the definition for “Small facility” in Clause 2.1 and see Clause B2.1).

1.5

This Standard does not apply to the following:

- (a) the transportation of refrigerants by any means;
- (b) the transportation of LNG by railcar, marine vessel, or pipeline; and
- (c) facilities designed to allow the use of LNG as a fuel for highway vehicles, railroad locomotives, or marine vessels.

1.6

All references to pressure throughout this document are gauge pressures unless otherwise specified.

1.7

All pipe sizes are shown as nominal pipe sizes (NPS).

10.4 Marine Shipping and Receiving

10.4.1

The design, construction, and operation of piers, docks, and wharves shall comply with the requirements of the regulatory authorities. For information on operation of piers, docks, and wharves, see Transport Canada Publication TP 743 or NFPA Standard 30.

November 2001

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10.4.2

Loading arms for marine loading and unloading shall be provided with alarms to indicate when the arms are approaching the limits of the extension envelopes.

10.4.3

Piping and components shall be located on the dock or pier so that they are not exposed to damage. Underwater piping shall be located or protected so that it is not exposed to damage, and its location shall be posted or identified as required.

10.4.4

Isolation valving and bleed connections shall be provided at the loading or unloading manifold for both liquid and vapour return lines so that hoses and arms can be blocked off, drained or pumped out, and depressurized before disconnecting. Liquid isolation valves, regardless of size, and vapour valves NPS 8 and larger shall be equipped with powered operators, in addition to a means for manual operation. Power-operated valves shall be capable of being closed both locally and from a remote control station located at least 15 m (50 ft) from the manifold area. Unless the valve automatically closes on loss of power, the valve actuator and its power supply within 15 m (50 ft) of the valve shall be protected against operational failure due to a fire exposure of at least 10 min duration. Valves shall be located at the point of hose or arm connection to the manifold. Bleeds or vents shall discharge to a safe area.

10.4.5

In addition to the isolation valves at the manifold, each vapour return and liquid transfer line shall be provided with a readily accessible isolation valve located on shore near the approach to the pier or dock. Where more than one line is involved, the valves shall be grouped in one location. Valves shall be identified for their service. Valves NPS 8 and larger shall be equipped with powered operators. Means for manual operation shall be provided.

10.4.6

Pipelines used for liquid unloading only shall be provided with a check valve located at the manifold adjacent to the manifold isolation valve.

10.4.7

Marine terminals used for loading ships or barges shall be equipped with a vapour return line designed to connect to the vessel's vapour return connections.

12.3.10 Marine Shipping and Receiving

12.3.10.1

General cargo, other than ships' stores for the LNG tank vessel, shall not be handled over a pier or dock within 30 m (100 ft) of the point of transfer connection while LNG or flammable fluids are being transferred through piping systems. Ship bunkering may be done, provided that bunkering is from a pipeline rather than a barge and after the LNG transfer is stabilized.

12.3.10.2

Vehicular traffic shall be prohibited on the pier or dock within 30 m (100 ft) of the loading and unloading manifold while transfer operations are in progress. Warning signs or barricades shall be used to indicate that transfer operations are in progress.

12.3.10.3

Prior to transfer, the officer in charge of vessel cargo transfer and the person in charge of the shore terminal shall inspect their respective facilities to ensure that transfer equipment is in the proper operating condition. Following this inspection, they shall meet and determine the transfer procedure, verify that adequate ship-to-shore communications exist, and review emergency procedures.