# Contents

Technical Committee on Highway Tanks and Portable Tanks for Transportation of Dangerous Goods x

Preface xiii

**1. Scope** 1

### **2. Reference Publications** 2

### 3. Terminology and Definitions 5

3.1 Terminology 5
3.1.1 General 5
3.1.2 The Term "Lethal Substance" in the ASME Code 5
3.2 Definitions 5

## 4. General 8

- 4.1 Highway Tanks 8
- 4.2 Portable Tanks 9
- 4.3 Welding 9
- 4.4 Tank and Plate Markings 9
- 4.5 Certificates and Reports 9

### 5. Specifications for Highway Tanks 9

5.1 Requirements for All Highway Tanks 9 5.1.1 The ASME Code 9 5.1.2 Means of Containment 11 5.1.3 Securement 12 5.1.4 Supports for Attachments and Appurtenances 12 5.1.5 Rear-End Protection 13 5.1.6 Marking 14 5.1.7 Certification 17 5.2 Highway Tanks for the Transportation of Liquefied Compressed Gases — Specification TC 331, TC 338, and TC 341 Tanks 18 5.2.1 General 18 5.2.2 Piping, Valves, and Fittings 18 5.2.3 Gauging Devices 22 5.2.4 Safety Relief Devices 23 5.2.5 Tank Design and Test Pressures 24 5.2.6 Inner Vessel or Tank Support Pads 25 5.2.7 Inspection Openings and Manholes 25 5.2.8 Ground Clearance 26 5.3 Highway Tanks Primarily for the Transportation of Compressed Gases as Liquefied Gas — Specification TC 331 Highway Tanks 26 5.3.1 Construction Standards 26 5.3.2 Design 26 5.3.3 Postweld Heat Treatment 27 5.3.4 Material 27 5.3.5 Material Thickness 28 5.3.6 Structural Integrity 28

5.3.7 Welding 31 5.3.8 Refrigeration and Heating Coils 32 5.3.9 Supports 32 5.3.10 Inspection and Testing 32 5.3.11 Marking 33 5.4 Insulated Highway Tanks — Specification TC 338 Tanks 33 5.4.1 Construction Standards 33 5.4.2 Design 33 5.4.3 Insulation 34 5.4.4 Material 35 5.4.5 Postweld Heat Treatment 35 5.4.6 Sketches 35 5.4.7 Material Thickness 35 5.4.8 Stress Calculations 36 5.4.9 Joints 37 5.4.10 Manholes 37 5.4.11 Openings 37 5.4.12 Holding Time 37 5.4.13 Inner Vessel or Jacket Supports 38 5.4.14 Supports for Protected Inner Vessel 39 5.4.15 Gauging Devices 39 5.4.16 Cleanliness 40 5.4.17 Inspection and Testing 40 5.4.18 Marking 41 5.4.19 Pressure Relief and Control 41 5.5 Highway Tanks for the Transportation of Nonflammable Refrigerated Liquids — Specification TC 341 Tanks 42 5.5.1 Inner Vessel Construction 42 5.5.2 Design Pressure 42 5.5.3 Material Thickness 43 5.5.4 Inner Vessel Interior 43 5.5.5 Inner Support System 43 5.5.6 Compatibility 43 5.5.7 Insulation Combustibility in Oxygen Service 43 5.5.8 Vacuum Gauge 43 5.5.9 Jacket 43 5.5.10 Materials 46 5.5.11 Joints 47 5.5.12 Openings and Controls 47 5.5.13 Pressure-Relief Devices 47 5.5.14 Piping, Valves, and Fittings 48 5.5.15 Frameless Highway Tanks — Supports and Anchoring 48 5.5.16 Gauging Devices 49 5.5.17 Inspection and Testing 49 5.5.18 Marking 49 5.6 Highway Tanks for the Transportation of Dangerous Goods Other Than Liquefied Compressed Gases — Specification TC 406, TC 407, TC 412, and TC 423 Tanks 49 5.6.1 General Requirements 49 5.6.2 Multi-tank Vehicle Connecting Structures and Drains 50 5.6.3 Material 50 5.6.4 Structural Integrity 53 5.6.5 Joints 55 5.6.6 Manhole Assemblies 55 5.6.7 Supports and Anchoring 56

July 2003

5.6.8 Circumferential Reinforcements 56 5.6.9 Damage Protection 58 5.6.10 Pumps, Piping, Hoses, and Connections 60 5.6.11 Pressure Relief 61 5.6.12 Tank Outlets 63 5.6.13 Gauging Devices 64 5.6.14 Pressure and Leakage Tests 64 5.6.15 Connections for Reinforced Plastic Tanks 64 5.7 Highway Tank Vehicle — Specification TC 406 64 5.7.1 General 64 5.7.2 Maximum Allowable Working Pressure (MAWP) 65 5.7.3 Material 65 5.7.4 Pressure Relief 65 5.7.5 Outlets 66 5.7.6 Specification TC 406 Crude Tanks 66 5.8 Highway Tank Vehicle — Specification TC 407 67 5.8.1 General Requirements 67 5.8.2 Material 67 5.8.3 Manhole Assemblies 67 5.8.4 Vacuum Relief 67 5.9 Highway Tank Vehicle — Specification TC 412 67 5.9.1 General Requirements 67 5.9.2 Material 68 5.9.3 Vacuum Relief 68 5.9.4 Alternative Minimum Venting Capacity for Tanks Transporting Corrosive Materials 68 5.10 Highway Tanks for the Transportation of Emulsion and Water-Gel Explosives — Specification TC 423 69 5.10.1 General 69 5.10.2 Material and Material Thickness 69 5.10.3 Circumferential Reinforcement 70 5.10.4 Insulation System 70 5.10.5 Pressure- and Vacuum-Relief Devices 71 5.10.6 Thermometer 71 5.10.7 Restrictions on Valves, Fittings, and Hardware 71 5.10.8 Cleaning and Drainage 71 5.10.9 Security 72 5.10.10 Electrical Wires and Fixtures 72 5.10.11 Heating Systems 72 5.10.12 Pumping Systems 72 6. Portable Tanks Other Than Intermodal Portable Tanks 80 6.1 Requirements for All Portable Tanks 80 6.1.1 General 80 6.1.2 The ASME Code 80 6.1.3 Means of Containment 80 6.1.4 Marking 80 6.1.5 Tank Mountings 81 6.1.6 Piping, Valves, and Fittings 82 6.1.7 Safety Relief Devices 83 6.1.8 Certificate of Compliance 84 6.2 Steel Portable Tanks — Specification TC 51 85 6.2.1 Construction Standards 85 6.2.2 Design 85 6.2.3 Material 85

6.2.4 Welding 85 6.2.5 Postweld Heat Treatment 86 6.2.6 Marking 86 6.2.7 Location of Openings 86 6.2.8 Gauging Devices 86 6.2.9 Additional Safety Devices 87 6.3 Portable Tanks for the Transportation of Liquid Dangerous Goods — Specification TC 60 88 6.3.1 Construction Standards 88 6.3.2 Postweld Heat Treatment 88 6.3.3 Design 88 6.3.4 Material Thickness 88 6.3.5 Expansion Domes 88 6.3.6 Manhole Cover Attachments 88 6.3.7 Bottom Openings 88 6.3.8 Design and Closures of Openings 89 6.3.9 Multi-tank Units 89 6.3.10 Lining 89 6.3.11 Pressure Test 89 6.4 Portable Tanks for the Transportation of Nonflammable Atmospheric Gases as Refrigerated Liquids — Specification TC 11 Portable Tanks 89 6.4.1 Construction Standards - 89 6.4.2 Inner Vessel 90 6.4.3 Insulation 92 6.4.4 Jacket 92 6.4.5 Cleanliness 92 6.4.6 Openings and Controls 93 6.4.7 Pressure-Relief Devices 93 6.4.8 Piping, Valves, and Fittings 93 6.4.9 Supports and Anchoring 94 6.4.10 Gauging Devices 94 6.4.11 Inspection and Testing 94 6.4.12 Marking 95 7. Inspection, Testing, and Maintenance of Tanks 95 7.1 Periodic and Obligatory Inspection and Testing 95 7.1.1 General Requirements for Periodic Inspection and Testing 95 7.1.2 Obligatory Testing 95 7.1.3 Decontamination 96 7.2 Inspections and Tests 96 7.2.1 External Inspection 96 7.2.2 Internal Inspection 97 7.2.3 Lining Inspection 98 7.2.4 Upper Coupler Inspection 98 7.2.5 Leakage Test 98 7.2.6 Thickness Test 99 7.2.7 Pressure Tests 100 7.2.8 Internal Inspection by the Wet Fluorescent Magnetic Particle Method 101 7.2.9 Test of Off-truck Emergency Shutdown System 102 7.2.10 Hose Assembly Inspection and Testing 102 7.3 Test and Inspection Reports 103 7.3.1 General 103 7.3.2 Welding Inspection Reports 104 7.3.3 Retention of Reports 104 7.4 Periodic Test or Inspection Marking 104

- 7.5 Repairs to Tanks 105
- 7.5.1 General 105
- 7.5.2 Decontamination Prior to Repairs 105
- 7.5.3 Exception Postweld Heat Treatment of Minor Repairs 105
- 7.5.4 Repair Procedures for Pressure Tank Trucks and Trailers 105
- 7.5.5 Overlay Patches 105
- 7.5.6 Field Welding 106
- 7.5.7 Testing and Inspection of Repairs 106
- 7.5.8 Additional Inspection for Pressure Tanks 106
- 7.5.9 Record Retention and Transfer 106

# 8. Facility Registration, Design Engineer Registration, Marking, Documentation, and Design Review Requirements 111

- 8.1 Facility Registration 111
- 8.1.1 General 111
- 8.1.2 Mobile Unit Limitation 112
- 8.1.3 Specific Requirements 112
- 8.1.4 Application for Registration 113
- 8.1.5 Design Engineer 114
- 8.1.6 Tank Inspector Qualification 114
- 8.1.7 Tester Qualification 115
- 8.2 Documentation 115
- 8.2.1 Certificate of Compliance 115
- 8.2.2 Reports of Inspections and Tests during Manufacture or Modification 115
- 8.3 Design Review 116
- 8.3.1 General 116
- 8.3.2 Manufacturer's Design Identification Number (MDIN) 116
- 8.3.3 Transport Canada Registration Number (TCRN) 116
- 8.3.4 Changes in Design and Tank Modification 117
- 8.4 Marking 117

### Appendices

- **A** Transition and Retrofitting 118
- **B** Sample Registration Documents 121
- C Alternatives to Internal Inspection of Vacuum-Insulated TC 341 Highway Tanks 129
- D Tests for Off-truck Emergency Shutdown Systems 135

# **Technical Committee on Highway Tanks and Portable Tanks for Transportation of Dangerous Goods**

B. Montague	Ontario Trucking Association, Toronto, Ontario	Chair
R.T. Hutchinson	Hutchinson Industries, Toronto, Ontario	Vice-Chair
F.B. Adams	Air-Products Canada Limited, Brampton, Ontario	Associate
J.E. Albrechtsen	Paul's Hauling Ltd., Winnipeg, Manitoba	
N. Attirgi	Bedard Tankers Inc., Montréal, Québec	
R. Awad	Régie du bâtiment du Québec, Montréal, Québec	Associate
R. Bahia	Advance Engineered Products Limited, Regina, Saskatchewan	
C. Benedetti	Transportation Safety Association of Ontario, Toronto, Ontario	Associate
H.F. Bickmore	Petro-Canada Products, Downsview, Ontario	
R. Boies	Ministère des Transports, Québec, Québec	
G. Buck	Pro-Par (1978) Inc., Lennoxville, Québec	
L.R. Comtois	Trimac Transportation Services, Kirkland, Québec	
J. Conley	National Tank Truck Carriers Incorporated, Alexandria, Virginia, USA	Associate
G. Dickson	Agricore United, Winnipeg, Manitoba Representing Agricore United and Ammonia Safety Council	
D. Ferguson	Goldec-Hamm's Manufacturing Ltd., Red Deer, Alberta	

D. Finlayson	Canadian Fertilizer Institute, Ottawa, Ontario	Associate
S. Godwin	Cusco Industries Incorporated, Richmond Hill, Ontario	
K. Green	Transport Canada, Ottawa, Ontario	
J. Harpin	Alberta Transportation Safety Services, Edmonton, Alberta	
L. Hébert	Tremcar Incorporated, Iberville, Québec	Associate
Y. Huang	Royal and Sun Alliance Insurance Company of Canada, Toronto, Ontario	Associate
C. Hughes	Transportation Technical Resources Ltd., Calgary, Alberta	
R. Lalonde	Praxair Canada Inc., St-Laurent, Québec	
D. Lamarche	Transport Canada, Ottawa, Ontario	Associate
K.T. Lau	Alberta Boilers Safety Association, Edmonton, Alberta	Associate
B. McWhirter	Alberta Boilers Safety Association, Edmonton, Alberta	
G. Nikolic	Underwriters' Laboratories of Canada, Scarborough, Ontario	Associate
J. Olson	Crude Oil Production & Transportation Association, Lloydminster, Alberta	
J.K. O'Steen	United States Department of Transportation, Washington, DC, USA	Associate
A. Park	Compressed Gas Association, Ottawa, Ontario	
J. Park	Universal Sales Limited, Saint John, New Brunswick	
M. Plut	Nordic Systems Incorporated, Mississauga, Ontario	Associate
J. Rasmussen	Quicksilver Manufacturing Ltd., Strome, Alberta	
R.E. Reid	Reid Engineering Services, Calgary, Alberta	

D. Scheifley	Clemmer Technologies Inc., Waterloo, Ontario	Associate
L.A. Schneider	Gibson Energy Ltd., Edmonton, Alberta	
V. Seeley	RST Industries, Saint John, New Brunswick	
Y.D. Sharma	Technical Standards & Safety Authority, Toronto, Ontario	
G. Snider	Lloydminster Heavy Crude Services Ltd., Lloydminster, Alberta	Associate
S. Sparling	Sparling's Propane Co. Ltd., Blyth, Ontario Representing Ontario Propane Association	Associate
R. Sprenger	SteelCraft Industries Limited, Stratford, Ontario	
D.J. Stainrod	D.J. Stainrod & Associates Ltd., Bowmanville, Ontario	
B. Steeves	Irving Oil Limited, St. John, New Brunswick	Associate
R.L. Wedge	Imperial Oil, Toronto, Ontario	
D.J. Wisdom	Ville d'Anjou, Québec	Associate
M. Dodd	CSA, Mississauga, Ontario	Project Manager

# Preface

This is the third edition of CSA Standard B620, *Highway Tanks and Portable Tanks for the Transportation of Dangerous Goods*. It supersedes the previous editions published in 1998 and 1987.

This Standard specifies requirements for highway tanks, portable tanks, fibre-reinforced plastic (FRP) highway tanks, and pressure/vacuum liquid waste highway tanks for the transportation of dangerous goods.

It is the intent of the CSA Technical Committee to further develop this Standard in the future in co-operation with industry representation and regulatory authorities in Canada and the USA to meet the needs of Canada and to achieve a maximum degree of uniformity with the USA.

It should be noted that this Standard, by itself, does not have the force of law unless it is officially adopted by a regulatory authority. Since the Standard may be adopted into regulations with certain exceptions or additional requirements, it is recommended that the regulations of the relevant jurisdiction be consulted in order to establish the extent to which this Standard has been adopted. Where an industry practice differs from the requirements of this Standard, an application for a permit for equivalent level of safety may be requested from the regulatory authority.

This Standard was prepared by the Technical Committee on Highway Tanks and Portable Tanks for Transportation of Dangerous Goods, under the jurisdiction of the Strategic Steering Committee on Mechanical Industrial Equipment Safety, and has been formally approved by the Technical Committee. It will be submitted to the Standards Council of Canada for approval as a National Standard of Canada.

#### July 2003

#### 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, 5060 Spectrum Way, Suite 100, Mississauga, Ontario, Canada L4W 5N6.

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, which is available on the CSA Web site at www.csa.ca.

# B620-03 **Highway Tanks and Portable Tanks for the Transportation of Dangerous Goods**

# 1. Scope

# 1.1

This Standard applies to tanks, other than intermediate bulk containers and tubes, used for the transportation of dangerous goods primarily by road. It considers the design, construction, certification, assembly, modification, repair, testing, inspection and periodic retesting, maintenance, and identification of such tanks. Additional design and construction requirements for tanks intended to carry specific products are provided in CSA B621, CSA B622, and CAN/CGSB 43.151 (see Clause 2).

# 1.2

The Transportation of Dangerous Goods (TDG) Act and the Transportation of Dangerous Goods Regulations can set out requirements that are additional to or different from those in this Standard due to particular characteristics or properties of individual dangerous goods. Where there is an inconsistency between the requirements of this Standard and those of the Act or Regulations, the Act or Regulations prevail to the extent of the inconsistency.

# 1.3

The use of this Standard does not reduce the necessity for competent engineering judgment or complete design calculations that take into account the intended use of the tank. The values of the various parameters in this Standard are the limiting values to which the tank is restricted. It is the responsibility of the tank manufacturer to ensure that the tank will safely carry out its intended function within these constraints.

# 1.4

In CSA standards, "shall" is used to express a requirement, i.e., a provision that the user is obliged to satisfy in order to comply with the standard; "should" is used to express a recommendation or that which is advised but not required; and "may" is used to express an option or that which is permissible within the limits of the standard. Notes accompanying clauses do not include requirements or alternative requirements; the purpose of a note accompanying a clause is to separate from the text explanatory or informative material. Notes to tables and figures are considered part of the table or figure and may be written as requirements. Legends to equations and figures are considered requirements.

# 1.5

The values given in SI (metric) units are the standard. The values given in parentheses are for information only.