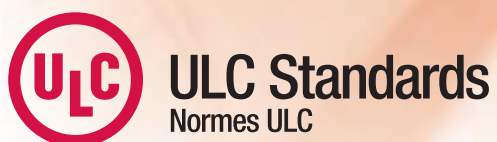




**CAN/ULC-S515-13-R2018
(Reaffirmed 2018)**

STANDARD FOR AUTOMOBILE FIRE FIGHTING APPARATUS



Standards Council of Canada
Conseil canadien des normes



Underwriters Laboratories of Canada (ULC) was established in 1920 by letters patent issued by the Canadian Government. It maintains and operates laboratories and certification services for the examination, testing and certification of appliances, equipment, materials, constructions and systems to determine their relation to life, fire and property hazards as well providing inspection services.

Underwriters Laboratories of Canada is accredited as a Certification Organization, a Testing Organization, and an Inspection Body under the National Standards System of Canada.

ULC Standards develops and publishes standards and other related publications for building construction, security and burglar protection, environmental safety, electrical equipment, fire protection equipment, gas and oil equipment, thermal insulation products, materials and systems, energy use in the built environment and electrical utility safety.

ULC Standards is a not-for-profit organization and is accredited by the Standards Council of Canada as a Standards Development Organization.

National Standards of Canada developed by ULC Standards conform to the criteria and procedures established by the Standards Council of Canada. Such standards are prepared using the consensus principle by individuals who provide a balanced representation of interests relevant to the subject area on a national basis.

ULC is represented across Canada as well as many countries worldwide. For further information on ULC services, please contact:

Customer Service: 1-866-937-3852

National Standard of Canada

A National Standard of Canada is a standard developed by a Standards Council of Canada (SCC) accredited Standards Development Organization, in compliance with requirements and guidance set out by SCC. More information on National Standards of Canada can be found at www.scc.ca.

SCC is a Crown corporation within the portfolio of Innovation, Science and Economic Development (ISED) Canada. With the goal of enhancing Canada's economic competitiveness and social well-being, SCC leads and facilitates the development and use of national and international standards. SCC also coordinates Canadian participation in standards development, and identifies strategies to advance Canadian standardization efforts.

Accreditation services are provided by SCC to various customers, including product certifiers, testing laboratories, and standards development organizations. A list of SCC programs and accredited bodies is publicly available at www.scc.ca.

CORPORATE HEADQUARTERS

Underwriters Laboratories of Canada
7 Underwriters Road
Toronto, Ontario M1R 3A9
Telephone: (416) 757-3611
Fax: (416) 757-9540

REGIONAL OFFICES

PACIFIC OFFICE

13775 Commerce Parkway, Suite 130
Richmond, British Columbia V6V 2V4
Telephone: (604) 214-9555
Fax: (604) 214-9550

EASTERN OFFICE

6505, Rte Transcanadienne, Suite 330
St-Laurent, Québec H4T 1S3
Telephone: (514) 363-5941
Fax: (514) 363-7014

For further information on ULC standards, please contact:

ULC STANDARDS

171 Nepean Street, Suite 400
Ottawa, Ontario K2P 0B4
Telephone: (613) 755-2729

To purchase ULC Standards, visit: www.ulc.ca/ulcstandards

The intended primary application of this standard is stated in its scope. It is important to note that it remains the responsibility of the user of the standard to judge its suitability for the particular application.

Copies of this National Standard of Canada may be ordered from ULC Standards.

CETTE NORME NATIONALE DU CANADA EST DISPONIBLE EN VERSIONS FRANÇAISE ET ANGLAISE

Standard for Automobile Fire Fighting Apparatus, CAN/ULC-S515-13-R2018

Third Edition, Dated March 2013

Summary of Topics

This revision of CAN/ULC-S515 is being issued to update the title page to reflect the reaffirmation of this Third Edition National Standard of Canada. No changes in requirements are involved.

The revised requirements are substantially in accordance with Proposal(s) on this subject dated December 12, 2017.

PLEASE NOTE THAT CERTAIN CODES MAY REFER TO A SUPERSEDED VERSION OF THIS STANDARD. IN THOSE INSTANCES, THE RELEVANT VERSIONS ARE AVAILABLE FOR PURCHASE.

Comments, or proposals for revisions on any part of this Standard, may be submitted to ULC Standards at any time. Proposals should be submitted via a Proposal Request in ULC Standards' on-line Collaborative Standards Development System (CSDS) at <https://csds.ul.com/canada>.

No Text on This Page



STANDARD FOR AUTOMOBILE FIRE FIGHTING APPARATUS

ICS 13.220.10



Standards Council of Canada
Conseil canadien des normes

First Edition. October 1988
Second Edition September 2004
THIRD EDITION MARCH 2013
REAFFIRMED MAY 2018

Copyright © 2018

ULC Standards

All rights reserved. No part of this publication may be reproduced in any form, in an electronic retrieval system or otherwise, without prior permission.

TABLE OF CONTENTS

ULC STANDARDS COMMITTEE ON FIRE PROTECTION EQUIPMENT AND SYSTEMS	I
ULC STANDARDS SUBCOMMITTEE ON AUTOMOBILE FIRE FIGHTING APPARATUS	II
REFERENCE PUBLICATIONS	III
PREFACE	VIII
1 SCOPE	1
2 GLOSSARY	1
3 GENERAL REQUIREMENTS	8
3.1 COMMON REQUIREMENTS	8
3.2 RESPONSIBILITY OF PURCHASER	9
3.3 RESPONSIBILITY OF CONTRACTOR	9
3.4 PERSONNEL PROTECTION	9
3.5 CONTROLS AND INSTRUCTIONS	10
3.6 COMPONENT PROTECTION	10
3.7 VEHICLE STABILITY	11
3.8 WEIGHT DISTRIBUTION	11
3.9 LOAD DISTRIBUTION	12
3.10 APPARATUS PERFORMANCE	12
3.11 ROAD PERFORMANCE	12
3.12 SERVICEABILITY	12
3.13 ROAD TESTS	13
3.14 TESTS ON DELIVERY	13
3.15 DOCUMENTATION	13
3.15.1 General	13
3.15.2 Fire Fighting Apparatus Documentation	14
3.15.3 Operations and Service Documentation	15
 PART I – APPARATUS REQUIREMENTS	
4 PUMPER FIRE FIGHTING APPARATUS	16
4.1 GENERAL	16
4.2 FIRE PUMP	17
4.3 WATER TANK	17
4.4 EQUIPMENT STORAGE	17
4.5 HOSE STORAGE	17
4.6 AERIAL DEVICE	18
4.7 GROUND LADDERS	18
4.8 SUCTION HOSE	18
4.9 MINOR EQUIPMENT	19
4.9.1 General	19
4.9.2 Fire Hose And Nozzles	19
4.9.3 Miscellaneous Equipment	19

5 AERIAL FIRE FIGHTING APPARATUS	21
5.1 GENERAL	21
5.2 AERIAL DEVICE	21
5.3 FIRE PUMP	21
5.4 WATER TANK	22
5.5 EQUIPMENT STORAGE	22
5.6 HOSE STORAGE	22
5.7 GROUND LADDERS	22
5.8 MINOR EQUIPMENT	22
5.8.1 General	22
5.8.2 Miscellaneous Equipment	23
6 INITIAL ATTACK FIRE FIGHTING APPARATUS (MINI-PUMPER)	25
6.1 GENERAL	25
6.2 FIRE PUMP	26
6.3 WATER TANK	26
6.4 EQUIPMENT STORAGE	26
6.5 HOSE STORAGE	26
6.6 GROUND LADDERS	26
6.7 SUCTION HOSE	26
6.8 MINOR EQUIPMENT	27
6.8.1 General	27
6.8.2 Fire Hose and Nozzles	27
6.8.3 Miscellaneous Equipment	27
7 QUINT FIRE FIGHTING APPARATUS	28
7.1 GENERAL	28
7.2 FIRE PUMP	29
7.3 AERIAL DEVICE	29
7.4 WATER TANK	30
7.5 EQUIPMENT STORAGE	30
7.6 HOSE STORAGE	30
7.7 GROUND LADDERS	30
7.8 SUCTION HOSE	30
7.9 MINOR EQUIPMENT	31
7.9.1 General	31
7.9.2 Fire Hose and Nozzles	31
7.9.3 Miscellaneous Equipment	32
8 MOBILE FOAM FIRE FIGHTING APPARATUS	33
8.1 GENERAL	33
8.2 FIRE PUMP	33
8.3 AERIAL DEVICE	34
8.4 FOAM PROPORTIONING SYSTEM	34
8.5 FOAM TANK	34
8.6 EQUIPMENT STORAGE	34
8.7 HOSE STORAGE	34
8.8 MINOR EQUIPMENT	35
8.8.1 General	35

8.8.2 Fire Hose and Nozzles	35
8.8.3 Miscellaneous Equipment	35
9 MOBILE WATER SUPPLY FIRE FIGHTING APPARATUS	36
9.1 GENERAL	36
9.2 FIRE PUMP	37
9.3 WATER TANK	37
9.4 EQUIPMENT STORAGE	37
9.5 HOSE STORAGE	37
9.6 SUCTION HOSE	37
9.7 DUMP VALVE	38
9.8 MINOR EQUIPMENT	38
9.8.1 General	38
9.8.2 Fire Hose and Nozzles	38
9.8.3 Equipment	39
10 SPECIAL SERVICES FIRE FIGHTING APPARATUS	40
10.1 GENERAL	40
10.2 FIRE PUMP	40
10.3 EQUIPMENT STORAGE	40
10.4 GROUND LADDERS	40
10.5 SUCTION HOSE	41
10.6 MINOR EQUIPMENT	41
10.6.1 General	41
10.6.2 List of Equipment	41
 PART II – EQUIPMENT REQUIREMENTS	
11 CHASSIS, ENGINE AND APPARATUS COMPONENTS	42
11.1 GENERAL	42
11.2 CARRYING CAPACITY	42
11.3 ENGINE AND ENGINE SYSTEM DESIGN	43
11.3.1 Chassis Engine	43
11.3.2 Engine Speed Auxiliary Control Device	44
11.3.3 Cooling System	44
11.3.3.1 General	44
11.3.3.2 Drain Valves	44
11.3.4 Lubrication System	44
11.3.5 Fuel and Air System	45
11.3.5.1 Diesel Engines	45
11.3.5.1.1 Air Intake Systems	45
11.3.5.1.2 Electric Fuel Priming System	46
11.3.5.2 Gasoline Engines	46
11.3.5.2.1 Air Intake Systems	46
11.3.5.2.2 Fuel System	46
11.3.6 Exhaust System	47
11.4 AUTOMOBILE COMPONENTS	47
11.4.1 Braking System	47
11.4.2 Parking Brakes	48

11.4.3	Suspension and Wheels	48
11.4.4	Steering	48
11.4.5	Tractor-Drawn Aerial Fire Fighting Apparatus	49
11.4.6	Transmission	49
11.4.7	Fuel Tank	49
11.4.8	Tow Hooks	50
12	LOW-VOLTAGE ELECTRICAL SYSTEMS AND WARNING DEVICES	50
12.1	GENERAL	50
12.2	WIRING	50
12.2.1	General	50
12.2.2	Wiring and Wire Harness Construction	50
12.2.3	Power Supply	52
12.2.3.1	General	52
12.2.3.2	Load Management	52
12.3	BATTERIES	53
12.4	STARTING DEVICE	54
12.5	TEMPERATURE EXPOSURE	54
12.6	ELECTRO-MAGNETIC INTERFERENCE	54
12.7	OPTICAL WARNING DEVICES	54
12.7.1	General	54
12.7.2	Flash Rate	55
12.7.3	Warning Light Colours	56
12.7.4	Requirements for Large Apparatus	56
12.7.5	Requirements for Small Apparatus	57
12.7.6	Tests of Optical Warning Devices	57
12.7.6.1	Mechanical and Environmental Test	57
12.7.6.2	Photometric Test Procedures for Optical Devices	58
12.8	AUDIBLE WARNING DEVICES	59
12.9	WORK LIGHTING	59
12.9.1	Ground Lighting	59
12.9.2	Hose Bed Lighting	59
12.9.3	Surface Lighting	59
12.9.4	Interior Lighting	59
12.9.5	Compartment Lighting	60
12.9.6	Switching	60
12.9.7	Protection	60
12.9.8	Testing	60
12.10	HAZARD LIGHT	60
12.11	BACKUP ALARM	61
12.12	STOP, TAIL, AND DIRECTIONAL LIGHTS	61
12.13	ELECTRICAL SYSTEM PERFORMANCE TESTS	61
12.13.1	General	61
12.13.2	Test Sequence	62
12.13.2.1	General	62
12.13.2.2	Reserve Capacity Test	62
12.13.2.3	Alternator Performance Test at Idle	62
12.13.2.4	Alternator Performance Test at Full Load	62
12.13.2.5	Low-Voltage Alarm Test	63
12.14	DOCUMENTATION	63
13	DRIVING AND CREW AREAS	63

13.1	GENERAL	63
13.2	SEAT HEAD HEIGHT	64
13.2.1	General	64
13.2.2	Seat Arrangement	65
13.2.3	SCBA Mounting	65
13.2.4	Equipment Mounting	65
13.2.5	Means of Escape	66
13.3	CAB TILT SYSTEMS	66
13.4	DRIVING COMPARTMENT	67
13.4.1	General	67
13.4.2	Driver's Seat	67
13.4.3	Instrumentation and Controls	67
13.5	TRACTOR-DRAWN VEHICLES	68
13.5.1	General	68
13.5.2	Seat Arrangement	68
13.5.3	Communications	69
14	BODY, COMPARTMENTS, AND EQUIPMENT MOUNTING	69
14.1	GENERAL	69
14.2	COMPARTMENT	70
14.3	EQUIPMENT CONTAINMENT	70
14.4	POWERED EQUIPMENT RACKS	70
14.5	SCBA STORAGE	70
14.5.1	General	70
14.5.2	Vertical Storage of SCBA Cylinders in Tubes	71
14.5.3	Horizontal Storage of SCBA Cylinders	71
14.6	PUMP AND PLUMBING ACCESS	71
14.7	STEPPING, STANDING, AND WALKING SURFACES	72
14.7.1	General	72
14.7.2	Slip Resistance	72
14.7.2.1	General	72
14.7.2.2	Sampling Strategy	73
14.8	ACCESS HANDRAILS	73
14.9	METAL FINISH	74
14.9.1	General	74
14.9.2	Painting	74
14.10	HOSE STORAGE	74
14.11	RECEIVERS AND ANCHORS FOR ROPE AND REMOVABLE WINCHES	75
14.12	SLIP-ON FIRE FIGHTING MODULE	75
14.12.1	General	75
14.12.2	Mounting	75
15	FIRE PUMPS AND ASSOCIATED EQUIPMENT	76
15.1	GENERAL	76
15.2	DESIGN AND PERFORMANCE REQUIREMENTS	76
15.2.1	Fire Pump Rated Capacity	76
15.2.2	Pumping System Capacity	76
15.2.3	Vacuum	77
15.2.4	Pump Suction Capability	77
15.3	PUMPING ENGINE REQUIREMENTS	78
15.3.1	General	78

15.3.2	Engine Speed	78
15.3.3	Indicator or Light	78
15.4	POWER TRAIN PERFORMANCE	79
15.5	CONSTRUCTION REQUIREMENTS	79
15.5.1	General	79
15.5.2	Hydrostatic Test	79
15.5.3	Pulsation-Free Fire Streams	79
15.6	PUMP INTAKE CONNECTIONS	80
15.6.1	General	80
15.6.2	Intake Strainer	80
15.7	PUMP DISCHARGE OUTLETS	82
15.7.1	General	82
15.7.2	Discharge Outlet Connections	82
15.7.3	Valves	83
15.7.4	Location of Discharge Outlets	83
15.8	PUMP DRAINS	83
15.9	PUMP OPERATOR'S PANEL	83
15.10	PUMP CONTROLS	83
15.10.1	General	83
15.10.2	Stationary Pump Driven Through Split Shaft PTO Automatic or Manual Chassis Transmissions	84
15.10.3	Stationary Pump Driven Through Transmission- Mounted PTO, Front-of-Engine Crank Shaft PTO, or Engine Flywheel PTO – Automatic or Manual Chassis Transmissions	84
15.10.4	Stationary and “Pump and Roll” Pump – Automatic or Manual Chassis Transmissions	85
15.10.5	Stationary Pumps Driven Through Transfer Case PTOs – Automatic or Manual Chassis Transmissions	85
15.10.6	Pump Operator's Panel Engine Speed Advancement – Automatic or Manual Chassis Transmissions	86
15.10.7	Parallel/Series Control	86
15.10.8	Pressure Control System	87
15.10.9	Priming Device	87
15.10.10	Protection of Pump Controls	87
15.11	PUMP ENGINE CONTROLS	87
15.12	INSTRUMENTATION	88
15.12.1	Pump Operator's Panel	88
15.12.2	Master Pump Intake and Pressure-Indicating Devices	89
15.12.3	Discharge Outlet Instrumentation	90
15.13	TESTING	91
15.13.1	General	91
15.13.2	Test Plate	91
15.13.3	Pump Test	92
15.13.3.1	Test Conditions	92
15.13.3.2	Equipment	93
15.13.3.2.1	Suction Hose	93
15.13.3.2.2	Test Gauges	93
15.13.3.3	Procedure	94
15.13.4	Pumping Engine Overload Test	95
15.13.5	Pressure Control System Test	95
15.13.6	Priming Device Tests	97
15.13.7	Vacuum Test	97
15.13.8	Water Tank-to-pump Flow Test	97

15.13.8.1 General	97
15.13.8.2 Volume Discharge Calculation	98
15.13.9 Engine Speed Advancement Interlock Test	98
15.13.10 Gauge and Flowmeter Test	99
15.13.11 Pre-delivery Test	100
16 WATER TANKS	100
16.1 GENERAL	100
16.2 TANK CONSTRUCTION	100
16.2.1 General	100
16.2.2 Clean-out Sumps	101
16.2.3 Water Level Indicator	101
16.3 TANK-TO-PUMP INTAKE LINE	101
16.3.1 General	101
16.3.2 Tank-to-pump Flow Rate	102
16.4 FILLING AND VENTING	102
16.4.1 Fill Opening	102
16.4.2 Vent/Overflow Outlet	102
16.4.3 Tank Fill Line	102
16.5 MOBILE WATER SUPPLY APPARATUS	103
16.5.1 General	103
16.5.2 External Fill	103
16.5.3 Water Transfer	103
17 AERIAL DEVICES	104
17.1 GENERAL	104
17.2 AERIAL LADDER REQUIREMENTS	104
17.2.1 General	104
17.2.2 Obstructions Below the Ladder	105
17.2.3 Piping System	106
17.2.4 Damage Prevention	106
17.2.5 Aerial Ladder Rated Capacity	107
17.2.6 Aerial Ladder Operating Position	107
17.2.6.1 General	107
17.2.6.2 Voice Communication System	108
17.2.7 Aerial Ladder Operating Mechanisms	108
17.2.7.1 Elevation	108
17.2.7.2 Rotation	108
17.2.7.3 Extension	108
17.2.7.4 Secondary Operator's Position	109
17.2.8 Aerial Ladder Water Delivery System	109
17.3 OPERATION TESTS	111
17.3.1 General	111
17.3.2 Aerial Device Water System Test	111
17.4 ELEVATING PLATFORM REQUIREMENTS	111
17.4.1 General	111
17.4.2 Platform Construction	112
17.4.3 Heat Shield	112
17.4.4 Water Curtain System	113
17.4.5 Piping System	113
17.4.6 Damage Prevention	113

17.4.7 Elevating Platform Rated Capacity	113
17.4.8 Elevating Platform Operating Positions	114
17.4.8.1 General	114
17.4.8.2 Voice Communication System	114
17.4.9 Elevating Platform Operating Mechanisms	114
17.4.9.1 General	114
17.4.10 Ladders on the Elevating Platform	115
17.4.11 Elevating Platform Water Delivery System	115
17.4.11.1 General	115
17.4.11.2 Waterway Drains	116
17.4.12 Tests	116
17.4.12.1 General	116
17.4.12.2 Turret Nozzle and Water System Operation	117
17.5 WATER TOWER REQUIREMENTS	117
17.5.1 General	117
17.5.2 Water Tower Rated Capacity	117
17.5.3 Water Tower Operating Mechanisms	118
17.5.4 Water Tower Water Delivery System	118
17.6 CONTROL DEVICES	119
17.7 SAFETY	121
17.8 HYDRAULIC SYSTEM	122
17.8.1 General	122
17.8.2 Hydraulic Reservoir	122
17.9 STRUCTURE	123
17.10 STABILIZATION	123
17.10.1 General	123
17.10.2 Sloping Surface	123
17.11 QUALITY CONTROL	124
17.11.1 General	124
17.11.2 Welder Certification	125
17.12 INSTRUCTION PLATES AND SIGNS	125
17.13 TESTS	126
17.13.1 General	126
17.13.2 Stability Tests	126
17.13.2.1 General	126
17.13.2.2 Common Requirements for Stability Testing	127
17.13.2.3 Requirements for Full Operating Envelope Aerial Devices	127
17.13.2.3.1 Stability Testing on Level Surface	127
17.13.2.3.2 Stability Testing on a 5° Slope	127
17.13.2.4 Requirements for Limited Reach Operating Envelope Aerial Devices	128
17.13.2.4.1 General	128
17.13.2.4.2 Stability Testing on Level Surface	128
17.13.2.4.3 Stability Testing on a 5° Slope	129
17.13.3 Horizontal Load Tests	129
17.13.4 Aerial Device Water System Test	129
17.14 PRE-DELIVERY TEST	130
18 FOAM PROPORTIONING SYSTEMS	130
18.1 GENERAL	130
18.2 DESIGN AND PERFORMANCE REQUIREMENTS OF A FOAM SYSTEM	130
18.2.1 General	130
18.2.2 Flush Lines	131

18.3 CONTROLS FOR FOAM SYSTEMS	132
18.4 FOAM SYSTEM PRESSURE-INDICATING DEVICES, FLOWMETERS, AND INDICATORS	132
18.5 ATMOSPHERIC FOAM CONCENTRATE TANK	133
18.5.1 General	133
18.5.2 Swash Partitions	133
18.5.3 Tank Drain	134
18.5.4 Labels	134
18.6 FOAM CONCENTRATE PUMP	134
18.7 PRESSURE VESSEL FOAM CONCENTRATE OR FOAM SOLUTION TANKS	135
18.8 LABELS, PLATES, AND INSTRUCTIONS	136
18.8.1 General	136
18.8.2 Operations and Maintenance Manual	136
18.9 FOAM PROPORTIONING SYSTEM ACCURACY	136
19 COMPRESSED AIR FOAM SYSTEMS	137
19.1 GENERAL	137
19.2 GENERAL REQUIREMENTS	137
19.3 COMPRESSED AIR SOURCE	137
19.3.1 General	137
19.3.2 Relief Valve	137
19.4 AIR MIXING	138
19.5 COMPRESSED AIR SYSTEM PIPING	138
19.6 AIR SOURCE CONTROLS	138
19.7 FOAM SYSTEM PRESSURE-INDICATING DEVICES, FLOWMETERS, AND INDICATORS	139
19.8 LABELS, PLATES, AND INSTRUCTION PLATES	140
19.8.1 General	140
19.8.2 Operations and Maintenance Manual	140
19.9 TESTING	140
19.9.1 General	140
19.9.2 CAFS Capacity Rating Test	140
19.9.3 Standby Run Test	141
20 LINE VOLTAGE ELECTRICAL SYSTEMS	142
20.1 GENERAL	142
20.2 GENERAL REQUIREMENTS	142
20.2.1 Stability	142
20.2.2 Conformance with Canadian Electrical Code	142
20.2.3 Location Ratings	143
20.3 GROUNDING AND BONDING	143
20.3.1 Grounding	143
20.3.2 Bonding	143
20.4 POWER SOURCE GENERAL REQUIREMENTS	144
20.4.1 General	144
20.4.2 Instrumentation	144
20.4.3 Operation	145
20.5 CHASSIS ENGINE-DRIVEN GENERATORS	146
20.6 ADDITIONAL POWER SUPPLY REQUIREMENTS	146
20.6.1 General	146
20.6.2 Direct Drive (PTO) Generators	146

20.6.3	Hydraulically Driven Generators	147
20.6.3.1	General	147
20.6.3.2	Hydraulic Components	147
20.6.4	Fixed Auxiliary Engine-Driven Generators	148
20.6.4.1	General	148
20.6.4.2	Fuel System	148
20.6.4.3	Exhaust System	149
20.6.5	Belt-Driven Generators or Dedicated Alternators Supplying an Inverter	149
20.6.6	Line Voltage Systems Derived from Apparatus Low Voltage Power Supply Systems	149
20.7	PORTABLE GENERATOR INSTALLATIONS	149
20.7.1	General	149
20.7.2	Wiring for Portable Generator Installations	150
20.8	LINE VOLTAGE SUPPLIED FROM AN EXTERNAL SOURCE	151
20.8.1	General	151
20.8.2	Transfer Switch Applications	151
20.9	POWER SUPPLY ASSEMBLY	151
20.10	OVERCURRENT PROTECTION	152
20.10.1	General	152
20.10.2	Power Source Protection	152
20.10.3	Branch Circuit Overcurrent Protection	152
20.10.4	Panelboards	153
20.11	WIRING METHODS	153
20.11.1	General	153
20.11.2	Additional Requirements for Flexible Cord Installations	154
20.11.3	Wiring Identification	155
20.12	WIRING SYSTEM COMPONENTS	155
20.12.1	General	155
20.12.2	Receptacles and Inlet Devices	156
20.12.2.1	Wet and Dry Locations	156
20.12.2.2	Receptacle Label	157
20.13	CORD REELS	157
20.13.1	General	157
20.13.2	Rewind Provision	157
20.14	SCENE LIGHTING SYSTEMS	159
20.14.1	General	159
20.14.2	Handle on Lights	159
20.15	POWER-OPERATED LIGHT MAST	160
20.15.1	General	160
20.15.2	Installation and Operational Requirements	160
20.15.3	Labelling	161
20.16	ELECTRICAL SYSTEM TESTING	161
20.16.1	General	161
20.16.2	Dielectric Voltage Withstand Test	161
20.16.3	Operational Test of Fixed Power Source	162
20.16.4	Test Procedure	162
20.16.5	Prime Mover-Driven Accessories	163
21	COMMAND AND COMMUNICATIONS	164
21.1	GENERAL	164
21.2	Location	164
21.3	Climate Control	164

21.4	Noise Levels	164
21.5	Lighting Levels	164
21.6	Command Working Surfaces and Countertop	164
21.7	Seating in Command Centre	165
21.8	Cabinets and Equipment Storage	165
21.9	Wall, Ceiling, and Floor Surfaces	165
21.10	Communications and Electrical Consoles	165
21.11	Computer Equipment and Installation	166
21.11.1	General	166
21.11.2	Computer Electrical Outlets	166
21.12	Video Equipment and Installation	166
22	AIR SYSTEMS	166
22.1	GENERAL	166
22.2	APPLICATION	167
22.3	PROVISIONS APPLYING TO ALL AIR SYSTEMS	167
22.3.1	General	167
22.3.5	Assembly and Installation Practices	167
22.3.5.2	Hot Surfaces	167
22.3.6	Locking Devices	168
22.3.7	Breathing Air Systems	168
22.3.8	General Piping and Installation	168
22.3.9	Flexible Hose	169
22.3.10	Operator's Panel and Controls	169
22.3.11	Maintainability	169
22.3.12	Labels and Plates	170
22.3.13	Documentation	170
22.3.14	Training and Instruction	171
22.4	BREATHING AIR COMPRESSOR	172
22.4.1	General	172
22.4.2	Compressor Intake	172
22.4.3	Cooling	172
22.4.6	Compressor Drive System, Controls, and Air Quality Monitoring	173
22.5	Purification System	174
22.6	AIR STORAGE SYSTEMS	175
22.6.1	Transportable Air Tanks	175
22.6.6	Air Tank Mounting	175
22.6.7	Air Tank Valve Control and Monitoring	176
22.7	Air Booster Systems	176
22.8	Air Supply Regulation	177
22.9	Air Control Panel	177
22.10	SCBA or SCUBA Air Cylinder Fill Station	178
22.10.7	Testing and Certification	179
22.11	Air Hose Reels	179
22.11.4	Size of Fluid Path	180
22.11.5	Reel Label Marking	180
22.11.6	Air Supply to Air Reel	180
22.11.9	Air Reel Installation	181
22.11.10	Low Pressure Breathing Air Reel	182
22.12	Air Hose	182
22.12.4	Discharge Ends	182
22.12.5	Color Coding	183

22.13	Low Pressure Utility Air Supply	183
22.14	Remote Breathing Air Systems	184
22.14.3	Piping System	184
22.15	Breathing Air System Testing and Delivery	184
22.15.4	Breathing Air Quality	185
22.16	Utility Air System Testing	186
23	WINCHES	186
23.1	GENERAL	186
23.2	Synthetic Rope or Winch Wire	186
23.3	Clutch	187
23.4	Winches that are Electric Powered	187
23.4.1	Controls	187
23.4.2	Power Supply	187
23.4.3	Removable Electric Winches	187
23.4.4	Requirements for the Electric Power for Removable Winches	188
23.5	Winches that are Hydraulically Driven	188
23.5.1	Hydraulic Hose	188
23.5.2	Hydraulic Control	188
23.5.3	Hydraulic Tanks	188
23.5.4	Hydraulic Fluid Cleanliness	189
23.5.5	Hydraulic Engagement Indicator	189
24	TRAILERS	189
24.1	GENERAL	189
24.2	General	189
24.3	Classification of Trailers	189
24.4	Trailer Carrying Capacity	190
24.5	Instruction Plates and Information Labels	190
24.6	Pressures and Fluids Specific to the Trailer Chassis	191
24.7	Trailer Braking System	191
24.8	Wheels and Suspension	191
24.9	Trailer Hitch	191
24.9.4	Safety Chains	192
24.10	Wheel Chocks	192
24.11	Warning Devices and Low Voltage Electrical Systems	192
24.11.3	Power Supply	192
24.11.4	Umbilical Connections and Cables	193
24.11.5	Optical Warning Devices	193
24.11.6	Work Lighting	194
24.11.7	Directional, Tail and Stop Lighting	194
24.11.8	Performance Tests on the Electrical System	194
24.12	Reflective Markings	194

FIGURES	196
TABLES	197
APPENDIX A (INFORMATIVE) – LIMITING DESIGN STRESSES	203
APPENDIX B – (INFORMATIVE AND NONMANDATORY) – MAINTENANCE, INSPECTION, AND TESTING OF IN-SERVICE AUTOMOBILE FIRE APPARATUS	204

Document ID: 123456789

ULC STANDARDS COMMITTEE ON FIRE PROTECTION EQUIPMENT AND SYSTEMS

NAME	AFFILIATION	REGION	CATEGORY
D. Bourdin	Parks Canada — Fire Management		User
P. Caron	Service de sécurité incendie de Montréal	Québec	User
J. Di Filippo	Kidde Canada Inc.	Canada	Producer
C. Ezea	Rotaflow Controls Inc.	Canada	General Interest
G. Faber	SCM Risk Management Services	Canada	General Interest
M. Gravel	Department of National Defence	Canada	Regulator
M. Harwood	iv3CUS/iv3 Solutions	Canada	General Interest
K. Jess	Alberta Municipal Affairs	Alberta	Regulator
N. Khan	Techin (Technical Inspection Network)	Canada	General Interest
D. Leonhardt	Mercedes Textiles Limited		Producer
D. Lord	Niedner Inc.	Canada	Producer
K. McGavney	Clow Canada	Canada	Producer
M. Mousseau	Canadian Interagency Forest Fire Centre	Canada	User
D. Schafer	Office of the Fire Commissioner	Manitoba	Regulator
R. Suche	Fire Apparatus Manufacturers' Association	Canada	Producer
J. Sward	Hub Fire Engines		Producer
D. Tiller	Office of the Fire Marshal & Emergency Management	Ontario	Regulator
D. Haitcock	Underwriters Laboratories Inc.	U.S.A	Non-Voting
Associate Member			
M. Ramlochan (Project Manager)	ULC Standards	Canada	Non-Voting

NOTE: This list represents the membership at the time the Committee balloted on the final text of this edition. Since that time, changes in the membership may have occurred.

ULC STANDARDS SUBCOMMITTEE ON AUTOMOBILE FIRE FIGHTING APPARATUS

MEMBER

REPRESENTING

B. McEvoy (Chair)	Bonnyville Regional Fire Authority, Alberta
J. Aiken	Pierce Manufacturing Inc., U.S.A.
R. Anselmi	Toronto Fire Services, Ontario
G. Berger	Hub Fire Engine & Equipment Ltd., British Columbia
A. Booth	Office of the Ontario Fire Marshal, Ontario
D. Ellwood	Ontario Professional Fire Fighters Association (OPFFA), Ontario
F. Hollett	Office of the Fire Commissioner, Newfoundland
J. Hunke	Smeal Fire Apparatus Co., Nebraska, U.S.A.
K. Jess	Alberta Municipal Affairs, Alberta
P. Jobin	Direction générale de la sécurité civile et de la sécurité incendie, Quebec
R. Lavicott	American LaFrance Corporation, Pennsylvania, U.S.A.
S. Meringer	Canadian Association of Fire Chiefs, Canada
P. Natale	Dependable Emergency Vehicles, Ontario
R. Suche	Fire Apparatus Manufacturers' Association, U.S.A.
R. Stacey	Metalfab Ltd., New Brunswick
L. Thibault	Eastway Emergency Vehicles, Ontario
B. Van Tighem	District of Elkford, British Columbia
J. Witt	Safetek Emergency Vehicles Ltd., British Columbia
P. Ginnaty-Moore	Underwriters Laboratories Inc., U.S.A.
M. Ramlochan	ULC Standards, Canada

REFERENCE PUBLICATIONS

The documents shown below are referenced in the text of this Standard. Unless otherwise stated elsewhere in this Standard such reference shall be considered to indicate the edition and/or revisions of the document available at the date on which the Committee approved this ULC Standard.

Document Published by the American Society of Mechanical Engineers
ASME International
Three Park Avenue, M/S 10E, New York, NY 10016-5990 U.S.A.
Telephone: 1-800-843-2763, Fax: (973) 882-1717 www.asme.org/codes

- ASME BPVC-VIII-2 2011, Boiler and Pressure Vessel Code (BPVC), Section VIII, Division 2
- ASME B40.100-2005, Pressure Gauges and Gauge Attachments

Document Published by the American Society for Nondestructive Testing Inc.
1711 Arlingate Lane, PO Box 28518, Columbus, OH 43228-0518 U.S.A.
Telephone: 1-800-222-2768, Fax: (614) 274-6899 www.asnt.org

- ASNT CP-189-2011, Standard for Qualification and Certification of Nondestructive Testing Personnel

Document Published by the American Society for Testing and Materials
100 Barr Harbor Drive, West Conshohocken, PA 19428-2959 U.S.A.
Telephone: (610) 832-9585, Fax: (610) 832-9555 www.astm.org

- ASTM D 4956 (Rev A)-11, Standard Specification for Retroreflective Sheeting for Traffic Control

Document Published by the American Welding Society
550 N.W. LeJeune Road, Miami, FL 33126 U.S.A.
Telephone: (305) 443-9353, Fax: (305) 443-5951 www.awspubs.org

- AWS B1.10.2009, Guide for the Nondestructive Examination of Welds
- AWS D1.1 2010, Structural Welding Code – Steel
- AWS D1.2 2008, Structural Welding Code – Aluminum
- AWS D1.3 2008, Structural Welding Code – Sheet Steel

Document Published by the Canadian General Standards Board
Place du Portage, Phase III, 6B1, 11 Laurier Street, Gatineau, Quebec K1A 1G6 Canada
Telephone: (819) 956-0425, Fax: (819) 956-5644 www.pwgsc.gc.ca/cgsb

- CAN/CGSB 62-GP-11M AMD1 1987, Marking Material, Retroreflective, Enclosed Lens, Adhesive Backing

Documents Published by CSA Group
5060 Spectrum Way, Suite 100, Mississauga, Ontario L4W 5N6 Canada

Telephone: 1-800-463-6727, Fax: (416) 747-2473 www.csa.ca

- CAN/CSA B339-08, Cylinders, spheres, and tubes for the transportation of dangerous goods
- CSA C22.1-09, Canadian Electrical Code, Part I, Safety Standard for Electrical Installations
- CSA C22.2 No. 42-10, General Use Receptacles, Attachment Plugs, and Similar Wiring Devices
- CSA W47.1-09, Certification of Companies for Fusion Welding of Steel
- CSA W47.2-11, Certification of Companies for Fusion Welding of Aluminum
- CSA Z11-12, Portable Ladders
- CSA Z94.4-11, Selection, Use, and Care of Respirators
- CSA Z180.1-00, Compressed Breathing Air and Systems

Documents Published by Compressed Gas Association
14501 George Carter Way, Suite 103, Chantilly, VA 20151 U.S.A.
Telephone: (703)-788-2700, Fax: (703) 961-1831 www.cganet.com

- CGA G-7, Compressed Air for Human Respiration
- CGA G-7.1, Commodity Specification for Air

Documents Published by the International Organisation for Standardization (ISO) available from:
ISO Central Secretariat: International Organisation for Standardization (ISO)
1, ch. de la Voie-Creuse, Case postale 56, CH-1211 Geneva 20, Switzerland
Telephone: +41 22 749 01 11; Fax +41 22 733 34 30
www.iso.ch

- ISO/IEC Guide 65:1996, General Requirements for Bodies Operating Product Certification Systems
- ISO 3411:2007, Earth-moving machinery Human physical dimensions of operators and minimum operator space envelope
- ISO 17020:2012, Conformity assessment - Requirements for the operation of various types of bodies performing inspection

Documents Published by the National Electrical Manufacturers Association
1300 North, 17th Street, Suite 1847, Rosslyn, VA 22209 U.S.A.
Telephone: (703) 841-3200, Fax: (703) 841-5900 www.nema.org

- NEMA Z535.4-2007, Product Safety Signs and Labels

Documents Published by the National Fire Protection Association
1 Batterymarch Park, Quincy, MA 02269-9101 U.S.A.
Telephone: (617) 770-3000, Fax: (617) 770-0700 www.nfpa.org

- NFPA 1901-2009, Standard for Automotive Fire Apparatus
 - NFPA 1911-2012, Standard for Testing Fire Department Aerial Devices
 - NFPA 1931-2010, Standard for Manufacturer's Design of Fire Department Ground Ladders
 - NFPA 1961-2007, Standard on Fire Hose
 - NFPA 1983-2006, Standard on Fire Service Life Safety Rope and System Components
-

Documents Published by the Society of Automotive Engineers
SAE World Headquarters, 400 Commonwealth Drive, Warrendale, PA 15096-0001 U.S.A.
Telephone: 1-877-606-7323, Fax: (724) 776-0790 www.sae.org

- SAE J156-2010, Fusible Links
- SAE J541-1996, Voltage Drop for Starting Motor Circuits
- SAE J551-1-2010, Performance Levels and Methods of Measurement of Electromagnetic Compatibility of Vehicles, Boats (up to 15 m), and Machines (16.6 Hz to 18 GHz)
- SAE J553-2004, Circuit Breakers
- SAE J554-1987, Electric Fuses (Cartridge Type)
- SAE J560-2009, Primary and Auxiliary Seven Conductor Electrical Connector for Truck-Trailer Jumper Cable
- SAE J575-2010, Test Methods and Equipment for Lighting Devices and Components for Use on Vehicles Less Than 2032 mm in Overall Width
- SAE J578-2006, Color Specification
- SAE J595-2008, Flashing Warning Lamps for Authorized Emergency, Maintenance, and Service Vehicles
- SAE J683-1985, Tire Chain Clearance – Trucks, Buses (except Suburban, Intercity, and Transit Buses), and Combinations of Vehicles
- SAE J845-2007, Optical Warning Devices for Authorized Emergency, Maintenance, and Service Vehicles
- SAE J994-2009, Alarm – Backup – Electric Laboratory Performance Testing
- SAE J1127-2010, Low Voltage Battery Cable
- SAE J1128-2011, Low Voltage Primary Cable
- SAE J1292-2008, Automobile Motor Coach Wiring
- SAE J1330-2007, Photometry Laboratory Accuracy Guidelines
- SAE J1690-1996, Flashers

- SAE J1888-1990, High Current Time Lag Electric Fuses
 - SAE J1889-2005, L.E.D. Lighting Devices
 - SAE J2077-1990, Miniature Blade Type Electrical Fuses
 - SAE J2180-1993 (R1998), A Tilt Table Procedure for Measuring the Static Rollover Threshold for Heavy Trucks
 - SAE J2394-2007, Seven-Conductor Cable for ABS Power – Truck and Bus
-

Documents Published by the Tire and Rim Association, Inc.
175 Montrose West Avenue, Suite 150, Copley, OH 44321 U.S.A.
Telephone: (330) 666-8121, Fax: (330) 666-8340 www.us-tra.org

- 2004 Year Book
-

Documents Published by Transport Canada
330 Sparks Street, Ottawa, Ontario, Canada K1A 0N5 Canada
Telephone: (613) 990-2309, Fax: (613) 954-4731 www.tc.gc.ca

- CMVSS No. 209, Seat Belt Assemblies, Regulations Respecting Safety for Motor Vehicles and Motor Vehicle Components, C.R.C., c.1038, Motor Vehicle Safety Act, M-10.01
 - CMVSS No. 210, Seat Belt Anchorages, Regulations Respecting Safety for Motor Vehicles and Motor Vehicle Components, C.R.C., c.1038, Motor Vehicle Safety Act, M-10.01
 - CMVSS No. 302, Flammability, Regulations Respecting Safety for Motor Vehicles and Motor Vehicle Components, C.R.C., c.1038, Motor Vehicle Safety Act, M-10.01
 - CMVSS No. 1106, Noise Emission Tests, Regulations Respecting Safety for Motor Vehicles and Motor Vehicle Components, C.R.C., c.1038, Motor Vehicle Safety Act, M-10.01
 - Regulations Respecting Safety for Motor Vehicles and Motor Vehicle Components, C.R.C., c.1038, Motor Vehicle Safety Act, M-10.01
-

Documents Published by Underwriters Laboratories of Canada (ULC)
7 Underwriters Road, Toronto, ON M1R 3A9 Canada
Telephone: (416) 757-3611, ext. 61744; FAX (613) 231-5977, "ATTN: Publications"
E-mail: publications@ulc.ca
www.ulc.ca

- CAN/ULC-S511-07, Standard for Lined Fire Hose for Interior Standpipes and Municipal and Industrial Fire Protection Services
-

Documents Published by ULC Standards
440 Laurier Avenue West, Suite 200, Ottawa, ON K1R 7X6 Canada
Telephone: (416) 757-3611, ext. 61744; Fax (613) 231-5977, "ATTN: Publications"
E-mail: publications@ulc.ca

www.ulc.ca

- CAN/ULC-S504-12, Standard for Dry Chemical Fire Extinguishers
-

Documents Published by Underwriters Laboratories Inc.
333 Pfingsten Road, Northbrook, IL 60062-2096 U.S.A.
Telephone: 1-847-272-8800, Fax: 1-847-272-8129 www.ul.com

- UL 969-1995, Standard for Marking and Labeling Systems

STANDARD FOR AUTOMOBILE FIRE FIGHTING APPARATUS

PREFACE

This is the Reaffirmation of the Third Edition of the Standard for Automobile Fire Fighting Apparatus, CAN/ULC-S515.

This Edition of the Standard has been formally approved by the ULC Standards Committee on Fire Protection Equipment and Systems.

This Standard has been developed in compliance with the requirements of SCC for accreditation of a Standards Development Organization.

Materials extracted from NFPA 1901-2009, Standard for Automotive Fire Apparatus, are copyrighted by NFPA and appear with permission of NFPA. It is recommended that NFPA 1901-2009, Standard for Automotive Fire Apparatus, be used in conjunction with this Standard.

This Standard has been derived from NFPA 1901-2009, Automotive Fire Apparatus, under license from the NFPA and contains material taken directly from or based on that NFPA standard. All Materials taken from NFPA 1901 are copyrighted by NFPA and are used under license.

It is intended that *fire fighting apparatus* encompassed in this Standard be certified by an independent third-party certification organization accredited by the Standards Council of Canada and/or in accordance with ISO/IEC Guide 65 or ISO/IEC 17065 when implemented, in conformance to the requirements detailed in this Standard. As an alternate to third party certification, *fire fighting apparatus* encompassed in this Standard can be inspected and tested by Type A inspection bodies accredited by the Standards Council of Canada and /or in accordance with ISO/IEC 17020 in conformance to the requirements detailed in this Standard. It is recommended that any *purchaser*-specified optional equipment shall be separately tested and certified by a third-party certification organization.

Metric SI unit of measurement is the primary unit of measurement used in this Standard. If a value for measurement is followed by a value in other units in parentheses, the second value may be approximate. The first stated value is the requirement. Unless otherwise stated, values in brackets used in this Standard refer to imperial units, and when followed by another unit within the bracket, US gallons.

Appendices A and B, identified as informative, are for informational purposes only.

In Canada, there are two official languages, English and French. All safety warnings must be in French and English. Attention is drawn to the possibility that some Canadian authorities may require additional markings and/or installation instructions to be in both official languages.

This Third Edition National Standard of Canada has now been reaffirmed.

Attention is drawn to the possibility that some of the elements of this Canadian standard may be the subject of patent rights. ULC Standards shall not be held responsible for identifying any or all such patent rights.

Requests for interpretation of this Standard should be sent to ULC Standards. The requests should be worded in such a manner as to permit a “yes” or “no” answer based on the literal text of the requirement concerned.

The review and action to revise or reaffirm this Standard will not exceed 5 years from the date of publication, unless the Standard is identified as fitting within a stabilized category, whereby the review will commence within the appropriate time frame set out by ULC Standards.

This Standard is intended to be used for conformity assessment.



1 SCOPE

1.1 This Standard defines the minimum performance requirements for new automobile fire fighting apparatus such as pumpers, water tank trucks, ladder trucks, aerial devices and combinations of these, as used for structural fire fighting in the municipal fire service.

1.2 This Standard defines the minimum requirements for the common types of fire fighting apparatus and the requirements for each of the components provided therein.

1.3 This Standard does not cover optional equipment typically carried by the various types of fire fighting apparatus and the variety of combinations and functions of this equipment.

2 GLOSSARY

NOTE: In the interest of consistency, various terms are drawn from NFPA 1901, Standard for Automotive Fire Apparatus. Terms used in this Standard that are in *italics* are defined as follows:

ACCEPTANCE TESTS – Tests performed on the *fire fighting apparatus* at the time of delivery to determine that the specifications and terms and conditions agreed upon between the *purchasing authority* and the *contractor*, as stated in a contract, have been complied with.

AERIAL DEVICE – An *aerial ladder*, *elevating platform*, or *water tower* that is designed to position personnel, handle materials, provide *continuous egress*, or discharge water.

AERIAL FIRE FIGHTING APPARATUS – A vehicle equipped with an *aerial ladder*, *elevating platform*, *aerial ladder platform*, or *water tower* that is designed and equipped to support fire fighting and rescue operations by positioning personnel, handling materials, providing *continuous egress*, or discharging water at positions elevated from the ground.

AERIAL LADDER – A self-supporting, *turntable-mounted*, power-operated ladder of two or more sections permanently attached to a self-propelled automobile *fire fighting apparatus* and designed to provide a *continuous egress* route from an elevated position to the ground.

ANGLE OF APPROACH – The smallest angle made between the road surface and a line drawn from the front point of ground contact of the front tire to any projection of the *fire fighting apparatus* in front of the front axle.

ANGLE OF DEPARTURE – The smallest angle made between the road surface and a line drawn from the rear point of ground contact of the rear tire to any projection of the *fire fighting apparatus* behind the rear axle.

AUTHORITY HAVING JURISDICTION (AHJ) – The government body responsible for the enforcement of any part of this Standard or the official or agency designated by that body to exercise such a function.

AUTOMATIC ELECTRICAL LOAD MANAGEMENT SYSTEM – A device that continuously monitors the electrical system voltage and automatically sheds predetermined loads in a selected order to prevent over discharging of the *fire fighting apparatus*' batteries.

AUXILIARY BRAKING SYSTEM – A braking system in addition to the service brakes, such as an engine retarder, transmission retarder, driveline retarder, or exhaust retarders.

AUXILIARY PUMP – A water pump mounted on the *fire fighting apparatus* in addition to a *fire pump* and used for fire fighting either in conjunction with or independent of the *fire pump*.

BOOM – An assembled section of an *aerial device*. The *boom* construction can be of the stressed skin box beam type, the trussed lattice type, or the open “U” truss-type design.

BREATHING AIR – A respirable gas mixture derived from either normal atmospheric air or from manufactured synthetic air, stored in a compressed state in storage cylinders and respirator *breathing air* cylinders, and supplied to the user in gaseous form.

BREATHING AIR SYSTEM – The complete assembly of equipment such as compressors, a purification system, pressure regulators, safety devices, manifolds, air tanks or receivers, and interconnected piping required to deliver *breathing air*.

CHASSIS – The basic operating motor vehicle including the engine, frame, and other essential structural and mechanical parts, but exclusive of the body and all appurtenances for the accommodation of driver, property, or passengers, appliances, or equipment related thereto other than control. Common usage might, but need not, include a cab (or cowl).

CMVSS – Canadian Motor Vehicle Safety Standards under Transport Canada’s Regulations Respecting Safety for Motor Vehicles and Motor Vehicle Components, Motor Vehicle Safety Act.

COMBINATION VEHICLE – A vehicle consisting of a pulling tractor and trailer.

COMPOUND GAUGE – A *gauge* that indicates pressure both above and below atmospheric pressure, i.e. a *gauge* reading pressure from 0 to maximum in kilopascals (*kPa*) and vacuum from 0 to -100 *kPa*.

COMPONENT – A unit or equipment that forms part of a *fire fighting apparatus*.

COMPRESSED AIR FOAM SYSTEM (CAFS) – A *foam* system that combines air under pressure with *foam solution* to create *foam*.

CONTINUOUS DUTY – Operation at a constant rated load for an indefinitely long period.

CONTINUOUS EGRESS – A continuous exit or rescue path down an *aerial device* from an elevated position to the ground.

CONTRACTOR – The person or company responsible for fulfilling an agreed upon contract.

CONVENIENT REACH – The ability of the operator to manipulate the controls from a driving/riding position without excessive movement away from the seat back or without excessive loss of eye contact with the roadway.

DEAD LOAD – The weight of the *aerial device* structure and all materials, *components*, mechanisms, or equipment permanently fastened thereto.

DEFECT – A condition of discontinuity in a part or a failure to function that interferes with the service or reliability for which the part was intended.

DOCUMENTATION – Any data or information supplied by the *manufacturer* or *contractor* relative to the *fire fighting apparatus*, including information on its operation, service, and maintenance.

EDUCTOR – A device placed in a hose line or a discharge pipe that incorporates a venturi and proportions *foam concentrate* or other fire fighting agents into the water stream.

ELECTRIC SIREN (ELECTROMECHANICAL) – An audible warning device that produces sound by the use of an electric motor with an attached rotating slotted or perforated disc.

ELECTRONIC SIREN – An audible warning device that produces sound electronically through the use of amplifiers and electromagnetic speakers.

ELEVATING PLATFORM – A self-supporting, *turntable*-mounted device consisting of a personnel-carrying platform attached to the uppermost *boom* of a series of power-operated *booms* that articulate, telescope, or both; and that are sometimes arranged to provide the *continuous egress* capabilities of an *aerial ladder*.

EXTERIOR – A non-sheltered location exposed to the environment, either continuously or intermittently.

FIRE FIGHTING APPARATUS – A vehicle designed to be used under emergency conditions to transport personnel and equipment, and to support the suppression of fires and mitigation of other hazardous situations.

FIRE PUMP – A water pump with a *rated capacity* of at least 950 L/min (210 *gpm* / 250 US-gpm) but less than 12 000 L/min (2600 *gpm* / 3000 US-gpm) at 1000 *kPa* (145 *psi*) net pump pressure, or a water pump with *rated capacity* of 12 000 L/min (2600 *gpm* / 3000 US-gpm) or greater at 700 *kPa* (100 *psi*) net pump pressure that is mounted on a *fire fighting apparatus* and used for fire fighting.

FIXED POWER SOURCE – Any *line voltage power source* except a portable generator.

FLY SECTION – Any section of an aerial telescoping device beyond the base section.

FOAM – A relatively stable aggregation of small bubbles having a lower density than water, designed to extinguish fire.

FOAM CONCENTRATE – A liquid containing all the ingredients of a *foam* fire fighting agent as received from the *manufacturer* that must be diluted with water and applied to make *foam*.

FOAM PROPORTIONING SYSTEM – The *fire fighting apparatus* and techniques used to mix concentrate with water to make *foam solution*.

FOAM SOLUTION – The combination of water and *foam concentrate* which is aerated and *properly* mixed to produce the *foam* used for actual fire suppression.

FULLY ENCLOSED PERSONNEL AREA – A driver or passenger compartment on the *fire fighting apparatus* that provides total enclosure on all sides, top, and bottom and has positive latching on all access doors.

GALLON (gal) – Imperial *gallon*; US gallon shall be referred to as US-gal.

GAUGE – A round, analog pressure-indicating device that uses mechanical means to measure pressure.

GAUGE PRESSURE – Pressure measured by an instrument where the pressure indicated is relative to atmospheric pressure.

GAWR (GROSS AXLE WEIGHT RATING) – The value specified by the *chassis manufacturer* indicating maximum load carrying capacity of a single axle system, as measured at the tire-ground interfaces. The axle system includes, but is not limited to, the axle, tires, suspension, wheels, frame, brakes and applied engine torque.

GCWR (GROSS COMBINATION WEIGHT RATING) – The value specified by the *chassis manufacturer* indicating maximum, load-carrying capacity for tractor trailer-type vehicles having three or more axle systems (a multi-axle installation is one system).

GPM – Imperial *gallons* per minute; US gallons per minute shall be referred to as US-gpm.

GRADE – A measurement of the angle used in road design and expressed as a percentage of elevation change over distance.

GVWR (GROSS VEHICLE WEIGHT RATING) – The value specified by the *chassis manufacturer* indicating maximum load-carrying capacity of a vehicle having two axle systems (a multi-axle installation is one system).

HIGH-IDLE SPEED CONTROL – A control or *switch* system that provides a means to increase the engine operating speed from an idle condition to a higher preset operating speed.

INDUSTRIAL SUPPLY PUMP – A water pump mounted on a *fire fighting apparatus* and used for fire fighting with a *rated capacity* of 12 000 L/min (2600 *gpm* / 3000 US-gpm) or greater at 700 *kPa* (100 *psi*) net pump pressure.

INITIAL ATTACK FIRE FIGHTING APPARATUS – *Fire fighting apparatus* with a permanently mounted *fire pump* of at least 950 L/min (210 *gpm* / 250 US-gpm) capacity, water tank, and hose body whose primary purpose is to initiate a fire suppression attack on structural, vehicular, or vegetation fires, and to support associated fire department operations.

IN-SERVICE WEIGHT – The maximum actual vehicle weight under any conditions of mobile operation, sometimes referred to as gross vehicle weight.

INSTABILITY – A condition of a mobile unit in which the sum of the moments tending to overturn the unit exceeds the sum of the moments tending to resist overturning.

INTERIOR – A sheltered location not exposed to the environment.

INTERLOCK – A device or arrangement by means of which the functioning of one part is controlled by the functioning of another.

KNUCKLE – A point of connection between upper and lower *booms* of an articulating device; the point at which lower and upper *booms* are hinged together.

kPa – Kilopascals. Imperial equivalent used is pounds per square inch (*psi*).

LABEL – A visual indication whether in pictorial or word format that provides for the identification of a control, *switch*, indicator, or *gauge*, or the display of information useful to the operator.

LADDER SECTION – A structural member normally of an open “U” truss-type design that includes the rungs and comprises the base or *fly section* of an *aerial ladder*.

LADDER TRUCK – A vehicle whose primary function is access, rescue and auxiliary duties frequently requiring ladders and access tools. It is normally equipped with an *aerial ladder* or *elevating platform* as well as an assortment of hand raised ground ladders.

LINE VOLTAGE CIRCUIT, EQUIPMENT, OR SYSTEM – An ac or dc electrical circuit, equipment, or system where the voltage to ground or from line to line is 30 V rms (ac) or 42.4 V peak (dc) or greater.

LOW-VOLTAGE CIRCUIT, EQUIPMENT, OR SYSTEM – An electrical circuit, equipment, or system where the voltage does not exceed 30 V rms (ac) or 42.4 V peak (dc), usually 12 V dc in *fire fighting apparatus*.

MANUFACTURER – The *contractor* whose interest in the products, materials or services is in their production, promotion, retailing or distribution, e.g., one who assembles on a *chassis* and other *components* to produce a piece of *fire fighting apparatus*.

MAXIMUM PUMP CLOSE-OFF PRESSURE – The maximum pump discharge pressure obtained with all discharge outlets closed, with the pump primed and running with the pump drive engine operating at maximum obtainable speed, and with the pump intake pressure at atmospheric pressure or less.

MISCELLANEOUS EQUIPMENT – Portable tools and equipment carried on a *fire fighting apparatus* not including *suction hose*, fire hose, ground ladders, *fixed power sources*, hose reels, cord reels, *breathing air systems*, or other major equipment or *components* specified by the *purchaser* to be permanently mounted on the *fire fighting apparatus* as received from the *fire fighting apparatus manufacturer*.

MISCELLANEOUS EQUIPMENT ALLOWANCE – That portion of the *GVWR* or *GCWR* allocated for the weight of the *miscellaneous equipment* and its mounting brackets, boards, or trays.

MOBILE FOAM FIRE FIGHTING APPARATUS – *Fire fighting apparatus* with a permanently mounted *fire pump*, *foam proportioning system*, and *foam concentrate tank(s)* whose primary purpose is for use in the control and extinguishment of flammable and combustible liquid fires in storage tanks and other flammable liquid spills.

MOBILE WATER SUPPLY FIRE FIGHTING APPARATUS (TANKER, TENDER) – A vehicle designed primarily for transporting (pickup, transporting, and delivering) water to fire emergency scenes to be applied by other vehicles or pumping equipment.

MOMENTARY SWITCH – A *switch* that returns to the neutral position (off) when released.

MULTIPLE CONFIGURATION – Variable configurations or positions of the *aerial device* (e.g., elevation, extension) in which a *manufacturer's* different rated load capacities are allowed.

NOZZLE REACTION – Force that occurs when a water stream is discharged from the nozzle.

OPERATOR'S PANEL – A panel containing *gauges*, *switches*, instruments, or controls where an operator can visually monitor the applicable functions.

OPTICAL CENTRE – The point specified by the *optical warning device manufacturer* of highest intensity when measuring the output of an *optical warning device*.

OPTICAL POWER – A unit of measure designated as candela-seconds/minute that combines the flash energy and flash rate of an *optical source* into one power measurement representing the true visual effectiveness of the emitted light.

OPTICAL SOURCE – Any single, independently mounted, light emitting *component* in a lighting system.

OPTICAL WARNING DEVICE – A manufactured assembly of one or more *optical sources*.

OVERRIDE – A system or device used to neutralize a given action or motion.

PLATE – A visual indication whether in pictorial or word format that provides instruction to the operator in the use of a *component* on the *fire fighting apparatus*.

POWER SOURCE – A device that produces line voltage electricity.

POWERED EQUIPMENT RACK – A power-operated device that is intended to provide storage of *suction hoses*, ground ladders, or other equipment, generally in a location above *fire fighting apparatus* compartments.

PROPER(LY) – In accordance with the *manufacturer's* specifications or as recommended by the *manufacturer*.

PSI – Pounds per square inch. Metric equivalent used is kilopascals (*kPa*).

PTO – Power takeoff.

PUMP OPERATOR'S PANEL – The area on a *fire fighting apparatus* that contains the *gauges*, controls, and other instruments used for operating the pump.

PUMP OPERATOR'S POSITION – The location from which the pump operator operates the pump.

PUMPER FIRE FIGHTING APPARATUS – *Fire fighting apparatus* equipped with a major pump, usually but not always a triple combination.

PURCHASER – The authority having responsibility for the specification and acceptance of the *fire fighting apparatus*.

PURCHASING AUTHORITY – The agency that has the sole responsibility and authority for negotiating, placing, and, where necessary, modifying each and every solicitation, purchase order, or other award issued by a governing body.

QUINT FIRE FIGHTING APPARATUS – *Fire fighting apparatus* with a permanently mounted *fire pump*, a water tank, a hose storage area, an *aerial ladder* or *elevating platform* with a permanently mounted waterway, and a complement of ground ladders.

RATED CAPACITY (AERIAL DEVICE) – The total amount of weight of all personnel and equipment that can be supported at the outermost rung of an *aerial ladder* or on the platform of an *elevating platform* with the waterway uncharged.

RATED CAPACITY (WATER PUMP) – The flow rate to which the pump *manufacturer* certifies compliance of the pump when it is new.

READILY ACCESSIBLE – Able to be located, reached, serviced, or removed without removing other *components* or parts of the *fire fighting apparatus* and without the need to use special tools to open enclosures.

REMOVABLE WINCH(ES) – A winch with quick disconnects for power and controls that can be temporarily mounted on the *fire fighting apparatus* at a permanently installed mounting receiver.

RESERVE CAPACITY – The ability of a battery to sustain a minimum electrical load in the event of a charging system failure or a prolonged charging system deficit.

RETROREFLECTIVE – The property of a device or surface that reflects light back to its source along a vector that is parallel to but opposite in direction from the wave's source.

SIGN – A visual indication whether in pictorial or word format that provides a warning to the operator or other persons near the *fire fighting apparatus*.

SLOW-OPERATING VALVE – A valve that has a mechanism to prevent movement of the flow regulating element from the fully closed position to the fully opened position or vice versa in less than 3 s.

SPECIAL SERVICES FIRE FIGHTING APPARATUS – A multipurpose vehicle that primarily provides support services at emergency scenes.

SPLIT SHAFT PTO – A power takeoff (PTO) drive system that is inserted between the *chassis* transmission and the *chassis* drive axle and that has the shift mechanism necessary to direct the *chassis* engine power either to the drive axle or to a *fire pump* or other accessory.

STABILIZER – A device integral with or separately attached to the *chassis* of a *fire fighting apparatus* with an *aerial device* that is used to increase the moments tending to resist overturning the *fire fighting apparatus*.

STABILIZER PAD – A plate inserted beneath a *stabilizer shoe* to give greater surface bearing area.

STABILIZER SHOE – A permanently mounted shoe on a *stabilizer* to provide a ground surface area.

SUCTION HOSE – Hose intended to be used to lift water from sources such as rivers, lakes, ponds, and wells, by draft, from a level below the *fire pump*, and designed to withstand collapse when subjected to vacuum conditions.

SUMP – A recessed area of a tank assembly designed primarily to entrap sludge or debris for removal and to serve as a central liquid collection point.

SUPPLY HOSE – Hose intended to be used to carry water from a source at positive pressure (such as a hydrant or pumper) to a *fire pump* supplying attack lines, aerial water systems, or other discharge points.

SWASH PARTITION – A vertical wall within a tank structure designed to control the unwanted movement of the fluid within that tank.

SWITCH – Any set of contacts that interrupts or controls current flow through an electrical circuit.

TOP RAIL – The top chord (rail) of an *aerial ladder* to which reinforcements are attached.

TURNING CLEARANCE RADIUS – One half the larger of the left or right full circle wall to wall turning diameter.

TURNTABLE – A structural *component* that connects the *aerial device* to the *chassis* and stabilization system through a rotating bearing that permits 360° continuous rotation of the *aerial device*.

ULTIMATE STRENGTH – The *ultimate strength* of a material in tension, compression, or shear, respectively, is the maximum tensile, compressive, or shear stress that the material can sustain, calculated on the basis of the ultimate load and the original or unrestrained dimensions.

WATER TOWER – An *aerial device* consisting of permanently mounted power-operated *booms* and a waterway designed to supply a large capacity mobile elevated water stream. The *booms* can be of articulating design or telescoping design.

WEATHERPROOF – Constructed or protected so that exposure to the weather and water spray will not interfere with its successful operation.

WET LOCATION – A nonsheltered location inside a compartment with a door or cover that, while open, exposes the electrical enclosure or panelboard to the same environmental conditions as the *exterior* of the *fire fighting apparatus*. A location on a nonenclosed, *exterior* surface of a *fire fighting apparatus* body or driving and crew compartment where the enclosure or panel is exposed to the environment.

YIELD STRENGTH – The stress at which a material exhibits a specified permanent deformation or set.

3 GENERAL REQUIREMENTS

3.1 COMMON REQUIREMENTS

3.1.1 Notwithstanding any other requirements, all *fire fighting apparatus* shall meet the requirements contained in the *CMVSS*, and all applicable regulations and requirements from the *authority having jurisdiction*.

3.1.2 All *fire fighting apparatus* shall meet the requirements of the following chapters of this Standard:

- A Chapter 3, General Requirements;
- B Chapter 11, Chassis, Engine and Apparatus Components;
- C Chapter 12, Low-Voltage Electrical Systems and Warning Devices;
- D Chapter 13, Driving and Crew Areas; and
- E Chapter 14, Body, Compartments, and Equipment Mounting.

3.1.3 All *components* shall be installed in accordance with the applicable *component manufacturer's* installation instructions. All *components* installed in a *fire fighting apparatus* shall comply with the applicable requirements in this Standard.

3.1.4 In addition to the requirements stated in Clause 3.1.2, each *fire fighting apparatus* type defined in Part I (Apparatus Requirements) of this Standard shall meet their respective requirements presented in the following Chapters:

- A Chapter 4, for *Pumper Fire Fighting Apparatus*;
- B Chapter 5, for *Aerial Fire Fighting Apparatus*;
- C Chapter 6, for *Initial Attack Fire Fighting Apparatus*;
- D Chapter 7, for *Quint Fire Fighting Apparatus*;
- E Chapter 8, for *Mobile Foam Fire Fighting Apparatus*;
- F Chapter 9, for *Mobile Water Supply Fire Fighting Apparatus*; and
- G Chapter 10, for *Special Services Fire Fighting Apparatus*.

3.1.5 In addition to the types of *fire fighting apparatus* listed in Part I of this Standard, other types of *fire fighting apparatus* shall be permitted by combining the requirements for the *components* to be used in the *fire fighting apparatus* as defined in Clause 3.1.4, with the requirements in Clause 3.1.2.

3.2 RESPONSIBILITY OF PURCHASER

REFERENCE 4.3 IN NFPA 1901-09

3.2.1 Specify the following details:

- A The *fire fighting apparatus*' required performance including where operation is required at elevations above 600 m (1960 ft) or on *grades* greater than 6 %;
- B Indicate the maximum number of fire fighters who are to ride inside the *fire fighting apparatus*;
- C Specific added continuous electrical loads that exceed the minimum requirements of this Standard; and
- D Identify any hose, ground ladders, or equipment to be carried on the *fire fighting apparatus* that exceed the minimum requirements of this Standard.

3.3 RESPONSIBILITY OF CONTRACTOR

REFERENCE 4.4 IN NFPA 1901-09

3.3.1 Provide detailed description of the *fire fighting apparatus*, list of equipment to be furnished, and other construction details to which the *fire fighting apparatus* shall conform.

3.3.2 The detailed description of the *fire fighting apparatus* shall include, but not be limited to:

- A Estimated weight;
- B *Turning clearance radius*;
- C Principal dimensions;
- D Transmission;
- E Axle ratios; and
- F *Rated capacity* of the *aerial device*, if applicable.

3.3.3 A qualified and responsible representative of the *contractor* shall instruct personnel specified by the *purchaser* in the operation, care and maintenance of the *fire fighting apparatus* and equipment delivered.

3.3.4 The *contractor* shall confirm with the *purchaser* and document any variation exceeding the minimum requirement as per Clause 3.2.1.

3.4 PERSONNEL PROTECTION

REFERENCE 4.9 IN NFPA 1901-09

3.4.1 Provide guards, shields or other protection where necessary to prevent injury of personnel by hot, moving, or rotating parts during non-maintenance operations.

3.4.2 Provide electrical insulation or isolation where necessary to prevent electrical shock from onboard electrical systems.

3.4.3 Vehicular workmanship shall ensure an operating environment free of accessible sharp projections and edges.

3.4.4 Caution, Warning, Danger and other Safety related *signs* shall meet the requirements of ANSI Z535.4, Product Safety Signs and Labels.

3.5 CONTROLS AND INSTRUCTIONS

REFERENCE 4.10 IN NFPA 1901-09

3.5.1 For all controls, *switches*, instruction *plates*, *gauges*, and instruments necessary for the operation of the *fire fighting apparatus* and the equipment provided on it, illumination shall be provided.

3.5.2 Where external illumination is provided, the illumination shall be a minimum of 50 lx (4.6 fc) on the face of the device.

3.5.3 Where internal illumination is provided, the illumination shall be a minimum of 14 candela/m² (4 ft-lamberts).

3.5.4 All required *signs*, *plates*, and *labels* shall be permanent, securely attached, and meet the requirements of Clause 3.4.4 and UL 969, Standard for Marking and Labeling Systems.

3.5.5 The *signs*, *plates*, and *labels* shall be resistant to damage from temperatures between -35 °C (-31 °F) and +71 °C (160 °F) and exposure to oil, fuel, water, hydraulic fluids, or other fluids used on the *fire fighting apparatus*.

3.5.6 It is required that *exterior* mounted *labels* related to safety or critical operational instructions be reflective or lighted as indicated in Clauses 3.5.1 through 3.5.3.

3.5.7 The centre line of *gauges* or visual displays shall not be more than 2.1 m (7 ft) above the level where the operator stands to read the instrument.

3.5.8 For any control, the central midpoint or centreline shall be no more than 1.8 m (6 ft) above the ground or platform that is intended to function as the operator's standing position.

3.5.9 *Gauges* and visual displays at the *fire fighting apparatus* operating positions shall readout in the metric system, unless the *purchaser* specifies a different system. *Gauges* and visual displays providing dual systems shall have the metric system as primary, unless the *purchaser* specifies otherwise. *Gauges* and visual displays on *chassis* shall be in units specified by Transport Canada.

3.6 COMPONENT PROTECTION

REFERENCE 4.12 IN NFPA 1901-09

3.6.1 Hydraulic hose lines, air system tubing, control cords, and electrical harnesses shall be mechanically attached to the frame or body structure of the *fire fighting apparatus*.

3.6.2 At each point where they pass through body panels or structural members or wherever they lay against a sharp metal edge, the type of equipment described in Clause 3.6.1 shall be furnished with protective looms, grommets, or other devices.

3.6.3 A through-the-frame connector shall be allowed in place of metal protective looms or grommets.

3.7 VEHICLE STABILITY

REFERENCE 4.13 IN NFPA 1901-09

3.7.1 The height of the fully loaded vehicle's centre of gravity shall not exceed the *chassis manufacturer's* maximum limit. The *fire fighting apparatus* shall meet the criteria of Clause 3.7.1.1 or be equipped with a stability control system in accordance with Clause 3.7.1.2.

3.7.1.1 Either of the criteria shall be met by the *fire fighting apparatus*:

- A When tested on a tilt table in accordance with SAE J2180, A Tilt Table Procedure for Measuring the Static Rollover Threshold for Heavy Trucks, the *fire fighting apparatus* shall remain stable to 26.5 degrees in both directions;
- B The centre of gravity (CG), whether it be calculated or measured, shall be no higher than 80 % of the rear axle track width.

3.7.1.1.1 The sample apparatus shall be considered significantly similar if it includes a *chassis* with equal or greater centre of gravity (CG) height, equal or narrower rear axle track width, equal or greater size and CG height of water tank, front and rear suspension of same type, and *aerial device* be of the same type and size.

3.7.1.1.2 The *fire fighting apparatus* shall be loaded, for the purpose of Clause 3.7.1.1, with fuel, fire-fighting agents, hose, ladders, a weight of 113 kg (250 lb) in each seating position, and a weight equivalent to the *miscellaneous equipment allowance* as defined in Table 2.

3.7.1.1.2.1 If the *fire fighting apparatus* is designed to meet any of the following, these greater loads shall be included in the testing, calculating, or measuring:

- A A specified higher equipment loading;
- B Larger hose bed capacity; or
- C Carry additional ground ladders.

3.7.1.1.2.2 An approximate typical in-service use weight distribution shall be met without exceeding the *manufacturer's* published individual compartment weight ratings when the weight is added to the *fire fighting apparatus* for the purpose of test, calculation, or measurement.

3.7.1.2 As a minimum, an apparatus equipped with a stability control system shall have a steering wheel position sensor, a vehicle yaw sensor, a lateral accelerometer, and individual wheel brake controls.

3.8 WEIGHT DISTRIBUTION

REFERENCE 4.13.2 IN NFPA 1901-09

3.8.1 The front to rear weight distribution of the fully loaded *fire fighting apparatus* as defined in Section 11.2, Carrying Capacity, shall be within the limits set by the *chassis manufacturer*.

3.8.2 The front axle loads shall not be less than the minimum axle loads as specified by the *chassis manufacturer* under full load and all other loading conditions.

3.9 LOAD DISTRIBUTION

REFERENCE 4.13.3 IN NFPA 1901-09

3.9.1 The *fire fighting apparatus manufacturer* shall calculate the load distribution for the *fire fighting apparatus* based upon the information supplied by the *purchaser*.

3.9.2 The *manufacturer* shall devise the *fire fighting apparatus* to comply with the *gross axle weight ratings (GAWR)*, the overall *gross vehicle weight rating (GVWR)* and the *chassis manufacturer's* load balance guidelines.

3.9.3 The *purchaser* shall locate the equipment on the *fire fighting apparatus* to assure that the difference in weight from side to side on the end of each axle shall not exceed 7 % or the limit allowed by the axle or *component manufacturer*.

3.10 APPARATUS PERFORMANCE

REFERENCE 4.14 IN NFPA 1901-09

3.10.1 Shall meet the requirements of this Standard at elevations up to 600 m (1960 ft) above sea level.

3.10.2 Shall meet all the requirements of this Standard while stationary on a *grade* of 6 % in any direction.

3.10.3 Shall meet the requirements of this Standard when tested within the ambient temperatures between -18 °C (0 °F) and 43 °C (109 °F).

CAUTIONARY NOTE: Be aware that, depending on the climatic zone of operation, a lower temperature limit for application of the requirements may apply.

3.11 ROAD PERFORMANCE

REFERENCE 4.15 IN NFPA 1901-09

3.11.1 Shall meet the following requirements performed on dry, paved roads that are in good condition when the *fire fighting apparatus* is fully equipped and loaded as defined in Section 11.2, Carrying Capacity:

- A From a standing start, attain a speed of 55 km/h (35 mph) within 25 s on a level road;
- B Attain a minimum top speed of 80 km/h (50 mph) on a level road; and
- C Maintain a speed of at least 30 km/h (20 mph) on any *grade* up to and including 6 %.

3.11.2 The road tests shall be conducted in accordance with Section 3.13, Road Tests.

3.12 SERVICEABILITY

REFERENCE 4.16 IN NFPA 1901-09

3.12.1 The design of the *fire fighting apparatus* shall allow the operator to perform all of the *manufacturer's* recommended routine maintenance checks of lubricant and fluid levels without lifting the cab of a tilt-cab apparatus or without the need for hand tools.

3.12.2 Special tools required for routine service on any *component* of the *fire fighting apparatus* shall be provided with the *fire fighting apparatus*.

3.12.3 *Fire fighting apparatus components* that interfere with repair or removal of other major *components* are to be attached with fasteners, such as cap screws and nuts, so that the *components* can be removed and installed with ordinary hand tools. These *components* are not to be welded or otherwise permanently secured into place.

3.13 ROAD TESTS

REFERENCE 4.17 IN NFPA 1901-09

3.13.1 To verify compliance with Section 3.11, Road Performance, tests shall be:

- A Conducted at a location and in a manner that does not violate the traffic laws of *authorities having jurisdiction*; and
- B Conducted on dry, level, paved roads that are in good condition.

3.13.2 The *fire fighting apparatus* shall be fully equipped and loaded as required in Section 11.2, Carrying Capacity.

3.13.3 The maximum governed speed of the engine shall not be exceeded during these tests.

3.13.4 There shall be two runs of the acceleration test in opposite direction over the same route. A GPS unit may be used to verify apparatus speed during this test. The GPS unit shall be in communication with at least four satellites for the duration of the test.

3.13.5 The *fire fighting apparatus* shall attain a speed of 55 km/h (35 mph) from a standing start within 25 s.

3.13.6 The *fire fighting apparatus* shall attain a minimum top speed of 80 km/h (50 mph).

3.13.7 If the *fire fighting apparatus* is equipped with an *auxiliary braking system*, the system shall be road tested to confirm that it is functioning as intended by the *manufacturer*.

3.13.8 The service brakes shall bring the fully laden *fire fighting apparatus* to a complete stop from an initial speed of 30 km/h (20 mph), in a distance not exceeding 9 m (30 ft) by actual measurement, on a paved, level surface road that is free of loose material, oil, or grease.

3.14 TESTS ON DELIVERY

REFERENCE 4.18 IN NFPA 1901-09

3.14.1 If additional *acceptance tests* are required at the point of delivery, they shall be run in accordance with the provisions of this Standard.

3.14.2 *Aerial device* stability tests shall be performed at the *manufacturer's* facility.

3.15 DOCUMENTATION

3.15.1 General

REFERENCE 4.19 IN NFPA 1901-09

3.15.1.1 Any *documentation* delivered with the *fire fighting apparatus* shall be permitted to be in printed format, electronic format, audiovisual format, or a combination thereof as specified by the purchaser.

3.15.2 Fire Fighting Apparatus Documentation

REFERENCE 4.20.1 IN NFPA 1901-09

3.15.2.1 The *contractor* shall supply, at the time of delivery of the *fire fighting apparatus*, at least one copy the *manufacturer's* record of *fire fighting apparatus* construction details, including the following information:

- A Owner's name and address;
- B *Fire fighting apparatus manufacturer*, model, and serial number;
- C *Chassis* make, model, and serial number;
- D *GAWR* of front and rear axles;
- E Front tire size and total *rated capacity* in kilograms (pounds);
- F Rear tire size and total *rated capacity* in kilograms (pounds);
- G *Chassis* weight distribution in kilograms (pounds) with water and *manufacturer-mounted* equipment (front and rear);
- H Engine make, model, serial number, rated horsepower and related speed, and governed speed; make, model, and gear ratio of engine transmission *PTO(s)* if applicable;
- I Fuel type and fuel tank capacity;
- J Electrical system voltage and alternator output in amperes;
- K Battery make, model, and capacity in cold cranking amps (CCA);
- L *Chassis* transmission make, model, and serial number; and if so equipped, *chassis* transmission *PTO(s)* make, model, and gear ratio;
- M Pump make, model, *rated capacity* in litres per minute (Imperial *gallons* / US gallons per minute where applicable), and serial number;
- N Pump transmission make, model, serial number, and gear ratio;
- O *Auxiliary pump* make, model, *rated capacity* in litres per minute (Imperial *gallons* / US gallons per minute where applicable), and serial number;
- P Water tank certified capacity in litres or Imperial *gallons* / US gallons;
- Q *Aerial device* type, rated vertical height in metres, rated horizontal reach in metres, and *rated capacity* in kilograms (pounds);
- R Paint *manufacturer(s)* and paint number(s); and
- S Company name and signature of responsible company representative.

3.15.2.2 If the *fire fighting apparatus* has a *fire pump*, the engine *manufacturer's* certified brake horsepower curve for the engine furnished, showing the maximum governed speed (Refer to Clause 15.3.2).

3.15.2.3 If the *fire fighting apparatus* has an *aerial device*, all the technical information is required for inspections to comply with NFPA 1911, Standard for the Inspection, Maintenance, Testing, and Retirement of In-Service Automotive Fire Apparatus.

3.15.3 Operations and Service Documentation

REFERENCE 4.20.2 IN NFPA 1901-09

3.15.3.1 At the time of delivery of the *fire fighting apparatus*, the *contractor* shall supply the following:

- A A minimum of two sets of complete operation *documentation*; and
- B A minimum of two sets of complete service *documentation*

which cover the completed *fire fighting apparatus* as delivered and accepted.

3.15.3.2 As a minimum the *documentation* shall cover at least the inspection, maintenance, and operations of the *fire fighting apparatus* and all major *components* thereof.

3.15.3.3 In addition, the *contractor* shall also provide *documentation* of the following items for the entire *fire fighting apparatus* and each major operating system or major *component* of the *fire fighting apparatus*:

- A *Manufacturer's* name and address;
- B Country of manufacture;
- C Source for service and technical information;
- D Parts replacement information;
- E Descriptions, specifications, and ratings of the *chassis*, pump (if applicable), and *aerial device* (if applicable);
- F Wiring diagrams for *low-voltage* and *line voltage systems* of the "as-built" *fire fighting apparatus* to include the following information:
 - (i) Pictorial representations of circuit logic for all electrical *components* and wiring;
 - (ii) Circuit identification;
 - (iii) Connector pin identification;
 - (iv) Zone location of electrical *components*;
 - (v) Safety *interlocks*;
 - (vi) Alternator-battery power distribution circuits; and
 - (vii) Equivalent circuit logic implemented in multiplexing systems;

- G Lubrication charts;
- H Operating instructions for the *chassis*, any major *components* such as a pump or *aerial device*, and any auxiliary systems;
- I Precautions related to *multiple configurations* of *aerial devices*, if applicable;
- J Instructions regarding the frequency and procedure for recommended maintenance;
- K Overall *fire fighting apparatus* operating instructions;
- L Safety considerations;
- M Limitations of use;
- N Inspection procedures;
- O Recommended maintenance procedures;
- P Troubleshooting guide;
- Q *Fire fighting apparatus* body, *chassis*, and other *component manufacturer's* warranties;
- R Copies of completed *manufacturer* testing and certifications, independent third-party certifications of test results, and other *component manufacturer's* certifications; and
- S A material safety data sheet (MSDS) for any fluid that is specified for use on the *fire fighting apparatus*.

3.15.3.4 All *manufacturers'* operations and maintenance documents supplied with *components* and equipment that are installed or supplied by the *contractor* shall be delivered with the *fire fighting apparatus*.

PART I – APPARATUS REQUIREMENTS

4 PUMPER FIRE FIGHTING APPARATUS

4.1 GENERAL

4.1.1 The *pumper fire fighting apparatus* shall have the following equipment:

- A *Fire Pump*;
- B *Water Tank*;
- C *Equipment Storage*;
- D *Hose Storage*, using hose bed area(s), compartments or reels;
- E *Fire Hose and Nozzles*; and
- F *Miscellaneous Equipment* listed in Clause 4.9.3.

4.1.2 For *pumper fire fighting apparatus* equipped with:

- A An *aerial device*, the requirements of Section 5.2, Aerial Device shall also apply.
- B A *foam proportioning system*, the requirements of Chapter 18, Foam Proportioning Systems shall also apply.
- C A *Compressed Air Foam System (CAFS)*, the requirements of Chapter 19, Compressed Air Foam Systems shall also apply.
- D A *line voltage system*, the requirements of Chapter 20, Line Voltage Electrical Systems shall also apply.

4.1.3 In addition to the requirement of Clause 4.1.1, the *pumper fire fighting apparatus* shall have the following equipment to be supplied by the *contractor*:

- A Ground Ladders;
- B *Suction Hose*; and
- C The necessary brackets or compartments needed to organize and mount the specified equipment.

4.2 FIRE PUMP

REFERENCE 5.2 IN NFPA 1901-09

4.2.1 Minimum *rated capacity*: 3000 L/min (625 *gpm* / 750 US-gpm).

4.2.2 Shall meet the requirements of Chapter 15, Fire Pumps and Associated Equipment, of this Standard.

4.3 WATER TANK

REFERENCE 5.4 IN NFPA 1901-09

4.3.1 Minimum capacity (combined, if applicable): 1135 L (250 *gal* / 300 US-gal).

4.3.2 Shall meet the requirements of Chapter 16, Water Tanks, of this Standard.

4.4 EQUIPMENT STORAGE

REFERENCE 5.5 IN NFPA 1901-09

4.4.1 Minimum dimension: 1.1 m³ (39 ft³).

4.4.2 Enclosed and weather-resistant.

4.4.3 Shall meet the requirements of Section 14.2, Compartment.

4.5 HOSE STORAGE

REFERENCE 5.6 IN NFPA 1901-09

4.5.1 Shall meet the requirements of Section 14.10, Hose Storage.

4.5.2 Able to accommodate minimum hose storage area of 1.1 m^3 (39 ft^3) for 65 mm (2.5 in) or larger fire hose; and two areas, each a minimum of 0.1 m^3 (3.5 ft^3) for 38 mm (1.5 in) or larger preconnected fire hose lines.

4.6 AERIAL DEVICE

REFERENCE 5.3 IN NFPA 1901-09

4.6.1 Shall meet the requirements of Chapter 17, Aerial Devices.

4.6.2 For water supplied to a permanently mounted waterway, the pump shall be capable of supplying the flow requirement under Clauses 17.2.8.1, 17.4.11.1.2, or 17.5.4.1. Maximum intake *gauge pressure*: 140 kPa (20 psi).

4.6.3 The pump operator shall not be in contact with the ground.

4.6.4 Warning *signs* of electrocution hazards shall be provided for the pump operator.

4.7 GROUND LADDERS

REFERENCE 5.7.1 IN NFPA 1901-09

4.7.1 Shall meet the requirements of NFPA 1931, Standard for Manufacturer's Design of Fire Department Ground Ladders except as permitted by Clauses 4.7.3 and 4.7.4.

4.7.2 Minimum requirements: one straight ladder with roof hooks, one extension ladder and one attic ladder or folding ladder.

4.7.3 Step ladders and other types of multipurpose ladders meeting CAN/CSA-Z11-M81 (R2005), Portable Ladders shall be permitted to be substituted for the folding ladder required in Clause 4.7.2.

4.7.4 Step ladders and other types of multipurpose ladders shall be permitted to be carried in addition to the minimum fire department ground ladders specified in Clause 4.7.2 provided they meet CAN/CSA-Z11-M81 (R2005), Portable Ladders.

4.8 SUCTION HOSE

REFERENCE 5.7.2 IN NFPA 1901-09

4.8.1 Shall meet the requirements of CAN/ULC-S511, Lined Fire Hose for Interior Standpipes and Municipal and Industrial Fire Protection Services.

4.8.2 Minimum required: 4.6 m (15 ft) of *supply hose* or 6.1 m (20 ft) of *suction hose*.

4.8.3 For *suction hose*, a suction strainer shall be furnished; and the friction and entrance loss of the combination *suction hose* and strainer shall not exceed the losses listed in Table 1 of this Standard.

4.8.4 For *supply hose*, couplings shall be provided that are compatible with the local hydrant outlet connection on one end and with the pump intake connection on the other end.

4.8.5 *Purchaser* shall specify:

A Type of *suction hose* to be provided;

- B Length and size of the hose;
- C Type and size of the couplings;
- D Manner in which the *suction hose* is to be carried on the *fire fighting apparatus*; and
- E Style of brackets desired.

4.9 MINOR EQUIPMENT

4.9.1 General

REFERENCE 5.8.1 IN NFPA 1901-09

4.9.1.1 List of equipment required on the *fire fighting apparatus* before the *fire fighting apparatus* is placed in service.

4.9.1.2 The necessary brackets or compartments needed to organize and mount the specified equipment shall be supplied.

4.9.1.3 The *purchaser* shall supply a detailed list of who is to outfit the items, and shall also provide the method for organizing and mounting these items.

4.9.2 Fire Hose And Nozzles

REFERENCE 5.8.2 IN NFPA 1901-09

4.9.2.1 Minimum required fire hose and nozzles:

- A 240 m (800 ft) of 65 mm (2.5 in) or larger fire hose in any combination;
- B 120 m (394 ft) of 38 mm (1.5 in), 45 mm (1.75 in), or 50 mm (2 in) fire hose;
- C One combination spray nozzle, 750 L/min (165 *gpm* / 200 US-gpm) minimum;
- D Two combination spray nozzles, 360 L/min (80 *gpm* / 95 US-gpm) minimum;
- E One playpipe with shutoff and 25 mm (1 in), 29 mm (1.14 in) and 32 mm (1.25 in) tips; and
- F One additional of either item C, one combination spray nozzle, or item E, one playpipe.

NOTE: Minimums may be exceeded as per Clause 3.2.1.

4.9.3 Miscellaneous Equipment

REFERENCE 5.8.3 IN NFPA 1901-09

4.9.3.1 Required additional equipment:

- A One 2.7 kg (6 lb) flathead axe;
- B One 2.7 kg (6 lb) pickhead axe;
- C One 1.8 m (6 ft) pike pole or plaster hook;

- D One 2.4 m (8 ft) or longer pike pole;
- E Two portable hand lights;
- F One approved dry chemical portable fire extinguisher with a minimum 80-B:C rating complying with CAN/ULC-S504, Standard on Dry Chemical Fire Extinguisher;
- G One self-contained breathing apparatus (SCBA) complying with CSA Z94.4, Selection, Use, and Care of Respirators, for each assigned seating position, but not less than four, mounted in brackets fastened to the *fire fighting apparatus* or stored in containers supplied by the SCBA manufacturer;
- H One spare SCBA cylinder for each SCBA carried, each mounted in brackets fastened to the *fire fighting apparatus* or stored in a specially designed storage space;
- I One first aid kit;
- J Four combination spanner wrenches;
- K Two hydrant wrenches;
- L One double female 65 mm (2.5 in) adapter;
- M One double male 65 mm (2.5 in) adapter;
- N One rubber mallet, suitable for use on *suction hose* connections;
- O Two salvage covers each a minimum size of 3.7 m x 4.3 m (12 ft x 14 ft); and
- P Two wheel chocks, each designed to hold the *fire fighting apparatus* when loaded to its maximum *in-service weight*, when on a 20 % *grade* with the transmission in neutral and the parking brake released, shall be mounted in *readily accessible* locations.

4.9.3.2 For *supply hose* not using sexless couplings: additional double female adapter and double male adapter required. Adapters sized to fit fire hoses 65 mm (2.5 in) or larger and mounted in brackets fastened to the *fire fighting apparatus*.

4.9.3.3 If none of the pump intakes required by Clause 15.6.1.1 are valved, a hose appliance that is equipped with one or more gated intakes with female swivel connection(s) compatible with the *supply hose* used on one side and a swivel connection with pump intake threads on the other side shall be carried. Any intake connection 90 mm (3.5 in) or larger shall include a pressure relief device that meets the requirements of Clause 15.6.2.10.

4.9.3.4 For *pumper fire fighting apparatus* equipped with an *aerial device* with a permanently mounted ladder, four ladder belts are also required. The ladder belts shall meet the requirements of NFPA 1983, Standard on Fire Service Life Safety Rope and System Components.