



Designation: F2783 – 17

Standard Practice for Design, Manufacture, Operation, Maintenance, and Inspection of Amusement Rides and Devices, in Canada¹

This standard is issued under the fixed designation F2783; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

Note—This ASTM Standard has been developed to replace CAN/CSA Z267-00 (R2011), which is being withdrawn as an active CSA Standard.

INTRODUCTION

The Canadian Standards Association (CSA) and the American Society for Testing Materials (ASTM) have paved the way for the development of new ASTM amusement device standards, introducing uniform safety criteria for both Canada and the United States of America.

Seeking to gain a level of consistency and eliminate much duplication, CSA and ASTM struck a subcommittee to develop a new ASTM F24 standard, a comprehensive, one-volume document, that provides a mechanism to:

- adapt F24 standards to Canadian needs;
- provide greater two way communication between CSA and ASTM; and
- facilitate adoption by Canadian provinces and territories.

This one-source standard replaces the current CSA Z267 Safety Code for Amusement Rides and Devices. As CSA Z267 was primarily based on the ASTM F24 Family of Standards, Practice F2783 is a realignment of those core essentials with new sections tailor-made for Canada. Categorized in four distinct sections, the standard includes:

- **Core Standards** (for example, Terminology, Design, Manufacture, Operation, Maintenance, and Inspection);
- **Supporting Standards** (for example, Measuring Ride Dynamics and Hardness of Composite Foam);
- **Specific Classification of Amusement Rides and Devices Standards** (for example, Go-Karts, Water Slides, Inflatables and Trains); and
- **Other Standards** (other standards used to support amusement device design).

This standard is structured such that Section 2.2 listings of Core Standards capture the essential and broad safety requirements for all amusement rides and devices. Section 2.3 listings of Supporting Standards are intended to complement in design of all amusement rides and devices where applicable. Section 2.4 listings of Specific Classification of Amusement rides and Devices Standards capture supplemental requirements in addition to Core Standards for anomalous amusement rides and devices. Section 2.5 listing Other Standards used to support amusement device design.

To provide greater application within Canada, Practice F2783 also incorporates specific sections that include: Standards Cross Referencing Table; Substitutions; Exceptions; and Additional Requirements.

This unique initiative would not have been possible were it not for the active collaboration of the CSA Z267 and the ASTM F24.80 Harmonization Committees, representative of a diverse stakeholder base, including delegates from government (regulators), manufacturers, engineers, park owners/operators as well as general and consumer interests.

Practice F2783 is supported by Canadian provincial and territorial regulators and amusement device stakeholders, the International Association of Amusement Parks and Attractions (IAAPA), CSA and ASTM.

This standard has been printed in Canada's two official languages.

1. Scope

1.1 This practice applies to the terminology, design, manufacture, operation, maintenance, and inspection of amusement rides and devices in Canada.

1.2 This practice adopts ASTM Committee F24 Standards listed under Sections 2.2, 2.3 and 2.4.

¹ This practice is under the jurisdiction of ASTM Committee F24 on Amusement Rides and Devices and is the direct responsibility of Subcommittee F24.80 on Harmonization.

Current edition approved Oct. 1, 2017. Published November 2017. Originally approved in 2014. Last previous edition approved in 2014 as F2783 – 14. DOI: 10.1520/F2783-17.

1.3 This practice includes an annex (mandatory), which provides additional information (for example, rationale, background, interpretations, drawings, commentary, etc.) related to the application of the criteria presented in this practice.

1.4 This practice includes an appendix (non-mandatory), which provides additional information (for example, rationale, background, interpretations, drawings, commentary, and so forth) to improve the user's understanding and application of the criteria presented in this practice.

1.5 It is the responsibility of the users of this practice and other ASTM Standards to judge their suitability for a particular purpose.

1.6 This practice includes the following sections:

Title	Section
Scope	1
Referenced Documents	2
ASTM Committee F24 Core Standards for Amusement Rides and Devices	2.2
ASTM Committee F24 Supporting Standards for Amusement Rides and Devices	2.3
ASTM Committee F24 Standards for Specific Classification of Amusement Rides and Devices	2.4
Other Standards	2.5
Reference Codes, Standards, Specifications, and Handbooks	2.6
Terminology	3
Significance and Use	4
Design	5
General	5.1
Substitution of Referenced Documents in Practice F2291 with Alternate Documents	5.2
General	5.2.1
Canadian Standards	5.2.2
Exceptions from Practice F2291	5.3
Additional Requirements	5.4
Manufacture	6
Ownership, Operation, Maintenance, and Inspection	7
Exceptions from Practice F770	7.3
Additional Requirements	7.4
Auditing of Amusement Rides and Devices	8
Recognized Certification Marks	Annex A1
Significance and Use	Appendix X1
Hardness Measurement of Patron Seat and Restraint Padding	Appendix X2

1.7 For a glossary of terms that includes the meaning and intent of words such as shall, should, may, will, standard, practice, guide, classification, specification, etc. used in ASTM standards, please refer to "Form and Style for ASTM Standards," which is available at www.astm.org.

1.8 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.9 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 The documents listed in 2.2, 2.3 and 2.4 contain provisions, which through reference in this standard, constitute provisions of this practice.

NOTE 1—For undated references, the latest edition of the referenced document applies. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, users of this practice are encouraged to investigate the possibility of applying the most recent editions of documents referenced below.

- 2.2 *Core Standards for Amusement Rides and Devices:*²
- F747 Terminology Relating to Amusement Rides and Devices
 - F770 Practice for Ownership, Operation, Maintenance, and Inspection of Amusement Rides and Devices
 - F1193 Practice for Quality, Manufacture, and Construction of Amusement Rides and Devices
 - F2291 Practice for Design of Amusement Rides and Devices
 - F2974 Guide for Auditing Amusement Rides and Devices
- 2.3 *Supporting Standards for Amusement Rides and Devices:*²
- F1957 Test Method for Composite Foam Hardness-Durometer Hardness
 - F2137 Practice for Measuring the Dynamic Characteristics of Amusement Rides and Devices
 - F2375 Practice for Design, Manufacture, Installation and Testing of Climbing Nets and Netting/Mesh used in Amusement Rides, Devices, Play Areas and Attractions
- 2.4 *Standards for Specific Classification of Amusement Rides and Devices:*²
- F2007 Practice for Design, Manufacture, and Operation of Concession Go-Karts and Facilities
 - F2374 Practice for Design, Manufacture, Operation, and Maintenance of Inflatable Amusement Devices
 - F2376 Practice for Classification, Design, Manufacture, Construction, and Operation of Water Slide Systems
 - F2460 Practice for Special Requirements for Bumper Boats
 - F2461 Practice for Manufacture, Construction, Operation, and Maintenance of Aquatic Play Equipment
 - F2959 Practice for Aerial Adventure Courses
 - F2960 Practice for Permanent Amusement Railway Ride Tracks and Related Devices
 - F2970 Practice for Design, Manufacture, Installation, Operation, Maintenance, Inspection and Major Modification of Trampoline Courts
 - F3054 Practice for Operations of Amusement Railway Rides, Devices, and Facilities
 - F3099 Practices for Parasailing
 - F3133 Practice for Classification, Design, Manufacture, Construction, Maintenance, and Operation of Stationary Wave Systems

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

F3158 Practice for Patron Transportation Conveyors Used with a Water Related Amusement Ride or Device

2.5 *Other Standards:*

D785 Test Method for Rockwell Hardness of Plastics and Electrical Insulating Materials

D2240 Test Method for Rubber Property—Durometer Hardness

F1159 Practice for Design of Amusement Rides and Devices that are Outside the Purview of Other F24 Design Standards

2.6 *Reference Codes, Standards, Specifications, and Handbooks:*

NOTE 2—Table 1 provides cross-references of document(s) acceptable in lieu of specific editions of codes, standards, specifications, and handbooks referenced in standards from ASTM Committee F24 on Amusement Rides and Devices. Only that portion of the codes, standards, specifications and handbooks as specified by the requirements of this standard is applicable.

3. Terminology

3.1 Terms that are meant to have common meaning among the ASTM Committee F24 standards referenced in Section 2 are defined in Terminology F747.

3.2 Terms that are meant to have specific meaning within the ASTM Committee F24 standards are defined in those standards referenced in Section 2.

3.3 *engineer, n*—an engineer as defined by and licensed in accordance with the applicable provincial or territorial statute.

3.4 *Clarification of Terminology in ASTM Committee F24 Standards:*

3.4.1 The term “attractions” used in the ASTM F24 Committee Standards for Amusement Rides and Devices hold the same meaning as “amusement devices or rides” defined in Terminology F747.

3.4.2 The term “English” used in the ASTM F24 Committee Standards for Amusement Rides and Devices means “English and French” for the purpose of this Standard.

4. Significance and Use

4.1 The purpose of this practice is to adopt the ASTM F24 Committee Standards for Amusement Rides and Devices for use in Canada.

4.2 This practice provides guidance for use of additional codes and standards in Canada.

4.3 In cases where conflicts exist between this practice and local codes, local codes would prevail.

5. Design

5.1 *General*—Amusement devices and rides shall be designed in accordance with Practice F2291.

5.1.1 The significance and use of Practice F2291 are explained in X1.1.

5.2 *Substitution of Referenced Documents in Practice F2291 with Alternate Documents:*

5.2.1 *General:*

5.2.1.1 Subsection 2.6 lists substitution of referenced documents in Practice F2291 with acceptable alternate documents for their applicability in Canada.

5.2.1.2 Amusement rides and devices shall meet the requirements specified in Sections 5.2.2 and 5.2.3.

5.2.2 *Canadian Standards:*

5.2.2.1 All electrical apparatus and wiring in amusement rides and devices shall conform to the requirements CSA C22.1.

5.2.2.2 All references to NFPA 70 (the National Electrical Code) in Practice F2291 shall have substituted the applicable rules of CSA C22.1, Canadian Electrical Code.

5.2.2.3 Where electrical equipment used in an amusement ride or device is not certified or listed, and marked or labeled to the pertinent standard in Part II of the Canadian Electrical Code, it shall be field evaluated and labeled or marked to the requirements of CSA SPE-1000, Model Code for the Field Evaluation of Electrical Equipment.

NOTE 3—Carnival and traveling show owners or operators, where required by the local jurisdiction, should arrange to have installation and connection of electrical equipment on amusement rides or devices inspected at every event to ensure they meet the safety standards defined in the adopted Electrical Safety Code. Annex A1 provides a listing of certification agencies acceptable by authorities having jurisdiction.

5.2.2.4 *Overhead Utilities*—Amusement devices or rides shall not be located in proximity to overhead electric supply and communication utility systems unless the overhead system meets the requirements of CAN/CSA-C22.3 No. 1.

NOTE 4—Proximity as defined in CAN/CSA-C22.3 No. 1 means that lines are so located that the failure of a conductor or any part of the overhead system (such as overturning at the ground line) would interfere with the normal use, operation, or maintenance of an amusement device or ride by contact or encroachment on minimum clearance requirements by the conductor or structure.

5.2.2.5 *Clearances to Structures*—Clearances between an amusement device or ride and structures not forming part of the amusement device shall meet the requirements of the National Fire Code of Canada (NFCC).

5.2.2.6 *Fixed Amusement Devices or Rides Foundation*—Foundations for fixed amusement devices or rides shall be designed in accordance with the National Building Code of Canada (NBCC).

5.2.2.7 *Amusement Devices or Rides Structure*—Wind, snow, ice, and earthquake loads on amusement devices or rides structure shall be calculated in accordance with requirements specified in the NBCC.

5.2.3 *Specific References within Canadian Standards:*

5.2.3.1 With respect to electrical grounding, reference to NFPA 70, Section 525-Ca in Practice F2291 may be understood to refer to CSA C22.1, Section 66.

5.2.3.2 With respect to wet areas, reference to NFPA 70, Section 680 in Practice F2291 shall mean CSA C22.1, Section 68.

5.3 *Exceptions from Practice F2291:*

5.3.1 *Subsection 1.2.10 of Practice F2291*—Subsection 1.2.10 of Practice F2291 shall not apply. This practice does not apply to the pre-existing design of amusement rides or devices or major modifications designed in the five years preceding the

TABLE 1 Cross-References of Documents

Reference Documents in ASTM F24 Committee Standards		Alternate Acceptable Documents in Canada		
Designation (Listed by Authoring Organization)	ASTM Standards Reference Source	Title	Designation (Publisher)	Comments
ACI Standards:				
ACI 301	F2291	Specifications for Structural Concrete	NBCC (NRCC)	National Building Code of Canada
ACI 318	F2291	Building Code Requirements for Structural Concrete (318) and Commentary (318R)	NBCC (NRCC)	National Building Code of Canada
AF&PA American Wood Council Standards:				
NDS 2005	F2291	National Design Specification for Wood Construction	O86 (CSA)	Consolidation – Engineering design in wood
AISC Manuals:				
AISC 316	F2291 F2970	Manual of Steel Construction, Allowable Stress Design (ASD)	(CISC) & S16 (CSA)	Handbook of Steel Construction – Ninth Edition; and Design of Steel Structures
AISC 360-05	F2291	Specifications for Structural Steel Buildings	(CISC) & S16 (CSA)	Limit States Design in Structural Steel Eighth Edition, and Design of steel structures
AISC M015	F2291 F2970	Manual on Steel Construction, Load & Resistance Factor Design (LRFD)	(CISC) & S16 (CSA)	Limit States Design in Structural Steel Ninth Edition, and Design of steel structures
ANSI Standards:				
ANSI B11.TR3	F2291	Risk Assessment and Risk Reduction—A Guide to Estimate, Evaluate, and Reduce Risks Associated with Machine Tools	None	None
ANSI B77.1	F2291 F2959 F3158	Passenger Ropeways—Aerial Tramways, Aerial Lifts, Surface Lifts, Tows and Conveyors—Safety Requirements	Z98 (CSA)	Passenger ropeways and passenger conveyors
ANSI B77.2	F3054	Funiculars - Safety Requirements	Z98 (CSA)	Passenger ropeways and passenger conveyors
ANSI Y32.10	F2291	Graphic Symbols for Fluid Power Diagrams	None	None
ANSI Z359	F2959	Fall Protection Code	None	None
ANSI A10.11	F2461	Personal and Debris Nets	None	See also provincial Occupational Health and Safety requirements related to Fall Protection
ANSI/IAF-9	F2461	American National Standard for Aquatic Recreation Facilities	None	Refer to Provincial pool safety standards as required. Also known as APSP-9.
APSP (Association of Pool & Spa Professionals) Document:				
ANSI/APSP-16	F3133	Suction Fittings for Use in Swimming Pools, Wading Pools, Spas and Hot Tubs	None	Refer to Provincial pool safety standards as required
AREMA (American Railway Engineering and Maintenance-of-Way Association):				
Manual for Railway Engineering (AREMA)	F2960	Manual for Railway Engineering	None	None

TABLE 1 Continued

Reference Documents in ASTM F24 Committee Standards		Alternate Acceptable Documents in Canada			
Designation (Listed by Authoring Organization)	ASTM Standards Reference Source	Title	Designation (Publisher)	Title	Comments
ASCE Standards:					
ASCE 7	F2291	Minimum Design Loads for Buildings and Other Structures	NBCC (NRCC)	National Building Code of Canada	ASCE 7 and the NBCC are to be used in conjunction with the section on loads and strengths in Practice F2291.
ASCE 16	F2291	Standard for Load and Resistance Factor Design (LRFD) for Engineered Wood Construction	O86 (CSA)	Consolidation – Engineering design in wood	
ASM Documents:					
Atlas of Fatigue Curves	F2291	ASM Atlas of Fatigue Curves	None	None	The ASM Atlas and the ASM Handbook are intended to complement the topic about fatigue strength of mechanical and structural components.
ASM Handbook Volume 19: Fatigue and Fracture	F2291	ASM Handbook Volume 19: Fatigue and Fracture	None	None	The ASM Atlas and the ASM Handbook are intended to complement the topic about fatigue strength of mechanical and structural components.
ASME Standards:					
ASME A17.1/CSA B44	F2291 F3158	Safety Code for Elevators and Escalators	ASME A17.1/CSA B44 (ASME/CSA)	Safety code for elevators and escalators	This standard may be applicable where elevator and escalator technology is used in the design of amusement rides or devices.
ASME B15.1	F2291	Safety Standards for Mechanical Power Transmission Apparatus	None	None	None
ASME B20.1	F3158	Safety Standard for Conveyors and Related Equipment	A17.1/B44 (ASME)	Safety code for Elevators and Escalators	Requirements of B20.1 may be subject to Provincial adoption
ASME BPVC	F2291	ASME Boiler and Pressure Vessel Code	B51 (CSA)	Boiler, pressure vessel, and pressure piping code.	Accumulators shall be constructed in accordance with Section 8, Division 1 of the ASME Boiler and Pressure Vessel Code for unfired pressure vessels, or equivalent.
ASNT Document:					
ASNT SNT-TC-1A	F1193	Topical Outlines for Qualification of Nondestructive Testing Personnel	48.9712 / ISO 9712 (CGSB)	Nondestructive Testing; Qualification and Certification of Personnel	For all NDT Personnel: Natural Resources Canada (NRCan), through the CANMET Materials Technology Laboratory (MTL), is the Certifying Agency for the Canadian Non-Destructive Testing (NDT) Personnel Certification Program. NRCan certifies individuals according to the Canadian General Standards Board Standard CAN/CGSB-48.9712 (Qualification and Certification of Non-Destructive Testing Personnel). For NDT of Welding to CSA W47.1: In Canada, the CWB (Canadian Welding Bureau) is the Certification Body for the administration of CSA Standard W178: 1) NDT shall be conducted by organization certified to W178.1-08 – Certification of Welding Inspection Organizations. 2) NDT shall be conducted by individual certified to W178.2-08 – Certification of Welding Inspectors.

TABLE 1 *Continued*
 Alternate Acceptable Documents in Canada

Reference Documents in ASTM F24 Committee Standards	ASTM Standards Reference Source		Title	Designation (Publisher)	Title	Comments
Designation (Listed by Authoring Organization)	ASTM Standards Reference Source	ASTM Standards Reference Source	Title	Designation (Publisher)	Title	Comments
ASTM Standards: ASTM D737	F2970	None	Test Method for Air Permeability of Textile Fabrics	None	None	None
ASTM D3574	F2970	None	Test Methods for Flexible Cellular Materials—Slab, Bonded, and Molded Urethane Foams	None	None	None
ASTM D3786	F2970	None	Test Method for Bursting Strength of Textile Fabrics—Diaphragm	None	None	None
ASTM D3787	F2970	None	Bursting Strength Tester Method Test Method for Bursting Strength of Textiles—Constant-Rate-of-Travel (CRT) Ball Burst Test	None	None	None
ASTM D4533	F2970	None	Test Method for Trapezoid Tearing Strength of Geotextiles	None	None	None
ASTM D4632	F2970	None	Test Method for Grab Breaking Load and Elongation of Geotextiles	None	None	None
ASTM D4833	F2970	None	Test Method for Index Puncture Resistance of Geomembranes and Related Products	None	None	None
ASTM D5034	F2970	None	Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test)	None	None	None
ASTM D5672	F2970	None	Test Method for Testing Flexible Cellular Materials Measurement of Indentation Force Deflection Using a 25 mm [1 in.] Deflection Technique	None	None	None
ASTM D6413	F2970	None	Test Method for Flame Resistance of Textiles (Vertical Test)	None	None	None
ASTM E84	F2970	None	Test Method for Surface Burning Characteristics of Building Materials	None	None	None
ASTM E543	F1193	48.9712 / ISO 9712 (CGSB)	Standard Specification for Agencies Performing Nondestructive Testing	48.9712 / ISO 9712 (CGSB)	Nondestructive Testing; Qualification and Certification of Personnel	For all NDT Personnel: Natural Resources Canada (NRCan), through the CANMET Materials Technology Laboratory (MTL), is the Certifying Agency for the Canadian Non-Destructive Testing (NDT) Personnel Certification Program. NRCan certifies individuals according to the Canadian General Standards Board Standard CAN/CGSB-48.9712 (Qualification and Certification of Non-Destructive Testing Personnel). For NDT of Welding to CSA W47.1: In Canada, the CWB (Canadian Welding Bureau) is the Certification Body for the administration of CSA Standard W178: 1) NDT shall be conducted by organization certified to W178.1-08 – Certification of Welding Inspection Organizations. 2) NDT shall be conducted by individual certified to W178.2-08 – Certification of Welding Inspectors.