



Standard Practice for Design of Amusement Rides and Devices that are Outside the Purview of Other F24 Design Standards¹

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1. Scope

1.1 This practice establishes information and procedures for the design and manufacture of patron directed amusement rides or devices (for example, go karts, bumper cars, bumper boats), artificial climbing walls, dry slides, coin operated rides, and amusement rides and devices that involve the purposeful immersion of the patron's body partially or totally in the water and involve more than incidental patron contact (for example, pools, water slides, lazy rivers, interactive aquatic play devices), and air-supported structures.

1.2 *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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:²

F1193 Practice for Quality, Manufacture, and Construction of Amusement Rides and Devices

F2291 Practice for Design of Amusement Rides and Devices

F2374 Practice for Design, Manufacture, Operation, and Maintenance of Inflatable Amusement Devices

2.2 Federal Document:³

OSHA 29 CFR Fall Protection Systems Criteria and Practices Part 1926.502 (d)

3. Significance and Use

3.1 This practice provides designers/engineers of amusement rides and devices not addressed in the other ASTM

Committee F24 standards with design references and criteria to use in design development.

4. General Design Requirements

4.1 *Design and Calculations*—Basic documentation and engineering analysis shall be in accordance with Practice **F2291**.

4.2 *Drawings and Records*—Records shall be kept in accordance with Practice **F2291**.

4.3 *Testing*—Document and record the testing performance of amusement rides and devices in accordance with the tests given in Practice **F1193**.

DESIGN PROCEDURES

5. Passenger Carrying Devices

5.1 *Design of Seats*—Design passenger seating to provide adequate support padding and containment for the passenger's body during operation, and to be consistent with the design intent of the ride.

5.2 *Methods of Restraint*—Where appropriate, base the passenger restraint on the design intent of the ride or device with consideration given, but not limited to, the height, speed, and forces on passengers.

5.3 *Passenger Clearance*—Design clearance to minimize the opportunity for contact between a contained passenger and any object where said contact is likely to cause injury during operation of a ride or device.

6. Amusement Ride and Device Structures Fastening, Mechanical Systems and Components, Fall Protection, Adhesive Bonding, and Coatings

6.1 Structures shall be designed in accordance with the provisions of Practice **F2291**, Section 8.

6.2 *Welding*—Welding and welding procedures shall be in accordance with the provisions of Practice **F2291**, Section 15.

6.3 *Fasteners*—Fasteners shall be designed in accordance with the provisions of Practice **F2291**, Section 16.

6.4 *Mechanical Systems and Components*—Mechanical systems and components shall be designed in accordance with the provisions of Practice **F2291**, Section 13.

¹ This practice is under the jurisdiction of ASTM Committee **F24** on Amusement Rides and Devices and is the direct responsibility of Subcommittee **F24.24** on Design and Manufacture.

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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.

³ Available from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

6.5 Fixed Air-Supported Structures—Where applicable, fixed air-supported structures shall be designed and manufactured with flame-resistant materials that meet or exceed a 2-s flame-out standard.

6.5.1 Fixed air-supported structures shall be designed and operated in accordance with the provisions of Practice **F2374**, subsections 5.4.1, 5.4.2, 6.1.11, 6.1.11.1, and 6.5.6.

6.5.2 Enclosed structures shall have within 100 ft of the normal point of egress adequately lighted emergency exits.

6.5.3 Power failure or failure of an inflation means shall be detected and result in an alarm, shall not result in loss of structural integrity of the inflatable device, and shall not substantially increase the risk of injury to anyone on or in the device.

6.6 Fall Protection—The manufacturer of an amusement ride or device shall provide appropriate anchorage points for attachment of personal fall arrest systems that may be used during routine assembly, disassembly, maintenance, and inspection. Personal fall arrest systems shall meet the minimum design requirements specified in OSHA 29 CFR PART 1926.502 (d).

6.7 Adhesive Bonding—When adhesive/chemical bonding is used, designer/engineer shall only use in accordance with the manufacturer's instructions and Material Data Safety Sheet.

6.8 Coatings—When material coatings are used, designer/engineer shall design for any degradation that may occur due to the environmental conditions.

6.8.1 Designer/engineer shall use material coatings in accordance with the manufacturer's instructions and Material Data Safety Sheet.

7. Electrical Components

7.1 Electrical components shall be designed in accordance with the provisions of Practice **F2291**, Section 12.

8. Hydraulic Components

8.1 Hydraulic components and systems shall be designed in accordance with the provisions of Practice **F2291**, Section 9.

9. Pneumatics

9.1 Pneumatics shall be designed in accordance with the provisions of Practice **F2291**, Section 10.

10. Operator Controls

10.1 Operator controls shall be designed in accordance with the provisions of Practice **F2291**, Section 17.

11. Brakes

11.1 When used, brakes shall be designed in accordance with Practice **F2291**, subsection 13.7.

11.1.1 For the purposes of this practice, Practice **F2291** subsection 13.7 shall not be interpreted to require a Safety Related Control System, or prevent the use of manually operated brakes, nor limit the application of said brakes to operator or patron use.

12. Machine Guards

12.1 Machine guards shall be designed in accordance with the provisions of Practice **F2291**, Subsection 13.5.

13. Fencing for Amusement Rides and Devices Subject to this Standard

13.1 Fences shall be designed in accordance with the provisions of Practice **F2291**, Section 14.

14. Safety Related Control Systems

14.1 Safety related control systems shall be designed in accordance with the provisions of Practice **F2291**, Section 11.

15. Sanitation/Disinfection

15.1 The atmosphere, material composition and configuration of surfaces, the nature of patron contact, potential for biological growth, disinfection techniques and frequencies, and the information in the disinfectant agent(s) associated Material Safety Data Sheets shall all be considered in the ride analysis.

16. Keywords

16.1 amusement rides and devices; design; manufacture

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