



Designation: F3133 – 21

# Standard Practice for Classification, Design, Manufacture, Construction, Maintenance, and Operation of Stationary Wave Systems<sup>1</sup>

This standard is issued under the fixed designation F3133; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This practice applies to the classification, design, manufacture, construction, operation, maintenance, and inspection of stationary waves.

1.2 Stationary wave systems shall be defined as a system that delivers a constantly flowing sheet of water nominally up to 24 in. thick travelling over a form allowing for patron interaction with a perpetual wave.

### 1.3 Significance and Use:

1.3.1 For the purposes of this practice, a wave system could include:

- 1.3.1.1 The ride surface,
- 1.3.1.2 The ride feature pump(s),
- 1.3.1.3 The water filtration and disinfection system,
- 1.3.1.4 The runout areas,
- 1.3.1.5 The structural supports,
- 1.3.1.6 Vehicles or other aquatic accessories that are part of the water ride as defined by the designer/engineer, and
- 1.3.1.7 Control systems.

1.3.2 This practice shall not apply to:

1.3.2.1 Amusement rides and devices whose design criterion is specifically addressed in other ASTM standards;

1.3.2.2 Preexisting designs manufactured before the effective date of publication of this practice if the design is service proven as defined in Practice F2291; and

1.3.2.3 Deep water wave pools, Action Rivers, lazy rivers or waterslides.

1.3.3 The terms stationary wave systems, standing wave systems, sheet wave systems, and wave systems shall be considered equivalent when used in this practice.

1.4 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

<sup>1</sup> This practice is under the jurisdiction of ASTM Committee F24 on Amusement Rides and Devices and is the direct responsibility of Subcommittee F24.70 on Water Related Amusement Rides and Devices.

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1.5 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.

1.6 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 ASTM Standards:<sup>2</sup>

- 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
- F2376 Practice for Classification, Design, Manufacture, Construction, and Operation of Water Slide Systems

### 2.2 Other Standard:

- ASME/ANSI APSP-16 Suction Fittings for Use in Swimming Pools, Wading Pools, Spas and Hot Tubs

## 3. Terminology

3.1 *Definitions*—Many terms have a common accepted use in the wave system industry that is unique. This is to establish a basic common vocabulary as well as a basis for classification that differentiates design parameters. All terms in this practice are candidates for inclusion in Terminology F747.

## 4. Design Requirements

4.1 Design of wave systems shall be in accordance with Practice F2291, Section 8 with the following exceptions and inclusions:

<sup>2</sup> 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.

4.1.1 Unless proven otherwise, loads from all operating conditions shall demonstrate a minimum of five to one factor of safety.

4.2 The designer/engineer shall design the ride such that it can reasonably prevent patrons from involuntarily exiting the ride during riding or runout.

4.3 Stationary wave system ride surface and runout area shall be clear of obstacles with the exception of those obstacles approved by the ride manufacturer for separation of participating patrons.

4.4 Where the ride surface allows for adjacent patrons, the designer/engineer shall consider the potential for contact between patrons and the measures required to mitigate against the potential for injury.

4.5 The designer/engineer shall determine an acceptable flow rate for each stationary wave system.

#### 4.6 *Runout Areas:*

4.6.1 Runout areas shall be designed by the designer/engineer in consideration of safe deceleration of the patron.

4.6.2 The designated runout area for each patron shall be designed to minimize the potential for patrons and ride vehicles to come in contact with other patrons when exiting the runout area.

4.7 Water suction fittings for the stationary wave system accessible to any patron shall be per ASME/ANSI APSP-16.

4.8 Areas within the stationary wave system that the patron may come in contact with shall be smooth.

4.9 Designer/engineer shall take reasonably appropriate measures as per Practice **F2291** subsections 6.6.1 and 6.6.2.

## 5. Ride Vehicle Requirements

### 5.1 *Ride Vehicles:*

5.1.1 Ride vehicles, if required or used, shall be specified by the designer/engineer. The designer/engineer shall provide specifications for the ride vehicles that identify performance features that are necessary in order to be compatible with the stationary wave system. Approved vehicle manufacture models shall be listed along with any limitations.

5.1.2 The designer/engineer shall provide measurable ride vehicle approval criteria to establish if a ride vehicle is in compliance with designer/engineer established ride vehicle design standard.

## 6. Test and Inspection Methods

6.1 Stationary wave systems, or major modification to an existing stationary wave system, shall be in compliance with Practice **F1193**.

6.2 *Flow Rate*—The water flow in each stationary wave system which has an effect on the performance of the ride surface.

6.2.1 The designer/engineer shall determine the flow rate and shall set a fixed range of performance of the ride surface.

6.2.2 The water flow controls shall be secured from interference or adjustment by unauthorized personnel.

6.2.3 Flow meters, calibrated means of flow measurement, or marker(s) indicating proper operational water flow/level shall be provided for each pump.

## 7. Identification Marking

7.1 Installed stationary wave systems shall be identified in accordance with Practice **F1193**.

## 8. Owner/Operator Responsibilities

8.1 Owner/operator responsibilities shall be in accordance with Practice **F770**.

8.2 The owner/operator shall maintain appropriate water quality in accordance with local requirements for bathing facilities.

### 8.3 *Ride Vehicles:*

8.3.1 The owner/operator shall evaluate for compliance all patron provided ride vehicles with respect to the ride vehicle approval criteria provided by the designer/engineer.

8.3.2 The owner/operator shall only allow ride vehicles which meet the ride vehicle approval criteria to be use on the stationary wave.

8.3.3 Alternative ride vehicles that do not comply with the ride vehicle approval criteria, shall require written approval from the designer/engineer, prior to use on the stationary wave systems.

## 9. Patron Responsibility

9.1 Patron responsibilities shall be in accordance with Practice **F770**.

## 10. Keywords

10.1 boogie board; construction; design; manufacture; ride surface; ride vehicle; runout area; stationary wave; surf

APPENDIXES

(Nonmandatory Information)

X1. CLARIFICATIONS

X1.1 Section 3 – Terminology

X1.1.1 Many terms have a common accepted use in the stationary wave system industry that are unique. This is to establish a basic common vocabulary as a basis for classification that differentiates design parameters. All terms in this practice are candidates for inclusion in Terminology F747.

X1.1.2 Specific terms used in this standard are defined as follows and should be interpreted as indicated in the following subsections:

X1.1.2.1 *Ride Surface*—Area of the attraction where patrons perform maneuvers on the flowing body of water.

X1.1.2.2 *Runout Area*—Area to which patrons are washed by the flow of water.

X1.1.2.3 *Ride Vehicle*—Device used to ride the flow of water.

X1.2 Section 4 – Design Requirements

X1.2.1 Safety factor of 5:1 were used because it is a general used industry standard for use in cable tension design(s).

X1.3 Subsection 6.2

X1.3.1 The language in this subsection was derived from Practice F2376 – Performance.

X1.3.1.1 Replace slide with “Stationary Wave System.”

X1.3.1.2 Replace sliding surface with “Ride Surface.”

X1.3.1.3 Replace valves with “Controls.”

X1.3.1.4 Replace flume with “pump.”

X1.4 Section 8

X1.4.1 This wording was copied from Practice F2376.

X2. DIAGRAMS

X2.1 See Fig. X2.1, Fig. X2.2, and Fig. X2.3.

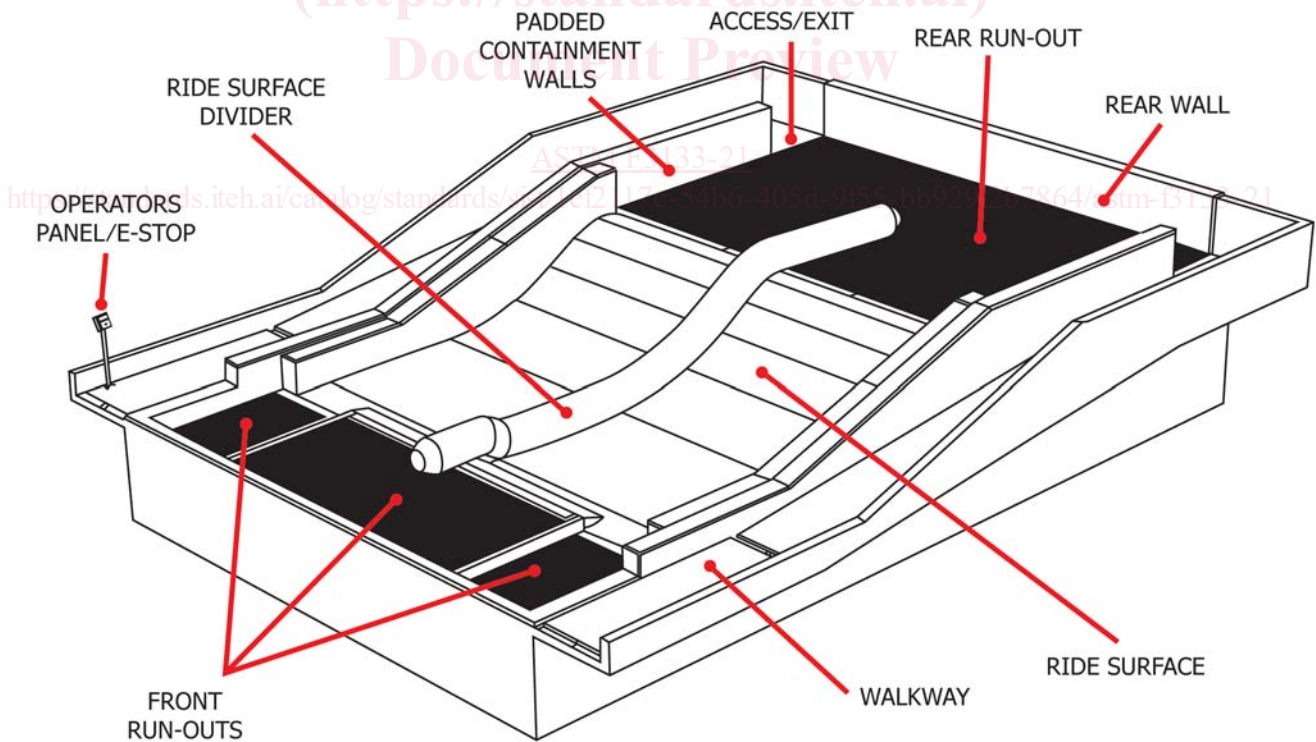


FIG. X2.1 Typical 2 Pump Stationary Wave System