Designation: F1193 – 22

Standard Practice for Quality, Manufacture, and Construction of Amusement Rides and Devices[1]

This standard is issued under the fixed designation F1193; 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.

1. Scope

1.1 This practice establishes the minimum requirements for a quality assurance program and the manufacturing of amusement rides and devices (including major modifications).

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

1.3 *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:*[2]

E543 Specification for Agencies Performing Nondestructive Testing

F770 Practice for Ownership, Operation, Maintenance, and Inspection of Amusement Rides and Devices

F1950 Specification for Physical Information to be Transferred With Used Amusement Rides and Devices (Withdrawn 2008)[3]

F2291 Practice for Design of Amusement Rides and Devices

2.2 *AWS Standards:*[4]

As applicable.

2.3 *ASME Standards:*[5]

As applicable.

2.4 *ASNT Document:*[6]

Recommended Practice SNT-TC-1A Personnel Qualification and Certification in Nondestructive Testing

3. Significance and Use

3.1 The purpose of this practice is to provide the minimum manufacturing requirements for amusement rides and devices and to provide the minimum requirements for a written quality assurance program for an amusement ride or device manufacturer, or component supplier. This is not intended to include suppliers of off-the-shelf components (for example, fasteners, electrical wire).

4. Quality Assurance Program

4.1 The manufacturer of an amusement ride or device shall have a written quality assurance program as specified in Practice F1193 for use in conjunction with the design, manufacture, construction, modification, or reconditioning of the amusement ride or device.

4.2 Quality assurance documents, that is, material certifications, test reports, and inspection reports, shall be retained for a period of time as deemed appropriate by the manufacturers.

4.3 *Drawing Control Procedure*—A procedure shall be in effect so that appropriate manufacturing drawings, their engineering revisions, and related documents are utilized.

4.4 *Material and Component Control Procedure:*

4.4.1 A procedure shall be in effect so that materials, processes, and components, including raw materials, are in accordance with the engineering specifications.

4.4.1.1 This procedure shall provide the purchasing agent with all the information required to order appropriate material.

4.4.1.2 A receiving procedure shall be in effect so that incoming material and components are checked against the purchasing specifications.

[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, Manufacture, Installation and commissioning.

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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] The last approved version of this historical standard is referenced on www.astm.org.

[4] Available from The American Welding Society (AWS), 550 NW LeJeune Rd., Miami, FL 33126.

[5] Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Three Park Ave., New York, NY 10016-5990.

[6] Available from The American Society for Nondestructive Testing (ASNT), P.O. Box 28518, 1711 Arlingate Ln., Columbus, OH 43228-0518.

4.4.2 A procedure shall be in effect so that appropriate inspections are made on purchased components.

4.4.3 A procedure shall be in effect so that material in stock can be properly identified for future use.

4.4.4 Documentation on any material, process, or components certified shall be filed for reference.

4.5 *Manufacturing:*

4.5.1 Amusement ride and device components and systems shall be manufactured and assembled in accordance with the designer/engineer specified criteria.

4.5.1.1 A procedure shall be in effect so that appropriate inspections are made on manufactured parts and subassemblies, for conformance with the designer/engineer specified criteria.

4.5.1.2 A procedure shall be in effect so that completed subassemblies, or where practical, the assembled amusement rides or devices are inspected prior to delivery.

4.5.1.3 Changes to the designer/engineer specified criteria shall be documented and approved by the designer/engineer or a qualified engineer before components, subassemblies, or systems are placed into use.

4.5.1.4 Manufacturers shall have a written procedure to address non-conforming components. Non-conforming components found in 4.5.1.1, 4.5.1.2, or 4.4.2 shall be identified and evaluated. Disposition of the non-conforming components shall be one of the following:

(1) The non-conforming component shall not be used in the specific intended purpose (for example, scrapped, altered, returned to vendor, properly identified, quarantine).

(2) The non-conforming component shall be reworked to bring it into compliance and re-inspected in conformance with 4.5.1.1, 4.5.1.2, or 4.4.2 of this practice.

(3) The design of the non-conforming component shall be re-evaluated in accordance with 4.5.1.3, and the drawing or documentation shall be modified or created to allow the component to be used as is.

4.5.2 *Welding:*

4.5.2.1 Welding procedures shall be in accordance with American National Standards Institute/American Welding Society (ANSI/AWS) or American Society of Mechanical Engineers (ASME), or equivalent standards.

4.5.2.2 For this section on Welding, equivalent standards are those that meet the ANSI/AWS and ASME welding process methodology. This methodology is outlined in the paragraphs below:

(1) Welding process shall be performed in accordance with a written Weld Procedure Specification (WPS) that specifies the applicable essential variables in accordance with the criteria of the applicable code. The specific values for these WPS variables shall be obtained from the Procedure Qualification Record (PQR) Essential variables may include: weld process, joint design, base material, filler material, shielding, preheats, position, electrical characteristics, technique, and travel speed.

(2) The WPS shall state the tolerances on an essential variable as indicated by the applicable standard.

(3) A WPS shall be qualified in accordance with procedures indicated by the applicable standard and documented on the Procedure Qualification Record (PQR), which serves as written confirmation of a successful WPS qualification.

(4) Only welders, welding operators, and tack welders who are qualified in accordance with the applicable standard shall perform welding. Welders, welding operators, and tack welders shall be qualified by testing as indicated by the applicable standard and documented on a Welding Performance Qualification Record (WPQR).

(5) The welding personnel shall follow a WPS applicable to the qualification test.

(6) The WPQR shall serve as written verification of welder qualification and shall list all applicable essential variables as indicated by the applicable standard (see Form E-1 in ANSI/AWS D1.1/D1.1M, Annex E).

(7) Welding performance standards that do not have acceptance or workmanship criteria shall not be considered an equivalent standard.

4.5.3 *Welding Process Inspection:*

4.5.3.1 Inspectors must meet the criteria in accordance with the applicable standard. An inspector can be an engineer or technician who, by training or experience, or both, in metals fabrication, inspection, and testing, is competent to perform the inspection of the work.

4.5.3.2 The Inspector shall verify that all welds conform to the acceptance or workmanship criteria of the applicable standard, and to the drawings and documentation.

4.5.3.3 The size and contour of welds shall be measured with suitable gauges.

4.5.3.4 Visual inspection for cracks in welds and base metal and other discontinuities shall be aided by a strong light, magnifiers, or such other devices.

4.5.3.5 The Inspector shall verify that only materials conforming to the specifications contained within the drawings and documentation are used.

4.5.3.6 The Inspector shall review all WPSs used for the work and shall verify that the procedures conform to the criteria of the application standard.

4.5.3.7 The Inspector shall inspect the work on a sampling basis and at suitable intervals during the process to verify that the criteria of the applicable sections of the standard are met.

4.5.3.8 The Inspector shall inspect the welding equipment used for the work to verify that it conforms to the criteria of the applicable standard.

4.5.3.9 The Inspector shall verify that electrodes are used only in the positions and with the type of welding current and polarity for which they are classified.

4.5.3.10 The Inspector shall review for accuracy and applicability the record of qualifications of all welders, welding operators, and tack welders; all WPS qualifications or other tests that are made; and such other information as may be appropriate.

4.5.3.11 Records of the qualifications of all welders, welding operators, tack welders, WPS qualifications or other tests that are made, applicable inspections, and such other information as appropriate shall be maintained pursuant to the manufacturer's record retention policy and made available to those authorized to examine them.

4.5.4 *Certification*—Prior to operating an amusement ride or device for the public, the manufacturer shall generate a document certifying that the amusement ride or device is in compliance with Practice F1193. This certification shall be retained with other quality assurance documents for the amusement ride or device. When requested by an amusement ride or device-certifying authority, purchaser, or owner, the manufacturer shall provide a copy of this certification document.

5. Installation and Commissioning

5.1 *Developmental Testing Requirements*—Where applicable, as determined by the manufacturer/designer, the following test procedures shall be developed and performed on a prototype amusement ride or device in order that the manufacturer/designer may determine the appropriateness for use, of not only the parts, but the entire system of a newly designed ride or device.

5.1.1 *Procedures to Verify Maximum Safe Design Loads:*

5.1.1.1 Procedures to verify such design characteristics as relevant deflections, loads, and forces that are placed on both the equipment and the passengers during operation of the ride or device,

5.1.1.2 A procedure to determine operational limits and restart criteria due to environmental conditions,

5.1.1.3 Procedures to allow the manufacturer to determine such factors as component variability and certification requirements of components, and

5.1.1.4 Any other procedures necessary to demonstrate a ride or device's appropriateness for its intended use.

5.2 *Installation Testing Requirements:*

5.2.1 This section of the standard covers those tests relevant not only to installation, but also includes post-modification and major modifications. The original manufacturer or supplier of an amusement ride or device shall also provide, where applicable, the following standard testing guides:

5.2.1.1 *Materials Testing*—Acceptable test procedures for the certification of all major structural components shall be provided. Where possible, this testing should be referenced to ASTM or to other commonly accepted industry standards.

5.2.1.2 *Erection/Modification Acceptance Testing*—Test procedures or criteria for the acceptance of such construction operations as welding and fastening shall be provided. Again, where possible, reference should be made to ASTM or to other currently accepted industry standards for this purpose.

5.2.1.3 *Performance Testing*—This should consist of a series of specified tests that can be used to determine that the newly erected ride or device conforms to the original design criteria.

6. Operation and Maintenance Documentation

6.1 The manufacturer of an amusement ride or device shall provide, with delivery of each ride or device, documented, recommended operating and maintenance instructions in the English language. These instructions shall include, but not be limited to the following:

6.1.1 Description of the ride or device operation, including the function and operation of its major components.

6.1.1.1 Description of the motion(s) of the ride or device during operation.

6.1.2 *Information Requirements:*

6.1.2.1 The information given in 7.1 and 6.1.2.2 – 6.1.2.14 shall be included, where applicable, on the information plate as specified in 7.1, and in the documented operating and maintenance instructions to be furnished by the manufacturer or seller at the time of sale of each amusement ride or device.

6.1.2.2 *Ride Duration*—The actual time the ride is in operation or a passenger is exposed to the elements of the ride functions, including passenger restrictions to maximum exposure time, shall be included.

6.1.2.3 *Recommended Balance of Passenger Loading or Unloading*—When passenger distribution is essential to the proper operation of the ride or device, the appropriate loading and unloading procedure with respect to weight distribution shall be provided.

6.1.2.4 *Environmental Restrictions*—Recommendations for operational restrictions relating to environmental conditions such as, but not limited to, wind, rain, salt corrosion, and extreme heat or cold.

6.1.2.5 *Recommended Passenger Restrictions*—Where applicable, any recommended passenger limitations such as, but not limited to, height passenger placement, or any other appropriate restrictions.

6.1.2.6 *Electrical Power Requirements*—Total electrical power required to properly operate the ride or device designated in watts, volts, and frequency, including minimum and maximum voltage limits.

6.1.2.7 *Mechanical Power Requirements*—Minimum horsepower necessary to operate ride properly.

6.1.2.8 *Water Flow*—Minimum/maximum water flow rates.

6.1.2.9 *Static Information*—The following information shall be provided for the amusement ride or device when it is in a nonoperational state with no passengers: height, width, diameter, and weight.

6.1.2.10 *Dynamic Information*—The following information shall be provided for the amusement ride or device when it is in an operational state: height, width, diameter, and weight.

6.1.2.11 *Trailering Information*—Each trailer necessary for the transport of a portable amusement ride or device shall be provided with the following information: height, width, length, and weight.

6.1.2.12 *Fastener Schedule*—A manufacturer-issued schedule for the correct grade, torque, and placement of all fasteners used in the assembly, or erection, or both, of the ride or device.

6.1.2.13 *Design Loads per Connection Point*—Loads for each footing or equivalent structural connection point as calculated for all the various load combinations as required by Section 8, Loads and Strengths, of Practice F2291.

6.1.2.14 *Elements and Structures*—Provided the proposed owner/operator furnishes the manufacturer with necessary data concerning proposed installation and usage of the ride or device, the manufacturer shall provide to the proposed owner/operator a description of all structural interface between the ride or device and the owner/operator supports. This structural requirement definition shall include the following: