Designation: ~~F1193 – 17~~ F1193 – 18

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F1950 Specification for Physical Information to be Transferred With Used Amusement Rides and Devices (Withdrawn 2008)[3]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

~~4.1 A procedure shall be in effect so that appropriate manufacturing drawings, their engineering revisions, and related documents are utilized.~~

[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] 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.

~~5. Material and Component Control Procedure~~

~~5.1 A procedure shall be in effect so that materials, processes, and components, including raw materials, are in accordance with the engineering specifications.~~

~~5.1.1 This procedure shall provide the purchasing agent with all the information required to order appropriate material.~~

~~5.1.2 A receiving procedure shall be in effect so that incoming material and components are checked against the purchasing specifications.~~

~~5.1.3 A procedure shall be in effect so that material in stock can be properly identified for future use.~~

~~5.1.4 Documentation on any material, process, or components certified shall be filed for reference.~~

~~6. Manufacturing~~

~~6.1 Amusement ride and device components and systems shall be manufactured and assembled in accordance with the designer/engineer specified criteria.~~

~~6.2 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.~~

~~6.3 *Quality Assurance Program:*~~

~~6.3.1 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.~~

~~6.3.2 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. ~~Inspection~~ 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 ~~inspections are made on manufactured parts and subassemblies, for conformance with the designer/engineer specified criteria.~~manufacturing drawings, their engineering revisions, and related documents are utilized.

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

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.

~~7.3 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 ~~Non-conforming components found in 7.1, 7.2, or 7.3 shall be identified and evaluated. Disposition of the non-conforming components shall be one of the following:~~*Manufacturing:*

~~7.4.1 The non-conforming component shall be scrapped or rejected, or~~

~~7.4.2 The non-conforming component shall be altered such that it cannot be used in the specific intended application for the component, or~~

~~7.4.3 The non-conforming component shall be reworked to bring it into compliance and re-inspected in conformance with 7.1, 7.2, or 7.3 of this practice.~~

4.5.1 ~~The design of the non-conforming component shall be re-evaluated~~ Amusement ride and device components and systems shall be manufactured and assembled in accordance with ~~6.2 of this practice, and the drawing or documentation shall be modified or created to allow the component to be used as is.~~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 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 be scrapped or rejected.

(2) The non-conforming component shall be altered such that it cannot be used in the specific intended application for the component.

(3) 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.

(4) The design of the non-conforming component shall be re-evaluated in accordance with 4.5.3 of this practice, and the drawing or documentation shall be modified or created to allow the component to be used as is.

4.5.1.5 Welding and welding procedures shall be in accordance with the appropriate American Welding Society (ANSI.AWS D1 specification) or the American Society of Mechanical Engineers, or other equivalent standard, and be performed by appropriately certified or qualified welders as required by the standard.

(1) Documentation for certified or qualified welders shall be maintained.

4.5.2 *Certification*—Before a manufacturer ships an amusement ride or device, 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.

~~**8. Welding**~~

~~8.1 Welding and welding procedures shall be in accordance with the appropriate American Welding Society (ANSI.AWS D1 specification) or the American Society of Mechanical Engineers, or other equivalent standard, and be performed by appropriately certified or qualified welders as required by the standard.~~

~~8.2 Documentation for certified or qualified welders shall be maintained.~~

~~**9. Certification**~~

~~9.1 Before a manufacturer ships an amusement ride or device, 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. ~~Information Requirements~~Installation and Commissioning

~~10.1 The information given in 10.2 and 10.3–10.15.3 shall be included, where applicable, on the information plate as specified in 10.2, 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.~~

5.1 ~~*Information Plate—*~~*Developmental Testing Requirements*—~~A manufacturer-issued information plate, printed in English, shall be permanently affixed to the~~ 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 ~~a visible location, and shall be designed to remain legible for the expected life of the~~ 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. ~~The plate shall include, but not be restricted to, all applicable items listed in 10.2 – 10.2.8.~~

~~10.2.1 *Ride Serial Number*—A manufacturer-issued unique identifying number or code affixed to the ride in a permanent fashion.~~

~~10.2.2 *Ride Name and Manufacturer*—A manufacturer-issued unique identifying ride name, including the name of the manufacturer by city, state, and country.~~

~~10.2.3 *Ride Model Number*—A manufacturer-issued unique identifying number or code assigned to each manufactured type of ride having the same structural design or components.~~

~~10.2.4 *Date of Manufacture*—The date (month and year) determined by the manufacturer that the given ride or device met his required construction specifications.~~

~~10.2.5 *Ride Speed*—Maximum and minimum revolutions or distance per unit of time, as applicable.~~

5.1.1 ~~*Direction of Travel—*~~*Procedures to Verify Maximum Safe Design Loads:* ~~When the proper direction of travel is essential to the design operation of the ride, the manufacturer shall designate the direction of travel, including reference point for this designation.~~

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.

~~10.2.7 *Passenger Capacity by Weight*—Maximum total passenger weight per passenger position and per ride.~~

~~10.2.8 *Passenger Capacity by Number*—Maximum total number of adult or child passengers per passenger position and per ride.~~

~~10.3 *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.~~

~~10.4 *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.~~

~~10.5 *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.~~

~~10.6 *Recommended Passenger Restrictions*—Where applicable, any recommended passenger limitations such as, but not limited to, height passenger placement, or any other appropriate restrictions.~~

~~10.7 *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.~~

~~10.8 *Mechanical Power Requirements*—Minimum horsepower necessary to operate ride properly.~~

~~10.9 *Water Flow*—Minimum/maximum water flow rates.~~

~~10.10 *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.~~

~~10.11 *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.~~

~~10.12 *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.~~

~~10.13 *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.~~

~~10.14 *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.~~

5.2 ~~*Elements and Structures*—~~*Installation Testing Requirements:* ~~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:~~

5.2.1 ~~Maximum static design loads of each footing or equivalent structural connection,~~This section of the guide 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.

~~10.15.2 Maximum dynamic design loads of each footing or equivalent structural connection, and~~

~~10.15.3 Any other structural interface design specification.~~

~~11. Operational Instruction Requirements~~

~~11.1 The manufacturer of an amusement ride or device shall provide, with delivery of each ride or device, documented, recommended operating instructions in the English language. These instructions shall include, but not be limited to the following:~~

~~11.1.1 Description of the ride or device operation, including the function and operation of its major components.~~

~~11.1.1.1 Description of the motion(s) of the ride or device during operation.~~

~~11.1.1.2 Description of the recommended passenger loading procedures during operation, including recommended seating, where applicable.~~

~~11.1.2 Recommended safety procedures and instructions, and information about safety equipment pertaining to patrons and ride or device operators and attendants.~~

~~11.1.2.1 Maximum total passenger weight and maximum number of passengers by carrier unit or ride total.~~

~~11.1.2.2 Description of the passenger restraint system, its recommended use and operation.~~

~~11.1.2.3 Ride or device operator and attendant safety check: recommended visual or other inspections to be performed by ride or device operators and attendants prior to and during each ride or device cycle.~~

~~11.1.2.4 Instructions to the patron: recommended information that should be made available to each patron of the ride or device.~~

~~11.1.2.5 Recommendations for operational restriction relating to environmental conditions such as wind, rain, or temperature fluctuation.~~

~~11.1.3 Manufacturer's recommended ride or device operating procedures, including the location of ride or device operators and attendants.~~

~~11.1.3.1 Description of the recommended, daily pre-opening inspection to be performed by ride or device operator(s) and attendants that is in addition to previously performed maintenance or other inspections.~~

~~11.1.3.2 Description of the recommended ride or device operator(s) and attendants positions and functions.~~

~~11.1.3.3 Description of the recommended series of steps, to be followed in a definite order, to complete the operation of the ride or device.~~

~~11.1.4 Manufacturer's recommended emergency procedures.~~

~~11.1.4.1 Recommended evacuation procedures for the ride or device.~~

~~11.1.4.2 Use of emergency power equipment, if provided with the ride or device.~~

~~11.1.4.3 Description of any emergency equipment that is provided with the ride or device, and its uses.~~

~~11.1.4.4 Description of any emergency procedure made necessary by an interruption of power, and restart procedures.~~

6. ~~Testing Performance Requirements~~Owner/Operator Instructions

~~12.1 *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.

~~12.1.1 *Procedures to Verify Maximum Safe Design Loads:*~~

~~12.1.1.1 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,~~

~~12.1.1.2 A procedure to determine operational limits and restart criteria due to environmental conditions,~~

~~12.1.1.3 Procedures to allow the manufacturer to determine such factors as component variability and certification requirements of components, and~~

~~12.1.1.4 Any other procedures necessary to demonstrate a ride or device's appropriateness for its intended use.~~

~~12.2 *Installation Testing Requirements:*~~

~~12.2.1 This section of the guide 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:~~

~~12.2.1.1 *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.~~

~~12.2.1.2 *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.~~

~~12.2.1.3 *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.~~

~~12.3 *Operational Testing Requirements:*~~

~~12.3.1 The manufacturer of a ride or device shall develop specific operational tests along with minimum intervals for these tests to be performed that will allow the owner/operator of the ride or device to determine whether a given ride or device is operating within prescribed operational limits.~~

~~12.3.2 All operational tests, except those necessarily recommended subsequent to the sale because of information not reasonably available to the manufacturer at the time of sale, should be recommended to the owner/operator at the time of sale. All tests, whether recommended at the time of sale, or subsequent tests, shall meet the following criteria:~~

~~12.3.2.1 All tests shall have been satisfactorily performed by the manufacturer prior to sale.~~

~~12.3.2.2 The tests must be such that the ride, device, or element can reasonably be expected to pass during the expected design life, assuming recommended maintenance and operative procedures have been followed.~~

~~12.3.2.3 All tests must be reasonable and such that the owner/operator can reasonably be expected to be competent to perform or cause to be performed.~~

~~12.3.2.4 Any operational test including load testing performed on an amusement ride or device shall be completely nondestructive in nature. Overload testing exceeding the above limits shall be deemed inappropriate.~~

~~12.3.2.5 Any installation or operational testing conducted on an amusement ride or device shall be accomplished within the rated limits of the information provided by the manufacturer.~~

6.1 ~~*Non-Destructive Testing Requirements:*~~ 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 6.1.2.2 and 6.1.2.3 – 6.1.2.15 shall be included, where applicable, on the information plate as specified in 6.1.2.2, 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 *Information Plate*—A manufacturer-issued information plate, printed in English, shall be permanently affixed to the ride or device in a visible location, and shall be designed to remain legible for the expected life of the ride or device. The plate shall include, but not be restricted to, all applicable items listed in 6.1.2.2*(1)* – 6.1.2.2*(8)*.

(1) Ride Serial Number—A manufacturer-issued unique identifying number or code affixed to the ride in a permanent fashion.

(2) Ride Name and Manufacturer—A manufacturer-issued unique identifying ride name, including the name of the manufacturer by city, state, and country.

(3) Ride Model Number—A manufacturer-issued unique identifying number or code assigned to each manufactured type of ride having the same structural design or components.

(4) Date of Manufacture—The date (month and year) determined by the manufacturer that the given ride or device met his required construction specifications.

(5) Ride Speed—Maximum and minimum revolutions per minute, feet per second, or miles per hour, as applicable.

(6) Direction of Travel—When the proper direction of travel is essential to the design operation of the ride, the manufacturer shall designate the direction of travel, including reference point for this designation.

(7) Passenger Capacity by Weight—Maximum total passenger weight per passenger position and per ride.

(8) Passenger Capacity by Number—Maximum total number of adult or child passengers per passenger position and per ride.

6.1.2.3 *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.

6.1.2.4 *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.

6.1.2.5 *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.

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

6.1.2.7 *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.

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

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

6.1.2.10 *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.

6.1.2.11 *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.

6.1.2.12 *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.

6.1.2.13 *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.

6.1.2.14 *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.

6.1.2.15 *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:

(1) Maximum static design loads of each footing or equivalent structural connection,

(2) Maximum dynamic design loads of each footing or equivalent structural connection, and

(3) Any other structural interface design specification.

6.1.3 Operational procedures shall include: