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Standard Guide for Testing Performance of Amusement Rides and Devices[1]

This standard is issued under the fixed designation F 846; 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 guide covers the basic tests which shall be conducted on amusement rides and devices during prototype development, installation or erection, following major modifications, and during normal operation to determine that the performance of a given ride or device meets the manufacturer's specified design criteria.

NOTE 1—The following standards developed by Committee F24 contain information relative to this guide: Specification F 698, Practices E 1212, F 1193, and F 770, Terminology E 1316, and Definitions F 747.

1.2 *This standard does not purport to address all of the safety problems, 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]

E 543 Standard Practice for Agencies Performing Nondestructive Testing

E 1212 Practice for Quality Control Systems for Nondestructive Testing Agencies

E 1316 Terminology for Nondestructive Examinations

F 698 Specification for Physical Information to be Provided for Amusement Rides and Devices

F 747 Terminology Relating to Amusement Rides and Devices

F 770 Practice for Operation Procedures for Amusement Rides and Devices

F 853 Practice for Maintenance Procedures for Amusement Rides and Devices

F 1193 Practice for Amusement Ride and Device Manufacturer Quality Assurance Program and Manufacturing Requirements

2.2 *ASNT Document:*[3]

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

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *installation or erection*—the actual act of onsite construction or the physical setting up and making ready for use of a ride or device.

3.1.2 *major modification*—any change in either the structural or operational characteristics of the ride or device which will alter its performance from that specified in the manufacturer's design criteria.

3.1.3 *prototype*—final operational assembly of a newly developed ride or device.

4. Significance and Use

4.1 The purpose of this guide is to establish pertinent test data on a given ride or device which shall be used as the basis for the evaluation of the ride or device's performance, including developmental testing, installation testing, and operational testing.

4.2 This guide is intended for the use of manufacturers, owners/operators, and those persons or agencies involved in the installation and operational testing of amusement rides and devices.

5. Developmental Testing by the Manufacturer

5.1 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,

[1] This guide is under the jurisdiction of ASTM Committee F24 on Amusement Rides and Devices and is the direct responsibility of Subcommittee F24.10 on Test Methods.

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

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.

6. Installation Testing

6.1 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:

6.1.1 *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.

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

6.1.3 *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.

7. Operational Testing

7.1 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.

7.2 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:

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

7.2.2 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.

7.2.3 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.

7.2.4 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.

7.2.5 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.

8. Nondestructive Testing (NDT)

8.1 This section pertains to the nondestructive testing of amusement ride and device components as recommended by the manufacturer. These tests shall be performed by a qualified NDT inspector in accordance with Practice E 543 or ASNT Recommended Practice SNT-TC-1A, or both. It is not intended to preclude any other schedule of NDT, inspection, or testing.

8.1.1 Nondestructive testing (NDT) is the development and application of technical methods such as radiographic, magnetic particle, ultrasonic, liquid penetrant, electromagnetic, neutron radiographic, acoustic emission, visual, and leak testing to examine materials or components in ways that do not impair the future usefulness and serviceability in order to detect, locate, measure and evaluate discontinuities, defects, and other imperfections; to assess integrity, properties and composition; and to measure geometrical characters.

8.1.2 NDT shall be used to verify the integrity of components which due to their design, location, or installation, or combination thereof, cannot be adequately evaluated by other means.

8.1.3 A schedule for testing on a given ride or device component shall be defined in terms of hours, days, or other units of operation. The initial design shall be developed to expect a period between tests to be no more frequent than annually.

8.1.4 The manufacturer shall recommend components to be tested along with appropriate acceptance criteria. The manufacturer may recommend the test method but shall not specify how the testing is to be conducted except where certain procedures might endanger other components on the ride or device. Any changes or additions to these recommendations shall be communicated to all known owner/operators of the ride or device, and inspection agencies via manufacturers' bulletins. Tests shall meet the requirements of 7.2.1-7.2.3.

8.1.5 The manufacturer shall include in an appropriate section of the ride or device manual the list and location of components to be tested, recommending specific areas to test and the schedule by which they shall be tested in accordance with 8.1.4.

8.1.6 Components found to have relevant indications that do not meet the acceptance criteria shall be replaced or reconditioned in accordance with Practice F 853.

8.1.7 Components found free of relevant indications, that meet the acceptance criteria or have been reconditioned, shall be further tested at the regular schedule in accordance with 8.1.3.

8.1.8 Within a reasonable time following a request by an owner/operator or inspection agency, the manufacturer of an amusement ride or device whose manual does not contain testing recommendations shall either provide a component listing or statement that no NDT is recommended on the ride or device as per the criteria outline of 8.1.2 When a manufacturer's list or statement is not available, it may be compiled by a registered professional engineer or engineering agency or by any individual qualified by training and experience to compile such a list or statement based upon the ride or device's specifications and history and using accepted engineering practices.

8.1.9 The owner/operator shall be responsible for implementing a program of testing based on the recommendations of Section 8.