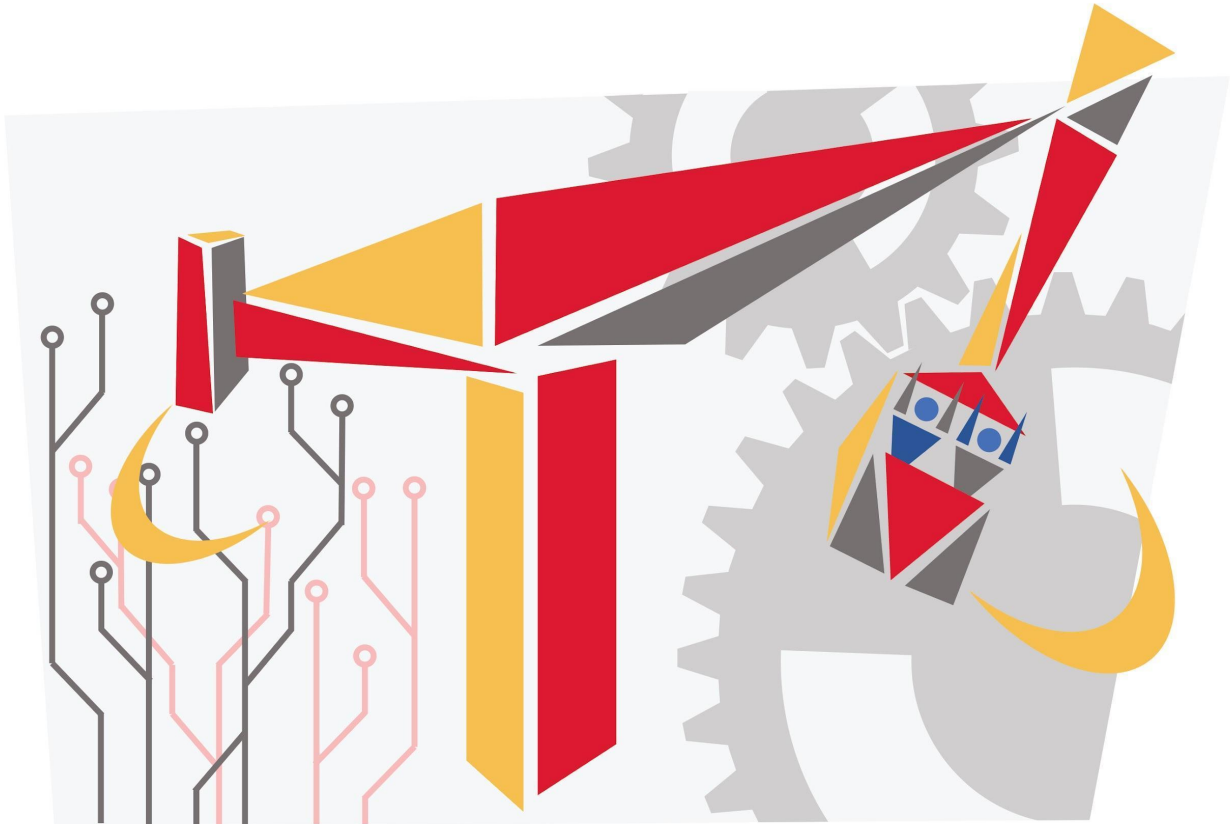


# Ride Engineering Competition



## ASTM Adaptation Document 2024

The Ride Engineering Competition

## Purpose

The ASTM F24 body of standards has been thoroughly developed by large numbers of industry professionals over the course of many years. These standards serve to ensure the safety of Amusement Rides and Devices. It is the responsibility of an engineer to understand and comply completely to all standards applicable to their work. The ASTM Compliance portion of the Ride Engineering Competition is designed to create a simplified educational experience where teams are only responsible for compliance to one real-world standard: F2291-23 Standard Practice for Design of Amusement Rides and Devices. (2023)

F2291 is written specifically for rides carrying human riders, and has many specific values and figures that are not feasible for the context of the Ride Engineering Competition's small scale inanimate riders. Additionally, there are many requirements in the standard that are outside the scope of the competition, or are impractical or impossible for teams to comply with.

Due to these differences, this ASTM Adaptation Document shall be used to filter and adapt the F2291 Standard for the context of the Ride Engineering Competition.

## How to use

When teams create their Compliance analysis, they are responsible for showing whether each requirement applies to their design, how they comply with the requirement that applies, and a rationale for each. For many requirements, this document shall serve as that rationale. The language in this document is not to be considered a standalone safety standard requirement, but rather to allow for reduction of scope for requirements that are not feasible, and allow for compliance using substitute values, as determined by the REC Planning Committee.

A team could state in the Compliance analysis for example:

*ASTM F2291 Section 7.1.1.2 states: "The acquired [Acceleration] test data shall be post-processed, with a 4-pole, single pass, Butterworth low pass filter using a corner frequency (Fn) of 5 Hz.*

*This Requirement does not apply to our ride. The REC 2024 ASTM Adaptation Document states that Section 7.1.1.2 does not fall within the scope of the Ride Engineering Competition.*

## **Obtaining F2291-22**

Most universities subscribe to the ASTM book of standards and students can download standards from the ASTM Compass portal. The ASTM F24 Committee has made an effort to make its standards available to all students by creating an ASTM account as a student and accessing their website [here](#). If you do not have access to these standards at your university please contact us.

## **Questions**

This standard is complex, and we may have missed something. If you have any questions about using this document, or how any specific section applies, please contact the REC Planning committee in the by email at [info@rideengineeringcompetition.org](mailto:info@rideengineeringcompetition.org) Any updates or clarifications during the season will be emailed to all teams. From section 8 and on, the committee determined that the standards from then on are specific to certain systems within a ride, and not the overall composition. If there is a question about how a specific standard that we have not covered applies, please contact us.

## **Adaptations:**

### **SECTION 1: Scope**

This Standard Shall apply to the Ride Engineering Competition Only with the following adaptations:

### **SECTION 2: Referenced Documents**

No Change

### **SECTION 3: Terminology**

No Change

### **SECTION 4: Significance and Use**

No Change

### **SECTION 5: General Design Criteria**

5.3.1.4 - Omit; Out of Scope; Reference not required

5.6.1 - Omit; Out of Scope; Refer to REC Rule Book

5.6.2 - Omit; Out of Scope

5.7.1.4 - Reference not required; Refer to REC Rule Book for any additional Information Required

### **SECTION 6: Patron Restraint, Clearance Envelope, and Containment Design Criteria**

FIG. 1 - See REC FIG. 1 Below

6.4.3.7 - Redundancy not required

6.4.3.8 - Redundancy not required

6.4.3.9 - Redundancy not required

6.6.3 - The minimum patron model shall be based on the rider characteristics included in the provided REC Rule Book, with an additional (extended) arm reach of not less than 1.5 mm.

### **SECTION 7: Acceleration Limits**

7.1.1 - Omit; No Test Data Required

7.1.1.1 - Omit; No Test Data Required

7.1.1.2 - Omit; No Test Data Required

7.1.1.3 - Omit; No Test Data Required

7.1.2 - Omit; Out of Scope

7.1.4.3 - Omit; Out of Scope

7.2.1.1 - Omit; Out of Scope

**SECTION 8: Loads and Strengths**

- 8.3 - The REC shall use a minimum 8 operational hour criteria
- 8.3.1 - The REC shall use a minimum 8 operational hour criteria
- 8.3.2.1 - The REC shall use a minimum 8 operational hour criteria
- 8.4 - The REC shall use a minimum 8 operational hour criteria
- 8.4.1 - The REC shall use a minimum 8 operational hour criteria
- 8.4.2 - The REC shall use a minimum 8 operational hour criteria; Include this list in the safety documentation for the REC; Reference not Required
- 8.4.3 - The REC shall use a minimum 8 operational hour criteria
- 8.5.1 - Omit; Out of Scope
- 8.6.1 - Use upper weight limit described in the REC Rule Book
- 8.6.2 - Use lower weight limit described in the REC Rule Book
- 8.6.3 - Use upper weight limit described in the REC Rule Book
- 8.6.5 - Use lower weight limit described in the REC Rule Book
- 8.6.7 - Include in the safety documentation for the REC; Reference not Required
- 8.6.8 - Omit; Out of Scope
- 8.6.8.1 - Omit; Out of Scope
- 8.11.1 - Consider forces assembling / servicing ride
- 8.12.1 - Omit
- 8.12.2 - Omit
- 8.12.3 - Omit
- 8.20.1 - Omit; Reference not Required
- 8.22.3 - Omit; Reference not Required
- 8.22.3.1 - Omit; Reference not Required
- 8.22.3.2 - Omit; Reference not Required
- 8.22.4 - Omit; Reference not Required
- 8.22.4.1 - Omit; Reference not Required
- 8.22.4.2 - Omit; Reference not Required
- 8.22.4.3 - Omit; Reference not Required
- 8.22.4.4 - Omit; Reference not Required
- 8.22.4.5 - Omit; Reference not Required
- 8.24.3 - Omit; Reference not Required
- 8.24.3.1 - Omit; Reference not Required
- 8.24.3.2 - Omit; Reference not Required
- 8.24.3.3 - Omit; Reference not Required
- 8.24.4 - Omit; Reference not Required
- 8.24.5 - Omit; Reference not Required
- 8.24.6 - Omit; Reference not Required
- 8.24.6.1 - Omit; Reference not Required
- 8.24.6.2 - Omit; Reference not Required
- 8.24.6.3 - Omit; Reference not Required
- 8.31.2 - Omit; Stability inspection out of scope

- 8.33.1 - Omit; Reference not Required
- 8.33.4 - Omit; Timber inspection out of scope
- 8.33.4.1 - Omit; Timber inspection out of scope
- 8.33.4.2 - Omit; Timber inspection out of scope
- 8.33.4.3 - Omit; Timber inspection out of scope
- 8.34.1 - Omit; Reference not Required
- 8.36.2 - Omit; Reference not Required

**SECTION 9:** *Hydraulic Equipment for Amusement Rides and Devices*

- 9.2.1.1 - Omit; Reference not Required
- 9.2.2 - Omit; Out of Scope
- 9.2.2.1 - Omit; Reference not Required

**SECTION 10:** *Pneumatic Systems and Components*

No Change

**SECTION 11:** *Safety Related Control Systems*

No Change

**SECTION 12:** *Electrical Requirements*

- 12.1.5.1 - Omit; No signage required

**SECTION 13:** *Mechanical Systems and Components*

- 13.2.1 - Omit
- 13.6.3.3 - Omit; Backup Rollers Out of Scope

**SECTION 14:** *Fencing, Guardrails, Gates, Walkways for Amusement Rides and Devices*

*Reminder - Riders are likely placed by a human, so fences and gates should not apply*

**SECTION 15:** *Welding*

No Change

**SECTION 16:** *Fasteners*

No Change

**SECTION 17:** *Operator Controls*

No Change

**SECTION 18:** *Documentation*

- 18.1 - Omit; Reference not Required

**SECTION 19:** *Coatings*

No Change

**SECTION 20:** *Fall Protection*

No Change

**SECTION 21:** *Sanitation/Disinfection*

No Change

**SECTION 22:** *Keywords*

No Change

**REC FIG. 1**

