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COMMUNITY AFFAIRS

DIVISION OF CODES AND STANDARDS

Carnival-Amusement Rides

ASTM F2291 Design of Amusement Rides

Proposed Amendments: N.J.A.C. 5:14A-7.2 and 9.21

Authorized By: Charles A. Richman, Acting Commissioner, Department of Community Affairs.

Authority: N.J.S.A. 5:3-36.

Calendar Reference: See Summary below for explanation of exception to calendar requirement.

Proposal Number: PRN 2015-107.

Submit written comments by November 7, 2015, to:

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The agency proposal follows:

Summary

N.J.A.C. 5:14A-7.2

The proposed amendments to N.J.A.C. 5:14A-7.2 would update the edition of ASTM F2291 that is adopted in the rules. ASTM F2291 is the standard for the design of carnival and amusement rides and is the basis for the New Jersey design criteria. With the adoption, the Department has attempted to make as few changes to the standard as possible. Previous changes to the standard regarding issues such as acceleration limits have been deleted. The standards for the design of amusement rides developed by ASTM are national consensus standards. They are developed by experts in the field representing a number of stakeholder groups, so absent any major omission in the standards, the Department is of the opinion that the standards should not be unnecessarily amended upon adoption. In addition, having separate standards for New Jersey is a hardship for manufacturers who would be forced to make rides specifically to New Jersey requirements. The industry has claimed that this has made some manufacturers reluctant to market their rides in New Jersey or, in other cases, charge higher prices in anticipation of modifications that will be needed to meet New Jersey's requirements. Therefore, the changes are, to the greatest extent possible, limited to administrative changes. The changes to the rules reflect, for the most part, making fewer changes to the standard.

Section 1. Scope

The change to section 1.5 of the standard is proposed for deletion. This subsection, which advises designers that they may have to consider items not specifically addressed in the standard,

was previously deleted because the language is somewhat advisory. In the interest of adopting the standard with as few amendments as possible, it is being retained at this time.

Section 2. Referenced Documents

The various standards that are referenced in this section are amended to include the edition that is being used.

Section 3. Terminology

The change to section 3.1.15 is proposed for amendment to reflect a numbering change in the standard.

The change to section 3.1.20, the definition of "previously compliant," is proposed for deletion because N.J.A.C. 5:14A already contains language about the standards that existing rides not undergoing alteration need to meet.

Section 3.1.25, which establishes a definition for "service proven practice," is proposed for deletion because it is only used in section 6.4.2, which is also proposed for deletion. Section 6.4.2 establishes requirements for "supervising companions" which are deficient and unenforceable. See the discussion under section 6.4.2 for additional details.

Section 4. Significance and Use

The change to section 4 of ASTM F2291 is proposed for deletion. The section discusses the significance and use of the standard. It was previously deleted because it does not contain a regulatory requirement. However, in the interest of adopting the standard with as few changes as possible, it is being retained.

Section 5. General Design Criteria

The change to section 5.1.1.3 (renumbered as 5.1.1.4(4) in the 2014 version) is proposed for deletion. The change was made to improve the grammar of the section; however, the Department thinks that the language is sufficiently clear and is retaining the language in the standard in an effort to make the rules consistent with the national consensus standard.

The change to section 5.2.1.4 (renumbered as 5.3.1.4 in the 2014 edition) is proposed for deletion. The change to the section clarified that the coordinate axis and load paths described in the standard apply to both the vehicles and the passengers. The Department believes this is understood without the existing change.

The change to section 5.4.1 (renumbered as 5.6.1 in the 2014 edition), which establishes a record retention schedule for design documents, is proposed for deletion, thereby retaining the records retention requirement in the standard. The records retention requirements found elsewhere in N.J.A.C. 5:14A are more complete; however, the requirements of the ASTM F2291 are not in conflict with these requirements and, therefore, the change is deleted in an effort to be as consistent with the national consensus standard as possible.

The change to add a new section 5.4.1.1, which requires the inclusion of voice communication systems with the ride application submitted by the manufacturer, is proposed for deletion to be consistent as possible with the requirements of the national consensus standard.

Section 6. Patron Restraint, Clearance Envelope, and Containment Design Criteria

The change to section 6.3.1 is proposed for amendment to delete the reference to ASTM F770 because this section does not exist in the most current version of ASTM F770. The term

designer/engineer is no longer deleted in an effort to adopt the standard with as little modification as possible. The designer/engineer is the responsible party for providing the information.

A proposed amendment is made to section 6.3.3 to delete the term “manufacturer,” since it is unclear whether this is the responsibility of the manufacturer or the designer/engineer. In an effort to not assign specific responsibility, the section is changed to simply require that the evacuation of patrons be considered in the design. This section was previously numbered as 6.3.6 in the 2004 version of ASTM F2291.

A proposed amendment is made to section 6.3.4 to delete the term “manufacturer,” since it is unclear whether this is the responsibility of the manufacturer or the designer/engineer. In an effort to not assign specific responsibility, the section is changed to simply require that the state of the restraint system during an unintended stop be considered in the design. This section was previously numbered as 6.3.7 in the 2004 version of ASTM F2291.

The change to section 6.3.6 is proposed for deletion. The amendment to the standard is no longer needed due to the change to section 6.3.3 as noted above.

The change to section 6.3.10 is proposed for deletion because the section in the standard was renumbered as 6.3.7.

The changes to sections 6.3.12 through 6.3.16 regarding passenger restraint are proposed for deletion in an effort to be consistent with the national consensus standard; these issues are also covered by the general restraint analysis. In addition, there is language in the standard now that eliminates the need for restraints for certain water based rides. Finally, the State is eliminating

those amendments that it made to the acceleration limits in the standard, in an effort to be consistent with national consensus standard.

The change to section 6.4.1 (renumbered as 6.4.3.2 in the 2014 edition of the standard) is proposed for deletion. This change corrected a typographical error that no longer exists in the newer version of the standard.

A proposed amendment is made to section 6.4.2 to delete the provisions dealing with the supervising companion. The section proposed for deletion attempts to define a supervising companion as either someone who has been permitted by the operator to act in that capacity based on policy or practice for a period of at least five years or, absent such a policy or practice, someone who is at least 14 years old and is otherwise qualified to ride the ride. The Department believes that these provisions are deficient and largely unenforceable. The provision as written does not define where the supervising companion needs to be in relation to the patron requiring the supervision. In addition, the standard does not require that the practice or policy be a written policy or practice making the determination of whether it has been in place for five years impossible. The section, in combination with the definition of a "time tested practice," allows that policy that has been in place for five years to be acceptable in cases where the policy has resulted in hazards provided that the hazards have been mitigated. It gives no guidance on how to assess whether the mitigation was effective. Therefore, the Department proposes its deletion. This concept was not addressed in the 2004 edition of the standard.

The change to section 6.6.2 (renumbered as 6.6.3 in the 2014 version) of the standard is proposed for deletion. The change eliminated the statement that the designer/engineer is responsible for determining the clearance envelope in favor of the fact that the design should include the

clearance envelope. In an effort to be as close as possible to the national consensus standard, the Department is proposing to retain the language in the standard that makes the designer responsible for determining the clearance envelope.

The change to section 6.6.3.3 of the standard is proposed for deletion. The change was to eliminate the reference to the designer engineer being responsible for considering the consequences of patron to patron contact in favor of just specifying that the design must account for it. In an effort to be as close as possible to the national consensus standard, the change is proposed for deletion.

The change to section 6.6.4.1 is proposed for amendment because the change of “may” to “shall” is no longer needed because the language in the standard has been amended.

Section 6.6.4.2 is proposed for amendment to reflect the fact that the value is specified in the design that the Department receives rather than determined by the designer/engineer or manufacturer.

The change to section 6.7 is proposed for amendment. The change of the “should” to “shall” is being eliminated because the Department does not think the permissive language affects the enforcement of the standard. In an effort to make the State’s adoption of the standard as close as possible to the national consensus standard, the Department is proposing that the change be eliminated.

The change to add a new section 6.8 that discusses being allowed to use secondary safety devices to limit the travel of the primary safety device is eliminated since the standard is written to discuss requirements rather than allowances.

Section 7. Acceleration Limits

The previous changes to section 7 of the standard, which established New Jersey specific acceleration requirements, are no longer made in an effort to be as consistent as possible with the national standard.

Section 8. Loads and Strengths

The change to section 8.3.2.1, which eliminated the reference to the engineer/designer in favor of the design and changed the amount that a designer can reduce the operational time of an amusement ride to account for loading and unloading from 50 percent to 30 percent, is proposed for deletion in order to make the adoption of as close to the national consensus standard.

The change to section 8.4.1 is proposed for amendment to make the provisions applicable to the design rather than the person doing the design.

The change to section 8.5 regarding service life of amusement rides is proposed for deletion since there is no justification for a different service life in New Jersey.

The change to section 8.6.4 is proposed for amendment to include the deletion of the words “for fatigue” because the Department believes that the intention is to analyze unbalanced loads for all conditions specified in the ride analysis.

The change to section 8.6.6 is proposed for amendment to clarify that the loads that should be considered are determined by the ride analysis rather than by the designer/engineer.

The change to section 8.6.7 to change the emphasis from the designer/engineer to the design is proposed for deletion in an effort to make as few changes as possible to the national consensus standard.

The change to section 8.7.1 is proposed for amendment to make it clear that all loads in the standard must be considered rather than just those specified by the designer.

The change to section 8.7 to add a new section 8.7.4 regarding loads in the trailering position is proposed for deletion in an effort to be consistent with the national consensus standard and because the Department believes that the issue is adequately addressed in another part of the standard.

The change to section 8.10 is proposed for amendment to clarify that the 100 pounds per square foot (psf) requirement is for primary circulation areas while other areas are permitted to use a load of 60 psf.

The change to section 8.11.1, which clarified that it was loads in the design that must be considered, is proposed for deletion in an effort to make as few changes as possible to the national consensus standard and because the Department thinks it is readily apparent that those are the applicable loads that must be considered without the change.

The change to section 8.12.1, which emphasized that it was the applicable design loads rather than those defined by the engineer/designer that must be considered, is proposed for deletion because the Department believes that the environmental loads can be picked by the designer based on the geographical area in which the ride is proposed to be used.

The change to section 8.12.2, which required that, for type certified rides, the design must be based on the worst case environmental conditions in New Jersey, is proposed for deletion since this requirement is already part of the type certification requirements found elsewhere in the rules.

The change to section 8.12.3 is proposed for modification to make it clear that the design has to indicate the environmental loads rather than the designer.

The change to section 8.13.1, which allowed exceptions to designing the ride for operation in winds up to 34 miles per hour, is proposed for deletion since such hardships can be accommodated by the variance requirements in the rules.

The change to section 8.13.2 is proposed for amendment to delete the reference to ASTM F1193 because the Department does not use the reference standard since it established responsibilities between owners, manufacturers, and designers and is outside of the scope of the rules. The purpose of the adoption of ASTM F2291 is to address the design of amusement rides, not what is included in the manual.

The change to section 8.13.3, which required overturning and load and strength calculations for operational wind loads, is proposed for deletion because the Department believes that this issue is addressed adequately elsewhere in the standard.

The change to section 8.14.1 is proposed for amendment to delete the reference to ASTM F1193 because the Department does not use the reference standard since it established responsibilities between owners, manufacturers, and designers and is outside of the scope of the rules.

The change to add a new section 8.14.2, which discussed the need to consider overturning and load and strength calculations under non-operational wind loads, is proposed for deletion because the section that covers environmental loads generally (8.12.1) covers all varying wind loads encountered.

The change to add a new section 8.14.3 is deleted because it establishes what must be within the maintenance manual rather than what is required in the ride design. The Department believes what must be in the manual is adequately addressed elsewhere in the rules.

The change to section 8.15.1, which allowed actual field measurement rather than calculations, is proposed for deletion since the Department is unsure of why calculations could not be provided as part of a design for a new ride. If the case arises, it can be accommodated through the variance process in the rules.

The change to section 8.15.3 is proposed for deletion because the language in the 2014 edition of the standard makes the change no longer necessary.

The change to section 8.15.7 is proposed for amendment so that the order of the terms in the change match the standard, and changes in the first two sentences of the section that did not change the requirements are being deleted in favor of the unamended national consensus standard.

The change to section 8.16.1 is proposed for deletion because there is not sufficient evidence that a greater impact factor than what is in the standard is needed for rides that exceed 60 miles per hour.

The change to section 8.16.5 is proposed for deletion because the Department finds it appropriate that the designer/engineer establish wear limits for the ride.

The change to section 8.20.1 is proposed for deletion because the Department finds that the reference to AISC M105 is appropriate and does not warrant a change.

The change to section 8.21 is proposed for deletion because the standard gives direction on load combinations in section 8.22.2 and defines dynamic loads as live loads in Section 8.22.2.4. Footing design is covered by the applicable building code.

The change to section 8.22 is proposed for deletion because the Department is retaining the language from the standard dealing with load combinations.

The change to section 8.23 is proposed for deletion since the Department is retaining the language in an effort to be as close as possible to the national consensus standard and the subsection simply states that the material values used in the Allowable Stress Design must be from a source.

The change to section 8.24 is proposed for deletion since the design methodology in the standard was reached by consensus of the industry for Load and Resistance Factor Design.

The change to section 8.25 is proposed for modification. Section 8.25 is amended to retain the design methodology for Load and Resistance Factor Design. Section 8.25.1.9 of the standard is, however, proposed for amendment to remove permissive language and make the requirement to consider higher loads where appropriate mandatory.

The change to section 8.26 is proposed for deletion and the requirements in the standard that require a source for resistance values of materials is retained.

The change to section 8.27.3 is proposed for deletion and the requirement in the standard that requires the designer to know or estimate the number of cycles during normal operation is retained.

The amendment to section 8.27.4 is proposed for deletion and the methodology for design based on fatigue included in the national consensus standard is retained.

The amendment to section 8.27.5 is proposed for deletion and the methodology for design based on fatigue included in the national consensus standard is retained.

The amendment to section 8.27 which added a new section 8.27.7 is deleted removing the requirement that a fatigue analysis be done in the trailering position. This requirement is addressed elsewhere in the standard.

The change to section 8.30.1 is proposed for modification because the reference to portable or fixed is not needed since it in effect applies to all rides. The reference to the designer is being retained in the standard as appropriate.

The change to section 8.30.2 is proposed for amendment to delete the section from the standard since it references ASTM F1159, which does not contain the information specified. This information is addressed elsewhere in the standard.

The change to section 8.30 to add a new subsection 8.30.3 is proposed for deletion since the method of designing for fatigue is already discussed in section 8.27.5 of the standard.

The change to section 8.31.1 which changed the term “designer/engineer” to “design,” is proposed for deletion in an effort to be as consistent with the national consensus standard.

The change to section 8.31.2 is proposed for amendment to match revised language in the standard. These changes are consistent with other changes that are made where the terms that discuss a person being responsible are changed in favor of what the design needs to provide.

The change to section 8.32, which added a new subsection 8.32.2, is proposed for deletion. The change specified that steel structures meet AISC Manual of Steel Construction. The change is being deleted to make the rules consistent with the national consensus standard. The requirements of the ASTM standard are more general, but cover environmental conditions, albeit under a broader heading, that of "suitability of materials."

The change to section 8.32 that added a new subsection 8.32.3, which required that metals be resistant to corrosion from salt air, is proposed for deletion to be consistent with the national consensus standard.

The change to section 8.33.2, which deleted reference to the designer/engineer, is deleted because, in this context, the designer/engineer's judgment is appropriate. Very specific design requirements are proposed for deletion in favor of more general requirements. The existing provisions actually prohibit the use of what would have been acceptable alternate designs.

The change made to section 8.33.4 is proposed for amendment to require the design to "specify" rather than "include."

The change made to Section 8.35.2 is proposed for amendment to emphasize that connection details must be properly selected.

Section 9. Hydraulic Systems and Components

A proposed amendment is made to section 9.2.1.1. These changes are consistent with other changes that are made where the terms that discuss a person being responsible are changed in favor of what the design needs to provide.

A proposed amendment is made to section 9.2.1.2. These changes are consistent with other changes that are made where the terms that discuss a person being responsible are changed in favor of what the design needs to provide. In addition, the provision to provide details to the purchaser is deleted since that is not part of the Department's role under the rules and would be a contract item between the manufacturer/designer and purchaser.

A proposed amendment is made to section 9.2.2.1 which would change the word "should" to "shall" to make the requirement enforceable.

Proposed amendments are made to sections 9.3.1 and 9.3.2. These changes are consistent with other changes that are made where the terms that discuss a person being responsible are changed in favor of what the design needs to provide.

A proposed amendment is made to Section 9.3.4. This change is consistent with other changes that are made where the terms that discuss a person being responsible are changed in favor of what the design needs to provide.

A proposed amendment is made to section 9.3.5.1. This change is consistent with other changes that are made where the terms that discuss a person being responsible are changed in favor of what the design needs to provide, as well as making the language mandatory and thus enforceable.

A proposed amendment is made to section 9.3.5.2. This change is consistent with other changes that are made where the terms that discuss a person being responsible are changed in favor of what the design needs to provide, as well as making the language mandatory and thus enforceable.

The change to section 9.6 is proposed for amendment to reflect a change in the numbering of the ASTM standard.

The change made to section 9.7 is proposed for deletion because the issue is now addressed by section 9.11.1 of the standard.

A proposed amendment is made to section 9.11.1 to make the requirements for pressure vessels on rides match the New Jersey Office of Boiler and Pressure Vessel Compliance rules, N.J.A.C. 12:90.

Section 10. Pneumatic Systems and Components

The change to section 10.2 is proposed for amendment to refer to the design rather than the designer for the requirement.

The change to section 10.3.2 is proposed for deletion. The section requires the marking of pneumatic components. The Department is retaining the language of the standard in an effort to be as consistent as possible with the national consensus standard.

The change to section 10.3.5 is proposed for deletion. The change to this section, which modifies a section of a standard referenced in ASTM F2291 to delete the section of the referenced standard, would be retained. The net result is that the design would have to consider additional hazards that might occur from failures of pneumatic systems.

The change to section 10.5 is proposed for amendment to make it clear that it is the design that must meet N.J.A.C. 12:90 since the standard being adopted is a design standard. Inspections for determining that the system in fact meets the requirements of N.J.A.C. 12:90 would be under the

purview of the New Jersey Department of Labor and Workforce Development; therefore, the section should not imply compliance beyond the design.

Section 11. Safety Related Electrical/Electronic/Programmable Electronic Control Systems

The change to section 11.2.1 is proposed for deletion because the wording of the section has changed in the 2014 edition and the change is no longer appropriate.

A proposed amendment is made to section 11.2.5. This change is consistent with other changes that are made where the terms that discuss a person being responsible are changed in favor of what the design needs to provide.

The change to section 11.3.1, which established New Jersey specific requirements for control systems, is proposed for deletion in an effort to be consistent with the national consensus standard. Language was added in the 2014 edition of ASTM F2291 that addresses these issues.

A proposed amendment is made to section 11.3.9.4 of the standard to require that all operator control stations have the ability to enact an emergency stop rather than just one operator.

The change to section 11.4 that established requirements for emergency stops is proposed for deletion in an effort to be as consistent with the national consensus standard as possible. Language was added to the 2014 edition of ASTM F2291 that addresses these issues.

The change to section 11.5 is proposed for deletion. This change is consistent with other changes that are made where the terms that discuss a person being responsible are changed in favor of what the design needs to provide.

The change to section 11.6, which is not a technical change, is proposed for deletion in an effort to be as consistent as possible with the national consensus standard.

Section 12. Electrical Requirements

The change to section 12.1.1 is proposed to be amended to make it clear that the requirement applies to both design and manufacture of electrical systems and components.

The change to add a new section 12.1.1.1 is proposed for deletion since the change relates to a section in the NFPA 70 rather than ASTM F2291. This change is no longer needed because the more recent versions of NFPA 70 and ASTM F2291 address these issues.

The change to section 12.1.2.2 is proposed for deletion since the change is largely grammatical and the Department would like to be as consistent as possible with the national consensus standard.

The change to section 12.1.3 and Table 1 (redesignated Table 2 in the 2014 version of the standard) are proposed for amendment to delete them in their entirety rather than to modify them. These sections describe the layout of the standard rather than establish requirements and are, therefore, not enforceable requirements.

The change to section 12.1.4.1 is proposed for amendment to delete section 12.4.1 in its entirety. The section contains requirements for existing equipment, but these issues are covered elsewhere in N.J.A.C. 5:14A.

The change to section 12.1.4.2 is proposed for deletion since it is covered by the proposed amendment to section 12.1.4.1 described above.

The change to section 12.1.4.3 is proposed for deletion since it is covered by the change to section 12.1.4.1 described above.

The change to section 12.1.5.1 is proposed for amendment because the “F” now appears after “ASTM” in the 2014 version of the standard, the references to the editions of NEC and F1159 are being eliminated for consistency with the national consensus standard. The reference to the edition of the National Electrical Code is being eliminated since that can be discerned from the year of electrical system manufacture. The reference to F1159 is proposed for deletion since that standard is only applicable to rock walls.

The change to section 12.1.5 that added a new subsection 12.1.5.3 for marking outlets that are greater than 120 volts to ground is proposed for deletion in order to be as consistent as possible with the national consensus standard.

The change to section 12.2.1.1, which establishes additional requirements for the service outlet that must be provided, is proposed for deletion since these requirements are covered by the general requirement that the electrical work comply with the National Electrical Code.

The change to section 12.2.2, which established New Jersey specific requirements for ride disconnects, is proposed for deletion in order to be as consistent as possible with the national consensus standard. The ASTM standard now includes a requirement for a disconnecting means; therefore, it is no longer necessary to add such a requirement to the rules.

The change to section 12.2.3.1 is proposed for deletion since the referenced wording in the standard has changed and the amendment is no longer applicable.

The change to section 12.2.3 which established a new section 12.2.3.3 that forbids the installation of overcurrent protection devices in neutral or grounding conductors is proposed for deletion since the general requirements of the National Electrical Code that are already referenced in the standard cover this.

The change to section 12.2.3 which established a new section 12.2.3.4 which requires that all step and control transformers be grounded is proposed for deletion since the National Electrical Code referenced in this standard already addresses these issues.

The change to section 12.3.2 which established a specific rating for electrical boxes is proposed for deletion since the existing language states that the appropriately classified box must be used.

The change to section 12.4.1.4 is proposed for amendment to make the language of the requirement clearer.

The change deleting section 12.5.1 is proposed for deletion, therefore retaining the requirements of section 12.5.1 of the standard, which states that emergency lighting is beyond the scope of the standard.

The change to section 12.5.3.1 is proposed for amendment to eliminate the year in the NEC reference and delete the insertion of “NFPA 70” since it is clear from the context of the section that NEC and NFPA 70 are synonymous.

The change to section 12.5.3.2 is proposed for amendment to eliminate the year in the NEC reference and delete the insertion of “NFPA 70” since it is clear from the context of the section that NEC and NFPA 70 are synonymous.

The change to section 12.5.4.1 is proposed for deletion since the changes are for the most part stylistic and an effort is being made to be as consistent as possible with the national consensus standard.

Section 13. Mechanical Systems and Components

The change to section 13.3.5 is proposed for deletion because it corrected a typographical error in the standard that no longer exists.

The change to section 13.3.13 is proposed for amendment to use the word “instituted” rather than “in place,” since it involves an inspection protocol that must be followed.

The change to section 13.4.5 is proposed for deletion since the section in the updated version of the standard adequately addresses the issue.

The change to section 13.6.3.3, which changed the word “should” to “shall,” is proposed for deletion in an effort to be as consistent as possible with the national consensus standard.

The change to section 13.7.2.1.1 is proposed for amendment to change the section numbering and to add language that more clearly identifies the function of a safety brake system.

The change to section 13.7.2.2 is proposed for amendment to change the section numbering and to make it clear that the requirements apply to the safety brake system rather than just the brake itself.

The change to section 13.7.2.3 is proposed for amendment to change the section numbering and to make it clear that the requirement is for the system and to clarify what the function of the system is.

The change to add section 13.7.2.3.1, which established additional requirements for safety brake systems, is proposed for deletion in an effort to be consistent with the national consensus standard.

The change to add section 13.7.2.3.2, which established additional requirements for safety brake systems, is proposed for deletion in an effort to be consistent with the national consensus standard.

The change to add section 13.7.2.3.4, which established additional requirements for safety brake systems, is proposed for deletion in an effort to be consistent with the national consensus standard.

The change to add section 13.7.2.5, which established additional requirements for safety brake systems, is proposed for deletion in an effort to be consistent with the national consensus standard.

The change to add section 13.7.2.6, which established additional requirements for safety brake systems, is proposed for deletion in an effort to be consistent with the National consensus standard.

The change to section 13.7.2.7 is proposed for amendment to change the section numbering and is amended to clarify that the pneumatic tank for safety brake systems be dedicated to that system and to clarify that the leak protection discussed is applicable to the supply to the tank.

A new section 13.7.2.6 is proposed that requires monitoring of the dedicated tank used for pneumatic safety brake systems.

The change to 13.7.3.1 is proposed for amendment to match the language in the new version of the standard retaining the word “specified” in the standard.

The change to add new sections 13.8 and 13.8.1 for internal combustion engines are proposed for deletion in an effort to be as consistent as possible with the national consensus standard.

Section 14. Fencing, Guardrails, and Handrails for Amusement Rides and Devices

The changes to chapter 14 regarding fencing are proposed for deletion because they were largely stylistic and an effort is being made to adopt the national consensus standard with as few changes as possible. Other requirements that were not stylistic such as the establishment of the force that barriers must resist are now included in the standard.

Section 15. Welding

The change to section 15.1, which added specific documents that welding procedures must follow, is proposed for deletion in favor of the more general language in the standard.

The change to section 15.4 is proposed for amendment to match the wording in the revised standard. The phrase to be deleted by the change is updated as “manufacturer’s record retention policy.”

Section 16. Fasteners

The change to section 16.1.5 is proposed for amendment to match the existing language found in the proposed standard, the amended change replacing “is” with “shall be,” and to delete the reference to the designer in favor of establishing requirements for the design.

The change to section 16.1.5.1 is proposed for deletion because the standard gives sufficient direction regarding the type of bolting that is appropriate.

The change to section 16.1.6, replacing “should with “shall,” is proposed for deletion in an effort to be as consistent with the national consensus standard.

The change to section 16.1.9 is proposed for amendment to add the provision that fasteners that have been torqued to greater than 75 percent of their ultimate strength can be used if "specifically demonstrated by the design to be acceptable."

The change to add a new section 16.1.10 that requires that all bolts, cap screws, and studs be SAE Grade 5, ASTM A325, equivalent or higher is proposed for deletion. This section is no longer necessary as the ASTM standard now covers the grading of bolts and washers.

The change to add a new section 16.1.10.1 that creates an exception for ungraded fasteners is proposed for deletion because section 16.1.10 that created the requirement is deleted.

The change to add a new section 16.1.10.2 that required proof testing of fasteners by lot is proposed for deletion because section 16.1.10 that created the requirement is deleted.

The change to section 16.2.2 deleting the words "where specified torque values," which requires flat washers under all grade 8 and above fasteners, is proposed for deletion in an effort to be consistent with the national consensus standard.

The change to add a new section 16.2.2.1, which added an exception to the need for washers under fasteners specified in section 16.2.2, is proposed for deletion because the section that required it is deleted.

Section 18. Information to be Provided to the Owner/Operator

A proposed change is made to delete the requirements of section 18 since the section deals with the responsibilities of the manufacturer, owner, and designer and does not cover the design of amusement rides which is the purpose of the referenced standard. This section was added in the 2014 edition of the standard.

Annex A1. Loads and Strengths

The changes to sections A1.1.1, A1.1.2, and A1.2.1 are proposed for deletion. All of these amendments are made to change the responsibility from the designer to simply requiring that the information be part of the design. In an effort to be as consistent with the national consensus standard, these sections are being retained.

The change to section A1.2.2.1, which changed the load/unload time specified, is proposed for deletion in an effort to be consistent with the national consensus standard.

The change to section A1.2.3, replacing “could” with “may,” is proposed for deletion in an effort to be as consistent with the national consensus standard as possible.

The change to section A1.2.4.1, which changed the operational hours calculated in the example, is proposed for deletion and the value in the standard is retained in order to be as consistent with the national consensus standard as possible.

The change to section A1.3.1 is proposed for amendment to delete the word “that,” which seems to be a typographical error. The words “to be exempt” are eliminated as they are redundant.

The change to A1.4.1 is proposed for amendment to require that the designer/engineer comply with the applicable requirements for over the road vehicles.

The change to section A1.5.1.2, which replaced “designed/engineer is required to” with “design shall,” is proposed for deletion in an effort to be as consistent as possible with the national consensus standard.

The change to section A1.5.1.5 that changed “should” to “shall” is proposed for deletion in an effort to be as consistent as possible with the national consensus standard.

The change to section A1.5.1.6, which deleted the section, is proposed for deletion, meaning that the section is retained in the standard. This change is made to be as consistent as possible with the national consensus standard. The language in the ASTM standard being retained says, in effect, that portable rides are self-contained. It is explanatory or descriptive and does not impose a requirement.

The change to section A1.6.2, which deleted the section, is proposed for deletion, meaning that the section is retained in the standard. This change is made to be as consistent as possible with the national consensus standard. The language in the ASTM standard being retained makes a broad, general statement about live loads. It does not contain a new requirement.

The change to section A1.7.1, which changed permissive language to mandatory language, is proposed for deletion in an effort to be as consistent with the national consensus standard as possible.

The change to section A1.8, which eliminated the reference to the design professional in favor of the design, is proposed for deletion in an effort to be as consistent with the national consensus standard as possible.

The change to section A1.9.1.3 is proposed for amendment to improve the grammar of the existing section.

The change to section A1.9.2.6(5), which mandated testing when calculated stresses are greater than the allowable, is proposed for deletion and the language in the standard is retained in an effort to be as consistent with the national consensus standard as possible. The language of the existing rule is no longer necessary as the ASTM standard now contains the requirement.

The change to section A1.9.2.7 is amended to make it clear that the design must contain the items listed rather than the section being a recommendation to the designer.

The change to section A1.10.4.4 that changes the word “must” to “shall” is proposed for deletion.

The change to section A1.10.5 that changed the designer/engineer to the design is proposed for deletion.

The change to section A1.11.1, which deleted the words “that would concern patrons and operators,” is proposed for deletion and the section would remain as it appears in the standard to be as consistent as possible with the national consensus standard.

The change to section A1.12.3, which deleted the third, fourth, and fifth sentences, is proposed for deletion and the section would remain as it appears in the standard in an effort to be as consistent with the national consensus standard as possible. The third, fourth and fifth sentences contain broad guidance and do not impose any new requirement.

The proposed change to section A1.14, which deleted the section, is proposed for deletion, in effect retaining the section as written in the standard. This change is made in an effort to be as consistent with the national consensus standard as possible. The result of retaining the language of the standard is to permit the use of actual data, thus eliminating the need for a load factor.

The change to section A1.15.3, which replaced “ASCE 16” with "AF&PA/ASCE 16," is proposed for deletion since ASCE 16 is no longer referenced in this section.

The change to section A1.16, which deleted the section, is proposed for deletion, in effect retaining the language in the standard in an effort to be as consistent with the national consensus

standard as possible. The ASTM standard contains guidance and does not impose any new requirements.

The change to section A1.17.2, deleting the words “Note also that,” is proposed for deletion in an effort to be as consistent with the national consensus standard as possible.

The change to section A1.18.1.1, replacing “resent” with “present,” is proposed for deletion because the amendment was made to correct a typographical error in the standard that no longer exists.

The change to section A1.18.1.2, which alters the ratio of standard deviation to fatigue strength, is proposed for deletion in an effort to be as consistent with the national consensus standard as possible. The result of this proposed change is to allow the use of the full range as opposed to the limits contained in the existing rule.

The change to section A1.18.1.5, which requires that structures be designed for infinite life except under limited exceptions, is deleted and the language of the standard is retained in an effort to be as consistent as possible with the national consensus standard. The language of the standard now contains the same requirement.

The change to section A1.18.2.1, which took the designers discretion out of the section, is proposed for deletion and the language in the standard is proposed to be retained in an effort to be as consistent as possible with the referenced standard.

An amendment is made to the edition of the ASTM standard that is referenced in the rules as well as the title of the name of the organization that publishes the standard.

N.J.A.C. 5:14A-9.21

Included in the above amendments to ASTM F2291-14 is an amendment to delete the requirements that apply to the rewiring of existing rides. The provision that is proposed for deletion in ASTM F2291-14 requires rides to be completely in compliance with the Chapter 12 of ASTM F2291 when more than one-third of the wiring is replaced and the operation of the ride is changed. N.J.A.C. 5:14A–9.21(a) states that all existing rides need to be maintained in compliance with Chapter 12 of ASTM F2291. By eliminating the wording that specifically applies to existing rides in ASTM F2291-14, N.J.A.C. 5:14A-9.21 would require any electrical work on existing rides to comply with requirements in ASTM F2291-14 for new rides. The Department believes that, for existing rides, compliance with standards for new rides is not necessary and that like for like replacements are acceptable. Therefore, the Department is proposing that N.J.A.C. 5:14A-9.21(a) and (a)1, which reference Chapter 12 of ASTM F2291, be deleted. The requirements of N.J.A.C. 5:14A–9.21(a)2, concerning verification of the continuity of the grounding conductor system used to reduce electrical shock hazards, are already covered by N.J.A.C. 5:14A–9.2(a)3 as well as N.J.A.C. 5:14A-9.21(d) and are, therefore, also proposed for deletion. Finally, the requirements in N.J.A.C. 5:14A–9.21(a)3, prohibiting exposure of energized points/surfaces to any personnel, are worker safety requirements rather than patron safety requirements and are thus covered by applicable Occupational Safety and Health Act (OSHA) rules, and are, therefore, proposed to be deleted. The proposed amendment to N.J.A.C. 5:14A-9.21(c) changes the cross-reference to N.J.A.C. 5:14A-7.2(c)12 to N.J.A.C. 5:14A-7.2(c)9 based on the proposed amendments made in the adoption of ASTM F2291-14.

As the Department has provided a 60-day comment period on this notice of proposal, this notice is excepted from the rulemaking calendar requirement pursuant to N.J.A.C. 1:30-3.3(a)5.

Social Impact

The proposed amendments to N.J.A.C. 5:14A-7.2 update the standard that New Jersey uses for the design of amusement rides. ASTM F2291, Standard Practice for Design of Amusement Rides and Devices, is a national consensus standard for the design of amusement rides, and adoption of the latest version of the standard ensures that new rides that are introduced into the State meet the current consensus safety requirements. The proposed amendments to N.J.A.C. 5:14A-9.21 allow ride owners to replace electrical components of rides on a like for like basis. The Department believes that this approach preserves public safety and that there is no adverse social impact.

Economic Impact

The proposed amendments to N.J.A.C. 5:14A-7.2 should have a positive economic impact by making the New Jersey rules consistent with the national consensus standard. Amusement ride manufacturers generally sell their product nationally. Referencing an older version of the standard requires manufacturers to design to multiple versions of the standard which increases the cost of amusement rides.

In addition, as part of the proposed adoption, the Department is making as few modifications as possible. This will also help manufacturers avoid having to design and produce New Jersey-specific rides. Owners of amusement rides have reported to the Department that the previous level of amendment that New Jersey made to the standard resulted in some manufacturers refusing to sell their rides in New Jersey or charging an extra fee.

The proposed amendments to N.J.A.C. 5:14A-9.21 should have a positive economic impact by eliminating requirements that mandate that existing rides meet the current ride design

standards based on a percentage of rewiring. Rather owners will be allowed to replace ride electrical wiring on a like for like basis ensuring that the ride is maintained at the safety level that was in place when it was manufactured.

Federal Standards Statement

A Federal standards analysis is not required because the amendments are not being proposed under the authority of, or in order to implement, comply with, or participate in, any program established under Federal law or under a State statute that incorporates or refers to Federal law, standards, or requirements.

Jobs Impact

The Department does not anticipate that the proposed amendments would result in either the creation or loss of jobs.

Agriculture Industry Impact

It is not anticipated that the proposed amendments will have any impact on the agriculture industry in New Jersey.

Regulatory Flexibility Analysis

The proposed amendments would apply to manufacturers of amusement rides and to owners of carnival and amusement rides, many of which would be considered small businesses as defined in the New Jersey Regulatory Flexibility Act, N.J.S.A. 52:14B-16 et seq. As described in the Summary above, the amendments update existing safety standards for the design of amusement rides and establish requirements applicable to the rewiring of existing rides. Costs of the proposed amendments are discussed in the Economic Impact above. Because these proposed amendments address the minimal safety standards for carnivals and amusement rides, they

cannot be adjusted based on business size. In addition, the intent of the proposed amendments is to update the version of a national consensus standard in use in New Jersey so that the burden of the rules on businesses of any size would be minimal since those businesses are presumably already complying with the standard in other jurisdictions. The proposed amendments do not impose any new reporting or recordkeeping requirements nor do they impose any new requirement to obtain professional services.

Housing Affordability Impact Analysis

Because the proposed amendments address amusement ride safety, the proposed amendments will not have any impact on the cost of housing.

Smart Growth Development Impact Analysis

Because the proposed amendments address amusement ride safety, it is not anticipated that there will be any impact on housing production within Planning Areas 1 and 2, or within designated centers, under the State Development and Redevelopment Plan.

Full text of the proposal follows (additions indicated in boldface **thus**; deletions indicated in brackets [thus]):

5:14A-7.2 Adoption as amended of ASTM practice [F 2291-04] **F2291-14**

(a) The Standard Practice for Design of Amusement Rides and Devices, designated by the [American Society for Testing Materials] **ASTM International** (ASTM) as [F 2291-04] **F2291-14**, is adopted by reference, as amended, and made part of this subchapter and shall be enforced as part of this subchapter.

(b) (No change.)

(c) The following sections of the standard are modified as follows:

1. [Chapter] **Section** 1, Scope, shall be amended as follows:

i.-ii. (No change.)

[iii. Section 1.5 shall be deleted in its entirety.]

2. [Chapter] **Section** 2, Referenced Documents, shall be [deleted in its entirety.] **amended as follows:**

i. Section 2.1:

(1) "F 770" shall be deleted and "F 770-14" shall be inserted in its place.

(2) "F 1159" shall be deleted and "F 1159-11" shall be inserted in its place.

(3) "F 1193" shall be deleted and "F 1193-06" shall be inserted in its place.

(4) "F 2137" shall be deleted and "F 2137-11" shall be inserted in its place.

ii. Section 2.3:

(1) "ACI-301" shall be deleted and "ACI 301-10" shall be inserted in its place.

(2) "ACI-318" shall be deleted and "ACI 318-11" shall be inserted in its place.

iii. Section 2.4: "NDS" shall be deleted and "NDS (2012)" shall be inserted in its place.

iv. Section 2.5:

(1) "AISC 316" shall be deleted and "AISC 316 (1989)" shall be inserted in its place.

(2) "AISC M015" shall be deleted and "AISC M015 (1986)" shall be inserted in its place.

v. Section 2.6:

(1) "ANSI B93.114M" shall be deleted and "ANSI B93.114M (1987)" shall be inserted in its place.

(2) “ANSI B11.TR3” shall be deleted and “ANSI B11.TR3 (2000)” shall be inserted in its place.

(3) “ANSI B77.1” shall be deleted and “ANSI B77.1 (2006)” shall be inserted in its place.

(4) “ANSI Y32.10” shall be deleted and “ANSI Y32.10 (1967)” shall be inserted in its place.

vi. Section 2.7:

(1) “ASCE 7” shall be deleted and “ASCE 7 (2005)” shall be inserted in its place.

(2) “ASCE 16” shall be deleted and “ASCE 16 (1995)” shall be inserted in its place.

vii. Section 2.8:

(1) “ASM Atlas of Fatigue Curves” shall be deleted and “ASM Atlas of Fatigue Curves (1986)” shall be inserted in its place.

(2) “ASM Handbook Volume 19: Fatigue and Fracture” shall be deleted and “ASM Handbook Volume 19: Fatigue and Fracture (1996)” shall be inserted in its place.

viii. Section 2.9:

(1) “ASME B15.1” shall be deleted and “ASME B15.1 (2000)” shall be inserted in its place.

(2) “ASME A17.1” shall be deleted and “ASME A17.1 (2007)” shall be inserted in its place.

ix. Section 2.10:

(1) “ANSI/AWS D1.1/D1.1M” shall be deleted and “ANSI/AWS D1.1/D1.1M (2008)” shall be inserted in its place.

(2) "ANSI/AWS D14.4" shall be deleted and "ANSI/AWS D14.4 (2005)" shall be inserted in its place.

x. Section 2.11:

(1) "BS 5400-10" shall be deleted and "BS 5400-10 (1980)" shall be inserted in its place.

(2) "BS 7608" shall be deleted and "BS 7608 (1993)" shall be inserted in its place.

xi. Section 2.15: "DIN 15018-1" shall be deleted and "DIN 15018-1 (1984)" shall be inserted in its place.

xii. Section 2.16:

(1) "EN 280" shall be deleted and "EN 280 (2001)" shall be inserted in its place.

(2) "EN 954-1" shall be deleted and "EN 954-1 (1996)" shall be inserted in its place.

xiii. Section 2.17: "FM6930" shall be deleted and "FM6930 (2009)" shall be inserted in its place.

xiv. Section 2.18: "USDA-72" shall be deleted and "USDA-72 (1999)" shall be inserted in its place.

xv. Section 2.19:

(1) "IEC-60204-1" shall be deleted and "IEC-60204-1 (2009)" shall be inserted in its place.

(2) "IEC-61496-1" shall be deleted and "IEC-61496-1 (2008)" shall be inserted in its place.

(3) "IEC-61508-1" shall be deleted and "IEC-61508-1 (2010)" shall be inserted in its place.

(4) “IEC-61511” shall be deleted and “IEC-61511-1 (2004)” shall be inserted in its place.

(5) “IEC-62061” shall be deleted and “IEC-62061 (2005)” shall be inserted in its place.

xvi. Section 2.20:

(1) “ISO 4113” shall be deleted and “ISO 4113 (1998)” shall be inserted in its place.

(2) “ISO 4413” shall be deleted and “ISO 4413 (1998)” shall be inserted in its place.

(3) “ISO 4414” shall be deleted and “ISO 4414 (1998)” shall be inserted in its place.

(4) “ISO 4406” shall be deleted and “ISO 4406 (1999)” shall be inserted in its place.

(5) “ISO 6149-1” shall be deleted and “ISO 6149-1 (2006)” shall be inserted in its place.

xvii. Section 2.21:

(1) “MIL 17” shall be deleted and “MIL 17 (2002)” shall be inserted in its place.

(2) “MIL 882C” shall be deleted and “MIL 882C (1993)” shall be inserted in its place.

xviii. Section 2.22: “NEMA 250” shall be deleted and “NEMA 250 (2008)” shall be inserted in its place.

xix. Section 2.23:

(1) “NFPA-79” shall be deleted and “NFPA-79 (2007)” shall be inserted in its place.

(2) “NFPA-70” shall be deleted and “NFPA-70 (2011)” shall be inserted in its place.

(3) “NFPA-101” shall be deleted and “NFPA-101 (2009)” shall be inserted in its place.

xx. Section 2.24:

(1) “NFPA/JIC T2.25.1M” shall be deleted and “NFPA/JIC T2.25.1M (1986)” shall be inserted in its place.

(2) “NFPA/ T2.24.1” shall be deleted and “NFPA/ T2.24.1 R1 (2007)” shall be inserted in its place.

xxi. Section 2.25:

(1) "SAE J-211" shall be deleted and "SAE J211/1 (2007)" shall be inserted in its place.

(2) "SAE J518" shall be deleted and "SAE J518 (2004)" shall be inserted in its place.

(3) "SAE J833" shall be deleted and "SAE J833 (2003)" shall be inserted in its place.

(4) "SAE J1926" shall be deleted and "SAE J1926/3 (2010)" shall be inserted in its place.

(5) "SAE HS 4000" shall be deleted and "SAE HS-4000 (2009)" shall be inserted in its place.

xxii. Section 2.27:

(1) "UL 508" shall be deleted and "UL 508 (2008)" shall be inserted in its place.

(2) "UL 508A" shall be deleted and "UL 508A (2009)" shall be inserted in its place.

xxiii. Add section 2.28: "The following documents are available from MIT Press, 5 Cambridge Center, Cambridge, MA 02142-1493:

(1) Dreyfuss Human Scale 4/5/6;

(2) Dreyfuss Human Scale 7/8/9."

3. [Chapter] **Section** 3, Terminology, shall be amended as follows:

i. Section [3.1.20] **3.1.15**, the definition of "manufacturer" shall be deleted.

ii. [Section 3.1.22, the words "ASTM Standard" shall be deleted and the words "provisions of N.J.A.C. 5:14A-7" shall be inserted in their place.] **Section 3.1.20, the definition of "previously compliant" shall be deleted.**

iii. Section 3.1.25 shall be deleted.

[4. Chapter 4, Significance and Use, shall be deleted in its entirety.

5. Chapter 5, General Design Criteria, shall be amended as follows:

i. Section 5.1.1.3: In the second sentence, the word "either" shall be deleted and following the words "Fault Tree Analysis" the word "or" shall be inserted.

ii. Section 5.2.1.4: In the first sentence, the words "for passenger and vehicles" shall be inserted after the word "Calculations".

iii. Section 5.4.1 shall be deleted and replaced with, "The manufacturer shall produce and retain as-built drawings, calculations, and control software as necessary for a full and complete review, as required by N.J.A.C. 5:14A-2.12. These documents shall be retained in accordance with N.J.A.C. 5:14A-5.6."

iv. Add new section "5.4.1.1 If a voice communication or signal system is required under N.J.A.C. 5:14A-9.13, to the extent that the manufacturer has been involved in its development, it shall be included in the manufacturer's documentation to the Department."

v. Section 5.4.2: In the second sentence, the word "review," shall be inserted after the words "to the".

vi. Section 5.5 shall be deleted in its entirety.]

[6.] **4.** [Chapter] **Section** 6, Patron Restraint, Clearance Envelope, and Containment Design Criteria, shall be amended as follows:

i. Section 6.3.1, the [wording "designer/engineer. This determination shall be based on the"] **last sentence** shall be deleted.

ii. Section 6.3.3, the word “manufacturer” shall be deleted and the word “design” shall be substituted in lieu thereof.

[ii.] **iii.** Section 6.3.4[: At the end of the section, the following sentence shall be added, "Restraints required because of ride elevation shall be the locking type, not capable of being

unlocked by patrons."]**, the word “manufacturer” shall be deleted and the word “design” shall be substituted in lieu thereof.**

[iii. Section 6.3.6: In the first sentence, the word "manufacturer" shall be deleted and the word "design" shall be inserted in its place. Also, at the end of the section, the following sentence shall be added, "The design for emergency evacuation shall be such that riders shall be kept safely on the ride or shall be safely evacuated."]

iv. (No change.)

[v. Section 6.3.10: In the first sentence, the word "manufacturer" shall be deleted and the word "design" shall be inserted in its place.

vi. Section 6.3, Patron Restraints, add new subsection: "6.3.12 Any ride where it is possible for a rider to slide laterally shall be designed to adequately and safely contain the rider in the ride. When designing ride pieces which riders will slide into, the design shall account for the rider and any fellow riders who will be sliding into those pieces while being contained by the ride."

vii. Section 6.3, Patron Restraints, add new subsection: "6.3.13 Restraints shall not be required for water slides, wave pools, water play areas, lazy rivers or other, similar rides."

viii. Section 6.3, Patron Restraints, add new subsection: "6.3.14 If Gx exceeds +0.2 g for more than 0.2 seconds, a backrest shall be required. If Gx exceeds +0.5 g for more than 0.2 seconds, a full backrest shall be required. If Gx exceeds 1.5 g for more than 0.2 seconds, see Note 1 on Figure 5. If +Gx exceeds +2.5 g for more than 0.2 seconds, a headrest, which discourages both lateral movement and movement away from the headrest, shall be required. As used in this subsection, a backrest does not allow a person to slide off the seat backwards. A full backrest supports the torso up to the shoulders. A headrest supports the back of the head."

ix. Section 6.3, Patron Restraints, add new subsection: "6.3.15 Unless the ride analysis indicates otherwise, if there are accelerations in the X or Z direction that exceed 1 g or Gy exceeds 0.5 g in either direction, there shall be hand holds (including, for example, the lap bar) with a 1 1/2 inch maximum diameter for the riders to grasp to help support themselves."

x. Section 6.3, Patron Restraints, add new subsection: "6.3.16 For any ride in which accelerations exceed 2 g or are less than -2 g in any direction, the rider shall be well and closely restrained in the direction to resist the acceleration.

6.3.16.1 One of the following may be used as an alternative method of rider protection:

6.3.16.1.1 The ride dynamics shall be designed such that no impact or only light impact with the restraint takes place while still keeping the rider well restrained;

6.3.16.1.2 Ride padding shall be designed to absorb impact load; or

6.3.16.1.3 Another means acceptable to the Department shall be used."

xi. Section 6.4.1: In the first sentence, following the word "part" the word "of" shall be inserted.]

[xii.] **v.** Section 6.4.2[: The first sentence] shall be deleted in its entirety. [In the second sentence, the words "another class of restraint" shall be deleted and replaced with the words "a class of restraint other than that indicated by Fig. 2."

xiii. Section 6.6.2: In the first sentence, the words "The designer/engineer shall determine" shall be deleted and the words "shall be" shall be inserted after the word "envelope."

xiv. Section 6.6.3.3: In the first sentence, following the word "ride," the word "and" shall be deleted and the word "or" inserted in its place. Also, the words "(for example, while seated in separate vehicles), the Designer/Engineer shall take reasonably" shall be deleted and the words

"shall be taken" shall be inserted after the word "steps." Also, add the following sentence to the end of this section, "Patron safety shall be addressed as dictated by the Ride Analysis."]

[xv.] **vi.** (No change from proposal.)

[xvi.] **vii.** Section 6.6.4.1: In the first sentence, the word "determined" shall be deleted and the word "specified" shall be inserted in its place. [Also, in the first sentence, the word "may" shall be deleted and the word "shall" shall be inserted in its place.]

viii. Section 6.6.4.2: In the first sentence, the word "determined" shall be deleted and the word "specified" shall be inserted in its place.

[xvii.] **ix.** Section 6.7: In the first sentence, the words "manufacturer shall determine and may make" shall be deleted and the words "design shall include" shall be inserted in its place. [In the second sentence, the word "should" shall be deleted and replaced with the word "shall."

xviii. Add new section: "6.8 Secondary safety devices such as latching belts, straps or other devices that limit the travel of a primary restraint device are acceptable."

7. Chapter 7, Acceleration Limits, shall be amended as follows:

i. Section 7.1.1 shall be deleted and replace it with the following: "7.1.1 Amusement rides and devices shall be designed such that the accelerations are within the limits specified in this practice. Any ride submitted for type certification/amended type certification or individual approval/supplemental modification certification, designed with g's in excess of 75 percent of the limits of this subchapter, shall be tested in accordance with ASTM F 2137. Any ride that has peaks greater than 75 percent of any value in the pulse width of less than 60 seconds in Figures 5 through 9, no matter how long its total run time, requires a Department-witnessed accelerometer test at the time of the acceptance inspection. For a portable amusement ride, this test may be

performed at the factory by a third party testing agency. Test data intended for evaluation against the limits specified in this subchapter shall be acquired and prepared as follows:"

ii. Section 7.1.3: In the fourth sentence, the words "Designer/Engineer" shall be deleted and the words "Ride Analysis" shall be inserted in its place. Also, add the following sentences to the end of this section, "For roller coasters, the maximum pitch, roll, and yaw design acceleration rates on the ride are ($1rev/sec^2$) or ($2\Pi/sec^2$). Higher values may be used if demonstrated to be safe in the Ride Analysis. These are not to be used to exceed maximum acceleration rate from Figures 5 through 9."

iii. Section 7.1.4.3: In the second sentence, the words "designer/engineer" shall be deleted and the words "Ride Analysis" shall be inserted in their place.

iv. Section 7.1.4.4 shall be deleted in its entirety.

v. Section 7.1.4.6: The second sentence shall be deleted and the sentence "Sustained exposure shall not exceed 90 seconds in a single event." shall be inserted in its place.

vi. Section 7.1.8: The sentence "Sustained exposure in +Gz shall not exceed 40 seconds in a single event." shall be added.]

[8.] **5.** [Chapter] **Section** 8, Loads and Strengths, shall be amended as follows:

i. (No change.)

[ii. Section 8.3.2.1: In the second sentence, the words "designer/engineer-defined" shall be deleted and the word "design" shall be inserted in its place. Also, in the third sentence, "50%" shall be deleted and "30%" shall be inserted in its place.]

[iii.] **ii.** (No change in text.)

[iv.] **iii.** Section 8.4.1: In the first sentence, **add the words “the design specifies instructions for” after the words “only when”; delete the word “are” after the word “component” and**

substitute in lieu thereof the words “to be” and delete the words "per the designer/engineer's **instructions.**" [shall be deleted and the words "as specified in the ride inspection and maintenance" shall be inserted in its place.]

[v.] **iv.** Section 8.4.2: In the first sentence, the words "designer/engineer" shall be deleted and the word[s] "design" shall be inserted in its place.

[vi. Section 8.5 shall be deleted and replace it with the following: "8.5 Operation beyond the 35,000 operational hour criteria:

8.5.1. No ride may operate beyond the life span of a ride, as provided in this practice and as calculated by the manufacturer, unless the ride has been reviewed by the design engineer or another licensed professional engineer and the ride has been determined to have remaining life. (In cases where such a review is undertaken by a licensed professional engineer who is not the design engineer, the design engineer shall be notified, where possible.)

8.5.1.1 To extend operation, the reviewing engineer shall perform an evaluation and inspection of the amusement ride and either prescribe appropriate inspection and testing at specified intervals, including a date when the ride is to be reevaluated for continued operation, or calculate a new, extended fatigue life or both.

8.5.1.1.1 The engineer's review shall include a review of the operating or maintenance instructions and a list of any new or modified operating or maintenance procedures, in addition to inspection and testing, to be followed.

8.5.1.2 Any new or modified operating or maintenance procedures, including any inspection and testing prescribed, shall be incorporated in the ride operating or maintenance instructions, or both, as may be appropriate. An amended type certification or an individual approval for the ride

shall be required and the ride shall not be used or operated beyond the lifespan unless and until such amendment is approved by the Department."]

[vii.] **v.** Section 8.6.4: The words **"for fatigue" shall be deleted. The words** "designer/engineer" shall be deleted and the words "ride analysis [or other design documentation]" shall be inserted.

[viii.] **vi.** Section 8.6.6: The words "[as specified by the] designer/engineer" shall be deleted **and the words "ride analysis" shall be inserted in lieu thereof**.

[ix. Section 8.6.7: In the first sentence, the words "the designer/engineer in" shall be deleted.]

[x.] **vii.** (No change in text.)

[xi.] **viii.** Section 8.7.1: In the first sentence, the words "designer/engineer-defined **applicable**" shall be deleted**; the word "that" after the word "loads" shall be deleted and the words "defined in this practice, to which" shall be added in lieu thereof; and the word "to" after the word "subjected" shall be deleted**.

[xii. In Section 8.7, Loads, add new subsection: "8.7.4 For portable rides, an evaluation shall be done in the trailering position. Steps shall be taken to provide any bracing that may be needed to support the ride structure, in order to protect it from fatigue and overload conditions."]

[xiii.] **ix.** In Section 8.10, Operational (Dynamic) Loads, add new subsection: "8.10.3 Elevated walking surfaces **in primary circulation areas**, including, but not limited to, waiting areas, loading and unloading areas, platforms, landings, stairs, and ramps, shall be designed to accommodate a live load of at least 100 pounds per square foot. **All other elevated walking surfaces shall be designed to accommodate a live load of at least 60 lb/ft^2.**"

[xiv. Section 8.11.1: The word "design" shall be added after the word "the."

xv. Section 8.12.1: The words "designer/engineer defined" shall be deleted. Also, add the words "that can be reasonably anticipated." following the word "loads."

xvi. In Section 8.12, Environmental Loads, add new subsection: "8.12.2.1 Each type certified ride shall comply with 8.12.2 above or shall be designed for the worst case environmental conditions in New Jersey."]

[xvii.] **x.** Section 8.12.3: [The first sentence shall be deleted and replaced with, "The operating and maintenance instructions shall clearly indicate the environmental loads for which the amusement ride or device was designed."] **The words "designer/engineer" shall be deleted and the word "design" shall be inserted in lieu thereof; the words "for which" shall be inserted after the word "loads"; and the words "for, in the operating and maintenance instructions. See section on Manufacturer's Responsibility of Practice F1193." shall be deleted.**

[xviii. In 8.13.1, add new section: "8.13.1.1 The Department may permit an exception to 8.13.1 when it is impractical and unnecessary to operate in wind speeds of 34 mph or greater. Rides designed to operate in winds of less than 34 miles per hour shall have operating limitations clearly stated in operating and maintenance manuals. This shall include, but not be limited to, clear instructions on wind speeds at which to cease operation."]

[xix.] **xi.** Section 8.13.2: In the first sentence, the words "designer/engineer or manufacturer" shall be deleted and replaced with the word[s] "[operating and maintenance instructions] **design**." Also, the words "in the operating and maintenance instructions" shall be deleted**. See section on Manufacturer's Responsibility of Practice F1193.**

[xx. Add new section: "8.13.3 Overturning calculations and load and strength calculations, as necessary, shall be required for operational wind loads."]

[xxi.] **xii.** Section 8.14.1: In the first sentence, the words "designer/engineer or manufacturer" shall be deleted and replaced with the word[s] "[operating and maintenance instructions] **design**." Also, the words "in the operating and maintenance instructions" shall be deleted**. See section on Manufacturer's Responsibility of Practice F1193.**

[xxii. Add new section: "8.14.2 Overturning calculations and load and strength calculations, as necessary, shall be required for non-operational wind loads."

xxiii. Add new section: "8.14.3 The maintenance manual shall clearly indicate wind speeds at which partial disassembly and removal shall take place if necessary."

xxiv. Section 8.15.1: Add a second sentence, "Test and measurement data may be substituted for numerical analysis."

xxv. Section 8.15.3: The first sentence shall be deleted and replaced it with the following, "The structural analyses shall consider and incorporate all significant loads and shall evaluate all significant stresses, strains and deflections that may be experienced by the amusement ride or device."]

[xxvi.] **xiii.** (No change in text.)

[xxvii.] **xiv.** Section 8.15.7: [At the beginning of the first sentence, add the words "An analysis of." Also, in the first sentence, the word "evaluated" shall be deleted and the word "required" shall be inserted in its place.] In the third sentence, the words "[engineer/]designer/**engineer**" shall be deleted and the word "design" inserted in its place.

[xxviii. Section 8.16.1: Add the following sentence to the end of this section, "Amusement rides or devices that exceed 60 miles per hour shall use an impact factor of not less than 1.5 in the calculations unless empirically measured values show that a value less than 1.5 is appropriate."

xxix. Section 8.16.5: In the first sentence, the words "design shall account for" shall be added after the first "The." Also, in the first sentence, the words "(as defined by the Designer/Engineer) shall be considered" shall be deleted.]

[xxx.] **xv.** (No change in text.)

[xxxi. Section 8.20.1: In the second sentence, "M105" shall be deleted and the words "Manual of Steel Construction ASD, 9th edition" shall be inserted in its place.

xxxii. In Section 8.21, Design for Strength, add new subsection: "8.21.3 The manufacturer shall perform a load combination analysis according to the equations in section 2.3.2 or section 2.4.1 of ASCE 7 or an equivalent standard for load combinations.

8.21.3.1 Live loads shall include dynamic loads.

8.21.3.2 Thermal loads affecting components of the ride or foundation shall be included in load combinations.

8.21.3.2.1 If it can be shown that footings may be allowed to move to accommodate thermal expansion and contraction without degrading the footings' ability to resist other loadings, then thermal loads may be treated separately and taken out of the combined loading equation.

8.21.3.3 The multiplier for the live load equations 2 and 3 in section 2.3.2 of ASCE 7 may be 1.33 instead of 1.6 as long as the live load is already being multiplied by an impact factor of 1.2, or greater."

xxxiii. Section 8.22 shall be deleted in its entirety.

xxxiv. Section 8.23 shall be deleted in its entirety.

xxxv. Section 8.24 shall be deleted in its entirety.]

[xxxvi.] **xvi.** Section 8.25**.1.9** shall be [deleted in its entirety] **modified to delete the words "The designer/engineer should use good judgment and consider using higher" and insert**

the word “Higher” in lieu thereof. **Also, in the second sentence, the words “shall be used” shall be inserted following the word “values.”**

[xxxvii. Section 8.26 shall be deleted in its entirety.

xxxviii. Section 8.27.3: In the first sentence, the words "Designer/Engineer either know (through empirical measurement) or estimate" shall be deleted and the words "design account for" shall be inserted in its place. Also, the following sentence shall be inserted after the first sentence, "This can be shown either through empirical measurement or by estimating."

xxxix. Section 8.27.4: In the first sentence, the words "and allowable utilized to evaluate the same structure" shall be deleted and the word "used" shall be inserted in its place.

xl. Section 8.27.5: In the first sentence, the words "by a" shall be deleted and the words "that in the AISC Manual of Steel Construction, 9th edition, Chapter K or another" shall be inserted in their place.

xli. In Section 8.27, Design for Fatigue, add new subsection: "8.27.7 For portable rides, an evaluation shall be done in the trailering position. Steps shall be taken to provide any bracing that may be needed to support the ride structure, in order to protect it from fatigue and overload conditions."]

[xlii.] **xvii.** Section 8.30.1: In the first sentence, the words "[designer/engineer] **for fixed or permanent amusement rides or devices**" shall be deleted [and the word" design" shall be inserted in its place].

[xliii.] **xviii.** Section 8.30.2 shall be deleted **in its entirety including Note 6.** [and replace it with the following: "8.30.2 In the case where the raw fatigue property data is available, the "Mean-2σ" value can be calculated by standard statistical techniques illustrated in Figure A1.1.

In the absence of such data, a reduction of 18 percent for welded joint details shall be used and a reduction of 12 percent for parent materials shall be used."

xliv. In Section 8.30, Fatigue Material Allowable Properties, add new subsection: "8.30.3 Performing cumulative damage analysis: If the Ride Analysis defines primary structure that should be designed or a finite fatigue life, the steps listed in the following subparagraphs should be followed.

8.30.3.1 Identification of loads and determination of the proper stress allowables are two key elements required to ensure amusement rides and devices possess adequate structural capability.

8.30.3.2 The procedure to be used to verify that structures possess adequate structural capability consists of the following basic steps:

8.30.3.2.1 Identifying all expected external and internal loading including where these loads will be applied.

8.30.3.2.2 Calculating, or empirically measuring, stresses and strains.

8.30.3.2.3 Determining the appropriate stress allowables (that is, strengths of materials).

8.30.3.2.4 Comparing the computed or measured values for stresses or strains, based upon expected loading conditions, to the values for the respective design stress allowables.

8.30.3.2.5 If the calculated stresses are determined to be greater than the material allowables, redesigning and validation of analytical predictions with empirical testing shall be done."

xlv. Section 8.31.1: In the first sentence, the words "designer/engineer provided" shall be deleted. In the second sentence, the words "designer/engineer" shall be deleted and the word "design" shall be inserted in its place.]

[xlvi.] **xix.** Section 8.31.2: In the first sentence, the words "Within the Manufacturer-provided [written]" **shall be deleted and the words “The design shall include” shall be substituted in**

lieu thereof; and **the words** "the manufacturer **shall**" shall be deleted **and the word "which" shall be substituted in lieu thereof**. [In the second sentence, the words "specific" and "instruction" shall be deleted. In the third sentence, the word "written" shall be deleted.

xlvii. In Section 8.32, Metal Structures, add new subsection: "8.32.2 For steel structures, the AISC Manual of Steel Construction shall be used for design and acceptance criteria. Another standard may be used if it can be shown to be equivalent."

xlviii. In Section 8.32, Metal Structures, add new subsection: "8.32.3 Materials shall be resistant to corrosion from salt air or shall be protected from such corrosion."

xlix. Section 8.33.2: In the first sentence, the words "shall be reduced as deemed adequate by the designer/engineer as required" shall be deleted and the words "may be reduced" inserted in their place.]

[l.] **xx.** (No change in text.)

[li. In Section 8.33.3, add a new section "8.33.3.1 To prevent compression damage to timber members around fasteners, appropriate methods, such as steel plates or large outside diameter washers, shall be provided. Star washers or other such devices shall not be used in disconnectable timber joints."

lii. In Section 8.33.3, add a new section "8.33.3.2 Where tensile forces associated with holes in timber members act at right angles or obliquely to the direction of the grain, where splitting or tearing of the wood might result, wraparound plates or other suitable means shall be used on either side of fastener holes to absorb these forces."]

[liii.] **xxi.** Section 8.33.4: In **the** first sentence, the words "designer/engineer shall design the" shall be deleted and the words "design shall [include] **specify**" shall be inserted in its place. In

the second sentence, the words "designer/engineer" shall be deleted and the word "design" shall be inserted in its place.

[liv.] **xxii.** Section 8.35.2: In the first sentence, the words "designer/engineer shall properly select and design" shall be deleted and the words "design shall include **properly selected**" shall be inserted in its place.

[9.] **6.** [Chapter] **Section** 9, Hydraulic Systems and Components, shall be amended as follows:

i. In section 9.2.1.1, in the first sentence, delete the words “designer/engineer” and substitute in lieu thereof the word “design” and delete the word “provide” and substitute the word “include” in lieu thereof.

ii. In section 9.2.1.2, delete the words “designer/engineer” and substitute the word “design” and delete the words “provide the purchaser with” and substitute the word “include” in lieu thereof.

iii. In section 9.2.2.1, delete the word “should” and substitute the word “shall” in lieu thereof.

iv. In section 9.3.1, delete the words “Designer/Engineer” and substitute the word “design” in lieu thereof.

v. In section 9.3.2, the words “designer/engineer” in the third sentence shall be deleted and the word “design” shall be substituted in lieu thereof.

vi. In section 9.3.4, delete the words “designer/engineer” in the first sentence and substitute the word “design” in lieu thereof.

vii. In section 9.3.5.1, the words “designer/engineer should” shall be deleted and the words “design shall” shall be substituted in lieu thereof.

viii. In section 9.3.5.2, the words “designer/engineer should” shall be deleted and the words “design shall” shall be substituted in lieu thereof.

[i.] **ix.** Add section "[9.6]**9.8.7.4** The design of hydraulic systems shall include means for isolating and locking-out stored hydraulic energy from ride components subject to maintenance and inspection."

[ii. Add section "9.7 Pressure vessels shall conform to requirements of N.J.A.C. 12:90."]

x. In section 9.11.1, the words “Section 8, Division 1 of the ASTM Boiler and Pressure Vessel Code for unfired pressure vessels, or equivalent standard for accumulators such as are available from EN, TUV or ISO” shall be deleted and “N.J.A.C. 12:90.” shall be substituted in lieu thereof.

[10.] **7.** [Chapter] **Section** 10, Pneumatic Systems and Components, shall be amended as follows:

i. Section 10.2: In the second sentence, the words "or designer/engineer" shall be deleted **and the words “and clearly stated in the design” shall be substituted in lieu thereof**.

[ii. In Section 10.3.2, the word "should" shall be deleted and the word "shall" shall be inserted in its place.

iii. In Section 10.3.5, the words "not create additional hazard (for example, by releasing any locating pin, index drive engagement, latch, clamping or similar device)" shall be deleted and the words "be deleted" shall be inserted in their place.]

[iv.] **ii.** (No change in text.)

[v.] **iii.** Add section "10.5 **The design of pneumatic** [Pressure] **pressure** vessels shall conform to requirements of N.J.A.C. 12:90."

[11.] **8.** [Chapter] **Section** 11, Safety Related Electrical/Electronic/Programmable Electronic Control Systems, shall be amended as follows:

i. [Section 11.2.1: Following "IEC 61508-1," and preceding the word "and," the words "EN 61496, UL 508A," shall be inserted] **In Section 11.2.5, the words “designer/engineer” shall be deleted and the word “design” shall be substituted in lieu thereof, and the word “identify” shall be deleted and the word “specify” shall be substituted in lieu thereof**.

[ii. Section 11.3.1 shall be deleted and replaced with the following:

"11.3.1 General requirements:

11.3.1.1 The safety-related control system shall be capable of maintaining the designed safety integrity level under operating conditions.

11.3.1.2 Safety-related control systems and functions shall have priority over all other control systems and functions.

11.3.1.3 Non-safety-related functions within or outside of the safety-related control system shall be designed so that non-safety related functions cannot compromise the integrity of the safety-related control system.

11.3.1.3.1 This requirement shall not apply to necessary manual procedures (for example, reset, maintenance, evacuation) undertaken with adequate safeguards.

11.3.1.4 The safety-related control system shall be designed and constructed so that the principles of IEC 61508, Functional Safety of Electrical/Electronic/Programmable Electronic Safety-related systems, and UL 508A, UL Standard for Safety for Industrial Control Panels, are fully taken into account; and

11.3.1.5 The safety-related control system shall be maintained when faults occur.]

ii. In section 11.3.9.4, the words “at least one operator while the device is running” shall be deleted and the words “each operator control station and additional locations as determined by the ride analysis” shall be substituted in lieu thereof.

[iii. Section 11.4 shall be deleted in its entirety and replaced with the following:

"11.4 Each amusement ride having one or more electrically powered machine actuators shall be provided with operator interface devices for stop and emergency stop that comply with NFPA 79.

11.4.1 A supply circuit disconnecting means shall be permitted to serve as an emergency stop device when located at an operator control station."

iv. Section 11.5: In the first sentence, the word "manufacturer" shall be deleted and the word "design" shall be inserted in its place. Also, in the first sentence, the word "manufacturer's" shall be deleted.

v. In Section 11.6, the words "that are" shall be deleted and the words "which shall be" inserted in their place.]

[12.] **9.** [Chapter] **Section** 12, Electrical Requirements, shall be amended as follows:

i. Section 12.1.1 shall be deleted and replaced with the following: "**Design and manufacture of** [Electrical equipment] **electrical systems and components** shall comply with NFPA 70 and NFPA 79, except as modified by this practice. [When allowed by the Department, equivalent] **Equivalent** standards may be used, including, but not limited to, standards from CSA, EN, DIN, ISO, and IEC."

[ii. Add new section "12.1.1.1 In subsection 525.21(A) of NFPA 70, National Electrical Code, 'Rides, Tents and Concessions', 'Disconnecting Means', the phrase 'ride and concession' shall be

deleted and replaced with the words 'concession and ride, which is not an inflatable and has one or more machine actuators.'"

iii. In Section 12.1.2.2, the word "Other" shall be deleted and the word "A" inserted in its place.]

[iv.] **ii.** Section 12.1.3[,] **and** Table [1:] **2 are deleted in their entirety.** [In the subtitle line, the words "ASTM F 1159" shall be deleted and the words "ASTM F 2291" inserted in its place, in two locations. Also, in the subtitle line, the words "NFPA 70-2000" shall be deleted and the words "NFPA 70-2005" shall be inserted in its place. In the line starting with 12.6 (ASTM F 1159 Section Number), the corresponding NFPA 70 Chapter 7 shall be deleted and Chapters "6 and 8" shall be inserted in its place. In the line starting with 12.7 (ASTM F 1159 Section Number), the corresponding NFPA 70 Chapter 8 shall be deleted and Chapter "5" shall be inserted in its place.]

[v.] **iii.** Section [12.1.4.1 In the first sentence, the words ", other than for routine maintenance/repair," shall be deleted. In the second sentence, the words "that changes the operation/function of the equipment"] **12.1.4** shall be deleted **in its entirety**.

[vi. Section 12.1.4.2 shall be deleted in its entirety.

vii. Section 12.1.4.3 shall be deleted in its entirety.]

[viii.] **iv.** Section 12.1.5.1: [Add "F" after ASTM in line 10 and add "or ASTM F 2291" after 1159 in the same line.] **Delete the words "Year Version of NEC Used for Design" and "Year Version of Practice F1159 Used in Design."**

[ix. In section 12.1.5, Signage Requirements, add new subsection: "12.1.5.3 All electrical outlets operating at more than 120 volts to the ground shall be clearly marked to indicate their voltage.

x. In Section 12.2.1.1, the words "20-ampere line-neutral branch circuit" shall be deleted and the words "125 volt, 20 ampere, branch circuit with GFCI protected receptacle outlet" shall be inserted in their place.

xi. Section 12.2.2 shall be deleted in its entirety and replaced with the following: "12.2.2 Each amusement ride having supply circuit(s) for electrical power shall be provided with supply circuit disconnecting means, in accordance with NFPA 79."

xii. In Section 12.2.3.1, the words "Refer to" shall be deleted and the words "shall be used, except when overridden by this subchapter or chapter." shall be added at the end of the sentence.

xiii. In Section 12.2.3, add a new section "12.2.3.3 No overcurrent protection device shall be installed in neutral or grounding conductors."

xiv. In Section 12.2.3, add a new section "12.2.3.4 All stepping and control transformers shall be grounded."

xv. In Section 12.3.2, the words "have a rating for the appropriate environment." shall be deleted and the words "be rated minimum 'NEMA 3R,' equivalent or better as necessary to address environmental conditions." shall be inserted in its place.]

[xvi.] **v.** Section 12.4.1.4: Add the following words to the end of the first sentence, "[except where riders and by-standers may have access to it] **where not accessible to patrons or spectators**."

[xvii. Section 12.5.1 shall be deleted in its entirety.]

[xviii.] **vi.** In Section 12.5.3.1, the [words] **term** "[NEC] 2000" shall be deleted [and "NFPA 70" shall be inserted in its place].

[xix.] **vii.** In Section 12.5.3.2, the [words] **term** "[NEC] 2000" shall be deleted [and "NFPA 70" shall be inserted in its place].

[xx. Section 12.5.4.1: In the first sentence, the word "located" shall be deleted and the words "shall be" shall be inserted in its place. Also, in the second sentence, the words "shall be" shall be inserted between the words "or" and "near."]

[13.] **10.** [Chapter] **Section** 13, Mechanical Systems and Components, shall be amended as follows:

i.-iii. (No change.)

[iv. In Section 13.3.5, the word "patch" shall be deleted and the word "path" shall be inserted in its place.]

Recodify existing v. and vi. as **iv. and v.** (No change in text.)

[vii.] **vi.** In Section 13.3.13, the words "should be considered" shall be deleted and the words "shall be [in place] **instituted**," shall be inserted in its place.

[viii. Section 13.4.5: Delete the third sentence and replace it with the following sentence, "When a rollback has occurred, at least one anti-rollback device shall be engaged until the rollback has been corrected."

ix. Section 13.6.3.3: In the first sentence, the word "should" shall be deleted and the word "shall" shall be inserted in its place.]

[x.] **vii.** (No change in text.)

[xi.] **viii.** Add new section ["13.7.2.1.1 If vehicles, or other components, of an amusement ride may collide upon failure of normal controls, a safety brake shall be provided to prevent such collision."] **"13.7.2.2 When an amusement ride or device has multiple vehicles, or trains, that travel simultaneously and independently of each other through a common course and collision of vehicles, or trains, is likely to create an unsafe condition, a safety brake system shall be provided to prevent collision."**

[xii.] **ix.** Add new section "13.7.2.[2]**3** Safety brake[s] **systems** shall be designed such that no single component failure can diminish the effectiveness of the brake[(s) such that the intended safety brake function is compromised] **system to perform its intended function**."

[xiii.] **x.** Add new section "13.7.2.[3]**4** Safety brake[s] **systems** shall be equipped with an automatic system that [causes correct positioning (closed or open) of the brakes, preventing a vehicle from entering a zone of block ahead of it that is occupied] **controls behavior required to perform intended function**."

[xiv. Add new section "13.7.2.3.1 Safety brakes pursuant to 13.7.2.1.1 shall have a redundant safety system that, in the event of a single component failure, prevents two vehicles or two trains from occupying the same block at the same time."

xv. Add new section "13.7.2.3.2 Alternative systems that achieve the same result may be used."

xvi. Add new section "13.7.2.4 Amusement rides and devices that make use of multiple vehicles of trains shall be equipped with a 'fail-safe' braking system that, in the event of a complete power failure, is designed to stop all vehicles or trains at the next stopping location. If a stoppage occurs, some vehicles may be on elevated parts of the ride. A written procedure for evacuation shall be in place to address such situations."

xvii. Add new section "13.7.2.5 All remote operator stations shall be equipped with an emergency stop button, or stop button, for the purpose of correctly positioning the safety brakes to stop the vehicle without allowing it to pass to another block."

xviii. Add new section "13.7.2.6 Safety braking systems utilizing air to activate brakes shall have a pressure sensing device installed after the main air source, which causes an emergency stop condition in the event of loss of air pressure."]

[xix.] **xi.** Add new section "13.7.2.[7]**5** Safety [braking] **brake** systems utilizing [air] **pneumatics** to activate brakes shall have [an individual] **a dedicated supply** holding tank at each set of brakes with a 'check valve' or 'one-way valve' **on the supply inlet** to prevent complete loss of air pressure, in the event of a [line] break **in the supply line** or compressor fault."

xii. Add a new section "13.7.2.6 Safety brake systems using pneumatics to activate brakes shall have a pressure-sensing device installed at the dedicated supply holding tank, which detects when pressure drops below minimum required for performing intended function of brakes and initiates an emergency stop condition."

[xx.] **xiii.** In Section 13.7.3.1, the words "designer/engineer [specified]" shall be deleted and the word "design" inserted in their place.

[xxi. Add new section: "13.8 Internal combustion engines."

xxii. Add new section: "13.8.1 Internal combustion engines for amusement rides shall be of adequate type, design, and capacity to handle the design load."

14. Chapter 14, Fencing, Guardrails, and Handrails for Amusement Rides and Devices, shall be amended as follows:

i. The words "Manufactured After January 1, 2003" shall be deleted from title.

ii. In Section 14.1, the word "patron" shall be deleted in two locations.

iii. In Section 14.2.1, the word "patron" shall be deleted in two locations.

iv. In Section 14.2.1.1, the word "patron" shall be deleted in four locations.

v. Section 14.2.1.2: Add the following words to the end of the first sentence, "and shall be designed to resist a load of 50 pounds per linear foot applied in any direction and to transfer the loads through the supports to the structure."

vi. In Section 14.3.1.1, the word "patron" shall be deleted in two locations.

vii. In Section 14.5.2, the word "patron" shall be deleted.

viii. Add new section "14.5.3 Gates shall be self-closing and self-latching or have an operator at gate when ride is operating."

ix. Add new section "14.6 For lift hills, guardrails shall have a top rail, an intermediate rail, and a toe board."]

[15.] **11.** [Chapter] **Section** 15, Welding, shall be amended as follows:

[i. Section 15.1: Add the following sentence to the end of the section, "All welding used as a method of fabrication or assembly shall conform to AWS D1.1-2000, Structural Welding Code or equivalent."]

[ii.] **i.** In Section 15.4, the words "manufacturer's **record** retention policy" shall be deleted and the words "record retention requirements of N.J.A.C. 5:14A" shall be inserted in their place.

[16.] **12.** [Chapter] **Section** 16, Fasteners, shall be amended as follows:

i. (No change.)

ii. Section 16.1.5: In the first sentence, the word[s] "is [the preferred]" shall be deleted and the words "shall be [the]" shall be inserted in its place. Also, **in** the second sentence**, the words "deemed appropriate by the designer/engineer" shall be deleted and the words "specifically demonstrated by the design to be acceptable"** shall be [deleted in its entirety] **substituted in lieu thereof**.

[iii. Add new section "16.1.5.1 An exception may be made by the Department for items which cannot be through bolted or are not intended to be removed for service or maintenance. In these cases, other fastening methods may be used, if demonstrated by the design to be appropriate.

iv. In Section 16.1.6, the word "should" shall be deleted and the word "shall" shall be inserted in its place.]

[v.] **iii.** In Section 16.1.9. the word "should" shall be deleted and the word "shall" shall be inserted in its place **and the words ", unless specifically demonstrated by the design to be acceptable." shall be added to the end of the sentence**.

[vi. In Section 16.1, General, add new subsection: "16.1.10 All bolts, cap screws, and studs shall be SAE Grade 5, ASTM A325, equivalent or better."

vii. Add new section, "16.1.10.1 An exception shall be permitted where the design demonstrates graded fasteners are not required."

viii. Add new section, "16.1.10.2 In safety-related structures, fasteners shall be proof tested by lot."

ix. In Section 16.2.2, the words "where specified torque values" shall be deleted.

x. Add new section "16.2.2.1 An exception shall be permitted where the design demonstrates hardened washers are not required."]

13. Section 18, Information to be Provided to the Owner/Operator, shall be deleted in its entirety.

[17.] **14.** Annex A1, Loads and Strengths, shall be amended as follows:

[i. Section A1.1.1: In the first sentence, the words "(that is, minimum design requirements and considerations) to be applied by the designer/engineer" shall be deleted and the words "for minimum design requirements that shall be used" inserted in their place.

ii. Section A1.1.2: In the second sentence, the words "by allowing the designer/engineer to determine" shall be deleted and the words "in defining" shall be inserted in their place. Also, in

the third sentence, the words "determined and treated by the designer/engineer" shall be deleted and the words "used in the design" shall be inserted in their place.

iii. In Section A1.2.1, the words "the designer/engineer can design" shall be deleted. Also, following the word "device," the words "may be designed" shall be inserted.

iv. Section A1.2.2.1: In the first sentence, "50%" and "43%" shall be deleted and "30%" shall be inserted in both places. Also, in the calculation, "0.43" shall be deleted and "0.30" shall be inserted in its place and "19,500 Operational hours" shall be deleted and "24,500 Operational hours" shall be inserted in its place.

v. Section A1.2.3: In the last sentence, the word "could" shall be deleted and the word "may" shall be inserted in its place.

vi. Section A1.2.4.1: In the first sentence, "19,500" shall be deleted and "24,500" inserted in its place. In the second sentence, the word "or" shall be deleted and the word "of" shall be inserted in its place. In the calculation, "19,500 Operational hours" shall be deleted and "24,500 Operational hours" shall be inserted in its place. Also, in the calculation, "2,394,000 load cycles" shall be deleted and "2,940,000 load cycles" shall be inserted in its place. In the last sentence, "2.39 x 10^6" shall be deleted and "2.94 x 10^6" shall be inserted in its place. Also in the last sentence, "19,950" shall be deleted and "24,500" shall be inserted in its place.]

[vii.] **i.** In Section A1.3.1, [the words "the designer/engineer to exempt" and] the word "that" shall be deleted. [Also, following the words "covered by 8.3.1," the words "to be exempt" shall be inserted.]

[viii.] **ii.** Section A1.4.1: In the second sentence, the word[s "Designers/engineers and manufacturers that design"] **“should”** shall be deleted and the word[s "Design of"] **“shall”** shall be inserted in [their] **its** place.

[ix. Section A1.5.1.2: In the second sentence, the words "designer/engineer is required to" shall be deleted and the words "design shall" shall be inserted in their place.

x. In Section A1.5.1.5, the word "should" shall be deleted and the word "shall" shall be inserted in its place.

xi. Section A1.5.1.6 shall be deleted in its entirety.

xii. Section A1.6.2 shall be deleted in its entirety.

xiii. Section A1.7.1: In the second sentence, the words "needs to" shall be deleted and the word "shall" shall be inserted in its place.

xiv. Section A1.8: In the last sentence, the words "as determined by the designer/engineer" shall be deleted.]

[xv.] **iii.** In Section A1.9.1.3, the words "**and** Wind (operational)" shall be added.

[xvi. Section A1.9.2.6 (5) shall be deleted in its entirety and the sentence "Validate analytical predictions with empirical testing as necessary." shall be inserted in its place.]

[xvii.] **iv.** Section A1.9.2.7:[Delete the first sentence and replace it with the following sentence, "The design shall account for the following loads:"] **The words “designer/engineer should” shall be deleted and the words “design shall” shall be substituted in lieu thereof.**

[xviii. Section A1.10.4.4: In the fifth sentence, the word "must" shall be deleted and the word "shall" shall be inserted in its place.

xix. In Section A1.10.5, the words "designer/engineer" shall be deleted and the word "design" inserted in its place.

xx. Section A1.11.1: In the second sentence, the words "that would concern patrons and operators" shall be deleted.

xxi. Section A1.12.3: The third, fourth and fifth sentences shall be deleted in their entirety.

xxii. Section A1.14 shall be deleted in its entirety.

xxiii. Section A1.15.3: In the first sentence, "ASCE 16" shall be deleted and "AF&PA/ASCE 16" shall be inserted in its place.

xxiv. Section A1.16 shall be deleted in its entirety.

xxv. Section A1.17.2: In the first sentence, the words "Note also that" shall be deleted.

xxvi. Section A1.18.1.1: In the second sentence, the word "resent" shall be deleted and the word "present" shall be inserted in its place.

xxvii. In Section A1.18.1.2, the third and fourth sentences shall be deleted in their entirety and the sentence "A ratio of standard deviation to mean value of fatigue strength shall be taken as 18% for welded joints and 12% for parent materials." shall be inserted in their place.

xxviii. Section A1.18.1.5 shall be deleted in its entirety and the following inserted in its place: "Stresses within a structure shall be less than the endurance limit for the material being used. This infers that the structure will last indefinitely without cracking for the given loading duty cycle. Where it is not feasible to keep the stresses within a structure less than the endurance limit for the material being used, where the presence of an endurance limit cannot be justified on the basis of available material data, or in the case of welded components, where the effect of corrosive agents on some metals, especially when in a welded configuration, leads to an S-N curve that does not exhibit a distinct flattened region at a high cycle count, a finite life calculation shall be required. See Fig. A1.1."

xxix. Section A1.18.2.1: In the first sentence, the words "considered by the designer/engineer" shall be deleted and the word "followed" shall be inserted in their place.]

(d) The ASTM standard [F 2291-04] **F2291-14** may be obtained from:

[American Society for Testing Materials] **ASTM International**

100 Barr Harbor Drive

West Conshohocken, PA 19428-2959.

5:14A-9.21 Electrical equipment and wiring

[(a) All electrical equipment and wiring shall be installed and maintained in compliance with Chapter 12 of ASTM F 2291, as amended in N.J.A.C. 5:14A-7.2.

1. Equipment and wiring in place as of December 16, 2002 shall be permitted to remain provided that it is not in an unsafe or hazardous condition. Replacement or new equipment or wiring shall conform to the requirements of Chapter 12 of ASTM F 2291, as amended in N.J.A.C. 5:14A-7.2.

i. Such works shall be identified in the maintenance log required to be maintained pursuant to N.J.A.C. 5:14A-9.3.

2. The continuity of the grounding conductor system used to reduce electrical shock hazards shall be verified as outlined in section 525.32 of the NEC each time a portable ride is connected.

3. During assembly/disassembly, no energized points/surfaces shall be exposed to any personnel.]

Recodify existing (b) and (c) as **(a) and (b)** (No change in text.)

[(d)] **(c)** Set-up of mobile amusement rides shall comply with Article 525 of NFPA 70, as amended by N.J.A.C. 5:14A-7.2(c)[12]**9**.