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KNOWLEDGE

EURO ATTRACTIONS SHOW 2018

World Safety Standards Amusement Rides & new EN13814

Har Kupers, COO Vekoma Rides

24 September 2018

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IAAPA

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World Safety Standards on Amusement Rides Introduction



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Har Kupers
C.O.O.
Vekoma Rides BV
Netherlands



Member

- IAAPA Global&EMEA Safety Committee
- ASTM F24 (Exec) Committee
- CEN TC 152
- ISO TC 254

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Safety Standards Amusement Rides



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Content :

- Summary World Standards
- Changes in the new EN 13814

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World Standards Amusement Rides

- Internationally accepted standards :
- ASTM F 24
 - EN 13814
 - ISO 17842/17929



Local Standards

- China GB8408
- Australia AS 3533

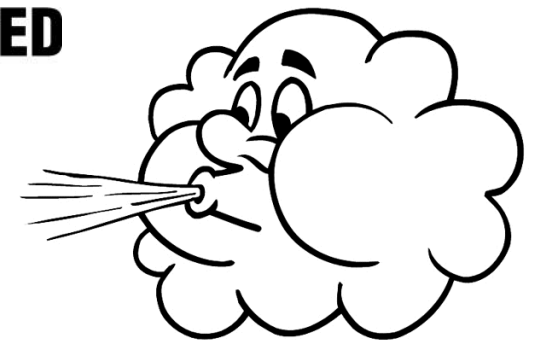
ICS 97.200.40
V 57



Specific Owner Standards (e.g. Disney and Universal)



Besides amusement rides – local Building, Environmental ,Electrical ...



Safety Standards Amusement Rides - ASTM



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ASTM F24

ASTM F24

- **Committee** which develops and maintains standards:
 - Near 1000 members
 - 12 Subcommittees
 - International contribution out of 26 countries
- Task groups who work on different subjects of the standards
- Committee meets twice a year with 150-200 members in different technical meetings
- Harmonization meetings during IAAPA shows
- 20 Standards all different subjects Amusement Rides
 - e.g..
 - F2291 Design
 - F770 Ownership & Operation
 - F2137 Measuring the Dynamic Characteristics



Restraints
Load & Strengths
Controls
G -forces



Designation: F2291 – 11

**Standard Practice for
Design of Amusement Rides and Devices¹**



ASTM F24

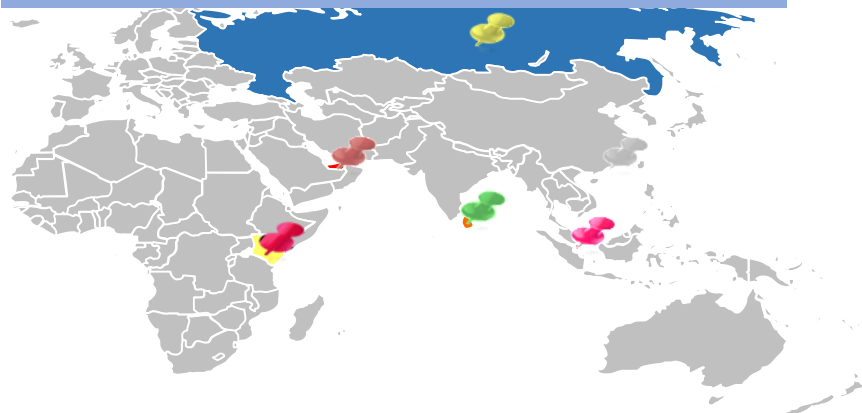
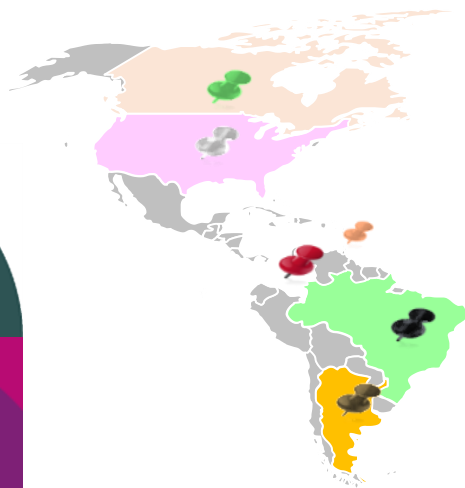
ASTM F24

- “Living standards” which are continuously updated
- React fast on new products in industry
- Private organization – not government related
- Not only United States but also other countries

-International



Adopted Regulations 30 US States
Adopted or Basis many countries e.g.
South America, Singapore, UAE, Canada



Safety Standards Amusement Rides - ISO



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ISO/TC 254: Status

History : 2011 Russia initiates ISO and is convener of the TC

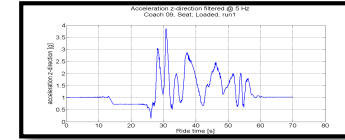
Workinggroups TC/254:

	Title
ISO/TC 254/WG 1	Biomechanical effects
WG1	Acceleration
	Ergonomics
	Anthropometrics
ISO/TC 254/WG 2	Design, manufacture and construction
WG2	Guest behaviour
	Control systems
	Electrical system
	Structural system
	Mechanical system
	Risk assessment
	Terms and definition
ISO/TC 254/WG 3	Operation and use
WG3	Initial approval, examination and acceptance
	Requirements for operation
	Maintenance and in-service inspection

WG4

Originally in 2015 established to write measuring standard
 → Never came to action because could be convinced to use also ASTM F2137

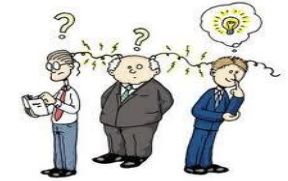
“Safety of Amusement Rides and Devices” -



- ISO 17929 :
Biomechanical effects on amusement rides passengers
published September 15, 2014 as **T**echnical **S**pecification

Based on new EN13814

- ISO 17842-Part1 :
Design and Manufacturing
- ISO 17842-Part2 : Operation ,
Maintenance and Use
- ISO 17842-Part3 : Inspection



Published
July1 2015

WG's kept "alive"
To align with EN

Safety Standards Amusement Rides - EN



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Revision of EN 13814 :2004

EN 13814 – Start Revision : **informal** preparation

Current version published 2004 after 16 years of development
From 2009 to Sept 2011 as private initiative of EAASI / IAAPA

- Prepare update for revision of the current EN 13814 :2004
- Voluntary group of experts in 8 different workgroups
- ASTM involved



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Revision EN 13814 – **Formal** Process



European Committee for Standardization

- From 2011 formal process under CEN (European Committee for Standardization -33 members)
- **CEN TC152** Technical Committee chaired by UNI –Italy
- Content by **WG1** chaired by AFNOR France
 - Several meetings per year
 - Mainly present NL,DE,UK, IT,DK,FR,NO



WG1 : EN13814 : Rides
WG2 : EN13782 : Tents



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EN 13814 revision – Current Status today

European Committee for Standardization

January 2016 Published **Draft prEN** for final review and comments (before April 2016)

Draft prEn13814 – January 2016 - Safety of Amusement Rides and Devices :

- Part 1 : Design and Manufacture } **Many Comments**
- Part 2 : Operation, Maintenance and Use } **Few Comments**
- Part 3 : Requirements for Inspection }



Early 2017 : CEN changed rules with respect to time frame Standard Revision.

- **Final meetings April 2017 virtual and in Paris**
- **Submit *final draft* to CEN for vote member countries**
- **To prepare for formal vote (start 18)**

Feb 2018 **FprEN** 13814 :

- **formal vote by member states April 18**
- **Approved (with possible editorial comments)**

Sept 2018 DAV (Date final text Available)

Dec 2018 DOA (Date of Announcement)

→ Adopted in CEN national countries March 2019 DOP (Date of national Publication)

In overlap of 3 years (2018-2021) the old 2004 version of EN13814 can still be used

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

FINAL DRAFT
FprEN 13814-1

February 2018

ICS 97.200.40

Will supersede EN 13814:2004

Revision of EN 13814

Event Structures - new standard and workgroup (WG 3 CEN TC 152)

Stages and Grandstands

- Design so far according to EN13814
- New EN out of scope



Develop new standard

- Under CEN/TC 152
- Chair Netherlands
- WG3 starting up



Stage + Stage roof

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Revision of EN 13814: The Big Changes

EN 13814 – Main differences new and current

- Standard in 3 parts
 - 1 Design and Manufacturing
 - 2 Operation, Maintenance and Use
 - 3 Inspection
- Risk Assessment
 - Design Risk Assessment (**DRA**) ← Designer
 - Operation and Use Risk Assessment (**OURA**) ← Operator
- Guest Behaviour / Accessibility
 - Human errors/misbehavior to be considered
 - Accessibility for guests with special needs



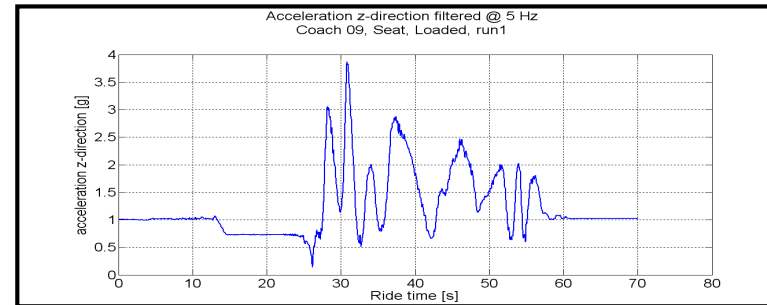
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10 YEARS
1918-2018
IAAPA

Revision of EN 13814: The Big Changes

Accelerations :

- Effects on passengers
- Restraints



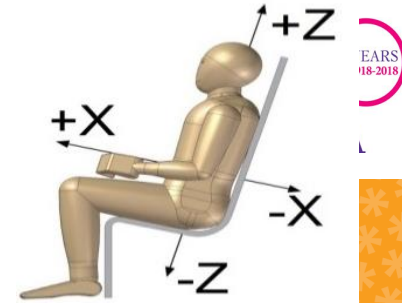
- Measurement of accelerations according to ASTM F2137



Changes : Acceleration effects on passengers

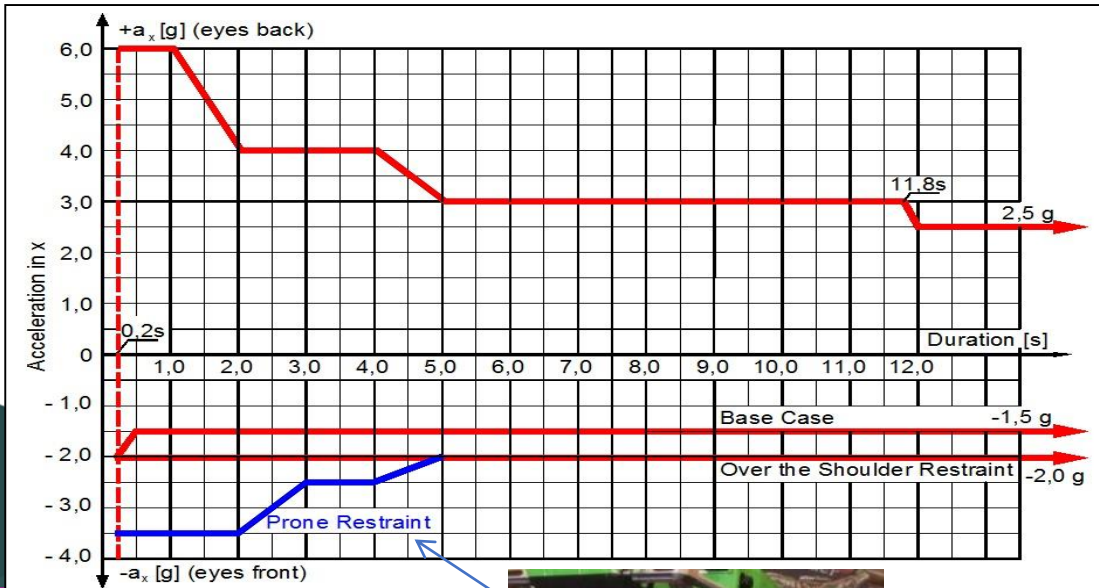


- Harmonized with ASTM
- Filtering 5 Hz (old 10Hz)

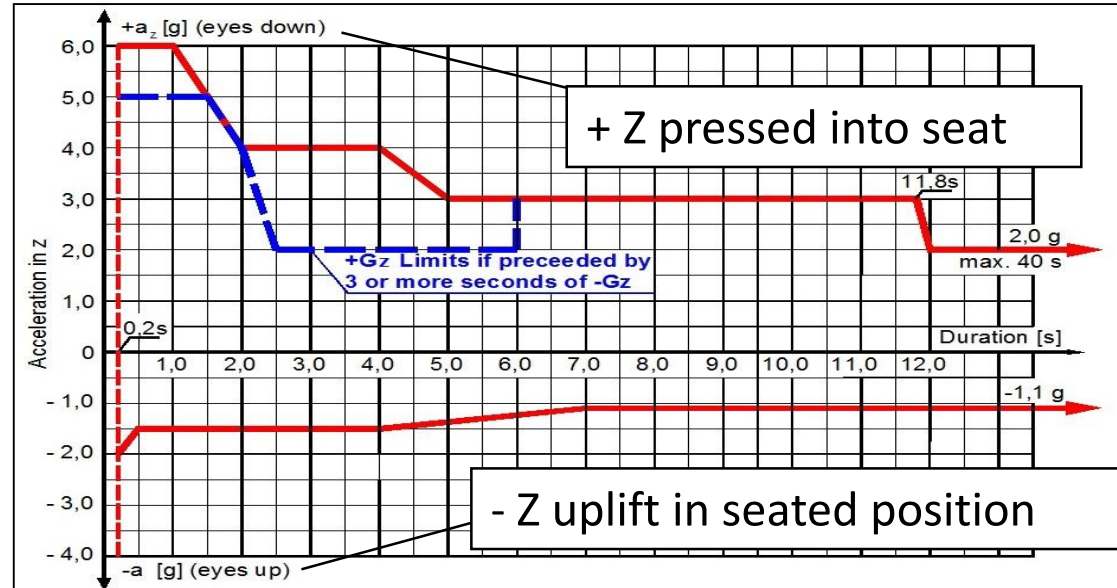


EARS 18-2018

Example Acceleration Limits - Graph for X



Example Graph for Z -direction



Changes: Restraints

Restraints



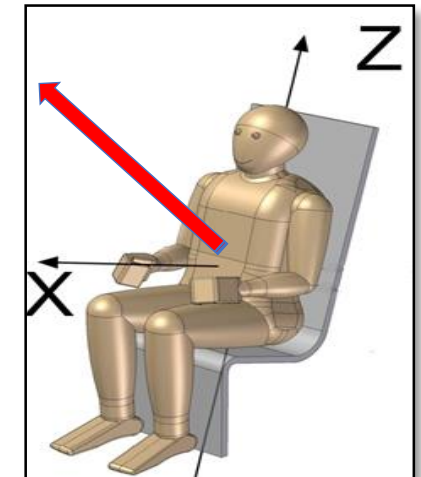
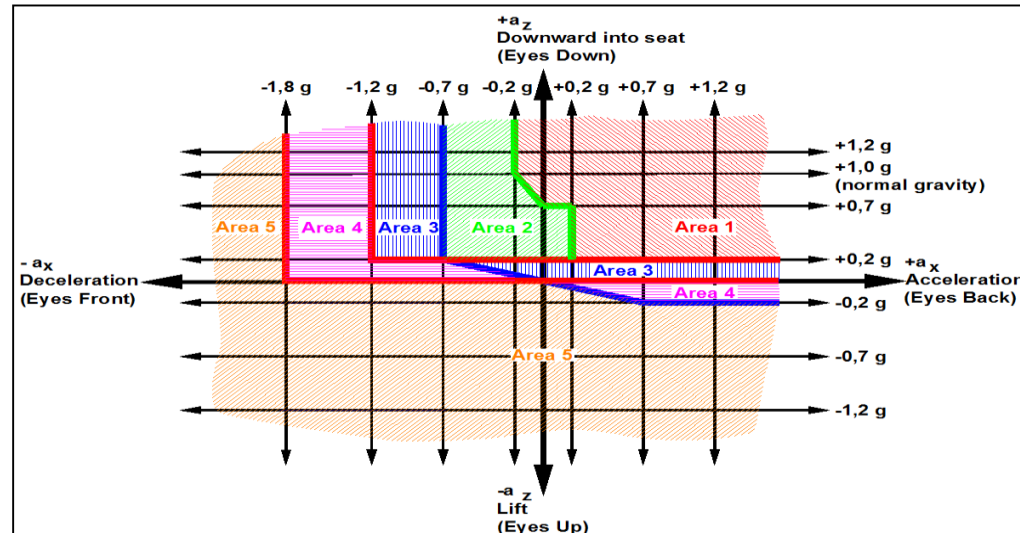
Restrains
G-forces

5 categories:



more ejecting (negative G in X and Z)
→ higher restraint requirements

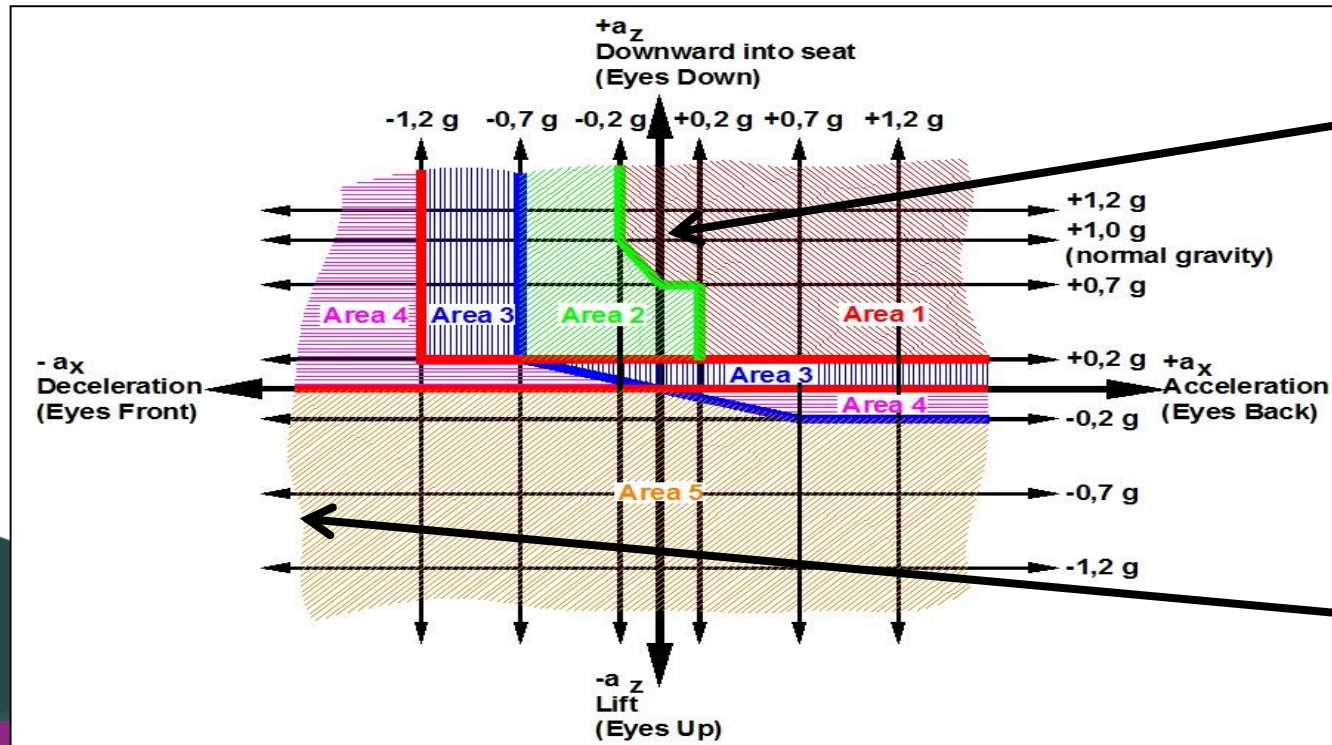
“Restraint Rose”



Old standard : design tool → New: also design verification by filtering 1 Hz

Changes: Restraints

Restraint : -----> **Containment**



Example Area 1 : park bench
-> no restraint?



Example Area 5 : Flying Coaster

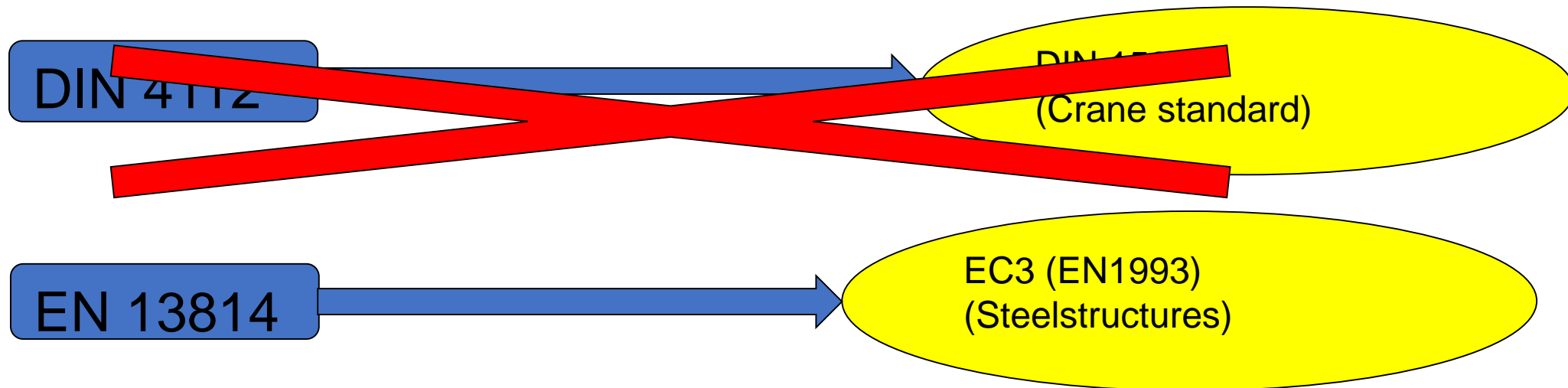
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Revision of EN 13814: The Big Changes

EN 13814 – Structural (fatigue) Design




Possibility that existing proven structure does not comply anymore



Revision of EN 13814: The Big Changes

Reach Envelop

NB ASTM larger !!  F2291 - 15

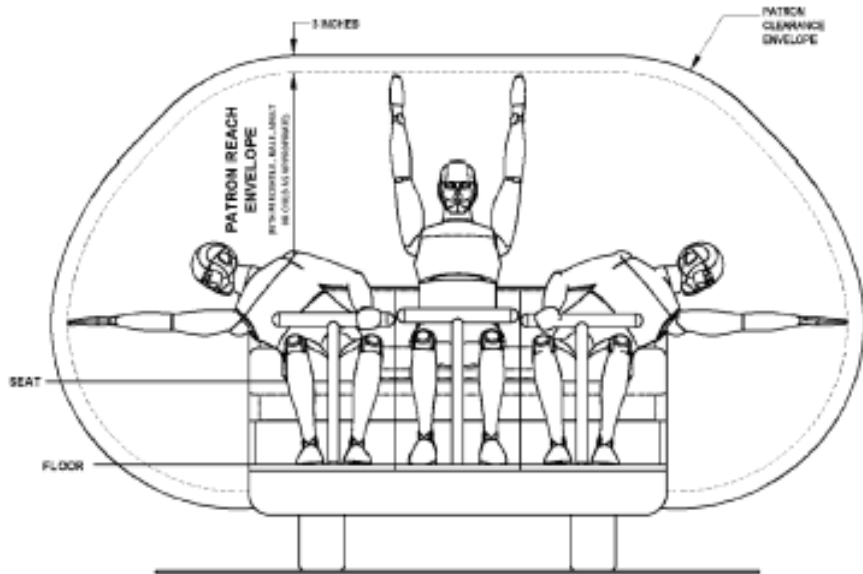
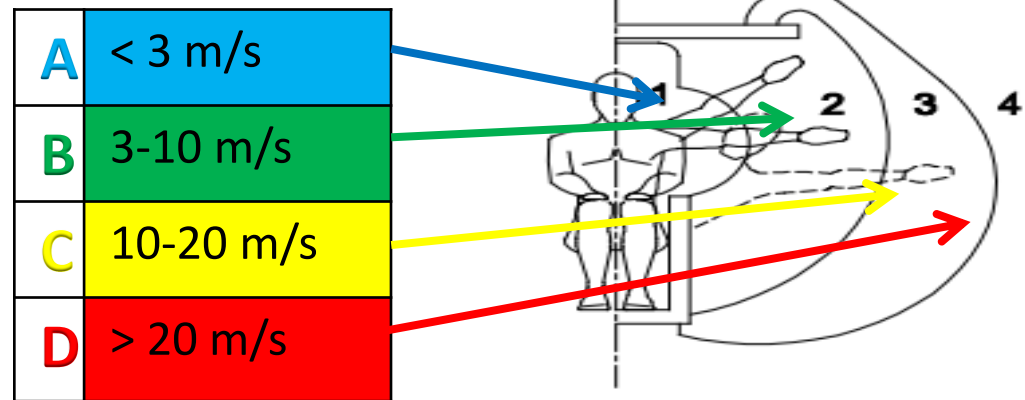


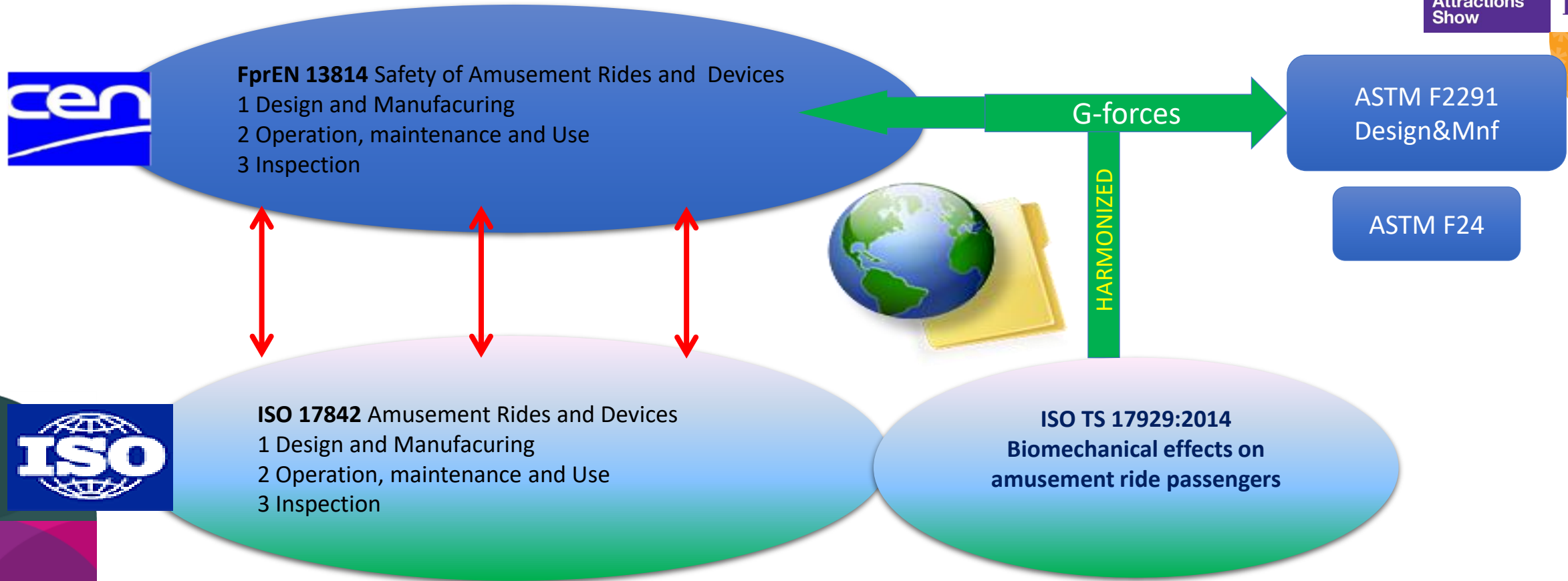
FIG. 3 Sample Patron Clearance Envelope Illustration
Front View Configuration

FprEN 13814 Reach envelop depending on

- Risk of injury
- Type of restraint and containment (site height)
- Velocity



Safety Standards Amusement Rides ASTM - EN - ISO Harmonization



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Thank you!

Har Kupers, Vekoma Rides
24 September 2018 Amsterdam

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CONTINUE YOUR JOURNEY ON IAAPA.ORG