

NAFLIC

National Association For Leisure Industry Certification

Standards & Related Documents Committee

TECHNICAL BULLETIN — October 2015

400. Hydraulic cylinder problems

Following the issue of TB No. 383 regarding Hoerbiger cylinders, a service bulletin (attached) has also been received from Vekoma and it appears that the issue is more widespread. Problems have also been identified with Knapp cylinders and Hagenbuch cylinders.

It is recommended that as part of daily checks by controllers, the cylinder should be checked by using prolonged rather than momentary force.

The information contained within is that of the manufacturer and not NAFLIC. When following the advice from the manufacturer, you are reminded of your duties and responsibilities under HSG175 regarding modifications.

Committee Members: Mr. D Dadswell (Chairman), Mr. A Mellor (Secretary), Mr. P Smith, Mr. J Green,
Mr. D Cox, Mr. M Thirkettle, Mr. I Davies, Mr. J Shilling & Mr. D Inman



Issuing Entity:	Bulletin No.: SB-033_01
Vekoma Rides Parts & Services B.V.	Release Date: 19-03-2015
Schaapweg 18	Effective Date: immediately
6063 BA VLODRUP	Supersedes: N.A.
The Netherlands	Completion Date: within 4 weeks fter release of this Bulletin
CoC Number: 12049585	

Service Bulletin

Original Ride Manufacturer: Table 1	Affected Production Dates: All
Ride Name: Various	Affected Serial Nos: Table 1
Model No: Various	

Abstract of issue:

Action required in relation to attention items as described by Hoerbiger Micro Fluid GmbH.

Reason for release:

The release of safety related document of Hoerbiger Micro Fluid GmbH about hydraulic locking units.

Action to be taken:

Each customer should take notice of the risk categories, as described on page 9. Depending on the risk category different actions has to be taken. Chapter 1 untill 2.3 are identical to SB-033_12012015_Rev00, this bulletin provides updated information starting in chapter 2.4.

Date	Revision date	Comment
01-2015	00	Initial version
03-2015	01	Updated information in regard 1050 cycle test

* In the interests of safety and as a service to the industry, Vekoma Rides Parts & Services B.V. issues technical information bulletins for the benefit of owners of amusement rides that are manufactured by Vekoma Rides Manufacturing B.V. (both companies are members of the Vekoma Rides B.V.). These bulletins may also contain technical information, on parts or modifications relating to amusement rides, manufactured by *Vekoma International B.V.* and / or *Vekoma Manufacturing B.V.* These are dissolved companies which have no legal relationship whatsoever with the Vekoma Rides B.V.

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IB-nr.	Original Ride Manufacturer	Project number
10505	Vekoma Rides Manufacturing B.V. (train), Arrow (ride)*	91178
10507	Vekoma International B.V./ Vekoma Manufacturing B.V.* (train)	91028/29/30/31
27505	Vekoma International B.V./ Vekoma Manufacturing B.V.*	91685
27521	Vekoma International B.V./ Vekoma Manufacturing B.V.*	89605
27526	Vekoma International B.V./ Vekoma Manufacturing B.V.*	95115
27546	Vekoma Rides Manufacturing B.V.*	60022
27547	Vekoma Rides Manufacturing B.V.*	60392
27548	Vekoma Rides Manufacturing B.V.*	60393
27550	Vekoma Rides Manufacturing B.V.*	60542
27551	Vekoma Rides Manufacturing B.V.*	60543
27552	Vekoma Rides Manufacturing B.V.*	60559
27541	Vekoma International B.V./ Vekoma Manufacturing B.V.*	99269
29003	Vekoma International B.V./ Vekoma Manufacturing B.V.*	78830
29501	Vekoma International B.V./ Vekoma Manufacturing B.V.*	80880
29504	Vekoma International B.V./ Vekoma Manufacturing B.V.*	84535
32003	Vekoma International B.V./ Vekoma Manufacturing B.V.*	93137
32010	Vekoma International B.V./ Vekoma Manufacturing B.V.* (1 train)	94136
32012	Vekoma International B.V./ Vekoma Manufacturing B.V.*	96398
34501	Vekoma International B.V./ Vekoma Manufacturing B.V.*	86760
34502	Vekoma International B.V./ Vekoma Manufacturing B.V.*	86700
36501	Vekoma International B.V./ Vekoma Manufacturing B.V.*	20121
36502	Vekoma International B.V./ Vekoma Manufacturing B.V.*	20160
36503	Vekoma Rides Manufacturing B.V.*	91086
36504	Vekoma Rides Manufacturing B.V.*	91091
36505	Vekoma Rides Manufacturing B.V.*	91152
36506	Vekoma Rides Manufacturing B.V.*	60001
36507	Vekoma Rides Manufacturing B.V.*	60024
38058	Vekoma Rides Manufacturing B.V.*	60588
38501	Vekoma International B.V./ Vekoma Manufacturing B.V.*	94138

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IB-nr.	Original Ride Manufacturer	Project number
39505	Vekoma Rides Manufacturing B.V.*	91116
39509	Vekoma Rides Manufacturing B.V.*	90350
40008	Vekoma Rides Manufacturing B.V.*	60114
40009	Vekoma Rides Manufacturing B.V.*	60123
40010	Vekoma Rides Manufacturing B.V.*	60159
40011	Vekoma Rides Manufacturing B.V.*	60237
44501	Vekoma Rides Manufacturing B.V.*	60004/13
44502	Vekoma Rides Manufacturing B.V.*	60031
44503	Vekoma Rides Manufacturing B.V.*	60054
44504	Vekoma Rides Manufacturing B.V.*	60157
45001	Vekoma Rides Manufacturing B.V.*	60102
45002	Vekoma Rides Manufacturing B.V.*	60071
45003	Vekoma Rides Manufacturing B.V.*	60178
45004	Vekoma Rides Manufacturing B.V.*	60440
45005	Vekoma Rides Manufacturing B.V.*	60459
45007	Vekoma Rides Manufacturing B.V.*	60507
45008	Vekoma Rides Manufacturing B.V.*	60523
45009	Vekoma Rides Manufacturing B.V.*	60565
50501	Vekoma Rides Manufacturing B.V.*	60327
50502	Vekoma Rides Manufacturing B.V.*	60356
50504	Vekoma Rides Manufacturing B.V.*	60343
50505	Vekoma Rides Manufacturing B.V.*	60584
51001	Vekoma Rides Manufacturing B.V.*	60338
39510	Vekoma Rides Manufacturing B.V.*	60428
44507	Vekoma Rides Manufacturing B.V.*	60386
45501	Vekoma Rides Manufacturing B.V.*	60160
50001	Vekoma Rides Manufacturing B.V.*	60195
55001	Vekoma Rides Manufacturing B.V.*	60195

Table 1: Affected serial Nos.

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1 Introduction

Through Hoerbiger Micro Fluid GmbH (hereafter referred to as “Supplier”) we received a safety related document that gives information about mainly 3 possible issues with their hydraulic locking units (hereafter referred to as “HLU”) which are manufactured before June 2014.

After reviewing the information from the Supplier, VRP&S would like to share the advice given by Supplier. In chapter 2 these items as well as an additional clarification are further illustrated and VRP&S’ advice is included for both the LE 25 and LE 32 HLU’s.

2 Main points of attention

The Supplier document mainly describes 3 points of attention on which they propose to take action, with the additional clarification of VRP&S (item 3) the following 4 items are mentioned:

1. Connection of the piston rod at joint head
2. Connection of the threaded screw assembly
3. Connection of the accumulator
4. Contaminated oil in the HLU

In the next paragraphs you will find more information and advice.

2.1 Connection of the piston rod at joint head

Issue	: In the past the Supplier could not guarantee that the piston rod could not come loose at the joint head.
Action Supplier	: With the newly delivered HLU’s, the production process was changed by adding Loctite 243, a locknut and torque striping. This way they are able to guarantee that the piston rod can not come loose at the joint head.
VRP&S’ advice	: Add torque striping to the piston rod at the joint head (see figure 1) and perform a weekly check on this area. HLU’s that are not installed yet (such as spare cylinders) need to be checked for Loctite 243 before installation. See the remarks next to Table 2 for the correct torque values of the rod ends for both the LE 25 and LE 32 units.

Note: *in case of old configuration HLU (without locknut).*

Apply Loctite 270 and torque striping. In case no locknut is applied, the torque values for the LE 25 and LE 32 unit are respectively 25 ±5Nm and 30 +5Nm.

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Figure 1: how to apply torque striping on the rod end.

2.2 Connection of the threaded screw assembly

- Issue : The supplier added an additional requirement on the length of the threaded screw assembly. Due to the adjustment function of this connection it is not guaranteed that the threaded screw assembly is within the specified range.
- Action VRP&S' : Checking this connection was included during installation of the HLU in the vehicle.
- VRP&S' advice : Check the length of the threaded screw assembly. If applicable it needs to be corrected. For the correct settings, please refer to the text below for the LE32 units and table 2 for the LE25 units (these values are created from the Supplier's document). Add torque striping to the connection (see figure 2) and perform a weekly check on this area.



Figure 2: how to apply torque striping on the threaded screw assembly at the bottom.

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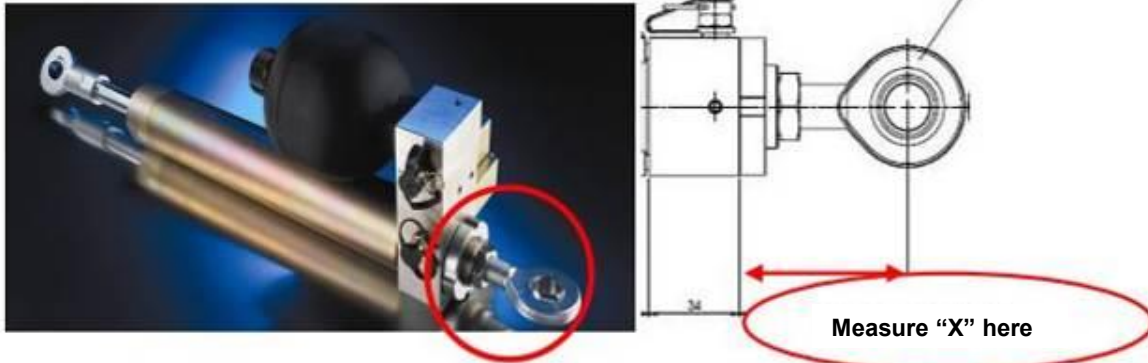


Figure 3: information for LE32 and LE25 screw connection at the bottom.

The following data apply for all LE32 versions:

For the LE 32 versions the screw thread depth is correct when the rod end length “X” is below 65 mm. ($X < 65\text{mm}$)

The following data apply for all LE25 versions:

For the LE 25 versions the screw thread depth is correct if the rod end length “X” is below the value as stated behind the product number in de table below. The small x at the end of the product number indicates the version number.

Product number	Maximum screw thread depth “X”	
850-7001-x	68	Mm
850-7002-x	68	Mm
850-7003-x	68	Mm
850-7004-x	68	Mm
850-7010-x	68	Mm
850-7013-x	65.5	Mm
850-7015-x	68	Mm
850-7016-x	68	Mm
850-7018-x	68	Mm
850-7019-x	68	Mm
850-7020-x	63.25	Mm
850-7021-x	63.25	Mm
850-8002-x	66	Mm
850-8003-x	66	Mm
850-8007-x	65.5	Mm
850-8008-x	68.25	Mm
850-8009-x	68.25	Mm

We strongly urge you to immediately check the measurement set out above on all Personal Restraint Systems in your possession and advise your technicians to adjust and maintain the measurements specified when installing the unit into a Personal Restraint System or during routine maintenance.

We recommend that the joint rod heads be secured at the specified dimensions and tightened with a torque wrench. The LE 25 version should be tightened to **80 Nm ±10 Nm**. The LE 32 version should be tightened to **90 Nm ±10 Nm**.

The correct measurement must be set and checked when installing or performing maintenance on the Cylinder Accumulator unit. In this way the required minimum screw thread depth engagement (as set out in VDI 2230) is maintained.

Table 2: LE25 screw connection lengths at the bottom and additional text box from Supplier’s document.

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2.3 Connection of the accumulator

- Issue** : After reviewing all connections and the Hoerbiger safety related document, below actions are taken to reduce the risk of a loosening accumulator.
- Action Supplier** : Checking the accumulator connection was included in the assembly process.
- VRP&S' advice** : Add torque striping between the connection of the accumulator and the manifold block (see figure 4) and perform a weekly check on this section.



Figure 4: how to apply torque striping on the accumulator.

2.4 Contaminated oil in the cylinder

- Issue** : During assembly of the cylinder the Supplier could not guarantee that small particles would not get stuck in the valve. This could affect the functionality of the HLU.
- Action Supplier** : The Supplier changed the production process by using an improved flushing system for the manifold blocks.
Besides that, they added a 1050 cycle test for all new manufactured HLU's, to convince themselves the HLU is not contaminated.
- VRP&S' advice** : For all HLU's in the field it is our advice to clearly instruct your operators to follow the instruction in the Owner's Manual: always check that the restraint is being closed as tightly as possible to the passenger's body. All restraints must be checked manually by pulling to see if they remain closed. Always check the restraint for locking before dispatch.
For all cylinders that are kept in stock: please return them to our facilities for general inspection and cycle test.

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Additional Requirements per release of this Bulletin:

Based on new information which was provided by Hoerbiger VRP&S needs to redraw the statement partially that no additional action is required for the HLU’s which are installed on operating vehicles. New information received by Vekoma from Hoerbiger shows a reduced level of confidence with regard to safe operation of the HLU.

While looking to our fleet of vehicles we can divide our fleet in 3 risk categories:

Category A: vehicles which are equipped with HLU which already passed the 1050 cycles test performed by Hoerbiger.

Category B: vehicles which are at lower potential risk, these vehicles are equipped with a category 3 restraint according to EN13814.

Category C: vehicles at higher potential risk, these vehicles are equipped with a category 4 or 5 restraint according to EN 13814.

In this Bulletin we clearly like to indicate the required actions for each category:

- **Category A: HLU which passed 1050 cycle test.**

No additional tests are required for the HLU’s which passed the 1050 cycle test succesfully. A check has to be performed to ensure that the HLU’s that are installed on the ride vehicles are marked with “Passed 1050 Test”

Table 2 (hereunder), shows all vehicles which are equipped with HLU which already passed 1050 cycle test.

IB-nr.	Original Ride Manufacturer	Project number
38058	Vekoma Rides Manufacturing B.V.*	60588
44507	Vekoma Rides Manufacturing B.V.*	60386
50505	Vekoma Rides Manufacturing B.V.*	60584
50001	Vekoma Rides Manufacturing B.V.*	60195
55001	Vekoma Rides Manufacturing B.V.*	60195

Table 2: Affected serial Nos.

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- **Category B: vehicles with lower potential risk.**

To ensure a certain level of safety, prior to the operation of the vehicles with guests we advise to perform the 1050 cycle test in two steps:

Step 1: Start cycle testing until 200 cycles are performed, like written in Chapter 2.5;

Step 2: Continue cycle testing until 1050 cycles are reached.

Table 3 shows all Category B vehicles.

IB-nr.	Original Ride Manufacturer	Project number
10507	Vekoma International B.V./ Vekoma Manufacturing B.V.* (train)	91028/29/30/31
34501	Vekoma International B.V./ Vekoma Manufacturing B.V.*	86760
34502	Vekoma International B.V./ Vekoma Manufacturing B.V.*	86700
36501	Vekoma International B.V./ Vekoma Manufacturing B.V.*	20121
36502	Vekoma International B.V./ Vekoma Manufacturing B.V.*	20160
36503	Vekoma Rides Manufacturing B.V.*	91086
36504	Vekoma Rides Manufacturing B.V.*	91091
36505	Vekoma Rides Manufacturing B.V.*	91152
36506	Vekoma Rides Manufacturing B.V.*	60001
36507	Vekoma Rides Manufacturing B.V.*	60024
38501	Vekoma International B.V./ Vekoma Manufacturing B.V.*	94138
39505	Vekoma Rides Manufacturing B.V.*	91116
39509	Vekoma Rides Manufacturing B.V.*	90350
39510	Vekoma Rides Manufacturing B.V.*	60428
40008	Vekoma Rides Manufacturing B.V.*	60114
40009	Vekoma Rides Manufacturing B.V.*	60123
40010	Vekoma Rides Manufacturing B.V.*	60159
40011	Vekoma Rides Manufacturing B.V.*	60237
45001	Vekoma Rides Manufacturing B.V.*	60102
45002	Vekoma Rides Manufacturing B.V.*	60071
45003	Vekoma Rides Manufacturing B.V.*	60178

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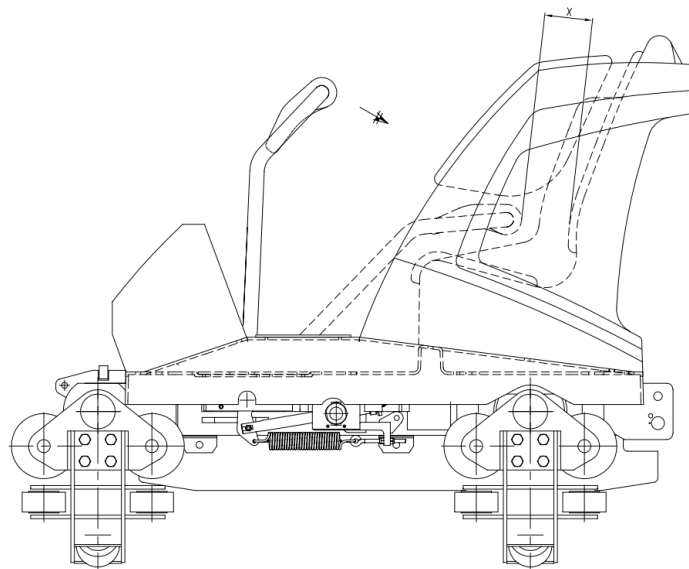
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45005	Vekoma Rides Manufacturing B.V.*	60459
45007	Vekoma Rides Manufacturing B.V.*	60507
45008	Vekoma Rides Manufacturing B.V.*	60523
45009	Vekoma Rides Manufacturing B.V.*	60565
50501	Vekoma Rides Manufacturing B.V.*	60327
50502	Vekoma Rides Manufacturing B.V.*	60356
50504	Vekoma Rides Manufacturing B.V.*	60343
51001	Vekoma Rides Manufacturing B.V.*	60338
45501	Vekoma Rides Manufacturing B.V.*	60160

Table 3: Affected serial Nos.

2.5 Cycle testing

The cycle test is a test which provides information about the functionality of the HLU and the scale of the contaminations. The cycles test has to be performed 1050 times. After completion of 200 cycles succesfully, the ride can be taken into operation with passengers.



This example image is for reference of dimension X only.

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Warning



The test needs to be carried out before riding with guests.

The test can be performed while the HLU is installed.

Test procedure, **restraint with 2 HLU's**;

1. Close the restraint, make sure the right hand side HLU is only locking the restraint;
2. Measure the minimal distance (X) between the restraint and the seat (only at start of test);
3. Log this dimension for every seat (only at start of the test);
4. Wait for 10 seconds;
5. Measure the minimal distance (X) between the restraint and the seat;
6. In case this dimension increased by 2 cm the HLU failed and needs to be replaced immediately by a HLU which passed the 1050 cycles;
7. If no dimension change was noticed proceed with step 1;
8. Keep repeating this procedure until 200 cycles have passed the test procedure;
9. Repeat this test and make sure the left hand side HLU is only locking the restraint;
10. After completion of the 200 cycle test for the left and the right HLU it is allowed to take the vehicle in operation.

Warning



The test needs to be carried out before riding with guests.

The test can be performed while the HLU is installed.

Test procedure, **restraint with 1 HLU**;

1. Close the restraint
2. Measure the minimal distance (X) between the restraint and the seat (only at start of test);
3. Log this dimension for every seat (only at start of the test);
4. Wait for 10 seconds;
5. Measure the minimal distance (X) between the restraint and the seat;
6. In case this dimension increased by 2 cm the HLU failed and needs to be replaced immediately by a HLU which passed the 1050 cycles;
7. If no dimension change was noticed proceed with step 1;
8. Keep repeating this procedure until 200 cycles have passed the test procedure;
9. After completion of the 200 cycle test for the single HLU it is allowed to take the vehicle in operation.

Keep track of HLU's that did not pass the test and return them to VRP&S.

After completion of the 200 cycles, continue this test until you have reached 1050 cycles within 4 weeks after release of this Service Bulletin.

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- **Category C: vehicles with higher potential risk.**

All customers with vehicles in Category C will be informed by a separate Service Bulletin.

2.6 Spare parts in customer Warehouse

All HLU's, at the customer warehouse should be checked if they are labelled with "passed 1050 cycle test". If this is not the case, contact VRP&S to make sure the HLU's will be tested prior to assembly into a vehicle.

The picture below shows the correct indication that the HLU has passed the 1050 Cycle test.



2.7 Ride in Operation >6 years

Hoerbiger is currently checking the replacement interval of the HLU's. Vekoma will receive an official statement within 5-6 months. However, we expect that the statement will clearly indicate that HLU's older than 6 years need to be replaced. Due to environmental influences it is not possible to base this replacement interval on actual ride cycles! We like to inform you upfront that this is the current situation.

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The following rides contain HLU's which are in operation > 6 years, see table 4:

IB-nr.	Original Ride Manufacturer	Project number
10505	Vekoma Rides Manufacturing B.V. (train), Arrow (ride)*	91178
10507	Vekoma International B.V./ Vekoma Manufacturing B.V.* (train), B&M (ride)	91028/29/30/31
27546	Vekoma Rides Manufacturing B.V.*	60022
29504	Vekoma International B.V./ Vekoma Manufacturing B.V.*	84535
36501	Vekoma International B.V./ Vekoma Manufacturing B.V.*	20121
36502	Vekoma International B.V./ Vekoma Manufacturing B.V.*	20160
36503	Vekoma Rides Manufacturing B.V.*	91086
36504	Vekoma Rides Manufacturing B.V.*	91091
36505	Vekoma Rides Manufacturing B.V.*	91152
36506	Vekoma Rides Manufacturing B.V.*	60001
36507	Vekoma Rides Manufacturing B.V.*	60024
39505	Vekoma Rides Manufacturing B.V.*	91116
40008	Vekoma Rides Manufacturing B.V.*	60114
40009	Vekoma Rides Manufacturing B.V.*	60123
40010	Vekoma Rides Manufacturing B.V.*	60159
44501	Vekoma Rides Manufacturing B.V.*	60004/13
44502	Vekoma Rides Manufacturing B.V.*	60031
44503	Vekoma Rides Manufacturing B.V.*	60054
45001	Vekoma Rides Manufacturing B.V.*	60102
45002	Vekoma Rides Manufacturing B.V.*	60071
45003	Vekoma Rides Manufacturing B.V.*	60178

Table 4: Affected serial Nos.

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Issuing Entity:

Vekoma Rides Parts & Services B.V.

Schaapweg 18

6063 BA VLODROP

The Netherlands

CoC Number: 12049585

Bulletin No.: SB-033_01

Release Date: 19-03-2015

Effective Date: immediately

Supersedes: N.A.

Completion Date: within 4 weeks fter
release of this Bulletin

3 General remark

Our advice is to clearly instruct your operators to follow the instruction in the Owner's Manual. Always check that the restraint is being closed as tightly as possible to the passenger's body. All restraints must be checked manually by pulling to see if they remain closed. Always check the restraint for locking before dispatch.

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According to the ASTM F853/ F1193 latest revision:

Supplemental bulletins delivered by the manufacturer to the owner / operator that were not provided at the time of hand over of the amusement ride and contain new information or newly recommended inspections or testing, or both, will be released as a Safety Alert, Service Bulletin or a Notification, with the following criteria in order to carry the force and effect of this practice:

- “Safety Alert” For notifications that recommend immediate action.
- “Service Bulletin” For notifications that do not recommend immediate action but do recommend future action.
- “Notification” For notifications that do not necessarily recommend future action but are promulgation of information.



For additional information contact Vekoma Rides Parts & Services B.V.:

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