



# COA-Recommended Code of Practice for Flexitanks

*A Recommended Code of Practice, developed by the Container Owners Association, for the Testing and Manufacturing of Flexitanks and for the Operation of Flexitank/Container Combinations*

**COA Flexitank Code of Practice:  
Version 2: Dated 1 January 2010**

[www.containerownersassociation.org](http://www.containerownersassociation.org)

# COA Recommended Code of Practice for the Manufacture of Flexitanks and Operation of Flexitank/Container Combinations

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## ***Introduction***

This Code of Practice has been prepared by the Container Owners Association to improve the quality of flexitanks being shipped in containers, thereby reducing flexitank failures and damage to containers. The COA recommends that shipping lines should carry flexitanks which meet the criteria detailed in this Code, so as to ensure safe operations and environmental protection.

Although the majority of flexitanks are transported in 20ft containers, this Code of Practice recognises that 30ft and 40ft containers are also used, and the Code also applies to these sizes.

The Code consists of:

1. A Summary of the Key Points that flexitank companies must adopt if flexitanks are to meet the Code of Practice requirements that are acceptable to shipping lines
2. Criteria which must be met in five Key Areas: Container selection; Testing of flexitank/container combinations and flexitank materials; Marking and Labelling; Incident management and insurance; and Training

## ***Schedule of Implementation***

The work to prepare this Code was undertaken by a Management Implementation Group (MIG), established by the Board of Directors of the COA (*see Note 1, page 17*). A draft Code was presented to a first meeting of interested parties, on 4 December 2008. Following this meeting, the Code was endorsed by the COA as a Provisional Code of Practice, effective 1 January 2009.

In 2009, the procedure for rail impact testing of Flexitank/Container Combinations was finalised by the Management Implementation Group and is included in Part 2 of this Document.

Following feedback from all sectors of the industry, a number of amendments were made to the Code, resulting in this Version ("Version 2"), which is valid from 1 January 2010. However, it is anticipated that the Code will continue to evolve during the course of 2010, and beyond.

## ***COA's Role in Preparing/Implementing the Flexitank Code of Practice***

### **A. The COA is responsible for:**

- The preparation and publication of the Flexitank Code of Practice
- Recording the details of those companies which meet the Criteria laid out in the Code
- Promoting and recommending the Code to all industry sectors (Shipping Lines; Flexitank Manufacturers, Operators, Fitters; Cargo Owners)

### **B. The COA is NOT responsible for:**

- Enforcing the implementation of the Code by individual Shipping Lines. Individual shipping lines will **always** have the **final** responsibility for:
  - (a) Which flexitanks they accept
  - (b) Which cargoes they accept

## ***Liability Exclusion***

The Container Owners Association and the COA Flexitank Management Implementation Group accept no liability whatsoever for any incidents or accidents that may occur during the course of the Flexitank/ Container Combination rail impact tests; or as a result of the recommendations in this Code of Practice being followed.

## Flexitank Code of Practice: Summary of Key Points

To comply with the COA Flexitank Code of Practice, manufacturers and operators of flexitanks for use in shipping containers must meet the following requirements:

Number	Item	See Part:
1	The criteria used for selecting containers to transport flexitanks should be as detailed in Part 1 of this Code	1
2	The flexitank design must comply with the Flexitank Test Criteria for ISO Containers specified in Part 2 of this Code	2
3	Flexitanks must be designed and selected in such a way to avoid permanent negative influence on the cargo, or on the flexitank or on the container	2
4	The flexitank shall be marked with the following information (which must be visible when the right-hand door of the container is opened): <ul style="list-style-type: none"> <li>▪ Unique flexitank number</li> <li>▪ Manufacturer's name or COA-supplied code</li> <li>▪ Type approval number (as issued by an officially registered classification society) applied to the flexitank and the bulkhead</li> </ul>	3
5	An A4 size Caution Label must be applied to the container's left-hand door	3
6	Insurance terms for flexitank shipments must be checked by the legal departments of shipping lines; but in any case there should be insurance cover for not less than US\$5 million for all parties involved in the chain	4
7	Both the flexitank shipper and operator shall have emergency plans documented. Emergency contact details of the flexitank operator shall be clearly marked	4
8	Flexitank manufacturers must prepare manuals for flexitank fitting, loading and discharge	5
9	Flexitank operators should comply with, as a minimum, the instructions given in the flexitank manufacturer's manual	5
10	The filling volume must be controlled by at least <b>one</b> of two methods:  Either (a) calibrated measuring equipment Or (b) the weight of the cargo	5

11	The flexitank manufacturer must be certified to ISO 9000 (or similar Quality Assurance programme)	
12	<p>The following details are required when a flexitank shipment booking is made:</p> <ul style="list-style-type: none"> <li>▪ Cargo must be booked as “non-hazardous bulk liquid in flexitank”</li> <li>▪ The Material Safety Data Sheet (MSDS) must be provided. <i>Annex B of this Code provides a list of information that must be provided in the MSDS</i></li> <li>▪ The name of the flexitank manufacturer + the approval number must be given</li> <li>▪ The flexitank operator must comply with the COA Flexitank Code of Practice</li> </ul>	
13	Flexitank companies must be an Associate Member of the Container Owners Association	

# Part 1: Container Selection for Transporting Flexitanks

## 1. General

It is critical that containers selected for flexitank shipments conform to certain industry accepted criteria, to ensure that they are suitable for carriage and satisfy the tests described in Part 2 of this Code. Specifically, the container must be specified and tested according to ISO 1496 – Part 1.

The criteria given in this part of the Code are compulsory for full compliance with this Code of Practice, but represent the minimum criteria required and have been chosen to maximise safety. Operators and shipping lines may wish to specify additional or more stringent criteria.

Dialogue should take place between the approved flexitank operator and the carrier in the country of origin, such that the shipping line recognises the need to supply containers conforming to this part of the standard.

It should be stressed that it is in the interests of all parties to supply containers conforming to this standard to avoid containers being rejected.

## 2. Applicability

This Container Selection part of the Code applies to flexitank operators only. *(Flexitank manufacturers are exempt from all paragraphs of this Part of the Code.)*

## 3. Minimum Gross Weight

- a) Containers selected for flexitank transport should have, as a first option, a gross weight rating of not less than 30 tonnes
- b) Where a 30-tonne gross rated container is not available, the permitted cargo mass should not exceed 0.6 of the container's declared maximum payload, where the container has been tested and fully certified according to ISO requirements.

Higher transported weights and/or lower rated containers can be used providing the Testing detailed in Part 2 of this document is successfully demonstrated.

## 4. Fully Corrugated Sides

Both side walls should be corrugated for the entire length of the side wall. Any container with flat decal panels must be rejected.

## 5. Door Locking Bars

Each door must have a minimum of two locking bars and each locking bar must be retained by a minimum of three locking bar brackets.

All locking bar cams should lock into both top and bottom locking bar cam retainers correctly. Handles should position freely into door handle retainers and door handle catches should close fully.

To ensure that doors can be closed properly, containers should be horizontal when they are being loaded.

## **6. Doors**

Structural parts of the door; vertical sections, upper and lower 'C' sections should be free from buckling and dents. All hinges should be in working order and free moving.

## **7. Floor**

Any container with any of the following features should be rejected (unless a suitable repair can be undertaken):

- Gouge greater than 15mm deep irrespective of length
- Gouge more than 6mm deep and greater than 150mm wide irrespective of length
- Delamination or other damage (affecting floor strength)
- Difference in height between adjacent planks / panels greater than 10mm
- Holes other than nail holes

## **8. Deformation**

Before loading, the container must be within ISO Standard 668.

## **9. CSC Plate**

A valid CSC plate must be correctly attached to the container.

## **10. Side and front panels damage and repairs**

Side and front panels must be examined by the container operator's depot to verify whether the quality of the repair is satisfactory or determine whether damage is acceptable

Repairs to panels are acceptable if they comply with IICL guidelines or a similar 'repair manual for steel freight containers'. If there is any doubt concerning the strength of a repair, the container must be rejected.

## **11. Container return**

After discharge of the flexitank, the container must be redelivered to the shipping line in the same condition that it was selected (subject to normal wear and tear) and completely empty.

## **Recommended Container Selection Check List**

Containers selected for the carriage of flexitanks should meet the following criteria:

### **Side Walls**

- Weld seams to side walls must have smooth weld seams and are free from sharp edges and objects
- Repair seams must be covered with tape
- There must be identical corrugations over the full length, there must be no logo panel or any flattened corrugations

### **Container Interior: Floor**

- The container must be free from transferable or non-transferable dry dust, carbon dust, sand, dirt or depot yard dust
- There must be no damp floor stains
- There must be no large burn marks
- The container must be free from debris, dunnage and previous cargo residue
- The floor must be free from splinters and protruding nails, screws and other fixings

### **Container Interior: Walls**

- There must be no excessive scratches to the interior
- The inside walls and roof must be free from large areas of rust or flaking paint
- There must be no transferable stains

### **Container Interior: General**

- The container must be free from taint and previous cargo odours
- The shoring slots (at door end) must be straight and free from dents and obstructions
- Where lashing bars are required, these should be checked for suitability

### **Door Hardware**

- Door gear fixing and bolt heads on the inside of the doors must be free from sharp points and edges

### **Exterior: General**

- The exterior must be free from hazardous markings or markings relating to previous cargo

## Part 2: Test Criteria: FCCs and Flexitank Materials

### Section A: Flexitank/Container Combination Rail Impact Test Criteria

1. The test container must be built according to ISO standards to meet ISO criteria and shall be a used container, with normal wear & tear
2. The flexitank, including bulkhead, must be fitted into an ISO container
3. To meet the COA Code of Practice, the Flexitank/Container Combination must – as a minimum – pass at least **ONE** of the two **COA Rail Impact Tests**, as shown below:

#### **COA TEST: Option 1 (eg TÜV Süd Rail)**

- **Specimen Unit**

The specimen unit shall comprise:

- A test container meeting the COA recommended container selection criteria
- The flexitank together with bulkhead which is to be tested

- **Unit on Rail Wagon**

The unit is to be placed on a rail wagon for impact testing as follows:

*(a) Container doors at impact end*

Firstly, with the container doors at the impact end, the rail wagon unit is to be subject to impacts at speeds of: 5 km/hr, 9.5 km/hr and 12 km/hr. These speeds equate to 3, 6 and 7.5 mph

*(b) Container end-walls at impact end*

Secondly, with the container end-walls at the impact end, the rail wagon unit is to be subject to an impact at a speed of 12 km/hr

- **Details of testing configuration:**

Principle details for Test 1 are given in Appendix A on Page 19 of this Code of Practice.

#### **COA TEST: Option 2 (eg TTCI/AAR)**

- **Specimen Unit**

The specimen unit shall comprise:

- A test container meeting the COA recommended container selection criteria
- The flexitank together with bulkhead which is to be tested

- **Unit on Rail Wagon**

The unit is to be placed on a rail wagon for impact testing as follows:

***(a) Container doors at impact end***

Firstly, with the container doors at the impact end, the rail wagon unit is to be subject to impacts at speeds of: 6.5 km/hr, 9.5 km/hr and 9.5 km/hr. These speeds equate to 4 mph, 6 mph and 6 mph

***(b) Container end-walls at impact end***

Secondly, with the container end-walls at the impact end, the rail wagon unit is to be subject to an impact at a speed of 9.5km/hr

- **Details of testing configuration**

Principal details for Test 2 are given in Appendix A on Page 21 of this Code of Practice

#### **4. Shock Response Spectrum Curve**

For both Test A and Test B, a Shock Response Spectrum curve must be provided for the highest speed testing, both when the container end-wall and the container doors are at the impact end.

#### **5. Acceptance Criteria**

- (a) No leakage at any test speed
- (b) The tank and bulkhead (if fitted) to be intact. The bulkhead (if fitted) itself must not be touching the door either during the tests, or after the tests have been completed.
- (c) The maximum allowable permanent deformations of the side-walls, end-walls and bottom side rails should be as specified in the UCIRC - the Universal Container Interchange Repair Criteria (the criteria used by shipping lines when interchanging containers – see [www.marisec.org/resources/CONTAINERCRIT.htm](http://www.marisec.org/resources/CONTAINERCRIT.htm)). However, the maximum deformation for the doors is 6mm.

For Test Option 1, at test speeds of 5km/hr and 9.5km/hr, the permitted deformations are as follows:

Bottom Side Rails: 50mm  
End Walls: 40mm  
Side Walls: 40mm  
Doors: 6mm

For Test Option 2, at test speeds of 6.5km/hr and 9.5km/hr, the permitted deformations are as follows:

Bottom Side Rails: 50mm  
End Walls: 40mm  
Side Walls: 40mm  
Doors: 6mm

#### **6. Witnessing and Certification**

The above tests must be witnessed and certified by an officially registered Classification Society (approved by the COA). The certificate shall apply to the flexitank system,

including tank components and tank installation devices (such as, but not limited to, the bulkhead); and specified cargo details (allowable range of volume and density); and apply to the ISO container as well.

For all successful tests, the approved Classification Society witnessing the test must record exact details of the flexitank's design and composition and a section of the flexitank must be cut out and retained by the COA for future reference.

## **7. Testing Certificate**

The Testing Certificate must include, amongst other information, the following details:

- Description of the flexitank system including detailed description of all components and their installation
- Allowable volume and density range of the cargo
- Flexitank model number and flexitank manufacturer

## **8. Flexitank Capacity and Valve Configuration**

If a flexitank is tested and passes, this validates all Flexitanks made to that particular design of that volume and below (as long as the flexitank is filled and meets the relevant capacity of the design which has been tested) for the relevant container size.

If a bottom discharge valve flexitank passes, then a top discharge is accepted. However, if a top discharge valve flexitank passes this does not constitute a pass for a bottom discharge flexitank.

# **Section B: Materials Testing**

The following are the tests to be carried out by flexitank manufacturers on the flexitank material, along with selected pass levels to demonstrate the ability of their product to prevent loss of containment when subjected to normal environmental stresses and conditions.

### **1. Puncture resistance or impact strength**

#### **ASTM F1306-90: Slow Rate Penetration Resistance of Flexible Barrier Films and Laminates.**

A 3.2mm diameter hemispherical headed probe is forced into the material at 25mm/min. The force required to break is recorded.

*Or:*

#### **ASTM D1709 – 08: standard test methods for impact resistance of plastic films by free falling dart method (method B).**

A dart with 50.80mm diameter hemispherical head dropped from a height of 1.50 m. Using the staircase method as defined in the standard, average impact failure weight is calculated.

### **2. Seal (weld) strength**

#### **ASTM F88 - 07a: Standard Test Method for Seal Strength of Flexible Barrier Materials**

A 25.4mm (1 inch) wide sample of the seal is placed into a Universal Testing Machine. Failure mode and force can be determined. This test can also be used for mechanical seals or welds used to secure valves or other accessories.

### 3. Tensile strength and elongation

There are two options for the tensile strength and elongation test:

*Either:*

**(a) ASTM D882 - 09 Standard Test Method for Tensile Properties of Thin Plastic Sheeting**  
A 25.4 mm (1inch) wide sample placed into a Universal Testing Machine is pulled to break at a relevant test speed suggested in the standard. The force and elongation at break is determined.

*Or*

**(b) ASTM D638 - 08 Standard Test Method for Tensile Properties of Plastics (Type IV)**  
Test is similar to the above. Sample is shaped like a dumb-bell and dimensions are according to Type IV defined in the standard. An extensometer must be deployed to measure the elongation at break accurately as stated in the standard.

### 4. Tear Resistance

ASTM D1004-08 Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting

The force required to initiate tearing on a test specimens cut out with a die conforming to the dimensions defined in the standard is recorded. The test speed is set at 51mm/min.

### 5. Temperature tolerance

This test is similar to the Tensile Strength and Elongation test according to either:

- (i) ASTM D882-09; or
- (ii) ASTM D638 – 07

All raw materials should be subjected to a minimum of six hours at:

- (a) + 60degC; and
- (b) – 10degC

The samples then need to be reconditioned in a lab environment and retested. All materials should still be within published specification

*Tests 1 – 4 described above shall be conducted at a minimum of **once per 100 flexitanks manufactured** as part of the internal QC program. Flexitank manufacturers must be able to demonstrate to the Classification Society that the results are in compliance with their published specifications.*

*Test 5 shall be conducted initially on all plastic films and subsequently on any new material where the supplier or resin composition has changed. These tests must be witnessed and certified by an officially registered Classification Society.*

### 6. Valve Leakage Testing

#### ***In-house method***

The valve is subjected to a pneumatic pressure of 0.5bar over 40 seconds in a closed position. Any drop of pressure of 0.002bar will be detected and will be considered a failure.

This test must be conducted on 100% of all incoming valves before putting them into the flexitank production.

# Part 3: Container and Flexitank Labelling

## 1. Introduction

Flexitanks cannot ship hazardous goods. However, adhesive warning and information labels should be placed on containers, enabling the instant identification of a Flexitank Container Combination and any dangers that may be present if warnings are not heeded.

All labels must be sea-water resistant and all types must be strong enough to still be readable after normal shipping conditions.

The flexitank itself must also be marked for traceability.

## 2. Container Marking

### a) Responsibility

Flexitank operators are responsible for marking containers with flexitank information.

### b) Door warning label

This shall be a minimum size of A4 (210 x 297mm). It should be affixed to the outside of the left hand door, in such a position that it is obvious before opening the left hand door.

The label must contain a warning about keeping the left hand door shut, along with a pictorial warning. These warnings should be in the following languages; English, French, Spanish, German and Chinese. Other languages may be added if required.

The label must also contain emergency contact information.

## 3. Flexitank Marking

The flexitank shall be marked with the following information (which must be visible when the right-hand door of the container is opened):

- Unique flexitank number
- Manufacturer's name or COA-supplied Code
- Type approval number (as issued by an officially registered classification society) applied to the flexitank and the bulkhead

## 4. Removal of Markings

All flexitank labels should be removed as follows:

- the label on the left hand door should be removed once the cargo has been discharged
- all other labels shall be removed once the flexitank has been removed and the container has been cleaned prior to redelivery

Failure to comply with these instructions could result in future mis-identification of the container.

# Part 4: Incident Management and Insurance

## Section A: Reaction to Incidents

### 1. Introduction

This part of the Code covers the required response by flexitank operators to deal with incidents; and it also covers the minimum level of insurance cover that is required for flexitank manufacture and operation.

### 2. Responsibility and declaration of contents

Flexitank operators are responsible for incident management and insurance. However, flexitank manufacturers must bear responsibility for incidents that are the result of manufacturing faults and, where appropriate, they should contribute to solving the problem.

Flexitank operators shall ensure that the shipper declares that the cargo on Bills of Lading as being: "Flexitank containing [.....] bulk liquid. They must also ensure that the same declaration is made for flexitanks sold directly to customers.

### 3. Stages of incident management

#### a) Information

Following the report of an incident, the initial requirement is for information regarding the product and the cargo owner. The flexitank operator should be able to identify the product, provide a Material Safety Data Sheet (MSDS) for the product and give details of the owner of the product within a reasonable amount of time to enable preparations to be made for opening the container and inspecting the flexitank.

#### b) Attendance

Once all relevant permissions have been obtained, a physical inspection of the flexitank is required to determine actions required. Preferably this should be performed by flexitank operators, their agents or representatives as, given their flexitank experience, they are most likely to be able to determine the root cause.

Independent cargo surveyors are often appointed to either attend with an operator representative or alone. (This is dependent on the type of insurance coverage in place and/or whether the flexitank operator or cargo owner requires such attendance). In some instances, the insurance company will issue a list of specially qualified and approved surveyors. In such cases, only such approved surveyors may be commissioned to comply with the conditions of insurance.

It is desirable therefore for surveyors to be trained in flexitanks to enable them to reach the appropriate conclusions. The speed with which an operator can analyze the problem has a direct effect on the choice of the corrective actions.

#### c) Action

If action is required, e.g. trans-loading product to another flexitank, IBC or other bulk container, it is essential that this is conducted quickly to restrict product loss and preserve quality of product. It is also important to ensure that any receiving vessel/container is clean and suitable for the containment of the product (eg has the necessary contaminant barriers in place in the case of certain sensitive products)

#### **d) Completion**

Once any action has been taken, all necessary paperwork and logistics arrangements should be made promptly to ensure that the incident is cleared from any quarantine area and to ensure customer satisfaction. Completion can be defined as the point when the product is delivered back into the normal logistics chain and any quarantine area is restored to normal following incident actions.

#### **4. Records**

All parties in the flexitank chain shall keep a detailed log/ database of incidents to allow them to identify trends and take corrective and preventive actions.

This record shall contain, as a minimum, the following information:

- Flexitank number
- Container number
- Date of incident
- Location of incident
- Type of incident
- Quantity of product lost
- Root cause (or possible root causes)
- Photographs of the incident including any damage to the flexitank, ancillary equipment and the shipping container

## **Section B: Insurance**

Flexitank operators shall maintain insurance in respect of potential product or public liabilities arising from any failure of their flexitank or operational service to a combined single limit of liability of not less than US\$5 million for any one incident, to be placed with a AAA-rated insurer on an established insurance market.

The operators will provide a statement to this effect from their insurance broker or Underwriter at the reasonable request of a Shipping Line, Rail Operator or client utilising the services of, or working with, the given flexitank company.

Flexitank manufacturers which do not provide flexitank transportation services and do not contract freight, should demonstrate product and public liability cover of not less than US\$5 million in respect of any liability arising from the failure of their product, attributable to manufacture, materials, design or quality control.

# **Part 5: Training**

## **1. Introduction**

All parties in the flexitank manufacturing and transport chain should participate in appropriate training courses.

The flexitank industry relies heavily on 3rd party depots and agents for container selection, preparation and fitting of flexitanks and also, along with independent surveyors, to inspect FCC's that have been involved in incidents.

Once training has been conducted, it is also essential that the procedures are regularly reviewed, to ensure that the up-to-date processes and documentation are being used, processes are being adhered to and any new staff are being trained by suitably experienced people using written training procedures and materials.

## **2. Training**

Training should cover such activities as:

- Container selection and preparation
- Flexitank installation and fitting
- Incident training

## Notes and Contact

### *Note 1: Management Implementation Group*

The Code has been prepared by a Management Implementation Group (MIG) comprising:

- Two shipping lines (Maersk Line and Hapag-Lloyd)
- Two flexitank companies (Trans Ocean Distribution and Braid Logistics)
- One classification society/QA company (Lloyd's Register).

The COA Secretariat has acted as Chairman and Co-ordinator of this MIG.

### *Note 2: Contact Information*

Any communication regarding this Code of Practice should be sent to:

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Suite 27a – Isabel House  
46 Victoria Road  
Surbiton KT6 4JL  
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Web: [www.containerownersassociation.org](http://www.containerownersassociation.org)

# Appendix A: Details of Testing Procedures

## COA Rail Impact Test 1

*In this test the flexitank/container combination under test is stationary and a load wagon is pushed at the required speeds to impact on the stationary wagon.*

### 1. Configuration

Details of the basis for this test method can be found in Annex D of ISO 1496/3: 1995, Incorporating Amendment No.1

The basic testing configuration will be as follows:

- An impact via the use of an 80 tonne wagon
- The rail wagon carrying the test container is to be instrumented with accelerometers to enable SRS measurements to be made.
- A speed measurement system is to be used to accurately determine the speed of impact.

### 2. Securing

Securing of the test container to the test wagon must be according to the above test procedure and must provide positive location and restraint in all three directions (longitudinal, transverse and vertical) by the use of twistlock-type features. The rail wagon must be fitted with features (stop blocks) that ensure the impact load is transmitted directly into the bottom corner castings. There must be minimal clearance between the stop-blocks and container corner fittings.

### 3. Flexitank fitting

The Flexitank manufacturer shall be responsible for fitting the Flexitank, lining, bulkhead etc to the test container and this must be in accordance with the Flexitank manufacturer's installation guide.

### 4. Weighing and Filling

The empty weight of the test platform as well as the container fitted with flexitank/bulkhead shall be recorded. Then the Flexitank shall be filled to 100% of its designed capacity. The final mass of the filled container-under-test shall be recorded.

### 5. Data acquisition

#### *Accelerometers*

Two accelerometers with a minimum amplitude range of 200 g, a maximum lower frequency limit of 1 Hz and a minimum upper frequency limit of three times the sampling frequency of the data acquisition system. Each accelerometer is to be rigidly attached to

the outer end or side face of the two adjacent bottom corner fittings closest to the impact source and aligned in such a way as to measure the acceleration in the longitudinal axis. The preferred method is to attach each accelerometer to a flat mounting plate by means of bolting and to bond the mounting plates to the corner fittings.

### ***Velocity***

A method of measuring the impact velocity with repetitious accuracy shall be used.

### ***Recording system***

Analogue-to-digital data acquisition system capable of recording the shock disturbance as an acceleration-time history at a minimum sampling frequency of 1 kHz and incorporating a low-pass anti-aliasing filter with a corner frequency set to 20% of the sampling rate and a roll of rate of 40 dB/octave.

## **6. Measurements**

Measurements to be made:

- Diagonals of sidewall corner castings: before and after testing only
- The plane of the Side and End walls to be measured:
  - ***Before loading***
  - ***After loading***
  - ***After testing at each speed***
  - ***After discharge***
- The side and end wall measurements must be made at 1/3rd and 2/3rd height locations
- Movement of Side Walls

These must be made at five equally positioned spaces along the length of the container

- Movement of End Walls and Door Ends

These must be made at three equally positioned spaces across the width of the container.

# COA Rail Impact Test 2

*In this test a load wagon is stationary and the flexitank/container combination under test is pushed at the required speeds to impact on the stationary wagon.*

## **1. Configuration**

Details of the basis for this test method can be found in AAR General Information Bulletin No 2, revised Feb 2000

The basic testing configuration will be as follows:

- An impact via the use of a 250000lb wagon
- The rail wagon carrying the test container is to be instrumented with accelerometers to enable SRS measurements to be made.
- A speed measurement system is to be used to accurately determine the speed of impact.

## **2. Securing**

Securing of the test container to the test wagon must be according to the above test procedure and must provide positive location and restraint in all three directions (longitudinal, transverse and vertical) by the use of twistlock-type features.

The rail wagon must be fitted with features (stop blocks) that ensure the impact load is transmitted directly into the bottom corner castings. There must be minimal clearance between the stop-blocks and container corner fittings.

## **3. Flexitank fitting**

The Flexitank Manufacturer shall be responsible for fitting the flexitank, lining, bulkhead, etc, to the test container and this must be in accordance with the Flexitank Manufacturer's installation guide.

## **4. Weighing and Filling**

The empty weight of the test platform as well as the container fitted with flexitank/bulkhead shall be recorded. Then the Flexitank shall be filled to 100% of its designed capacity. The final mass of the filled container-under-test shall be recorded.

## **5. Data acquisition**

### ***Accelerometers***

Two accelerometers with a minimum amplitude range of 200 g, a maximum lower frequency limit of 1 Hz and a minimum upper frequency limit of three times the sampling frequency of the data acquisition system.

Each accelerometer is to be rigidly attached to the outer end or side face of the two adjacent bottom corner fittings closest to the impact source and aligned in such a way as to measure the acceleration in the longitudinal axis. The preferred method is to attach each accelerometer to a flat mounting plate by means of bolting and to bond the mounting plates to the corner fittings.

### ***Velocity***

A method of measuring the impact velocity with repetitious accuracy shall be used.

### ***Recording system***

Analogue-to-digital data acquisition system capable of recording the shock disturbance as an acceleration-time history at a minimum sampling frequency of 1 kHz and incorporating a low-pass anti-aliasing filter with a corner frequency set to 20% of the sampling rate and a roll of rate of 40 dB/octave.

## **6. Measurements**

Measurements to be made:

- Diagonals of sidewall corner castings: before and after testing only
- The plane of the Side and End walls to be measured:
  - ***Before loading***
  - ***After loading***
  - ***After testing at each speed***
  - ***After discharge***
- The side and end wall measurements must be made at 1/3<sup>rd</sup> and 2/3<sup>rd</sup> height locations
- Movement of Side Walls

These must be made at five equally positioned spaces along the length of the container

- Movement of End Walls and Door Ends

These must be made at three equally positioned spaces across the width of the container.

## **APPENDIX B: MATERIAL SAFETY DATA SHEET (MSDS)**

**IMO classified commodities should NEVER be loaded in flexitanks.**

A MSDS should cover the following items.

### **Section 1:**

- Material and manufacturers company identification
- Details of person/company who prepared the MSDS
- Emergency telephone number

### **Section 2:**

- Material composition and information on ingredients
- Identification of the substance (can be a trade name)
- Use of the product

### **Section 3:**

- Hazards identification
- Name of the dangerous substance(s) with percentage(s)
- EINECS and/or CAS number or numbers
- Hazardous identification (toxic, flammable, explosive etc.)
- Flashpoint
- Flammability
- Explosive properties
- Oxidising properties
- Relative density
- Boiling point/range
- Vapour pressure
- Solubility (in water and/or other solvents)
- Hazardous decomposition products

### **Section 4:**

- First aid measures

### **Section 5:**

- Fire fighting measures

### **Section 6:**

- Accidental release measures

### **Section 7:**

- Handling and storage

**Section 8:**

- Exposure controls / Personal protection
- Exposure limits
- Respiratory protection
- Hand protection
- Eye protection
- Skin protection

**Section 9:**

- Physical and chemical characteristics (pH values)

**Section 10:**

- Stability / reactivity

**Section 11:**

- Toxicological information

**Section 12:**

- Ecological information
- Environmental risks

**Section 13:**

- Disposal considerations

**Section 14:**

- Transport information
- Proper shipping name (PSN)
- Marine pollutant
- Any other relevant information

**Section 15:**

- Regulatory information

**Section 16:**

- Other information
- Conditions to avoid
- Materials to avoid