



# FEM

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Sub-Group Elevating Equipment



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# Dock Shelters

## Guidance

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## **Introduction**

This document concerns a further elaboration of the Dock shelter as covered in the **FEM Guidance 12.009** *Ways to save energy in a Vehicle Loading Dock Area* (October 2018).

Given the nature of the Guidance document 12.009, only the energy saving properties of shelters have been emphasized.

In order to show that dock shelters have more to offer than just energy savings, it is also important to clarify how and when the different shelters should be used.

## **Intention of this Guideline**

To provide users, architects, contractors and suppliers with an awareness of the benefits and specific characteristics of the different Dock shelter types used in the loading dock area.

### **Nomenclature**

Generic name: Dock shelter.

### **What is a Dock Shelter?**

A dock shelter is a device that is used in a loading dock area to seal the gap between the dock door opening and the truck during loading or unloading. It is mounted on the outer perimeter of the dock door opening.

### **Why use a Dock Shelter?**

The dock door opening is only partly covered by the docked vehicle, leaving an unwanted gap. Sealing this gap may be done for the following reasons:

#### **Ergonomics**

- Reduction of temperature variations
- Reduction of wind, draughts, ingress of dust and airborne pollutants.
- Can help reducing outside noise getting in or vice versa.

#### **Safety/Security**

- Reduction of the ingress of water which can cause slippery wet floors
- Making unauthorised access through the loading area past a docked vehicle more difficult.

#### **Hygiene**

- Where handling food, helps keeping out dust, vermin and insects.

### **Saving energy**

- Providing savings in energy, reducing whether heating or cooling costs.
- The climate change that we see occurring today and the resulting need to stop using fossil fuels and consume as little energy as possible, are a good reason to consider the use of dock shelters.

### **Cost Savings**

- The ingress of the before mentioned matters can lead to damage of the goods that are transported, which may lead to high costs.
- Better ergonomics lead to higher efficiency and less sick-leave, both saving costs.

## **Dock Shelter Types**

The principle of all shelter types is the same: a frame that is attached to the wall of the building, and a sealing member that is attached to the frame.

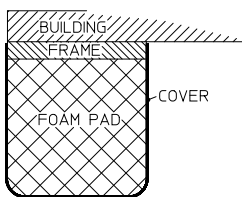
The current state of technology has different sealing principals: Compression, Wiping and Touching.

<b>SHELTER</b>	<b>SEALING PRINCIPLE</b>	<b>COMMERCIAL NAMES</b>
Type I	Compression seal	Foam pad, Cushion
Type II	Wipe seal	Curtain, Flap, Flexible panel
Type III	Touch seal	Inflatable, Air bag, Bellow
Type IV	Combined seals	Hybrid

### **Type I Shelter – Compression Seal**

#### **What is a Type I Shelter**

This shelter comprises compressible top and side pads, also called foam pads or cushions.



The construction of the sealing member consists of a foam pad and a wear resistant cover.

The designation 'compression seal' refers to the compression of the seal, due to the truck reversing against it. With this type of shelter the *vehicle is moving against the seal*.

#### **When to use a cushion shelter**

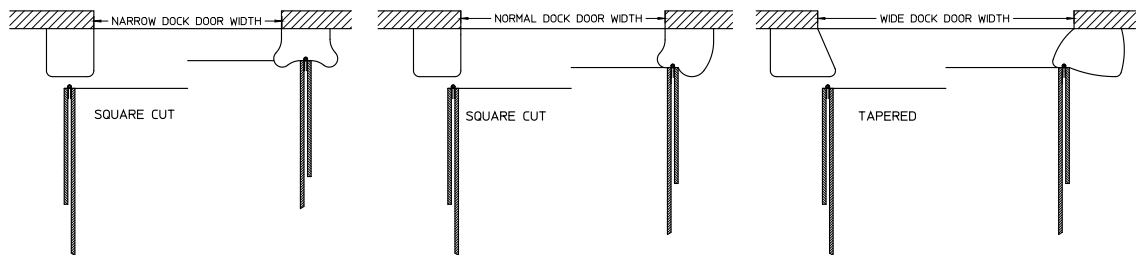
- When vehicles have more or less the same width and height.
- When an excellent seal is wanted and this type of seal is suitable.
- When a cost efficient solution is wanted.

### Typical Properties

- Cost index: €€ / €€€
- Excellent seal between vehicle and building, even in windy conditions.
- The gap between the vehicle's side wall and its open door is also sealed (applicable to barn doors, not roller shutters).
- Neat and compact appearance.
- The rugged design makes it less susceptible to damage, when used with the correct vehicle type.
- This shelter type I requires a smaller dock door opening than shelter type II and III, and depending on the chosen seal types also type IV.

### More to Consider

- a) With a standard square cut seal, the inside door and shelter width are smaller than the width of the vehicle. When two pallets have to be fitted in the width of the vehicle, this can be a problem. Bevelled or tapered seals can be fitted in case of larger door openings



- b) The correct positioning of the vehicle at the loading dock is mandatory for a proper seal. For that purpose, most shelters have markings on the front of the side pads indicating the right position. The use of wheel guides can further prevent the occurrence of air gaps at the sides of the vehicle.
- c) In order to accommodate vehicles with different heights, or trucks with air suspension, larger or adjustable-height top cushions can be applied.
- d) Tapered seals may be necessary to reduce uneven wear, and ensure a good seal, where the vehicle approach slopes either down or up.



- e) Cushion shelters are not suitable for trucks with a top lid.



- f) Trucks with air suspension will rise and fall during loading and unloading, which may require additional protection of the front of the cushion and may lead to additional maintenance costs.
- g) Sharp edges and construction details on the rear and the doors of the vehicle can damage the seal. Additional protection may be required.
- h) The seal is positioned in the driving direction. To protect both shelter and building, the amount of compression of the seal must be limited by external means like bumpers.
- i) Portions that are anticipated to require more frequent repairs, may be fixed in a way that allows quick replacement (e.g. Velcro type fixing).

## **Type II Shelter – Wipe Seal**

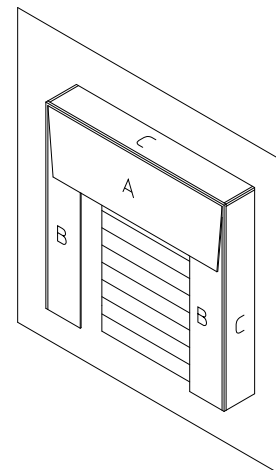
### **What is a Type II Shelter?**

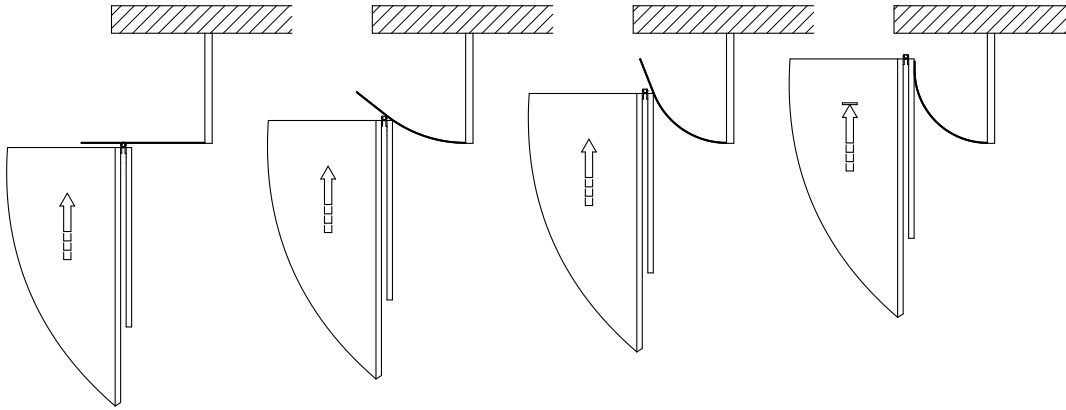
This type of shelter has curtain-shaped seals at the top (A) and the sides (B), which are typically mounted at the front of a frame (C), at a projection from the facade.

The curtains have leaf-spring-like reinforcements or material properties that have a similar effect, e.g. providing sufficient pressure of the seal against the vehicle, and returning the curtain to its rest position.

The frame can either be rigid or flexible/collapsible, and is closed at the sides and the top, thus forming a casing.

When the reversing vehicle strikes the curtains they will bend inward and wipe against the vehicle's sides and top, thus providing the 'wipe seal'.





*the vehicle is moving, making a wiping contact with the seal.*

### **When to Use a Type II Shelter**

- When a wide range of vehicle sizes has to be accommodated.
- When the full inside width of the vehicle must be accessible.

### **Typical Properties**

- Cost index: **€€ / €€€**
- Suitable for trucks with air suspension
- Suitable in case of inclined or declined vehicle approach
- Wide variety of curtain sizes, materials and customizations possible
- Ability to handle trucks with a top lid (special head curtain and projection may be necessary)

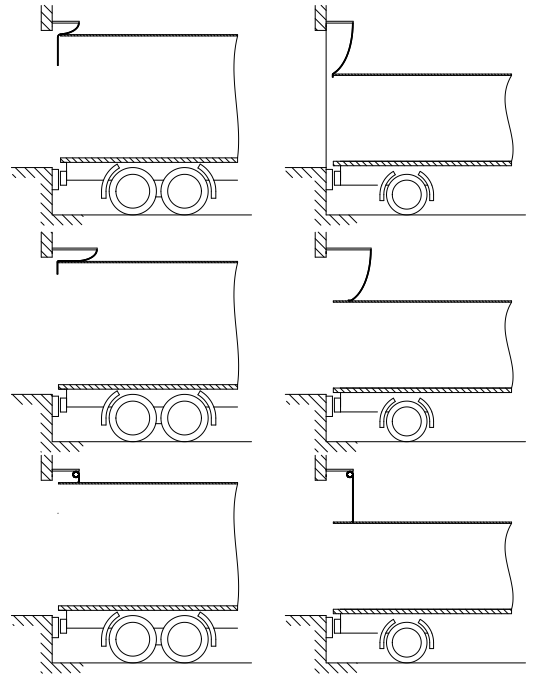
### **More to Consider**

- a) When a vehicle backs in correctly i.e. within the markings on the front of the side curtains, the seal is most efficient. But when vehicles back in off-centre, or barn doors are not pinned back correctly, damage may be caused to the shelter. There are ways to prevent this:
  - the use of wheel guides, in which case a rigid frame may be sufficient
  - a flexible or collapsible frame, which will retract to minimize the risk of damage, but in this case the dock bumper should be of sufficient projection to avoid crushing the shelter frame.
  - The use of heavy duty gantry brackets may reduce damage caused by unpinned doors.

- b) The difference between the size of the largest and the smallest vehicle to be taken into account, must be used to determine the size of the curtains and the projection of the shelter.

A big difference means longer head curtains and a larger projection, to prevent for example, the top curtain from hanging far into the doorway when loading or unloading the highest vehicle.

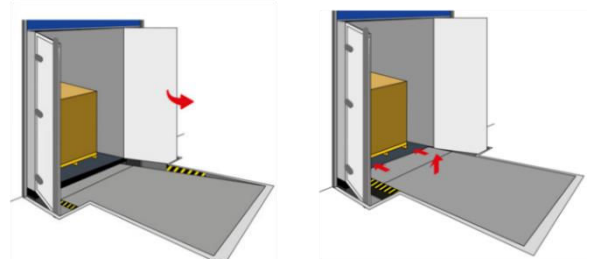
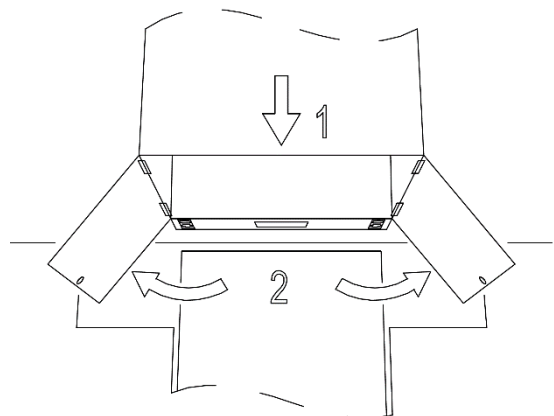
This difficulty may also be solved by using a roller head curtain instead of a fixed length curtain.



- c) The bottom corner of the sides of the shelter can be closed to improve the sealing. This is mostly done by means of (optional) sealing cushions that are mounted between the wall of the building, the shelter frame and the side curtain.

- d) Other than with the cushion shelter, the gap between the truck door and its side wall is not sealed with a curtain shelter. There are however special side curtain designs that help sealing this gap. But these may also have the disadvantage of limiting the accessibility of the loading area of the vehicle, as well as higher risk of being damaged by the transported load.

Another way of dealing with this problem, is a different docking process. Where normally the vehicle's doors are opened before it reverses into the dock, in this process the vehicle backs in with closed doors (1). This requires a special dock design, in which there is a leveller with a lower resting position, and a space provided in the dock floor on either side of the leveller for the doors to be opened (2). This is mostly done with refrigerated, or bonded warehouses, in order to be able to keep the door of the building closed until the vehicle is docked and the dock shelter is effectively sealing the gap.





- e) The vehicle door design, including top lids, may contain sharp parts that pose the risk of damaging the curtains when the vehicle move up and down when unloading or loading, or when driving out of the dock after loading or unloading. This may require special attention to selection of the curtain material and design, and require additional maintenance.
- f) Type II shelters can accommodate a wide range of vehicle sizes because of large curtains. When the shelter design is not properly tailored to the usage situation, this can result in the side curtains being damaged because they may become stuck between the dock bumper and the vehicle, or the top curtain between the doors when the doors are closed while the vehicle is docked (see d)). This will result in the top curtain being torn off when the vehicle leaves the dock.
- g) Curtain shelters are more prone to damage, or loss of sealing efficiency caused by winds. Particularly where the design of the building is likely to cause vortex winds, or where strong gusts of wind can occur such as in exposed environments, special attention should be paid to the choice of shelter type and the materials used.

### Type III Shelter – Touch Seal

#### What is a Type III Shelter

Similar to the type II shelter, the inflatable shelter has a closed frame which functions as a casing (B). Instead of curtains, this shelter has inflatable airbags (A) that are mounted on the inside of the sides and the top of the frame.

The deflated seals are commonly stored behind small side curtains (C), which help guide the air bags into an out-of-sight resting position, and may have markings to help guide the reversing vehicle into position.

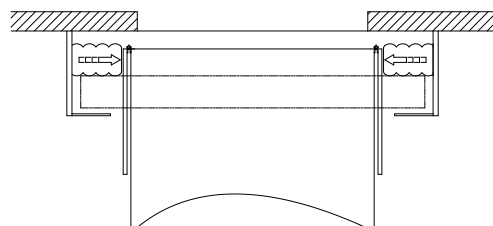
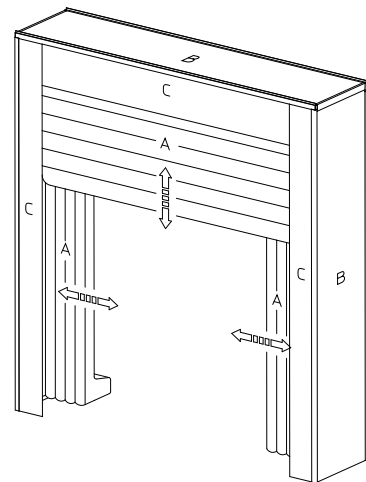
The air bags are inflated by a blower which stays active during the loading/unloading process.

When the blower is switched off, the seals are automatically returned to the stored position by means of e.g. counterweights or springs.

When the seals are inflated, they approach the vehicle from the sides and the top until they touch it.

That's why this shelter can be described as having a 'touch seal'.

Other than with the cushion and curtain shelter, with an inflatable shelter during the sealing process, *the vehicle is stationary and the seal moves towards the vehicle.*



### **When to Use an Inflatable Shelter**

- When a wide range of vehicle sizes has to be accommodated.
- When the full inside width and height of the vehicle must be accessible.
- When the best available sealing combined with a wide range of vehicles is mandatory.

### **Typical Properties**

- Cost index: **€€€€€**
- Provides a virtually airtight contact with the vehicle body, and reduces the ingress of water via the roof of the vehicle.
- Ideal for 'closed door docking' at temperature controlled warehouses.
- Inflated seals stay clear of the load opening, giving optimum accessibility and maximum working space.
- Less suitable for trucks with air suspension.
- Suitable in case of inclined or declined vehicle approach.
- Wide variety of curtain sizes, materials and customizations possible.
- Ability to handle trucks with a top lid

### **More to Consider**

- a) When a vehicle backs in correctly i.e. within the markings on the front of the side curtains, the seal is most efficient. Correct alignment of the vehicle helps to prevent uneven wear and may prolong life. Off-centre backing in may lead to damage of the deflated bags and the shelter casing. This risk can be reduced by the use of wheel guides.
- b) Type III shelters have a 'drive system', which makes them machines according to the EU Regulation on Machinery. Therefore the design and construction have to meet the relevant essential health and safety requirements set out in Annex III of this Regulation. This has to be demonstrated by the conformity assessment procedure, and confirmed with a declaration of conformity.
- c) When a vehicle leaves the dock while the seals are still in contact, the shelter may get seriously damaged. Therefore the air bags have to be deflated before the vehicle leaves the dock. The risk can be reduced by a vehicle restraint system as part of an integrated system for the inflatable shelter, dock leveller and loading door. A cheaper method can be a simple traffic light system.
- d) Any projecting components on a vehicle may cause additional wear or increased maintenance costs during the up and down movement of the vehicle during the loading process, or the raising and lowering of air suspension (if done with inflated seals).

e) The difference between the size of largest and smallest vehicle to be taken into account, must be used to determine the size of the air bags and the projection of the shelter. A big difference means amongst other things a longer head airbag. When in this case loading or unloading the lowest vehicle, the lateral stability of this head airbag may be insufficient, leading to loss of contact between top and side bags, thus causing reduction of the sealing efficiency.

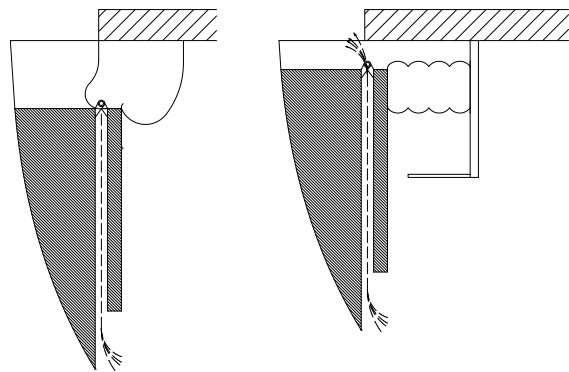
A similar problem may occur when a forklift truck leaves the load area of the truck, causing a sudden upward movement which forces the airbag to deflate. But with the still active blower there is too much resistance to get rid of the air, causing the airbag to buckle and losing contact with the side bags. This may be solved by e.g. a guide at the sides, that prevents the head air bag from buckling.

f) The bottom corner of the sides of the shelter can be closed to improve the sealing. This can also be done in case of an inflatable shelter by means of (optional) sealing cushions that are mounted between the wall of the building, the shelter frame and the side curtain. It is also possible to do it with inflatable bottom corner cushions integrated into the side bags.

g) Other than with the cushion shelter, the gap between the truck door and its side wall is not sealed with an inflatable shelter (and the type II wipe seal) when the truck is docked with open doors. The seals will touch the doors.

Inflatable shelters are most suitable for the different ‘closed door’ docking process mentioned under the curtain shelter. Where normally

the vehicle’s doors are opened before it reverses into the dock, in this process the vehicle backs in with closed doors. This requires a special dock design, in which there is a leveller with a lower resting position, and a space provided in the dock floor on either side of the leveller for the doors to be opened. This is mostly done with refrigerated warehouses, in order to be able to keep the door of the building closed until the vehicle is docked and the dock shelter is effectively sealing the gap.



## **Type IV – Combined Seal Types**

### **What is a Type IV Shelter**

These shelters have a combination of different seal types, as well as customized seals. All combinations are possible, and have their own specific benefits, meeting the demands of specific circumstances.

For example, the combination of side cushions (type I) with an inflatable top seal (type III), provides optimal sealing in case of small vehicle width variation but larger vehicle height differences.

### **When to use a Hybrid Shelter**

- When specific vehicles like Vans, or a large range of vehicles like Double Deckers down to 7.5 tonne have to be loaded or unloaded.
- When the goods or the loading/unloading process requires special seals.
- When a combination of benefits provides the most cost effective solution.

### **Typical Properties**

- Cost index: **€€€ / €€€€€**
- In specific cases the most cost effective solution
- More effective seal because cut-to-size
- In case of Vans, prevents damage of the back of the Van

### **More to Consider**

- a) An example of a process that requires a specific solution, is the transport of hanging goods that are forwarded on conveyor systems. There, the top of the loading opening needs to be clear. When there is no, or little variation in width of the vehicles, the side seals can be cushion types and the head seal an inflatable airbag, or a roller curtain, thus providing the most effective seal.
- b) The hybrid type shelter for Vans is an example of a solution for specific vehicles. Vans are (much) smaller than trucks/trailers and cannot effectively be sealed at the same docks that are used for trucks. The uniform width and shape of Vans, allow the use of specially shaped side foam pad seals, offering a perfect seal for the 180 (270) degrees opened doors. The inflatable head airbag or a roller curtain, seals the top of the Van leaving free access to the load opening.

## **Additional Remarks**

### **Water Ingress**

There is always a risk of ingress of water in case of e.g a declined vehicle approach and/or rainy weather with strong winds. This may require special provisions on the contact faces of the seals, with the goal to either stop the water or guide it to the sides. Specifically with shelters fitted with wipe seals and touch seals Type II, III and IV, the risk of ingress of water is higher when vehicles have air tabs on the rear edges of the trailer to reduce the drag. This might e.g. require a large(r) projection to get the seal past these protrusions.

### **Bottom Seals**

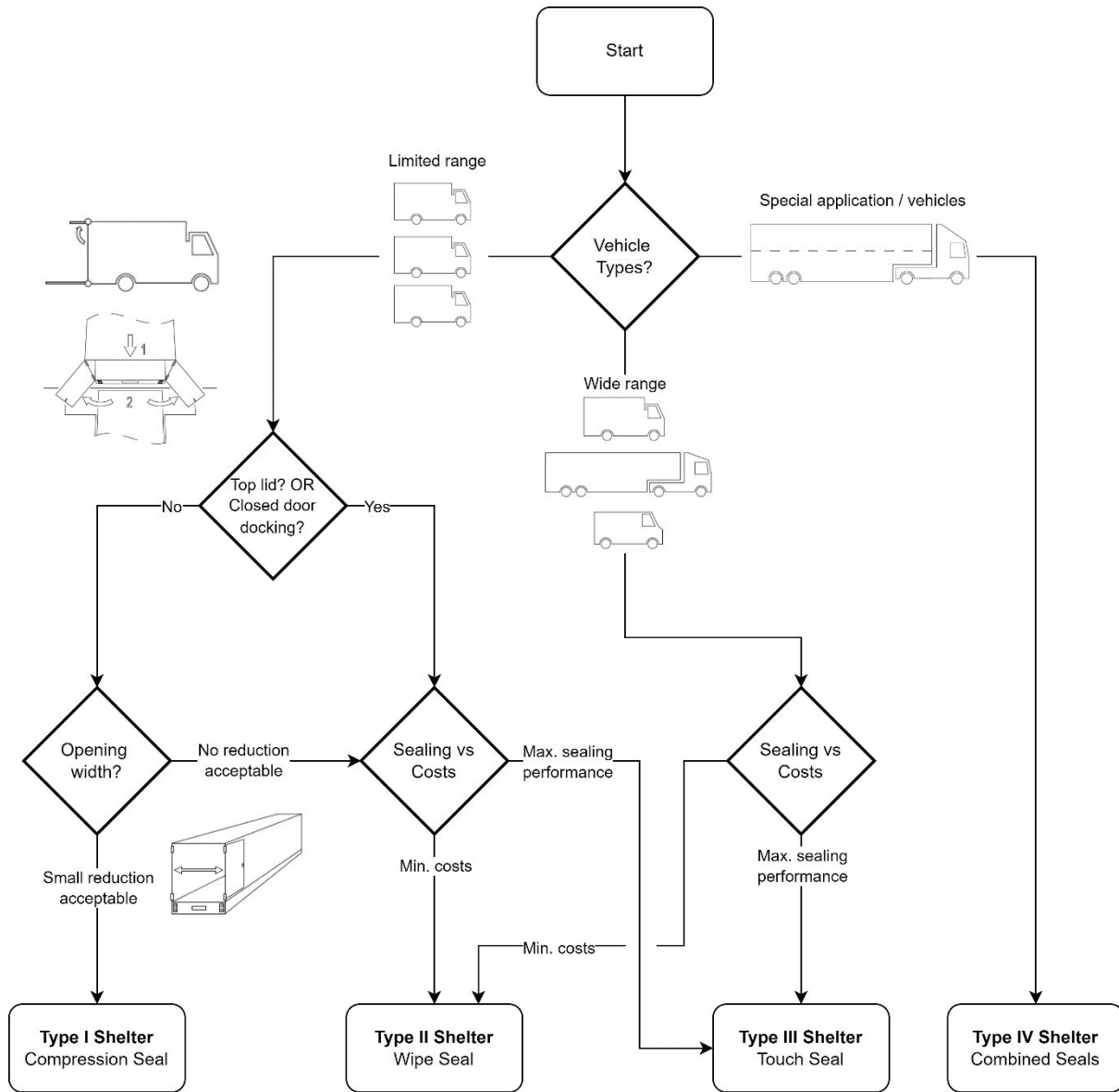
For all shelter types, the information above is related to three sided (top and 2 sides) sealing. The fourth side is the end of the truck (trailer) floor. Because this is the spot where the leveller lip is resting on the truck floor, sealing is difficult. Apart from that, the rear of the truck often has all kinds of

protrusions like sharp steel profiles, bumpers, rollers and door fittings. In situations where there is no dock leveller, the shelter may reach all the way down to the road, and applying a bottom seal is easier. Solutions like a removable bottom flap or, in case of a dock floor, a full width bottom pad with integrated bumpers, can provide a seal between the vehicle floor and the dock edge.

Bottom seals that will be combined with a leveller may require a special dock design that includes removable bumpers, and a seal that can follow the movements of the vehicle and leveller during loading and unloading, as well as withstand the contact with the before mentioned protrusions at the rear of the vehicle floor and nevertheless seal the gap.

# Appendix

## Shelter Type Selection Flowchart




**Note:**

The purpose of this flow chart is to provide an impression of basic factors that might determine the choice of shelter type.

The scope of this document is however quite varied and there are multiple conditions and vehicle types that can lead to an alternative choice.

Always contact a local technical sales organization or installer for professional advice.



The recommendations and advice contained in this Guidance Note are based on specifications, procedures and other information that have been collected from the FEM from its members. They represent what is, as far as FEM is aware, the best available data at the time of publication on the instruction and use of the equipment concerned in the general conditions described and are intended to provide guidance for such use.

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