الهيئة السعودية للمواصفات والمقاييس والجودة

Saudi Standards, Metrology and Quality Org (SASO)

SASO/CD 32181 (E)

السيارات - حواجز الحماية الجانبية للشاحنات والمقطورات

Motor Vehicles-Lateral Underrun Protective Devices for Trucks and Trailers

ICS: 43.040.60

مقدمة

قامت بالهيئة السعودية للمواصفات والمقاييس والجودة بإعداد مشروع المواصفة القياسية السعودية " السيارات - حواجز الحماية الجانبية للشاحنات والمقطورات " عن طريق الفريق الفني لمركبات الطرق بعد استعراض المواصفات القياسية العربية والأجنبية والدولية والمؤلفات المرجعية ذات الصلة على أن تلغي هذه المواصفة القياسية السعوديةSASO GSO 2113:2011.

Foreword

The Saudi Standards, Metrology and Quality Organization (SASO) has prepared the draft of Saudi Standard " Motor vehicles- Lateral Underrun Protective Devices for Trucks and Trailers " by technical committee of road vehicle based on relevant ADMO, International and National foreign Standards and references. These standards will be replace SASO GSO 2113:2011.

Motor vehicles - Motor Vehicles-Lateral Underrun Protection Devices for Truck and Trailer

1- SCOPE AND FIELD OF APPLICATION

This standard is concerned with the requirements for the lateral protection devices (side guards) of vehicles categories N2, N3, O3 and O4 [(1)];

This standard does not apply to tractors for semi-trailers and vehicles designed and constructed for special purposes where it is not possible for practical reasons to fit such lateral protection

2- COMPLEMENTARY REFERENCES

2.1 SASO 469 “Motor Vehicles - Weights and Dimensions”.

2.2 SASO Technical Regulation for Front, Rear and Side Barriers for Trucks and Trailers.

3- DEFINITIONS

3.1 Motor vehicle: A vehicle, excluding motorcycles or trailers, operated by means of a motor without dependence on rails, cables or similar guides.

3.2 Truck: A motor vehicle intended for carrying goods. It may also tow a trailer.

3.3 Maximum weight: The weight stated by the vehicle manufacturer to be technically permissible.

3.4 Approval of a vehicle: The approval of a complete vehicle type with regard to its lateral protection;

3.5 Vehicle type: A category of vehicles which do not differ with respect to the essential points such as the width of the rear axle, the overall width, the dimensions, the shape and the materials of the whole side of the vehicle (including the cab if fitted), and the characteristics of the suspension in so far as they have a bearing on the technical requirements specified in this standard.

3.6 Maximum mass: The mass stated by the vehicle manufacturer to be technically permissible (this mass may be higher than the "permissible maximum mass" laid down by the national administration);

3.7 Unladen mass: The weight of the vehicle in running order, unoccupied and unladen, but complete with fuel, coolant, lubricant, tools and spare wheel, if supplied by the vehicle manufacturer as standard equipment;

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(1) **N2:** Vehicles used for the carriage of goods and having a maximum mass exceeding 3.5 tonnes but not exceeding 12 tonnes. (Commercial Truck)
N3: Vehicles used for the carriage of goods and having a maximum mass exceeding 12 tonnes. (Commercial Truck)
O3: Trailers (including semi–trailers) with a maximum mass exceeding 3.5 tonnes, but not exceeding 10 tonnes
O4: Trailers (including semi–trailers) with a maximum mass exceeding 10 tonnes

3.8 Unprotected road users: The pedestrians, cyclists or motor cyclists using the road in such a way that they are liable to fall under the sides of the vehicle and be caught under the wheels.

3.9 The definitions in SASO Technical Regulation for Front, Rear and Side Barriers for Trucks and Trailers.

4- REQUIREMENTS

The following shall be met.

4.1 General

4.1.1 All vehicles carrying goods, including tankers, mobile cranes, mobile workshops, trailers and semi-trailers shall be constructed and equipped in such a way as to offer, throughout their length, at both sides effective protection to unprotected road users against the risk of falling under the sides of the vehicle and being caught under the wheels. This shall be complied by providing one of the following:

4.1.1.1 The vehicle is equipped with a special lateral protective device (side guards) according to the technical requirements specified in item 4.5.

4.1.1.2 If the vehicle is so designed and/or equipped at the side that by virtue of their shape and characteristics, its component parts can be incorporated and/or regarded as replacing the lateral protective device and comply with the requirements specified in item 4.5.

4.2 Material

4.2.1 The mechanical properties of the underrun protective device's material shall be either hot rolled high strength Steel with a minimum yield strength of 350 N/mm^2 and minimum tensile strength of 480 N/mm^2 or high strength Aluminum Alloy with a minimum yield strength of 350 N/mm^2 and minimum tensile strength of 480 N/mm^2.

4.2.2 The minimum mechanical properties of bolts should be made of Low-carbon martensite with 10.9 class bolt with minimum proof strength of 830 N/mm^2, minimum yield strength of 940 N/mm^2 and minimum tensile strength of 1040 N/mm^2.

4.3 Welding

4.3.1 Welding could only use between the UPD and the bridge/support. It is strictly prohibited to weld the UPD or the bridge/support to the chassis of the truck or trailer.

4.3.2 Welding should be fully welded. (Figure 1)

4.3.3 Welding thickness (h) should be compatible between the bridge/support and the UPD. (Figure 2)

4.3.4 The minimum requirements for the welder wire's material used in welding is AWS electrode number (E90xx), with minimum yield strength of 531N/mm^2 and minimum tensile strength of 620N/mm^2.

4.4 The retro-reflective marking (Tape)

4.4.1 The retro-reflective marking (Tape) should be on the UPD, so that it can be seen at night or when the visibility is not clear.

4.4.2 The retro-reflective marking (Tape) should be yellow. The width of a side tape material shall be 50 mm or 100mm, with tolerance +2 mm depend on the type of trucks or trailers. It should be complied with the Saudi Standard (SASO 2913).

4.4.3 Width of the Retro-Reflective Marking (tape) used on the lateral underrun protective device for trucks less than 12 tons and trailers less than 10 tons is 50 mm, and 100 mm for trucks greater than 12 tons and trailers greater than 10 tons.

4.5 LUPD Technical requirement

4.5.1 The side guard shall not increase the overall width of the vehicle.

4.5.2 The main part of side guard's outer surface shall not be more than 120 mm in board from the outer most plane of the vehicle. (Figure 4)

4.5.3 The side guards forward end may be turned inwards in accordance with the requirements mentioned below.

4.5.4 The side guard's rearward end shall not be more than 30 mm in board from the outermost edge of the rear tyres over at least the rearmost 250 mm. (Figure 4)

4.5.5 The outer surface of the guard shall be smooth, and so far, as possible continuous from front to the rear.

4.5.6 Adjacent parts may overlap, provided that the overlapping edge faces rearwards or downwards or a gap of not more than 25mm measured longitudinally may be left, provided that the rearward part does not protrude outboard of the forward part.

4.5.7 Domed heads of bolts or rivets may protrude beyond the surface to a distance not exceeding 10 mm and other parts may protrude to the same extent provided that they are smooth and rounded.

4.5.8 The external edges and corners shall be rounded with a radius not less than 2.5 mm.

4.5.9 The device may consist of a continuous flat surface or of one or more horizontal rails or a combination of surface and rails.

4.5.10 The rails used shall be not more than 300 mm apart. (Figure 5)

4.5.11 The rails used shall be not less than 50 mm high for vehicles having maximum mass less than 12 tons and trailers having maximum mass less than 10 tons.

4.5.12 The rails used shall be not less than 100 mm high for vehicles having maximum mass more than 12 tons and trailers having maximum mass more than 10 tons.

4.5.13 The forward edge of the side guard shall be constructed and positioned in such a way that it will comply with the following:

4.5.13.1 On a motor vehicle: It shall not be more than 300 mm to the rear of the vertical plane perpendicular to the longitudinal plane of the vehicle and tangential to the outer surface of the tyre on the wheel immediately forward of the guard.

4.5.13.2 On a drawbar trailer: It shall not be more than 500 mm to the rear of the vertical plane perpendicular to the longitudinal plane of the trailer and tangential to the outer surface of the tyre on the wheel immediately forward of the guard.

4.5.13.3 On a semi-trailer: It shall not be more than 250 mm to the rear of the transverse median plane of the support legs, if support legs are fitted, but in any case the distance from the front edge to the transverse plane passing through the centre of the kingpin in its rearmost position may not exceed 2.7m. Construction:

4.5.13.4 When the forward edge of the guard lies in an open space, the edge shall consist of a continuous vertical member extending the whole height of the guard, the outer and forward faces of this vertical member shall measure at least 50 mm rearwards and be turned 100 mm inwards in the case of trucks having maximum mass of 3.5 tons to 12 tons and trailers having maximum mass of 3.5 tons to 10 tons.

4.5.13.5 The outer and forward faces of this vertical member in item 4.5.13.4 shall measure at least 100 mm rearwards and be turned 100 mm inwards in the case of trucks having maximum mass exceeding 12 tons and trailers having maximum mass exceeding 10 tons.

4.5.13.6 On a motor vehicle if the forward edge of the guard which is 300 mm dimension falls within the cab, the guard shall be so constructed that the gap between its forward edge and the cab panels does not exceed 100 mm and it shall be turned in through an angle not exceeding 45^{o}.

4.5.13.7 On a motor vehicle if the forward edge of the guard which is 300 mm dimensions falls behind the cab and the side guard is extended forward to within 100 mm of the cab, then the provisions of the previous item shall be met.

4.5.13.8 On a central axle trailer: in the area forward of the transverse plane passing through the centre of the front axle but not more than the front of the bodywork, if any, to ensure the normal manoeuvrability of the trailer."

4.5.14 The rearward edge of the side guard shall not be more than 300 mm forward of the vertical plane perpendicular to the longitudinal plane of the vehicle and tangential to the outer surface of the tyre on the wheel immediately to the rear.

4.5.15 The lower edge of the side guard shall be not more than 450 mm above the ground at any point.

4.5.16 The upper edge of the side guard shall not be more than 350 mm below that part of the structure of the vehicle, cut or contacted by a vertical plane tangential to the outer surface of the tyres, excluding any bulging close to the ground, except in the following cases.

4.5.16.1 Where the plane in the item 4.5.16 does not cut the structure of the vehicle, then the upper edge shall be level with the surface of the load-carrying platform, or 950 mm from the ground whichever is the less.

4.5.16.2 Where the plane in item 4.5.16 cuts the structure of the vehicle at a level more than 1.3 m above the ground, then the upper edge of the side guard shall not be less than 950 mm above the ground.

4.5.16.3 On a vehicle specially designed and constructed, and not merely adapted, for the carriage of a container or demountable body, the upper edge of the guard shall be determined in accordance with any one of the items (4.5.16.1 and 4.5.16.2) mentioned above.

4.5.17 Components permanently fixed to the vehicle, e.g. spare wheels, battery box, air tanks, fuel tanks, lamps, reflectors and toolboxes may be incorporated in the guard, provided that they meet the dimensional requirements of this satandard. The requirements of items from 4.5.5 to 4.5.8 shall generally apply as regards gaps between protective devices and permanently fixed components.

4.6 Design

4.6.1 The side guards shall be rigid and shall be mounted securely without any vibration in normal use of the vehicle.

4.6.2 The side guard shall be made of metal material

4.7 The side guard shall not be used for the attachment of brake, air or hydraulic pipes.

5- MARKING

5.1 The marking shall be comply with SASO technical regulation forTechnical regulation For front, rear and Lateral Underrun Protective Devices for Trucks and Trailers.

6- DIMENSION SPECIFICATIONS

6.1 Measuring instruments

6.1.1 Dimensions measuring instrument

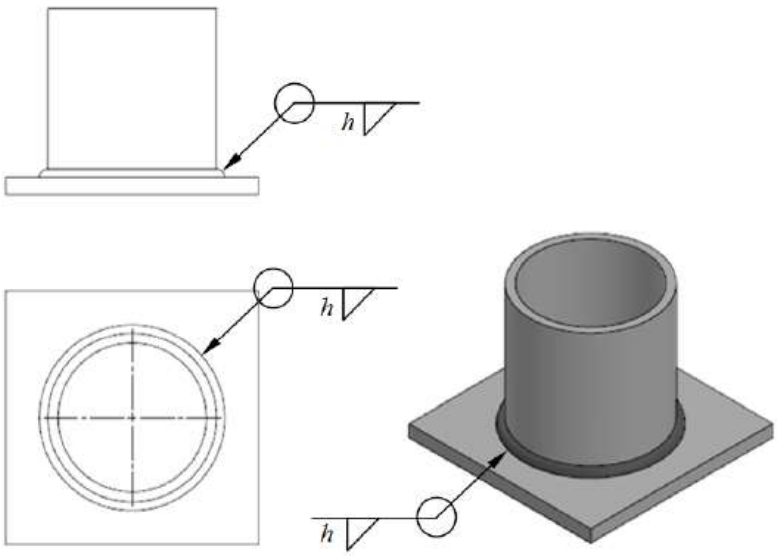
The instruments used shall permit measurement to an accuracy of ± 1 mm.

6.2 Approval Dimension Specifications

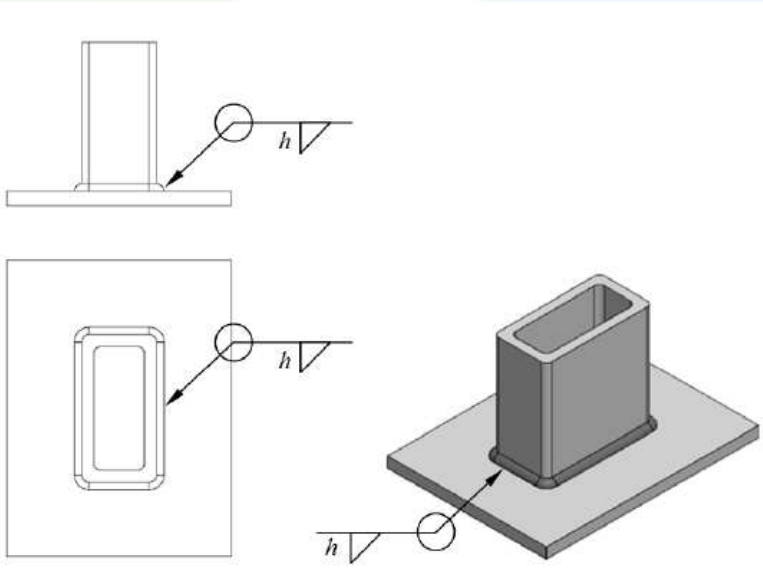
The following Dimension specifications design for lateral underrun protective devices shall be followed at Annex 1.

7- CRITERIA OF TECHNICAL CONFORMITY

7.1 The Lateral Underrun Protection Devices shall be considered complying with all the requirements of this standard when the withdrawn sample from the consignment or the supplied sample by the manufacturer, otherwise the front underrun protective device shall be considered noncomplying.



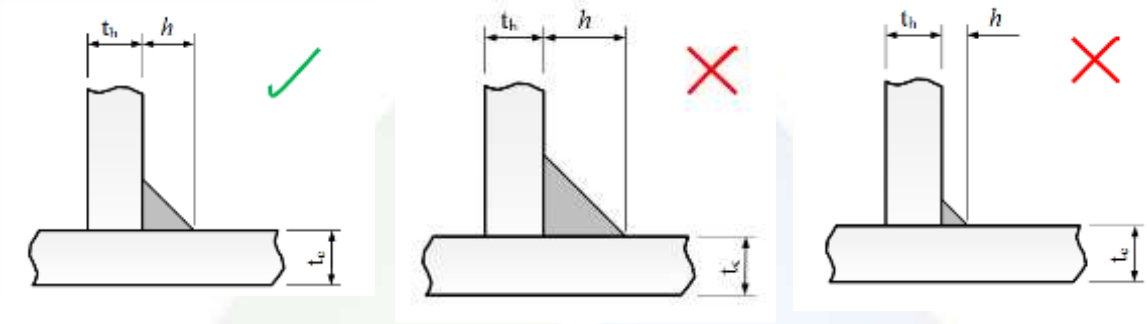
A) Welding a bar having a circular section to a flat surface.



B) Welding a bar having a rectangular section to a flat surface.

Knowing that (h) means welding thickness.

Figure 1: Approved welding shape



$t_C = h$ & $t_h = h$ when $t_h = t_C$
$t_C > h$ & $t_h = h$ when $t_C > t_h$

$t_C < h$ & $t_h < h$
Not a correct welding

$t_C > h$ & $t_h > h$
Not a correct welding

Where, h (welding thickness), t_c (thickness of the bridge or support) and t_h(thickness of the UPD)

Figure 2: Correct methods followed in welding.

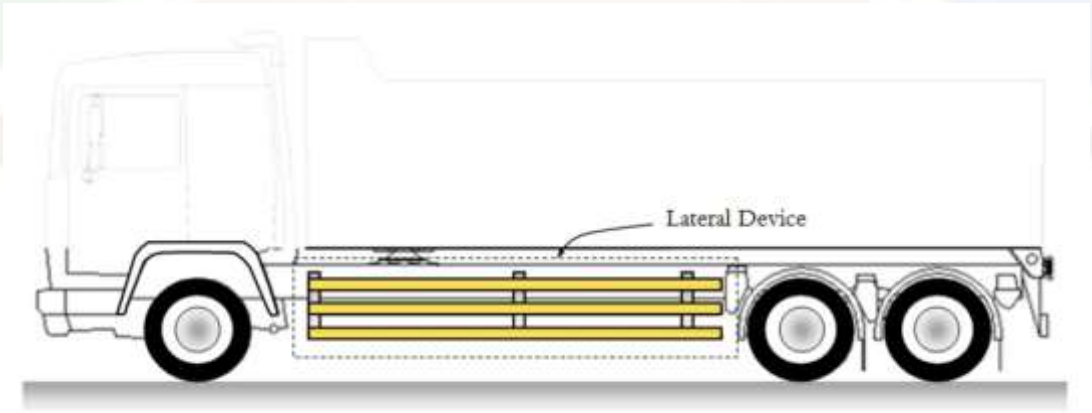


Figure 3: The way of fixing the Retro-Reflective tape on the lateral device of the truck

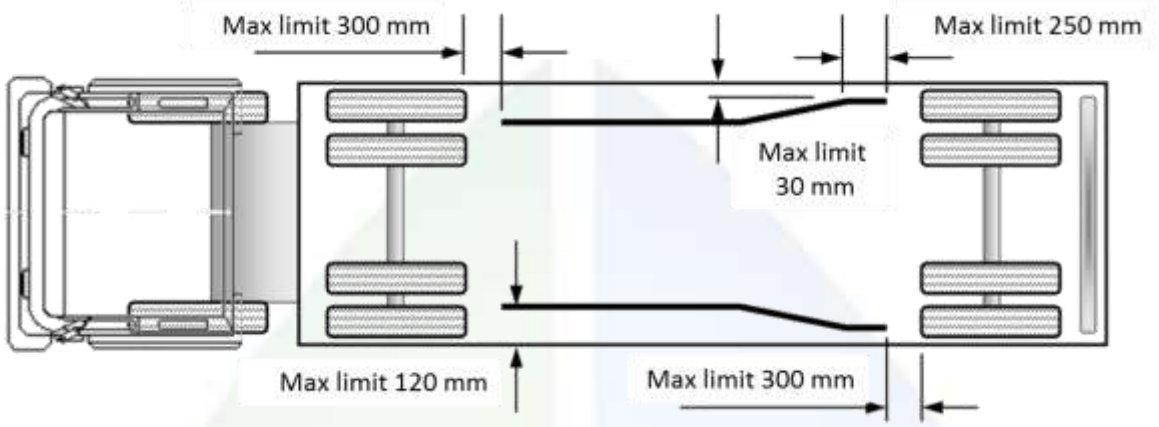


Figure 4: Top view of a truck showing the general specifications for LUPDs

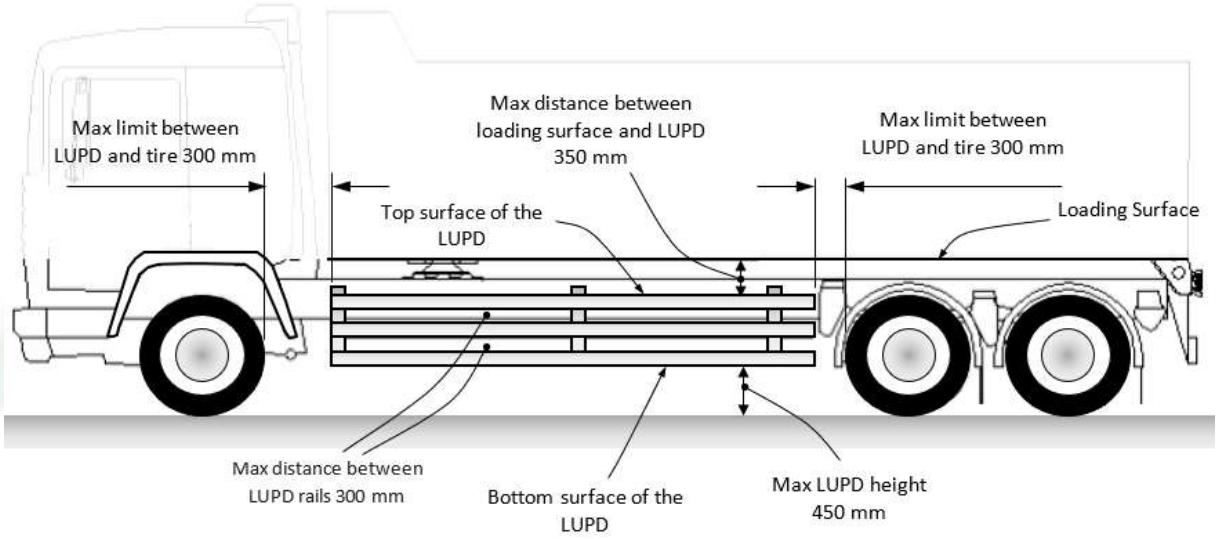


Figure 5: side view of a truck showing the general specifications for LUPDs

Annex 1

Approval Dimension Specifications

1. The following Dimension specifications design for lateral underrun protective devices shall be followed.

1.1 Visual inspection

The lateral underrun protective device shall be visually examined to check for exact dimensions, bolts type, welding standard, any damage, crack, sharp outer edge, and any apparent defects.

1.2 The mechanical properties of the underrun protective device's material shall be as follows:

Material Used	**Type**	**Min. Yield Strength**	**Min. Tensile Strength**
Steel	Hot Rolled	350 N/mm^2	480 N/mm^2
Aluminum Alloy	(Al-Cu Alloy)	350 N/mm^2	480 N/mm^2

1.3 General Dimensions of LUPD

1.3.1 The main cross-section area for the LUPD are shown in Figure 6.

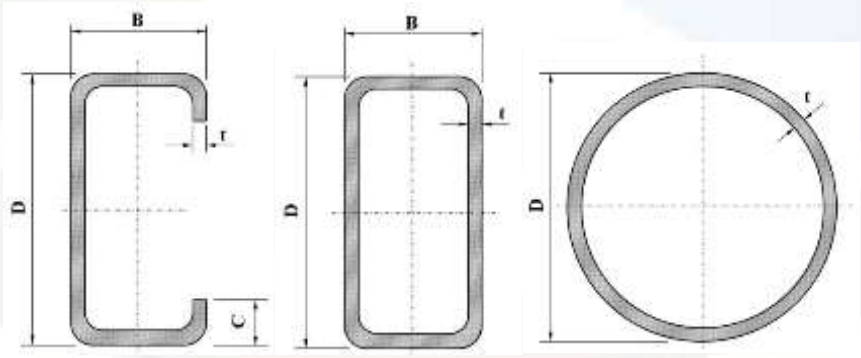


Figure 6: Main models of LUPD cross-sectional area.

1.3.2 Dimensions of cross-sectional area

For trucks with a weight less than 12 tones and trailers with a weight less than 10 tones.

Model Cross-sectional Area	D (mm)	B (mm)	C (mm)	minimum t (mm)
C-section	50	25	10	2.5
Rectangle section	50	25	-------	2.5
Round section	50	-------	-------	2.5

Table 1

For trucks with a weight more than 12 tones and trailers with a weight more than 10 tones.

Table 2

Model Cross-sectional Area	D (mm)	B (mm)	C (mm)	minimum t (mm)
C- section	100	50	20	3.0
Rectangle section	100	50	-------	3.0
Round section	100	-------	-------	3.0

1.3.3 Different Main Models of LUPDs

1.3.3.1 It consists of LUPD and the carrier bridge that connects the LUPD to the track or trailer chassis as shown in Figure 7.

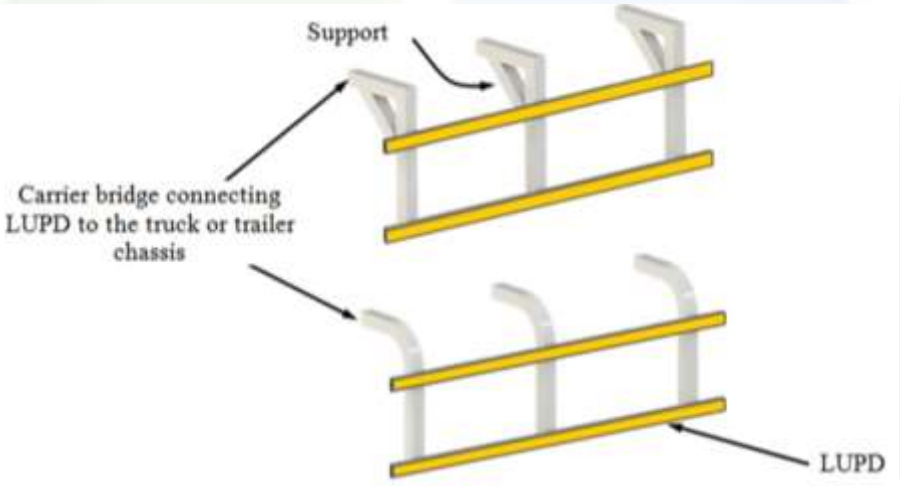


Figure 7: Model of LUPD for a truck or trailer.

LUPD distances between carrier bridge.

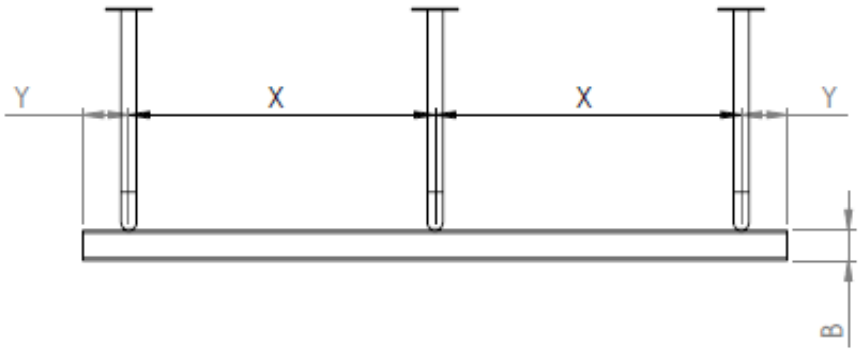


Figure 8: View showing the position of installing the LUPD to the carrier bridge

A table clarifies the position of installing the LUPD to the carrier bridge

Type of Material	**X (mm)**	**Maximum Y (mm)**
Steel	900 ± 100	500
Aluminum Alloy	900 ± 100	500

Table 3

1.3.3.2 Carrier Bridge Connecting LUPD to Truck or Trailer Chassis (Figure 9).

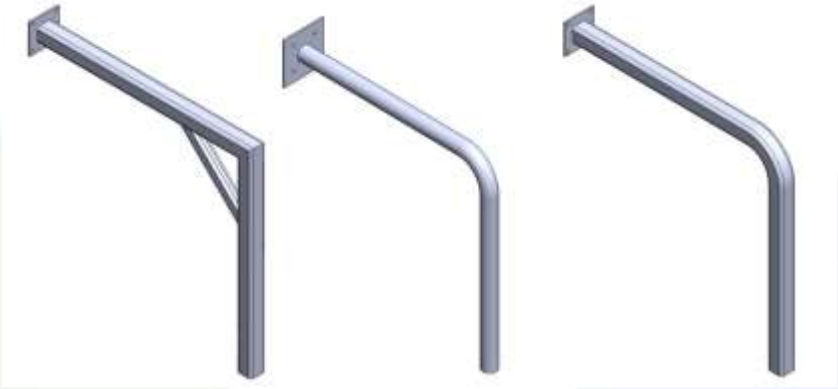


Figure 9: Carrier bridge models used to connect the LUPD to the chassis of the truck or trailer.

Measurements of the underrun protective device carrier bridge

Cross-sectional area of barrier bridge	Minimum d (mm)	Minimum t (mm)
Square Section	40 x 40	3
Round Section	40	3

Table 4

1.3.3.3 Connecting LUPD Parts

Connection can be done by welding or using bolts as clarified in item 4.2. For bolts, they should be as follows:

Trucks with a weight less than 12 tones Trailers with a weight less than 10 tones		Trucks with a weight more than 12 tones Trailers with a weight more than 10 tones	
Number of Bolts	Bolt Diameter (mm)	Number of Bolts	Bolt Diameter (mm)
4	12-15	4	15-18

Table 5

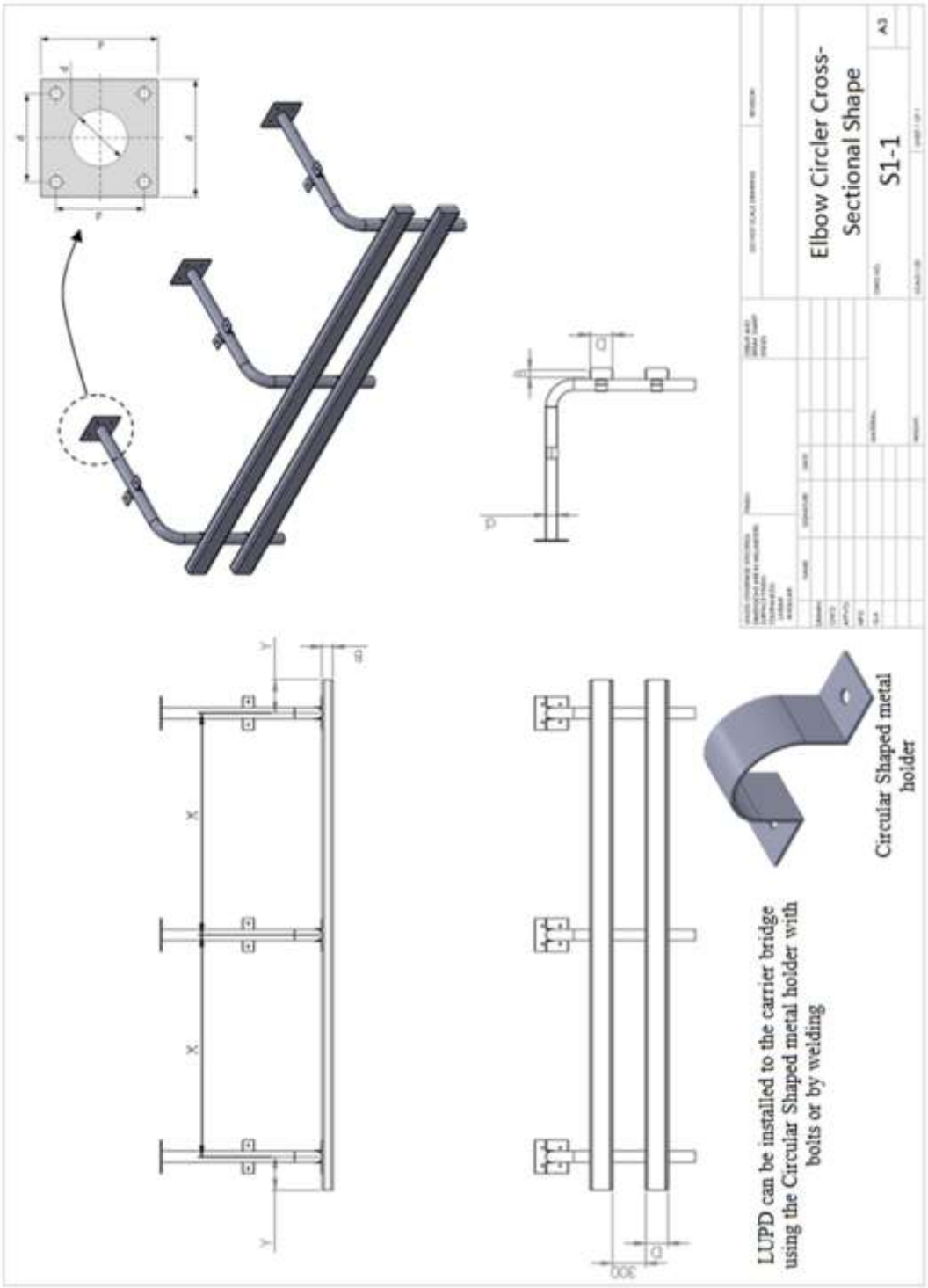
1.3.3.4 Models of Truck and Trailer LUPDs (Figure 8).

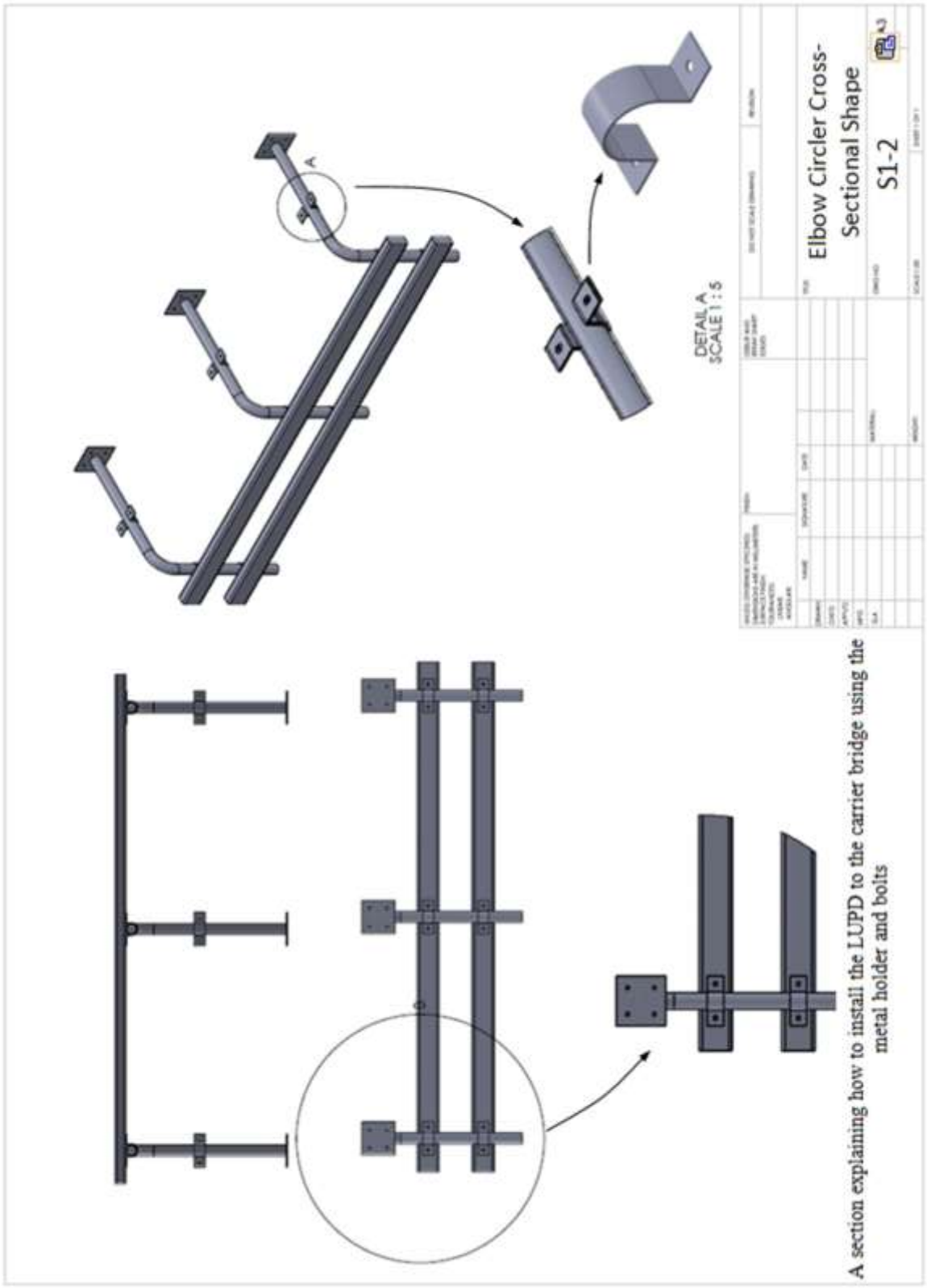
Figure 8: Models of lateral truck and trailer **LUPD**s

1.3.3.5 For further details, see (Annex 2 and 3).

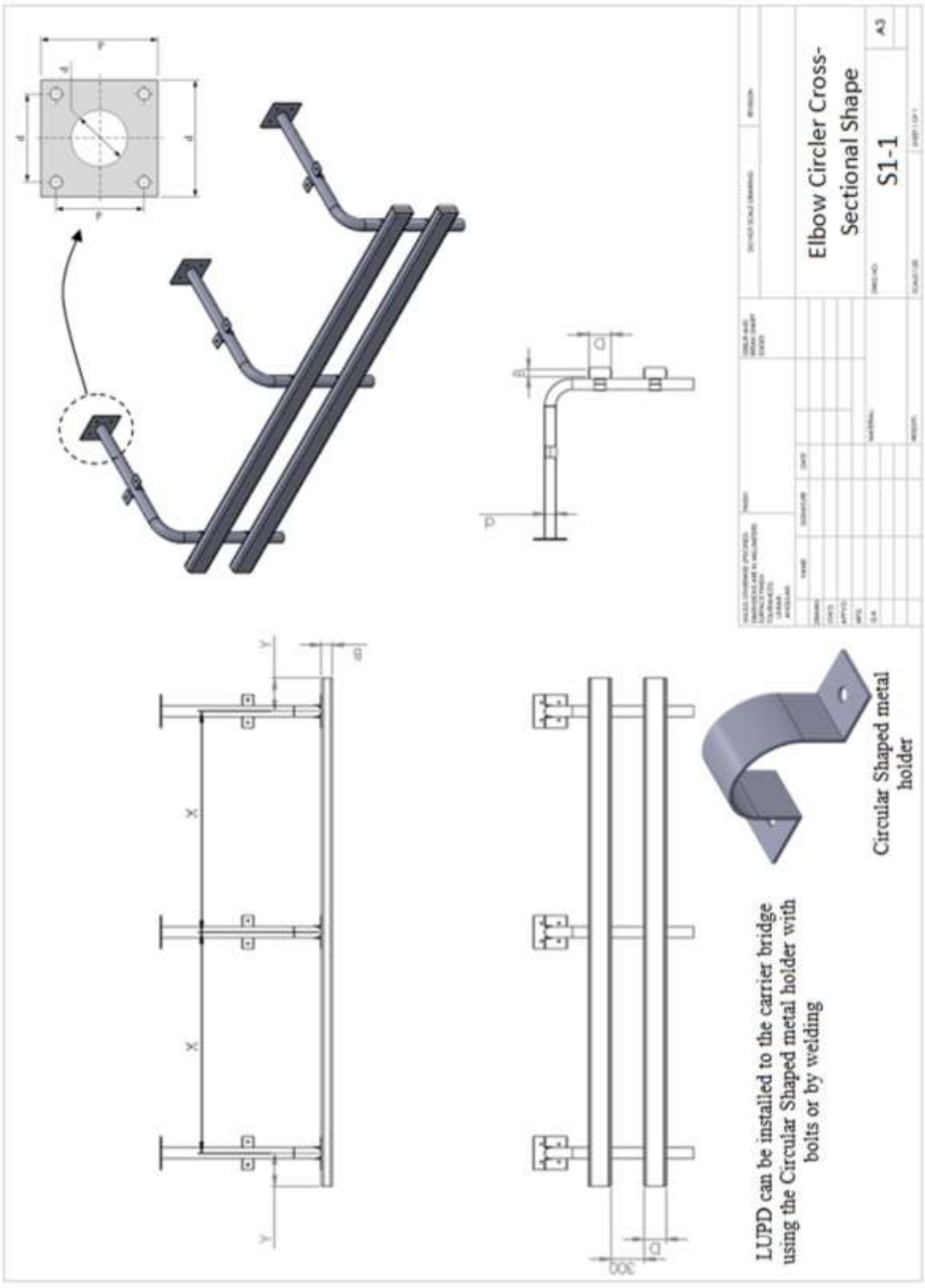
Annex 2

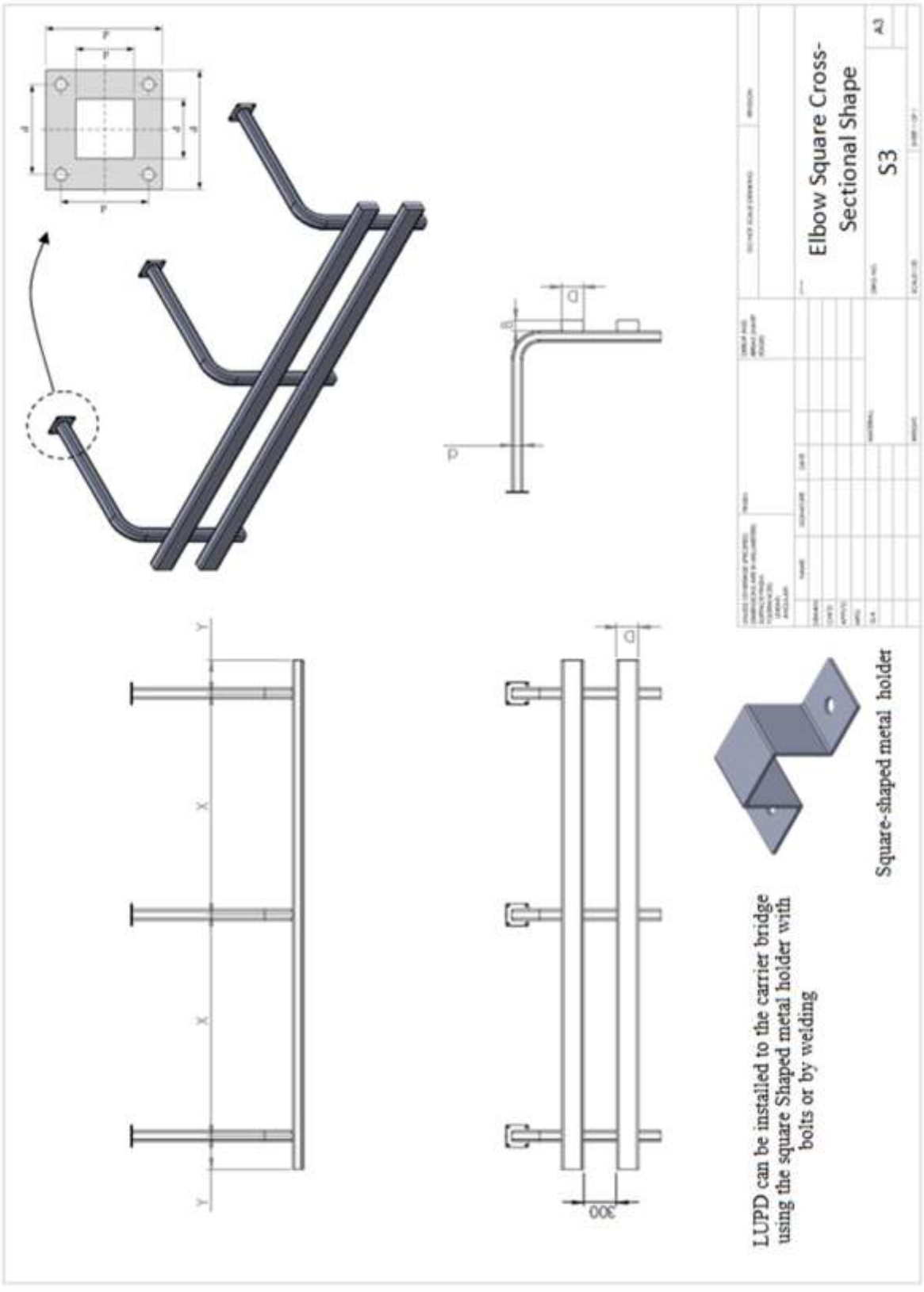
Sample Models of LUPDs in Truck





A section explaining how to install the LUPD to the carrier bridge using the metal holder and bolts


Elbow Circler Cross-Sectional Shape
S1-1
A3
Circular Shaped metal holder
LUPD can be installed to the carrier bridge using the Circular Shaped metal holder with bolts or by welding


Elbow Square Cross-Sectional Shape
S3
A3
Square-shaped metal holder
LUPD can be installed to the carrier bridge using the square Shaped metal holder with bolts or by welding
300

Annex 3

Implementing UPDs for Some Special Cases Types of Trucks and Trailers

Case 1: When the cab is narrower than the rear of the vehicle

a. When the cab is narrower than the truck chassis, the forward edge of LUPD shall not be less than 45° towards the cab to protect unprotected road users from the sharp edge that protrudes out from the cabin outer plane as shown in Figure 3.1.

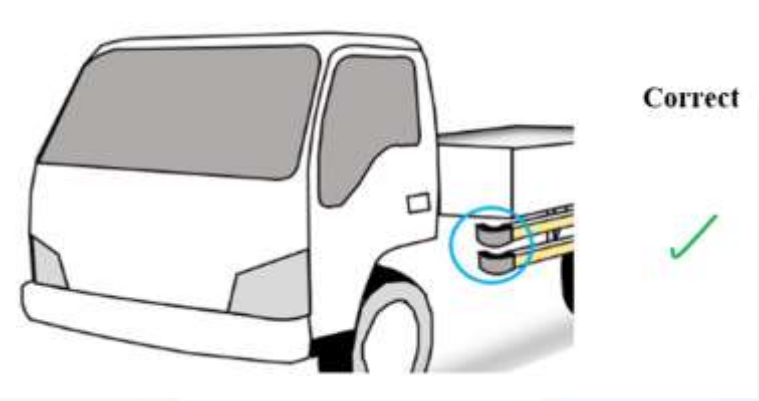


Figure 3.1

b. Putting the LUPD straight with no angle may harm unprotected road users and cause injuries as shown in Figure 3.2.

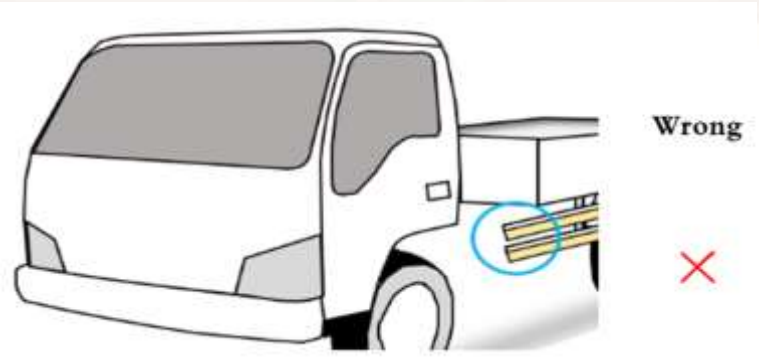


Figure 3.2

Case 2: If there is apart from the cab on the same plane as LUPD

a. If there is apart from the cab on the same plane as LUPD, no installation of LUPD is required and the part is treated as LUPD as shown in Figure 3.3.

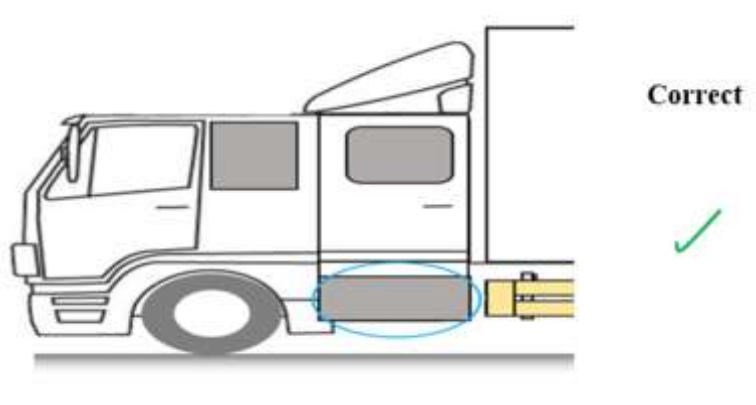


Figure 3.3

b. Putting LUPD over the part from the cab is not necessary and it leads to increasing the width of the vehicle as shown in Figure 3.4.

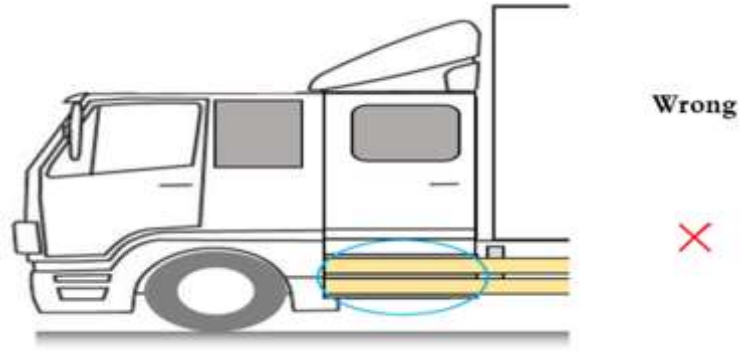


Figure 3.4

Case 3: When there is space below the cab

a. In case there is an unprotected space under the cab, LUPD is extended while leaving no more than 300mm to protect unprotected road users as in Figure 3.5

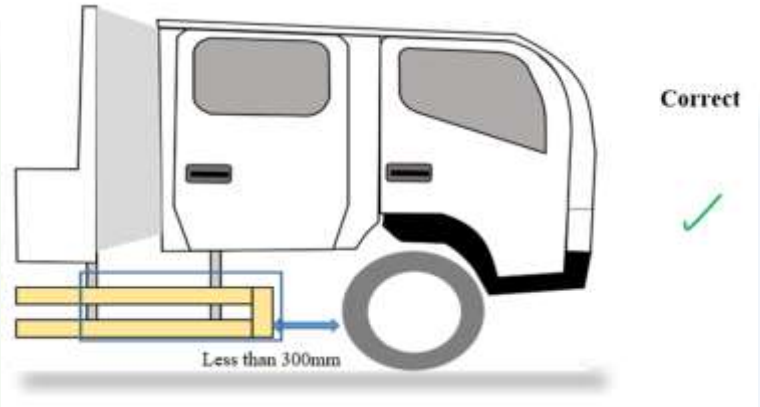


Figure 3.5

b. If the distance between LUPD and outer surface of the front tire is more than 300mm and vertical distance from the cab to ground is more than 450mm, it may harm unprotected road users as in Figure 3.6.

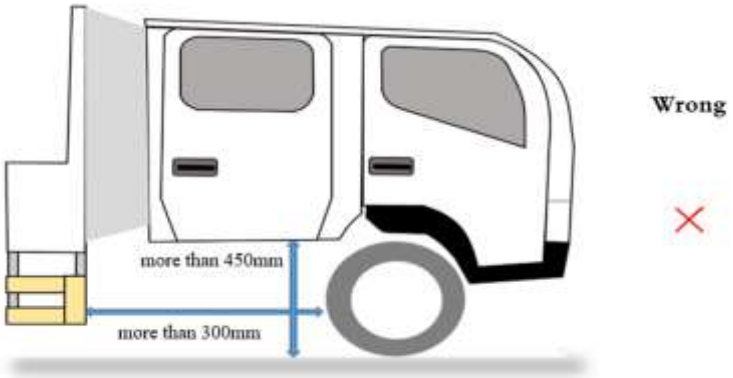


Figure 3.6

Case 4: If the truck box is in the same plane as LUPD

a. If there is a truck box on the same plane as LUPD, that box is treated as LUPD and if the distance between the box and outer surface of the front tire is less than 300mm, there is no need to extend the length of LUPD as in Figure 3.7.

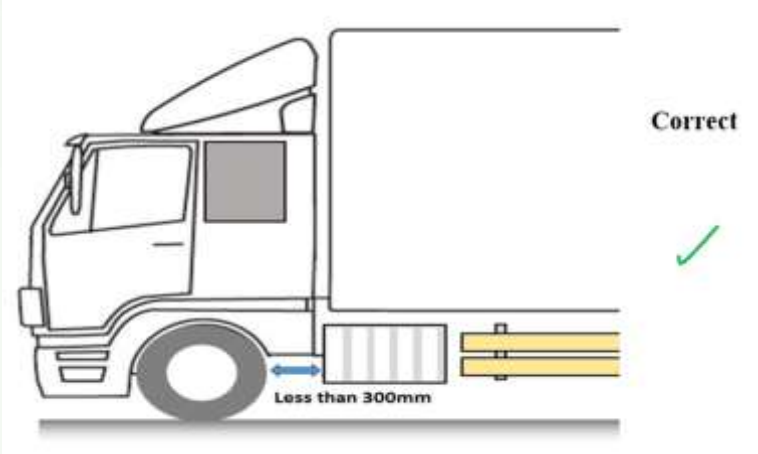


Figure 3.7

b. There is no need to install an extra part for the LUPD after the truck box towards the front tire if the distance between them is less than 300mm as shown in Figure 3.8.

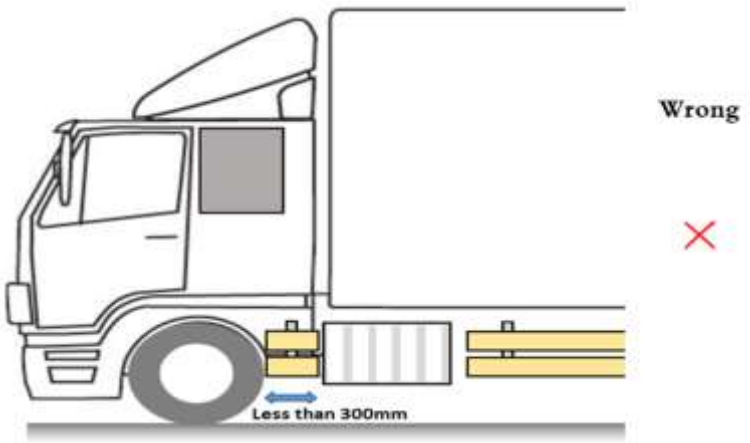


Figure 3.8

Case 5: Extending LUPD after the rear tire when needed

a. When the distance after the outer surface of the rear tire is more than 300mm, an extra LUPD is installed to avoid any damages that may occur as in Figure 3.9.

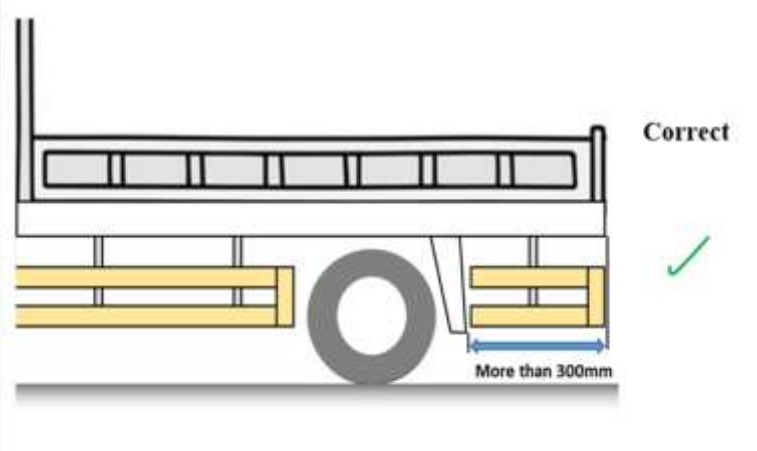


Figure 3.9

b. When the area behind the rear tire is more than 300mm as shown in Figure 3.10. Leaving it without LUPD may harm unprotected road users.

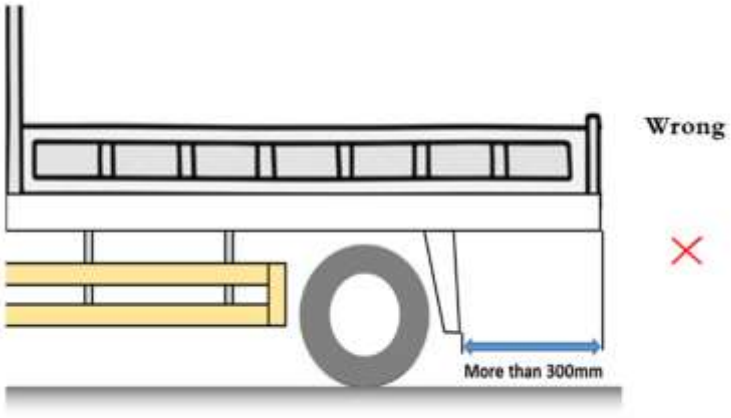


Figure 3.10

Case 6: Dealing with distance between the vehicle tires

a. In case there are spaces between tires, it can be dealt with as follows:
   1. If the distance is more than 300mm, LUPD is installed as shown in Figure 3.11.
   2. If the distance is less than 300mm, no need to install LUPD as shown in Figure 3.11

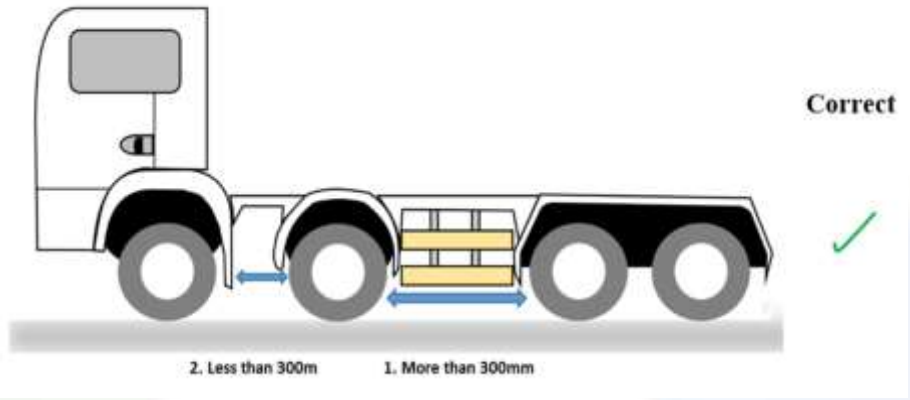


Figure 3.11

b. Putting an LUPD between tires when distance is less than 300mm is not necessary as it shows in Figure 3.12

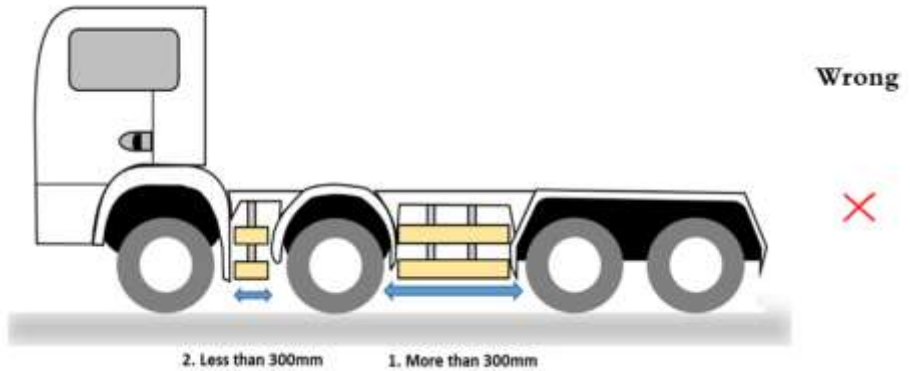


Figure 3.12

Case 7: Some parts of the truck that can be treated as LUPD

a. Some parts of the truck can be treated as LUPD and nothing is added if it were on the same plane as LUPD as shown in Figure 3.13 such as:
   1. Cylindrical air tank.
   2. Silencer protection box.
   3. There is a small area between air tank and the rail that does not require LUPD due to its small size.

Figure 3.13

b. Installing a LUPD between the air tank and the rail is not necessary as it shows in Figure 3.14.

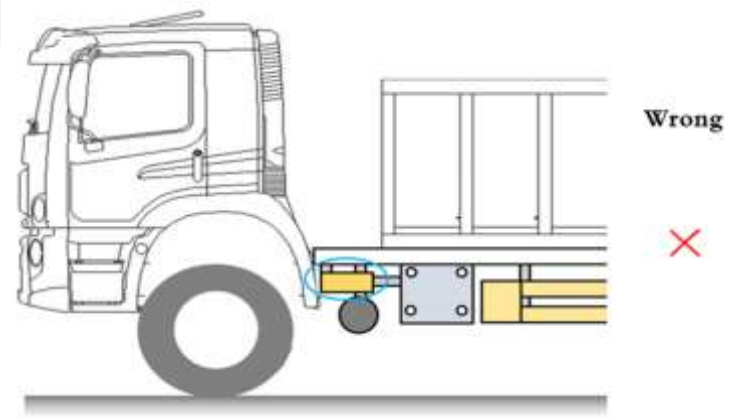


Figure 3.14

Case 8: Some truck parts that cannot be treated as LUPD and needs a LUPD

a. The toolbox can be considered as LUPD but it is not enough and a LUPD must be installed underneath it as in Figure 3.15.

Figure 3.15

b. Not installing a LUPD may harm unprotected road users and that because it exceeds the allowable distance as shown in Figure 3.16

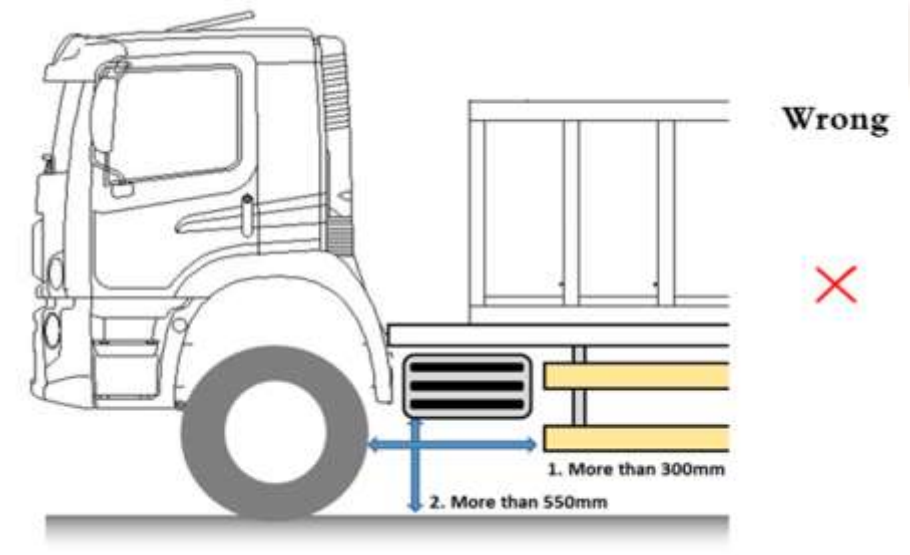


Figure 3.16

Case 9: The possibility of a disconnected LUPD if required

a. LUPD sometimes can be cut if necessary as it shows in Figure 3.17, because of a reflector light as in 1 or the opening of a water or fuel tank as in 2.

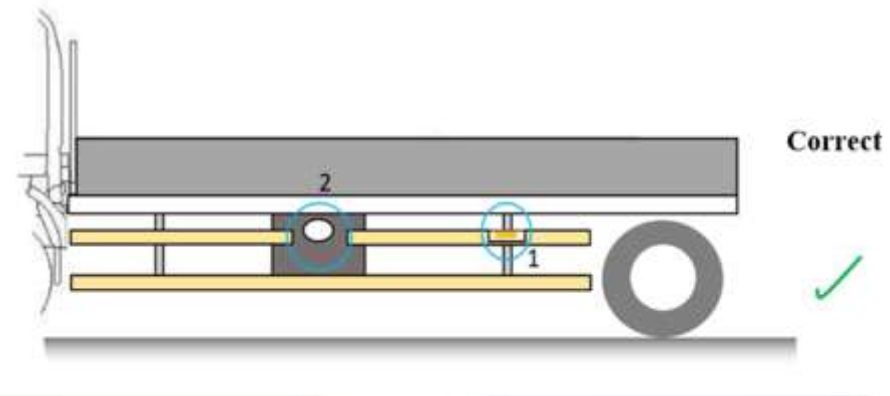


Figure 3.17

b. Trying to add an extra disconnected LUPD is not necessary or beneficial as shown in Figure 3.18

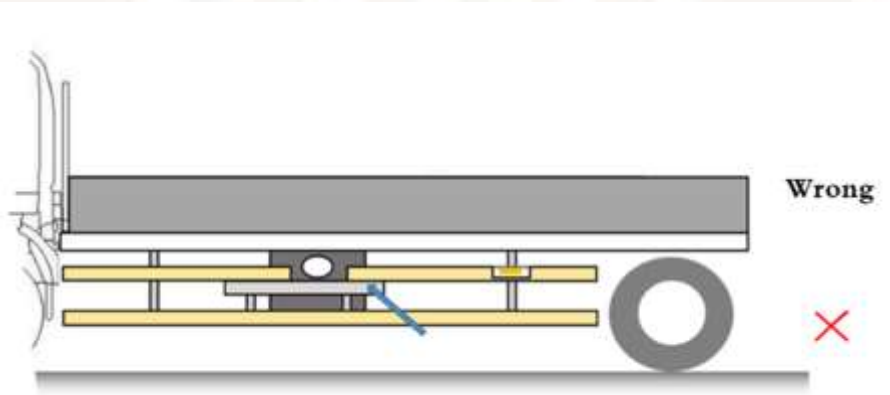


Figure 3.18

Case 10: When a LUPD is already installed by the truck manufacturers

a. In case the truck comes with a pre-installed LUPD that fulfills the requirements, then there is no need to install another LUPD as in Figure 3.19.

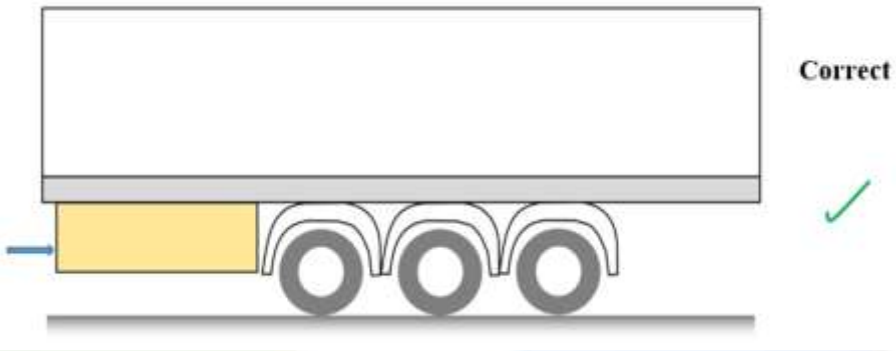


Figure 3.19

b. Installing a LUPD when one is already installed on the truck is unnecessary as in Figure 3.20.

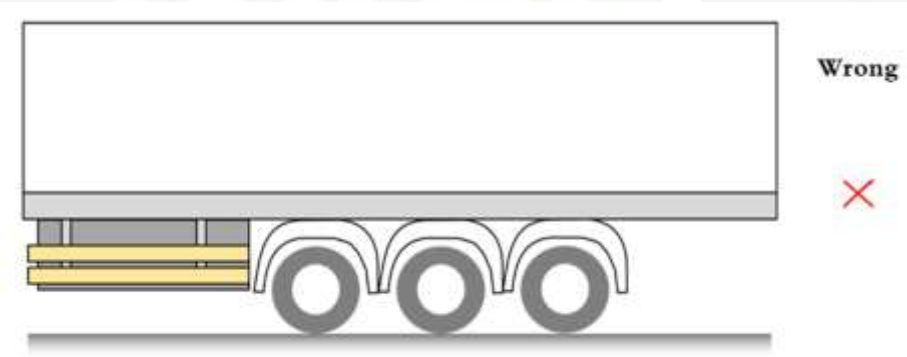


Figure 3.20

Case 11: Increasing the truck width because of LUPD

a. When installing a LUPD, it should not be installed in a way that increases the vehicle width as shown in Figure 3.21

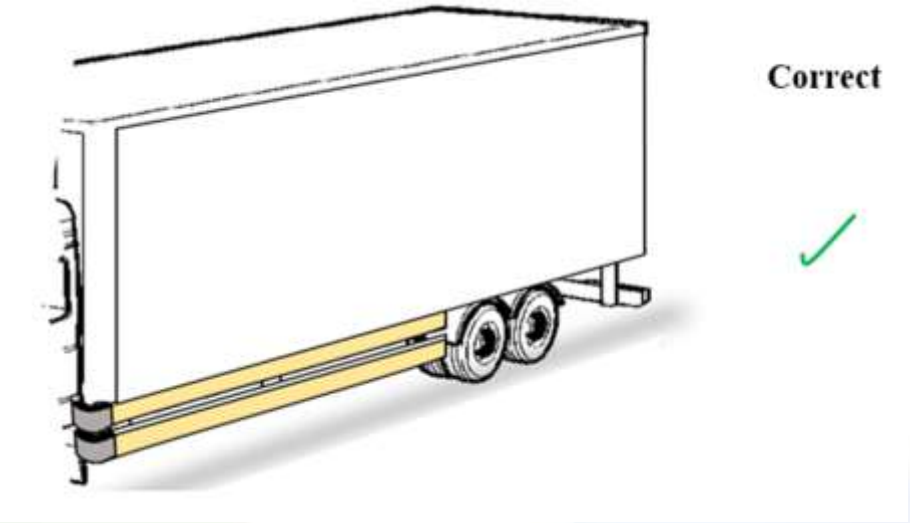


Figure 3.21

b. Installing a LUPD in a way that increases the vehicle width is incorrect and must be modified as it shows in Figure 3.22

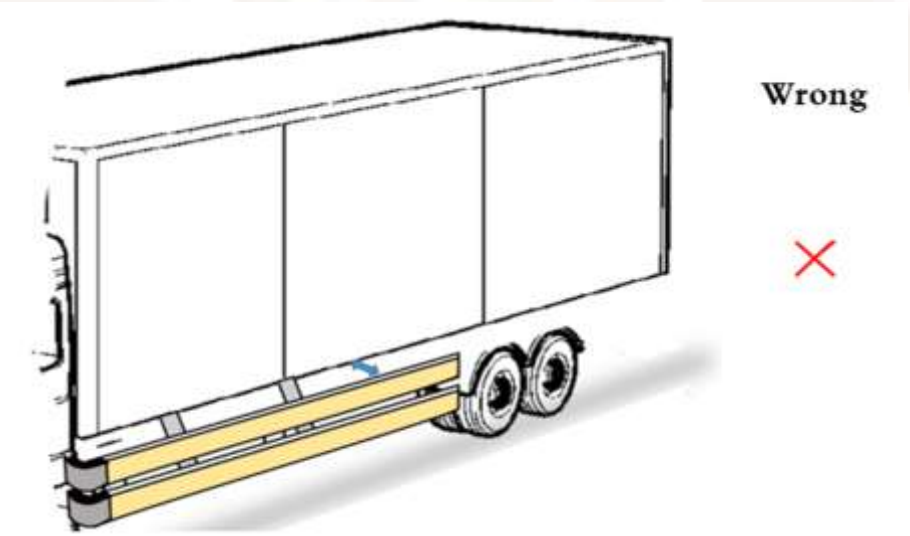


Figure 3.22

Case 12: Lower loading surface for the vehicle

a. In case the loading surface for the vehicle is low and fulfill the pre-mentioned requirements, there is no need to install a LUPD as in Figure 3.23

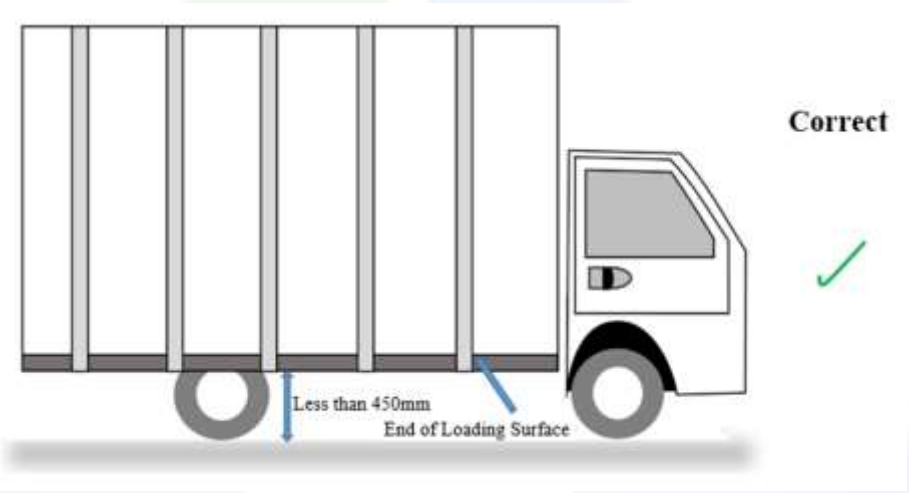


Figure 3.23

b. Having an extra LUPD is unnecessary and may cause damages to the vehicle due to being very low and close to the ground surface as shown in Figure 3.24.

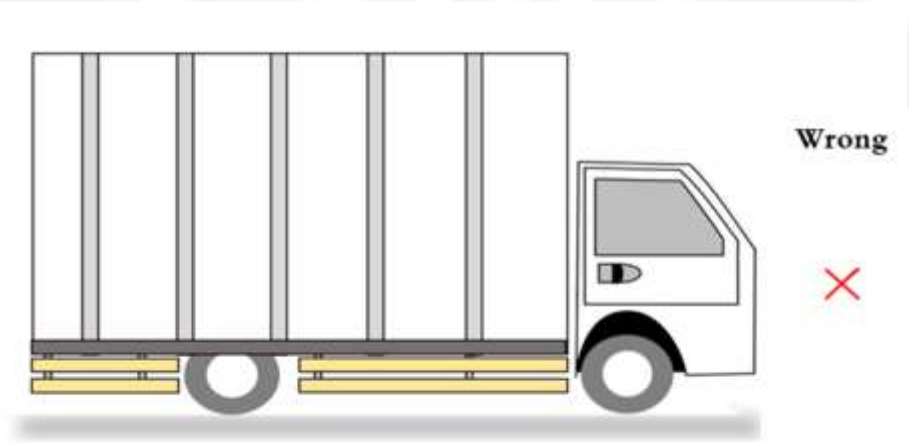


Figure 3.24