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TORSIONALLY RIGID BODYWORK

Tankers, bulk cargo bodies and monocoque van boxes are examples of torsionally rigid bodies.

This type of body makes strict demands on the mounting to the chassis frame. The mounting must be designed so that the torsional movements of the chassis will not be restricted when the truck is travelling on irregular road surfaces.

If mounting is not carried out correctly, damage may be caused to the body, mounting and chassis frame.

See chapter 2 for general information on the design of the auxiliary frame.

A torsionally rigid body is one that has high inherent resistance to torsion.
VAN BOXES AND CONTAINERS

The common feature of these bodies is that they are built on or incorporate a bodywork frame, the entire length of which rests on the chassis frame. The dimensions of the bodywork frame must be determined to suit the special requirements of a specific body.

The bodywork frame should start as far forward as possible. A bodywork frame which extends far forward reduces the load on the chassis frame and reduces the chance of uncomfortable chassis frame vibration occurring.

For the same reason, the body should be mounted as far forward as front axle weight will allow.
Mounting van boxes and container

The body should be mounted so that the chassis frame is permitted to move in relation to the body. Examples of attachments which allow a certain amount of vertical movement in the body in relation to the chassis frame can be found in chapter 2.

The chassis frame and body should only move in relation to each other when there is torsional flexing and when the road surface is very uneven. In order to prevent the body oscillating in relation to the chassis frame when travelling on a smooth road surface, the movement should be damped.

The magnitude of the movement depends on the torsional rigidity of the body and the road conditions. If driving with a torsionally rigid body on uneven roads, the mountings must allow a large degree of movement.

The mounting must also guide the body laterally and longitudinally. The mounting should be designed so that it allows for the longitudinal displacement between the body and the chassis frame which occurs as the chassis frame twists.

Flexible mountings are normally used in the front part of the auxiliary frame and rigid ones in the rear part, from just in front of the forwardmost rear spring bracket. In trucks with a long rear overhang, it may sometimes be necessary to also use a flexible mounting at the rear.

A and B in the drawing depend on the axle distance and the length of the rear overhang. See the tables in chapter 2.
FREEZER AND REFRIGERATOR UNITS

Always check that the clearance (A) between the unit and the swept radius for the tilted cab is sufficient before fitting a freezer or refrigerator unit.

The swept radius for different cab types can be found in the main dimension drawings binder.

TANKER AND BULK CARGO

Choosing wheelbase

The choice of wheelbase is extremely important and should be as short as possible in order to minimise the risk of chassis frame vibration.

The centre of gravity of the body should be as low as possible to minimise roll.

For tanks containing liquids, the need for transverse and longitudinal antislosh baffles must be considered.
A factor common to tankers and bulk cargo bodies is that they normally rest on supports (mountings) on the chassis frame.

The location of these supports is important. The first support should be located as far forward as possible towards the rear front spring brackets on trucks with leaf spring suspension.

Trucks which have an air sprung front axle and a single chassis frame may require the frame to be reinforced around the front mounting, or alternatively a wide front mounting with a large contact area on the frame in order to reduce the risk of chassis frame oscillation.

Correspondingly, the remaining mountings should be located with consideration to load and chassis frame oscillation. Avoiding chassis frame oscillation is a matter of ensuring that the natural frequency of the chassis and body is such that oscillation does not occur.

The mounting should be designed and attached so that the load is well distributed between all mountings and so that torsional forces due to the body are distributed between the front axle and rear axle or bogie section.

The following recommendations for locating the mountings are made with load and comfort taken into account.

When the hole cluster located 875 mm behind the front axle is used as a part of a larger mounting for three holes, one of the bolts securing the engine mounting can be used.

See drawing.
Attachment and mountings should be designed so that the vertical forces from the body do not expose the chassis frame side members to large torsional forces. The weight of the body should rest in the same plane as the chassis frame side member webs.

The following figure shows a suitable tank mounting that meets the requirements.

Chapter 2 gives an example of another type of flexible tank mounting.

A = Coil spring for upward movement
B = Rubber element for downward movement.
   Rubber grade = about 70 shore
C = Part of mounting attached to chassis
D = Part of mounting attached to tank

Tank mounting with a certain freedom of downward movement and somewhat greater freedom of upward movement.
Mounting - tank
The following figures show examples of tank mounting on different chassis types.

The drawings show how the attachment points should be distributed in order to minimise stress to the chassis frame. Some dimension examples are given.
In order to see where to body holes are located on a particular chassis, how many hole clusters there are between the front and rear axles and whether there are holes in the rear chassis frame overhang, see the tables in chapter 2 and the chassis dimension drawing for the particular chassis.

There is a reference hole for measuring dimensions above the first rear axle.

A = Wheelbase > 4700
B = See table
C = At J > 1800

A = Wheelbase > 4700
B = At J > 1000
When road conditions are excellent and with a body which resists a small amount or torsional flexing, mountings can be made as in the adjacent figure. The tank frame should be in contact with the chassis frame.

**Note:** If this type of mounting is used when road conditions are poor and the surface uneven, the body and mountings will be exposed to extremely high torsional forces.
Mounting weighing equipment

Equipment for weighing the payload normally consists of two weight sensors at the front and two at the rear (A and C in drawing) and a guide (B) which takes up forces when the truck is travelling.

In order to minimise stress on the frame, it is important that the mountings are as wide as possible against the frame.

It is also important from the point of view of load that the distance Y is as short as possible, especially on tri-axle trucks, and that X is as close as possible to the rearmost rear axle.
Mounting - bulk cargo

The following figures show examples of mountings for different types of bulk cargo body. These recommendations presuppose that the body and containers form a unit which is rigid to both torsion and bending.

Example of one method of mounting for bulk cargo body.
A pendulum support should be used for the front mounting.
A pendulum support can also be used for the rear mounting.
If the body does not allow for 2 support points between the rear front-spring mounting and the front rear-spring mounting in trucks with leaf spring suspension, the first or second support point can be arranged on a short auxiliary frame.

We primarily recommend that trucks with a double frame be used for bulk cargo bodies.

In the case of a front axle with air suspension, an auxiliary frame should always be fitted for the first and second supports. The auxiliary frame is extended as far forward as possible in order to prevent frame oscillation.

We primarily recommend that trucks with a double frame be used for bulk cargo bodies.
TANKER BODY - FIRE APPLIANCE

Note: The design of the cab in the above figure is not yet definite.

Long cab for transporting crew (Crew Cab), available mounted from factory.

The following should be taken into account in the design of a tanker body for fire appliances in order to obtain a chassis which has relatively good handling and anti-roll properties.

For truck types where front and rear anti-roll bars are available, it is recommended that these be fitted.

The stiffness of the rear leaf springs is of great importance and these should be as stiff as possible from ride comfort and mobility aspects.

The centre of gravity of the tank should be as low and as far forward as possible. This reduces roll tendencies and gives a more even distribution of the roll forces between the front and rear axles.
Mounting the tank

The same principles apply for mounting the tank as those described in the section covering van boxes and containers.

The rear part of the tank must be attached with brackets in order to provide the necessary rigidity in the rear part of the chassis frame.

See the figure below for examples of mountings for attaching the tank body to a fire appliance.

Options:  
A Tank frame against the chassis frame  
B Clearance between tank frame and chassis frame  
C Bracket
All-wheel-drive rescue vehicle

All-wheel-drive vehicles are normally intended to provide mobility in difficult terrain. In order to prevent the body limiting the mobility of the vehicle, it can be constructed in several separate sections, each of which is torsionally rigid. The separate sections can twist in relation to each other, creating a body which is torsionally flexible overall and is adapted for mobility in difficult terrain.
REFUSE COLLECTION UNIT
Mounting the refuse collection unit

The principles which apply are the same as in the section covering van boxes and containers.

The rear part of the body must be attached using brackets in order to provide the necessary rigidity in the rear part of the chassis frame.

The figures below show examples of refuse collection unit mountings for different types of chassis.