

Loading requirements

Load standards

There is no current Australian Standard that specifically deals with trench drains.

AS 3996 specifies the requirements for access covers and grates for use in vehicular and pedestrian areas for a clear opening up to 1,300mm.

The only standard written specifically for grated trench drains that is internationally recognised is EN 1433. This standard includes different grate widths and different channel sizes.

The Standard EN 1433 specifies test methods with loads up to 900kN for both the grate and channel body. The test accounts for both serviceability and ultimate loading.



Factors affecting load on a trench drain

There are a number of key factors that affect a trench drain's resistance to load:

- a) **Type of traffic** – for example pedestrians, cars, trucks and forklifts crossing the drain. For trolleys and forklifts, consider the weight of the loads being carried.
- b) **Frequency of traffic** – more frequent traffic may require a heavier duty drain.
- c) **Speed of traffic** – fast moving traffic can intensify the load effect on the drain.
- d) **Location of the drain** – if the drain is positioned where traffic will be turning, braking, or if it is installed at the bottom of a ramp, the drain will be subjected to dynamic forces.
- e) **Wheel type** – solid tyres exert loads through smaller contact areas than pneumatic tyres. A heavier duty drain may be required.

Selecting the right trench drain is essential for a durable long lasting installation.

Certification

ACO's policy is to continuously improve and develop its products to the highest quality.

ACO has a NATA accredited testing facility operated by fully trained technicians.

NATA accreditation number 15193.



ACO is authorised to conduct tests and prepare documentation to meet AS 3996 and EN 1433 requirements.

ACO can provide the following:

- Certificate of Compliance or Conformance
- NATA endorsed load test report to AS 3996 and EN 1433

AS 3996 table of load classification



10kN

Extra light duty

80kN

Light duty

150kN

Medium duty

240kN

Heavy duty

400kN

Extra heavy duty

600kN

Extra heavy duty

900kN

Extra heavy duty

Typical Uses

Footpaths and areas accessible to pedestrians and cyclists	Residential properties and footpaths suitable for light vehicles	Malls and pedestrian areas open to slow moving commercial vehicles	Major roads, freeway shoulders and loading docks	Carriageways of freeways and heavy industrial areas	Docks and aircraft pavements subjected to high wheel loads	Docks and aircraft pavements subjected to very high wheel loads
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Approximate Nominal Wheel Load

330 kg	2,670 kg	5,000 kg	8,000 kg	13,700 kg	20,000 kg	30,000 kg
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EN 1433 Equivalent

Class A 15kN	Class B 125kN	Class C 250kN	Class D 400kN	Class E 600kN	Class F 900kN
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Load testing

AS 3996

The diagrams below show the test load applied to typical grates through an AS 3996 specified test block size.

Grate for 100mm clear opening trench drain

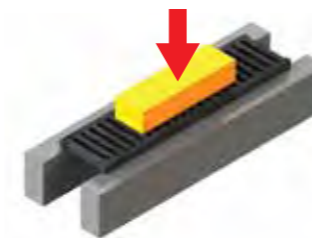
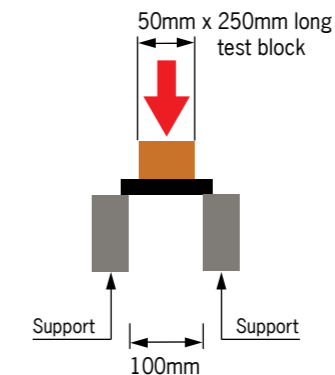


Diagram shows test block positioned centrally on grate.

The Standard prescribes a minimum clearance of 25mm to the supports.



Grate for 200mm clear opening trench drain

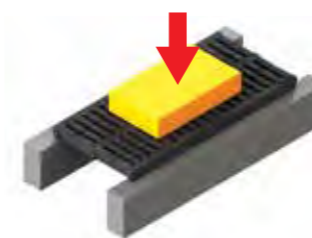
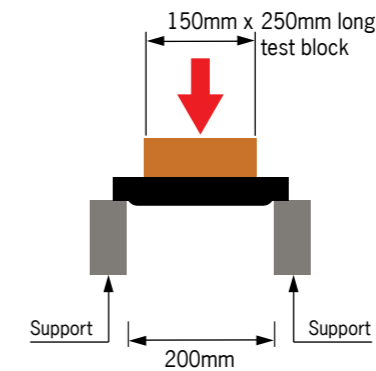


Diagram shows test block positioned centrally on grate.

The Standard prescribes a minimum clearance of 25mm to the supports.



Grate for 300mm and over clear opening trench drain

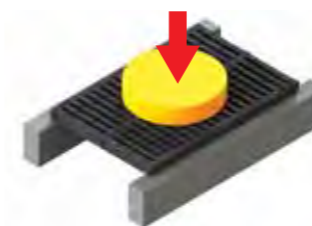
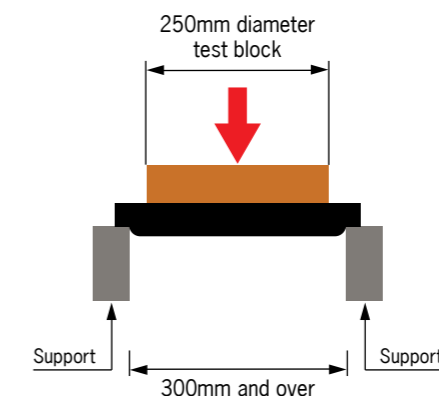


Diagram shows test block positioned centrally on grate.

For clear opening of 390mm and over, a 240mm x 240mm square test block can be used as an alternative to the circular test block.



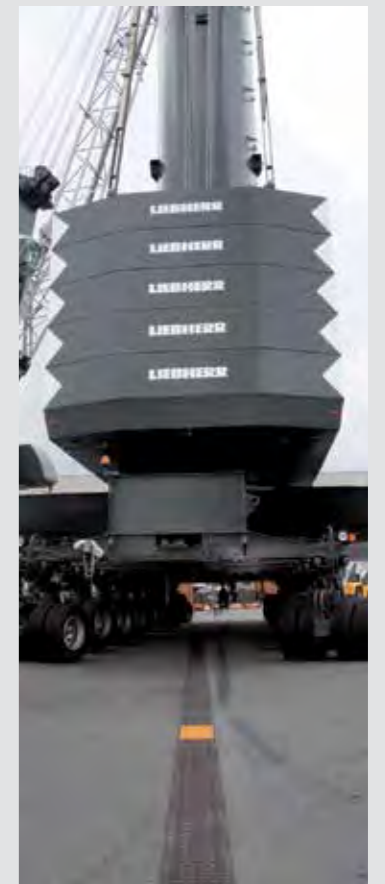
EN 1433

The only standard written specifically for trench drains and internationally recognised is EN 1433 *Drainage channels for vehicles and pedestrian areas*. EN 1433 accounts for different widths of grates and channels.

For grates less than 200mm wide, the test block for load testing is 250mm long by 75mm wide. For grates 200mm to 300mm wide, the test block is 250mm long by 150mm wide; for grates over 300mm, the test block is 250mm diameter.

EN 1433 also prescribes methods for testing the complete trench drain and grate and accounts for both proof loading and catastrophic failure.

EN 1433 also outlines testing for monolithic trench drains with grate and body manufactured as a single unit. Contact ACO for information on monolithic trench drains.



LOAD CLASSES
AS 3996 Table 3.1

A Load Class A
Non vehicular traffic pavements
(Approximate nominal wheel load 330kg)

B Load Class B
Footpaths, car parks and residential properties
(Approximate nominal wheel load 2,670kg)

C Load Class C
Minor roads and pedestrian malls
(Approximate nominal wheel load 5,000kg)

D Load Class D
Major roads, freeway shoulders, warehouse and loading docks
(Approximate nominal wheel load 8,000kg)

E Load Class E
Freeway and motorway carriageways, heavy industrial areas with container forklifts
(Approximate nominal wheel load 13,700kg)

F **G** Load Class F and Load Class G
Airport aprons, military bases, container terminals, wharves and mining sites
(Approximate nominal wheel load 30,000kg)

1 Application

Factors affecting load on a trench drain

Loading

Loading is often referred to as traffic and is any weight that will rest on or travel over a trench drain. Traffic may come from pedestrians, machinery or vehicles.

Traffic is the most important factor to consider in pavement design and a trench drain is an integral part of the pavement.

The type of trench drainage system and the surrounding concrete encasement requires careful consideration.

Contact area

The contact area between the load and the grate in a trench drain determines the force per unit area, referred to as 'stress'.

Usually the stress relates to the size and type of tyre, but can include anything that may rest permanently or periodically on the drain.

Large tyres and pneumatic tyres spread the load over a larger contact area beyond the grate width, which exerts a lower stress on the trench drain.



Small tyres and solid tyres concentrate load onto a small contact area, which exerts a higher stress. This application requires a drainage system with a higher load rating.



Wheel load

A wheel load is combined with contact area to determine loading.

- Weight of vehicle/cart and its typical load, e.g. forklift and weight of typical loaded pallet.
- Number of wheels and axles that load is distributed over affects individual wheel load.
- Unusual traffic going over the trench, for example industrial trolleys, pallet jacks or skip bins.

Load frequency

It is important to consider how often a load will be applied to the drainage system. Frequent and continuous loads will require a heavy-duty trench drain and a stronger concrete encasement than occasional loads of the same weight.

Static loads compared to dynamic loads

Static loads



Static loads are the weight applied vertically onto a trench drain with no other movement. Static loads are used in load testing a grate or trench drain, as they provide an objective measure to rate products. They are not typically found in real-life scenarios.

Dynamic loads



Forces created by dynamic or moving loads tend to twist trench drains and grates out of position. The more movement the greater the dynamic load. Forces also rise rapidly as the traffic speed increases.

Factors that intensify dynamic loads include:

- Vehicles travelling across or along the trench drain.
- Traffic braking, accelerating or turning on the trench drain.
- The speed of traffic.
- A trench drain located at the top or the bottom of a ramp.

The trench body, type of grate, quality of installation and locking mechanism are all important factors to consider when addressing dynamic loads.

Note: During the construction phase, it will be necessary to protect the modular trench from the site traffic. See page 126 for more information.



ACO DRAIN

ACO Technical Services – Structurally fit for purpose

Load categories

To assist product selection, ACO can provide NATA endorsed test reports for each channel and grate to load standards, AS 3996 and EN 1433. Ratings are categorised into classes from light duty 10kN to heavy duty 900kN.

An overview and comparison of AS 3996 and EN 1433 is provided on page 104.

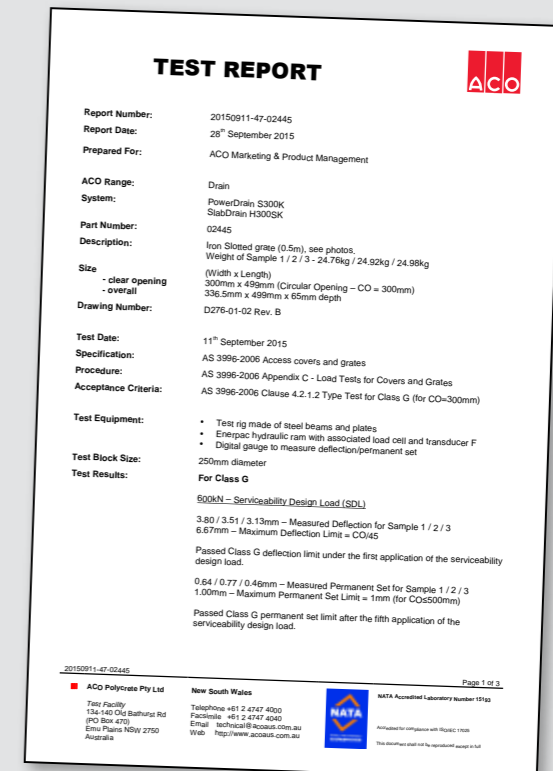
The following information is required for ACO to provide advice on the most appropriate load class for the specific application:

- Weight of vehicle (including load hauled).
- Type and direction of traffic moving over the trench drain.
- Wheel type and size.
- Typical vehicle speed.
- Vehicles turning or braking on the trench drain.
- The location of the trench drain, for example at the bottom of a ramp or alongside a building.
- Unusual traffic, for example skip bins.

ACO can supply the relevant load test report and a Certificate of Compliance or Conformance on request.



ACO's NATA Accredited Testing Machine



Concrete encasement

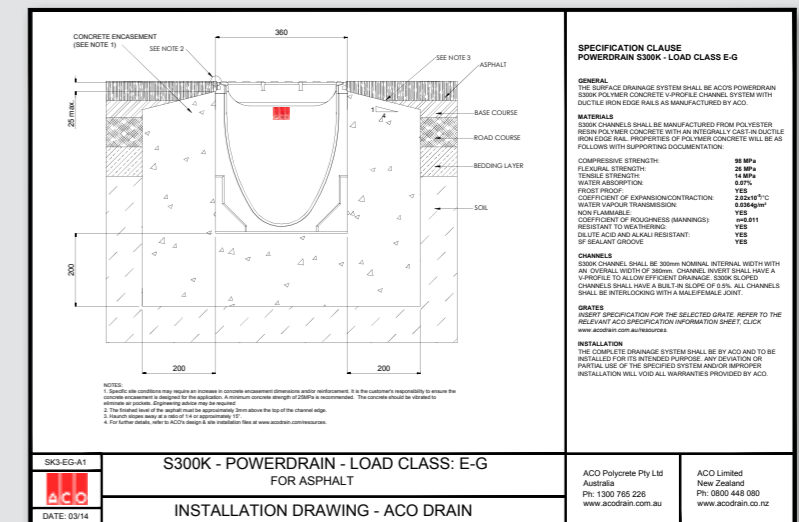
Loading will also impact the size of concrete encasement required. It is recommended that the cement concrete encasement be durable and conform to minimum strength requirements shown in ACO's recommended installation details.

Poor site conditions and low load bearing pavements may require an increase in the size of concrete encasement to meet both vertical and lateral loads.

Some applications may require steel reinforcement. Always seek engineering advice for specific applications.

The following information is required for ACO to provide advice on the correct concrete encasement section detail:

- Load class required.
- Product type and width e.g. PowerDrain S300K.
- Pavement type.



Download installation details for all products and pavements at: www.acodrain.com.au/resources/site-installation.htm