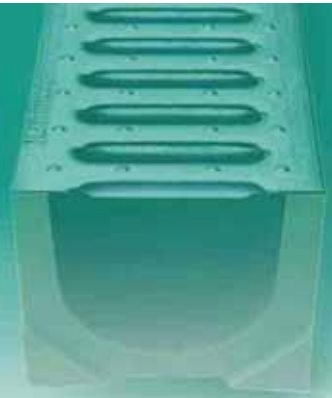
INSTALLATION INSTRUCTIONS



PREFABRICATED DRAINAGE SYSTEMS

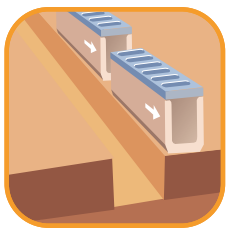
KILLESHAL

building into the future since 1969

ULMA

Polymer Concrete

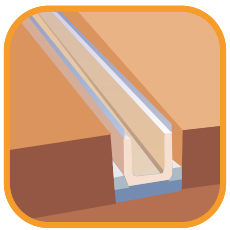
1 Prepare a trench of sufficient width for the concrete bedding, always taking into account the dimensions X, Y, Z, indicated in Table 1 (Pg. 5), according to the type of load to support.



2 Set a string line and lay the channels along the length of the trench.
Check that the arrow on the side of the channel indicates the correct direction of the flow towards the outlet.

3 Then open the outlets, always drilling the perimeter of the outlet pre-marked every 5-6 cm or cutting with a rotaflex.

4 **Pour a good-quality concrete into the base of the trench and before it hardens add the channels.**



5 **Place the channels on a concrete bedding with a base as per the minimum** recommended by Table 1 (Pg. 5). Check the alignment along the trench.
NOTE: For waterproofing, we recommend applying an polyurethane elastic sealer between the joints.
When placing the channel in the trench, always start at the outlet point or the lowest point on the evacuation line.

6 **To prevent damage such as lateral compression, place woden planks or the** gratings suitably protected in the channel groove.

7 **Pour the concrete along the sides of the channel, according to Table 1 (Pg.** 5). It is VERY IMPORTANT, in areas where two layers of concrete will meet, that both layers are applied within a reasonable period of time to ensure their adherence. When the channels are used in an area with heavy loads, install the appropriate wire mesh before pouring the entire concrete base and sides in one homogeneous pour.

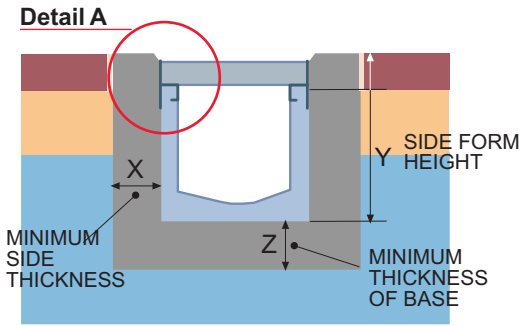
8 **Fasten the gratings using the appropiate locking system, applying a tightening** torque sufficient to avoid rocking of the gratings when vehicles pass over. For the system to work properly, it is essential the correct locking system be installed. See locking systems (Pg. 10).

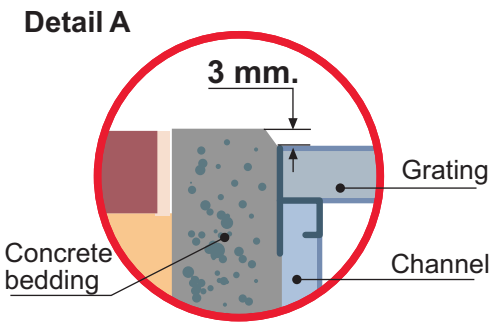
9 **If the surface is made of concrete, elastic expansion joints (polystan,** neoprene, etc) must be installed to prevent pressure being applied on the side of the channels.

See recommendations for specific pavements. (Pgs. 6, 7 and 8)

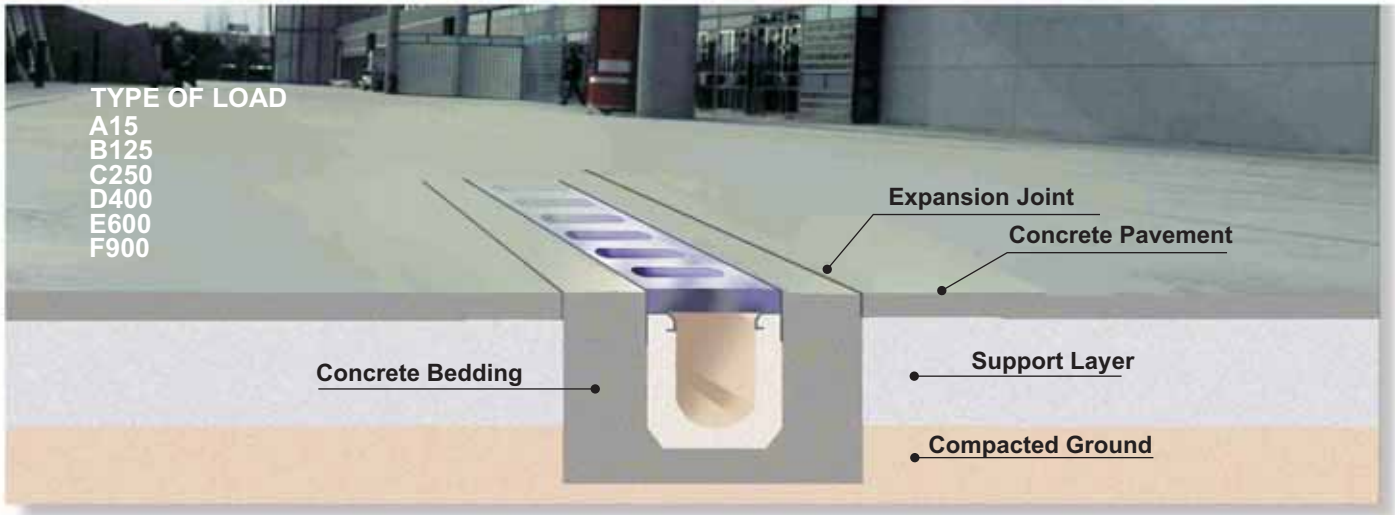
TABLE 1: THICKNESS OF CONCRETE BEDDING

Load according to Standard EN-1433	X Minimum side thickness (mm)	Z Minimum thickness of base (mm)	Y Height of side form (mm)	Recommended wire mesh (cm x cm x mm)	Type of concrete (Kg/cm²)
A-15	100	100	At least at a point located at 40 mm below the level of the pavement.		150
B-125	100	100			250
C-250	150	150	Up to the level of the wire mesh and the adjoining pavement.	15 x 15 x 6	250
D-400	150	150		15 x 15 x 6	250
E-600	150	150		15 x 15 x 10	250
F-900	200	200		20 x 20 x 12	250





Concrete Pavement



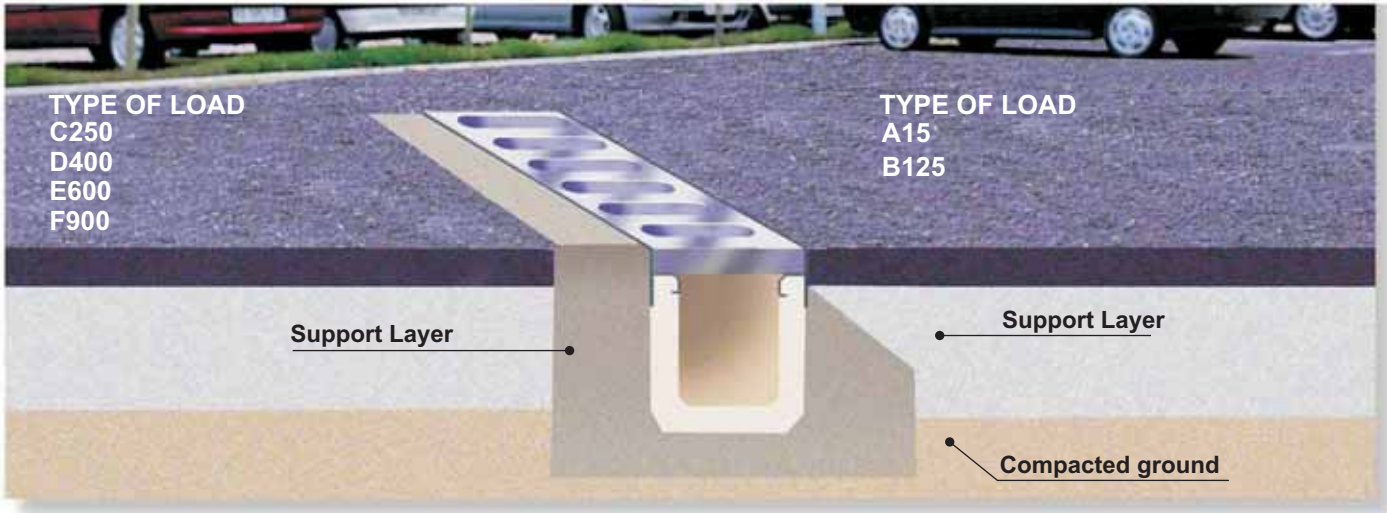
1.- When compacting the surrounding pavement, the compactor must never pass over the channel.

2.- Where one of the layers adjacement to the drain is also concrete, place the expansion joint between the channel sourround and the said concrete layer.

3.- Support Edge, shall not rise above the level of the surrounding pavement. See detail on page 5.

4. If there is a channel without a profile, anticipate the thickness of the grate at the time of finishing off the pavement. The gratings must not rise above the level of the adjacent pavement.

Asphalt Pavement



1.- When compacting the surrounding pavement, the compactor must never pass over the channel.

2.- Where one of the layers adjacement to the drain is also concrete, place the expansion joint between the channel sourround and the said concrete layer.

3.- Support Edge, shall not rise above the level of the surrounding pavement. See detail on page 5.

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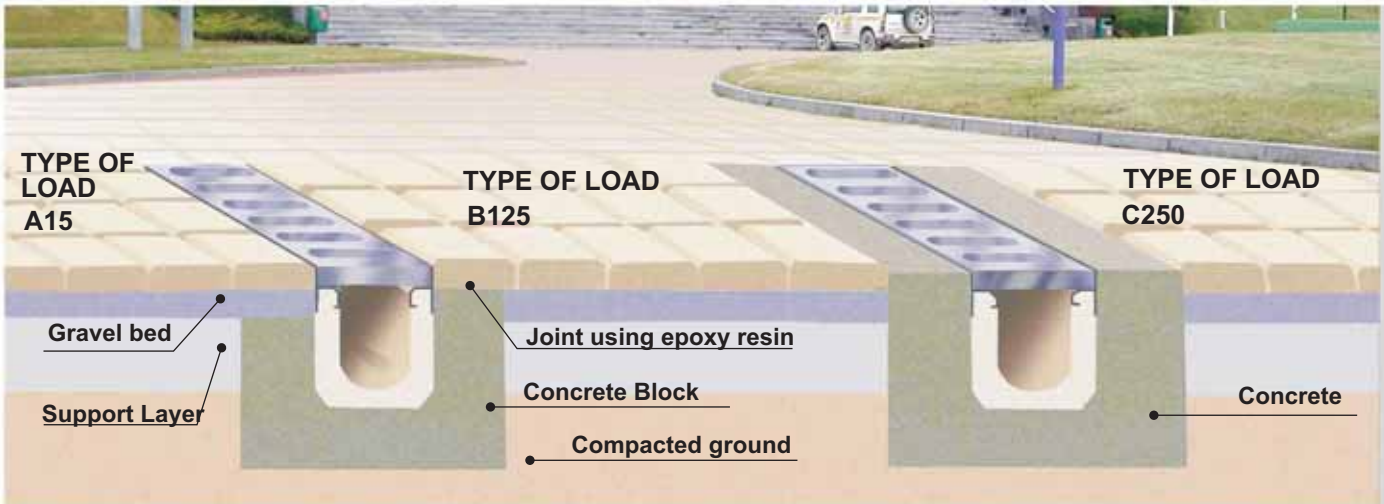
Paving



1.- When paving, fill the joint along the length of the channel using a mass of crushed stone for paving or asphaltic cement.

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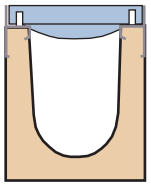
4. If there is a channel without a profile, anticipate the thickness of the grate at the time of finishing off the pavement. The gratings must not rise above the level of the adjacent pavement.

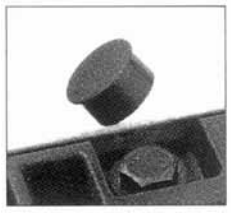
TYPES OF LOADS RECOMMENDED, ACCORDING TO STANDARD EN-1433

TYPE	CONTROL POWER (kN)	PLACES RECOMMENDED FOR USE	
A 15	15 kN	Areas exclusively used by pedestrians or cyclists	
B 125	125 kN	Sidewalks or similar pedestrian areas, private car parks and multi-level parking for light vehicles only.	
C 250	250 kN	Kerb side areas, parking areas cars and slow moving commercial vehicles.	
D 400	400 kN	Public roads including pedestrian precincts, motorways and parking areas for all types of road vehicles.	
E 600	600 kN	Areas used by heavy vehicles and areas used by slow moving heavy vehicles such as forklift trucks.	
F 900	900 kN	Very specific areas subjected to high loadings, such as Airport runways, taxiways and parking areas. Ports, military and very heavy industrial installations, etc...	

4 BOLT LOCKING SYSTEMS

- Channel with ductile iron or galvanised edge potection.
- The gratings are fixed by 4 screws fixed into the protective edge.



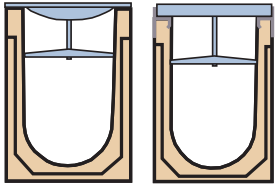


RECOMMENDED USE

Areas with intense traffic and with heavy vehicles.
Forklift areas, loading decks, service stations, etc…

SCREW LOCKING SYSTEMS

- Channel with or without a galvanized edge protection.
- Screws are fixed into locking bars or in the bottom of the channel.



RECOMMENDED USE

Pedestrian areas and occasional traffic areas, for light vehicles.

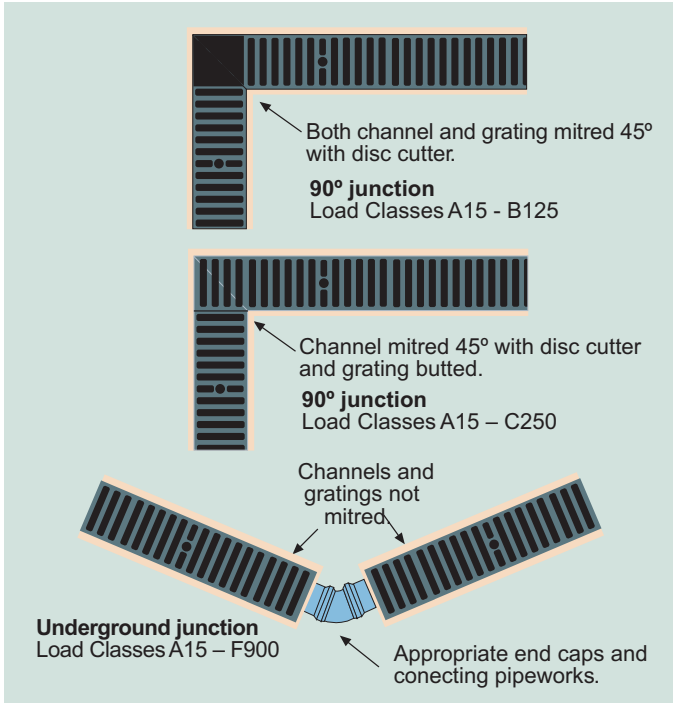
CUTTING POLYMER CONCRETE AND FORMING MITRE JOINTS

Mitre joints are formed by sawing the channels to the required angle and buting them together dry jointed or resin bonded. It is recommended that higher load class channels (D400, E600 and F900) are not mitred. Note: pre-mitred joints and junctions can be formed with connecting pipework.

CAULKS, GROUTS AND SEALANTS

Openings, fittings and joints may be filled or sealed with proprietary materials. Suitable adhesive should be used in corrosive environments. Sealants used should be able to withstand contact with the effluent or chemical solution.

Flexible joints: Silicone or similar sealant. Rigid joints: Epoxy grout. Cementious grouts in cases where high durability and chemical resistance is not required.



INDIVIDUAL PROTECTIVE EQUIPMENT NEEDED

- Head Protection: Hard hat

- Hand Protection: Gloves, mitts

- Body Protection: Work apparel

- Protective Footwear: Boots, safety shoes

- Other equipment

MOST USUAL RISKS TO PREVENT

- Objects falling when handling

- Overexertion, due to improper lifting

- Airborne fragments or particles

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