

BUILDING DRAINAGE



Planning and design in building drainage



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FOREWORD

Planners and builders have to take into consideration numerous aspects early on when designing, planning and executing drainage systems – whether they are drains, backflow stops or separators. In addition to the purely functional aspects, it is important that planning and installation complies with the relevant standards.

It is therefore essential that all of the necessary questions are clarified and assessed systematically.

This is the principle on which this manual has been based: each chapter deals systematically with different aspects of drainage (floor drains, flat roof drainage and pipe systems, fire protection, backflow and the separation of greasy water).

After describing the basics and a short discussion on the statutory regulations and standards, the manual then deals with each of the relevant planning aspects. These always observe the latest standards which are used as the basis for calculations and layouts.

The modus operandi of the products are then looked at briefly, followed by a discussion of their applications. The next section in each case describes the work directly associated with installation and assembly. The next subsection then discusses the maintenance and inspection aspects, and naturally also goes into the special issues involving each particular product (e.g. disposal of grease separators). Every main chapter is then rounded off with a double-page product description presenting possible applications, typical installation situations and installation instructions.

Many thanks to all of our colleagues at ACO Werbung whose tireless commitment made this manual possible. We now hope that it will prove useful to many people, and look forward to receiving any ideas and criticisms.

Stadtlengsfeld and Phillipsthal August 2007.

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LIST OF ABBREVIATIONS

RTG	Recognised technical guidelines
Fig.	Figure
ABP	General Building Supervisory Authority Test Certificate
Para.	Paragraph
ABZ	General Building Supervisory Authority Authorisation
ATV	General technical contractual conditions
AW	Connecting value
d	Diameter
DIN	German Standardisation Institute
EN	European norm
ETB	Adopted technical regulations
F	Fire resistance class for building components such as walls and ceilings
K	Kelvin
LAR	Pipe and cable system regulations
LBO	State building regulations
m	Metre
m ²	Square metre
MBO	Model planning regulations
R	Fire resistance class for measures to prevent fires spreading via pipes and drains
RbALei	Technical fire protection regulations for pipe and cable systems
SBO	Special planning regulations
VOB	Contractual regulations for construction work and contracts

DRAIN SYSTEMS

1. Principles

1.1 Applications

Floor drains and drainage channels are designed to drain grey water from floors into the drainage system in a way that poses no risk to humans or the structure of the building. They must be installed where grey water collects on floors and needs to be safely drained off.

DIN 1986 – 100 defines the obligatory use of floor drains. A high priority is given here to hygiene and preventing sewer gases from entering closed spaces.

1.2 Statutory regulations and standards

In accordance with the test sign directive laid down by the German states (state building regulations LBO) floor drains can only be used with odour seals if they comply with EN 1253 and are marked with the compliance sign “Ü”. If the design of floor drains deviates considerably from the stipulations in this standard, they have to have a General Building Supervisory Authority Authorisation (AbZ number.: Z-...), General Building Supervisory Authority Test Certificates, or individual approval. The manufacturer must engage an authorised testing agency to test new products and implement in-house supervision of its production.

ACO Haustechnik has also pledged as a member of GET Fachverband Gütesicherung Entwässerungstechnik (drainage technology quality assurance trade association) to allow its products to be inspected by third parties. This guarantees the highest levels of quality and safety.

Planning and execution is regulated by the state building regulations, local authority and municipal bylaws, and standards and regulations. The standards can be divided into application and product standards.

Application standards e.g. EN 12056 specify how, where and under what conditions, standardised drainage components may be used. Product standards such as EN 1253 regulate aspects such as minimum outflow capacity, minimum flange width and maximum temperature tolerance, as well as materials and drainage product specifications.

Standards	
EN 12056-1	General application and design requirements
EN 12056-2	Grey water plants, planning and calculation
EN 12056-5	Installation and check, instructions for operation, servicing and use
EN 752	Drainage outside buildings

1.3 Definitions

Wastewater

Water which is changed by use and each kind of water flowing into the drainage object, e. g. domestic grey water, industrial and commercial wastewater, condensates and rain water if it is drained into the drainage object.

Domestic wastewater

Wastewater from kitchens, laundry rooms, bathrooms, lavatories and similar rooms.

Industrial wastewater

Wastewater which is changed or polluted following industrial or commercial use, incl. coolant.

2. Planning

2.1 Floor structure/ drain type

Selecting a suitable drain to drain wastewater within and outside of buildings is already an important aspect during the planning stage, and must comply with the planned structure of the ceilings and floors.

The structure of floors is defined on the basis of the different types of ceilings in buildings such as

- Above ground ceilings (ceilings in contact with the soil)
- Storey ceilings (ceilings between floors)
- Roof ceilings (ceilings which close off a building at the top and the outside)

The specified load, e.g. planned traffic load or drainage of wastewater also has to be taken into consideration.

In terms of building physics, the different floor structures can be divided into four groups:

- I. **without sealing**
- II. **with sealing by floor covering**
- III. **with sealing by sealing membrane¹⁾**
- IV. **with sealing by two sealing membranes.**


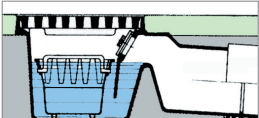

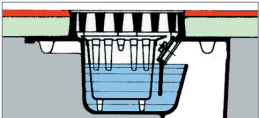
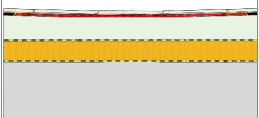
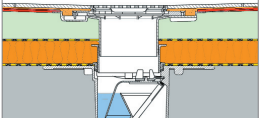

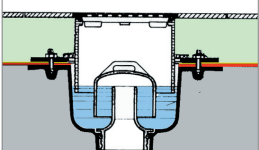
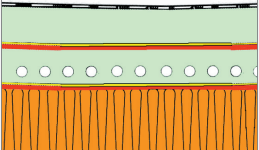
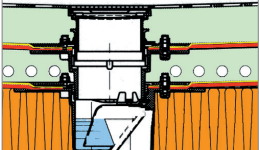
For installation in relevant floor structure, floor drains must have particular design features. It must be differentiated between floor drains:

- without connecting rim/holding edge
- with connecting rim/holding edge
- with compression-sealing flange/adhering flange
- of dual-body design with compression-sealing flanges

1) This also includes the so-called "alternative" sealings which are compound systems with integrated sealing in the thin bed process.

In the following table, a suitable floor drain type is assigned to each floor structure.

Interdependence of floor structure and drain type

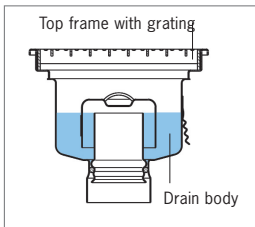
Floor structure	Drain type	
 <p data-bbox="124 512 152 528">B1</p>	 <p data-bbox="406 512 434 528">A1</p>	<p>B1: Without sealing</p> <p>A1: Without connecting rim/ holding edge</p>
 <p data-bbox="124 703 152 719">B2</p>	 <p data-bbox="406 703 434 719">A2</p>	<p>B2: With sealing by floor covering</p> <p>A2: With connecting rim/ holding edge</p>
 <p data-bbox="124 919 152 935">B3</p>	 <p data-bbox="406 919 434 935">A3</p>	<p>B3: With sealing in the thin bed process (alternative sealing)</p> <p>A3: With adhering flange/com- pression-sealing flange and thin bed top section</p>
 <p data-bbox="124 1158 152 1174">B4</p>	 <p data-bbox="406 1158 434 1174">A4</p>	<p>B4: With sealing by sealing membrane</p> <p>A4: With adhering flange/ compression-sealing flange</p>
 <p data-bbox="124 1430 152 1445">B5</p>	 <p data-bbox="406 1430 434 1445">A5</p>	<p>B5: With sealing by two sealing membranes</p> <p>A5: With two adhering flanges/ compression-sealing flanges</p>

2.2 Construction types

Our floor drains are differentiated into two construction types: floor drains with compact forms (compact floor drains) and floor drains for combining with various top sections (combination floor drains).

2.2.1 Compact designs

In compact drains, the grating frame and the drain form one unit. The grating in this case can be inserted directly into the drain body or adjusted in steps to the floor structure by using a top frame.



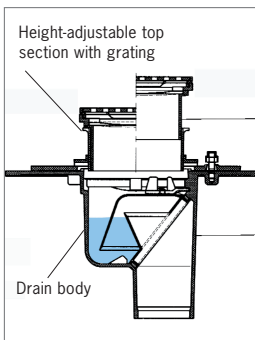
Compact floor drain

Only stepped adjustment is possible to the specified floor structure. It is also not possible to create a seal between each of the top frames.

The area of application of this design is therefore simple floor structures where the floor drain can be directly installed at the floor level required. This means that the floor structure must be defined at a very early stage during planning or with construction of a rebate after the floor has been laid.

These drain designs (e.g. made of cast iron) are particularly suitable for areas affected by high traffic loads (class M125) because the housings are highly resistant to this type of traffic load and disperse it directly into the concrete ceiling when the drains are completely concreted in.

2.2.2 Combination design



Combination design floor drains are modern drain designs which can always be adjusted (even retro-fitted) to existing or planned floor structures by using different top sections.

The gratings in combination drains cannot be set directly in the drain body but have to be combined with a telescopic continuously height-adjustable top section. This enables the optimal top section to be selected for each type of floor structure and floor covering.

Any traffic loads are dispersed via the top section into the floor structure and not transferred into the drain body and the pipes.

This modular system also means that other tops and intermediate sections can be used – e.g. for a second sealing membrane or an additional lateral inlet.

2.3 Odour seals

Odour seals are installed in floor drains to prevent dangerous sewer gases entering buildings from the public sewers. This is why every drainage object inside buildings has to be fitted with an odour seal.

The effective odour seal height for floor drains has now been defined as follows in European-wide regulations pursuant to EN 1253:

- 50 mm: floor drains for grey water
- 100 mm: drains for rain water

Odour seals must always be installed in a position where they are not affected by frost.

These minimum specifications apply to all CEN members (European Standardisation Committee).

These regulations exclude the following floor drains:

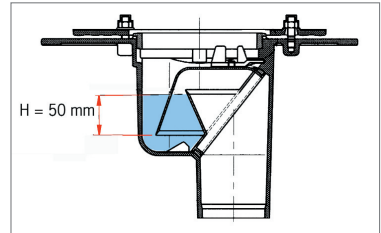
- In garages connected to separate rain water pipes.
- In garages, connected to mixed rain water pipes if the pipes have odour seals in frost-free positions
- Floor drains which drain surfaces via light oil separators²⁾ (EN 858).

In rooms including air conditioning control rooms subjected to over and under pressure, measures must be implemented to ensure that there is always enough water in the trap.

Modern floor drain designs have one-piece removable odour seals. The ACO Haustechnik WAL-Selecta, VARIANT-CR and Easyflow floor drain product lines are designed accordingly.

These floor drains can be quickly and easily cleaned if the pipes become blocked. Removal of the odour seal exposes the whole cross section of the pipe to cleaning tools.

However, opening the drain in this way to create a direct connection to the sewers is only a short term measure and the drain should be sealed as quickly as possible after cleaning and maintenance by replacing the odour seal and filling the trap with water. When testing the water tightness of buried pipes, floor drains of this type can be sealed off with a sealing balloon and tested along with the pipes.



²⁾ Floor drains draining via grease separators (EN 1825) must be fitted with an odour seal.

2.4 Nominal width of the floor drains

The layout, number and nominal widths of the floor drains is calculated depending on the surface to be drained and the amount of water to be drained off.

The minimum outflow capacity of floor drains for grey water for a 20 mm accumulation of water above the grating is as follows pursuant to EN 1253:

Nominal width (DN)	50	70	100	125	150
Minimum outflow capacity (l/s)	0.8	0.8	1.4	2.8	4.0

The following connecting values (AW) for floor drains are used as the basis for calculating the pipes connected to the drains pursuant to DIN 1986-100 (German regulation) issued March 2002:

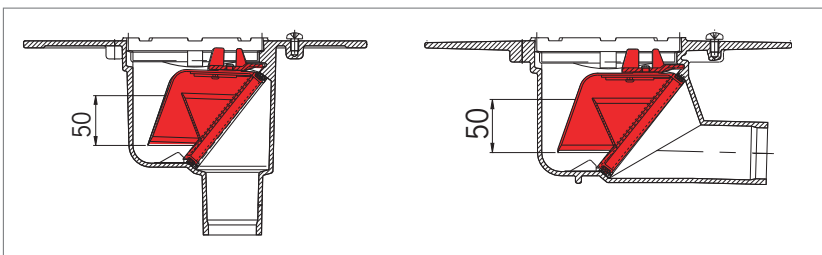
Nominal width (DN)	50	70	100
Connecting value (AW)	0.8	1.5	2.0

The nominal width for a single connecting pipe depends on the nominal width of the floor drain. The nominal width of the collective connecting line and the main drains are calculated pursuant to EN 12056-2.

2.5 Gradient of the outlet socket

The layout of the drain pipes is a crucial factor for selecting the angle of the outflow socket of the floor drain. The 1.5° inclination (horizontal) is used if the pipe is to be laid in or above the raw concrete ceiling. Allowance here must be made for the ceiling structure and the required thickness of the rebates. In owner-occupied apartments, the pipes must not penetrate the raw concrete ceiling. Floor drains with 1.5° (horizontal) outlet sockets are therefore recommended in this case to enable the connecting pipes to be laid within the ceiling.

90° inclination (vertical) is selected when the pipes have to be laid below a ceiling, e.g. in the case of suspended ceilings or when holes in the ceiling have to be kept particularly small for structural reasons.



Floor drain with vertical (90°) outlet socket (left) or horizontal (1.5°) outlet socket (right)

2.6 Wastewater inflow to the drain body

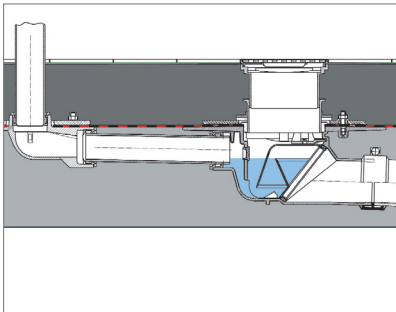
The wastewater can flow into the drain in four ways:

- Directly into the grating from the floor
- From above, directly into the grating from an outlet pipe ending directly above the grating (e. g. trough)
- Through a pipe through the lateral inlet in the drain
- Through seepage openings

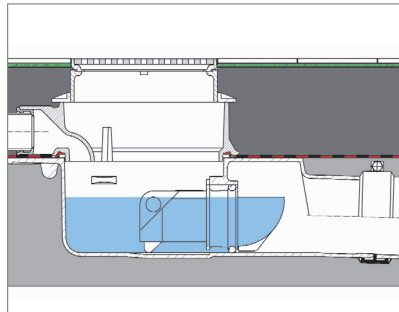
In the case of direct discharge into the drain, typical for washing facilities and medicinal basins, the discharge pipe of the equipment involved must stop almost immediately above the grating to prevent bacteria from entering the basin. An appropriately large grating holder (e.g. stainless steel trough) should be planned if sudden surges of water are expected.

In many cases (e.g. private bathrooms, swimming pools and boiler rooms) sanitary installations such as leakage water pipes are connected directly to the lateral inlet in the floor drain.

Floor drains are available for this purpose with DN 40 and DN 50 lateral inlets.



WAL-SELECTA floor drain, inlet below the sealing membrane.



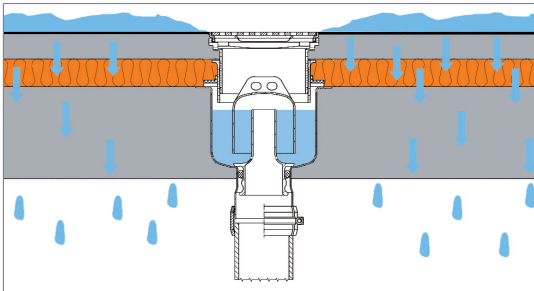
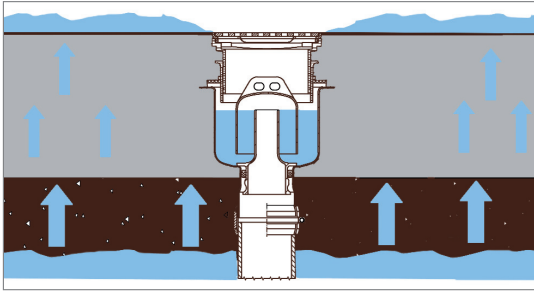
WAL-SELECTA floor drain, inlet above the sealing membrane.

Connection using a lateral single connection pipe above or below the sealing membrane depends on the type of floor structure. A rebate is required in the ceiling if a connection is needed for a single connection pipe below the sealing membrane. This pipe penetrates the sealing membrane by definition and is connected below the sealing membrane to the floor drain. If any water leaks out of the pipe connections there is a risk that water will penetrate the ceiling.

Adequate cover is required if a single connection pipe is to be connected to the floor drain above the sealing membrane. The floor structure therefore needs to be of adequate height above the sealing membrane. The advantage of this approach is that any leakage from the pipe will not penetrate the sealing membrane.

2.7 Connecting sealings and sealing floor coverings

There is a risk in wet rooms (e.g. tiled showers) that moisture can penetrate the floor covering and enter the floor construction – i.e. non-pressurised water.



Non-pressurised water (below) or rising damp (above) require sealing membranes to be installed in the floor structure.

It is also possible that basement plates can be affected by moisture from the wet soil penetrating the concrete from below. To ensure that the raw concrete ceiling is not affected by water or moisture damage, it is essential in these cases to install a sealing membrane in the floor structure or in the floor plate.

Because floor drains penetrate these sealing membranes, the body of the drain must be equipped with suitable adhering flanges or compression-sealing flanges to ensure that the sealing membrane can be safely secured and made water-tight.

The most common form of sealing membranes are plastic sheets or bitumen sheeting. These are connected to the drain body by adhering flanges or compression-sealing flanges.

As a general rule, the sealing membrane is always laid within the floor structure with a slight gradient towards the drain body to ensure that seepage water is also drained off.

2.7.1 Connecting rim/holding edge

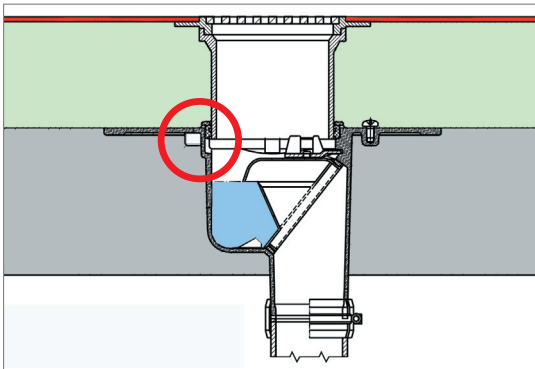
Floor drains with a holding edge cannot act as seals.

A sealing floor covering such as mastic asphalt or artificial resin coatings can be connected to floor drains with connecting rims.

Floor coverings such as PVC flooring can be connected with top sections (e.g. art. no 5141.86.00).

A sealing ring is required here to prevent pooled water penetrating the floor structure between the top section socket and the body of the drain.

If a second sealing membrane is available in the raw concrete ceiling, there is no need to use a sealing ring. Care should be taken in this case to ensure that the thermal insulation/ floor insulation is also water-tight.



WAL-SELECTA floor drain with top section article number 5141.86.00 for sealing by a floor covering. Sealing ring between both components (red circle).

2.7.2 Adhering flange

The adhering flange is the simplest method of connecting a sealing membrane to a drain body. This usually involves sticking on bitumen sheeting. Creating a secure connection between the sealing membrane and the adhering flange of the drain unit is solely dependent on the pre-treatment of the flange and proper professional gluing of the membrane to the flange. The width of the adhering flange is specified in EN 1253.

To prevent any wastewater from penetrating the load-bearing ceiling construction, any seepage water such as that penetrating the floor structure through the gaps between tiles is directed along the top surface of the sealing membrane to the drain unit.

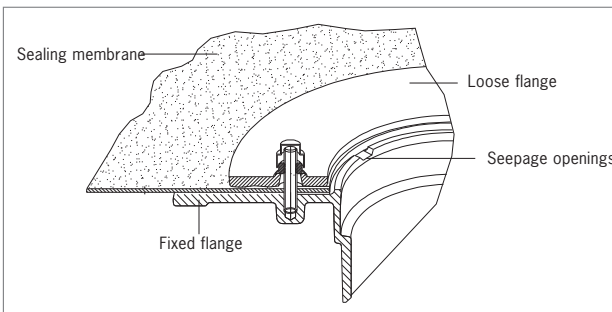
Floor drains with adhering flanges therefore must have seepage openings to ensure that the seepage water which collects is safely drained off through the floor drain.

2.7.3 Compression-sealing flange

The most reliable means of connecting sealing membranes to floor drains is the compression-sealing flange. This consists of two parts: the fixed flange and the loose flange.

The sealing membrane (e.g. polymer or bitumen materials) is glued and laid professionally on the loose flange and then compressed with the compression-sealing flange. The loose flange is compressed by tightening up nuts or screws.

If very thin sealing membranes are used, several layers of the membrane should be laid around the floor drain in the area of the compression-sealing flange to ensure that the flange functions properly. As an alternative, an intermediate layer should be installed above and below the sealing membrane. These intermediate sealing layers must be completely and fully compatible with the sealing membrane itself. Full compliance with the material instructions of the sealing membrane manufacturer must be ensured.



The components of a compression-sealing flange

2.7.4 Thin-bed flange

A thin-bed seal is an alternative sealing method which involves spreading or painting a single component or two component sealant onto the floor structure to act as the seal. This type of seal is usually applied directly above the screed and below the tile adhesive. The tiles are then laid in a thin tile bed above the thin-bed seal. This method is therefore called the thin-bed method. This type of sealing method is increasingly displacing conventional sealing methods particularly where wet rooms are concerned.

The advantage compared to the thick-bed method is that the floor structure cannot be penetrated by damp because the seal is located directly beneath the tiles.

2.8 Seepage openings

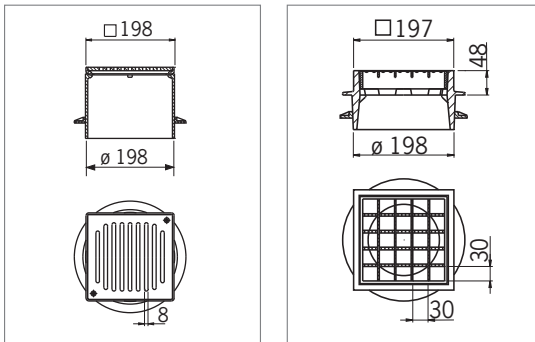
Floor drains for floor structures without sealing membranes do not require any seepage openings. In wet rooms subjected to heavy duty use (e.g. commercial wet rooms, hospitals, baths) water can penetrate leaky tile joints so that seepage water reaches the sealing membrane. Floor drains with compression-sealing flanges must therefore also have seepage openings (see figure in Section 2.7.3). The floor drain must always be installed at the lowest point of the sealing membrane to ensure that the seepage water is always safely drained off. It is important when using combination floor drains (i.e. floor drains with top sections) that there is no sealing ring between the drain body and the top section, if the sealing membrane is connected to the drain body by a flange (exception: top sections for thin bed sealing).

It is recommended when using two-piece floor drains that the sealing membrane is connected with a sealing ring between the drain body and the upper section so that no moisture can penetrate the thermal insulation.

2.9 Grating types

We differentiate between slotted gratings and lattice gratings.

Slotted gratings are used in sanitary zones where people may walk about in bare feet. The maximum width of the slot in such zones is 8 mm because there is a risk that small children can catch their toes in wider slots and injure themselves.



Top section with slotted grating (left) and top section with lattice grating (right)

Slotted gratings are the preferred option in industrial applications when the wastewater contains long fibrous constituents which need to be flushed into the drainage channel or the floor drain (meat processing operations etc.).

Lattice gratings (including the non-slip models) should be used when the wastewater contains short-fibrous constituents discharged directly above the drainage channel or the floor drain. The large open cross-section means there is little or no resistance to water surges and therefore very little wastewater splashes back onto the tiles.

The large open cross-section of the grating is due to the narrow bars which offer little resistance to surges of wastewater. This means that if a boiling-kettle is emptied into a lattice grating, the large volume of water goes straight into the drain without splashing.

Lattice gratings are therefore particularly suitable for industrial kitchens etc. where hot wastewater is discharged directly into the drains. Dirt buckets should be used in the floor drains and drainage channels if coarse constituents are expected in the wastewater and have to be retained.

2.10 Drainage channel applications



The crucial aspects for the installation of drainage channels are the size of the floor, the amount of wastewater and the use of the rooms.

In places where large amounts of wastewater are generated (e. g. in food and beverage industry production sites) or where sloping floors are undesirable (e. g. in showers) drainage channels are used in connection with floor drains.

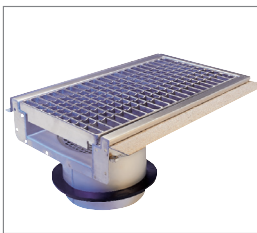
Floor drains are preferentially used to drain large surfaces affected by only small quantities of water, e.g. during floor cleaning or where single appliances have to be drained.

The proper layout of the drains avoids long drain off distances and ensures rapid removal of the grey water.

Drainage channels are preferentially used in operations where greasy wastewater and coarse constituents fall on the floor and get in the way of operations and work flows. The very large capacity of the channels prevents any flooding of the floor.

2.10.1 Box channels

Box channels are primarily used in industrial kitchens and in industrial food production sites. Sloping floors, greasy wastewater and coarse wastewater constituents which land on the floor in these areas considerably hinder operations and work flows.



VARIANT®-CR Box channel

These channels can be fitted with wide-mesh lattice gratings. Flooding of the floors is avoided thanks to the large drainage capacity of the box channels. This prevents grease being deposited on the floor. Box channels are supplied in a range of widths (e.g. 150, 300 or 450 mm). Box channels are completely welded and supplied ready for installation in lengths up to 6000 mm.

Channels with total installed lengths exceeding 6000 mm are supplied in units with a max length of 6000 mm for transport reasons. Sections can be connected by welding or screwed together via flanges.

2.10.2 Slotted channels

Stainless steel slotted channels are used in areas where the grey water is only expected to be contaminated with minor amounts of dirt, and where heavy loads and a lot of traffic are expected, e.g. from fork lift trucks.

The grey water enters the channel body via a narrow slot from where it is safely drained into the floor drain. Because no gratings are required on the floor, fork lift trucks will not cause any damage to gratings and channel bodies.



Slotted channel with two arms: the top section connected in the middle, is itself connected to a floor drain.

Slotted channels can be supplied in all lengths between 1000 and 5000 mm with a range of slot widths. The channel sections are joined up on-site with watertight pipe connectors. Unlike the standard drainage channels with gratings, the grey water in the slotted channels is drained off through horizontal DN 70 connecting sockets into a top section which drains into the floor drain.

2.10.3 Shower channels

The wet bathroom of old is increasingly evolving into a customised wellness centre. The main priority today is quality design and the absence of barriers. Because very high quality designer tiles are increasingly used, the customers are no longer prepared to have the overall appearance spoiled by the installation of conventional floor drains.



Cross-section through a floor structure with a shower drain.

This was the reason behind the development of a completely new type of channel system especially for showers. These channel systems only require a sloping tiled surface on one side and are usually installed at the entrance to the shower. This retains the integrity of the tiling overall, ensures that the shower can be entered safely and comfortably at floor level, and that no shower water can flood the bathroom as a whole.

The ACO Showerdrain features a rugged channel body and a built-in lateral gradient. This guarantees clean removal of the wastewater.

The odour trap can be removed and taken apart to ensure quick and easy cleaning of the channel, the connecting pipe and the odour trap.



Dismantling the odour trap in an ACO Showerdrain.

The dimensions of the channels match today's standard shower sizes and can be fitted with a range of gratings.

The Showerdrain is fitted with an all-round flange for connection using alternative sealing methods (thin-bed sealing). All standard sealants for thin-bed sealing can therefore be used to connect the channel body to the floor.

2.11 Drain classification according to the installation point

The installation location and the associated traffic loads and use determine the model and thus the carrying capacity of the grating. The drains are classified according to the point of installation.

Load class	Load up to	Fields of application
H 1.5	—	For non-used roofs with sealings (flat roofs)
K 3	300 kg	For non-trafficked areas, such as terrace surfaces, porches, balconies and green roofs
L 15 ³⁾	1.5 tons	For light-trafficked areas without fork-lift trucks
M 125 ⁴⁾	12.5 tons	For trafficked areas, such as multi-storey car parks

Load classes as per EN 1253.

3) Load class L 15 inside buildings according to EN 1253 corresponds to load class A 15 outside buildings according to EN 124.

4) Load class M 125 inside buildings according to EN 1253 corresponds to load class B 125 outside buildings according to EN 124.

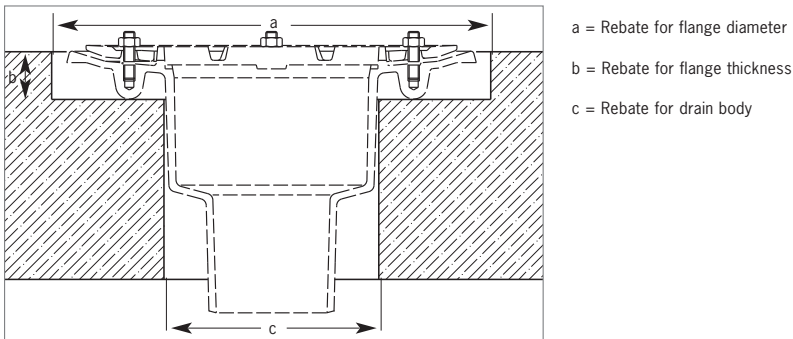
2.12 Recesses/ core boreholes

The dimensions of the recesses and rebates depend on the size and design of the drain body. We differentiate between rebates which have to be planned in advance and those which have to be drilled out afterwards in the already completed ceiling.

Fitted rebates are usually designed as rectangular recesses. This makes enough room available to install the drain body. The remaining space in the recess allows the drain to be cemented in after fitting the necessary formwork below the ceiling.

It is usually difficult and expensive to modify fitted rebates, and often impossible for structural reasons.

If floor drains have to be installed at a later date, or the precise position of the floor drains is not known during the planning phase, the rebates are drilled into the raw ceiling after it has been built.



Core borehole dimensions for drain bodies.

The diameter and structure of the core boreholes needed for floor drains depend on the design and size of the drain. If no sealing is required, it is often adequate to restrict the borehole diameter to the minimum size needed to hold the drain.

However, if the drain is to be connected to a sealing membrane, a second core borehole will be required whose depth depends on the thickness of the flange. This ensures that the sealing membrane slopes continuously down to the flange of the drain and that water can flow down the sealing membrane without being blocked by the edge of the flange.

Core borehole C is designed to accommodate the body of the drain. Depth depends on the thickness of the ceiling. Borehole A accommodates the flange and its depth B depends on the thickness of the flange.

Ensure that the cavity between the drain and the core borehole is professionally sealed. ACO Haus-technik sells the ACO FIT-IN installation kit designed to fit the special dimensions of the SELECTA and VARIANT drainage systems. More details on page 122 in the Fire Protection Chapter.

2.13 Materials

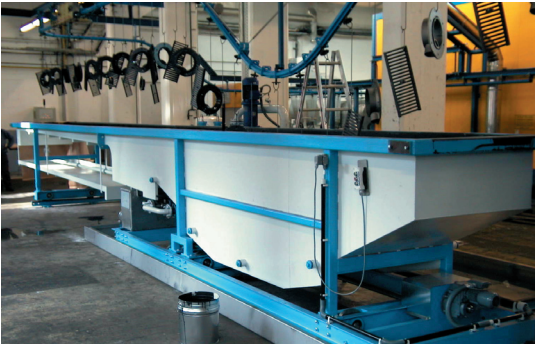
The installation and the use of the drain primarily determine the selection of the appropriate materials. The first aspect to be looked at is therefore the loads affecting the drain.

The loads which have to be taken into consideration depending on the use primarily concern traffic loads and the type of wastewater. In addition, the drain is affected by building operations during the construction phase. The protruding collars of the drains are also at risk during the later interior finishing work when vehicles move around on the raw concrete ceiling.

2.13.1 Cast iron

Corrosion resistance

Cast iron drains, top frames and gratings are made of cast iron with graphite flakes pursuant to EN 1561. This is an iron-carbon alloy in which the carbon is incorporated within the metallic ground mass in the form of flakes. This graphite lattice gives the cast iron its superb corrosion resistance. This special cast iron therefore has an excellent track record in drainage applications.



Submersion tank for priming

Cast iron is particularly resistant to domestic wastewater. Cast iron also has good corrosion resistance to chemicals, e.g. alkalis etc. If the drains are affected by industrial effluent in addition to domestic sewage, it may be necessary to coat the surface of the cast iron depending on the media involved. The type of coating has to be selected in accordance with the concentration of the media, its temperature and the retention time in the drain. The standard primer coating applied to cast iron drains is only applied to protect the drains during transport and storage.

If the drain bodies and the gratings have to comply with higher hygiene and style specifications, and if a special surface structure is required – in applications when the special advantages of cast iron are also needed – the components involved can be given an artificial resin powder coating (epoxidisation). This coating also improves the surface of the cast iron.

Material benefits

- Cast iron has temperature resistance up to 400°C without being affected by any changes in its mechanical properties.
- Cast iron is absolutely resistant, even to surfacing materials which are laid hot, such as mastic asphalt.
- Because cast iron and concrete have almost identical coefficients of expansion, the drain remains permanently bonded to the ceiling even when affected by strong temperature fluctuations after installation.

Cast iron drains are therefore the first choice for installation in water-impermeable concrete.

2.13.2 Stainless steel

The regulations concerning hygiene, surface properties, operational safety and material resistance are particularly high in the food and beverage industries, and restaurants etc. Stainless steel floor drains and drainage channels have therefore established themselves as the norm in these areas of application in recent years. This was also largely attributable to the hygiene regulations in the European Union, the material properties, and the many years of positive experience of the relevant industries with this durable material.

The drains, top sections and drainage channels are made of material 1.4301 and 1.4571.

Stainless steel is considered to be a particularly high quality and hygienic material because of its high strength, good forming properties, its corrosion resistance, and its smooth and permanently attractive surface. However, even this material is not optimally suited to all of the media which can enter drains. Analysis is required on a case-by-case basis to determine which material has the appropriate resistance in draining away non-domestic effluent.

The smooth hard surface of stainless steel prevents the adhesion of significant amounts of dirt. This makes cleaning these components much easier.

The low amount of maintenance required because of the fast and simple cleaning and the extremely long service life of the material also account for its popularity.

2.13.3 Plastic

Plastic floor drains are primarily used today in single and multiplex houses. These materials have adequate resistance to the temperature ranges of cold and warm water in homes.

Conventional standardised drain pipes in a range of materials can be easily connected to the outlet sockets of the floor drain either directly or by using the appropriate adapters.

Plastic drains are not suitable for installation in water-impermeable concrete because the material does not bind with the concrete. Plastic and concrete also have different coefficients of expansion.

2.14 Fire protection

Refer to the Fire Protection Chapter (page 96).