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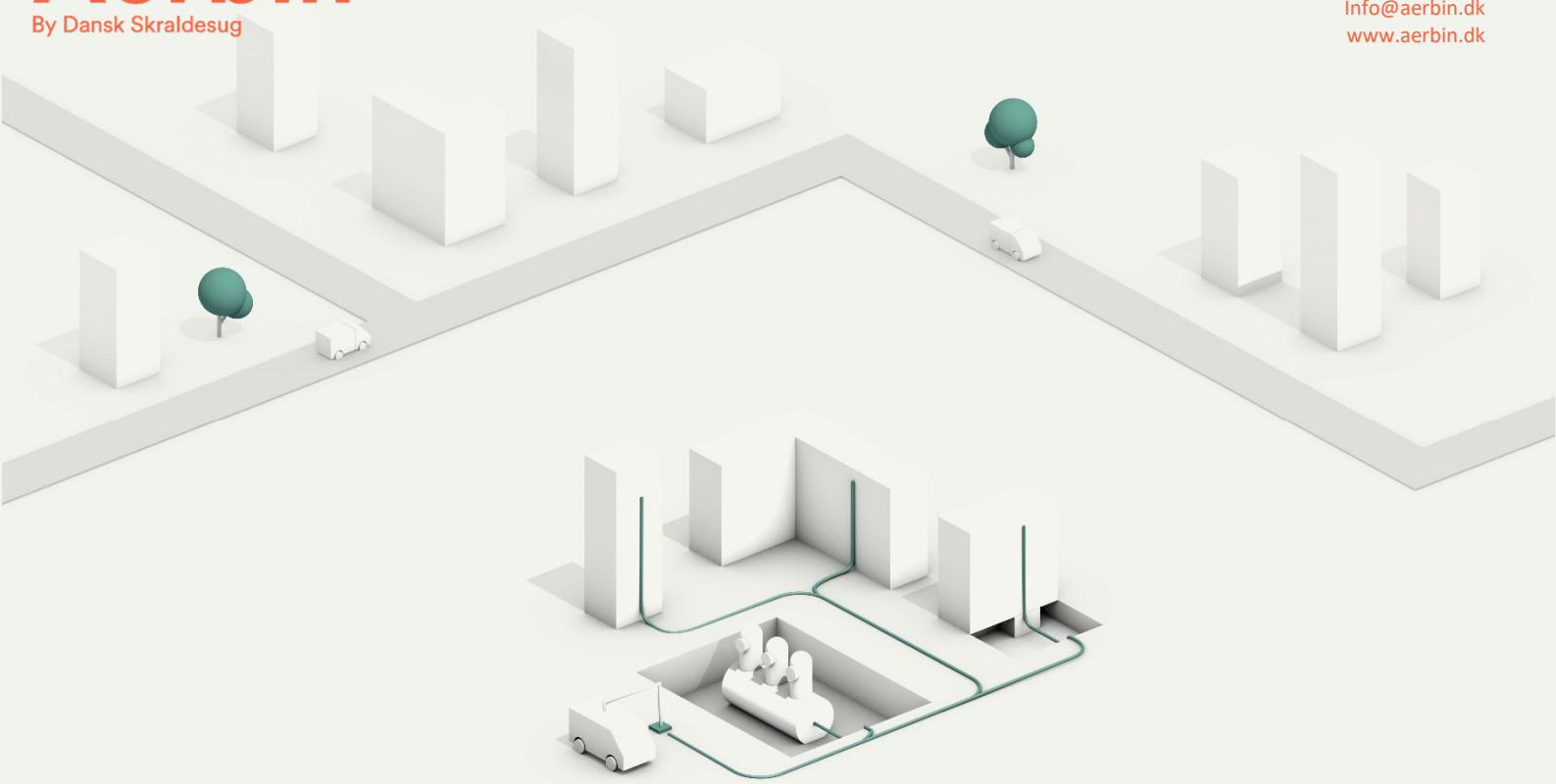

Instructions

DESCRIPTION OF COMPONENTS FOR MOBILSUG

For more information,
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Preface

Our Local Automatic Waste Collection System (*LAWCS*) is intended as a means of household waste disposal. Everyday household waste, packaged in 20 litre closed plastic sacks/bags, is collected in steel tanks (placed underneath built-in waste chutes), which are emptied 1 to 2 times a week by a suction truck.

Commercial/industrial waste must not be mixed with residual waste; bottles, glass, paper and magazines must be collected in compliance with local waste disposal regulations and must not therefore be placed in the mobile suction system.

Figure 1 - Odense Renovation Suction Truck

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1 Introduction

Planning for the installation of our mobile suction system will most likely involve asking the same questions everybody asks. How big does the waste tank need to be? How much space do we need to allocate for it? How much replacement air is needed?

This guide is intended for architects and construction engineers, and we hope that it can help to answer various questions associated with planning for the installation of a mobile suction system.

We hope that the following will shed light on some of the most important points, so that they can be taken into account at as early a stage as possible during the planning phase.

We want to make it as simple a process as possible to install a mobile suction system, so we are at your disposal at any time to provide further information and diagrams/drawings.

2 Quick dimensioning of mobile suction systems.

A brief guide to the dimensioning of waste tanks and compartment sizes. For more detail about the individual points, please refer to the relevant sections and Appendix A.

2.1 Tank size

Tank size is determined by the amount of waste, i.e. number of homes x amount of waste. For densely populated buildings (i.e. with typically more than 30 homes per stairwell), two weekly collections can be requested.

The amount of waste per week is determined as follows:

Type of housing	Copenhagen and Frederiksberg	Aarhus	Odense
Ordinary family home	130 litres per week	130 litres per week	95 litres per week
Youth housing	100 litres per week	110 litres per week	60 litres per week

Example:

You require a tank size suitable for 20 ordinary family homes in Copenhagen, i.e. 130 litres of waste amount per week.

- The tank size for a single weekly collection would be: 20x130 litres = 2,600 litres
- The tank size for two weekly collections would therefore be: 2600x4/7 litres = 1,486 litres.

The next size up waste tank should be selected, see section 3.2.1.

All waste tanks can be requisitioned as Revit objects.

The waste tanks are available in three types: horizontal, vertical or spiral.

- The vertical tank has the smallest footprint but requires the largest headroom.
- The horizontal tank requires a longer floor space but has the lowest installation height.
- The spiral tank is only used for waste volumes exceeding 4-5 m^3.

For further information see section 3.2.1.

All tank sizes and types are available as Revit objects, IFC, STEP, 3D DWG and 2D DWG. Please contact Aerbin for drawings.

2.2 Compartment size

Minimum compartment height is achieved when the chute is placed directly above the tank.

Compartment width needs to be at least the width of the tank + 700 mm.

Required compartment height: height of the waste tank + 1.7 x the distance from the centre of the chute to the centre of the tank (see Figure 23 - Tank Height, Height Clearance & Compartment Height).

Waste chute slope angle: Max. 35 degrees from vertical.

Compartment length: This is determined by the length of the waste tank and how the suction pipe is routed out of the waste compartment. Typical compartment length will be as shown below:

- Suction pipe direct out through outer wall: Tank length + 200 mm
- Suction pipe routed under the ceiling: Tank length + 820 mm
- Suction pipe routed vertically through decking: Tank length + 820 mm
- Suction tube in base plate: Tank length + 1035 mm

Supply of replacement air to waste compartment: Minimum 2,200 cm^2 of clearance in damper/grid. Fire dampers are only required if the replacement air is sourced from adjacent rooms.

Lighting must be installed in each waste compartment in accordance with applicable Danish Standard standards/regulations and Danish building regulations.

There must also be 1 pc. 230V service socket and 1 pc. 1x10Amp 230V 1F+N supply for automation on its own circuit with its own HPFI circuit breaker with 1 pc. repair switch breaker at the end.

For further information see section 3.2.

3 Detailed description of components etc.

This section contains detailed information about components and their installation.

3.1 Chute and throw-in hatch

This section describes the three types of waste chute that are currently on the market. Throw-in stands and chute hatches are also described in this section.

3.1.1 Internal chutes

The chute is a vertical structure of galvanised 1.25 mm sheet steel ø400 mm pipes with branching "T-pipes" through the wall, ending at a chute hatch cover.

Each branch is secured to the wall of each floor/storey. For walls thicker than 300 mm, branches are installed at an angle of 35° from the vertical.

The chute pipe terminates after the throw-in hatch on the top floor with a bag catch and a transition to ø160 mm spiro pipe for forced ventilation of the waste chute as required by Danish Building Regulations.

The chute shaft must then be clad/fire insulated with walls class EI60 A2-s1, d0 building component.

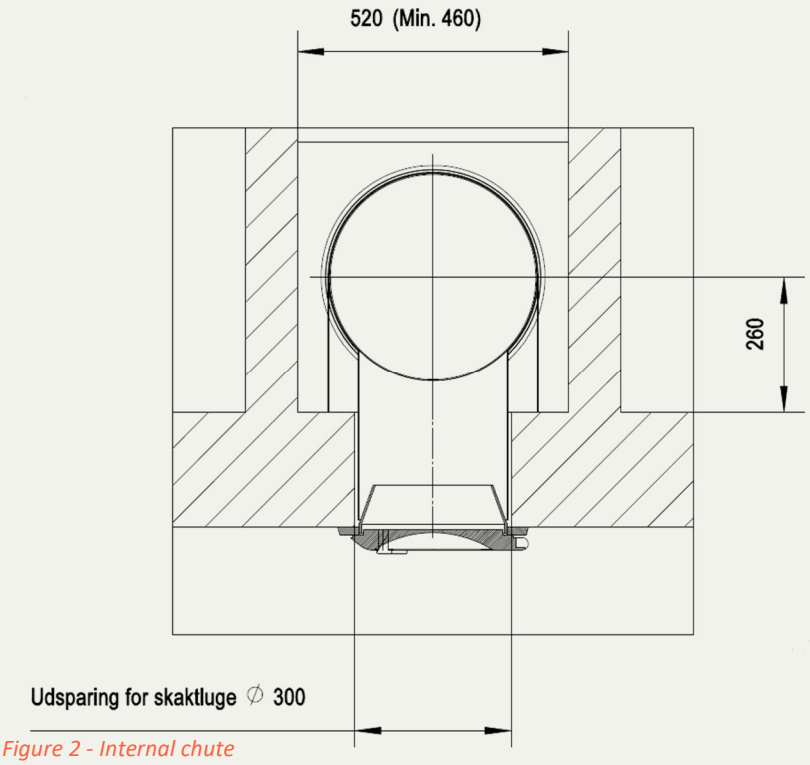


Figure 2 - Internal chute

3.1.2 External chutes

The chute is a vertical structure of galvanised 3 mm hot-dip galvanised sheet steel pipes with branches to the throw-in hatch, ending at a chute hatch cover.

The chute elements are attached to each floor deck. Concrete elements will require inserts to secure the chute. Balcony protection should be planned so that the hatch can be placed 900-1,100 mm above the finished floor.

3.1.3 Concrete chute (Non-DS deliverable)

If a concrete chute is used, this must be terminated with a flat chute base. See Appendix B.

3.1.4 Throw-in hatch stand

Made of 3 mm sheet steel, hot-dip galvanised or painted in any RAL colour.

The throw-in hatch stand is available in two variants, see Figure 3 and Figure 4.

If you have special design requirements for throw-in hatch stands, we would be pleased to develop these to the specifications you require.

Figure 3 - Gallaria throw-in hatch stand

Figure 4 - Décor throw-in hatch stand

3.1.5 Hatch covers

Standard hatch covers are available in two variants: JAI and Örby.

The Örby hatch cover is made of aluminium, is self-closing and has an internal reducer. The hatch has a fixed handle and is powder coated in RAL 7035 but can be supplied in other RAL colours.

Figure 6 - Örby hatch fitted

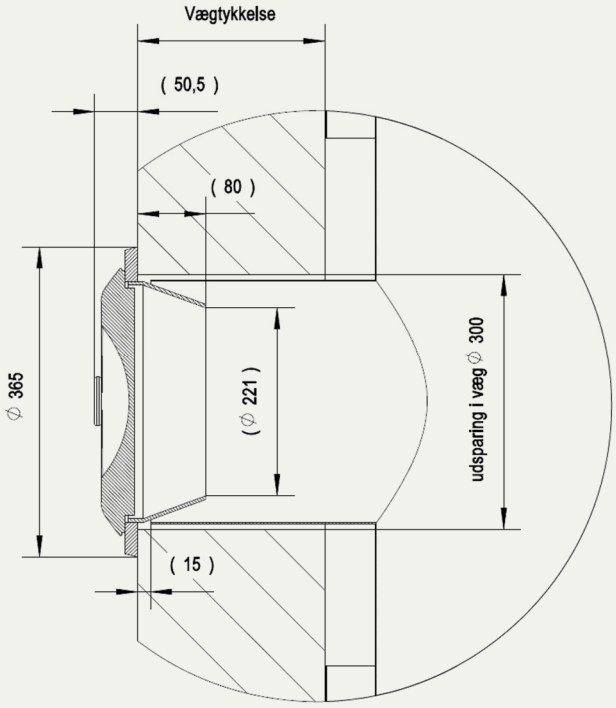


Figure 5 - Örby hatch detail

Throw-in hatch type JAI is made of aluminium, as standard glossy polished, but can be delivered powder-coated in any RAL colour.

Figure 7 - JAI hatch

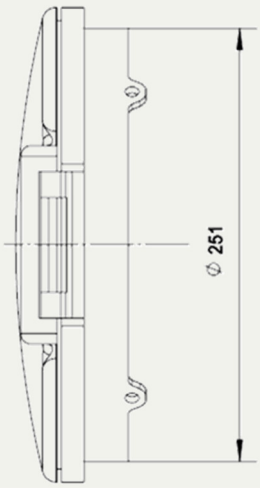


Figure 8 - JAI hatch detail

3.2 Waste compartment

This section presents tank types and factors that will influence the geometry of the waste compartment.

3.2.1 Waste tanks

The waste tanks are containers for storing waste. The tanks are available in different designs and sizes. The tank should be selected according to the amount of waste and the location of the tank.

3.2.1.1 Horizontal tanks

The horizontal tank is a horizontal round/oval cylinder, manufactured in painted 5 mm plate steel.

The tank is available in sizes from 1.7 m³ to 5 m³.

Horizontal tank overview:

Tank type	Volume m³	TW	TH	TL
12x15	1.7	1,250	1,300	2,387
12x15M	2.2	1,323	1,500	2,387
13x15	2.1	1,361	1,400	2,387
13x15M	2.5	1,364	1,600	2,387
14x15	2.4	1,460	1,500	2,387
14x15M	2.9	1,510	1,700	2,387
14x19	2.8	1,460	1,500	2,787
14x19M	3	1,510	1,700	2,787
16x23	4	1,650	1,700	3,228
16x23M200	5	1,690	1,900	3,228

TL: Includes 500 mm cleaning hatch

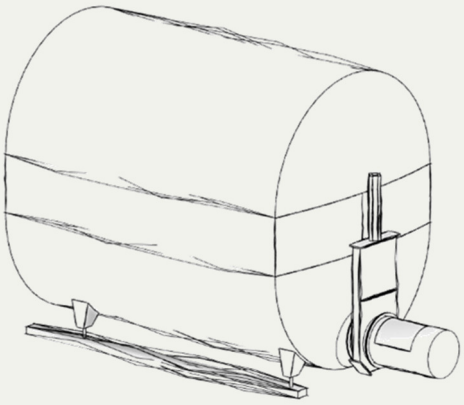


Figure 9 - Horizontal tank, isometry

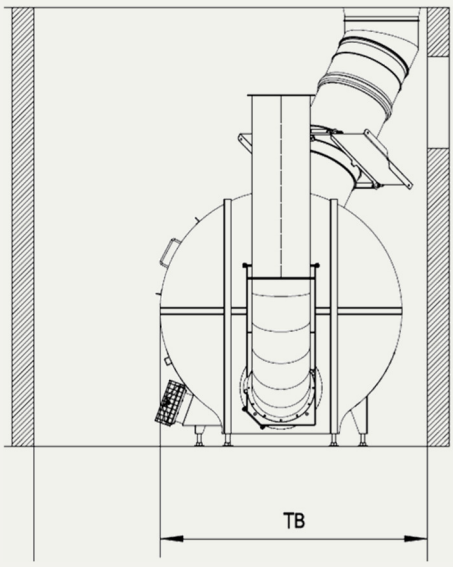


Figure 11 - Horizontal tank, width

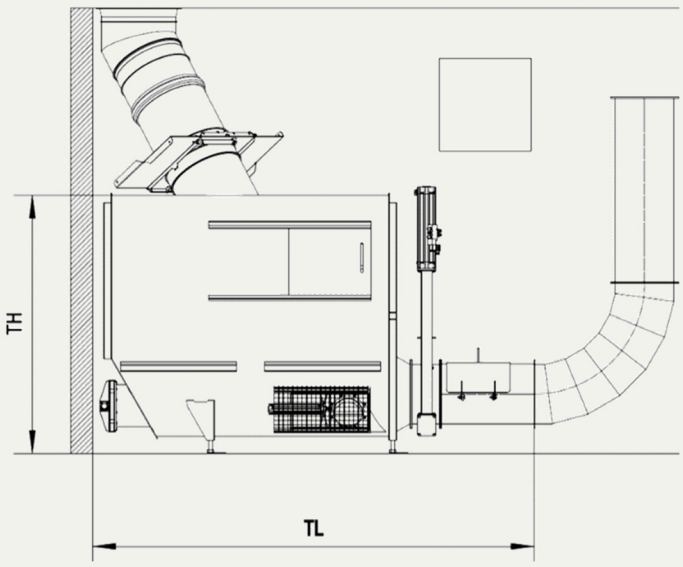


Figure 10 - Horizontal tank, length and height

3.2.1.2 Vertical tank

The vertical tank is an upright standing cylinder-shaped tank, manufactured in painted 5 mm plate steel.

The tank is available in sizes from 1 m³ to 3.5 m³.

Vertical tank overview:

Volume m³	TW	TH	TL
1.0	1,200	1,518	1,714
1.5	1,300	1,759	1,817
2.0	1,550	1,809	2,063
2.5	1,650	1,984	2,162
3.0	1,850	2,040	2,259
3.5	1,850	2,174	2,265

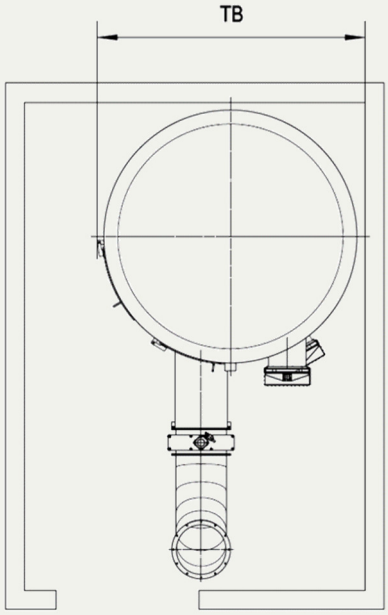


Figure 13 - Vertical tank, width

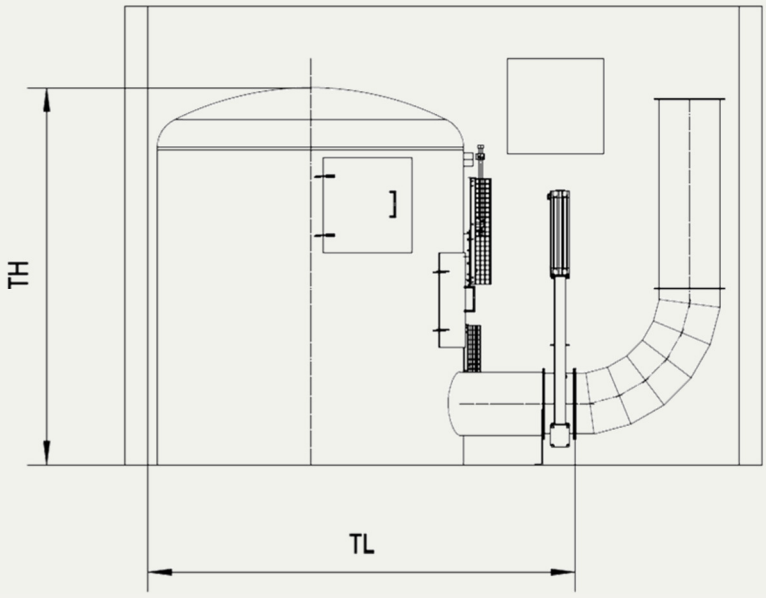


Figure 12 - Vertical tank, length and width

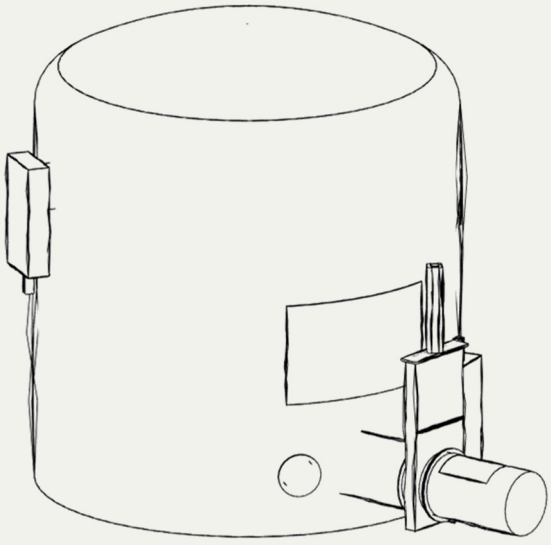


Figure 14 - Vertical tank, isometry

3.2.1.3 Spiral tank

The spiral tank is manufactured in painted 3 mm steel. The tank is mounted in a building or concrete socket and can be delivered mounted in PE pipe for burial.

The tank is available in sizes from 4.5 m³ to 7.5 m³.

Please contact Aerbin for compartment dimensions and installation dimensions.

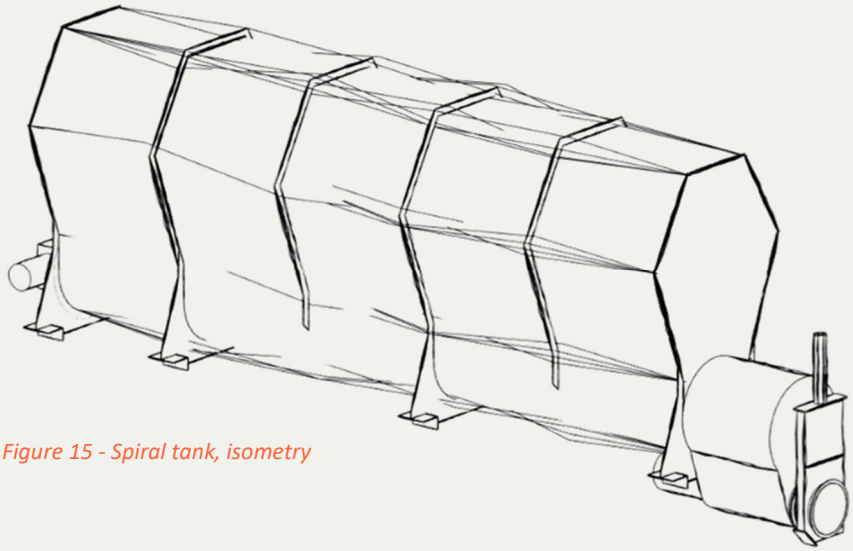


Figure 15 - Spiral tank, isometry

3.2.1.4 Underground tanks

Underground tanks are for direct burial and are manufactured in 5 mm hot-dip galvanised steel.

The tank is available in sizes from 1.5 m³ to 2.5 m³.

Please contact Aerbin for compartment dimensions and installation dimensions.

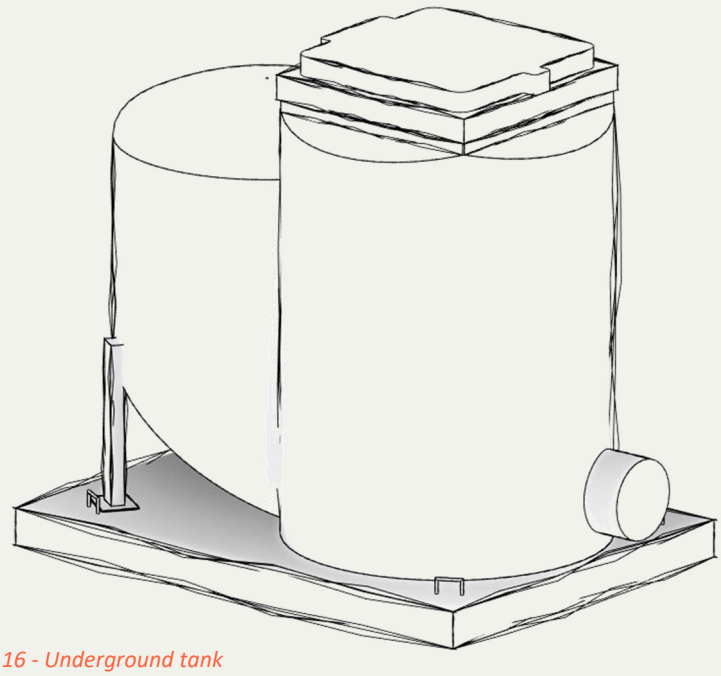


Figure 16 - Underground tank

3.2.2 Compartment layout

The waste compartment layout will depend on heights, tank types and suction pipe pathways as well as chute location.

3.2.2.1 Dimensions

- Width
- Length
- Height

The width of the waste compartment is determined by the size of the tank. Section 3.2.1 explains tank types and sizes. The City of Copenhagen requires 700 mm of free space on one side of the waste tank for service etc. See Appendix A.

Minimum compartment width = Tank width (TW) + 700 mm.

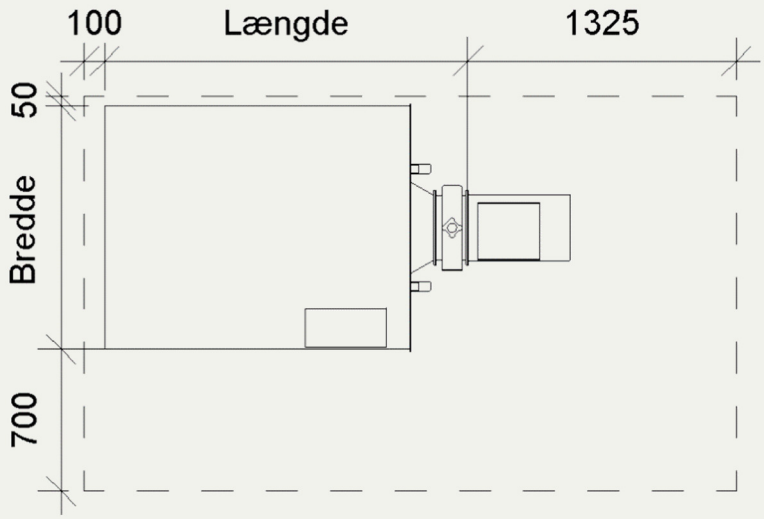


Figure 17 - Compartment Dimensions Plan

The length of the waste compartment is determined by the size of the tank. Section 3.2.1 explains tank types and sizes.

Minimum compartment length depending on suction pipe pathways:

- Suction pipe directly out through outer wall: Tank length (TL)+ 200 mm
- Suction pipe routed under ceiling: Tank length (TL)+ 820 mm
- Suction pipe routed under decking: Tank length (TL)+ 820 mm
- Suction pipe in base plate: Tank length (TL)+ 1,020 mm

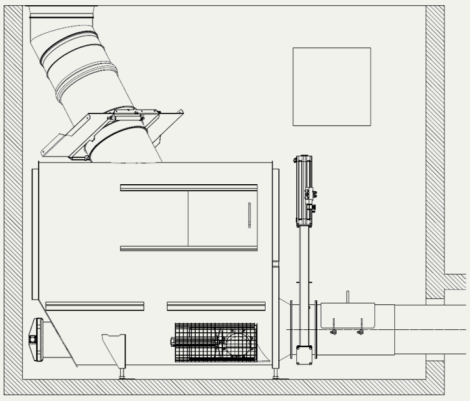


Figure 18 - Suction pipe directly out through outer wall

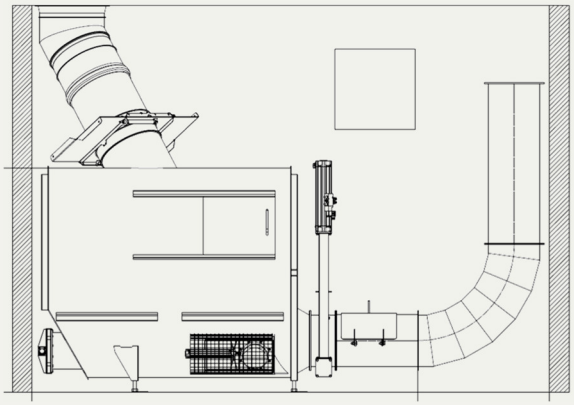


Figure 19 - Suction pipe routed under ceiling

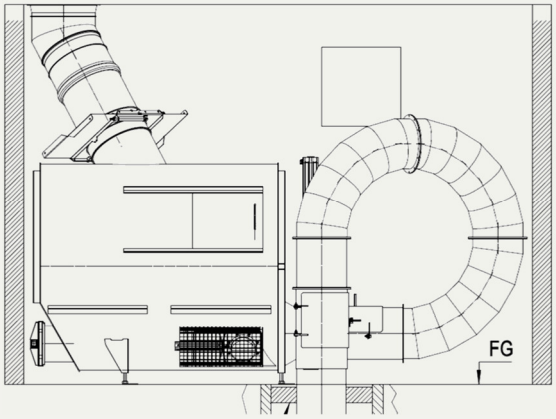


Figure 20 - Suction pipe vertical through decking

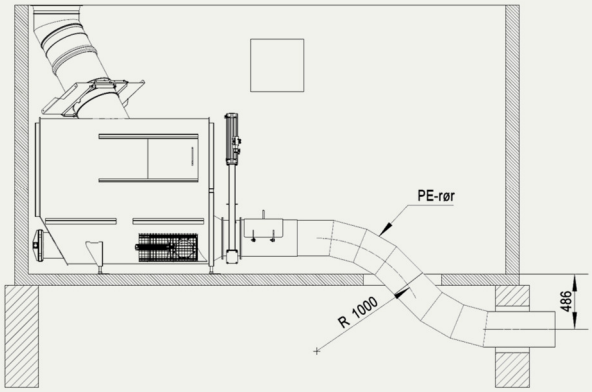


Figure 21 - Suction pipe in base plate

Waste compartment room height is determined by the size of the waste tank and any necessary clearance above the tank.

Clearance is mostly determined by the position of the chute relative to the tank. On the plan, measure the horizontal distance (see Figure 22) from the centre of the waste chute to the centre of the waste tank. As a rule of thumb, multiply this distance by 1.7.

Clearance above tank = distance x 1.7

Waste compartment height is determined by the size of the tank. Section 3.2.1 explains tank types and sizes.

Once you know the height of the waste tank, you then need to take into account any required clearances between the tank and the lower edge of the ceiling.

Room height = Tank height (TH) + Clearance above tank. See Figure 23.

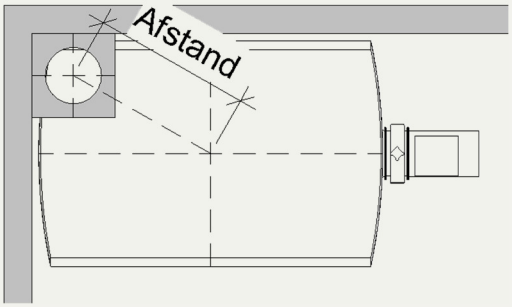


Figure 22 - Distance centre of chute to centre of waste tank

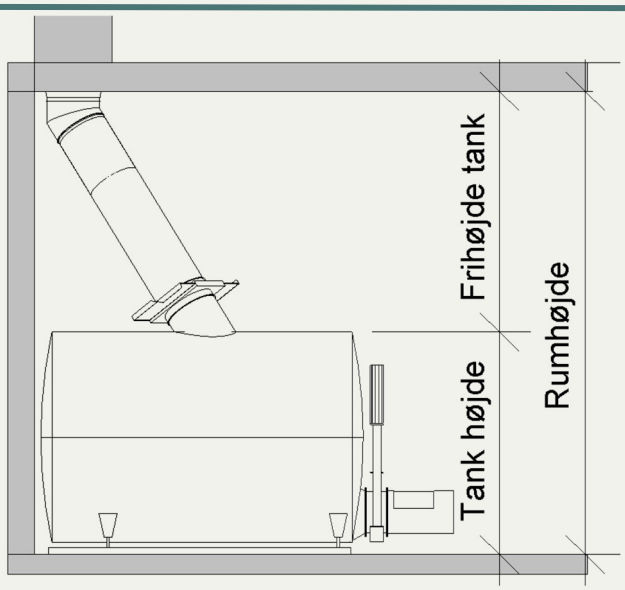


Figure 23 - Tank Height, Height Clearance & Compartment Height

3.2.2.2 Intermediate chute pipe

An intermediate chute pipe is installed at each tank from the lower edge of the waste compartment ceiling to the waste tank. The chute pipe is attached to the underside of the ceiling with a transition bolted to the underside of the ceiling. Transitions and angles are made of ø400 2 mm wall thickness primed steel. Chute pipes and telescopic pipes are made of ø400

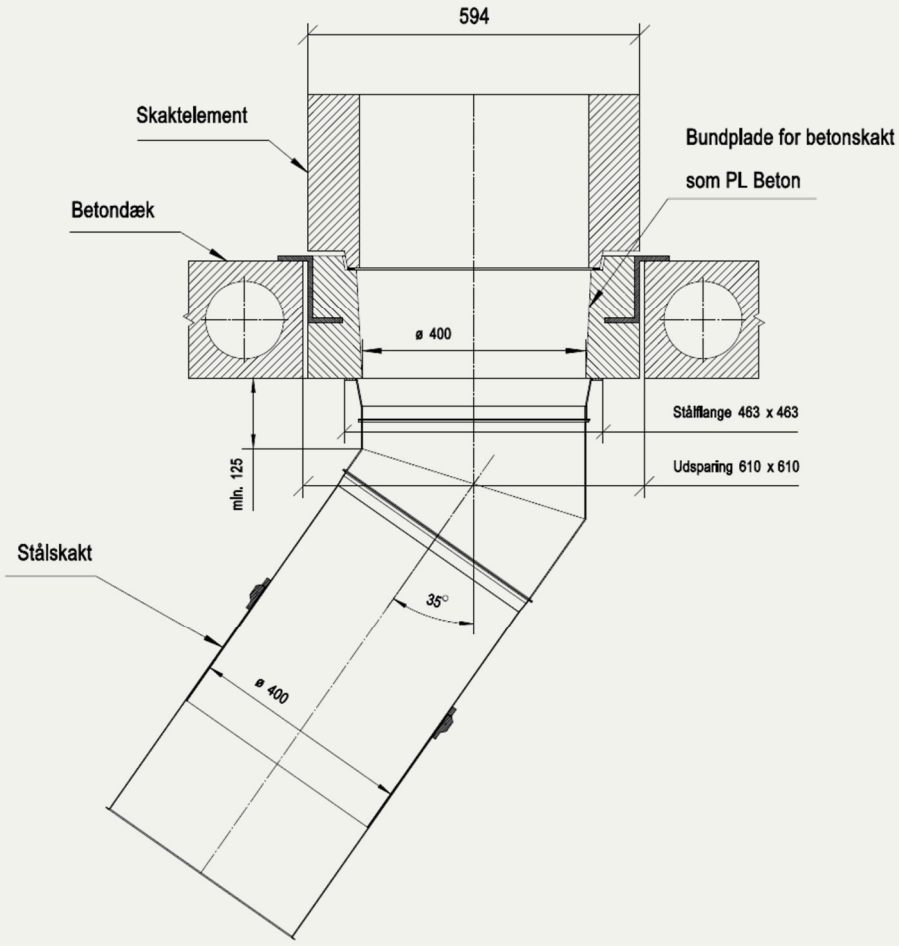


Figure 24 - Intermediate chute pipe, slope

1.25 mm galvanised steel. The intermediate chute pipe must have a maximum slope of 35° from the vertical.

3.2.3 Other requirements and installations

This section presents requirements for ventilation, replacement air, fire, recesses and noise.

3.2.3.1 Ventilation

Replacement air requirements are reviewed in section 3.2.3.4. Ventilation requirements for waste disposal facilities are set out in Danish Building Regulations.

There are no requirements for balanced mechanical ventilation of waste disposal facilities. There are, however, hybrid ventilation requirements for mechanical suction extraction corresponding to 1 l/s per waste container, with a minimum capacity of 15 l/s. Danish Building Regulations do not distinguish between the sizes of waste containers and/or tanks.

If there are mechanical or other forms of ventilation in adjacent rooms, the consultant must assess the risk of unpleasant odours spread from waste disposal compartments.

Reference is also made to Danish Building Regulations BR18 paragraphs 63 to 68, which deal with waste systems.

3.2.3.2 Fire

When setting up waste storage compartments inside a building, the floor, walls and ceiling must, by way of minimum, be executed as a fire-risk unit.

Building elements adjacent to the fire-risk unit should be executed as class REI 60 A2-s1,d0 [BS building part 60] elements. Ventilation ducts should be executed to duct class EI 30/E 60 (ve ho i <-> o) A2-s1,d0 [BS duct 30 with integrity as F duct 60].

Reference is also made to Danish Building Regulations BR18 paragraphs 63 to 68, which deal with waste systems.

3.2.3.3 Cavities

When routing suction tubes, walls and/or decking are penetrated, and this requires cavities for suction tubes and control cables. Cavities must be executed as drilled holes with smooth surfaces. See Figure 25 and Figure 26.

Suction pipe cavities must be Ø400. A LINK-SEAL seal must be used when an outer wall or floor deck is penetrated.

Cavities for air ventilation and control cables must be Ø100. A Brattberg seal must be used for sealing. See Figure 25 and Figure 26

Where suction pipes are routed through in-situ decks, a fibre cement *Hülse* sleeve must be used as shown in Figure 25.

Where the suction pipe is routed through foundations, the foundation cavity must be at least Ø500 mm. Corrugated pipe must not be used for cavities. Aerbin currently has no requirements for fillings/seals around foundation cavities.

Because the fittings have a respective bend radius of 1,300 mm for PE and 600 mm for steel, it is important that cavities are positioned according to the plans.

Aerbin supplies all the above components for casting.

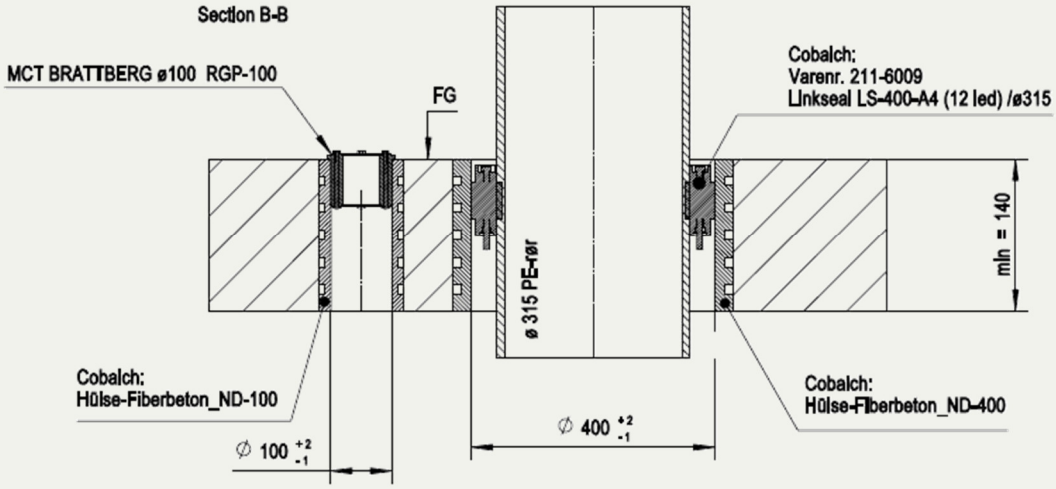


Figure 25 - Cavities in decking

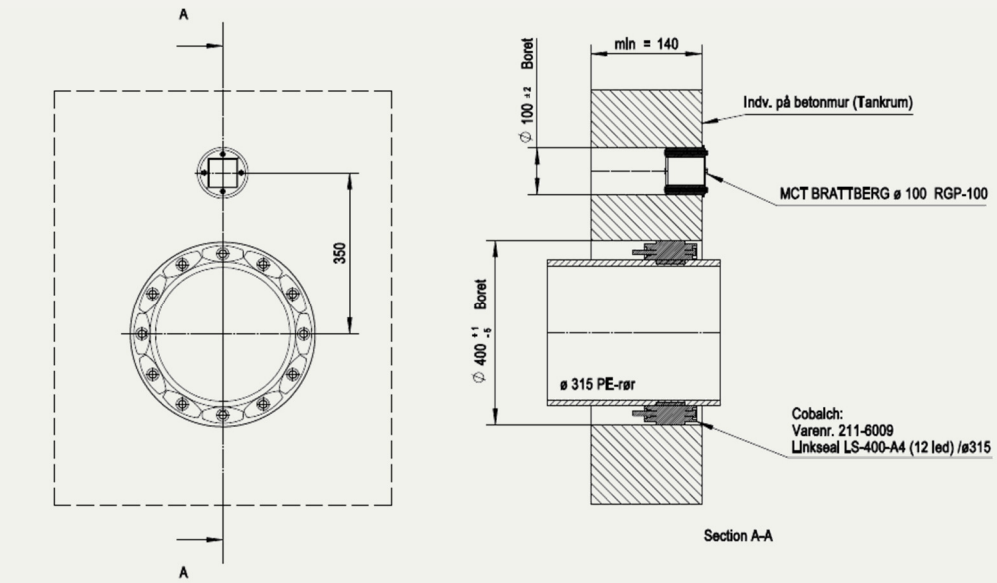


Figure 26 - Wall cavities

3.2.3.4 Replacement air

The waste compartment must be supplied with replacement air. When emptying the waste tank, approx. 7,000–9,000 m³/h or 2-2.5 m³/s will be required. A typical emptying cycle is five intervals of approx. 15 seconds.

Replacement air must be supplied through a grate or other aperture to the outside. The aperture area must supply a volume flow that corresponds to the extracted volume flow.

If mechanical ventilation is installed in the waste compartment, the consultant will need to assess the potential for any risk that replacement air will not be circulated through if the pressure drop for the projected replacement air supply path is too great.

Reference is also made to BR.15 Chapter 8.7 on waste facilities.

No fire damper is required if the replacement air is sourced directly from outside through the outer wall.

Total pressure loss across grates and ducts/routings must not exceed 500 Pa.

A 50 x 50 cm ventilation aperture to the open air with a grate as shown in Figure 27 would produce a negative pressure in the waste compartment of approx. 1000 Pa during emptying.

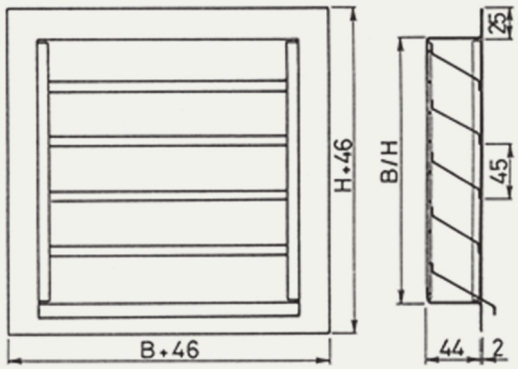


Figure 27 - Vent cover

The consultant must assess whether the sound level in dampers exceeds permissible limits for short-term noise. The damper described previously produces sound levels exceeding 60dB(a). If replacement air is taken close to the junction, consider using a damper with a free area of min. 1m², which would make it possible to keep noise levels at about 35dB(a).

Especially when light wall constructions and long ventilation ducts are involved, pressure drops must be documented, and the building's statics verified by a consultant. The waste compartment must be dimensioned for a negative pressure of 2,000 Pa.

There have been cases when fire doors have been sucked inwards and walls have fallen or cracked if the ventilation opening is undersized and/or blocked, see Figure 28


Figure 28 - Wall cracked due to lack of replacement air.

When cold replacement air is introduced, the consultant should consider heat loss calculations in relation to cold and warm rooms/compartments.

3.2.3.5 Fire damper

Aerbin does not supply fire dampers.

There is some doubt as to whether a fire damper should be used in the ventilation aperture between the waste compartment and e.g. underground car parks. Some municipalities require that waste compartments are secured to DS 428 standards and that tanks also have sprinkler systems installed. We therefore recommend that you contact the local fire authority to find out about their requirements and for final approval of the compartment's installations.

According to the DS428-4 fire standard, fire dampers must be approved according to DS / EN1366-2 standard and must be classified according to the EN13501-3 standard.

Fire dampers must be CE labelled. Each fire damper must be supplied with a declaration of conformity.

All dampers must be motorised and connected to a smoke detector. There is also a requirement for a weekly automatic function test via the mandatory automatic system. Finally, an annual manual inspection is required as well as a start-up and function test, including a start-up report which must be submitted to the authorities.

The fire damper for the waste compartment must normally be open and provide feedback as shown in the connection diagram in Appendix C. The system can only be emptied when the fire damper is open.

3.2.3.6 Noise

When emptying the system, there will be a sound pressure level in the tank compartment of approx. LAeq=105 dB(A) for a period of approx. 5 x 15 seconds per tank. See Appendix D.

It is the responsibility of the consultant to ensure satisfactory sound conditions in adjacent rooms as stipulated in BR15 chapter 6.4.1.

3.3 Trace

The pipe system connects the waste tanks to the suction point. The pipe system consists of straight pipes and bends at different angles and different bending radii.

3.3.1 Steel pipe

Primed DN 315 standard steel pipes with a wall thickness of 2 mm are used in buildings and waste compartments. The steel pipes are flanged together. Pipes can be wall or ceiling mounted or run along the floor on a pipe stand. The distance between suspension brackets must be 2 m. The segment bends have a bend radius of 600 mm.

3.3.2 PE pipe

Ground installations require the use of PE100 RC DN 315 SDR 26 pipes and segment bends. The entire pipe system is butt-welded. 24 mm PE and 3 mm steel sandwich construction reinforced segment bends and branch pipes must be used when laying pipes during construction.

Segment bends have a bending radius of 1,300 mm. The branch pipe is set at a 15° angle.

Where pipes are laid under buildings and below the ground water table, these must be secured against buoyancy with acid-resistant straps placed at a maximum distance of 3 m.

Minimum earth cover for reasons of upfloat is 400 mm. Maximum earth coverage is 16 m with no deformation calculation.

We recommend a minimum of 600 mm earth cover for normal load and a minimum of 900 mm where there are traffic loads.

For cross-sectional detail see Figure 29.

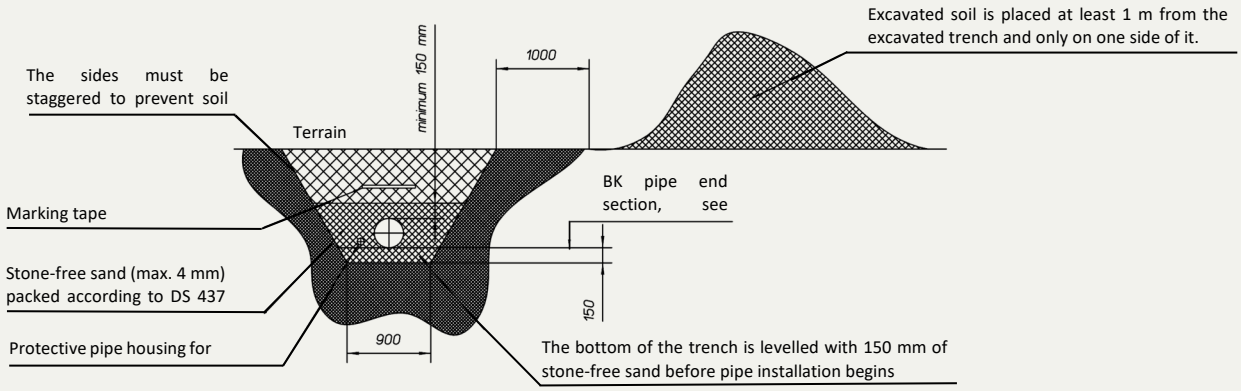


Figure 29 - Construction of trenches for suction pipes in terrain

Aerbin has no requirements for distances in respect to other pipelines. Distance in respect of other pipelines is in accordance with DS 475 whereby suction pipes can be considered as “drainage: Plastic” as shown in Table 4.6.1. It is the responsibility of the consultant to coordinate distances according to common rules and norms.

Where the suction pipe is routed through foundations, the foundation cavity must be at least Ø500 mm. Corrugated pipe must not be used for cavities. Aerbin currently has no requirements for fillings/seals around foundation cavities.

3.4 Suction outlet

The suction outlet is the connection point to which the suction vehicle attaches its pipe to empty the system.

3.4.1 Positioning

The suction outlet must be placed max. 3 m from where the suction vehicle is parked. Consideration must also be given to whether the mobile suction truck needs to turn. This means taking into account a 12 m long, 4-axle vehicle with a weight of 32 tons and a width of 2.55 m + mirrors.

3.4.2 Suction stand

The suction point can be located e.g. with a flush placed port in the pavement or in a raised suction stand. If the suction point cannot be placed on your own plot, it can be placed on public land according to the guest principle. The location of the suction point must therefore be approved by town utility services in the form of a roadway alteration.

The suction point is supplied as standard as a raised suction port, with a lockable cover with a cylinder that lifts out of the cover. The stand is made of 3 mm hot-dip galvanised steel (dimensions ø 780 mm x 1,000 mm). A lock adapted to the relevant waste disposal company's system key is included. The stand also features PLC with display, connection to compressed air, manometer, key box for waste compartment, 10 or 20 pole Harting plug for connection to suction truck, and 230V power outlet.

Raised suction stand

The raised suction stand is a ø780 mm cylindrical metal stand. This is supplied as standard in hot-dip galvanised metal and can be supplied painted in any RAL colour at an additional cost.

The raised suction stand is often a municipal requirement. A raised suction stand is more ergonomically correct for renovation operatives. This solution is also much more weather-resistant, keeping water and grit out of the plug, electrical and control box, while also protecting the pipe network against flooding.

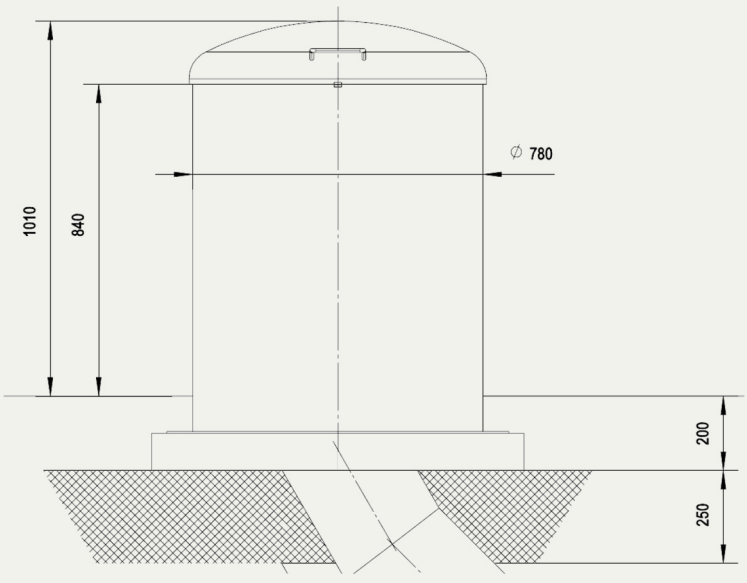


Figure 30 - Raised suction stand

Dimensions:
Ø: 780 mm x H: 1,010 mm

For excavation diagrams, see Appendix E.

Figure 31 - Raised suction stand in RAL colour

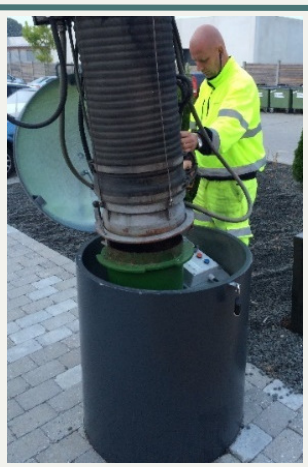


Figure 32 - Emptying raised suction stand

Flush suction port

The flush recessed suction port is a square cast iron cover that lies flush at ground level.

A flush recessed suction port is necessary where the suction point needs to be integrated into the pavement.
Flush recessed suction ports are also available in a 40 tons variant for roads with heavy traffic.

Figure 33 - Suction cover plate

Dimensions
W:950 mm x L:950 mm x H:312 mm

For excavation diagrams, see Appendix F.

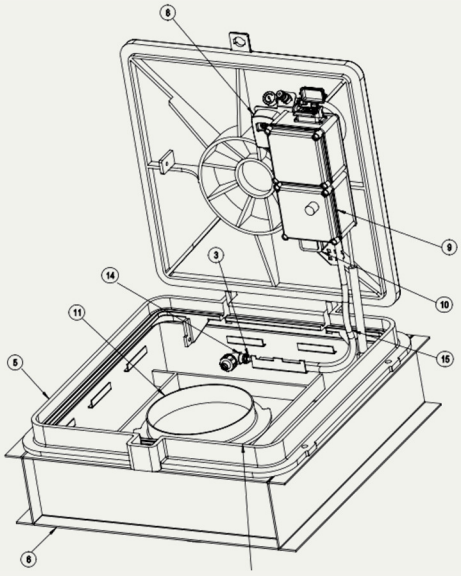


Figure 34 - Suction cover plate, detail

Figure 35 - Emptying via a flush recessed suction port

3.4.3 Suction truck

If the suction truck emptying the collection tank needs to turn, you will need to take into account that the 4-axle vehicle is 12 m long, weighs 32 tons and has a width of 2.55 m plus mirrors.

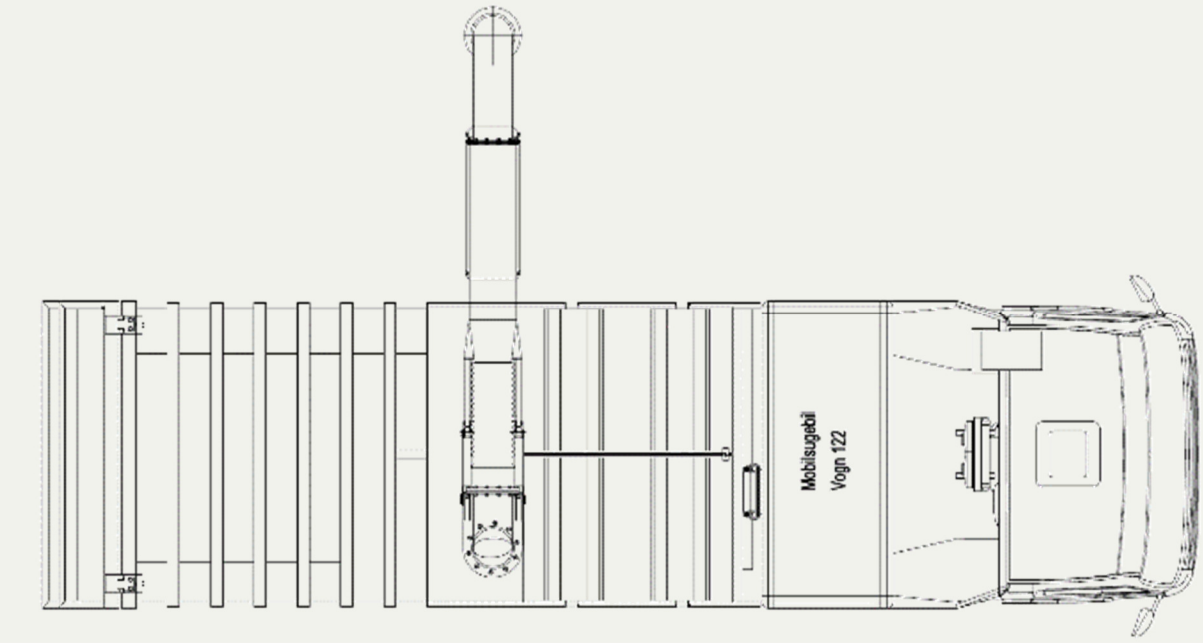


Figure 36 - Suction truck, plan diagram

For information about noise levels produced by the suction truck, see Appendix G.

Appendix A – AT items for building permits

We include here a (translated) copy of the standard response that is always received after a building permit application, so you will need to incorporate the following from the very start of your planning.

Byens Udvikling, Klima (Town Development, Climate), has no objections to the establishment of a mobile suction system for the collection of normal household waste, provided:

1. *that the facility is dimensioned so that each home has an effective waste volume corresponding to 125 litres per week. The facility will also require excess capacity, corresponding to a filling rate of 80%. Collection frequency must be agreed with the Centre for Customer-Oriented Operations, Waste and Recycling, affaldskonsulenter@tmf.kk.dk.*

2. *that approval of facilities and docking points takes place by agreement with the City of Copenhagen.*

3. *that Byens Anvendelse, Tilladelse til vejændring (Town Usage, Permits for road changes), approves the location of mobile suction docking points.*

4. *that the distance from the suction truck's approved parking space to the suction site does not exceed 300 cm.*

5. *that – if the suction truck emptying the mobile suction collection tank needs to turn – it has been taken into account that the 12-metre vehicle has four axles, weighs 32 tons and has a width of 2.55 m plus mirrors.*

6. *that raised suction points are established where possible, for reasons of health and safety, accessibility and cloudburst protection.*

7. *that a tank is established under each waste chute and that the bend of the chute pipe does not exceed 35°. For tanks larger than 1,800 litres, a 40° pipe bend is accepted. Any bends greater than this will have to be approved by the City of Copenhagen/Climate.*

8. *that tanks are established with a minimum of 0.7 meters of space around pipes and inspection hatches to allow for inspection and service.*

9. *that all residents of the property basically have access to a throw-in chute on the floor where they live.*

10. *that the facility is established with an open source data connection, so that all waste collection companies can log in and empty the facility.*

11. *that in connection with the conclusion of an agreement on the start-up of the facility, an information form and a drawing of the facility must be submitted to the Centre for Customer-Oriented Operations, Waste and Recycling, affaldskonsulenter@tmf.kk.dk. The form is available from the same email address.*

12. *that maintenance of the facility is the responsibility of the landowner. The Centre for Customer-Oriented Operations, Waste and Recycling recommends that water and water drainage be established in the tank compartment to enable cleaning after any downtime. As a minimum, there must be a low plastic box of approx. 1 m x 0.5 m x 0.3 m, which can be pushed under the hatch. (We do not recommend drainage in the compartment itself due to the vacuum system)*

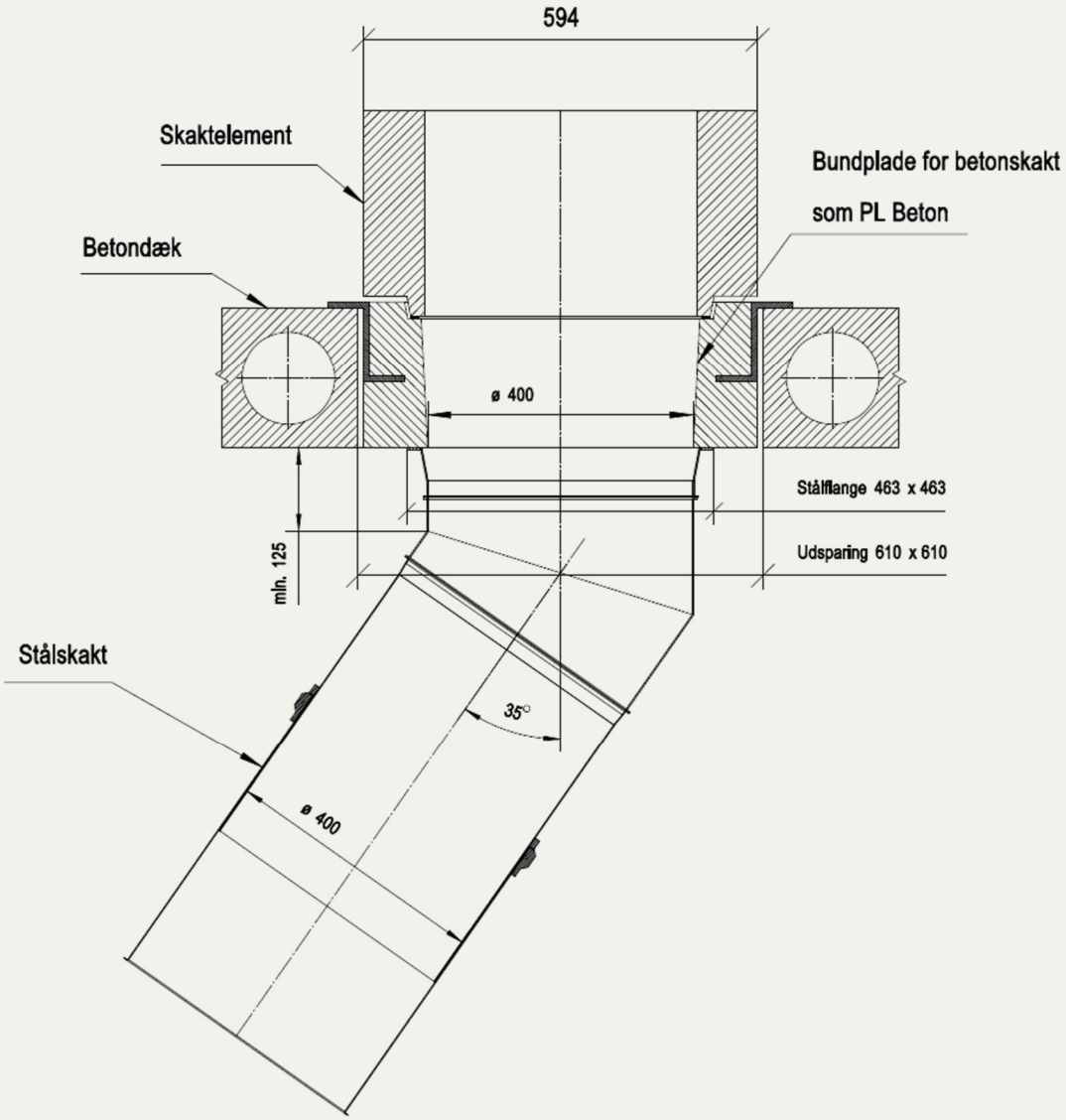
13. *that the landowner informs users about how to use the facility correctly.*

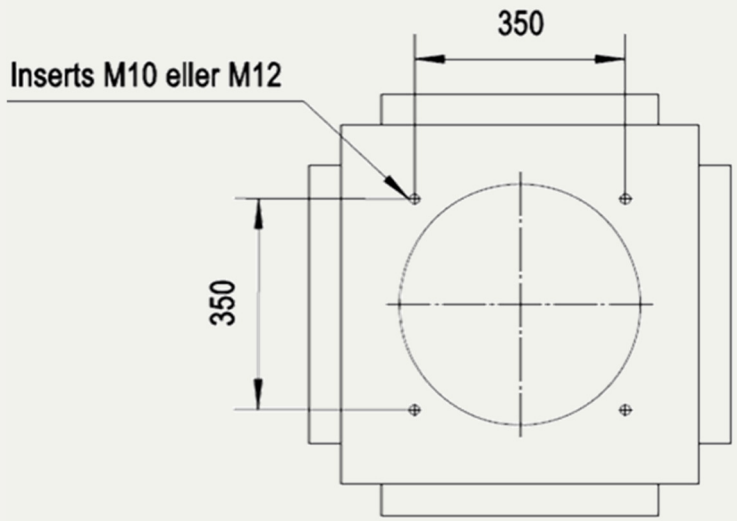
Aerbin clarifies the following points 1, 6-8, 10, 11 and 13 in cooperation with the developer and their advisers.

Furthermore, the waste collection company must submit the check form below to the City of Copenhagen for approval of a new mobile suction system.

Description	OK	Not OK	Can the facility be commissioned	Not relevant
Dock location				
Surfacing around docking				
Shrubs/plants around docking				
Is there a help function to open the dock?				
Key box				
Is there a City key?				
Does the dock have a 10-pole connector?				
Access pathway from dock to tank				
Can the public be harmed?				
Descent shaft into the tank				
Do the covers have safety stops?				
Do the covers have assistive functionality?				
Is there a good solid ladder?				
Can lights be operated from the descent shaft?				
Is the area around the cover clearly apparent to others (hole)?				
Is there air to the tank compartment?				
Is there headroom in the tank compartment?				
Does the tank compartment permit natural working posture?				
Can you walk upright to and from the tank?				
Does the outlet damper work?				
Does the chute damper work?				
Is there light in the tank?				
Is there light in the tank compartment?				
Is there at least 0.5 m of free space around the tank?				
Does the remote control work?				
Is it clean in the tank compartment?				
Do stairs have handrails?				
Is the system CE labelled?				

Appendix B – Chute base, concrete chute





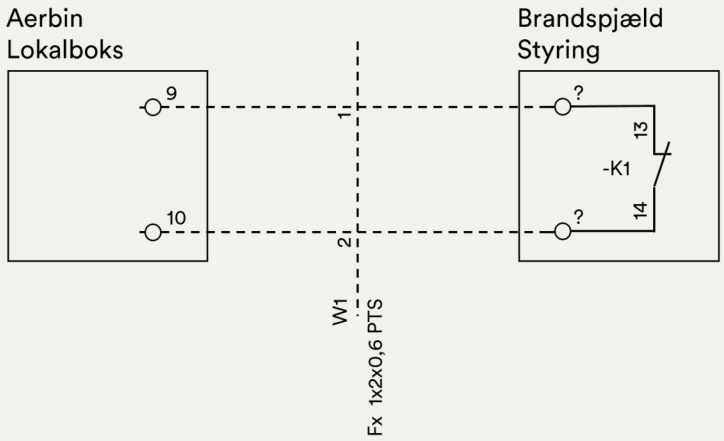
Appendix C – Connecting fire dampers

Installation weighing regarding connection of Aerbin's system to fire dampers.

1. Systems with only a single fire damper per waste compartment that have their own control system and are not connected to ABA facilities or other central equipment. Fire dampers are expected to be open in normal position.

- A single potential-free breaker signal is routed to our local box in the waste compartment so that the signal is broken if the fire damper is closed, regardless of the state of the equipment at the control centre.

Example:

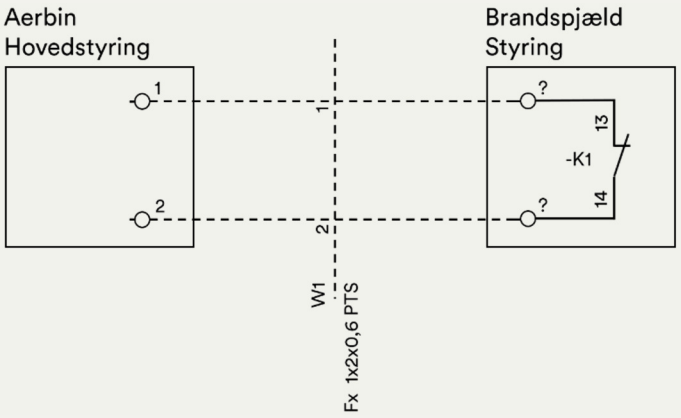


- Cable is routed to local box, but connection in local box may only be performed by Aerbin.

2. Facilities with more than one fire damper connected to central control, e.g. ABA system. Fire damper is expected to be open in normal position.

- A single potential-free breaker signal is routed from the control centre to Aerbin's main control system. The location of this will be specified by Aerbin. The signal must be such that if the fire damper is closed, the signal is broken regardless of the state on the central control system.

Example:



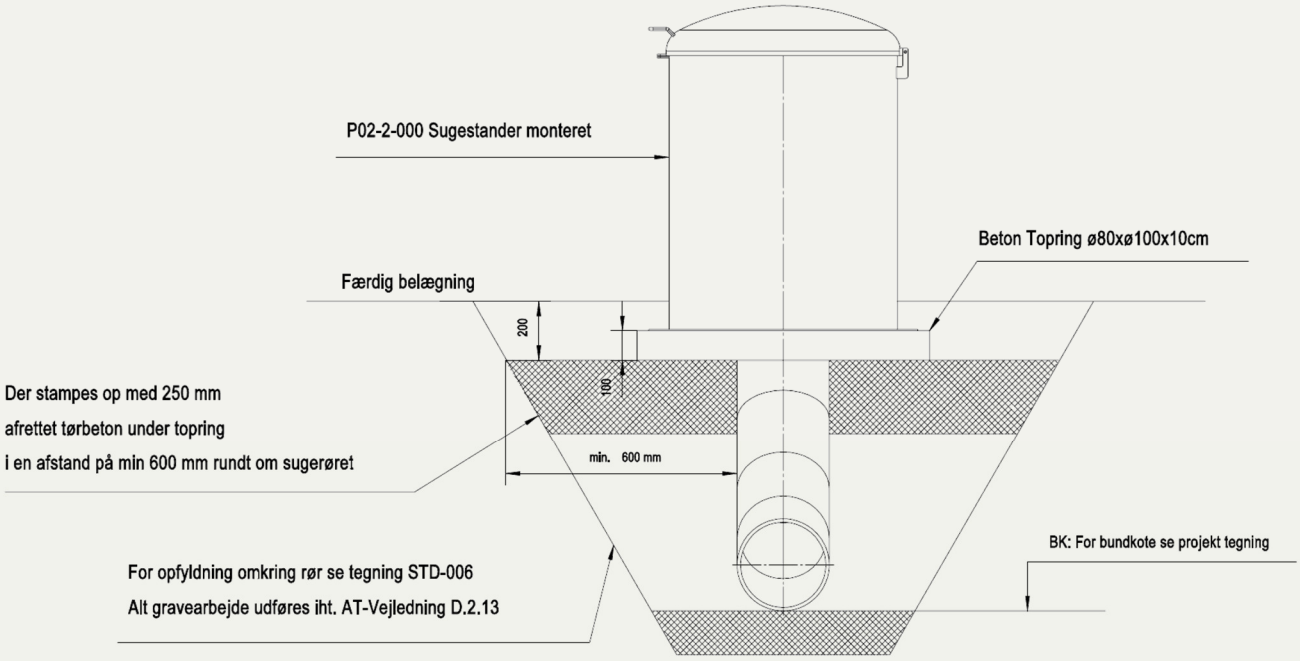
- If fire dampers are connected to more than one central control system, the potential-free signal from each control system must be sent on to Aerbin's main control.

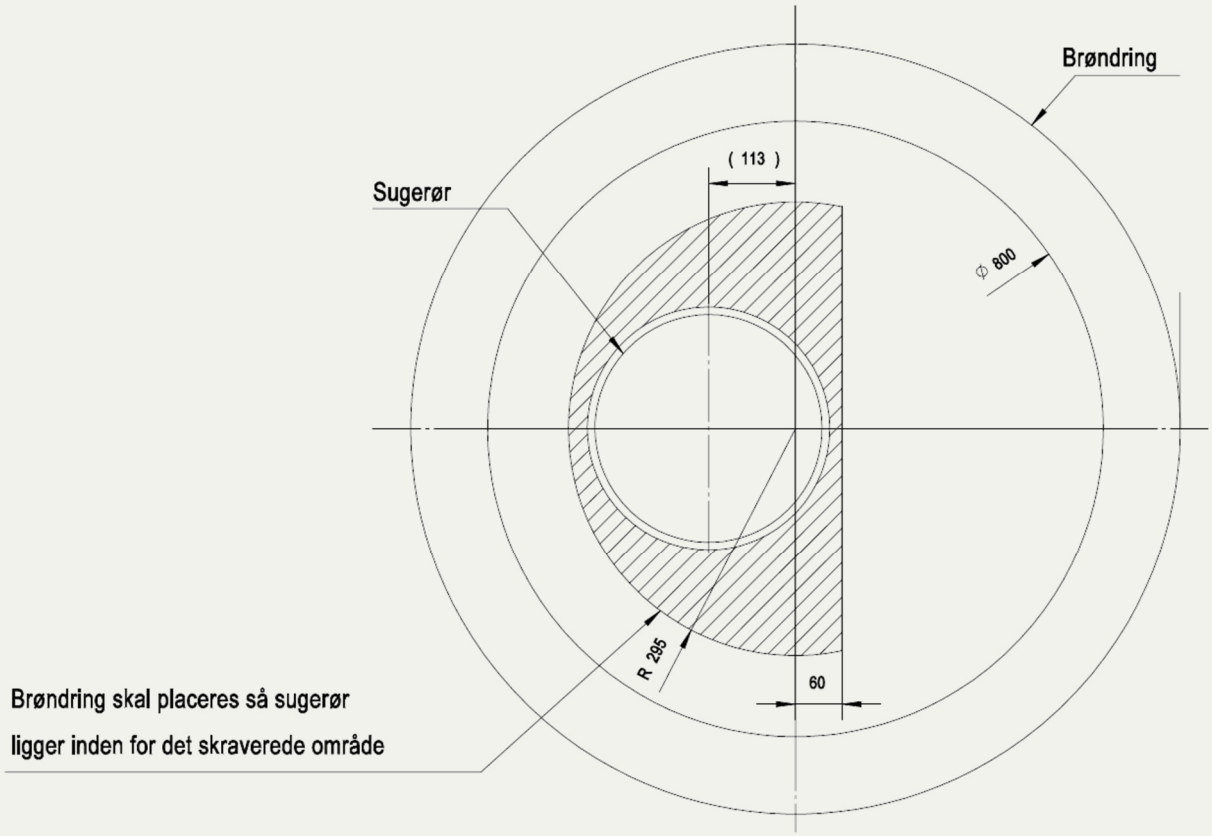
Appendix D – Noise, waste compartment

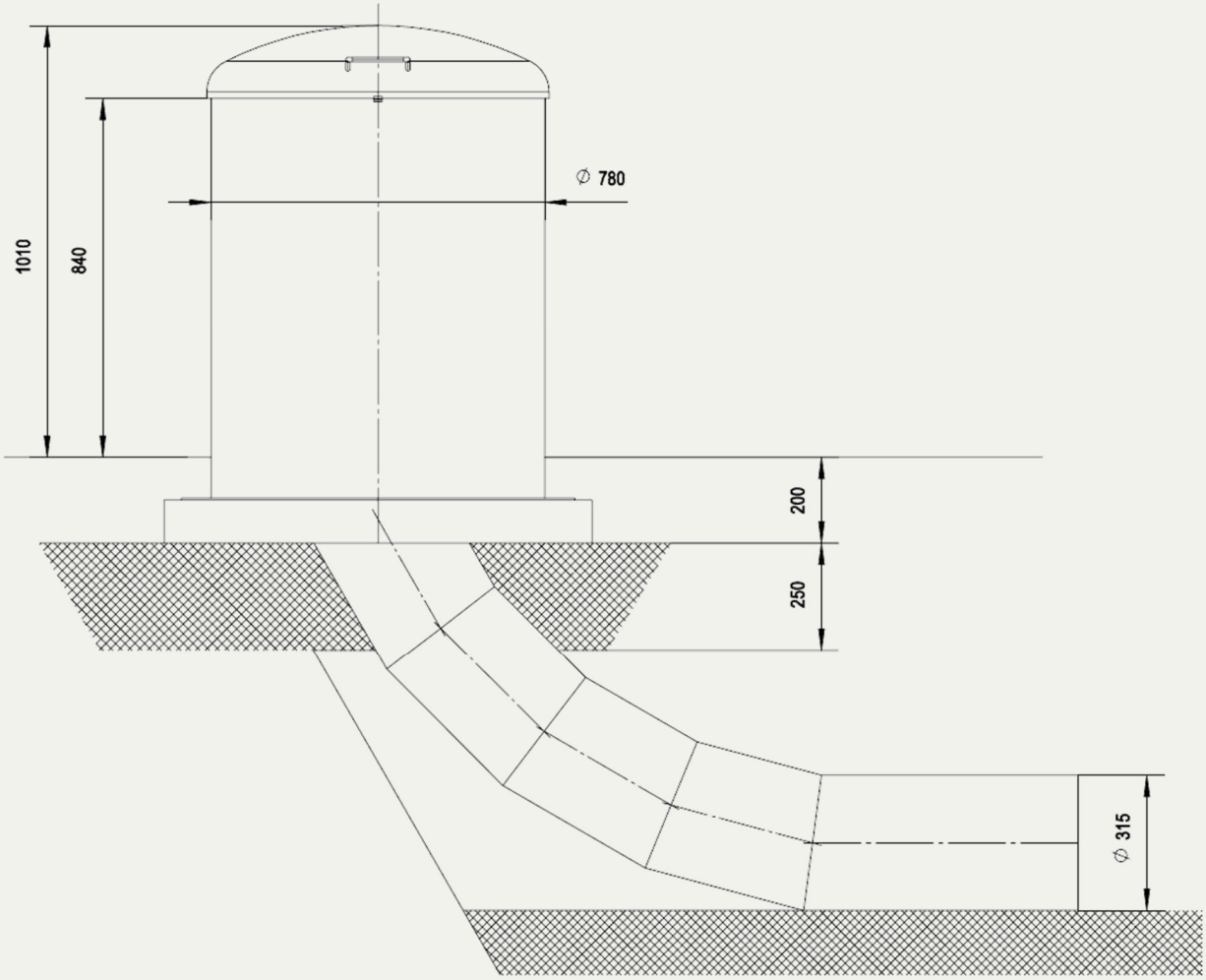
Frequency band, 1/3-octave (Hz)	Equivalent sound pressure level L_{eq} (dB)	Echo time T_{20} (s)
12.5	96.8	
16	92.5	
20	88.9	
25	86.2	
31.5	83.9	
40	82.9	
50	77.7	1.03
63	81.8	3.33
80	80.3	2.60
100	80.5	2.05
125	88.5	1.26
160	85.0	2.08
200	87.3	1.80
250	88.4	1.95
315	88.0	1.41
400	88.7	1.24
500	89.3	1.08
630	90.5	0.88
800	91.3	0.87
1000	91.9	0.90
1250	91.6	0.84
1600	93.0	0.83
2000	92.8	0.86
2500	92.3	0.87
3150	91.0	0.83
4000	89.9	0.78
5000	88.5	0.76
6300	86.0	0.67
8000	84.6	0.57
10000	82.2	
12500	76.7	
16000	72.7	
20000	67.6	

(Ballinger, 2017)

Appendix E – Excavation diagram, raised suction stand





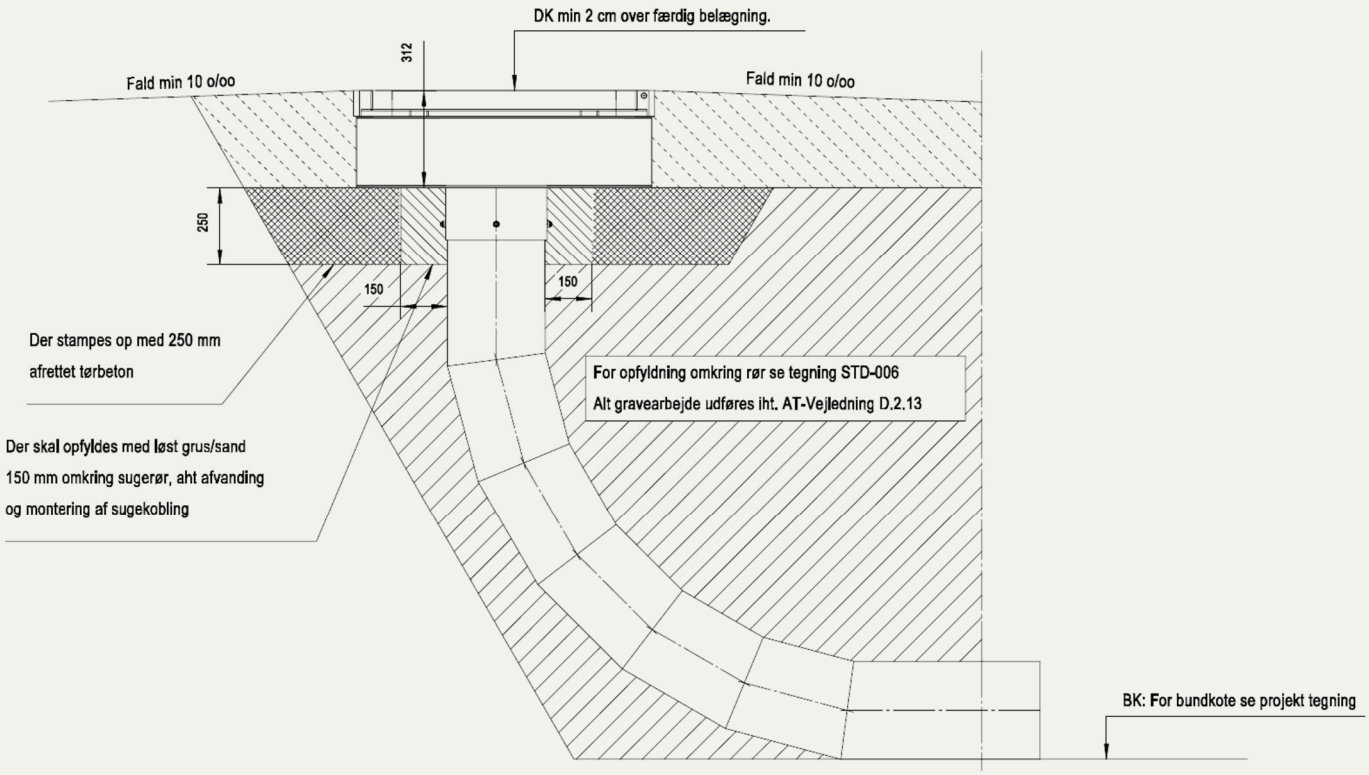

∅ 780
1010
840
200
250
∅ 315

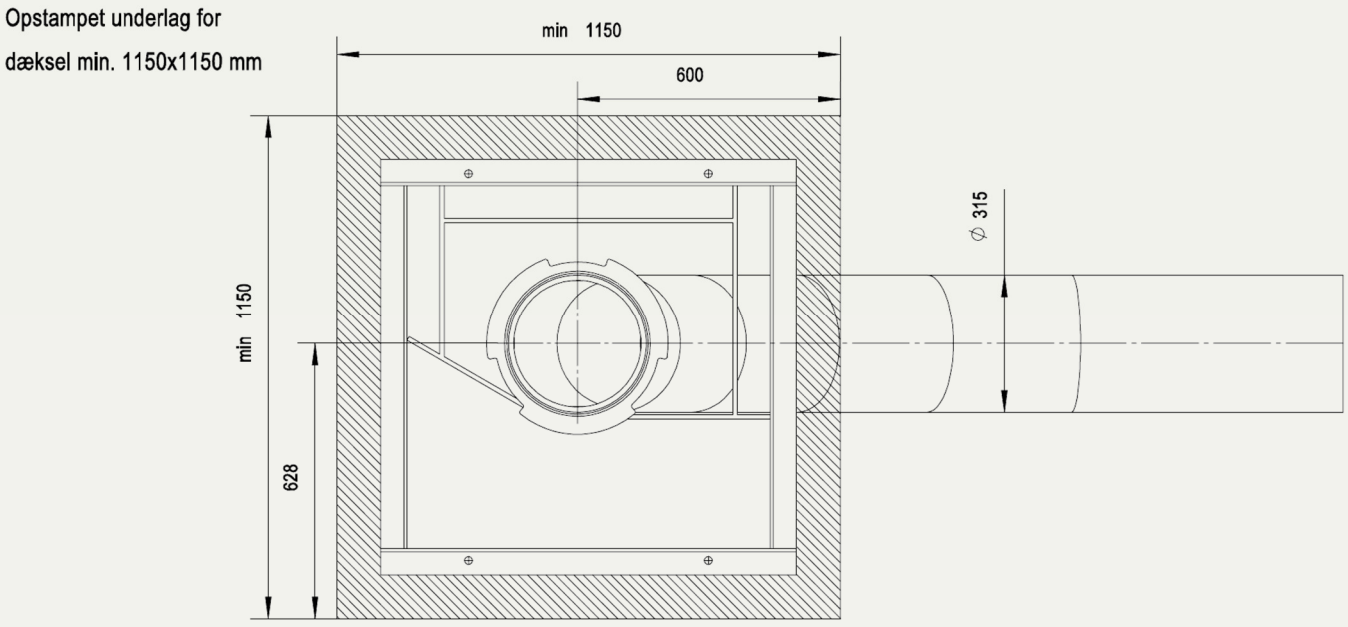
Appendix F – Excavation diagram, cover plate

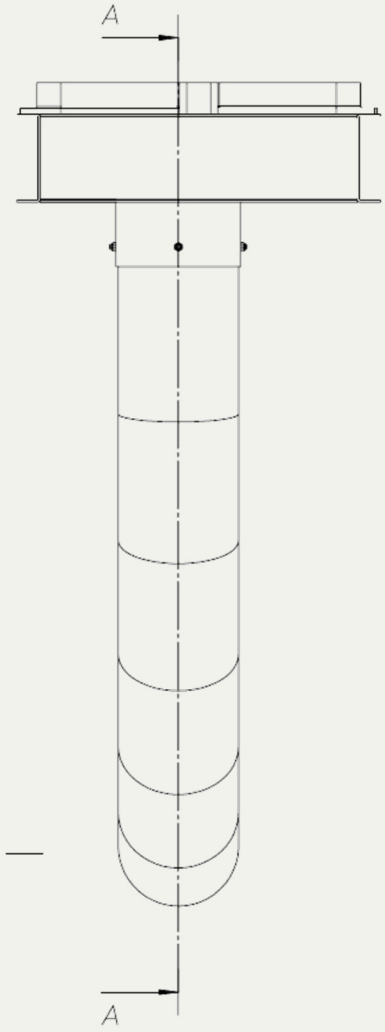
Note:

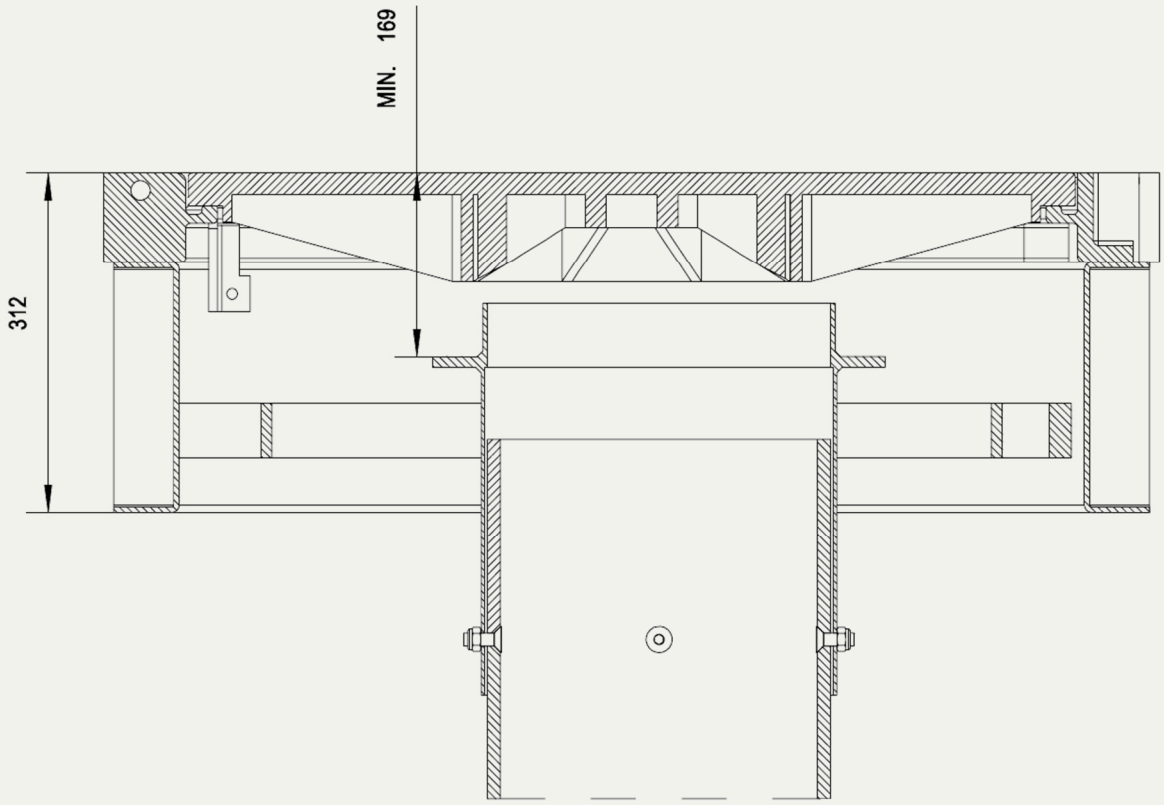
The cover must be higher than the finished road or paving surface. If the cover is not above the RK for the nearest drain, a volume drain will need to be established with a drain to a sewer to avoid flooding of the suction well and basement.

A raised suction stand must be used if this is not possible, see drawing P02-2-25






A
A


MIN. 169
312

Appendix G – Suction truck, noise

Source strength measurement before attenuation:

Frequency [Hz]	63	125	250	500	1k	2k	4k	8k	sum
L_{pA}, average	51.6	68.1	70.2	80.3	80.8	71.2	65.6	58.6	84.2
L_{WA}	80.8	97.2	99.3	109.4	109.9	100.3	94.7	87.7	113.3

Figure 5, A-weighted sound pressure level L_{pA} in dB re. µ20 Pa, and calculated sound power level L_{WA} in dB re. 1pW

Source strength measurement after attenuation:

Frequency [Hz]	63	125	250	500	1k	2k	4k	8k	sum
L_{pA}, average	49.9	62.4	65.7	72.5	71.1	68.1	62.9	56.7	76.6
L_{WA}	79.1	91.5	94.8	101.7	100.2	97.2	92.1	85.8	105.7

Figure 6, A-weighted sound pressure level L_{pA} in dB re. µ20 Pa, and calculated sound power level L_{WA} in dB re. 1pW

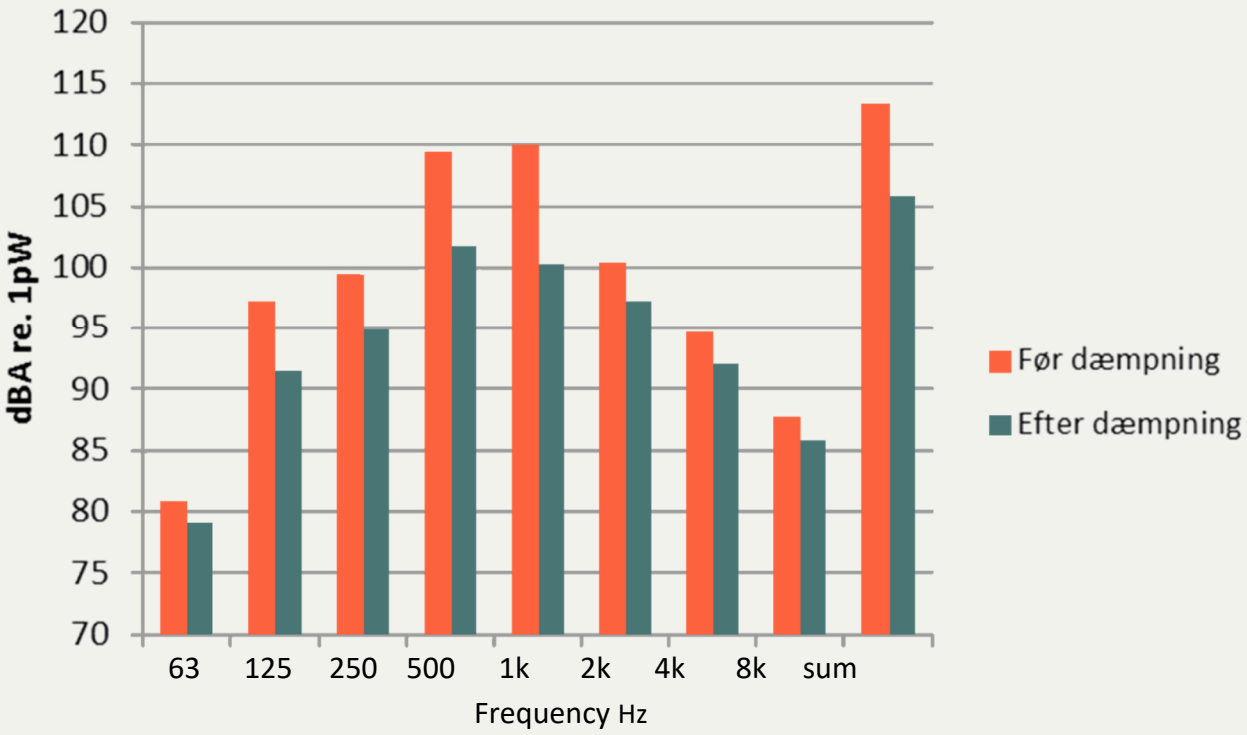


Figure 7, !/1-Octave band of sound power level before and after attenuation, LWA in dB re. 1pW

(Hansen, 2016)

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