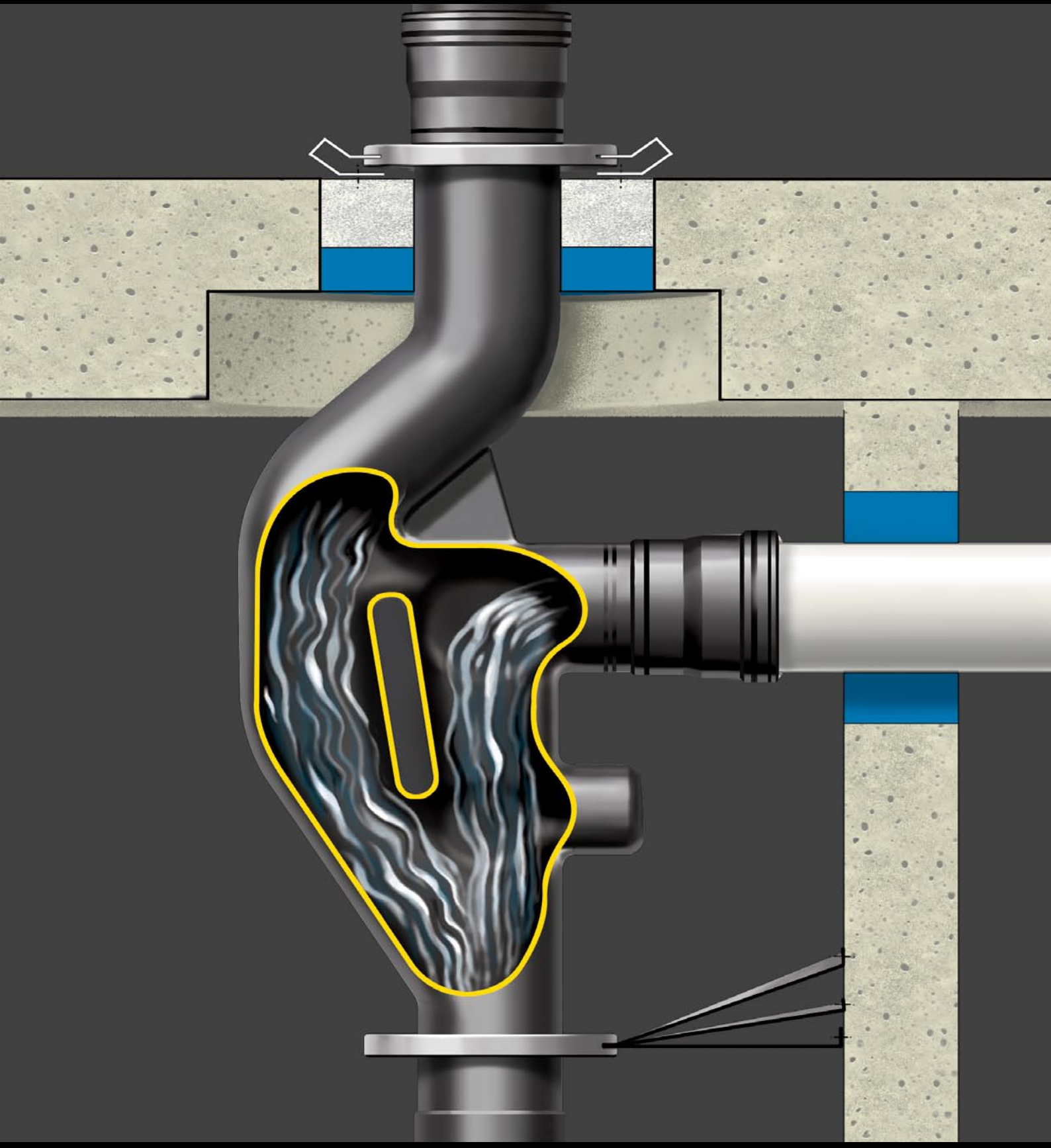
The Akatherm Akavent System

- Design guidelines



Plumbing Solutions

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Introducing a new innovation to Australian/New Zealand Plumbing

Akavent Multi-Storey Sewer Drainage System

The Akavent Multi-Storey Sewer Drainage System comprises 110 mm and 160 mm high-density HDPE plastic fittings that eliminate the relief venting requirements of traditional drainage systems.

The Akavent system is part of Akatherm's HDPE plastic drainage range and is specifically designed for multi-storey building applications.

The Akavent Multi-Storey Sewer Drainage System was launched in late 2003 and is operational in the 15-storey Flynn Apartments building in Brisbane, Museum Hotel Apartments Wellington and designed into the 80-storey Q1 tower at Surfers Paradise on the Gold Coast, the world's largest residential building now under construction.

The Akavent system:

- Slows the downward flow of water to prevent the formation of hydraulic plugs.
- Prevents waste water from branch lines mixing with other waste water until below the junction point.
- Has only one outlet pipe, replacing the need for a conventional two-pipe fully-vented or a fully ventilated modified stack system for multi-storey buildings.
- Provides significant cost savings through reduced pipe work and associated construction increasing flexibility for architects and designers of multi-storey buildings.
- Australian standards compliant in accordance with AS/NZS3500 for multi-storey sewer drainage

Distinctive Features

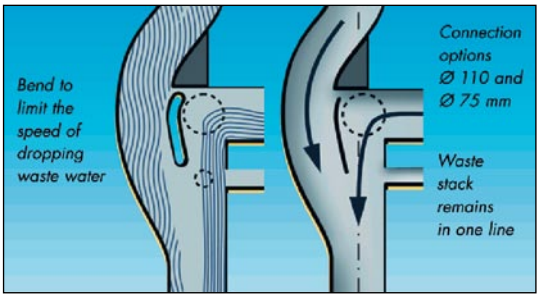
- A single pipe stack, eliminating all additional pipe work required for relief venting
- Increased design flexibility with longer unvented branch drains, to a maximum of up to 10 metres
- Space-saving through the elimination of bulkheads
- Installation and construction cost savings through the elimination of venting pipe work.
- Long-life HDPE construction, offering an environmentally friendly system with superior strength and durability

Select, design and install with confidence.

Akatherm Akavent

The Akavent system is based on the principle invented in the early 50's in Switzerland. By studying hydraulic and pneumatic characteristics of intermittent flows and simulations it was concluded that controlling the flow made a separate venting system redundant.

The Akavent system is the ideal DWV system for high-rise buildings.



Akatherm Snap socket

The Akatherm Akavent will be delivered with the necessary connections already prefabricated. These must be made by using the Akatherm snap socket a unique plug in socket with an extra snap-ring.
This ring provides the following extras:

- Pull tight connection if the snap groove is made into the connecting pipe.
- Centring the pipe in the ringseal thus preventing "hanging "of the pipe onto the seal.
- Scraping the pipe for dirt so it will not reach the ring seal.

The top connection, to the stack, will be equipped with a snap expansion socket, which is able to cope with the expansion of the PE pipe.

The other connections, the branches, will be equipped with the standard snap socket.

Akatherm snap expansion socket

Akatherm snap socket

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Elements of the system

The Akatherm Akavent system consists of prefabricated assemblies in the form of:

1. A stack made of standard Akatherm pipe and fittings sized by fixture unit load.
2. Akavent Aerators are required at each floor when horizontal branches enter the stack as follows:

   a. 100mm Soil branch **b. 100mm Waste branch** **c. Waste branch less than 100mm**

3. A de-aerator assembly at the bottom of the stack to make a transition to the general sewerage drain possible.
4. Relief vent where the stack is offset over distance greater than 45°.

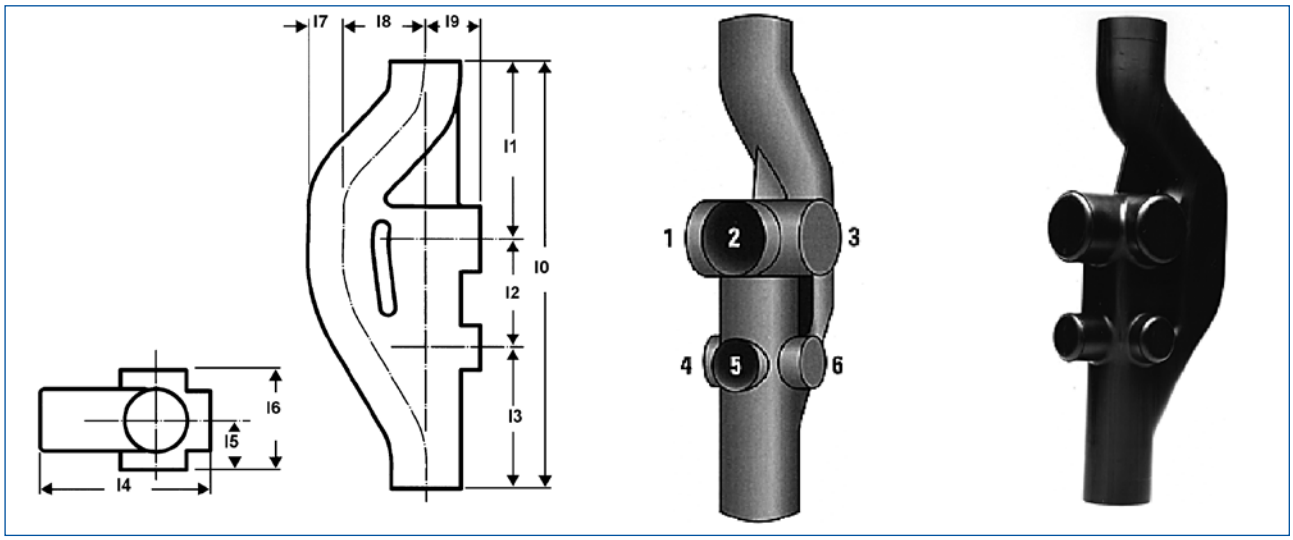
Akavent systems have no height limitation, and sizing is determined solely on the number and type of fixtures connected.

The Stack

In an Akavent system the formation of a solid “hydraulic plug” is eliminated allowing greater flow of air. Because of this airway there is a balance between the pressures in the stack. The water will cling to the wall and go downward in a swirling motion leaving the open airway in the centre of the pipe.

If the water flow wasn’t controlled by the aerators it would increase in speed until sufficient air resistance would fatten out the water and form a complete blockage of the tube (terminal velocity). This can cause significant positive and negative pressures ahead and behind the flow. This siphonage and/or blowback can cause trap seal failures.

Akavent dimensions



d1	Art. Nr.	1/2/3	4/5/6	l_0	l_1	l_2	l_3	l_4	l_5	l_6	l_7	l_8	l_9
110	60 11 07	max Ø 110 mm	max Ø 75 mm	750	320	170	260	275	90	180	55	130	90
160	60 16 07	max Ø 110 mm	max Ø 75 mm	715	320	160	235	310	100	200	75	125	110

Document legend

Refferences to portions of AS NZS 3500 2.2

Numerical text sections of this document

Figures / sketches in this document

Rules for the design of Akavent systems

1.0 The stack

1.1 Stack sizing

1.1.1 The stack must be sized by fixture unit loading using Table 6.1 and table 7.2 of AS NZS 3500 2.2. for stack pipe sizing.

1.1.2 Akavent Stacks must not reduce in size in any direction except for where vent interconnection allows for the vent size to be increased or manifolding at a first floor level. (see figure 3.a.)

1.1.3 For design purposes all references to aerator sizes in this document are based on metric OD sizes (110mm and 160mm). To convert to the comparative PVC sizing use the following:
160mm = 150mm PVC, 110mm = 100mm PVC, 75mm = 65mm PVC.

1.2 Akavent aerators

1.2.1 An Akavent aerator is required at each floor level that receives a soil or waste branch.

1.3 Offsets in stacks

1.3.1 A double inline offset is required where the distance between any two Akavent aerators or an Akavent aerator and a de-aerator exceeds 5m (see figure 1.)

1.3.2 Any stack offset greater than 45∞ will require a pressure relief vent (see figure 2.)

1.3.3 The fixture unit loading of the horizontal section of any offset must be sized according to (section 7.4.9 and Table 7.2 AS NZS 3500 2.2).

1.3.4 Minimum grade of all stack offsets must be 2%

1.3.5 Restrictions applying to connection near graded offsets (see section 7.12.2.3-5 AS NZS 3500 2.2);

1.3.5.1 No connection shall occur above graded offsets within:

(a) 600mm of a bend when the stack exceeds no more than 15m above the offset

(b) 1m of a bend when the stack exceeds more than 15m above the offset

1.3.5.2 No connection shall occur below graded offsets

(a) Within 600mm of the bend

1.3.5.3 No connection shall occur within the following areas within the graded offset

(a) 2.5m of the upper bend

(b) 450mm of the lower bend

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1.4 Service drains receiving stacks

1.4.1 The Main service drain at the base of the building must be sized in accordance with (As per table 3.1 AS NZS 3500 2.2)

2.0 Stack venting

2.1 The stack size of an Akavent system must be continued on when passing through the roof to form the vent except where interconnection of stack vents occur.

2.2 Interconnection of stack vents may occur 1m min above the highest flood rim level of the highest fixture for termination above roof level at a common point by increasing the size of the vent by one HDPE pipe size downstream of each the interconnection Junction. (see figure 3a)

2.3 The maximum number of stacks that can be interconnected is 5 x 110mm stacks or 4 x 160mm stack, which gives a greatest diameter of vent terminating through the roof being 315mm.

2.4 Stack vents may offset above the highest fixture but must be increased by 1 HDPE pipe size when the horizontal exceeds 12m (see figure 3b).

3.0 De-aerators

3.1 An Akavent De-aerator must be installed at the base of any vertical stack before it is connected to the main drain servicing the stack (see figure 4a). The maximum distance from the De-aerator to the closest aerator or double offset must not exceed 5m. (see figure 2)

3.2 The pressure relief line on a de-aerator shall run a minimum distance of 2.5m from the centreline of the stack to the centre of the relief vent inlet junction.(see figure 4.a.) No connection can be made into the relief vent pipe. No connections can be made to the de-aerator base pipe within 2.5m of the stack base. (see figure 2.)

3.3 Pressure relief lines for de-aerators can run parallel to the base of the de-aerator as long as the bottom of the vent is not lower than the centreline of the base. (see figure 4b.)

3.5 The relief vent of the De-aerator must be marked using identification stickers. (As per AS/NZS 1345)

4.0 Branch Drains

The following point are in reference to the Drainage Principles of AS3500

4.1 The maximum length of an unvented branch drain is 10m from the stack aerator to the trap weir. The maximum length of discharge pipe for a single fixture connected directly to the stack aerator is 4.5m.
(a) If these distances are exceeded install a vent as per AS3500

4.2 A maximum of 3 WCs are permitted to connect to an un-vented common discharge pipe (maximum 2 branches per aerator)

4.2.1 The discharge loading for each unvented branch (maximum 2 per aerator) is as per AS3500 refer appendix "C" and table 3.6.

4.3 When there is a need for 3 x 90˚ changes in direction of any branch the bend closest to the stack must be made using 2 x 45˚ bends. If more than 3 major changes in direction are required all but the bend closest to the fixture will be made of 2 x 45˚ bends (see figure 5a).

4.4 When a riser to a fixture exceeds 1m in height the change of direction at the riser base must be made using 2 x 45˚ bends or an offset no longer than 300mm. Risers must not exceed 1.5m. (see figure 5b)

4.5 Bidets and basins discharge pipe with an outlet of 40mm shall not exceed 2.5m in length and shall conform to 4.4.

4.6 Fixtures are to connect to a common discharge pipe at 45˚ through an oblique junction.

4.7 Where branch relief vents are required to enter an Akavent stack they must enter downwards at 45˚ with the highest section of vent being a point higher than the flood rim level of lowest fixture on the floor level (see figure 2.)

4.8 All WC's must be connected to the branch by 100mm pipe.

5.0 Venting of branch drains.

5.1 Vents or Air admittance valves shall be provided-

(a) At the upstream end of any 100mm discharge pipe that exceeds 9m in length

(b) At the upstream end of any common discharge pipe to which 4 or more WCs are connected.

5.2 Where a common discharge pipe requires a group vent it shall conform to AS NZS 3500 2.2 section 6.8 figure 6.8 / or 7.11.1-3 figure 7.10 and enter the Akavent stack at 45o (vents to enter Akavent stack not relief vent)

6.0 Testing openings

6.1 Each Akavent aerator comes supplied with a 100mm testing opening to access the stack and branches

7.0 Testing of pipe work

7.1 Testing of pipe work can be achieved by using an Akavent aerator system bung or similar.

8.0 Bracketing (see figure 6.)

8.1 To assist in restraining any movement in the Akavent aerator it must be supported by using a 3 way rigid fixing sound absorbing bracket (Binder BE 1310 or equivalent) at a point directly below the upstream

expansion socket and directly below the Aerator.

8.1.1 Stack support brackets using a single fixed sound absorbing bracket must be installed at a maximum spacing of 1.5m apart on the remainder of the Akavent stack.

8.2 All other under-floor pipe work must be installed according to AS NZS 3500 2.2

9.0 Fire protection

9.1 Fire stop collars must be of a "drop in" type that has been tested and approved for use with HDPE (Promat Fyregaurd Model FCDP100-120 for 110mm and Model FCDP 150-120 for 160mm) (see figure 7.) and must be installed to manufacturer's specification.

10.0 Slab core hole and slab thickness

10.1 A core hole size of (210mm for 160, 160mm for 110) must be allowed for the Akavent Aerator expansion socket to pass through the slab and then the fire stop collar to be dropped and then fixed into the void.

10.2 The slab thickness at the point where the Akavent aerators penetrates the concrete floor must be 120mm. For slab thickness greater than this boxing out from the core hole using foam must be made according to the following:

10.3 For every mm of slab thickness greater than 120mm the radius of boxing below 120mm level must be increased. (see figure 7.)

11.0 Service duct sizing (See figure 8)

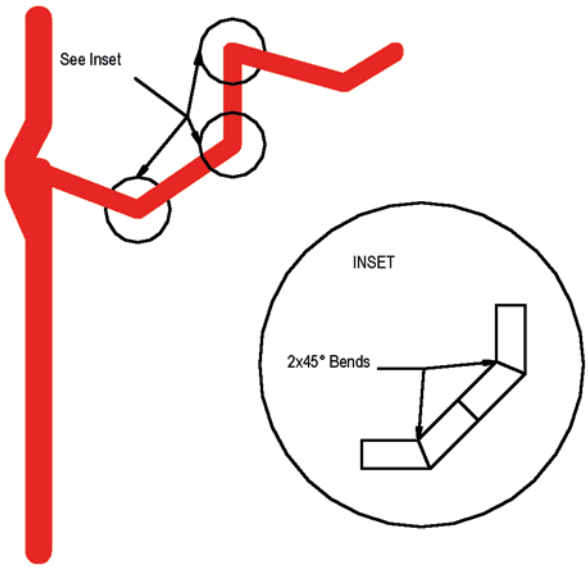
Acknowledgements

This document has been compiled using some text and drawings from the Australian Standard AS NZS 3500 2.2.

Compilation of this data was completed by Philmac Pty. Ltd. to allow for easier design of Akavent Stack Systems for Australian installations.

For further details about Akatherm Stack Systems contact Marley New Zealand on 0800 627 539.

Fig 5b Branch Risers Over 1m



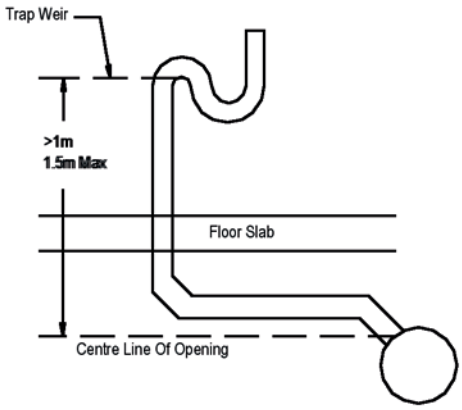


Fig 1 Double Inline Offset

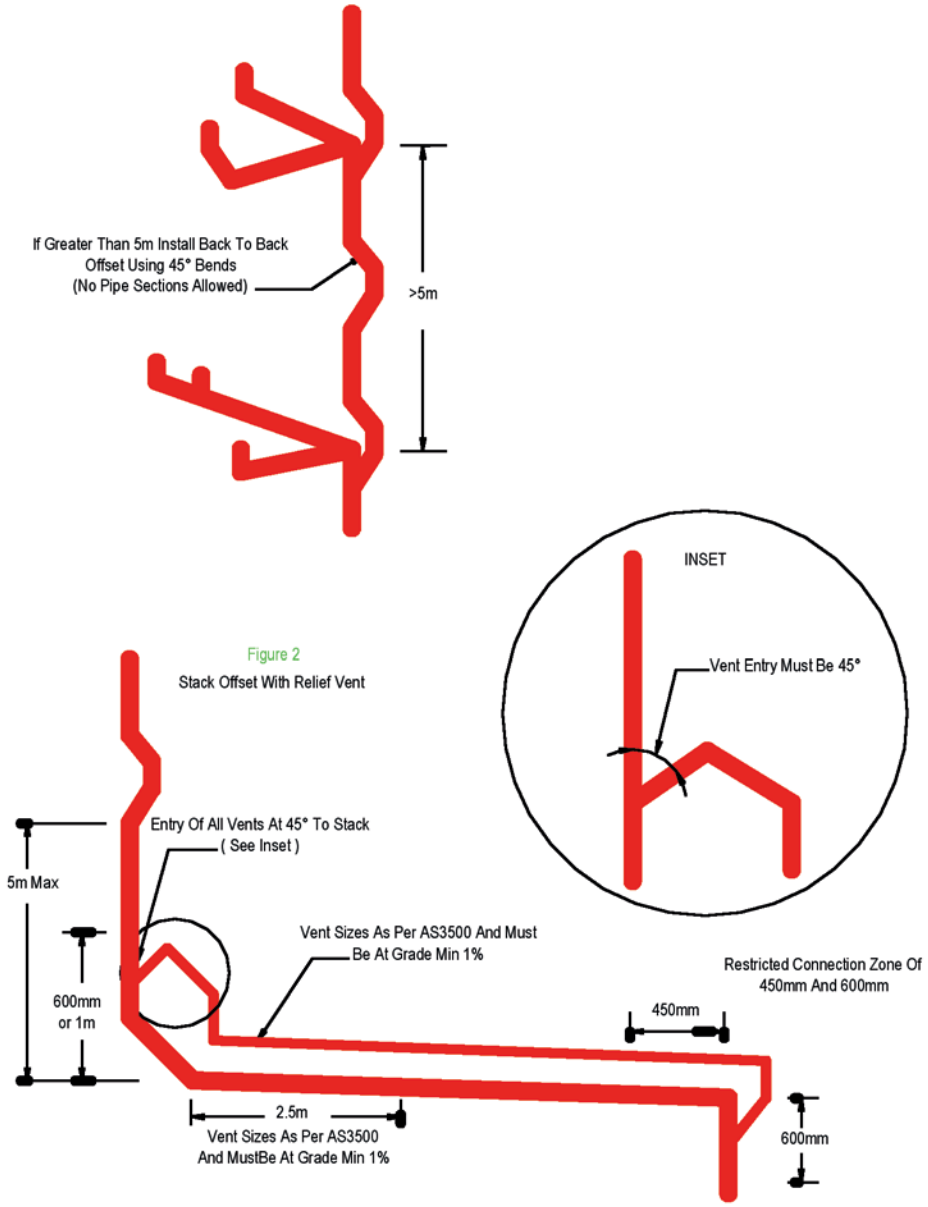


Fig 4a De-aerator

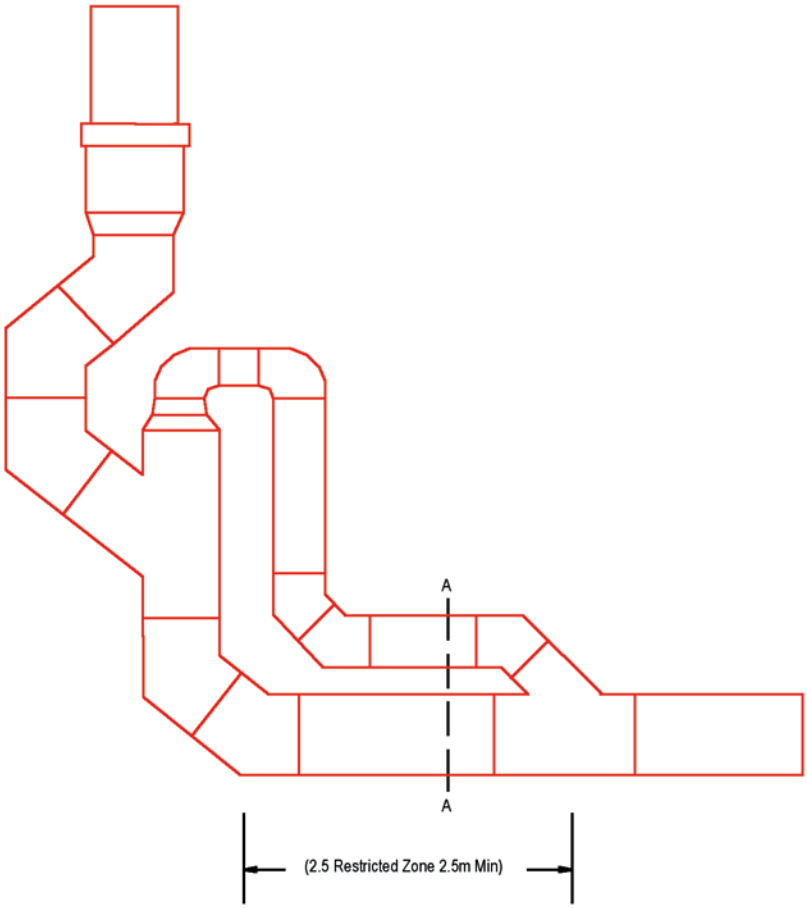


Figure 4b (Section A-A Of Figure 4a)

Lowest Level Of Entry To The De-Aerator Base/Relief Vent To Stack Offset

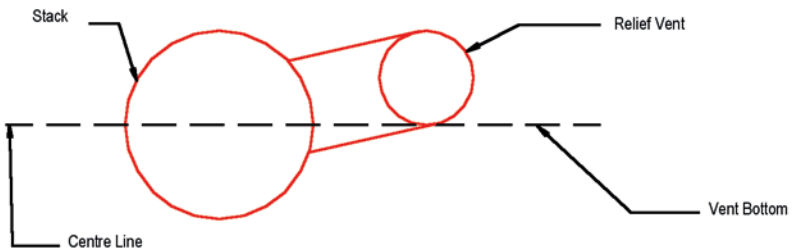


Fig 3a Manifolding Of Stack Vents

Example using 160mm Akavent Stacks (Sizing in HDPE)

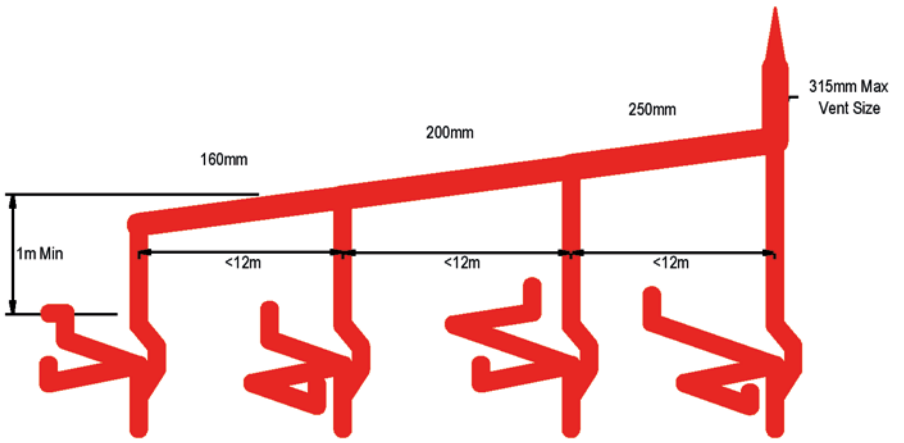


Figure3b

Stack Offsets Over 12m

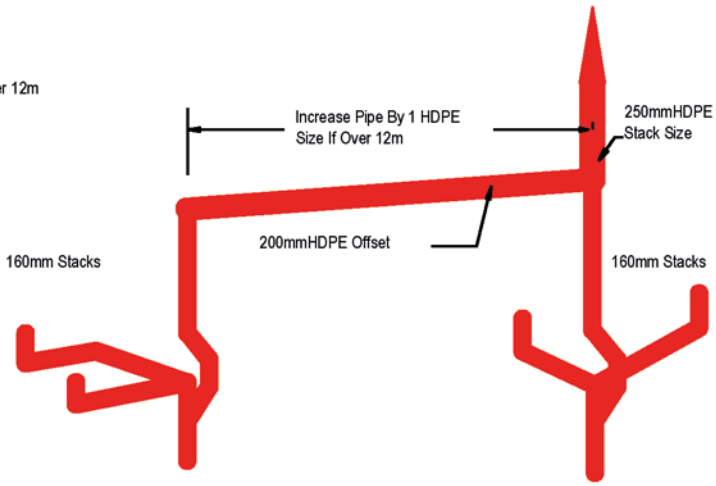


Fig 6 Bracketing of Akavent stacks

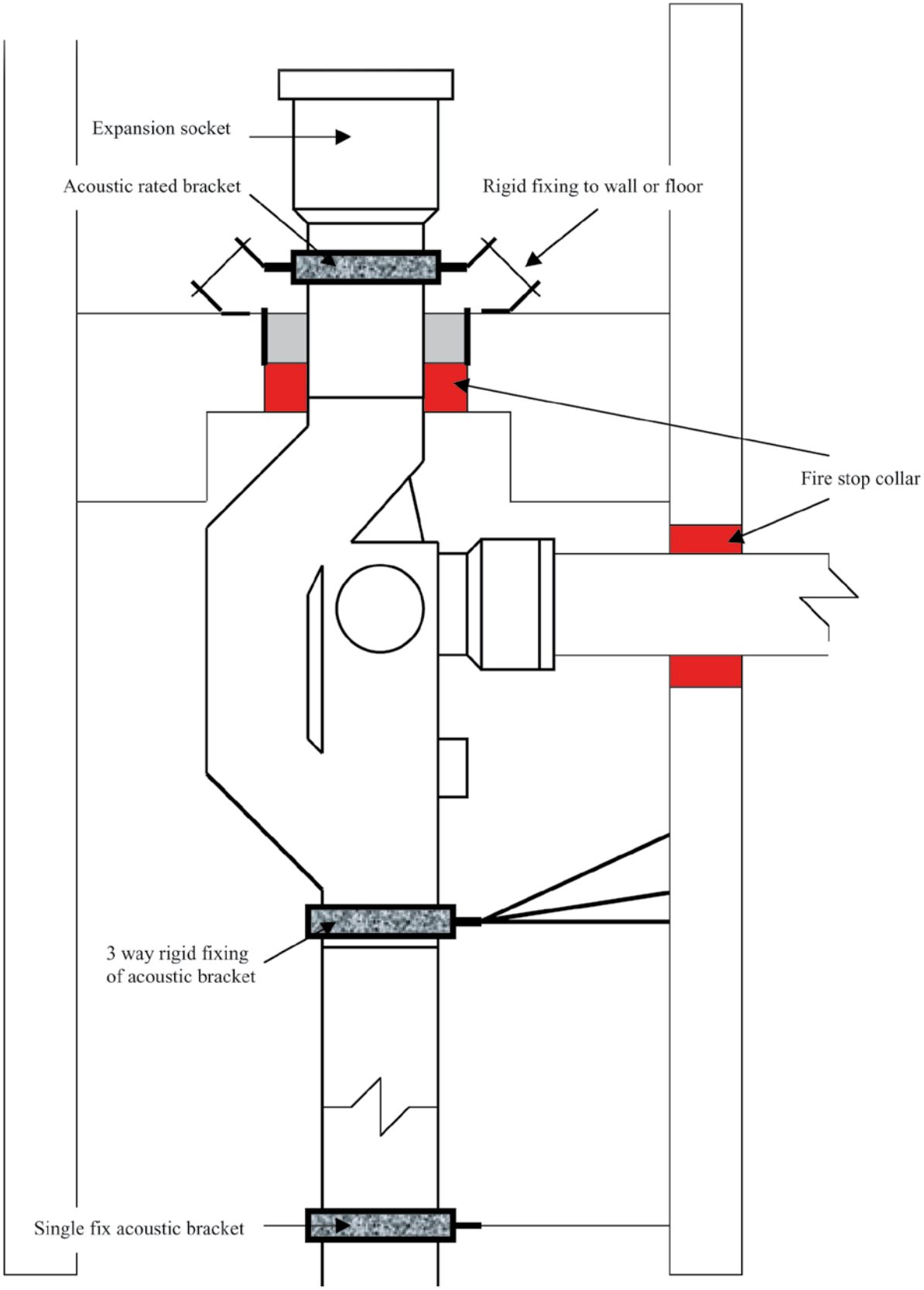


Fig 7 Fire stop collars for Akavent Stacks

NOTE: During the pouring of the floor slab a foam penetration block must be inserted to give the dimensional requirements required.

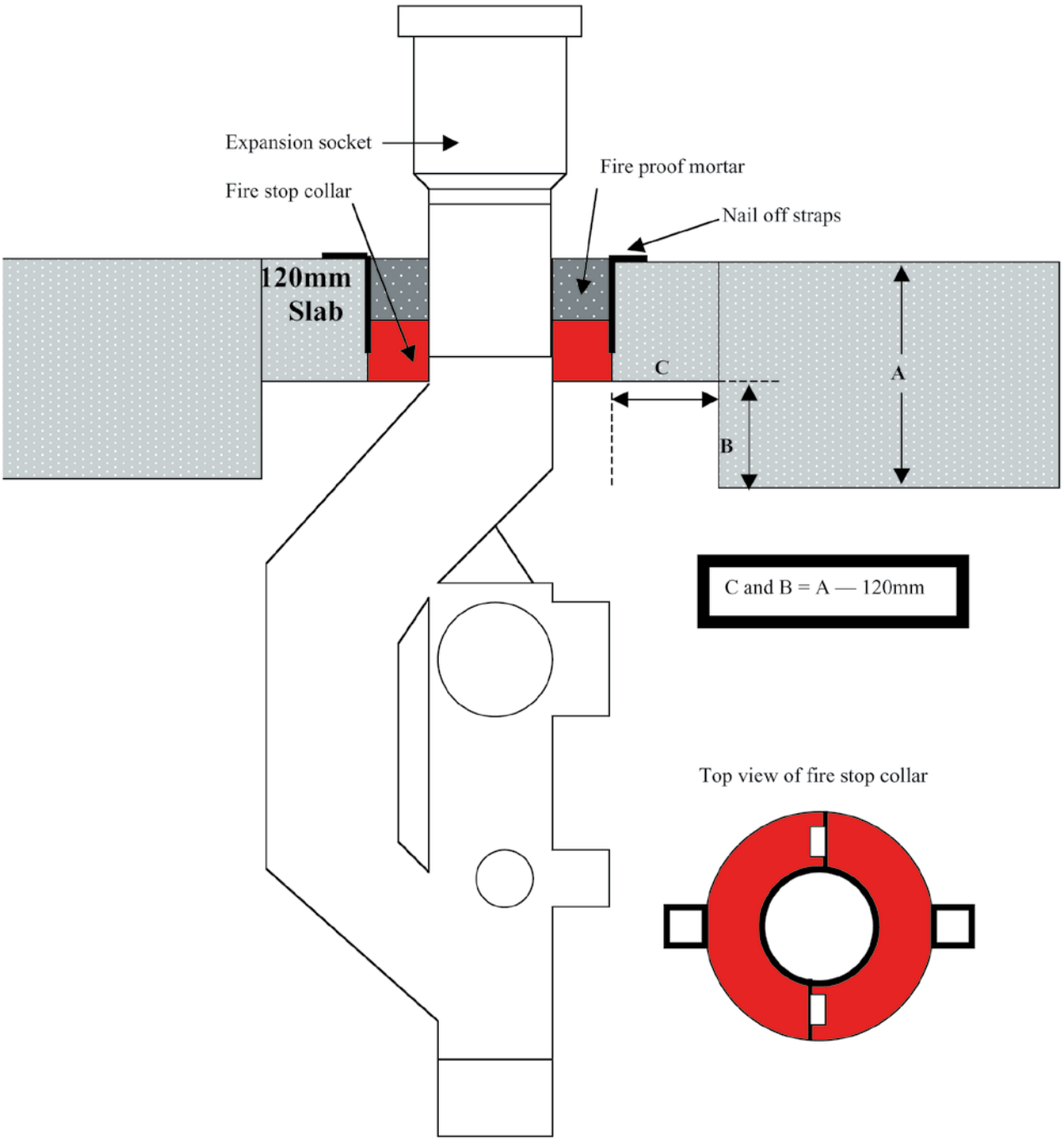
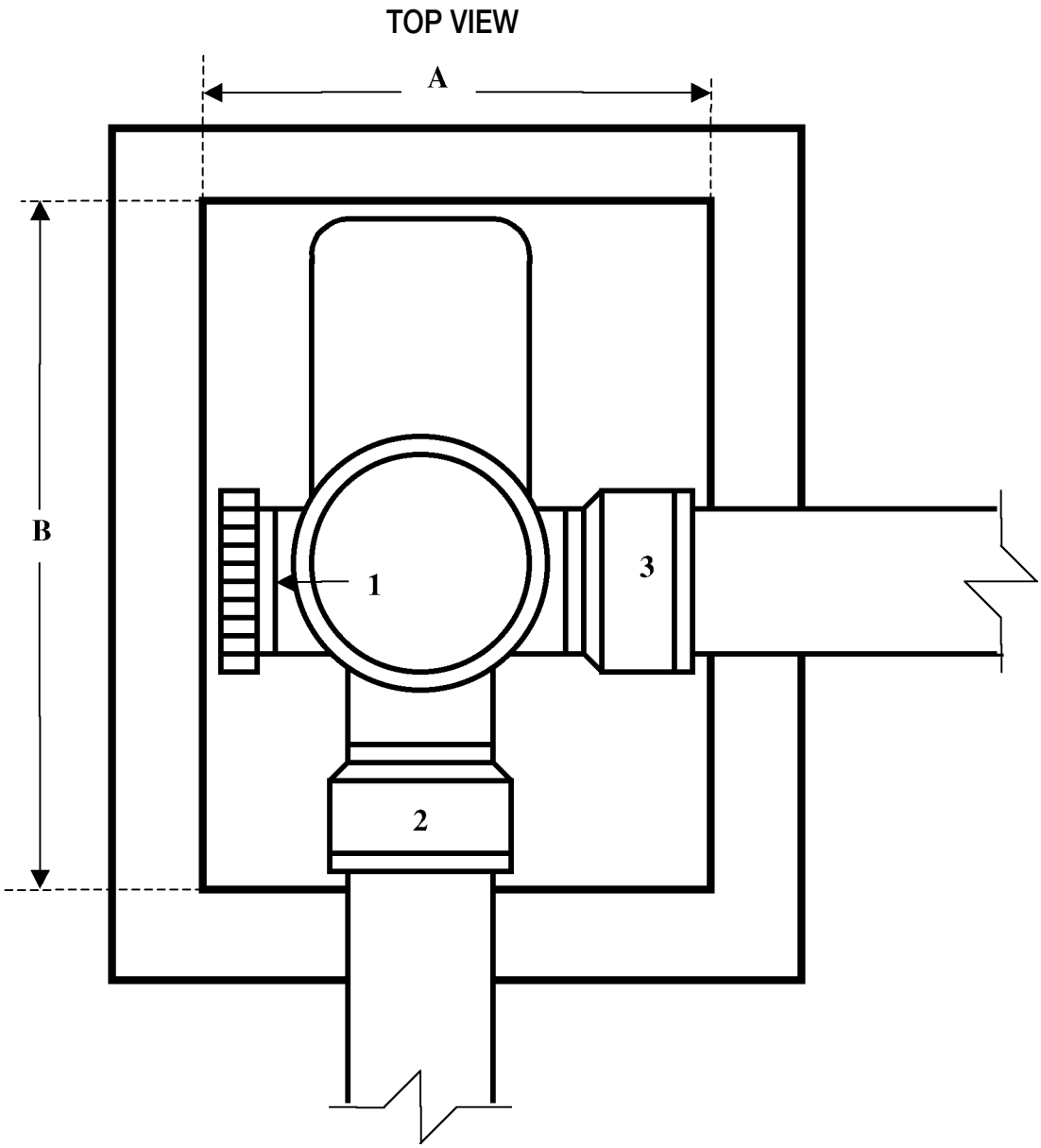


Fig 8 Service duct sizing

Service Duct sizing chart for Akavent aerators

	Inlet	Inlet	Inlet
160mm	2 only	(3 or 1) only	2 and (3 or 1)
A	300mm	450mm	350mm
B	400mm	450mm	400mm
110mm			
A	270mm	420mm	320mm
B	400mm	400mm	400mm



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