

# Installer Guide:

# Condensate discharge pipe installation

October 2018 Issue 1.0



**In April 2005 revisions to the Building Regulations came into force, stating that all replacement gas or oil boilers must be a condensing type. The introduction of condensing boilers has been fundamental in reducing the UK's carbon emissions.**

In 2010 and again in 2018 the UK experienced prolonged spells of sub-zero temperatures down to minus 20 centigrade and below in many areas. This resulted in a significant increase in the number of calls to boiler manufacturers and heating engineers from householders with condensing (high efficiency) boilers where the condensate discharge pipe had frozen and become blocked with ice causing the boiler to shut down. **In the vast majority of cases such problems occur where the condensate discharge pipe is located externally to the building for some part or all of its length.**

British Standards, Building Regulations and industry guidance currently advise on how condensate discharge pipes should, be run either internally or externally, or a combination of both. This document gives guidance on how to install the pipes in order to reduce the possibility of freezing.

**However, in certain circumstances this guidance may not be sufficient to prevent freezing in extreme conditions with widespread and prolonged sub-zero temperatures.**

With the UK weather patterns showing more "extremes" in future due to the effects of global climate change, the following guidance updates previous recommendations on condensate discharge pipe installation. In addition to this guidance all other technical requirements for condensate discharge installation given in British Standard BS 6798:2014, or in boiler manufacturers' installation instructions should still be followed.

### **\*\*\*\*Boiler Manufacturer's Warranty Information**

It should be noted that where the manufacturer's instructions have not been followed then the boiler warranty may not be valid.

**Note** - the Benchmark Commissioning checklist supplied with the boiler and detailed in the manufacturer's instructions requires the heating engineer to confirm that the condensate drain has been fitted correctly.

## Summary of main requirements

### Internal Condensate Pipe Discharge Connection

Where an installer is fitting a new or replacement boiler, the condensate discharge pipe should be connected to an internal "gravity discharge point" such as an internal soil stack (preferred method), internal kitchen or bathroom waste pipe such as sink, basin, bath or shower waste. External pipes from sink wastes or washing machine outlets should be a minimum of 30mm internal diameter, insulated with waterproof UV resistant material, terminated below the grid but above the water line and a suitable drain/leaf guard fitted. The end of the waste pipe should be cut at 45 degrees where it terminates into the grid to help reduce the potential for the pipe to freeze.

### Condensate Pumps

Where it is not possible to connect the boiler condensate discharge pipe to an internal "gravity discharge point" then the installer should use a condensate pump connected to a suitable internal connection point such as an internal soil stack (preferred method), internal kitchen or bathroom waste pipe such as a sink, basin, bath or shower waste.

### Existing Installations

When servicing or repairing a boiler the heating engineer should check any boiler installations especially those that have external condensate drains to see if they can be terminated internally or upgraded to the latest guidance. The responsible person (home owner) should be advised and it is recommended that the installer completes the responsible persons frozen condensate information leaflet as a suitable means for advising the work that is required. See annex A

This guidance should be followed where work is carried out to "upgrade" the condensate discharge system to reduce the risk of freezing in extreme conditions and it is recommended that the condensate pipe is identified with a suitable label or marking even if the responsible person does not go ahead with the upgrade so as to allow easier identification in the future.

## Manufacturers Instructions

Manufacturer's instructions must be followed for the correct connection of the condensate discharge pipe from the boiler as this may vary due to the design of the boiler. For example a visible air break and trap is not required if there is a trap with a minimum condensate seal of 75 mm incorporated into the boiler.

### Internal Pipe Run In Unheated Spaces

Condensate discharge pipes that are routed in an unheated space such as a loft or garage should be insulated to prevent freezing.

## Internal Condensate Pipe Discharge Termination

Internal condensate discharge pipework must be a minimum of 19mm ID (typically 22mm OD) plastic pipe or as per manufacturer's instructions and this should "fall" a minimum of 45mm per metre away from the boiler, taking the shortest practicable route to the termination point.

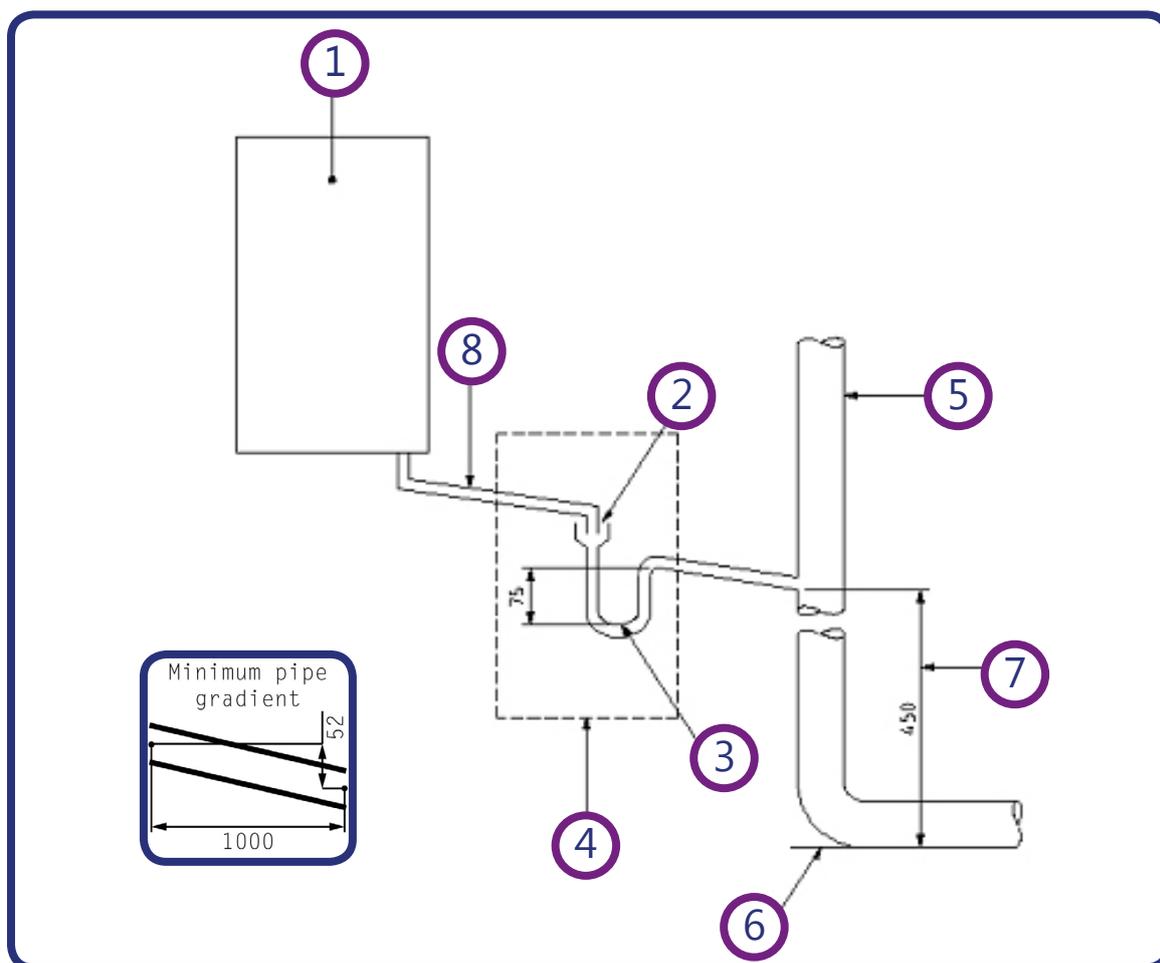
(45mm as per BS6798, 52mm per metre as per industry practice is specified in the following diagrams)

To minimise the risk of freezing during prolonged sub-zero conditions, an internal "gravity discharge point" such as an internal soil stack (preferred method), internal kitchen, utility room or bathroom waste pipe e.g. from a sink, basin, bath or shower should be adopted, where possible.

Note - A suitable permanent connection to the foul waste pipe should be used. Figures 1, 2(a), 2(b) show appropriate connection methods.

Manufacturers Instructions must be referred to when installing boiler condensate discharge pipes

**Figure 1** – Connection of condensate discharge pipe to internal soil and vent stack.  
**Note** – Check manufacturer’s instructions to see if an air break is required.



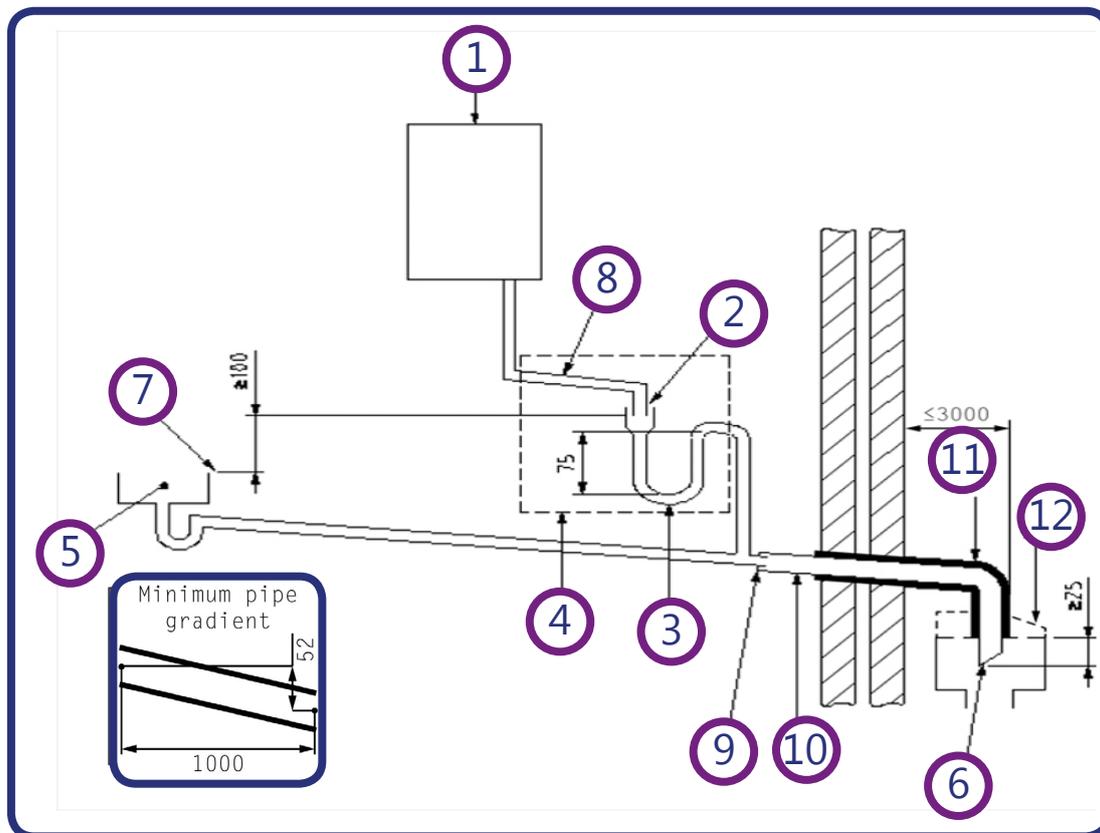
**Key**

- 1 Boiler
- 2 Visible air break
- 3 75 mm trap
- 4 Visible air break and trap not required if there is a trap with a minimum condensate seal of 75 mm incorporated into the boiler
- 5 Soil and vent stack
- 6 Invert
- 7 450 mm minimum up to three storeys
- 8 Minimum internal diameter 19 mm

## Internal Condensate Pipe Discharge Termination

Figure 2(a) – Connection of a condensate discharge pipe downstream of a sink, basin, bath or shower waste trap.

Note – Check manufacturer's instructions to see if an air break is required.



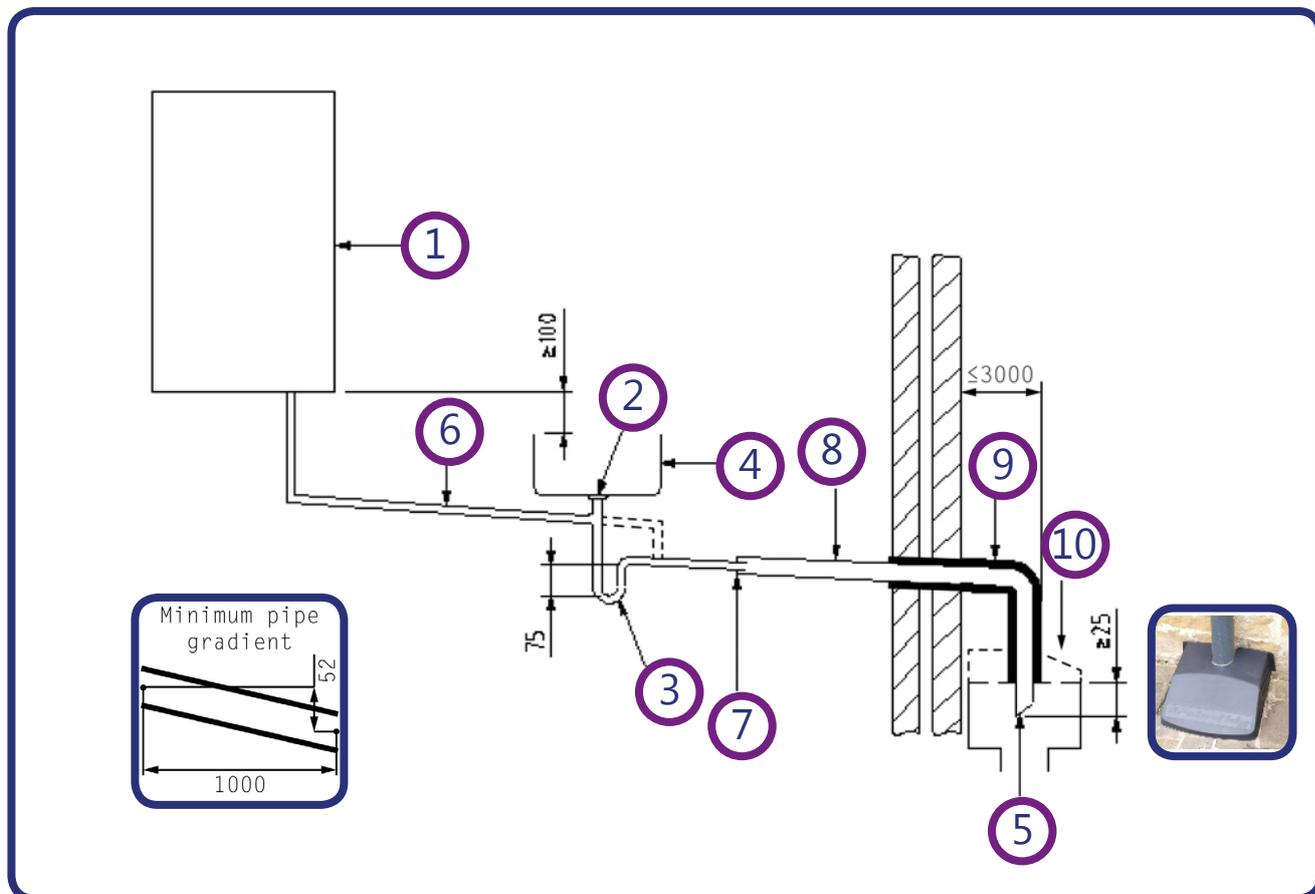
### Key

- 1 Boiler
- 2 Visible air break
- 3 75 mm trap
- 4 Visible air break and trap not required if there is a trap with a minimum condensate seal of 75 mm incorporated into the boiler. In this case the 100 mm is measured to the trap in the boiler.
- 5 Sink, basin, bath or shower
- 6 Open end of condensate discharge pipe direct into gully 25 mm min below grating but above water level; end cut at 45 °  
Note – the maximum external condensate discharge length is 3 metres
- 7 Sink lip
- 8 Minimum internal diameter 19 mm
- 9 Pipe size transition
- 10 Minimum internal diameter 30 mm
- 11 Water/weather proof insulation
- 12 Drain cover/leaf guard

Manufacturers Instructions must be referred to when installing boiler condensate discharge pipes

## Internal Condensate Pipe Discharge Termination

Figure 2(b) – Connection of a condensate discharge pipe upstream of a sink, basin, bath or shower waste trap



### Key

- 1 Boiler
- 2 Visible air break at plug hole – alternative connection can be below sink trap
- 3 75 mm sink, basin, bath or shower waste trap
- 4 Sink, basin, bath or shower with integral overflow
- 5 Open end of condensate discharge pipe direct into gully 25 mm min below grating but above water level; end cut at 45 °

Note – the maximum external condensate discharge length is 3 metres

- 6 Minimum internal diameter 19 mm
- 7 Pipe size transition
- 8 Minimum internal diameter 30 mm
- 9 Water/weather proof insulation
- 10 Fit drain cover/leaf guard

## Internal Condensate Pipe Discharge Termination

The possibility of waste pipes freezing downstream of the connection point should be considered when determining a suitable connection point - e.g. a slightly longer pipe run to an internal soil stack may be preferable to a shorter run connecting into a kitchen waste pipe discharging directly through the wall to an external drain.

**Note - Where "gravity discharge" to an internal termination is not physically possible (e.g. the discharge point is above the appliance location, or access is obstructed by a doorway), or where very long internal pipe runs would be required to reach a suitable discharge point, then a condensate pump should be used.**

External waste pipes from kitchens, utility rooms or bathrooms such as sink, basin, and bath or shower waste outlets should be insulated with waterproof UV resistant, class 0 material, terminated below the grid but above the water line and a drain/leaf guard fitted. The waste pipe should be cut at 45 degrees where it terminates into the grid. (See insulation section for guidance on suitable materials).

### Condensate Pumps

#### **Use of a Condensate Pump to an Internal Termination**

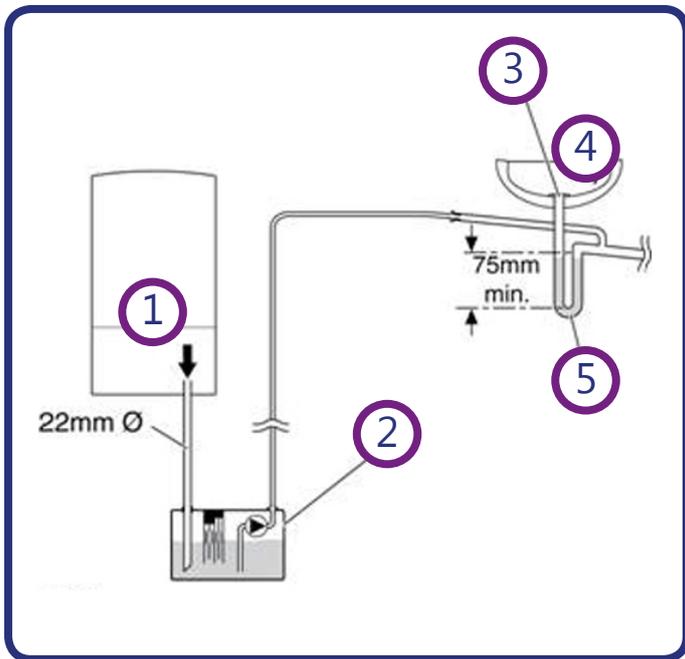
Condensate can be removed using a proprietary condensate pump, of a specification recommended by the boiler or pump manufacturer. In order to minimise the risk of freezing during prolonged sub-zero spells, one of the following methods internal to the property for terminating the boiler condensate pump to a foul water discharge point should be adopted such as an internal soil stack (preferred method), internal kitchen, utility room or bathroom waste pipe such as sink, basin, and bath or shower waste. Figure 3 shows a typical connection method.

Manufacturers Instructions must be referred to when installing boiler condensate discharge pipes

# Internal Condensate Pipe Discharge Termination

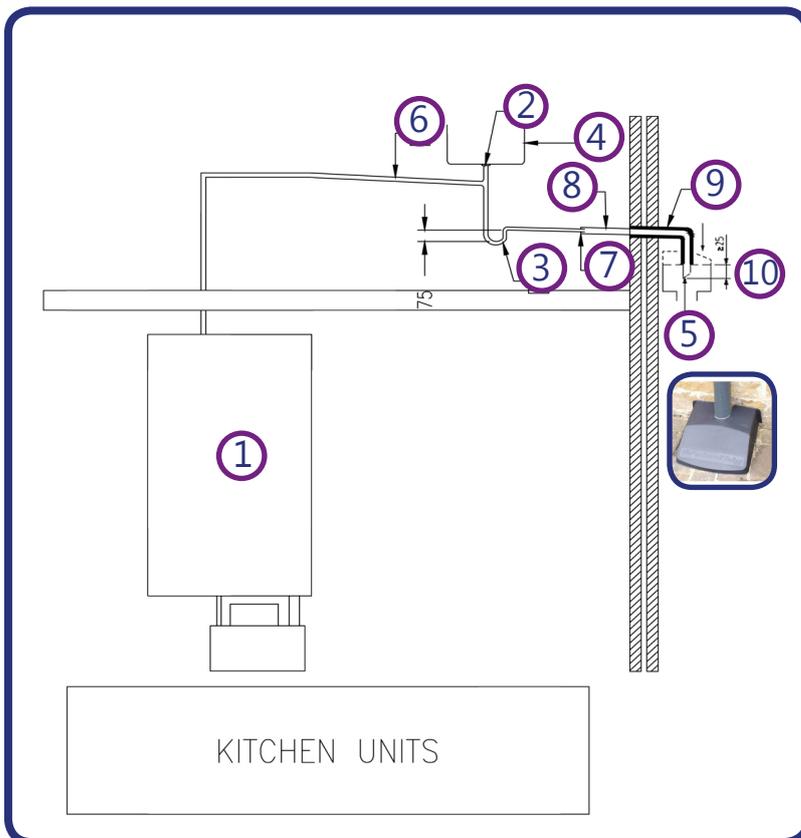
Figure 3 – Connection of a condensate pump - typical method (NB manufacturer's detailed instructions should be followed).

Note – Any external pipe work should be insulated, pipe cut at 45 degrees and a drain/ leaf guard fitted.



## Key

- 1 Condensate discharge from boiler
- 2 Condensate pump
- 3 Visible air break at plug hole
- 4 Sink or basin with integrated overflow
- 5 75mm sink waste trap



## Key

- 1 Boiler
- 2 Visible air break at plug hole
- 3 75 mm sink, basin, bath or shower waste trap
- 4 Sink, basin, bath or shower with integral overflow
- 5 Open end of condensate discharge pipe direct into gully 25 mm min below grating but above water level; end cut at 45 ° Note – the maximum external condensate discharge length is 3 metres
- 6 Minimum internal diameter 19 mm
- 7 Pipe size transition
- 8 Minimum internal diameter 30 mm
- 9 Water/weather proof insulation
- 10 Fit drain cover/leaf guard

### External Connections

Only fit an external boiler condensate drain connection if an internal gravity or pumped connection is **impractical** to install.

The pipe work from the boiler should be of a minimum 19mm ID or as per manufacturer's instructions and the condensate discharge pipe shall be run in a standard drainpipe material, e.g. poly (vinyl chloride) (PVC), un-plasticized poly (vinyl chloride) (PVC-U), acrylonitrile butadiene-styrene (ABS), polypropylene (PP) or chlorinated poly (vinyl chloride) (PVC-C).

**Note - Fixing centres for brackets should be a maximum of 300mm for flexible pipe and 500mm for solid pipe and manufacturer's recommendations should be followed.**

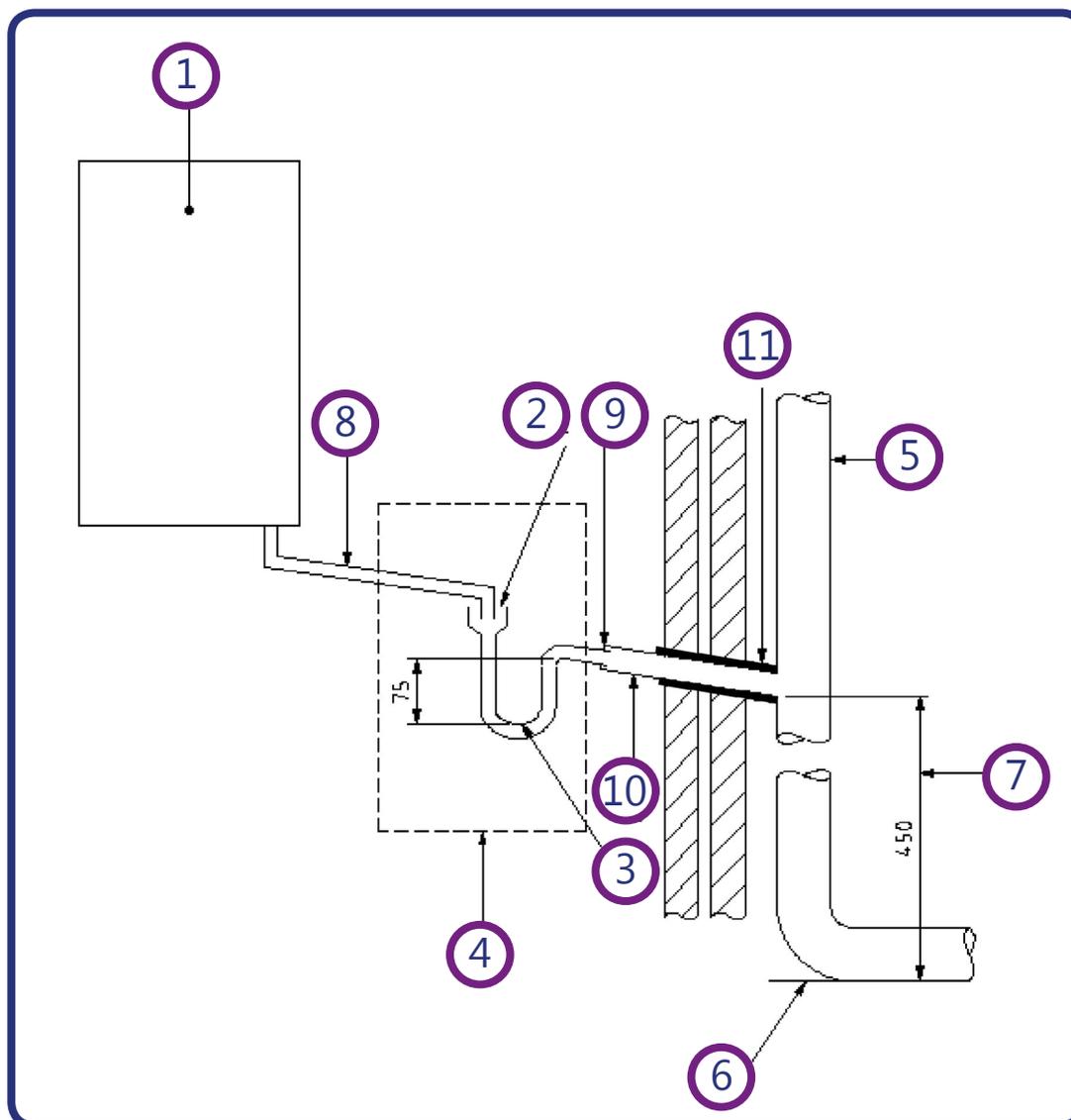
The condensate pipe should be run internally as far as possible before going externally and the pipe diameter should be increased to a minimum of 30mm ID (typically 32mm OD) before it passes through the wall. The angle of the pipe should slope downwards by at least 3 degrees as it passes through the wall to assist in maintaining a good velocity as the condensate exits the building.

The external pipe run should be kept as short as possible to a maximum of 3 metres, taking the most direct and "most vertical" route to the discharge point, with no horizontal sections in which condensate might collect.

Manufacturers Instructions must be referred to when installing boiler condensate discharge pipes

## External Connections

Figure 4 – Connection of condensate discharge pipe to external soil and vent stack



### Key

- 1 Boiler
- 2 Visible air break
- 3 75 mm trap
- 4 Visible air break and trap not required if there is a trap with a minimum condensate seal of 75mm incorporated into the boiler.
- 5 Soil and vent stack
- 6 Invert
- 7 450mm minimum upto three storeys
- 8 Minimum internal diameter 19 mm
- 9 Pipe size transition point
- 10 Minimum internal diameter 30mm
- 11 Water/weather proof insulation

### Alternative Solutions

Cold weather protection methods approved or endorsed by boiler manufacturers and/or service organisations may be adopted if these are considered suitable by the parties involved. It is the responsibility of the manufacturer of these products to ensure they have completed the necessary testing or calculations to ensure the product offers suitable protection to prevent the condensate pipe from freezing. The product manufacturer should provide information as to what level of external temperature and for what time period the product can protect against sub-zero temperatures, i.e. -15°C for 48 hours. BS6798 refers to devices that pump the condensate produced by a condensing boiler to a fine misting nozzle in the boiler flue terminal so that the condensate is discharged with the hot flue gas. (BS6798 section 6.3.8 note 4). The boiler manufacturer's instructions will provide advice regarding fitting and siting of the flue terminal to ensure safe disposal of the condensate.

### Additional Measures

At least one of the following measures should be fitted in addition to the measures detailed above for external condensate discharge pipes

- *Insulate external pipe with a minimum thickness of insulation to be 19mm "O" class PVC coated material.*
- *Fit trace heating – with insulation as recommended by manufacturer.*
- *Fit internal auxiliary(additional) high volume syphon unit*

### Auxiliary Syphon – Fitted Internally

Auxiliary siphons fitted inside the premises assist with the siting of the boiler where an external condensate pipe **must** be fitted. The storage capacity of the auxiliary siphon increases the volume of condensate discharge reducing the risk of freezing. A further reduction in the potential for the pipe to freeze is achieved when combined with the external insulation requirements.

Manufacturers Instructions must be referred to when installing boiler condensate discharge pipes

### Electric Trace Heating

Trace heating with an external thermostat can be fitted to the external condensate pipe to raise the temperature of the condensate pipe in freezing conditions. Trace heating takes the form of an electrical heating element run in physical contact along the length of the condensate pipe. The pipe is usually covered with thermal insulation to retain heat losses from the pipe. Heat generated by the element then maintains the temperature of the pipe. If such a system is used then the installation instructions of the trace heating manufacturer and any specific recommendations regarding pipe diameter, insulation, etc. should be followed. All other relevant guidance on condensate discharge pipe installation should also be followed.

### Insulation Materials

Insulation used for external condensate pipes, sink or washing machine waste pipes should be of class 'O' grade with an outer coating that is weather proof, bird/animal proof, and UV resistant finish. A minimum of 19mm thick insulation is recommended for 32mm external pipes.

### Use of Air Breaks In Condensate Discharge Pipes

Heating engineers should follow manufacturer's instructions on the use of air breaks in condensate discharge pipes. A visible air break is not required if the boiler condensate trap has a minimum condensate seal of 75mm incorporated into the boiler.

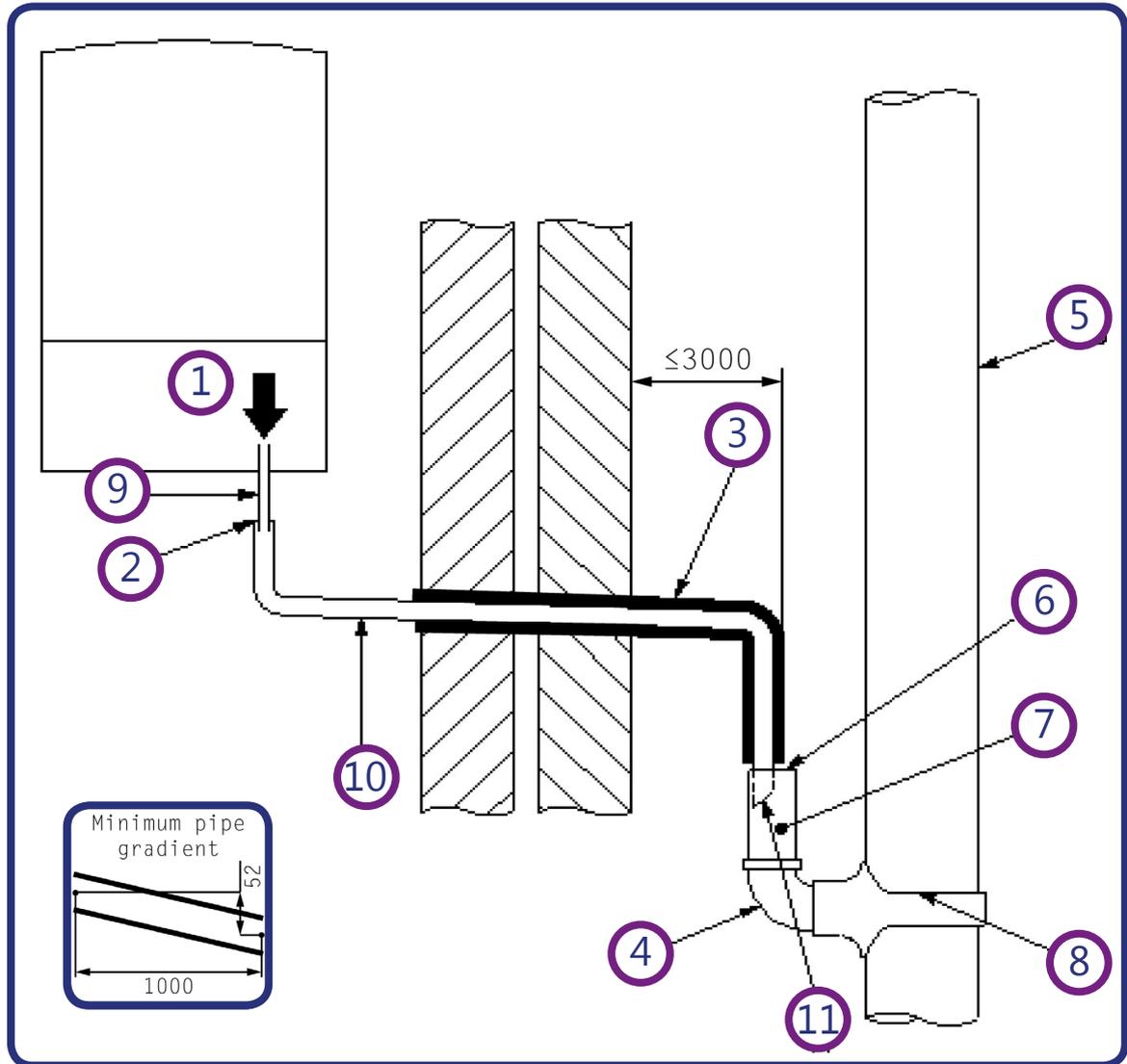
### Connecting to a rain water downpipe/External Soil Stack

When an external soil stack or rain water downpipe is used as the termination (NB only permissible if this downpipe passes to a combined foul and rainwater drainage system) an external air break must be installed between the condensate discharge pipe and the downpipe to avoid reverse flow of rainwater/sewage into the boiler should the downpipe itself become flooded or frozen.

Figure 5 shows a suitable connection method. Pipe insulation should be fitted.

## External Connections

Figure 5 – External termination to rainwater downpipe (NB only combined foul/rainwater drain)



### Key

- 1 Condensate discharge pipe from boiler
- 2 Pipe size transition point
- 3 Water/weather proof insulation
- 4 43mm 90° male/female bend
- 5 External rain water pipe into foul water
- 6 External air break
- 7 Air gap
- 8 68mm PVCu strap on fitting
- 9 Minimum internal diameter 19mm
- 10 Minimum internal diameter 30mm
- 11 End cut at 45°

Manufacturers Instructions must be referred to when installing boiler condensate discharge pipes

### External Termination of the Condensate Pipe

Where the condensate discharge pipe is terminated over an open foul drain or gully, the pipe should terminate below the grating level, but above water level, in order to minimise “wind chill” at the open end. Pipe drainage and resistance to freezing will be improved if the termination end of the condensate pipe is cut at 45 degrees as opposed to a straight cut.

The use of a drain cover (such as those used to prevent blockage by leaves) **must** be fitted to offer further protection from wind chill. Figure 6 (following page) shows a suitable connection method. Where the condensate drain pipe terminates in a purpose-designed soakaway (see BS 6798:2014 or boiler installation manual for soakaway design requirements) any above-ground section of condensate discharge pipe should be run and insulated as described above. Figure 7 (following page) shows a suitable connection method.

### Unheated Areas in Buildings

Internal condensate drainage pipes run in unheated areas such as lofts, basements and garages should be treated as external connections and insulated accordingly. Weather proof materials may not be necessary and should be assessed by the heating engineer.

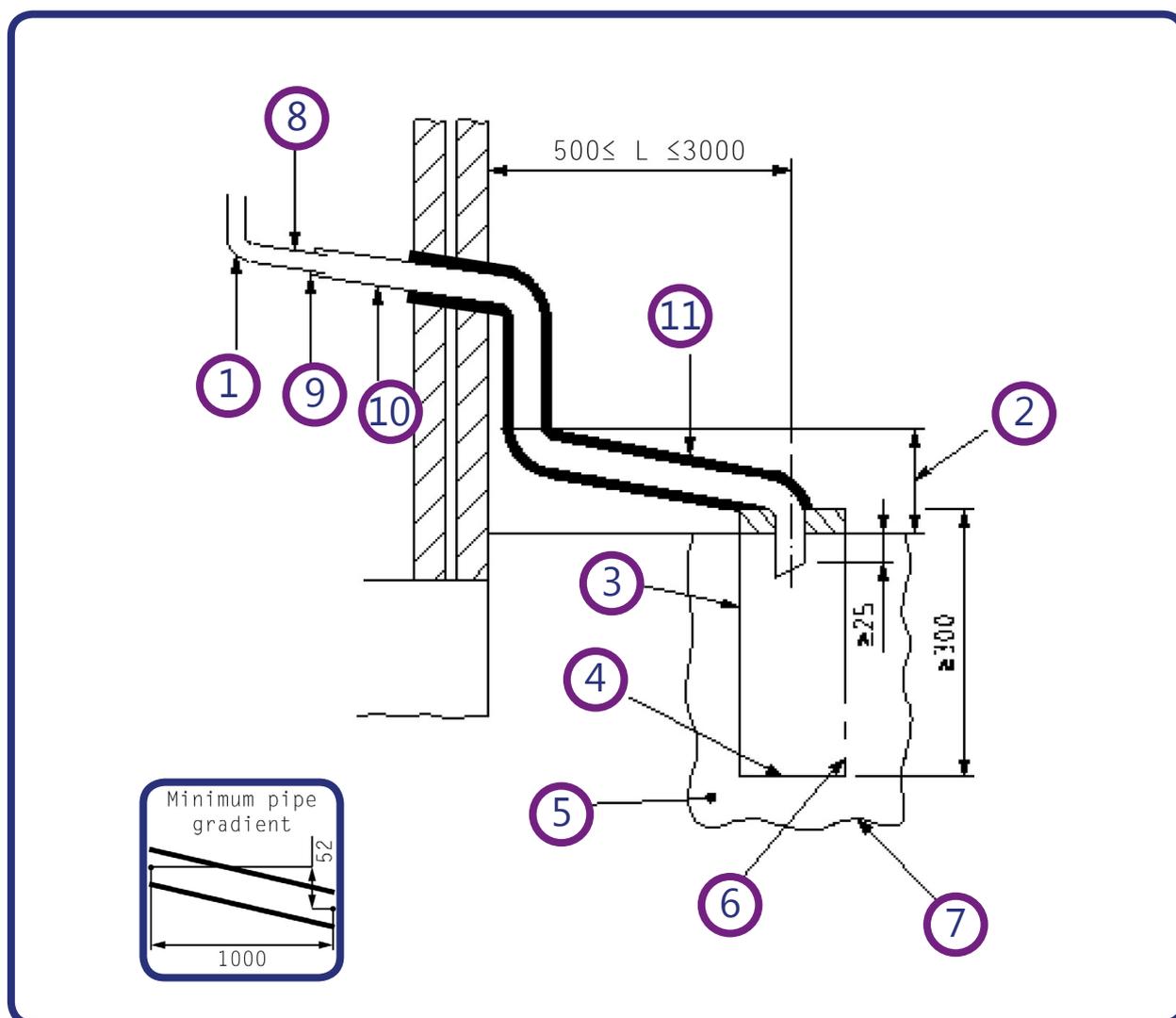
### Use of Air Breaks In Condensate Discharge Pipes

Installers should follow the manufacturer’s instructions on the use of air breaks in condensate discharge pipes. A visible air break and trap is not required if the boiler condensate trap has a minimum condensate seal of 75 mm incorporated into the boiler.



## External Connections

Figure 7 – Example of a purpose made soakaway



### Key

- 1 Condensate discharge pipe from boiler
- 2 Ground (this section of the condensate discharge pipe may be run either above or below ground level); End cut at 45°
- 3 Diameter 100 mm minimum plastic tube
- 4 Bottom of tube sealed
- 5 Limestone chippings
- 6 Two rows of three 12 mm holes at 25 mm centres, 50 mm from bottom of tube and facing away from house
- 7 Hole depth 400 mm minimum by 300 mm diameter
- 8 Minimum internal diameter 19 mm
- 9 Pipe size transition point
- 10 Minimum internal diameter 30 mm
- 11 Water/weather proof insulation

Our customer information guide on frozen boiler condensate discharge is also available for download.

It includes a condensate assessment form, for engineers to complete and advice to customers during extreme cold weather conditions.

## Customer information: Frozen boiler condensate discharge

October 2018 Issue 1.0



### Condensing Boiler

Guidance and advice for customers- endorsed by the Heating and Hotwater Industry Council, HHIC

 [info@hhic.org.uk](mailto:info@hhic.org.uk)

 01926 513777

 @HHIC

Camden House  
Warwick Road  
Kenilworth  
CV8 1TH

