

In a series of articles on interlocking concrete roof tiles, experts from the **Concrete Tile Manufacturers Association** have pooled their knowledge. This Construction Note discusses ventilation tiles and pipes.

### Ventilation tiles

Ventilation tiles provide a means of allowing air or noxious gasses to pass through the middle of a tiled roof slope without compromising the weatherproof qualities of the roof covering. Vent tiles are used for roof space ventilation, mechanical extraction of moist air, soil vent pipe terminals and gas flue terminals. Ventilation tiles may be manufactured from the same material as the surrounding tiles, i.e. concrete, or from plastics, or a combination of both materials. It should be stressed that most ventilation tiles, particularly those containing plastics, are not suitable for the extraction of hot flue gases.

### Penetrations

The vent tile will penetrate the underlay, and if not detailed correctly may allow water to penetrate through the tiled roof covering, into the roof void. The penetration can take the form of a ventilation tile, a vertical soil pipe, rainwater pipe or flue pipe.

### Underlay

Where the pipe passes into the roof void it will penetrate the underlay (A). A hole slightly larger than the pipe or duct will need to be cut in the underlay. The hole will need to be protected to prevent rain which falls on the underlay during construction, or wind driven snow, condensation or dust which runs down the underlay during the remaining life of the roof, from draining through the hole. The hole in the underlay could also allow insects in the batten cavity to get into the roof void. Conversely the increased air pressure in the roof void will leak into the batten cavity and add pressure to the underside of the roof tiles requiring a higher fixing specification at that point. It is therefore important to seal the hole around the pipe or duct using the underlay seal (B), normally provided with the vent tile. For vertical pipes or flues where an underlay seal is not available, water on the underlay needs to be collected and diverted away from the opening. This can be done by laying an extra strip of underlay (C),

1.0m wider than the penetration, down from the underlay lap above the penetration. It should be turned back onto the top of the tile batten directly above the hole, forming a trough, which discharges any water into the next rafter space, clear of the hole.

With hot flue pipes fitting an underlay seal is difficult, as Building Regulation Approved Document J requires a minimum of 25mm between the flue pipe and any combustible material. In this instance a sheet metal collar should be used.

### Roof Space Ventilation

Where a roof needs to be ventilated to comply with British Standard 5250, Code of practice for control of condensation in buildings, and Building Regulation Approved Document F2, it may be necessary to install regularly spaced vent tiles. The regulation requires either 5 000 (high level), 10 000 or 25 000 (low level) mm<sup>2</sup> per metre run of ventilation. To calculate how many vent tiles will be required the following calculation needs to be done:-

Low or high level total length (m) x vent area / metre (5, 10 or 25 000 mm<sup>2</sup> / metre run)  
= Minimum total vent area required.

Total vent area required ÷ free vent area of each Vent tile (mm<sup>2</sup>)  
= Total number of vent tiles to be evenly spaced along low or high level. (round up)

Where insulation is placed between the rafters, each rafter space will need to be separately vented, and a simplified calculation can be used:-

Rafter centres (m) x vent area / metre (5 or 25 000 mm<sup>2</sup> / metre run)  
= Minimum vent capacity for each vent tile / rafter space

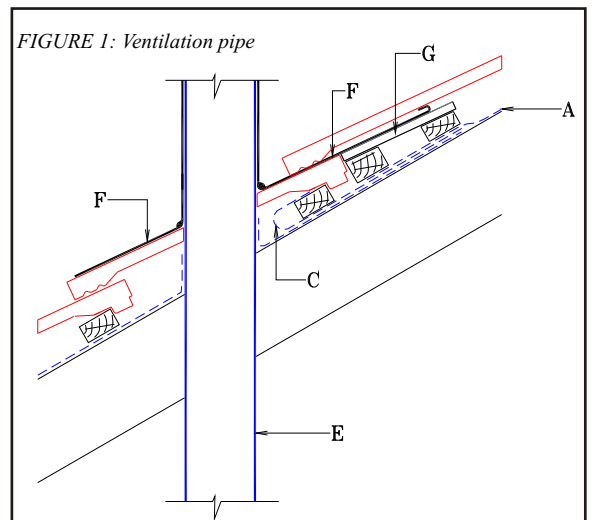
It is therefore important that the free vent area of the vent tile is known. Each manufacturer and type will have a different free vent area. There is a balance to be struck between having one very large vent or lots of small vents. Whilst one single vent tile may comply with the requirements, it will provide too much ventilation at one point and

nothing further along the roof slope. Small vents equally spaced out will produce a more even airflow and vent the roof space more effectively. Conversely if vent tiles are placed next to each other to provide the free vent area required, especially if they are one above another, air is likely to enter one and exit the other, rather than the two vents together. Where insulation is placed between the rafters there may only be 50mm between the underlay and the insulation. The pipe on the underside may need to be cut back to prevent it being impaled in the insulation and providing no ventilation at all.

The design of the vent tiles may vary from eyebrow and mushroom caps to the more unobtrusive top surface and leading edge vents. Regardless of which is used it should firstly keep out large insects by using a grill or mesh that has a maximum 4mm spacing. The design of the vent tile should prevent wind driven rain from draining down the vent pipe and allow water blown into the vent tile to drain out and also integrate correctly with the adjacent tiles to ensure water cannot penetrate the interlocks of the tiles. The vent must be capable of being mechanically fixed in accordance with the requirements of BS 5534, and without compromising the fixing of the surrounding tiles.

### Soil Vent pipes

Soil pipes can be vented using the same vent tiles as used to ventilate



# Construction Notes - No 13 Ventilation tiles and pipes

the roof void, provided that there is a means of connecting the round soil pipe to the vent tile. The connection is normally a flexible rubber or plastic pipe (D), which can turn from a vertical stack to the pitch of the roof. The size of the vent tile needed depends upon the requirements of British Standard 5572 1994 Code of practice for sanitary pipework and Building Regulation Approved Document H1. The regulation states that for single occupancy houses up to two floors high the vent pipe above the highest connection can be reduced to 75mm dia. ( 4 420 mm<sup>2</sup>). For all other situations the soil pipe diameter must be maintained. I.e. 100mm dia.( 7 855 mm<sup>2</sup>) and 150 mm dia. ( 17 674 mm<sup>2</sup>). For the vent tile to be acceptable, most building control organisations require an air test to be done on the soil pipe system, and this will require a means of sealing off the vent tile with a drain pipe bung to allow the pressurisation to be achieved. The position of the soil pipe terminal on the roof slope should be at least 900mm above any opening into the building where the terminal is within 3.0 m horizontally of the opening. This may mean that if dormers, or roof windows, are installed close to the ridge it may be impossible to use vent tiles.

## Mechanical Extract vent

Vent tiles can be used as terminals for mechanical extract systems, for example bathroom and kitchen ventilation to comply with Building Regulation Approved Document F1, or domestic heat recovery systems. For larger air conditioning and swimming pool systems they are unlikely to be large enough. With mechanical extraction systems the fan will blow air out at the rate of 60

litres per second for kitchens, 30 lit/sec for cooker hoods or utility rooms and 15 lit/sec for bathrooms. The smaller the duct size the harder the fan needs to work. The more bends in the ductwork and the design of the baffles in the terminal, so the air will slow down and place more load on the fan. Therefore a small capacity vent tile will place more load on the fan than a large capacity vent tile. The resistance of the air pressure is measured in Pascals (Pa) at a flow rate (normally 100 m<sup>3</sup>/hour). The lower the figure, the less the resistance. Some resistance is always needed to ensure that wind driven rain does not blow directly into the duct.

As most mechanical extract systems will be removing moist air from bathrooms and kitchens, the risk of condensation forming in the duct, even if it is very well insulated, is quite high, especially where the duct passes through the tiles vent. It is therefore always recommended that a condensation trap be installed between the fan and the terminal. The condensation trap collects any drains water running down the inside face of the duct, preventing it from reaching the fan motor and causing any possible damage. The collected water can then be removed harmlessly by evaporation, or drained off into an overflow pipe.

## Gas Flues

Gas flue pipes are mostly 100 or 125 mm dia. and discharged at the ridge via gas flue ridge terminals or conventional chimneys. However the latest generation of gas condensing boilers have special terminals that form both the air inlet and the flue and can be as small as 50mm dia. These units are similar to vent tiles but are specific to each gas appliance. Conventional vent tiles are not suitable for this situation. Solid fuel effect fires require a much larger diameter flue that is larger than most gas flue ridge terminals can cope with. These should therefore be terminated through a conventional chimney.

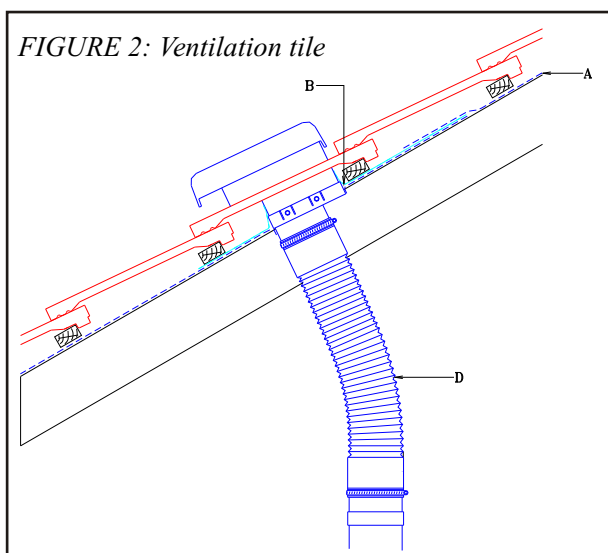
The position of a gas flue on the roof should always be at least 600mm away from an opening into the building. Where the gas terminal is on the roof slope, the boiler manufacturer's recommendations should be complied with.

## Vertical Pipes

Where a vertical pipe (E) passes up through the tiles, it is advisable to arrange that the hole is cut through the side interlocks, with half of the hole in one tile and half in the other tile. Around the pipe and over the cut tiles lead slate/ flashing (F), which fits tightly around the pipe and dresses out over the adjacent tiles, will be needed. The flashing should have sufficient width to provide coverage of one complete roll of a profiled tile on both sides, and lap over the tile below, and under the tile above, by the distance indicated in the flashing lap table. Where the flashing laps under the tile above the lead flashing, it should be supported on a support board (G), level with and to the same profile as the tiles to support the tile above and prevent wind driven rain blowing in between the flashing and the tiles. The use of a cut piece of tile may be appropriate, but will not work with all types of interlocking tiles or at low rafter pitches as it may clash with the tile batten of the course above. For large pipes it may be appropriate to remove a whole tile and form the flashing in two or more pieces (the fewer number the better).

## SUMMARY

- Roof ventilation should be spaced out evenly.
- Ensure water, dust and insects cannot get into the roof void.
- Mechanical extract systems should include a condensation trap in the ducting.
- Soil vent pipes and gas flue terminals must be positioned well away from roof windows and dormers.



CTMA members are:

- Cemex
- Forticrete
- Lafarge
- Marley Eternit
- Sandtoft