

Fire Testing Floor Waste Pipe Penetrations

Fire testing floor waste pipe penetrations, often referred to as floor drains or shower wastes, present unique challenges compared to continuous "stack" pipes, both in terms of practical test setup and performance.

Challenges in Testing

The primary challenge in testing floor waste pipe penetrations is the positioning of thermocouples (TCs, temperature measurement) directly on the floor waste grate. As soon as the test begins, the uPVC components of the floor waste under the floor rapidly combust and disappear, leaving a direct passageway for furnace gases. This causes the thermocouple to read temperatures exceeding the threshold of $\Delta 180$ K.

For stack pipes, this is less of a concern, since in a continuous pipe, there are no thermocouples directly impacted by furnace gases. The most vulnerable thermocouple is positioned on the outside of the pipe, which provides a delay in heating since uPVC is a poor conductor of heat. Furnace gases flue through the pipe and exit 2 meters away at the top of the pipe until the firestopping system closes the pipe.

Thermocouple Positioning

Figure 1 shows the positioning of thermocouples:

Floor Waste: TC 1 sits on the grate directly over the opening, and TC 2 is positioned 25 mm from the grate on the flooring (slab, screed, or tiles, depending on the setup).

Stack Pipe: TC 1 is positioned on the pipe, 25 mm up from the level of the flooring, and TC 2 is positioned on the flooring, 25 mm from the pipe

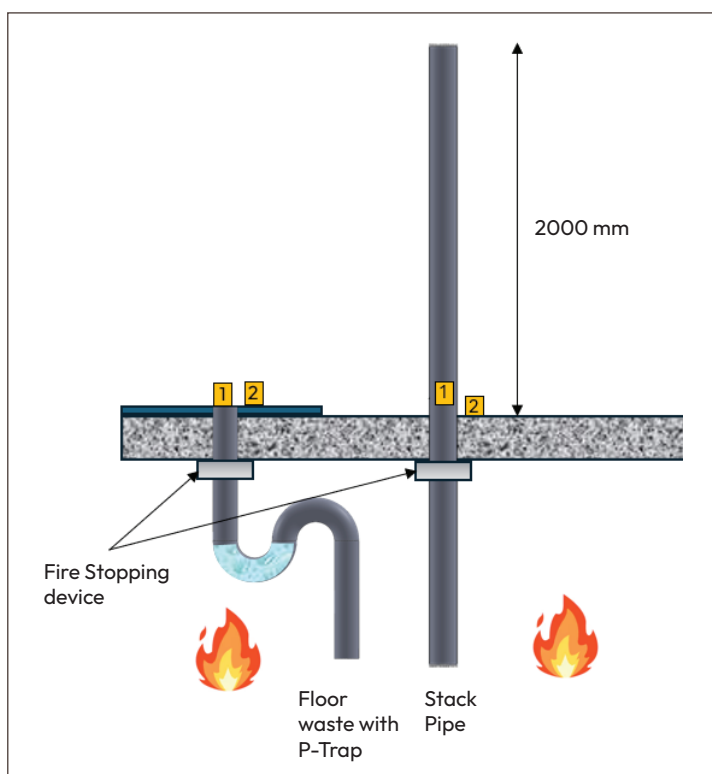


Figure 1 – test configurations for floor waste and stack pipes

Firestopping Systems

For floor waste, the firestopping system, usually a collar (cast-in or retrofit), must seal the void rapidly and with greater force to prevent hot gases from heating the highly vulnerable TC 1. Standard uPVC stack pipe firestopping systems using older intumescent technology have been unable to close the void in sufficient time to reduce the heating of the grate thermocouple. Figure 2 shows an example of a Standard Stack Pipe firestopping collar when tested on a floor waste.

Historically, dedicated floor waste firestopping systems have been designed with mechanical assistance to add closure speed through fusible link spring-loaded devices to squeeze the pipe shut until the standard intumescent has time to expand and take over. Intumescent-only firestopping collars typically had been unable to perform this task.

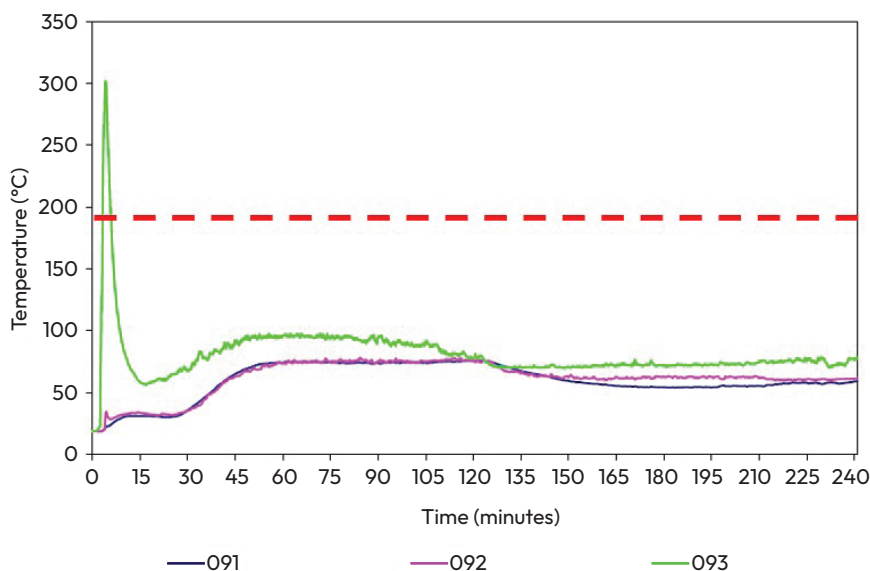
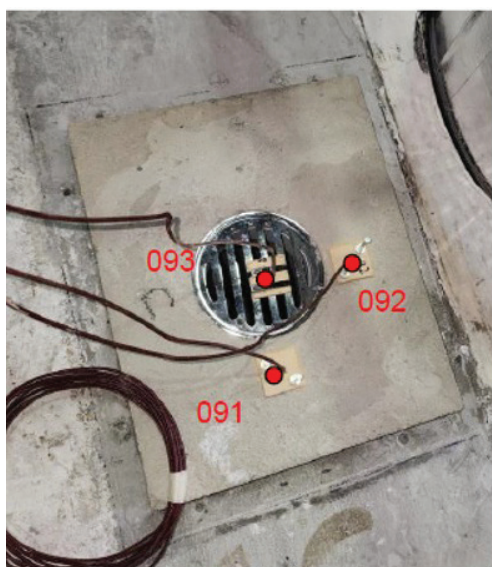


Figure 2– Standard Stack Pipe collar tested on a floor waste configuration.

Grate Type Influence

The type of floor waste grate can significantly influence the test outcome. It is best practice to use the "worst case" grate, which is usually an open slotted metal grate. This arrangement exposes the thermocouple to furnace gases more directly compared to a tile insert type of cover. For the tile insert, the thermocouple positioned on the insert is protected from furnace gases through the thermal inertia of the tile and diversion of gases away from the thermocouple. If a floor waste firestopping system was tested with such a grate system, then this test would not be valid for installations using metal grates (figure 3).



Figure 3 – Open metal gate vs closed tile insert

FIREFLY T1 and T2

With the latest generation of intumescent technology, FIREFLY T1 and T2, expands with greater speed and force than standard collars, eliminating the need for contraptions such as springs or blades. In testing, the furnace gases hitting the grate are minimised, and the grate TC remains well below the threshold of $\hat{e}180$ K.

In addition, FIREFLY T1 and T2 were tested in the more onerous configuration of open slot steel grate and are compliant when installed on site using either type of grate.