

Phone: +61 (0)7 5455 5148, Mobile: 0409 399 190, Email: rafoster@bigpond.net.au

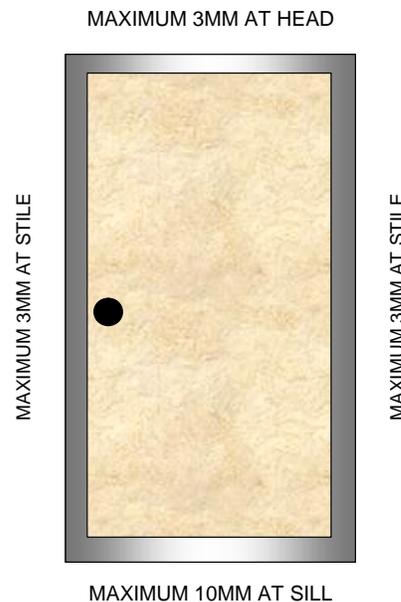
### MODELLING SMOKE LEAKAGE THROUGH FIRE DOORS

Fire and Security Consulting Services is frequently asked about the rate of smoke leakage through the gaps around a fire door.

This is especially relevant where apartment entry (fire) doors open out on to stair and lift lobbies in multi-storey buildings.

The provision of smoke seals to fire doors significantly reduces smoke leakage rates into the lobby when the doors are closed. For example, "Warrington Fire Research - Fire Resistant Barriers and Structures"<sup>[1]</sup>, Table 8.6, provides a maximum leakage rate of 308m<sup>3</sup>/h (0.085m<sup>3</sup>/s), based on a pressure differential of 75Pa. Tests carried out by Rakic at Lorient International<sup>[2]</sup> on doors with smoke seals fitted to door jambs, heads and sills indicate leakage rates of around 16m<sup>3</sup>/h (0.004m<sup>3</sup>/s) can be achieved at similar pressures. This indicates that a DtS design with no smoke seals fitted will permit almost 20 times the amount of smoke into an adjacent corridor than a fire door with smoke seals fitted.

As1905.1<sup>[3]</sup> (The Australian Standard on Fire Doors) limits clearances between fire doors and frames to that depicted in Figure 1 below.



For a 2080 x 820 sized fire door this equates to a vent of 23,062mm<sup>2</sup>. If one were to model such a vent without smoke seals it would be equated to a vertical slot 2.08m high and 11.1mm wide.

Taking the Rakic test data that a door with smoke seals passes 20 times less smoke, the equivalent vertical slot would be 2.08m high and 0.6mm wide.

- [1] Warrington Fire Research, "Fire Resistant Barriers and Structures", Building Control Commission, 2000.
- [2] R Rakic, J "The Performance of Unit Entry Doors When Exposed to Simulated Sprinkler Controlled Fires", Lorient International.
- [3] Standards Australia 1997 AS/NZS1905.1 – *Components for the protection of openings in fire-resistant walls. Part 1: Fire-resistant doorsets*, Standards Australia International, Sydney NSW Australia