

INTUMESCENT TECHNOLOGY IN FIRE RESISTING DOORSETS



Fire Resisting Doorsets

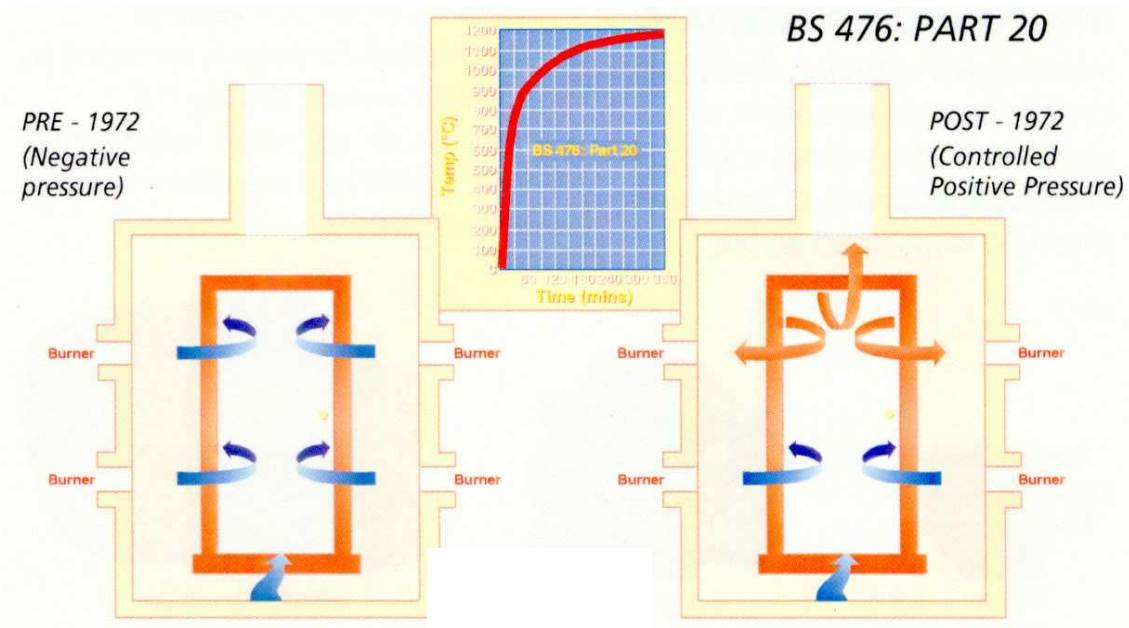
INTRODUCTION

History

- <1972: negative pressure furnace testing.
- >1972: positive pressure furnace testing.
- Neutral pressure at 1m.
- Premature test failures.
- Door stop burn away in approx. 15min.
- Intumescent strips introduced.

Fire Resisting Doorsets

Fire Resistance Testing



Fire Resisting Doorsets

European Test Procedure

- BS EN 1634
- Fire Resistance Tests for Door and Shutter Assemblies.
- Alternative compliance with Building Regulations.
- Plate thermocouple.
- Positive pressure changes.

Fire Resisting Doorsets

UK Test Procedure

- BS476:Part20:1987
- “Fire tests on Building Materials, Method for Determination of the Fire Resistance of Elements of Construction.”
- Test report.
- Performance assessment.
- Third Party product certification.

Fire Resisting Doorsets

BS476:Part20 Test Series.

- Part 21: Load bearing elements that have a fire resistance.
- Part 22: Non-load bearing elements that have a fire resistance.
- Part 23: Elements that make a contribution to the fire resistance of a structure.

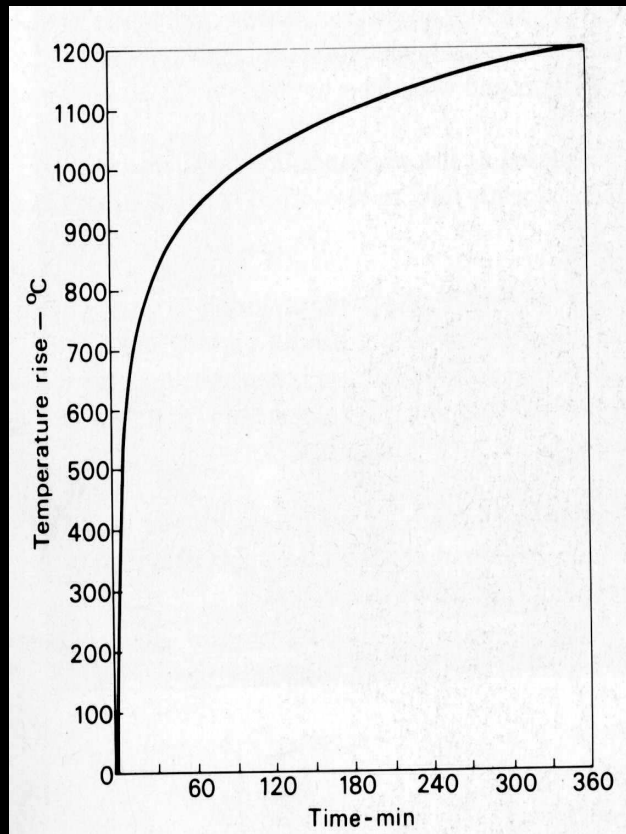
Fire Resisting Doorsets

BS476:Part 22 & 23



Fire Resisting Doorsets

BS476:Part20 Temperature Conditions



- Post flashover fire representation.
- 10min: 700⁰C
- 30min: 820⁰C
- 60min: 940⁰C
- Intumescent strip: activation 120-200⁰C 12-14minutes.

Fire Resisting Doorsets

INTUMESCENT MATERIALS

- Swell to many times original volume under the influence of heat.
- Fire resisting properties.
- Essential components of fire resisting doorsets.

Fire Resisting Doorsets

Intumescent Materials



Fire Resisting Doorsets

Sodium Silicate

- Uni-axial expansion.
- Approximate expansion: x10.
- Medium pressure.
- Moisture and Carbon dioxide sensitive.
- Mechanical damage protection.

Fire Resisting Doorsets

Expandable Graphite

- Tri-axial expansion.
- Approximate expansion: x20.
- High pressure.
- Unaffected by Moisture or Carbon dioxide.
- No special protection requirements.

Fire Resisting Doorsets

Mono-Ammonium Phosphate

- Tri-axial expansion.
- Approximate expansion: x40.
- Low pressure.
- Hygroscopic components.
- Mechanical damage protection.

Fire Resisting Doorsets

Intumescent Materials

Medium Volume
Uni-axial Expansion
Medium Pressure

Sodium
Silicate

High Volume
Tri-axial Expansion
High Pressure

Expandable
Graphite

High Volume
Tri-axial Expansion
Low Pressure

Mono Ammonium
Phosphate

Fire Resisting Doorsets

General Material Issues

- Door-frame gap 3-4mm.
- BS 8214: 2008 Code of Practice for Fire Door Assemblies.

Fire Resisting Doorsets

FIRE DOOR TESTING

- Test procedure requires both inward and outward opening to be tested (when most onerous is unknown).

Fire Resisting Doorsets

Timber Doors

- Normally tested opening into furnace.
- Shrinkage of heated face leading to distortion into furnace.
- Intumescent seals to close gaps and restrict distortion.

Fire Resisting Doorsets

BS476:Part 22 & 23



Fire Resisting Doorsets

Steel Doors

- Normally tested opening out of furnace.
- Expansion of heated face leading to distortion out of furnace.
- Intumescent seals not normally required.

Fire Resisting Doorsets

INSTALLATION

- FD30 & FD60 door sets can normally be made up from separately purchased components which are within their performance assessment scope.
- Complete sets only for FD90 & FD120.
- Third party installer approval schemes.
- IFC Certification, FIRAS, LPCB

Fire Resisting Doorsets

Intumescent Fire Seal



Fire Resisting Doorsets

SMOKE CONTROL

- Fire door with no intumescent seals will 'leak' cold smoke at approximately 30m³/hour/metre.
- BS9999 (Fire precautions in the design and Construction of Buildings) requires a smoke leakage limit of 3m³/h/m at 25pa pressure.

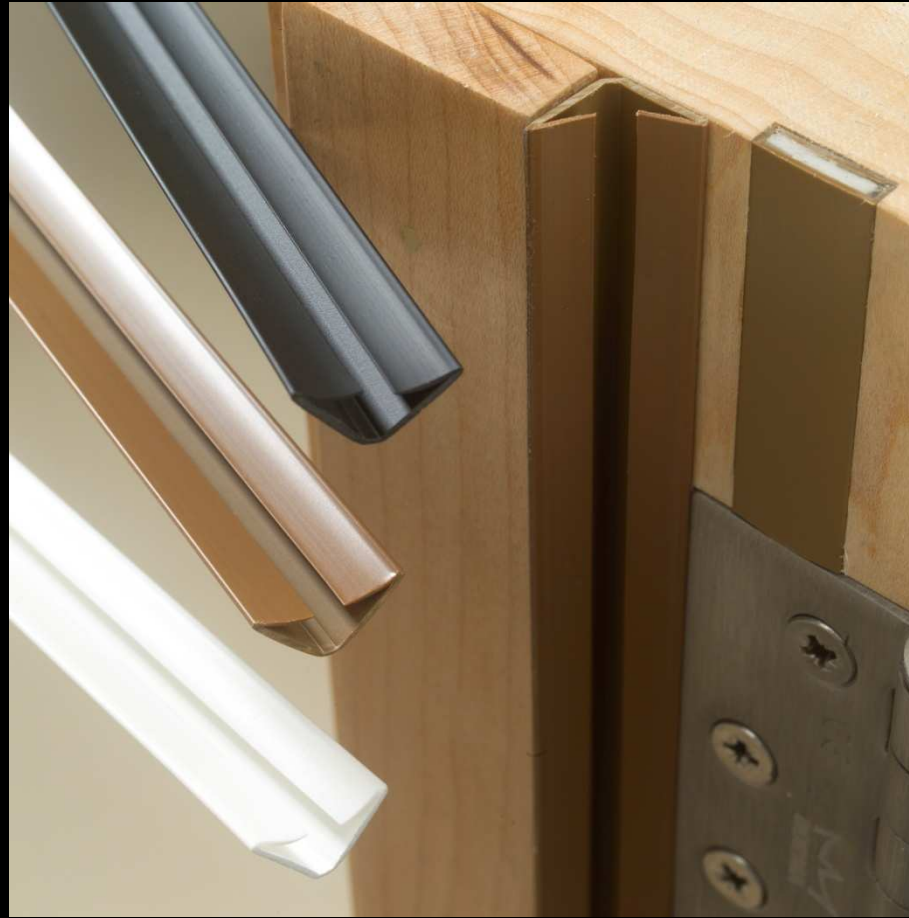
Fire Resisting Doorsets

Intumescent Fire and Smoke Seal (1)



Fire Resisting Doorsets

Intumescent Fire and Smoke Seal (2)



Fire Resisting Doorsets

CONCLUSION

- Relevant testing, 3rd party accreditation.
- Appropriate installation.
- Variable gap sizes.
- Hot and cold smoke.
- Evidence of product longevity. (IFSA)
- Third party certified installers.

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