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# Fire Resistant Doors and Shutters

By John Rakic - Executive Officer for the Alliance for Fire & Smoke Containment

**This paper was delivered at the recent Passive Expo organized by FPA Australia and the Alliance for Fire and Smoke Containment and held in April 2005.**

*As many readers would know, Australian Standards Committee FP19, through its relevant sub committees, has been working hard for several years on revisions to both AS/NZS1905.1 – 1997 and AS1905.2 – 1989, dealing with fire resistant doorsets and fire resistant roller shutters respectively. This resulted in the release of public comment DRAFT for both standards with the intention of seeing some new and improved versions published hopefully sometime in 2005*

*This paper compliments the presentation provided at the "Passive Expo" and provides an overview on both fire resistant doorsets and fire resistant roller shutters, as well as providing some insight into the proposed new standards and training, accreditation and licensing initiatives in the Passive industry sub sector.*

## Introduction ———

No one would disagree that the effects of a fully developed fire can be disastrous and fire containment barriers are an established means of containing the spread of fires from one area to another. Large openings in these so-called "fire

walls" requires the inclusion of either "fire doors" or "fire shutters". This paper discusses the basic principals of both of the product types, their fire testing, the product standards specific to each, installation, labeling, certification and maintenance. It touches briefly on the competency of those working on these products and training initiatives, as well accreditation and licensing and how it is evolving.

## Acknowledgement ———

I would like to acknowledge the previous Chairman of FP19 (Passive Fire Protection) and the Sub Committee Chair for fire doors, Mr Eoin Shearer OAM, for his dedication and tireless work on the fire doors and other Standards over many years. Eoin passed away recently and he will be sadly missed by all of us in fire industry.

## Defining Relevant Terminology ———

For the purposes of this paper, the following definitions apply:

**Standard fire resistance test** - AS 1530 Part 4, a test methodology based for door and shutters specifically on ISO 834 and ISO 3008.

**Fire Resistance Level (FRL)** rating – the BCA "fire rating" consisting of the appropriate grading period in minutes, established in the standard fire resistance test and applied to an element of building construction for the three criteria of—

- (a) structural adequacy;
- (b) integrity; and
- (c) insulation;

and expressed in that order, noting that the structural adequacy criterion is not applied to fire doorsets.

**NOTE: The standard fire test applies a fourth criterion, radiation, to glazed apertures in fire-resistant doorsets.**

**Australian fire equipment product standard** – an Australian Standard dealing specifically with an item of fire equipment providing advice to manufacturers, suppliers and installers in relation to design, installation, labeling, certification and associated documentation.

Example – AS 1905 Part 1 – Fire resistant roller shutters

**Doorset** - a complete **assembly** comprising—

- the door leaf or leaves including any glazing and other inbuilt features;
- the door frame, if any, with its fixings to the wall and, for a sliding doorset, with

all guides and their respective fixings to the lintel, wall or sill;

- any fixed panel and its associated transom or mullion (including the methods of fixing) which is contained within the door frame; and
- all door hardware.

**Hardware (or door hardware)** - a broad term used to group together all items that are fitted or related to doors and includes:

hinges, pivots, sliding door track assemblies, locks, latches, snibs, panic exit devices, closers, pull handles, sequence selectors, bolts, reed switches, buffers, power transfers, hold-open devices, any part of an automatic closing device which is attached to the doorset, and all (door) furniture.

**Fire resistant doorset** – a doorset which, except when varied as permitted by this Standard, is identical in assembly, construction and installation with a specimen doorset that has been submitted to the standard fire test, and has fulfilled all the relevant test requirements.

**NOTE:** Fire-resistant doorsets are commonly referred to as 'fire doors'.

**Fire resistant roller shutter** – a complete assembly, identical in construction and installation with a specimen that has been submitted to the fire resistance test and has fulfilled all the relevant test requirements to achieve the nominated fire resistance level, typically comprising—

- a curtain;
- vertical guides between which the curtain can slide when being raised or lowered, together with associated fittings;
- a horizontal barrel, mounted above the opening, on which the curtain is rolled when being raised or lowered, together with associated fittings;
- a fusible link to provide for automatic operation; and
- a governing device to control the speed of descent of the curtain immediately following actuation.

## Fire Testing ———

Both fire resistant doorsets and fire resistance roller shutters are fire tested to the standard fire test (AS1530 Part 4).

This test method allows the determination of the Fire Resistance Level (FRL) rating, based on both the integrity (resistance to the passage of hot flames and gases) and insulation (temperature rise on the non-exposed side) as appropriate.

Typically fire tests are conducted on a full size specimen or the biggest that can be accommodated in the three (3) metre by three (3) metre full-scale fire resistance furnaces.

### Author's point to highlight

As someone who has been actively involved in product development and fire resistance testing, as well as smoke leakage testing, it would be remiss of me



*Photo of a full scale fire resistance test on a pair of single fire resistant doorsets*

Some development work and/or the fire testing of some alternative types of door hardware are conducted on a pilot scale or small scale furnace, which is typically one(1) metre by one (1) metre or bigger in size.

not to highlight one important misunderstanding that many people have.

**A fire tested door or any other fire test component does not mean this product will stop smoke leakage or keep tenable conditions on the non exposed side for the duration of the fire rating or FRL.**



*Photo of some perimeter and automatic door seals being fire tested on a small scale (pilot scale) furnace – Courtesy of Lorient Australia*

There are different test methods, such as AS/NZS1530 Part that deal specifically with smoke leakage capabilities of assemblies.

## Fire Ratings

Fire ratings are determined by way of the results from the standard fire resistance and are expressed as an FRL for Regulation / Building Code of Australia purposes.

I would like to draw your attention to the definitions for fire resistant doorset and fire resistant roller shutter. It is no coincidence that the terms **assembly** are highlighted. The FRL or fire rating applies to the whole assembly or system, not to the individual items.

This is an important issue to understand as it underpins the philosophy of the product standards and their use and implementation.

It is not technically correct to state to use one hour fire rated lock for example, although we all here it regularly. What we should be saying is that the doorset should incorporate a compatible lock and the whole assembly should be capable of providing an FRL of -/60/30.

## Fire Resistant Doorsets

### AS/NZS 1905 Part 1

Most of us with any basic knowledge at all relating to fire doors would have heard of AS/NZS1905 Part 1, commonly referred as the "fire door code". This Australian Standard effectively is the "bible" for fire doors.

The current version is a joint Australia and New Zealand version published in 1997. Recently a revised version was presented to the public as a Public Comment DRAFT (DR 04098) and it is hoped that we will see a new 2005 version later this year.

The objective of these Standards is:

*"to provide manufacturers, suppliers and installers with a set of requirements for the construction and installation of fire resistant doorsets designed to protect the openings in walls and elements of construction which are required to resist the passage of fire."*

It is very hard in a few pages or few minutes to cover very much on fire resistant doorsets and their design and function, so I have decided to provide a basic summary of key points, entitled "Fire Doors 101".

## Fire Doors 101

### Construction

Most Australian fire doors consist of non combustible core (infill) materials clad with timber facings and incorporating timber based edge strips or lippings to allow for ease of fitting into steel door frames which might be slightly out of plumb. Or to accommodate irregular floor finishes. (Refer to Figure one below).

Essential items of door hardware, such as hinges, door closers and locks for example, are fixed in metal reinforcing plates as a rule.

### Self closing and self latching

This is probably the most fundamental aspect of these products. The must be closed to be effective and must latch so that the pressure in the fire cannot force the door open and allow flame spread.

Self-closing or automatic door closers are fitted to provide the closing function and door locks / latches and door strikers are utilized to ensure a positive latching function.

**Note – Dead bolt or other hardware which can render a door non-self latching are not permitted. These should not be confused with dead latches. There is a very fundamental difference.**

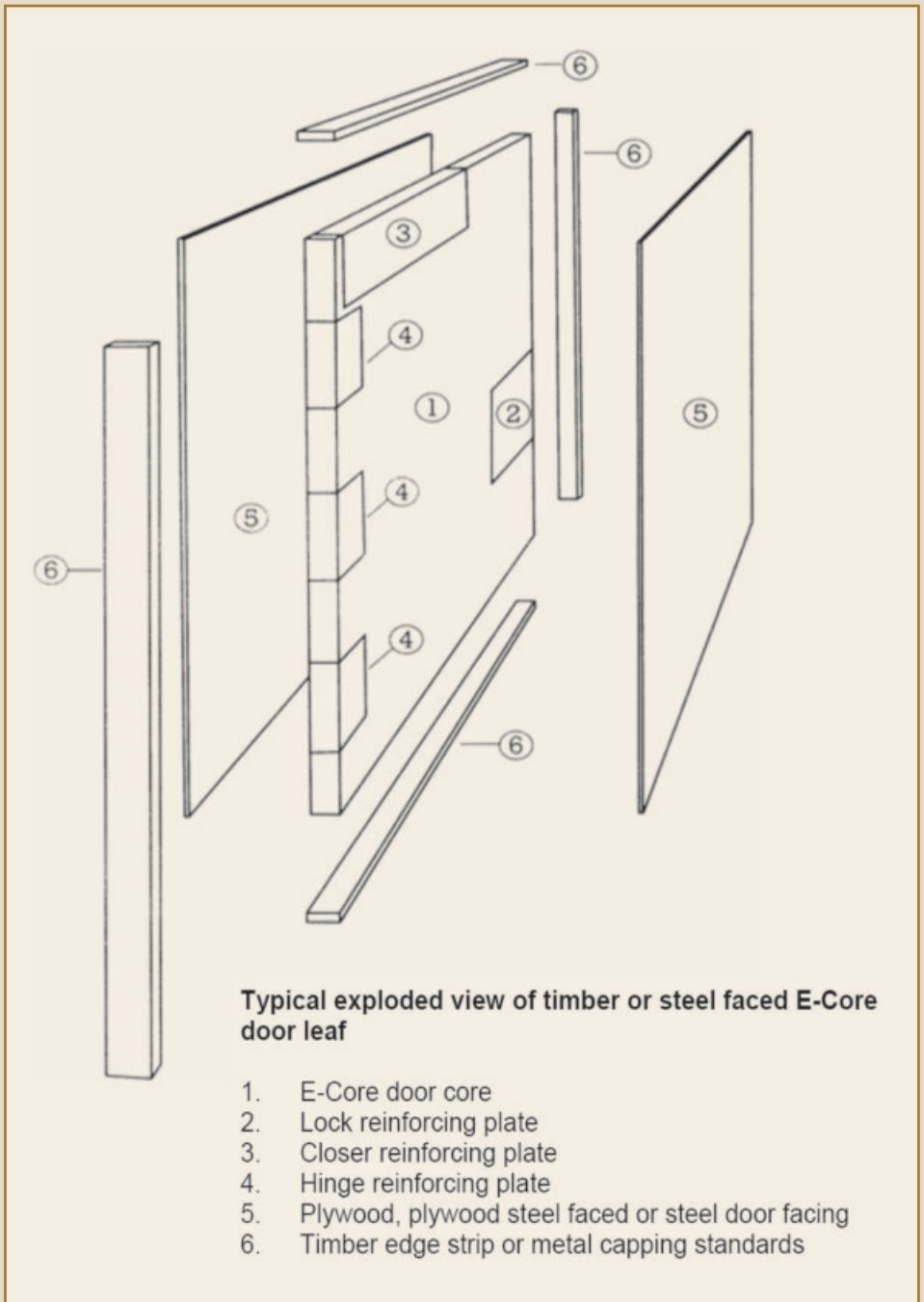


Figure One – Typical door construction – Courtesy of Trafalgar Building Products

**Proprietary nature of fire doors**

Although there are some similarities in different manufacturers and suppliers fire doors, they are a proprietary product, and the fire test data and field of application for each type is different. Most fire door manufacturers provide user manuals (such as the Trafalgar Door Book for example) which outlines the different sizes and configurations of fire doors as well as the approved fire door hardware makes and models.

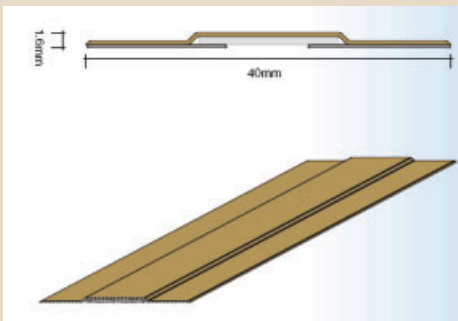
**Clearances**

I would like to say clearances, clearances, clearances, clearances.....

Yes, I am laboring this point. This should be pretty straight forward but my own inspections in the field reveal larger than the 3mm allowable perimeter (head, lock and hinge stiles) and 10mm at the bottom of hinged doors.

Care must be taken during installation and competent installers used to ensure these clearances or gaps are maintained.

In recent times we have seen the use of clever intumescent upgrade products which can at least salvage doors with non compliant and excessive clearances.



Lorient Australia – HP 4002 product – an example of an self-adhesive type intumescent perimeter seal for use on doors with excessive gaps

**Operational forces**

The opening forces are also becoming more and more important with issues relating to access and egress for the disabled and of course of doors to fire rated stairwells where stair pressurization systems are employed.

**Door frames**

In Australia, we predominately use steel or "metal" door frames and I often joke about it being due to the termite problems we experience when I am speaking with overseas colleagues.

- o Door closers
- o Hinges
  - Floor springs & transom closers
- o Panic Exit Devices
- o Door seals
  - Perimeter, automatic door bottoms
- o Meeting stiles & sequence selectors (double doors)
- o Magnetic door holders
- o Furniture
  - Viewers, kick plates, knobs and levers etc

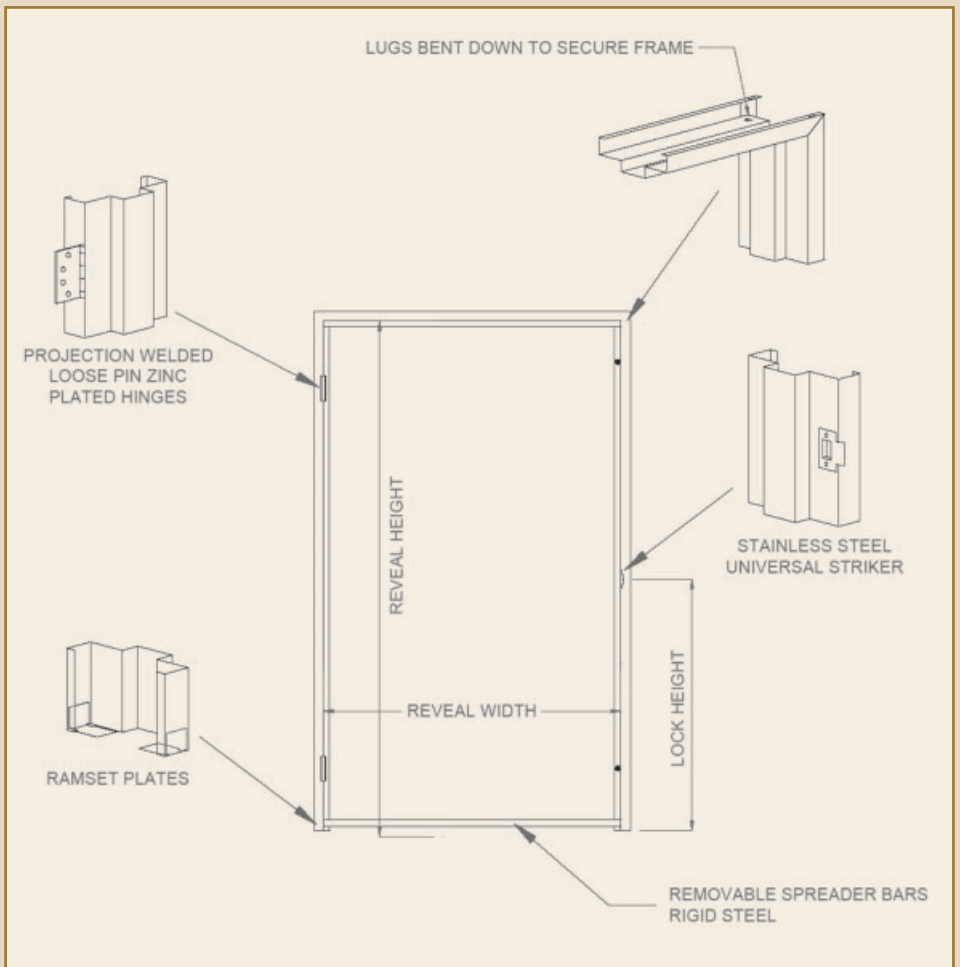


Diagram showing some nomenclature for a typical "knock down" type steel door frame – Courtesy of Trafalgar Building Products

**Door hardware**

There are many different types of fire door hardware, and as discussed above they need to be fire tested and approved for use on the different proprietary doorsets.

Some of the more prevalent items of door hardware include:

- o Locks
  - Cylindrical, tubular & mortice
- o Door strikes
  - Conventional & electric

- o Sliding door hardware
  - Tracks, rollers, pulleys, guides, flame guards etc.

Although not quite hardware, inbuilt features could possibly be mentioned here also. These include such items as:

- Vision panels, and
- Air transfer grilles

## Installation

AS/NZS1905 Part 1 does provide some advice on installation.

I would like to stress that fire door leaves are different to standard timber doors, and a suitably trained and competent door installer should be used.

I will not discuss competencies in any detail here except to say as part of the initiatives supported by the Alliance for Fire and Smoke Containment, (PFPA) Accredifire has been launched. This business aims to provide training in the Passive Fire and Smoke Containment area.

A fire door and fire door hardware, installation and maintenance training course is being finalized at the time of writing and will be delivered by Accredifire, a new business unit supported by the Alliance for fire and smoke containment. (Refer to section of training and accreditation below and visit [www.pfpa.com.au](http://www.pfpa.com.au)).

## Maintenance

Maintenance is not covered in AS/NZS 1905 Part 1. There is an existing and separate Australian Standard, AS1851 Part 7 dealing with maintenance of fire resistant doorsets.

## Marking and other documentation

All fire resistant doorsets are labeled after they have been inspected. This is in the form of a metal tag, and hence the process is usually referred to as "tagging".

This helps identify the manufacturer, supplier and installer of the fire resistant doorsets for maintenance, repair and possible replacement purposes.

As part of the certification by the sub contractor or company ultimately responsible for supply and installation of the fire resistant doorset, an Evidence of Compliance Certificate and accompanying Evidence of Compliance Schedule (previously referred to as a "log book") are used.

AS/NZS1905 Part 1 outlines the procedure and provides pro-forma documents.

## Training & Accreditation

As discussed earlier, competencies have been developed for the overall Passive Fire Protection industry sub sector and the next obvious initiative to follow is the development and delivery of training, and

assessment of competent individuals against these competencies.

The Alliance for Fire and Smoke Containment has supported the launch of Accredifire to deliver training for the Passive Fire Protection industry sub sector.

In August of September this year, Accredifire will start delivering training for installers and service providers for fire doors and fire door hardware. Accredifire is a National initiative, but plans to run a pilot program in NSW initially with plans to expand the training into other regions late in 2005.

Fireproofing, fire stopping, fire retardant and other products or fire and smoke containment training modules will inevitably also be developed and delivered also.

## Licensing of fire practitioners

Queensland as many of you know requires all fire door installers and service providers to be accredited and licensed under the Queensland Building Services Authority Act and Regulations.

National licensing of fire practitioners in the author's opinion is inevitable.

FPA Australia in conjunction with the Alliance Fire and Smoke Containment, (PFPA) have been working hard on a Strategic Document which can be sourced from either organization, which discusses a National approach to accreditation, and Occupational Licensing for the overall fire protection industry.

Of course the initiatives of Accredifire and other training and accreditation programs are an important link in the chain, providing the necessary endorsement of individuals to supplement a successful Government licensing system.

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## The proposed new AS1905 Part 1 Standard

The current Standard has stood the test of time in my humble opinion, and as a result the proposed new Standard is not too dissimilar from the current version.

A few of the changes worthy of highlighting are:

- The fact that the new Standard will not be a joint Standard with New Zealand and therefore many of the New Zealand only clauses will be removed and therefore avoiding unnecessary confusion
- The allowable variations from the fire tested specimen which do not require additional testing or a formal opinion / assessment will be moved into AS1530 Part 4 to be consistent with the ISO approach.
- Cotton wool pad testing is applied to the perimeter of doors to determine integrity failure in conjunction with the gap gauges (although this is in the proposed AS1530 Part 4, but I had to mention it so I could put my favorite photo in below).



*A photo of the head of a door which has not failed integrity according to the 150 x 6mm continuous gap failure criteria but which would provide excessive smoke leakage*

Of course there are also many small embellishments to clarify areas of previous confusion in the proposed new Standard.

## Fire Resistant Roller Shutters —

These are not used as predominately as fire doors, but nonetheless are an important fire barrier product.

The definition provided earlier, akin to fire resistant doorsets, highlights the important fact that the overall assembly achieves the FRL.

### AS1905 Part 2

Akin to the "fire door code", is the "fire resistant roller shutter code".

The current version was published in 1989 and is a little dated now.

The objective is very similar to that for fire doors:

*to provide manufacturers, suppliers and installers of roller shutters with minimum requirements for the design, installation and operation of roller shutters for use in walls and elements of construction required to provide fire resistance.*

### Design issues

A couple of notable design issues apply to fire resistant roller shutters:

#### Position of fusible link

A fusible link is a device that melts or breaks due to the heat of the hot gases in a fire condition and initiate closure of the fire resistant roller shutters. They need to be positioned in the air stream in the door opening and not shielded to allow them to perform the function they are designed for.

#### Egress limitations

Due to the operational characteristics of roller shutters, they shall not be used as the only means of egress from an enclosure.

#### Insulation against radiant heat

Experience with uninsulated fire-resistant roller shutters, (i.e., with curtains manufactured from steel) in actual fires has demonstrated their ability to impede the passage of flame and hot gases; however, they become extremely hot and can represent a significant heat radiation hazard.

#### Controlled decent

Speed governors or speed limiting devices are employed to provide a controlled

decent to ensure no people trying to exit are injured by the closure of the fire resistant roller shutter.

### Installation

AS1905 Part 2 provides some advice in relation to installation and commissioning.

Accredifire may also look at a training course in this area also.

### Maintenance

Unlike fire resistant doorsets, there is currently no Australian Standard for maintenance of fire resistant roller shutters. This does not mean they are any less important or should not be maintained.

The new proposed AS1851 suite is planned to include a maintenance regime for these products.

## The Proposed New AS1905 Part 2 Standard —

The major change in the proposed new AS1905 Part 2 is the removal of the proposed removal of the existing specification for manufacture and installation for a fire resistant roller shutter. I am comfortable with this personally as it is not too much to ask of a manufacturer and supplier to test their roller shutter product like all other fire containment products.

Like the proposed new AS1905 Part 1, the allowable variations from the fire tested specimen which do not require additional testing or a formal opinion / assessment will be moved into AS1530 Part 4 to be consistent with the ISO approach.

Of course there are also many minor changes to clarify the anomalies with the existing 1989 version.

## Summary —

FRL ratings relate to assemblies, not individual components and provide data on flame or fire spread, not necessarily smoke spread.

Fire doors and shutters are proprietary in nature and manufacturers and suppliers usually provide documentation regarding the sizes and features that they have fire test and other relevant supporting data for by way of a "Door Book" or similar publication.

Product Standards exist and are in the process for fire doors and shutters of being improved and hopefully republished in conjunction with the standard fire resistance test method during the course of 2005.

Training, training and training.... Cannot say it enough are important to provide people with the necessary knowledge to do their job in a professional and competent manner. Accredifire is one initiative in this area.

Accreditation and licensing are on the way in and are underpinned by competency based training.

## About the Author —

John Rakic is the Principal of JRAK Consulting and is also the Executive Officer of the Alliance for Fire & Smoke Containment and founder of Accredifire.

John is heavily involved in Australian Standards Committee work and is currently the FP19 Chair for both fire resistant doorset sub committee and the fire resistant roller shutters sub committee so is in a good position to write about this topic.

John, as many readers would know is a frequent contributor of articles for Fire Australia and other magazines dealing with fire protection.





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