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SFPE TECHNICAL MEETING AUCKLAND - 14 JULY 04 "LATEST F RATING REVISIONS" BY CLIFF BARNETT

Cliff is one of the nine members of the BIA working Group that has been working on the revision of the F ratings since August last year.

Cliff gave an overview of the reasons behind the changes and the new design method used to revise the current figures. He explained how a recent research in New Zealand showed that drywall fire rated barriers commonly used in New Zealand could under high intensity fires, fail in times much less than specified ISO Ratings. Unlike the S rating which are mainly for property protection and necessary to sustain a complete burnout, the F rating is intended to prevent structural collapse for sufficient time to provide for safe evacuation of occupants during a fire and fire service operations.

F rating figures need to be higher in well-ventilated buildings, when the fire reaches higher temperature earlier than the standard furnace test. This is due to increased cumulative radiant heat in real fires compared to the same duration in a standard fire resistance test. A new calculation method is used to quantify the difference between the FRR as determined by the standard furnace test and the expected time to failure in a typical building fire.

The values of F ratings were obtained by multiplying the TTF (time to failure of drywall construction) by a T_{er} multiplier representing the cumulative radiant heat equivalence. Fire engineers will be able to use this method to calculate F ratings for any fire intensity depending on the Purpose Group, fire hazard category, building height and the minimum time required for safe evacuation of occupants and the fire service response and intervention.

Cliff showed a comparison between the current and the proposed F rating Tables. Once the proposed F ratings have been adopted, both the S and F rating Tables in the Acceptable Solution will be in terms of drywall construction. In the near future the BIA will send out a draft documents on the revised F ratings for public comments.

Vian Ahmed
Fire Engineer
MacDonald Barnett Partners

IMPROVING THE PERFORMANCE OF POLYSTYRENE INSULATED PANEL IN NEW ZEALAND

Introduction

This article is a brief summary of a project conducted by BRANZ and sponsored by the New Zealand Fire Service Commission, Plastics New Zealand Inc (PNZ) and the Building Research Levy. The full report is available as NZFSC Research Report Number 45 on the NZFS web site at: http://www.fire.org.nz/research/reports/reports/Report_45.pdf

The principal objective of this research project was to better understand the fire performance of polystyrene insulated panels (PIP) in New Zealand and how the performance may be improved. An industry workshop was held to bring together all the relevant stakeholders, with representation from manufacturers, designers, product end-users, the Fire Service, regulators, insurers, fire engineers, and contractors etc. The purpose of the workshop was to clearly establish the key fire performance issues that affect the stakeholders, and hence the general direction that the research program would take.

The workshop was followed by an international literature survey and evaluation of the current fire safety requirements for PIP in the NZBC.

Experimental Programme

The issues identified as being crucial to a better understanding and improving the fire performance of polystyrene insulated panel in decreasing order of importance were:

- Fixing of panels to prevent structural collapse and delamination
- Fire spread within panels, establishing whether and how it may occur in practice, and if so trial methods to reduce it
- Containment of EPS within panels by improved joint details and fixing to minimise involvement in fire
- Demonstrate the value of flame retardant treatment of the EPS
- Ignition characteristics including critical radiation fluxes, configurations, and durations.

These issues formed the basis of the experimental programme and the individual trials were designed to address the issues raised with the following findings.

Key Findings from Research

Suspended ceilings

The current practice of using steel-shafted mushroom bolts to secure the ceiling panels to the suspension system was demonstrated to be satisfactory. Accordingly, it is recommended that steel-shafted mushroom headed bolts continue to be used to suspend PIP ceilings and that in no circumstances should all-plastic mushroom headed bolts be used in this application.

The alternative scenario of a fire from above in a ceiling space was trialled where the upper portion of three suspension systems were immersed in ISO fire conditions fire for 60 minutes. One system using high carbon steel wire failed at 33 minutes and the other two using chains had not failed at 60 minutes. In all cases some deformation and elongation was indicated, but these extreme conditions demonstrated the integrity of the suspension systems.

Cavity fire spread

The trials to investigate the phenomena of cavity spread between the metal skins of the PIP failed to produce any significant burning beyond the zone that was externally preheated by the flame from the burner. The experimental findings suggested little to be gained by incorporating non-combustible barriers within the core of the PIP. As a result, there are no recommendations to improve the fire performance of PIP in relation to the issue of cavity fire spread.

Joints between panel sections

The trials on the joints showed there is scope for improvement in the performance by making the joints more secure. It is recommended that those who design and install PIP can improve the fire performance of PIP by using the following methods to improve the integrity of panel joints:

- Closer rivet spacing on joints
- Substitute aluminium rivets with a higher melting point alternative
- Use light-gauge steel angle on corner joints instead of aluminium angle.

Flame retardant

The testing of samples in the cone calorimeter demonstrated the benefits of flame retardant treated EPS in terms of delaying ignition time, reduced heat release (peak and total) and average smoke extinction area for equivalent heat fluxes. Similar benefits were observed with the addition of a flame barrier (steel skin).

However, it is acknowledged that small scale tests such as the cone calorimeter do not take into account how a system utilising PIPs including large panels and joints will behave in practice.

Future research

It is recommended that future areas of research investigate:

- A more thorough examination of potential improvements in jointing systems
- More realistic alternatives to the current flame barrier test methods contained in the Approved Documents of the Fire Safety Clauses of the NZBC.

In the interests of conformity, there is a strong case that any new test method be internationally acceptable.

A current research project at BRANZ is evaluating test methods being used on PIP products and other types of panels internationally and will conduct tests to support the most appropriate method and make recommendations to the BIA.

Peter Collier
Fire Research Engineer
BRANZ

EVACUATION QUESTIONS FROM A FIRE ENGINEERING PERSPECTIVE

What is evacuation?

According to the Fire Safety and Evacuation of Buildings Regulations 1992 it is the safe, expeditious, and efficient method for removing the occupants of a building from the scene of a fire, in the event of the fire emergency requiring that action, to an assembly point where all occupants can be accounted for.

From a fire-engineering viewpoint, it is the ultimate proof for most buildings that the Objectives of Clauses C2, C3 and F7 of the Building Regulations 1992 have been met. These require that people are safe guarded from injury or illness due to a lack of awareness of an emergency, when evacuating a building due to fire and while escaping to a safe place.

Once aware of a fire occupants must have means of escape from fire that are of adequate size and number, easy to find by way of signage and illumination, are free from obstruction and are able to be traversed at any time by any person. The Fourth Schedule of the Building Act, 1991 amended the Fire Service Act 1975 to include section 21A whereby evacuation schemes for public safety were required.

Does it work?

The Fire Safety and Evacuation of Buildings Regulations, 1992 required those buildings listed in the First Schedule to that Act to apply for approval of their scheme 30 days after the issue of a Code Compliance Certificate for the building. In other words, once the building had had all the appropriate alarm systems, emergency lighting, signage, etc installed, there was at least 30 days, if not months or years, before those features had their ultimate test.

The Building Act, 1991 brought into being the Compliance Schedule and Warrant of Fitness whereby these safety features were inspected and certified at varying intervals as working and therefore satisfactory. None of these tests required people to actually 'use' the system but merely for an expert to 'view' the system. A bit like a new car being tested in the factory with all the appropriate equipment but never actually being driven on the road.

What has the new building bill changed?

A Building Consent Authority (Building Certifier or Accredited Territorial Authority) must apply to the Territorial Authority, in the district in which work is to occur, for a Project Information Memorandum when it receives a Building Consent application (s124). An owner may also apply for a PIM if they intend to carry out building work. The PIM must contain information relating to the land and services that may be relevant to the building work. In addition, if the Territorial Authority considers that the building will require an evacuation scheme, under Section 21A of the Fire Service Act, they must state that fact.

It will also be a requirement some time after 31 Mar 05 that Building Consent applications for certain types of building, as gazetted by the Chief Executive of the Ministry, must be copied to the Fire Service Commission (s133). The Fire Service may give advice on means of escape and the needs of fire fighters within 10 days, provided that advice does not exceed the performance criteria of the Building Code (s134(1)). The Authority issuing the Building Consent must have regard to that advice, if any, in deciding whether to grant or refuse a Building Consent (s134(2)).

Is it any better?

Clearly this must all be subjective, as the events described above have not yet occurred (but will on 31 Mar 05). Obviously it would make sense to ensure that the practitioner who was to carry out that ultimate test was aware of the mind of the fire engineer at the design stage. The current situation begs the question as to how the evacuation practitioner can put into effect a system that they may have no knowledge of. This is most prevalent in accommodation buildings where the likelihood of evacuations at the most inopportune times is very real.

The way forward will need a far greater liaison between fire engineers, evacuation consultants, the Fire Service and the building owner (our mutual client). Imagine calling the Fire Service to your fire but requesting only personnel on the basis that you will provide a selection of tools (of your choice) for them to use when they arrive. Somehow we have done remarkably well to now but there is definitely room for improvement.

Historically, NZS1900 Chapter 5 generally only looked at buildings whilst the Building Act, 1991 looks at buildings with regard to their occupants, and other property with regard to preventing damage. We have an Act and Regulations whose purpose is to control building work and ensure means of escape from fire. Why is there another Act and Regulations purporting to do the same thing but with the additional protection of the owner's property? 12 years of duplicity has created numerous headaches and 'courtroom dramas' over whose Act takes precedence. The Fire Safety and Evacuation of Buildings Regulations, 1992 are extremely prescriptive in their approach whilst the Building Regulations 1992 are performance based with the result being that for some parties there is only one way to skin a cat.

Key Questions

Should the evacuation consultant be part of the design team?
Should the Warrant of Fitness be a requirement of the evacuation scheme approval?

Should the evacuation scheme be part of the Compliance Schedule and Warrant of Fitness?

Should approval of a draft evacuation scheme be a requirement of the Code Compliance Certificate?

Should the Code Compliance Certificate be contingent on evacuation scheme approval within a given time?

Aren't the evacuation regulations just an Acceptable Solution to Clause C2.2 of the Building Regulations 1992?

John Davidson
Fire Engineer
Macdonald Barnett Partners

FIRE SAFETY WATER SUPPLIES FOR HOUSES LOCATED AT DISTANCE OF 270M OR MORE FROM HYDRANTS IN RETICULATED TERRITORIAL AUTHORITY AREA.

The NZ Fire Service have been severely restricted in fire fighting responses to several residential house fires located on larger blocks of land in the foothills of the Waitakere Ranges, Auckland. The access may have been inadequate for standard Fire Appliance vehicles, distance from road hydrant excessive and no on site water source available so new requirements will apply in this Territorial Authority area now.

The Waitakere City Council and subsidiary Eco-water Solutions with NZ Fire Service Henderson have addressed this by applying Legislation viz:

- The water supply is provided to meet Ministry of Health standards for quality only as the Local Government Act, has been amended to delete provision of fire fighting flows.
- The NZ Fire Service Code of Practice SNZ PAS4509: 2003.
- The inclusion under Resource Management and Building Consents for Owner to provide Fire safety in form of Residential Sprinkler system to Standard NZS 4517-2002 or alternative on site storage.

Readers are referred to NZ Fire Service Code of Practice SNZ 4509-2003 page 7-Clause 1.2 for legal context establishing this arrangement between parties.

In addition, the Waitakere City Council has other environment requirements for subdivisions in the foothills of Waitakere Ranges with a document titled "Countryside and Foothills Stormwater Management" Code of Practice which requires control of water from hard surfaces [and limits the size of same] into tanks for supply to domestic toilets and gardens plus control of peak rainfall into storage tank with orifice control of final discharge to natural watercourse.

Case 1, --New Residence on Lifestyle Block 600 metres from hydrant in road.

A subdivision of former orchard into 14 Lifestyle Blocks each of 4000m² or more on a new right of way access off existing road. Hydrants have been provided by Eco-Water Solutions

on the watermain in the road. A 50mm domestic water main has been installed in the right-of-way.

The source from reservoir some 100 metres higher gives good supply but hydrants were not provided, or permitted to be fitted, hence any house more than 270 metres from existing road hydrants will have a condition on Consent to meet the new rules.

With the co-operation of Eco-Water Solutions, NZ Fire Service Henderson Staff and a Fire Engineer from Auckland Region, the alternative options were explored and the results are tabulated.

During this process the options of combining the Fire Fighting reserve with a tank control of rainwater was considered but in this case the 50mm supply will be a most suitable source for a Domestic sprinkler system option chosen by Owner. Had this piped supply been inadequate then a tank source for sprinkler system would open question of power source for the pump, which is not addressed in Standard NZS 4517. To depend on electrical source from overhead lines to provide primary water supply does not inspire confidence in the reliability of such a system.

Case 2

The Owner purchased a rear section which was some 275 metres from the street hydrant at the entry to the section. The site had to meet the new conditions. The Owner had planned a swimming pool at the higher end of the section so the solution is a supply pipe with standpipe at corner nearest road.

Summary

The application of this Legislation may become more common around New Zealand and introduce more Domestic sprinkler systems which is most desirable. The "Approval" of design and installation is to be as specified in Standard i.e., by Installation Contractor who shall have completed a specific training programme. (Note: Unitec in Auckland, currently offer such a training programme for Plumbing Contractors).

The question of annual Warrant of Fitness applying has not been addressed.

John Fraser
Fire Engineer

**Summary of Table 2 from Fire Fighting Water Supplies Code of Practice SNZ PAS 4509: 2003
(for single family dwellings and similar within urban Fire Districts)**

Case	Description	Approved sprinkler system	Water supply classification	Domestic supply method	Sprinkler supply method (1)	Fire fighting water supply method (2)	Required flow from hydrants	Required storage for fire fighting (3) (4)
1	Non-reticulated area with no approved sprinkler system	No	W3	Tank	-	Tank	-	45m ³
2	Reticulated area with hydrants but no approved sprinkler system	No	W3	Mains	-	Hydrant	12.5 l/s within 135m + additional 12.5 l/s within 270m	-
3	Non-reticulated area with approved sprinkler system	Yes	W1	Tank	Tank	Tank	-	11m ³
4	Reticulated area with approved sprinkler system and hydrants	Yes	W1	Mains	Mains	Hydrant	12.5 l/s within a distance given by the NZFS (5)	-
5	Reticulated area with approved sprinkler system but insufficient mains flow for fire fighting	Yes	W1	Mains	Mains	Tank	-	11m ³
6	Reticulated area but insufficient mains flow for domestic supply and/or fire fighting	Yes	W1	Mains or tank	Mains	Tank	-	11m ³

NOTE –

- 1) Where a reticulated water supply is unavailable, or insufficient for fire fighting, tank supply is the preferred alternative. However, fire fighting water may be supplied from any year-round source as contained in Appendix B5 of SNZ PAS 4509: 2003
- 2) Storage for fire fighting water supply should not be used for any other purposed.
- 3) Where storage for fire fighting water is required, hard standing must be provided for fire appliances as detailed in Appendix B of SNZ PAS 4509: 2003
- 4) Water supply for a sprinkler system should be based on the hydraulically calculated flow rate and duration specified in the appropriate standard and is additional to the requirements for fire fighting water supply contained in the table. Indicative design flows are contained in Table A1 SNZ PAS 4509: 2003
- 5) Where an approved sprinkler system is provided, fire hydrant spacing may be increased by agreement with the Chief Fire Officer of the Fire District.

New Members

We seem to have had a bumper year for new members.
To date these are:

Steven Charles
Jerome Chuang
Gilbert Gordon
Stuart Harris
Gary Higham
Yuguang Li
Greg North
Jonathan Nyman
Russell Pearson
Russell Peat
Eddy Saul
Judith Schulz
Ming Wei Bong
Michael Williams

We welcome them and trust they will find their membership beneficial and interesting.

C R Barnett
Sec/Treasurer

FIREXPO & FPANZ CONFERENCE

FIREXPO & the FPANZ conference are being held on 6th and 7th of October respectively.

SFPE technical session on the 6th at 3pm at the Genius Lounge, Ellerslie Convention Centre, Ellerslie Racecourse, 80 – 100 Ascot Avenue, Auckland.

Speakers –

Alan Moule, Technical Director (Fire) at BIA is the guest speaker presenting a paper entitled “Alternative Fire Engineered Solutions and Their Future in Building Design”.

John Lockwood of Lanwood Industries will be speaking about insulated sandwich panels. All SFPE members who can attend are urged to do so.

PLEA FOR ARTICLES

It is extremely difficult to produce this newsletter when one or two people have to source all the articles.

We would clearly like to produce 4 to 6 issues a year, but to do so we need articles.

Surely there are many readers who could provide an article or two, so please email the Editor at rbrand@beca.co.nz