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EMERGENCY LIGHTING AND WAY FINDING SIGNAGE

BUILDING CODE PERFORMANCE APPROACH

FIRE ENGINEERING GUIDE

Revision 1

1. INTRODUCTION

Ferm Engineering, a group of Fire Safety Engineers who have practised in Queensland for the last five years and their staff have been in the Fire Safety Industry for more than 21 years. Our experience in way finding and evacuation designs spans 10 years of performance Building Codes.

The Director Stephen Burton, was undertaking early assessments of way finding developed by CSIRO for the International Airport Project in 1994. Since then, a number of progressions have been made in the area of luminescent signage and egress way finding systems.

This guide is intended to outline the performance provisions of the Building Code of Australia and the legislative framework within Queensland to adopt them. The current Australian Standard AS2293 for exit signage and emergency lighting at the last revision, way finding signage was not implemented by the current committee. It does however, in the preface, give credence to the next revision adopting such performance style exit signage.

Internationally this has already been adopted in countries like United Kingdom, Europe, and various parts of the United States. It is mandatory in industries such as aviation and marine vessels. This is the use of floor and corridor marking systems to allow passengers and the general public to reach a point of safety in the shortest time in conditions where visibility has been reduced.

In Australia, Fire Engineers are able to adopt these international standards using performance code provisions in current legislation.

Building Legislation Provisions

Within Queensland buildings are designed and approved under the Integrated Planning Act. In addition the Queensland Building Act of 1975 with amendments and the standard Building Regulation 1993 with amendments, provide the legal framework for our building designs.

From these documents, we are able to implement the Building Code of Australia with Queensland amendments for the design of our projects. A significant portion

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of the Building Code relates to Fire Safety. Ensuring that persons are able to be protected and evacuate a building depending on its size, height, function and fire loads. We highlight the relevant sections of building legislation that under performance provisions can be used for egress designs.

Section D and E – Access and Egress

The performance requirements of Section D in the Building Code outlines the design parameters and performance requirements for safe effective egress from within buildings. Elements cover the number of exits required, the travel distances that are required and the dimensions of exits.

Combinations of fire isolated and non-fire isolated paths of travel are accommodated. Section D also outlines how the exits and pathways and ramps are to be constructed and for areas that will assist the people with disabilities.

Section E of the Building Code outlines the services and equipment for fire safety. This includes fire fighting equipment, smoke hazard management, lift installations and emergency lighting, exit signs and warning systems. Under Part E4, the performance requirements for exit signage and emergency lighting requirements is outlined as follows:

- EP4.1 – Deals with levels of illumination
- EP4.2 – Deals with suitable signage or means of identification for occupants to locate exits.
- EP4.3 – is for systems to warn occupants of an emergency

As part of any alternative solution to Part E4, the fundamental elements of EP4.1 and EP4.2 are adopted as normal.

EP4.1

A level of illumination for safe evacuation in an emergency must be provided, to the degree necessary, appropriate to—

(a) the function or use of the building; and

(b) the *floor area* of the building; and

(c) the distance of travel to an *exit*.

EP4.2

To facilitate evacuation, suitable signs or other means of identification must, to the degree necessary—

(a) be provided to identify the location of *exits*; and

(b) guide occupants to *exits*; and

(c) be clearly visible to occupants; and

(d) operate in the event of a power failure of the main lighting system for sufficient time for occupants to safely evacuate.

In addition to these there is an impact on the variants when looking at Part D, Section D for provisions of escape. In that regard we normally include an assessment to DP4, which deals with creation of exits that allow occupants to safely evacuate with their number, location and dimensions. Length of travel is

often an issue with these alternative solutions and the location of exits in relation to the height and size of the building.

DP4

Exits must be provided from a building to allow occupants to evacuate safely, with their number, location and dimensions being appropriate to—

(a) the travel distance; and

(b) the number, mobility and other characteristics of occupants; and

(c) the function or use of the building; and

(d) the height of the building; and

(e) whether the *exit* is from above or below ground level.

Alternative Solution Parameters or Criteria

In assessing EP4.1, EP4.2, and DP4, the fire engineer will need an acceptable level of travel time and decision making from the occupants of the building. Installing systems that can influence the decision time and the ability to reach an exit form part of the performance solution.

The method of acceptable criteria is ensuring that exit paths have low impact on the evacuating occupants, which will include the following elements:

- Smoke in path of travel to be of low irritant value and of a density that vision is not impaired less than 10m.
- Thermal impact on occupants is such that they are not severely injured in the process of escaping via the exit paths, which is subjective to clothing and the environment.
- The visibility within the space and lighting levels are sufficient to find the way out
- Markers, signage and information is given to occupants so that they can find emergency exits in a timeframe that will allow them to escape while conditions are still tenable.
- That warning systems for audible and hearing impaired can be applied to the appropriate population in the building.

Concentrating on the area of emergency way finding and signage is that research by a number of international researchers from NIST, Greenwich University, Interflam, SP Sweden Fire Safety Research, TNO of the Netherlands and similar organizations have contributed largely to this field of research in the last 10 years. Documentation and articles researched by Ferm Engineering have indicated that the application of low level, way finding signage has an improvement in travel times and travel distances to finding exits.

Current Australian Standards

The current Australian Standard of AS2293.1 is based on a ceiling or upper level lighting regime that provides a minimum lighting level directly to the floor surface. The calculations of these are based on a non-smoke condition and Australia requires 0.2 Lux. New Zealand uses 1.0 Lux .

Extract...

> **2.1 SCOPE OF SECTION** This Section sets out requirements for the operational performance, arrangement and control of emergency lighting systems. It also specifies a discharge test, applicable at the time of commissioning the completed installation, to check that the appropriate duration of operation is achieved.
>
> **2.2 OPERATION OF EMERGENCY LUMINAIRES AND EXIT SIGNS** On failure of the electrical supply to the normal lighting, emergency luminaries and exit signs shall be automatically energized from their emergency supply, in accordance with Clause 2.4.2.

Exit signage is based on illuminated signage and where a plain sign is used it must be located within 1.5m of an emergency light fitting and some form of ventilation is available. Typical luminescent signs from Lunna Glow have been tested to DIN and UL standards and have short charging times (1 hour typically) that can then operate in loss of light immediately after.

Whilst this standard provides a reasonable means of finding exits and illuminating pathways, it cannot be maintained under all conditions of a fire where smoke has entered the evacuation path or a section of a room or large building which will diminish the high level lighting systems to those occupants at the lower level.

This is clearly outlined in research papers, from our own experience in fire studies and insurance reconstructions of fires. The Queensland Fire and Rescue Service are clearly aware of these conditions as they enter buildings to fight fires with the ability to see and provide additional lighting for their officers to enter and evacuate buildings during fire fighting operations.

From International research, the adoption of low level way finding signage has been standardised within European Union, British Standard BS5499 acceptance and ANSI N-540 Standards American standards of exit signage. LED based signs and Photo-luminescent signs are also used in the world with UL924 approvals.

The various means available in today's technology include:

1. LED illuminated signs operated by the fire system.
2. Linear light optical fibre systems.
3. LED stand alone floor signs and lights.
4. Photo Luminescent signage

Summary

Using a performance approach for the determination of Alternative Building Solutions in lighting, as engineers we can apply Australian and International based standards for local use. In reality, Australia is 10 years behind in egress performance.

We can adopt these methods because the evidence clearly shows their value in the following measures:

- improved way finding ability
- lower capital cost
- reduced maintenance
- low environmental impact when compared to disposal of old battery based signage systems
- extended life cycle
- low cost to building owners.

The technology is getting better every year and when used in conjunction with appropriately design emergency lighting, we can implement good sound fire safety solution that allow occupants to easily find and exits and travel to them under these adverse conditions with added confidence.

We have allied this on the following projects:

The Warehouse 50000m^2 facility
The Good Guys Oxley
International Airport
Hong Kong Airport
Heathrow Airport Terminal 1, 2, 4
RBH Children's Care Unit
Aged Care Facilities,
Shopping Centres
All Tunnels use this system
All marine ships of more than 25 passengers

Please contact us for a more detailed presentation of these methods and acceptance criteria.

Yours truly,

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