

## Which way out?

*New emergency lighting guidelines have not delivered the clarity the industry needs and may increase risks to public safety.*

For years emergency lighting designers and installers have been calling for clarity on compliance issues and their concerns have largely gone unanswered.

Now the Building Industry Authority (BIA) has thrown fuel on the fire with changes to its 'acceptable solution' or 'Approved Document' F6/AS1 Lighting for Emergency, which many in the industry believe is a backward step.

The document F6/AS1 Lighting for Emergency is a voluntary 'means of compliance' for designers and installers to provide emergency lighting installations which comply with New Zealand's mandatory Building code. If you use F6/AS1 as a pathway to compliance, you must also design and install your systems in accordance with AS/NZS 2293 Emergency Evacuation Lighting for Buildings. However, the most significant change to F6/AS1 now appears to run counter to the primary intent of AS/NZS 2293 which is to provide immediate emergency lighting for people in order to get them safely out of a building in the event of danger.



Spot the exit sign – 'Exit signs must be clearly visible at all times'. The one in this picture is larger than required and about 50 metres away – the proposed maximum distance allowed between signs

Changes to F6/AS1 and upcoming changes to BIA 'Approved Document' F8/AS1 Signs are also causing concern for manufacturers who may have to alter their emergency luminaires to accommodate:

- different lamps
- power from generators as well as from batteries
- and different lettering options and what they depict on their exit signs.

*ElectroLink* believes many designers and installers may run the risk of having to correct non-complying installations, possibly at their own cost, after an industry sample survey we conducted showed few people in the industry have been made aware of the BIA revisions. To help promote a better understanding of these changes - and to boost your chances of providing installations which comply, *ElectroLink* has asked emergency lighting suppliers able to assist the industry to comply with F6/AS1 and F8/AS1 to confirm the compliance of their systems. Those willing to promote their compliance appear in the accompanying table on page 59.

It pays to know what is going on in this area since designers and installers often face the ire of building owners and developers who believe the cost of installing emergency lighting is excessive and that systems are often over-engineered. While this may be true in some cases, an unclear regulatory environment is the primary cause of it.

Many designers do not want to be found at fault in the event of an emergency evacuation that leads to death or injury which could be blamed on inadequate lighting. Because the content of BIA approved documents F6/AS1 Lighting for Emergency and F8/AS1 Signs differs in certain parts with AS/NZS 2293, it may be that only a court can determine what is an 'acceptable solution' for emergency lighting.

### **Overview**

Emergency lighting is required in most new buildings apart from houses and outbuildings and, as with other essential systems, is regulated under the Building Act. The BIA, which is responsible for administering the Act, issues 'Approved Documents' which explain the required objectives of the Act's regulations and propose 'acceptable solutions' that will satisfy the requirements of the Act.

There are two Approved Documents that relate to emergency lighting (beside the 'C' series fire safety documents): F6/AS1 Lighting for Emergency and F8/AS1 Signs. F8/AS1 relates to emergency exit signage. F6/AS1 mandates the joint Australia New Zealand emergency lighting standard AS/NZS2293 as the only 'acceptable solution' (F6/AS1) for designing, installing and maintaining emergency lighting systems.

As far as compliance with the Building Code is concerned, emergency lighting does not necessarily have to comply with the requirements of F6/AS1 and AS/NZS 2293 so long as it complies with the performance-based criteria defined in regulation F6 of the Building Act. (Because Approved Documents are not prescribed in law they do not preclude 'alternative solutions' that achieve the same outcomes).

According to Paul Clements, fire engineering manager at consultants Sinclair Knight Merz Limited, following AS/NZS 2293 alone will not ensure compliance with the Building Code. Clements also points out that whatever kind of emergency lighting system is installed, it also should be approved by a representative of the local Territorial Authority (TA) or a BIA registered 'Building Certifier' who may or may not have as much technical expertise in emergency lighting as the designer.

"Getting approval can be difficult," says consultant Geoff Waller of Beca Carter Hollings & Ferner. "Some planning authorities will not approve consultant's designs. They don't take any responsibility and simply say that if the consultant says okay, then that's up to the consultant."

Besides these requirements, emergency lighting also has to satisfy the safety requirements of the local Fire Service's egress plan. And, just because an emergency lighting system complies with relevant approved BIA documents, or the sometimes ambiguous interpretations of them, it does not mean they will satisfy Fire Service requirements. There have already been a number of cases where 'compliant' emergency lighting systems have had to be altered to suit the Fire Service which enforces the Fire Service Act 1996 and the Fire Safety and Evacuation Regulations. On occasion, says Clements, Fire Service personnel are not averse to demanding changes beyond the requirements of the Building Act and their own authority.

Again, a lack of clarity in legal powers and obligations in this area causes designers to minimise their risks by over-engineering solutions beyond the requirements of AS/NZS 2293 to be on the safe side. (AS/NZS 2293 is very specific about how emergency lighting should be designed, installed, maintained and tested as well as how emergency luminaires are tested and classified.)

Indeed, changes in the new F6/AS1 and those in the pipeline for F8/AS1 seem to diverge more from their 'acceptable solution', the emergency lighting standard. This does not sit well with those in the lighting industry who have already spent a lot of their own time helping to formulate the standard with the specific objective of protecting lives by ensuring immediate and effective emergency lighting.

### **Differences**

One of the BIA revisions F6/AS1 Lighting for Emergency came into effect on 1 June 2001 and is a done deal. The revisions to F8/AS1 Signs have not yet come into effect but are already provoking controversy amongst the few in the lighting industry who have found out about them.

The main change to F6/AS1, which seems to go against the intent of the standard, is the time that is allowed to pass after the normal lighting fails and the emergency lighting begins to fully operate. There is a reference to 15 seconds, which many consider is far too long and could cause or increase panic in an emergency and prolong evacuation times.

According to Geoff Waller, part 1.1 of the standard states "the objective of the standard is to provide visual conditions which will alleviate panic and permit safe evacuation of building occupants." The standard also contains other references such as "to prevent a period of total darkness". He says the intent of the standard is clear on this issue but the revised F6/AS1 seems to undo this.

BIA spokesman John MacGregor told ElectroLink that, "Under the current fire safety approved documents, where emergency power is supplied by a generator to emergency lighting systems, the emergency power supply system shall be installed and maintained in accordance with NZS 6104:1981 (paragraph 9.8 of C3 Fire Safety, acceptable solution AS1). The electrical source specified is a generator driven by a diesel engine or a gas turbine. NZS 6104 requires that the emergency plant shall be such that full speed may be attained and initial load applied within 15 seconds from the initiating signal. In addition the emergency lighting system has priority as the initial load."

He says: "It is not expected that there would be total darkness within the 15 second period, but rather an initial dim glow of the emergency lighting which would gradually increase as the generator came up to full speed." This may or may not occur, depending on whether the lighting is fluorescent or incandescent and whether the generator engages before it is up to its designed operating speed, frequency and voltage.

John Penny of power specialists Vectek Electronics Ltd says it is unrealistic to expect all generators to operate in the manner expected by the BIA. He warns that loading a generator before it has attained full turbine speed is not recommended as few, if any, have been suitably designed and tested for this kind of operation.

"Loading a generator before it achieves full speed (generally eight seconds) may

cause it to stop altogether or cause delays in power being supplied for considerably longer than 15 seconds. If the generator is self-actuated, premature loading is likely to stop the generator by denying it momentum to get the rotor up to speed. Because of this, self-actuated generators are designed to supply power only after full speed is attained."

In defence of the BIA's decisions, MacGregor says the BIA requirements have not changed since the fire safety Approved Documents were published in July 1992. "The new fire safety Approved Documents have simply reproduced the status quo in F6/AS1 Lighting for Emergency. In addition F6/AS1 makes it clear that generators are acceptable as an emergency power source."

Perhaps instead of confirming the acceptability of generators, the BIA should have excluded them as a source of power for emergency lighting, especially when F6/AS1 does not require batteries to provide immediate illumination. This is despite the fact that AS/NZS 2293 requires the prevention of "a period of total darkness" and the only identified source of power in the standard is from batteries which includes inverter and UPS based systems.

ElectroLink surveyed 25 companies (a mix of emergency lighting manufacturers, consultants and installers) and all but four stated 15 seconds was an unacceptable delay before generator-driven systems were required to activate emergency lighting. Two who thought 15 seconds was acceptable also stated this was only suitable in 'certain circumstances'. The majority of the other respondents were emphatically against the 15-second delay.

One such consultant, Keith Gibson of Intellex Limited, believes that generators are not entirely reliable. "The problem with standby generators is their reliability, which is usually only between 70% and 90% and so they should not be solely relied on for life safety components without battery back-up."

According to Penny, without ongoing regular weekly/monthly maintenance and simulated power failure start-ups (which may increase building running costs), generators should not be relied upon to start at all.

Perhaps more alarming than the contentious 15-second reference is the extraordinary way it is worded. Despite the apparent intention, compliance with F6/AS1 does not appear to require a generator to power emergency lighting within 15 seconds, if at all. As MacGregor has correctly stated, F6/AS1 says, "the emergency plant shall be such that full speed may be attained and initial load applied within 15 seconds from the initiating signal." The wording is may be attained and applied; there is no mention of must. When it comes to prosecutions, judges understand the difference. Are large building owners being let off the hook here?

There is also another issue in relation to generators. What happens when one or two lighting circuits fail in an emergency or otherwise? Will the standby or emergency generators start if the mains supply itself has not failed?

If F6/AS1 is now permitting structured blackouts, then it is mounting a serious challenge to AS/NZS 2293 and its measures designed to "prevent a period of total darkness."

Perhaps it is the view of the BIA that we New Zealanders now take longer to panic

than our overseas counterparts. AS/NZS 2293 requires 10% of the required light level to be provided within one second of energisation and 80% within 15 seconds to minimise panic. How could the BIA allow an apparently flawed understanding of generator functionality and reliability to override these vital safety provisions by risking a considerable period of darkness?

Technology advances of the last 20 years provide full illumination of emergency lighting in one second, yet the BIA has chosen not to mandate these technologies and to fly in the face of the objective of Building Regulations clause F6, "to safeguard people from injury due to inadequate lighting in the event of an emergency."

A lack of modern lighting and electrical industry skills and a reliance on the fire industry for input into its working group reviewing the Building Act could explain the deficiencies of the revised F6/AS1 document. The BIA amendments appear to lack the understanding that lighting for emergency needs to be lighting for all emergencies, not just fire. In earthquakes, which are quite common in parts of this country, emergency lighting and exit signs are more vulnerable to failure when reliant on a single reticulated generator-driven power system when compared with individual, self-contained, battery-powered units.

The Illuminating Engineering Society (IESNZ) in a submission to the BIA on the revision of F6/AS1 adds its voice to the view that the generator solution and permissible delays to the full illumination of emergency luminaires do not comply with the intentions of F6/AS1 and AS/NZS 2293, nor does it conform with "good current practice".

The IES called on the BIA to withdraw the proposed F6/AS1 before it came into force, but the BIA declined. It did, however, express interest in taking up an offer from the IES to assist in draughting acceptable solutions in the future.

A major current concern of the IES is the requirement in F6/AS1 for emergency lighting only in exitways. The IES told the BIA that "since 1992 there has been a controversy over where an escape route starts". The issue centres on the word 'from' in the 'escape route' definition in F6/AS1 and the regulatory requirement that adequate lighting has to be provided "within all escape routes in an emergency". Legal opinion provided to Beca and published in ElectroLink (July August 1997, page 74) applied an inclusive meaning to 'from', concluding that escape routes need to be lit starting 'from' a worker's location through to the final exit.

John MacGregor agrees this is so in certain situations but not all. He acknowledges that the building code requirement 'throughout the building' has been modified by F6/AS1 and says the apparent anomaly between the Building Code clause F6 and the F6/AS1 acceptable solution was accepted at the initial stages of the development of the acceptable solutions for fire safety (originally published in 1992) but the BIA decided at the time to run with a solution that "dovetailed into the other fire safety acceptable solutions."

He says the fire safety acceptable solutions are based on the categorisation of building uses into purpose groups. These purpose groups do not relate directly to the classified uses specified in the building code.

"At the time of the original drafting, a draft acceptable solution was prepared for the emergency lighting requirements of the building code in relation to its classified uses.

However this was rejected in favour of an acceptable solution that related to the fire safety purpose group classifications."

He says the BIA has been unaware of any misunderstandings concerning where an escape route starts and interpreting this in relation to the definition of an 'open path'.

MacGregor acknowledges F6/AS1 relaxes the Building Code's requirements for emergency lighting. However, the lighting industry is far from relaxed about the BIA's decisions.

He says: "It is true that the building code requirement 'throughout the building' has been modified by the Authority's 'deemed to comply' acceptable solution. This is in terms of the relaxation of the requirement for emergency lighting, for certain uses of a building or parts of a building, in various purpose groups. 'Throughout the building' is itself modified by the word 'adequate' in Clause F6.2. This allows a certain amount of flexibility in the application of Clause F6.3.1, in order to safeguard people from injury in any particular case."

It will be interesting to see how the courts treat the legality of a voluntary 'acceptable solution' being provided by an enforcement authority as an acceptable means of 'modifying' or overriding the law.



Paul Clements – 'following AS/NZS 2299 alone will not ensure compliance with the Building Code'

### **Signs they are a-changing**

The proposed changes to F8/AS1 Signs are not as significant, but they will make a difference to the way illuminated exit signs are used. In terms of emergency lighting, the objective of Building Regulations clause F8 is to "safeguard people from injury or illness from inadequate identification of escape routes or of hazards within or about the building."

One revision to F8/AS1 proposes allowing pictograms, such as the 'running man' for identifying escape routes. "Pictograms may be used as a substitute for, or in conjunction with, written signs." The BIA says this is because "ISO standards and Europe are moving towards pictograms only, although there is no need to adopt this requirement immediately."

The European Union of many countries and languages has also adopted only one word for denoting exit signs - EXIT - in plain English. However, the BIA proposes that Maori may be used on exit signs too. "Written signs shall be in either English or the Maori language. Signs in the Maori language must be accompanied by pictograms." The BIA says that this is "a reflection firstly of our official bilingual state and secondly of our multicultural society."

ElectroLink's emergency lighting survey showed that 85% were in favour of the word EXIT only, 39% were pro-pictogram and only 15% in favour of allowing exit (PUTANGA) signs in Maori. One survey respondent commented that an emergency was not a good time to start learning Maori. Another said that he, "assumed that avoidance of confusion in an emergency was a requirement. A diversity of approved signage will not achieve that, and will cause confusion and misunderstanding."

One significant change to F8/AS1 is the new maximum spacing of exit signs. "Signs on escape routes shall be spaced no further apart than 50 metres and be readily distinguishable from other signs or display material."

The BIA comments that "the rapid identification of nearest escape routes is particularly important in buildings such as shopping malls and supermarkets where occupants tend automatically to escape via the familiar route used for entry." The reason for this is that the existing F8/AS1 has no maximum spacing. The minimum 100mm height of lettering on exit signs, which currently applies only in theatres, cinemas and public halls is also being extended to signs in shopping spaces with an occupancy load of over 100. The new F8/AS1 proposes no upper limit for sign lettering height.

Perhaps the most significant change to F8/AS1 is that exit signs will need to be continuously illuminated whenever a building is occupied. This could have quite an impact on manufacturers who have invested resources in producing non-maintained signs (visible only on mains-failure).

"Exit signs in escape routes shall be illuminated in buildings required to have emergency lighting. The sign lighting may be internal, external, self-luminous or photoluminescent." The BIA comments that "Exit signs shall be visible at all times that the building is in use. In most situations the sign will be visible by means of illumination from the general lighting, however in some instances specific lighting will be required. Internally illuminated signs are preferred to externally illuminated ones as they are a self-contained unit and are more easily seen in smoky conditions."

The revision also proposes that all emergency lighting luminaires and illuminated exit signs are marked with the symbol as per the standard so they can easily be identified by maintenance and inspection personnel.

In another proposed revision to F8/AS1 a reference to AS/NZS 2293 has been added as the first version referred to the old emergency lighting standard. In revising this, the BIA has taken out the wording "as modified by F6/AS1." Does this mean that the standard has precedence over F6/AS1 when it comes to illuminated exit signs?

### **Clarity**

The review of F6/AS1 and F8/AS1 began over five years ago but for what result? Key issues of concern to the electrical and lighting industries have not been clarified and

even more compliance issues have been created.

While BIA staff endeavour to assist the industry by providing their opinions on compliance with the Building Code and its 'acceptable solutions', contradictory opinions have emerged leaving the industry no less unsure as to the appropriate emergency lighting design for any particular location.

As a final resort, the IES is now asking the BIA to provide details of the process for obtaining a 'determination' which will decide the legal validity of using generators and exactly where emergency lighting is required.

Surely there has to be a better way of regulating industry practice than forcing law abiding professional people to obtain a legal ruling just so they can understand and comply with the law. If the IES is unable to get the answers it wants, it may take a tragedy to force a court decision.

***Building Regulations Clause F6***

*Objective F6.1 The objective of this provision is to safeguard people from injury due to inadequate lighting being available during an emergency.*

*Functional requirement F6.2 Buildings shall be provided with adequate lighting within all escape routes in an emergency.*