MEMORANDUM

November 29, 2010

To: California Utilities Statewide Codes and Standards Team
From: Gary Goodson (HMG), Owen Howlett (HMG)
Re: Key points from the initial Title 24 emergency egress lighting scoping interviews

This memo reports the results of the initial “scoping interviews” conducted for this CASE study, in advance of a formal survey of facilities staff, building officials and lighting specifiers. The purpose of these scoping interviews is to identify the issues and challenges regarding the control of egress lighting, so that the formal surveys can ask questions about how those challenges can be addressed.

The scoping interviews produced a consistent picture. Egress lighting controls have an established position in the market, are compliant with existing fire codes, and although their adoption in other codes has encountered problems, there are many organizations and individuals that expressed no reservations about the adoption of egress controls within the energy code. California’s Senior Deputy Fire Marshal said that “California has been thinking outside of the box for many years, and how we address egress lighting is probably just another step with regards to energy usage and safety. How do we address buildings that are not occupied? In many cases the code allows you to shut the lights off—how do we do achieve that and still maintain safety?"

This memo sets out:

- Current proposed code language
- Issues and challenges for egress lighting control
- Next Steps for this proposed change to Title 24 2013
- Current and proposed code requirements for egress lighting (in other Jurisdictions)

The proposed code language shown in this memo is based on the information gathered from these interviews.

The interviewee list was compiled by HMG staff and includes a diverse group of respondents. We developed an interview guide to focus the discussion. During each interview we used an interview guide (shown in the Appendix) and asked each interviewee the questions that were relevant to their practice. Their answers were recorded on the interview form. HMG has conducted 15 scoping interviews.

The interviewees included:

- Committee chairs and members from the relevant ASHRAE 90.1 and IESNA committees
- Lighting designers
- Manufacturer and industry group representatives
- California’s Senior Deputy Fire Marshal
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To: Egress Lighting Survey Recipients
Re: Key points from the initial Title 24 emergency egress lighting scoping interviews

Other experts

The interview covered the following issues (the interview guide is shown in the Appendix):

- Egress lighting controls in other state and local building codes
- Egress control system types and market share
- Egress control system performance

**Proposed Language**

The proposed language would require the egress lighting in buildings to be automatically switched off when a building is not occupied.

The exception for egress lighting in Section 131(a) (automatic or manual area controls) is proposed to be retained, because to meet the requirements of the California Fire Code Section 1006.1, the means of egress “shall be illuminated at all times the building space served by the means of egress is occupied.” Therefore occupants cannot be given the ability to switch the egress lighting off using a wall switch while they are still occupying the space, or while others are occupying space served by that egress path. This exception would, in practice, apply to many open areas and all corridors, but not to private offices.

The exception for egress lighting in Section 131(d) (automatic shut-off controls for each floor) is proposed to be removed, because the intention of the shut off control requirement is that the lighting should be shut off only when the building is unoccupied. This is the same condition as for egress lighting, so the two are wholly compatible. Override switches are required to be provided under Section 131(d)2, which allow the lighting to remain on for up to two hours after the main lighting has been switched off. These override switches could be used, if desired, to implement a two-stage switching sequence where the main lighting would switch off after (for instance) one hour, and the egress lighting would switch off after one more hour, if the system did not detect occupancy.

The exception for “building security” lighting is proposed to be removed, on the basis that this is not defined either in Part 6 or Part 1 of Title 24 and is therefore a loophole.

We propose to add to the definition of “automatic controls” in Section 131(d), to make it clear that the lighting can be automatically shut down by another building system, such as a security system. This is an important issue in buildings such as assembly buildings, which do not have fixed schedules.

In the following proposed language additions are shown underlined and deletions are shown in strikeout.

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1 It is noteworthy that a strict reading of the Fire Code would mean that wall switches in private offices that do not have egress luminaires are not compliant, because occupants should not be given the ability to switch off all the lighting in their space while they are still occupying it. It may be desirable to amend the definition of the means of egress in the Fire Code to exclude private offices.
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SECTION 131 – INDOOR LIGHTING CONTROLS THAT SHALL BE INSTALLED

(a) Area Controls.

1. Each area enclosed by ceiling-height partitions shall have an independent switching or control device. This switching or control device shall be:

   A. Readily accessible; and

   B. Located so that a person using the device can see the lights or area controlled by that switch, or so that the area being lit is annunciated; and

   C. Manually operated, or automatically controlled by an occupant-sensor that meets the applicable requirements of Section 119.

2. Other devices may be installed in conjunction with the switching or control device provided that they:

   A. Permit the switching or control device to manually turn the lights off in each area enclosed by ceiling-height partitions; and

   B. Reset the mode of any automatic system to normal operation without further action.

EXCEPTION 1 to Section 131(a): Up to 0.3 watts per square foot of lighting in any area within a building that must be continuously illuminated for reasons of building security or emergency egress, if:

   A. The area is designated an security or emergency egress area on the plans and specifications submitted to the enforcement agency under Section 10-103(a)2 of Title 24, Part 1; and

   B. The security or egress lighting is controlled by switches accessible only to authorized personnel.

EXCEPTION 2 to Section 131(a): Public areas with switches that are accessible only to authorized personnel.

(d) Shut-off Controls.

1. In addition to the manual controls installed to comply with Section 131(a) and (b), for every floor, all indoor lighting systems shall be equipped with separate automatic controls to shut off the lighting. These automatic controls shall meet the requirements of Section 119 and may be an occupant sensor, automatic time switch, signal from another building system, or other device capable of automatically shutting off the lighting.

EXCEPTION 1 to Section 131(d): Where the lighting system is serving an area that must be continuously lit is in continuous use, 24 hours per day/365 days per year.

EXCEPTION 2 to Section 131(d): Lighting in corridors, guestrooms, and dwelling units of high-rise residential buildings and hotel/motels, and parking garages.

EXCEPTION 3 to Section 131(d): Up to 0.3 watts per square foot of lighting in any area within a building that must be continuously illuminated for reasons of building security or emergency egress, provided that the area is designated a security or emergency egress...
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area on the plans and specifications submitted to the enforcement agency under Section 10-103(a)2 of Title 24, Part 1.

EXCEPTION 3 to Section 131(d)1: Lighting in stairwells shall be switched off only when all the floors served by that stairwell are unoccupied.

EXCEPTION 4 to Section 131(d)1: Lighting along the path of emergency egress shall be energized during failure of normal mains power and/or in response to a fire or security alarm, provided that the area is designated an emergency egress area on the plans and specifications submitted to the enforcement agency under Section 10-103(a)2 of Title 24, Part 1.

[The remainder of Section 131 is not proposed to be changed under this proposal]

**LIKELY COMPLIANCE PATH TO PROPOSED CODE CHANGE**

Based on the results of the interviews, we anticipate that the most common way to comply with this new requirement would be to use the same shut-off control system that is used to shut off the lighting for the rest of the floor at unoccupied times. The most common type of shut-off system is a timeclock control with manually-operated override switches. Another type of shut-off system is a network of occupancy sensors also with manually-operated override switched. These shut-off systems would be installed in conjunction with devices that allow the egress luminaires to draw their power from either the normal mains supply or a source of emergency power, in order to maintain their ability to respond to mains power failure.

**Equipment and Wiring**

Based on the interviews, the two most commonly available types of equipment to allow emergency operation of ballasts are:

- Emergency ballasts (these replace the regular ballast inside the luminaire, and contain a battery or transfer switch.)
- Dual source transfer switches (mounted in the electrical room, these devices provide power to several egress luminaires on one or more circuits, and can transfer between normal utility power and emergency power.) Dual source transfer switches can typically handle one or two 20 amp distribution circuits.

Note that these devices have to be U.L. Listed (U.L. 924 for emergency lighting equipment and U.L. 1008 for transfer switch equipment).

In both cases, a small amount of additional power wiring is required (compared to 24/7 egress lighting), since these devices must be wired to two or three separate power sources in order to determine whether the egress lighting should be energized.

Based on a detailed review of the requirements of the California Fire Code (Title 24 Part 2), we believe that the most likely shut-off control system choices are shown in Figure 1.
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<table>
<thead>
<tr>
<th>Timeclock control with overrides</th>
<th>Networked occupancy sensors with overrides</th>
<th>Standalone occupancy sensors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private offices and other spaces with only one means of egress</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>All other spaces (open areas and corridors)</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Figure 1. Anticipated egress lighting control solutions

Control Sequence

Based on the interviews, and in keeping with current typical practice, we anticipate that the control system would be set to “flash” a signal to people still in the building, several minutes before shutting off the lights. If a “manually operated override switch” is pressed, the lights stay on full output for no more than two hours. The area controlled by the override switch is not to exceed 5,000 square feet.

One possible variation on this control sequence is to have the lighting reduce down to a lower level of output (either by dimming, or by leaving only the egress luminaires energized). The lighting might stay in this reduced state for a period of time, before switching off completely. We anticipate that, especially in larger buildings, many facilities managers would specify a system with this feature in order to avoid an abrupt shutoff of all the lighting. This approach would be compliant with the proposed code language, as long as both control steps occurred within the allowed 2-hour time window.

Extent of Required Controls

The California Fire Code (Code of regulations, Title 24, Part 2) Section 1006.3 requires that:

In the event of power supply failure, an emergency electrical system shall automatically illuminate the following areas:

1. Aisles and unenclosed egress stairways in rooms and spaces that require two or more means of egress.
2. Corridors, exit enclosures and exit passageways in buildings required to have two or more exits.

As shown in Figure 2, this means that emergency lighting is not required in private offices and other spaces that have only one means of egress. However, egress lighting is required from “any occupied portion of a building or structure to a public way” (CA Title 24 Part 2 Section 1006.3), so egress lighting is required in private offices and other spaces that have only one means of egress.
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<table>
<thead>
<tr>
<th>Private offices and other spaces with only 1 means of egress</th>
<th>Required to have egress lighting when occupied?</th>
<th>Required to have emergency lighting?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Open areas and other spaces with 2 or more means of egress</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Corridors, exit areas</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Figure 2. Spaces required to have egress and emergency lighting**

If the most typical compliance path involves networked occupancy sensors, this would represent an additional increase in cost over the current baseline for Title 24 (timeclock controls). This cost increase would be in addition to the cost increase due to the transfer switches or emergency ballasts discussed above.

**ISSUES AND CHALLENGES FOR EGRESS LIGHTING CONTROLS**

The scoping interviews identified many opportunities and issues. These are summarized in this section, along with other factual information that we gathered as supporting evidence. Note that the interview guide used during the interviews is shown in the Appendix.

**Safety Considerations**

In each interview, we asked about safety concerns in two ways: First, we asked whether the interviewee had any comments about how existing and proposed codes address safety concerns; and second, whether the interviewee had any concerns based on their own use of egress lighting control systems.

Because the new requirement would result in egress lighting being shut off only when the building is unoccupied, there should be no safety concerns unless the system fails to energize the lighting when required during an emergency (the same as for existing emergency lighting systems). Failure modes are addressed by the U.L. standards for emergency equipment, to ensure that equipment fails in a safe way. Two U.L. specifications are applicable to emergency lighting equipment: U.L. 924 (relays) and U.L. 1008 (automatic transfer switches). If any restrike lamps (high intensity discharge HID or high pressure sodium) are installed as a part of the egress lighting system it is important to install arc keepers or use an uninterruptible power supply (UPS) so that the lamps don’t go out in the case of a power outage.

A concern voiced by several interviewees (in various ways) is that building occupants should not be “plunged into darkness” if they are still in the building. This could result in a trip or fall hazard as the occupant finds their way out under extremely low light. To avoid this potential, systems could be set to shut off the lights in two stages, to give people additional notice. An alternative would be to provide a network of occupancy sensors to ensure that even if an
occupant does not know to actuate the light switch, they would still be detected by the system. Both these approaches are allowed under the present and proposed Title 24 code.

In regards to safety in general, we are encouraged that California’s Senior Deputy Fire Marshal said that egress lighting controls is something that the Office of the State Fire Marshal could support. The State Fire Marshal’s office reviews all Title 24 submissions and changes.

The Fire Marshal’s office said that we need to consider life safety for firefighters and other emergency personnel, as well as for building occupants. This is a detailed issue requiring more research; we are therefore intending to hold ongoing discussions with the State Fire Marshal about the key safety concerns of emergency personnel when entering a building in response to an emergency call or alarm, during the code development process.

Another recommendation we received from a lighting designer/architect is that automated time clock or automatic shut-off controls need to have an “educated building population as well as many well-marked, easily operated override controls. These systems are not very intuitive; you need a way to guide people (to the wall mounted switches).” Another lighting designer noted that; “…you have to be careful not to compromise the system by making the manual controls difficult to get to, or…the system will be disabled by someone who is frustrated that the lighting system is not meeting their needs.” The more widespread use of wireless controls anticipated by 2014 should make it easier to reconfigure switches and sensors to meet changing or unanticipated needs.

Another safety consideration mentioned by many of the interviewees is that the entire path of egress must be illuminated, not just the area around the occupant (to provide a clear indication of the way out). This is required by Title 24 Part 2 (the Fire Code). This means that local systems such as standalone occupancy sensors cannot be used as the basis for controlling the egress lighting. A central system such as a time clock control with overrides, or a network of occupancy sensors, would be required.

**Defining Egress Lighting Versus Emergency Egress Lighting**

Several interviewees drew our attention to the fact that NFPA 101 contains separate definitions for “Illuminating the Means of Egress” (Section 7.8) and “Emergency Lighting” (Section 7.9). Note that NFPA 101 is not a mandatory code in California, but is widely referred to in other codes and is considered a best practices guide. The difference is that egress lighting “shall be continuous during the time that the conditions of occupancy require that the means of egress be available for use”, whereas emergency lighting “shall be provided for a minimum of 1.5 hours in the event of failure of normal lighting.” A table showing the four possible states of these two systems is shown in Figure 3.
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<table>
<thead>
<tr>
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<th>Unoccupied</th>
</tr>
</thead>
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<tr>
<td>Normal power</td>
<td>Egress on, emergency off</td>
<td>Egress off, emergency off</td>
</tr>
<tr>
<td>Power failure</td>
<td>Egress on, emergency on</td>
<td>Egress off, emergency on</td>
</tr>
</tbody>
</table>

*Figure 3. State Diagram for Separate Egress and Emergency Systems*

In practice, both these needs are often met by a combined system that fulfills the coverage and illuminance requirements for both egress and emergency lighting, and remains on under both sets of circumstances, as shown in Figure 4. Furthermore, to reduce the initial cost of the system, it simply remains on all the time, rather than switching off when the building is unoccupied and supplied by normal mains power.

<table>
<thead>
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<tr>
<td>Normal power</td>
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<td>Off</td>
</tr>
<tr>
<td>Power failure</td>
<td>On</td>
<td>On</td>
</tr>
</tbody>
</table>

*Figure 4. State Diagram for Combined Egress and Emergency System*

Several interviewees stated that it is best not to mix the terms “emergency” and “egress.” Staff from the City of Portland, Oregon, did combine these terms in a proposed code change and it caused “a lot of difficulty.”

Thus, in addition to the proposed removal of Exception 3 to §131(d), we also recommend an exemption to include an exception for "emergency egress lighting" that "provides illumination in the event of a power failure or in response to an alarm.” We do not believe that there is a need to specify a maximum lighting power density for this lighting, because its energy use will be minimal due to the very short periods of operation (actual emergencies, security tests, accidental triggers, etc.)

**Use of Occupancy Sensors to Control Egress Lighting**

The 2007 California Building Code (Title 24, Part 2, Section 1006 Means of Egress Illumination, 1006.1 Illumination Required) requires that “The means of egress, including the exit discharge, shall be illuminated at all times the building space served by the means of egress is occupied.”

This requirement means that whenever anyone is present in the building, the *entire* path of egress must be illuminated. This, in turn, means that the use of “local” occupancy sensors would not be adequate in open areas and corridors, because local sensors would only illuminate the path of egress immediately in front of the occupant. However, it should be noted that a network of occupancy sensors, that kept the egress lighting on until all of the sensors were in an

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2 Note that the California code mirrors NFPA 101 (a code which is mandatory in some jurisdictions and voluntary in California). NFPA 101 states “All means of egress must be illuminated by artificial lighting during the entire time the building is occupied.”
“off” state, would be compliant in these spaces. “Standalone” occupancy sensors would be compliant in private offices and other spaces with only one means of egress, according to the California Fire Code, Title 24 Part 2 Section 1006.3.

Opinion was divided among interviewees about whether it was “best practice” to use occupancy sensors for the control of egress lighting. On one hand, we were told that occupancy sensors avoid the potential problem of occupants not knowing where the override switches are, but on the other hand occupancy sensors, like any electronic equipment, can potentially fail and not detect an occupant. The concern about occupancy sensors failure would be reduced by the use of networked sensors, because the chance of all the sensors in an area failing would be extremely small. Also, a survey of electrical contractors found that, based on callbacks, they consider occupancy sensors to be highly reliable.

Whether a timeclock or occupancy sensors are used, under Title 24 Part 6 Section 131(d), override devices (switches) are also required. Therefore networked occupancy sensors would always represent an increase in amenity over a timeclock system.

Several interviewees informed us that there is currently not a U.L. standard that can be used as a basis for demonstrating “fail-safe operation” of occupancy sensors (fail safe operation is recommended in NFPA 101 for emergency lighting equipment, although it should be noted that the occupancy sensors would not be part of the emergency lighting system, only of the egress lighting system (see page seven for more on this distinction). These interviewees were uneasy about specifying occupancy sensors, although some specified them anyway. We were told that an alternative to occupancy sensors (in stairwells) may be to use U.L. Listed (all-in-one) units such as Lamar’s Voyager fixture or Prudential’s Snap fixture with integral occupancy sensors that are built so if the power fails the units default to the on position.

From what the interviewees told us, although occupancy sensors would not be required to be UL listed, we believe it may be desirable for U.L. to create a standard for fail-safe operation for both standalone and networked occupancy sensors, in advance of Title 24 2011 being implemented. Note that NEMA publishes performance standards but does not publish safety standards, so a NEMA standard would not be an option in this case.

One interviewee told us that the State of Washington had passed a code (WAC 51-11-1515) requiring egress lighting controls stating that: “Emergency lighting and means of egress illumination that is normally on during normal building operation shall, during periods that the space served by the means of egress is unoccupied, be shut off and controlled by a combination of listed emergency relay and occupancy sensors.” The interviewee stated that, under pressure from developers who filed a lawsuit, in November 2009 the State of Washington removed this section from the rule, noting that “the intended switching mechanisms that will be used in this proposal have not been tested and approved by U.L. or any other listing agency to meet the more stringent criteria associated with life safety devices.” The California Senior Deputy Fire Marshal concurred with this statement, saying that any devices used to control emergency

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lighting would need to be U.L. Listed, or listed by some other authority. We believe that the wording of the Washington code did not distinguish adequately between emergency and egress systems, and that it was correct to withdraw the requirement. Because this Title 24 proposal does not require the emergency lighting to be controlled by occupancy sensors, the concern about the lack of a U.L. standard is addressed.

“Building Security” Lighting

One potential challenge for floor-wide egress lighting is that there may be areas of the building that the owner wishes to remain illuminated while the building is unoccupied, for reasons of security.

The 2008 Title 24 language allows an exception for “building security” lighting. Because this term is not defined in Title 24 and is not common terminology, we believe that this creates a loophole that could be used inappropriately to avoid the use of egress lighting controls. On the other hand, there are areas (especially in larger buildings) that are continuously staffed (even overnight) for security reasons. We believe that these areas are covered by the existing (and proposed revised) exception under Exception 1 to Section 131(d)1:

“Where the lighting system is serving an area that is in continuous use, 24 hours per day/365 days per year.”

In the online survey that will be based on these interview responses, we will ask the survey recipients whether there are other specific uses within their buildings for which they believe that an exception to the egress lighting controls requirements should be provided.

CURRENT AND PROPOSED CODE LANGUAGE IN OTHER CODES

This section reviews how other building codes handle the requirement for egress lighting controls, at the city, state and national level.

Interviewees told us that the history of adoption of egress controls in other codes is an important issue for Title 24. This is because several other codes have failed in their attempts to adopt egress controls, either due to conflicts with other elements of code, or due to the requirements being wrongly worded. Understanding this history will be critical for successful adoption within Title 24.

State of Oregon Energy Code

The State of Oregon code requires egress illumination to be shut off when a portion of the building is unoccupied. This closely follows the language in NFPA 101, and like NFPA 101 it does not specify what a “portion” of a building is. Section 505.2.1.1 of the Oregon code was adopted in 2010:

“Egress illumination should be controlled by [the] combination of listed emergency relay and occupancy sensor to shut off during the period when the portion of the building served by the egress lighting is unoccupied.”
Note that this language requires a combination of specific technologies (emergency relays and occupancy sensors), which is something that we are not proposing for Title 24.

**ASHRAE/IESNA Standard 90.1 Proposed Addendum and Current Status**

The 2010 version proposed by the lighting subcommittee sought to require occupancy sensors to control egress lighting at all times of the day. However, the proposed version was voted down and will not be part of the 2010 code.

The ASHRAE/IESNA 90.1 office lighting subcommittee considered adding a controls requirement for egress lighting (Addendum cu). Upon review, an ASHRAE 90.1 committee member felt that “the wording of Addendum cu gives the false impression that there are three ways to control emergency lights to meet the requirements of NFPA 101 – 7.8.1.2.2 where [in the committee member’s opinion] there is really just one method, which is to pair each lighting fixture with a ceiling mounted sensor so that one foot-candle is available where emergency lighting fixtures are 35’ to 50’ apart.” This means that, in an emergency, the only light that an occupant would have would be the one adjacent to his or her location, because all other surrounding egress lighting would be off. Therefore, as the 90.1 committee member described “a safe egress path would not exist creating a potentially unsafe condition.” This concern is entirely consistent with NFPA 101 which requires the entire egress path to be illuminated (not just the part of the egress path immediately in front of the occupant).

The proposed change to 90.1 depended only on occupancy sensors to control egress lighting, which is a flawed approach under state and national emergency lighting requirements.

**Proposed Addendum cu to ASHRAE/IESNA Standard 90.1–2007**

“This proposal will control the ‘night lights’ that are part of the emergency system when there are no occupants in the space. This has definite energy savings and is not prohibited by the electrical codes. There is nothing in the National Electric Code that dictates that emergency lighting be ON when normal power is present or the building is unoccupied.”

Note that this proposed language is flawed because it confuses “night lights” (which typically provide both egress and emergency illumination) with single-purpose emergency lights. NFPA and state codes do in fact require “night lights” to be on when normal power is present and the building is occupied.

**Current Status of Addendum cu to Standard 90.1–2007**

Addendum cu was sent back to the ASHRAE 90.1 lighting subcommittee for further review. It has not been reviewed since that time. Eric Richman, chair of the lighting subcommittee, was also a member of The National Energy Code of Canada for Buildings (NECB) lighting committee. Eric said that the ASHRAE 90.1 lighting subcommittee may use the Canadian Code as a model. According to Eric, Canada is about to adopt a code where “egress lighting that is also normally used is not exempted from the auto shutoff requirements.” In any case the Addendum would not be approved until 2013 due to the three-year ASHRAE/IESNA code cycle.
IESNA RP–1 Current Status

IES Office Lighting Committee has prepared a revised version of IESNA RP–1 “Recommended Practice for Office Lighting, RP–1.” RP–1 is not a code or a standard, but is often cited as guidance on best/typical practices for office lighting.

The proposed language in RP–1 closely follows the wording of NFPA 101.

IESNA RP–1 Proposed Language

“Emergency egress lighting systems must illuminate the pathway leading to exits, including all passageways, turns, corridor intersections, stair treads and landings, exit doors, and additionally, the exit discharge. Emergency egress lighting must be artificial lighting (not natural daylight) and must be available any time a building is occupied.”

Current Status

This draft was released to IES members on November 3rd 2010. The members of the IES office lighting committee are responsible for addressing all comments and concerns. IES is not partnering with ASHRAE on this proposal, but has selected ANSI instead. If all goes according to plan, the IES/ANSI revised RP–1 will be published in March or April 2011.

City of Seattle

The City of Seattle requires the use of” Automatic Shut-Off Controls, Interior” as outlined below in 1513.6, 1513.6.1, 1513.6.2, and 1513.7.

City of Seattle Code Language

“1513.6 Automatic Shut-Off Controls, Interior: Buildings greater than 5,000 ft² and all school classrooms shall be equipped with separate automatic controls to shut off the lighting during unoccupied hours. Within these buildings, all office areas less than 300ft² enclosed by walls or ceiling-height partitions, and all meeting and conference rooms, and all school classrooms, shall be equipped with occupancy sensors that comply with Section 1513.6.1. For other spaces, automatic controls may be an occupancy sensor, time switch or other device capable of automatically shutting off lighting that complies with Section 1513.6.1 or 1513.6.2.

EXCEPTIONS:

1. Areas that must be continuously illuminated (e.g. 24-hour convenience stores), or illuminated in a manner requiring manual operation of the lighting.
2. Emergency lighting systems.
3. Switching for industrial or manufacturing process facilities as may be required for production.
4. Hospitals and laboratory spaces.
5. Areas in which medical or dental tasks are performed are exempted from the occupancy sensor requirement.

1513.6.1 Occupancy Sensors: Occupancy sensors shall be capable of automatically turning off all the lights in an area, no more than 30 minutes after the area has been vacated. Lighting fixtures controlled by occupancy sensors shall have a wall-mounted, manual switch capable of turning off lights when the space is occupied.

EXCEPTION: Occupancy sensors in stairwells are allowed to have two step lighting (high-light and low-light) provided the control fails in the high-light position.

1513.6.2 Automatic Time Switches: Automatic time switches shall have a minimum 7 day clock and be capable of being set for 7 different day types per week and incorporate an automatic holiday "shut-off" feature, which turns off all loads for at least 24 hours and then resumes normally scheduled operations. Automatic time switches shall also have program back-up capabilities, which prevent the loss of program and time settings for at least 10 hours, if power is interrupted.

Automatic time switches shall incorporate an over-ride switching device which:

a. is readily accessible;

b. is located so that a person using the device can see the lights or the areas controlled by the switch, or so that the area being illuminated is annunciated;

c. is manually operated;

d. allows the lighting to remain on for no more than 2 hours when an over-ride is initiated; and

e. controls an area not exceeding 5,000 ft$^2$ or 5% of footprint for footprints over 100,000 ft$^2$, whichever is greater.

1513.7 Commissioning Requirements: For lighting controls which include daylight or occupant sensing controls, automatic shut-off controls, occupancy sensors, or automatic time switches, the lighting controls shall be tested to ensure that control devices, components, equipment and systems are calibrated, adjusted and operate in accord with approved plans and specifications. Sequences of operation shall be functionally tested to ensure they operate in accord with approved plans and specifications. A complete report of test procedures and results shall be prepared and filed with the owner. Drawing notes shall require commissioning in accordance with this paragraph.”

**Initial Information on Cost Effectiveness**

During the interviews we asked the interviewees to comment on the cost-effectiveness of egress lighting controls. In these initial interviews we did not ask for detailed cost and savings data, but instead we asked whether they had conducted their own cost-effectiveness estimates
or calculations. None of the interviewees had a cost analysis on hand, but we received the following general comments on cost-effectiveness:

- In Oregon (where as noted, egress controls are required), a local lighting designer/architect said there is usually a rapid payback on egress lighting control systems “since you are evaluating the cost of lighting that is normally on 24/7/365 and which is using anywhere from 0.1 to 0.25 watts per square foot.” He typically sees a simple payback of two to three years (Oregon’s electricity is far less expensive than California’s). The same designer went on to say that “We’re finding that our project costs do vary dramatically. Sometimes the cost increase over a regular lighting system [equipment and installation] is 10-15%; the smaller the space the higher the percentage. The typical cost increase is 5-10%. But if your design includes a lot of private offices then you’re going to need a lot of egress control units and that also drives up the premium”.

- A lighting designer noted that: “A few years ago having egress lighting on a separate switch (requiring an emergency transfer switch) was a notable additional cost. Today they have shunts, relays and other tricks that are becoming more widely accepted, and there are ballasts that sense the line voltage to see if there is a stop at the neutral, rather than just at the trunk level. And other equipment that makes (the cost) more reasonable.”

**APPENDIX: OUTLINE FOR SCOPING INTERVIEW**

I’m contacting you on behalf of the California Utilities Statewide Codes and Standards Team. We’re conducting research for a proposed change to the Title 24 energy code, which would require the emergency egress lighting in buildings to be switched off when not required, to save energy. This would apply only to the egress lighting, not to emergency signage. The main method for doing this would be to require overrides are wall switches at various locations throughout the building; when they’re pressed, the lights will stay on for another hour or two. Then they automatically turn off after that time period. To be consistent with Title 24 these are called “manually operated override switching device”.

1. Which other organizations or governmental entities have/or are attempting to codify similar actions?
2. What is your role? If you haven’t been involved in egress lighting code development, can you tell me about experience with code compliance? (Interviewer if the interviewee is involved with egress lighting code development ask them questions 3-9, in addition to any other applicable questions).
3. What is the process?
4. Was expert and/or public comment required?
5. What are the related statute names/numbers/dates?
6. What code changes were proposed? Was the code changed? If not, what were the objections?
7. Have costs and benefits been quantified? If so, which tools were used?

8. Have technical feasibility studies been done?

9. How are life and safety concerns being addressed?

10. System Types

We believe that there are three common types of egress lighting system in use; can you confirm that each of these is considered to be typical or good practice? And if so, what percentage of buildings has each kind of system?

**Good Practice?**

- Wall mounted equipment with a rechargeable battery pack
- A central auxiliary power system powering a dedicated egress circuit
- Rechargeable battery packs in ceiling mounted luminaires.

**a. System types--Market Share**

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Wall mounted equipment with a rechargeable battery pack</th>
<th>A central auxiliary power system powering a dedicated emergency egress circuit.</th>
<th>Rechargeable battery packs in ceiling mounted luminaires</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%-25%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26%-50%</td>
<td></td>
<td></td>
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<tr>
<td>51%-75%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>76-100%</td>
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<td></td>
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</tbody>
</table>

**b. System types--Other issues**

What safety/performance/maintenance issues have come up either in practice or in discussions of best practices or code development with this type of equipment?

11. Types of Control

We believe that there are two common types of egress lighting control in use; can you confirm that each of these is considered to be typical or good practice? And if so, what percentage of buildings has each kind of system?

**Good Practice?**

- **Controlled by occupancy sensor** so that the emergency egress lighting circuit can be automatically turned off when not needed?
- **Controlled by a time clock (with manual overrides)** so that the emergency egress lighting is automatically switched off when not needed?
- **No controls (egress lighting is ON 24/7)?**
- **No controls (dedicated egress lighting that is OFF 24/7)**

**a. Types of Control--Market Share**
MEMORANDUM (continued)  
To: Egress Lighting Survey Recipients  
Re: Key points from the initial Title 24 emergency egress lighting scoping interviews

![Image of the page content]  

### How Frequent

<table>
<thead>
<tr>
<th>How Frequent</th>
<th>Controlled by occupancy sensor</th>
<th>Controlled by a time clock (with manual overrides)</th>
<th>No controls and egress lighting is on 24/7</th>
<th>No controls and egress lighting is off 24/7</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%–25%</td>
<td>N/A</td>
<td>N/A</td>
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</tr>
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<td>N/A</td>
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</tr>
</tbody>
</table>

#### b. Types of Control—Other Issues

What safety/performance/effectiveness/maintenance issues have come up either in practice or in discussions of best practices or code development with this type of equipment?

#### 12. Conservation Mode Power Usage

Does the emergency egress lighting still consume some residual power in conservation mode?

- Yes
- No

#### 13. Other Contacts

We are trying to ensure that we identify all possible technical or safety hurdles to the use of egress lighting controls, especially in offices, retail and warehouses. Who else do you suggest we should talk to?

- People who have vocally, or quietly, support this approach
  - Yes
  - No

- People who have vocally, or quietly, opposed this approach
  - Yes
  - No

#### 14. Other Considerations?

Is there anything else you’d like the Statewide Utility Codes and Standards Team to consider regarding the proposed code changes?
MEMORANDUM (continued)

To: Egress Lighting Survey Recipients
Re: Key points from the initial Title 24 emergency egress lighting scoping interviews

☐ Yes
☐ No

Thank you for your time. Also would you like to be added to our Cal Codes update email list? Also, would you like to be added to our Cal Codes update email list?

☐ Yes
☐ No