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Safety in design



Although the intent of workplace health and safety regulations are clear, the discharge of safety-in-design responsibilities is a complex area that is not widely understood across the Australian HVAC&R industry. **Sean McGowan** takes a closer look at the main issues confronting designers.

As buildings and processes become more complex, so too do the systems for which HVAC&R designers take responsibility.

Although there have been significant improvements in construction site safety, HVAC maintenance service providers often face risks related to safe access, isolations and manual handling that could have been avoided or reduced through more effective control measures.

As with any other industry, the HVAC&R industry is required to comply with Australian work health and safety (WHS) and occupational health and safety (OH&S) laws.

Unfortunately, however, such requirements and compliance methods are often not well understood by practitioners in the HVAC&R industry. So to address this, AIRAH has produced *A Guide to Model WHS Law in Australia for the HVAC&R Industry*.

According to AIRAH technical manager, Vince Aherne, M.AIRAH, the guide was originally developed in 2012 as an internal document that the Institute used to better understand the full implications of the WHS model laws when they were first introduced in 2011.

“Having shared this internal report with several stakeholders over the years, the feedback received was that the report would be a useful resource for AIRAH members and the HVAC&R industry in general,” says Aherne.

“AIRAH updated the report in late 2016 and conducted a peer-review process so that it could be published as an industry resource this year.”

Among the topics the guide covers is an overview of the safety-in-design principles enshrined in Australian WHS and OH&S law.

Despite being made more explicit following the introduction of WHS laws in 2011, safety in design is a complex area that remains poorly understood by many building developers, owners, project managers, designers and constructors.

“When people talk about safety in design, they are generally referring to the WHS, OH&S and common-law duties that a designer has to downstream stakeholders in regards to the safety characteristics of the systems they design,” says Aherne.

The guide aims to increase awareness among HVAC&R designers as to the extent of their safety duty (and associated legal responsibilities) to downstream stakeholders.

“Many designers may consider their primary duty is to their clients,” Aherne says. “However, Australian WHS/OH&S legislation is clear that designers have separate and non-transferrable duties to downstream installers, operators and service personnel in so far as the design [that the designer created] does not pose unreasonable safety risks to these people.”

Although the guide doesn't provide a compliance pathway, it does make clear that any risk that was foreseeable and was not mitigated, may remain the responsibility of the designer – even years after the design was conceived and regardless of others in the supply chain.

“The mitigation of safety risks is something that should be at the forefront of a designers' mind,” said Aherne.

“It is not something that can be automatically transferred to people further down the supply chain. All information on all safety risks associated with the design should be disclosed by the designer.”

CRACKING THE CODE

Although a number of definitions for “safety in design” exist, Warwick Stannus, M.AIRAH, group engineering manager for the A.G. Coombs Group of Companies, uses a plain-English definition.

WHO IS RESPONSIBLE?

“The first user of the design is typically the construction team – yet it is rare for designers to communicate the safety-in-design process completed to date – and any unresolved risks – within the tender documentation,” says A.G. Coombs’ Warwick Stannus, M.AIRAH.

“Designers often wrongly believe, particularly where the project is to be delivered as a D&C project, that the construction team has the responsibility for safety in design.”

“My plain-English definition is that a designer of a workplace must assure, so far as is reasonably practical, that it will be without risks to the health and safety of future users of the workplace,” Stannus says.

“Where this is not achievable, then the designer has a responsibility to communicate the residual risks to the users of the workplace. This might be through provision of safety signage and safe work procedures, etc.”

Stannus says the safety-in-design process begins in pre-design and carries through to final handover.

“It applies the principles of risk management to the design process to assure, as far as reasonably practical, that the building can be safely constructed, operated and maintained through its life cycle, including its ultimate removal or replacement,” he says.

Understanding what forms “reasonably practical” is perhaps the single most challenging aspect of WHS regulations – this term typical of the broad-brush language that can make the WHS laws inaccessible to those who need to know them intimately.

To this end, Safe Work Australia provides a seven-page interpretive guideline on the meaning of “reasonably practical”. Although it provides some clarification, it also alludes to the complexities involved.

CHANGING ENVIRONMENT

Stannus says one of the problems facing today’s HVAC&R designers is their increasing separation over time from site construction activities and building services maintenance.

“As the involvement of design professionals in downstream construction and building maintenance and operation continues to reduce, their understanding of constructability and safe work methods for maintenance and testing also tend to decrease,” says Stannus.

“But it is this knowledge that is central to effective safety-in-design outcomes.”

Another sharing a similar view is Dr Cameron Chick, M.AIRAH, director of Acronem Consulting Australia.

He says while a theoretical assessment of a finished project may be relatively easy to perform from the desktop, safety in design also demands an understanding of the whole project as it progresses.

“This includes the interaction between operations that may overlap, and how the unfinished nature of the project will affect the works as they are performed,” says Chick.

“It is a responsibility that must be shared by the owner, designers and installers, as all involved must pool their knowledge to ensure the safe discharge of their individual responsibilities.”

Australian standards and industry guidelines should be relied upon to provide designers with a starting point to determine minimum requirements from a safety-in-design perspective, but many areas – such as roof access – are not covered.

Further challenges arise when practices that clearly fail safety-in-design tests become accepted industry practice due to commercial pressures to drive costs down.

“The widespread use of control isolators on large VSD-driven motors is one example of an industry practice,” Stannus says, “that clearly breaches the relevant electrical safety standards.”

MORE THAN RISK MANAGEMENT

Although the discipline of risk management is generally well understood by design and construction professionals, Stannus says safety in design is complicated by three key principles embedded in the regulations.

Firstly, they rely on the designer having a clear understanding of the term “as far as reasonably practical”.

Secondly, they require designers to have an understanding of what can be “reasonably expected” of the constructor’s and maintainer’s “state of knowledge” and methods of safe work.

And finally, they require determination of the responsible designer – which can be complex in cases where many parties contribute to a design through the project delivery.

SAFETY IN DESIGN: MAINTENANCE ACCESS

Mechanical services present the majority of access issues within the built environment, and for this reason, the type of access provisions (permanent or temporary) needs to be assessed with regards to the frequency and nature of the maintenance tasks to be performed.

“Roof access is perhaps the most common issue,” says Warwick Stannus, M.AIRAH, from A.G. Coombs.

“The inadequate provision of safe access for technicians is still more common than it should be. It is particularly concerning how often plant is located close to live edges and safe access points to the roof have not been provided.”

Cooling towers also present significant WHS challenges due to their size and the frequency of cleaning and maintenance activities required.

“While access platforms for cleaning are now generally provided, there is also a need to provide permanent, safe access for routine maintenance and adjustment of the fan and drive,” says Stannus.

He says another common issue is safe access to isolating and control valves, and sensors in congested cooling tower enclosures.

“Walking on pipe work to reach a valve is clearly not acceptable, but frequently still required in many installations of recent times.”

“In a commercially driven project environment,” Stannus says, “What should be relatively simple to achieve is sometimes challenging to deliver.”

RISK REGISTER

One tool designers can use to help manage their safety-in-design responsibilities is a risk- management register.

Stannus says a risk-management register needs to include assessment of both construction and operation risks, and should be used as an active project management tool – a live document that captures project learnings.

“Preferably, there should be a single project safety in design risk register that is continually updated through the project and finally closed out at project handover once all required methods of control have been completed,” he says.

For smaller projects, the use of structured risk-management procedures may not be warranted; however, it is still necessary to document safety-in-design requirements and outcomes.

Though risk registers provide a good starting point when combined with well-developed check lists covering requirements set out in relevant Australian standards and industry

guidelines, safety in design requires much more.

“It must be effectively integrated with the project design and construction delivery,” Stannus says. “And it is this integration where issues tend to arise.”

“Importantly, designers need to communicate design decisions and control measures to downstream stakeholders, including the construction team, future operators and maintainers.”

This can be achieved through a variety of means, including the issue of safety-in-design reports and risks registers. Detailed requirements in relation to safety in design should also be addressed in the project documentation, including head contract preliminaries and technical specifications.

BIM (building information modelling) can also play an important role in this space.

Completing safety-in-design reviews of the virtual build model ahead of site construction can help to identify constructability issues and resolve them prior to becoming evident on site. The ability to view maintenance access from the perspective of the technician in 3D also means that problems become

apparent far more readily and can be addressed with minimum cost impact.

“The development of design and manufacturer’s plant and equipment models that include maintenance and access zones greatly assists this review process,” says Stannus.

Safety in design should also form a key theme within project handover deliverables, including training systems, operating and maintenance manuals, and hazard signage.

A LEGAL PERSPECTIVE

According to Melissa Kirby, lawyer and strategist for Melbourne law firm Sharpe & Abel, issues around safety in design are becoming increasingly common.

“Most of our clients are the brains and brawn behind the smarts in buildings and infrastructure,” Kirby says.

“Their difficulty is when they design safety into structures and processes, but there is disagreement with others on sites.

Sadly, the issue often doesn’t come to light until someone gets hurt and that is just too late.

“If we have the conversation up front and put safety at the forefront of design generally, then these situations wouldn’t need to occur.”

While existing regulations might provide a well-constructed legal framework that gives designers flexibility to deliver safety-in-design outcomes both effectively and at minimum cost, the language used remains a barrier.

“They are written in a language that is difficult for many to comprehend,” says Stannus. “And the designer is almost certainly guilty of not knowing everything that they should have known if tested in a court of law, or was partly involved in the design so therefore will be joined in legal action.”

He says the most effective means of addressing practitioners’ safety-in-design concerns would be to create a set of plain-

English “deemed-to-satisfy safe design guidelines”, or codes of practice related to maintenance provisions.

“Then if a building owner and designer wish to move outside the deemed-to-satisfy provisions, the alternative solution and the application of risk-management processes, together with all that it involves, can still be undertaken,” he says.

Another change Stannus would like to see is the broad adoption of a Safety in Design Report, inclusive of a design risk register, as a standard design-phase deliverable and provided in the tender issue documentation.

And he says improvement in safety-in-design compliance is also warranted.

“There is now an increasing focus by construction safety auditors on safety-in-design compliance,” he says. “However, there does not seem to be the same level of independent review of safety-in-design compliance in the building services design sector.” ■