The Ten Key Principles of Green Fire

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Fire Protection Services are one particular area of buildings that has not been fully explored with respect to sustainable design, maintenance and management. There is significant opportunity to reduce the amount of water they use over their life, to substantially lessen the extent of materials and other environmental impacts required for their installation and ownership, and to lessen the limitations that fire services can sometimes place on achieving broader sustainability solutions and outcomes.

Ten key principles for "Green Fire" are put forward below, grouped for convenience into the categories set out in the Green Building Council of Australia's Green Star Office Design Rating Tool (v2). The appropriate Reference Number is provided where there is a direct correlation to Green Star points.

Water

The most obvious positive impact resulting from environmentally conscious fire services design is reduction in the consumption of the potable water supply. This can come from design consideration of both the automatic fire sprinkler system and hydrant system and is especially important where automatic pumps are used.

1. **Fire pumps configured to incorporate either a recirculating test water tank or discharge test water to grey water recycle system to minimise the amount of water used in testing.**

The required periodic testing of fire pumps typically discharges a great deal of potable water to waste. Most of the testing of fire pump systems is required to demonstrate the availability of the fire pump whilst only a small portion of testing is used to demonstrate pressures and flows etc. Fire pump installations can be designed to incorporate either test water discharge to a grey water system or recirculate water to and from a testing tank. With special attention to back flow prevention, valving and pipework materials the water may also be used to feed a potable supply tank. This initiative is currently considered as part of the Green Star Credit Wat-5.

The reuse or capture of water from testing is currently being considered as part of the update of the Australian Standard for sprinkler systems (AS 2118). The volume of water consumed by testing is also reduced in the new Australian Standard regarding maintenance of fire systems (AS 1851) through reduced testing frequencies.

2. **Sprinkler system drain down arrangements to drain to grey water storage systems where this is installed.**

Sprinkler head relocates and additions are a common requirement in tenancy changes and the system typically must be drained to enable the work and recharged at the end of each day. This drained water can be sent to a grey water system, if one is installed, for reuse. This initiative is also currently considered as part of the Green Star Credit Wat-5.

3. **Sprinkler system drain down valves to be located and arranged to allow the isolation and drain down of systems on a floor by floor basis or by zones for larger floor plates.**

Sprinkler systems that are not designed to enable localised drain down for head relocations can result in excessive amounts of water being drained down and wasted for minor sprinkler head relocations or additions. This also has an improved benefit on the availability of the sprinkler system from a fire protection perspective as it maintains protection in areas not being modified. This is a common design practice for new larger developments but can be relatively easily implemented on existing systems.

Materials

The first three items below relate to the types of materials used that are potentially detrimental to the environment. The second three items relate to reducing the quantity of materials installed and thus reducing the embodied energy required for the installation.

4. **Where possible reduce the use of PVC sheathed cables and incorporate the selection of cables sheathed in low environmental impact materials such as low halogen type materials.**

There are various environmental concerns with the production of Poly Vinyl Chloride (PVC). PVC sheathed cable is typically used for monitoring or control purposes in fire and life safety systems. There are also safety concerns over the combustion products of these cables. In some instances there are cable alternatives without the same extent of environmental concerns including those that use halogen free materials. This initiative in conjunction with other PVC reduction initiatives is currently considered in the Green Star Credit Mat-7.

5. **Where possible limit or preclude the use of chromium plated sprinkler heads and incorporate the selection of natural brass or painted finish sprinkler heads**

The production of hard chromium plating has a number of deleterious environmental effects including the possible release of hexavalent chrome to the environment and carcinogenic concerns with discharges from the plating process. For sprinkler heads there are alternatives to the use of chrome finish as a decorative finish.

6. **Where possible limit or preclude the use of ionisation detectors and use alternative photoelectric types.**

Ionisation type smoke detectors include a small mount of radioactive material (usually Americium 241). Whilst only very small amounts are used in individual detectors there is concern over introducing this element into the environment generally, there are also concerns relating to the release of this element into the environment as a gas in the event of the detector being burnt. There are alternative types of detectors that in many applications will be an acceptable solution. In some applications, however, ionisation type detectors are required by building codes.

7. **Likely future modifications to tenancy layout to be considered in design of sprinkler head grid and pipework to maximise adaptability of system and minimise extent of change needed to meet requirements of future layout changes.**

Sprinkler head relocates and additions are a common requirement in tenancy changes. Consideration of the design of the space and how future tenancy changes may occur and the effect these may have on sprinkler head location may result in the design of systems that require less or easier modification; e.g. matching layouts to architectural grids and other relevant building features and services design or proving blanked connections for future provisions.

8. **The installation of flexible sprinkler droppers to be considered to maximise adaptability of the sprinkler system and minimise extent of change needed to meet requirements of future layout changes.**

Sprinkler head relocates and additions are a common requirement in tenancy changes. The installation of a flexible sprinkler dropper system may make the system more adaptable to meet future tenancy layout requirements and minimise the amount of rework. Care needs to be taken to ensure that the environmental first cost of installation for flexible sprinkler droppers is not considerable higher than that for conventional systems. Flexible droppers can produce high pressure drops requiring increased pipe and pump sizing.

9. Consideration should be given where appropriate to the combination of pipework elements of the fire sprinkler and hydrant systems to minimise the extent of the pipework installation

In some circumstances it is possible to combine pipework elements of the sprinkler and fire hydrant systems into a common reticulation and thereby reduce the extent of pipe work installation. This is usually dependant on the available pressure and flow of the water supply. This can also lead to installation cost savings especially where pumps can be consolidated. The combining of the fire services with other water reticulation systems may also be considered but this is typically limited by the pressure ratings of system fittings of the non-fire services installations.

Management

10. Applying a fire safety engineering approach to determine the most appropriate fire and life safety solution for the building while cognisant of the total environmental impact and environmental design.

Fire Safety Engineering takes a performance approach to determine the most appropriate fire and life safety systems solution to a particular building and occupancy circumstance rather than a Code based prescriptive solution. In determining the optimum solution, the environmental implications of the various design options should be considered along with the usual criteria of fire and life safety performance and cost.

In addition, prescriptive fire and life safety solutions can be barriers to the implementation of some broader ESD design solution concepts and a fire safety engineering approach can offer a way to deal with this problem. An example is the contradiction between natural ventilation solutions and smoke compartmentation requirements. Natural ventilation solutions typically work towards to open buildings to promote air flow while smoke compartmentation attempts to limit the spread of smoke through air tight barriers at regular intervals. The Fire Safety Engineering designer must work closely with the ESD designer to ensure that the complete design will still meet building code requirements.

Whilst the key elements set out above are not an exhaustive list of the possible sustainability initiatives in the fire protection services field they do demonstrate that there is considerable opportunity to lessen the environmental impact of the installation and ownership of these systems. It is also hoped that a greater awareness of these “Green Fire” opportunities will lead to the identification of additional areas for environmental improvement in this area.

About the Author:

Bart Taylor is a Mechanical Engineer with notable experience and expertise in fire protection solutions and with a detailed understanding of building legislative requirements, building services and fire safety engineering. He is Engineering Services Manager for Walker Fire Protection, specialist providers of fire protection solutions for commercial and industrial buildings.
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