Carry out a risk assessment

The impending Part G changes have focused attention on the potential hazards in providing hot water services, says Martyn Griffiths of HWA member Waterheating UK.

The HWA recommends that, when installing or modifying a hot water storage system, a risk assessment should be carried out. This is particularly important when using alternative heat sources such as solar panels and heat pumps.

This article concentrates on a common-sense approach for domestic households. In applications such as public buildings, or where there are persons at high risk, different factors and legislations will apply.

If the delivery temperature is too high, then scalding can occur. There is, of course, a theoretical risk of explosion, but this is almost zero as long as existing good practice and the G3 requirements for vent pipes on vented cylinders and temperature-relief valves on unvented systems are adhered to.

Using heat pumps or solar can lead to some water being stored at lower temperatures than usual, which can encourage microbiological growth.

**SCALDING RISK**

Hot water is generally stored at 60°C, but cylinder thermostats are not precision devices and can occasionally drift or fail.

The bath tap is the area of greatest risk, and the delayed revision of Building Regulations Part G is expected to advise that thermostatic control should be fitted to prevent bath tap temperatures from exceeding 48°C to prevent scalding.

In order to maximise the benefits of solar input, many control systems allow the cylinder contents to reach much higher temperatures than 60°C. We strongly recommend using a thermostatic blend valve or equivalent device to prevent high temperatures reaching an outlet.

Vented cylinders are normally fed from a feed and expansion tank in the roof space. The tank should be fully supported over its base area, with a 150mm overlap stipulated in the guidance to the G3 Building Regulations. This means if the tank does seriously overheat, it won’t collapse and discharge its contents through the ceiling.

All directly-heated vented cylinders (immersion heaters) must incorporate a non-auto-resetting energy cut out. Indirectly-heated vented cylinders must have an additional level of safety control, which in practice can be the boiler thermostat controlling the primary temperature.

**MICROBIOLOGICAL GROWTH**

Legionella bacteria are always present in the water supply but, if given favourable breeding conditions, can reach unacceptable levels.

The highest risk areas are large-scale systems such as in hotels and hospitals, but the problem can occur in domestic dwellings.

There are specific requirements for higher-risk situations where the HSE L8 document applies, but less onerous requirements are appropriate for the normal domestic situation.

The preferred breeding temperature range of legionella is from 20°C to 50°C. Once temperatures exceed 50°C, the bacteria starts to die off. This is almost instantaneous at 70°C or above, but over 90% of legionella are killed in under 10 minutes at 60°C, and in one hour at 55°C.

Evident from countries where solar systems are well established suggests a minimal additional risk in domestic applications that can be controlled by good design.

The most popular strategy is the hot top, where the top portion of the cylinder is regularly brought up to around 60°C for a period sufficient to neutralise the bacteria — usually one hour at 60°C on a daily basis. The cylinder should be designed so the hot top volume capable of being heated by the backup heat source, if required, approximates to daily demand.

Another option is to pasteurise the cylinder contents by heating to 60°C or above on a regular basis (once or twice a week).

One equally effective means of controlling the growth of legionella is to reduce the dwell time within a system to avoid stagnation. This is typical of thermal stores, where the minimal amount of stored domestic hot water reduces the risk significantly.

The best control is not to let the bacteria multiply in the first place. With an existing vented system fed by a cold-feed tank, the first area to look at is the feed tank itself. The tank should have a close-fitting lid with any breather or discharge pipe including a protective mesh.

If there are any doubts about the tank’s integrity or cleanliness, it should be replaced.

The tank must also be adequately insulated. While such insulation may be primarily for frost protection, it also helps avoid excessive water temperatures during the summer.

If it looks as if the feed and expansion tank needs replacing, it may be more cost-effective to install a mains-pressure unvented cylinder or thermal store.

The second area to consider is pipework, and undesirable features such as dead legs or where hot and cold pipes run in close proximity. It is in doubt replace the offending sections and consider disinfecting the whole system during commissioning.

The areas at most risk are shower outlets, since legionella is transmitted as an aerosol. Attention should be given to the pipes feeding the shower, including the condition and positioning of any flexible hoses so they are, as far as possible, self-draining and not likely to be immersed in warm bath water.