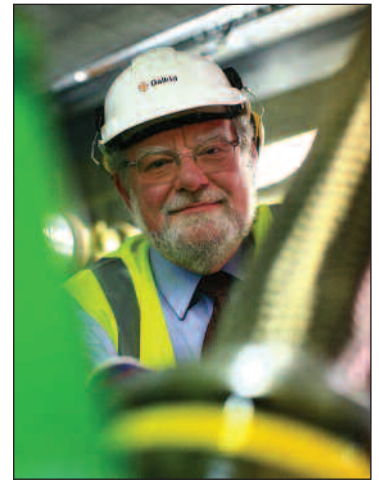


# Maximising safety in the boilerhouse

Last month's *HEJ* featured an article, the second in our new series of guidance pieces aimed principally at Technician-level engineers, highlighting some of the key steps that boiler operators can take to maximise system performance and efficiency, and thus reduce running both costs and carbon footprint. In the third such article, Derry Carr, C.Env, I.Eng, BSc (Hons), M.I.Plant.E., M.S.O.E., technical manager & group gas manager at Dalkia, who is vice-chairman of the Combustion Engineering Association, examines the key regulatory and safety obligations for hospital energy managers and boiler technicians, a number of which have seen changes in recent years with revision to guidance and other documentation.



Derry Carr.

Modern hospitals require a high volume of energy – often derived from on-site boiler plant, in order for healthcare professionals to efficiently carry out their facility-critical medical duties. Boiler systems are required to comply with a raft of different legislation, including the Management of Health & Safety at Work Regulations 1999; the Pressure Equipment Regulations 1999; the Pressure Systems Safety Regulations 2000, and The Dangerous Substances and Explosive Atmospheres Regulations 2002.

The Guidance documents from the

Health and Safety Executive (HSE) on the safe operation of boilers, PM5 and PSG2, were withdrawn in 2011, and have since been replaced by a much more open document, INDG 436, which provides basic advice on the operation of steam boilers. However, the guidance in INDG 436 is both very specific on the responsibilities of owners, managers, and supervisors, and well-suited for use by those who may not have access to technical industry guidance.

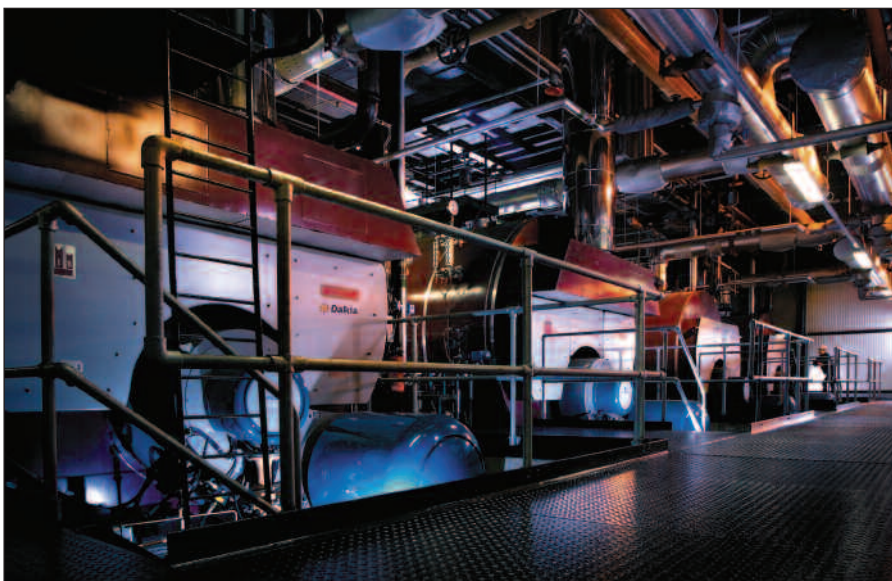
BG01 is a boiler guide endorsed by the HSE, and prepared by the Combustion

Engineering Association (CEA) and Safety Assessment Federation (SAFed), which details stringent guidance that boiler houses must be operated in accordance with, and runs in parallel with INDG 436. BG01 is applicable to any facility with an industrial or commercial steam and hot water boiler operating at between 0.5 and 32 bar gauge, and at a temperature between 110°C and 400°C.

## Due diligence processes

Although the standards set out in these documents are not ratified by law, those who do not conform to them are required to set out their own standards and due diligence processes, that must be shown to be either equal to, or better than, these requirements.

One of the most important things to note for the owners of boiler plant in healthcare is that overall responsibility for the equipment lies, and remains with, them. BG01 states that: "While third parties such as maintenance contractors can be used to assist in achieving compliance with these legal obligations, the overall and legal responsibility remains on the owner/user, and cannot be contracted out, although there is scope for certain duties to be transferred (as set out in a written agreement) between the



Four 15-tonne/hour boilers at the Royal Victoria Infirmary, Newcastle-upon-Tyne. These form part of a Dalkia 3.8 MWe CHP energy centre that is saving the hospital 10,880 tonnes of CO<sub>2</sub>/year.

owner and user." This means that, while a specialist contractor can take on the risk of operation and maintenance, all liability remains with the hospital owner.

### Low awareness

This is a key point for health estates managers, but awareness of the differences between what is laid out in current standards, and in the 'old' PM5, is currently very low. There is no guarantee that, where a utilities and energy management specialist is contracted to operate and maintain the boilers, they will automatically take on the liability on behalf of the customer. The exception is that, in some cases, plant equipment remains the property of the outsourced company, with the resulting power sold to the customer.

### Legally binding

One of the legally binding obligations is that boiler owners must have in place a 'suitable and sufficient' risk assessment, which is reviewed periodically. The responsibility for this lies with the plant owner, although of course advice from manufacturers, controls experts, and utilities management specialists, will ensure a thorough assessment. A full risk assessment must be in place for the boiler house, a particularly important factor where there is a planned alteration to the operating and maintaining regime of the boilers. In an environment where there are five or more employees, the findings of the risk assessment must be recorded.

The assessment must cover and address issues such as the likelihood of injuries from burns from hot water, steam, burners, or flues; electric shock; fuel escape; fire; asphyxiation, and the toxic effects from combustion products. It must also consider the position of the boiler. Taking into account the nature of some hospital sites, where plant equipment can be located beneath hospital buildings themselves, a thorough risk assessment is vital. It should cover the proximity of the boiler plant to premises and those occupying these; the proximity to the public and vulnerable people – including hospital patients; and the potential impact on neighbouring sites in the event of an incident.

### Requirement for a 'Competent Person'

BG01 calls for a Competent Person, recognised by the insurer, to regularly inspect the plant. This person carries a lot of influence; their opinion is what determines how often, within a 14-month period, the boiler must be inspected. In the event that the boiler house operations fall below standards



*The flue serving the 1.4 MWe CHP energy centre at University Hospital Hartlepool.*

set out in BG01, the Competent Person has the authority to demand that the steam boiler plant be inspected as regularly as once a month. Taking into account the time involved to strip down the boiler before re-installing and commissioning it again, up to a week can be wasted in downtime for the plant room – at a cost of around £3,000.

### Evolving technology

Inspection and boiler house attendance requirements have changed, to take into account evolving boiler house technology, such as remote monitoring, which is not covered in previous documents. The latest guidance advises on a wide range of control options, and recommends that personnel receive adequate training to perform their jobs safely and competently. BG01 recommends that operators and

managers achieve the national industry standards through either the Certified Industrial Boiler Operator (CertIBO) scheme for operators, or the Diploma in Boiler Plant Operation Management (DipBOM) for managers. Both qualifications are part of the Boiler Operation Accreditation Scheme (BOAS).

### Lower manning levels

Boiler houses have traditionally been fully attended, but with emerging technologies that provide greater automation, there is now provision for the plant to be visited once every 24 hours, and even less frequently – once every three days. If hospital Trusts are to feel confident of being able to cut down on the frequency of visits to this degree, they will need to have in place some very sophisticated automation. For example, high integrity self-checking probes must be in place to ensure that any failure triggers a failsafe device in the boiler. The risk assessment will determine the minimum frequency of routine testing required. A high level of fire protection is clearly crucial, and alarms and shut-off for the fuel must be key considerations in the design and set-up of a boiler house.

Equipment with a monitoring role or safety function, which acts in a predetermined manner to prevent a dangerous situation from occurring, is available to enhance the automation of the boiler house. For example, a 'low water level' alarm prevents boiler operation when the water level falls, but allows automatic restart and resumption of operation once the water level has risen to a safe level. A second low-level lock-out is fitted as a precautionary measure should water levels fall too low, and, if triggered, this requires manual intervention by a trained boiler operator before the boiler can be reinstated. Safety systems should be designed according to BS EN 12953 and BS EN 61508, but, where electrical equipment is involved, BS EN 50156 should be applied.

### Feedwater issues

A major cause of boiler failure lies with the treatment of the feedwater that enters the system. If this is not strictly controlled and monitored, there is a risk of limescale build-up, to the point of failure. Safe and efficient operation depends on the boiler remaining within its safe parameters during operation. A feedwater specialist should be employed to regularly check the water treatment plant, and test the quality of its resulting water before it enters the system.

While all combustion plant



*At the Prince Charles Hospital, Merthyr Tydfil, heating, hot water, and electricity, are provided by a 500 kWe CHP-based energy centre.*

has an environmental impact, maintenance and operation of a boiler house according to best practice guidelines will help to support an energy-efficient regime. This should include metering to monitor the boiler's efficiency; correct water treatment to ensure that this efficiency is not compromised; combustion analysis and burner adjustment to reduce energy loss, and the introduction of improvement devices such as economisers, variable speed drives, and flue gas dampers. Larger installations are required to have the Environment Agency's Pollution Prevention and Control (PPC) permit. Operating the boiler outside of the conditions that this permit scheme applies is illegal. Smaller plants still fall under regulatory environmental control; the Clean Air Act 1993 covers local issues such as smoke and dust from the plant.

### Correct understanding vital

Using substantial volumes of energy, generated on site, is inherent in the proper functioning of healthcare facilities. Yet without the correct understanding, interpretation, and implementation, of the law, the hospital Trust or owner of the boiler stands to be liable for any failure. Accidents involving boilers have the potential to kill; as a result, the law is strict. The Combustion Engineering Association is offering healthcare estates



*A typical boiler pressure gauge.*

personnel in the NHS a discounted membership, which in turn provides access to the knowledge available on all aspects of boiler house management. (A flat rate subscription of £250 cover will provide membership for an entire NHS Estates Department, and give access to CEA events at reduced rates. For more information, telephone 01740 625538, or email: [info@cea.org.uk](mailto:info@cea.org.uk)) An efficient energy and utilities management company, meanwhile, can provide the support and expertise required to navigate compliance in the boiler house for healthcare professionals. +

## Derry Carr

Derry Carr, C.Env I.Eng BSc (Hons) M.I.Plant.E. M.S.O.E., is the technical manager and group gas manager at Dalkia. He is also Vice-Chairman of the Combustion Engineering Association, an organisation which played a key role in developing INDG436.

Starting his career as an apprentice, Derry Carr has worked with an extensive range of boiler and CHP plants throughout a career encompassing operational, maintenance, and construction activities, in healthcare and industry. Over the past decade he has managed many hospital energy plants, including major plant upgrade projects at Southampton General Hospital, Kingston Hospital, and King's College Hospital.

He is also part of the STEM Ambassadors Programme, which actively seeks to create opportunities to inspire young people in science, technology, engineering, and mathematics (STEM). The Programme – supported by over 25,000 volunteers – enables youngsters to develop and sharpen their skills, while improving their 'employability' and choices in the UK's competitive job market.