Authorising Engineer’s ‘pivotal role’ explained

Graeme Dunn, engineer, Design and Engineering at Atkins, who serves as an Authorising Engineer (MGPS) for both NHS clients and healthcare providers throughout the UK, Ian Sandford, a medical gas consultant (associate) at Hulley Specialist Gas Services, a specialist division of consulting engineers Hulley and Kirkwood, and Alex Black, an experienced technical consultant and AE (MGPS), of Alex Black and Associates, examine how the AE (MGPS) role developed, and highlight what they describe as its “pivotal importance” today.

To gain an understanding of the Authorising Engineer role, we should perhaps look back to the early days of piped medical gases. The Authorising Engineer (MGPS) role was introduced in Scotland over 30 years ago, based on a decision to investigate the problems being experienced by the five Regional Boards making up the NHS in Scotland prior to the introduction of a national code of practice.

With the advent of the IHEEM voluntary register for Authorising Engineers (MGPS), and the relatively recent introduction of Authorising Engineers throughout the UK, there has been a current train of thought that the focus of the AE role is perhaps restricted to the audit process. While recognising the importance of thorough and regular audit of an organisation’s MGPS (medical gas pipeline systems) operational management arrangements, it is also important to realise the full extent of the demands and scope of work that can be placed on the AE when under contract to provide the NHS board/healthcare organisation with a specialist MGPS advisory service.

Background
Following a fatal accident enquiry in the 1960s, the Scottish Home and Health Department at that time issued Scottish Hospital Memorandum No. 67/1966, which laid down the conditions and procedures to govern the future acceptance of medical gas installations. From this Memorandum came the first code of practice, which was issued by the then Western Regional Hospital Board. This Memorandum placed the responsibility for the inspection and testing of new installations before signed acceptance with the Regional Engineer and, where appropriate, the appointment of the Hospital Engineer as the Responsible Officer. Considering the absence of guidance, training, and specification, in the 1960s and early 1970s, the control of piped medical gas projects tended to sit exclusively with the liquid or gas suppliers, who imposed their design philosophy and installation methodology on the health service which, without strict controls in place, was to the service’s detriment.

The absence of training for the Responsible Officer (later designated as the Authorised Person), particularly in relation to the management and commissioning of systems as part of new build projects, or the refurbishment of existing buildings, resulted in the contractor effectively determining the overall quality of the medical gases installation.

First national code of practice
The introduction of the first national code of practice, HTM 22, in 1972, allowed the NHS to apply some pressure for an improvement in both the MGPS design and installation aspects, with the Regional Engineer’s department leading the way with respect to the validation and verification of the medical gas projects. This was followed by the issue of the Permit to Work System, with the recommendation that the appointment of

A nitrous oxide automatic changeover manifold arrangement.
the Authorised Person would be carried out by a Chartered Engineer within the health service, who had specialised knowledge and training in medical gas pipeline systems. The professional status requirement would ensure that a level of integrity and professionalism was recognised in the event of any court action arising through the negligence of the individual. When dealing in a restricted market with the absence of credible competitors, a monopoly situation existed, giving a master/pupil relationship which tended to restrict quality improvement. This resulted, in many instances, in a delay in acceptance of hospitals. Without the acceptance of the piped medical gas systems, a hospital would be deemed "not fit for the purpose". During that period, it was the only means of achieving the aim of improved patient safety, and for gaining tighter control on the design and installation aspects. HTM 22, as possibly expected of the first published code of practice, gave rise to various interpretations and anomalies within the code of the standards required that, only in time, would ensure a common purpose.

Validation of designs
In February 1980, the Scottish Office issued an instruction to all Scottish Health Boards that, with immediate effect, the validation of designs carried out by consultancy firms or specialist contractors for all major projects would be a Common Services Agency (CSA) responsibility. The Building Division of the Common Services Agency was part of the NHS in Scotland at that time, and was subsequently privatised in 1994. The validation of the MGPS design would be carried out prior to project commencement. The subsequent commissioning and authorising systems for use would also be a CSA responsibility. Thus, under the Scottish Office directive, the appointment of the CSA Authorising Engineer (who had been given the authority to determine standards and to control and manage the medical gas installations on all new projects) would ensure that contractual procedures were put in place, thereby eliminating the "tail wagging the dog" philosophy that had previously existed.

The principal remit of the role was to protect against any error or act of negligence. The need for the AE (MGPS) has not diminished in today’s environment. The authorising the systems for use, with a contractor representative often appointed as a Common Services Agency (CSA) Authorising Engineer, to be thoroughly conversant in all aspects of MGPS, be thoroughly conversant in all aspects of MGPS. There will usually have been limited opportunity to have gained the experience to commission large-scale projects; therefore the requirement to have an independent AE appointed is generally unavoidable. Far from being an external auditor removed from any responsibility, the Authorising Engineer should be on hand to support the Authorised Person, and be prepared to take the lead role in contractual matters.

Relevance of the Authorising Engineer (MGPS) today
The need for the AE (MGPS) has not diminished in today’s environment. In fact, the opposite is the case, with the introduction of the eight specialist subjects under the core element of HTM 00, the increasing stream of European Standards issued, and the contractual importance of ensuring the NHS position as the user is protected against the introduction of a variety of private finance procurement methods now employed, with external service providers providing the facilities management function.

Within the “traditional” NHS set-up, the estates department in most instances does not have the expertise in-house to provide the specialist knowledge required by the board for advising on the relevant standards, contractual agreements, specifications, and design and commissioning aspects of MGPS. Considering the vast all-round knowledge required by an estates officer in today’s healthcare environment for managing the day-to-day operation of a range of critical engineering services commonly found within the acute hospital environment, it would be unreasonable to expect the average estates officer, even when appointed as an Authorised Person (MGPS), to be thoroughly conversant in all aspects of MGPS. There will usually have been limited opportunity to have gained the experience to commission large-scale projects; therefore the requirement to have an independent AE appointed is generally unavoidable. Far from being an external auditor removed from any responsibility, the Authorising Engineer should be on hand to support the Authorised Person, and be prepared to take the lead role in contractual matters.

PFI/PPP contracts
The same applies with PFI/PPP contracts, where the project company, main contractor, and facilities management provider, are required, under a duty of care, to be legally and rightfully covered against any error or act of negligence. Considering the very nature of medical gas pipeline systems, which provide a service from source direct to the patient, each party will have under contract a specialist professional adviser. The project company will have responsibility for the monitoring and quality of the testing carried out. The main contractor’s responsibility relates to the commissioning, and, most importantly, to signing off and authorising the systems for use, with a contractor representative often contracted to act as the MGPS contract supervising officer. The facilities management provider will appoint the Chartered Engineer as professional adviser/AE for the duration of the facilities management function.
management contract. In such cases, the AE should examine the contract closely prior to acceptance, as within PFI contracts the FM provider is liable for financial penalties in the event of failure to deliver services, or through non-availability of clinical and other areas. Benefits of employing the AE have already been demonstrated at an ongoing major PFI acute hospital project – in terms of providing advice through all stages of the contract, from assisting in the preparation of the brief, advising on design/installation/validation, site training and assessment of prospective APs, through to post-construction.

There are some PFI projects currently where private FM providers employ an AE from within the organisation where the APs are appointed. This is contrary to the recommendation of the HTM that the AE should be independent of the organisation providing the APs. However, there are other FM providers that have recognised the need to employ an independent, registered AE, and, from current feedback, the FM provider in such instances has acknowledged the benefit of utilising this resource.

A ‘concerning trend’
There is a continuing and concerning trend, on major, minor, and PFI capital projects within the MGPS field, of some consultancy firms issuing a brief, and often inadequate, specification. MGPS drawings have been issued with “detailed design is the responsibility of the specialist contractor” stamped across them, with the consultant indicating that the MGPS contractor is perhaps more competent in this regard. In such cases the fine print of the contractual agreement between client and consultant could be contested, in that a conflict of interest could exist – with the specialist contractor being both designer and installer.

With the appointment of the Authorising Engineer, such consultancy firms would demonstrate a further step back in the chain of responsibility by ensuring that the AE is copied in to all correspondence, and ensuring that the AE’s approval is required when queries arise. These actions could be viewed as a throwback to the 1970s, which fortunately is now realised by NHS boards, who include validation of design at an early stage within the Authorising Engineer’s terms of contract.

Figure 1 illustrates the hierarchy of responsibilities of the various parties responsible for MGPS within a health authority, while Figure 2 indicates the inter-relationship between health authority and PFI/PPP contracts.

Role of the Authorising Engineer (MGPS)
The Authorising Engineer (MGPS) needs to be a “technical expert” on all aspects of MGPS, including design principles and commissioning (validation and verification), as well as having a thorough understanding of the operational management requirements. A detailed knowledge of Dental Air and Vacuum Systems (DAVS) and Pathology Laboratory Gas Systems (PLGS) is also of benefit to the practising AE, as such systems are often installed along with medical gas pipeline systems, with the Authorised Person often having additional responsibility for the management of these systems. It is also now established practice in Scotland, and will form part of the amended SHTM02-01 for use in Scotland, to install PID-controlled variable speed plant in AGSS and DAVS central piped systems.

As well as acting as a specialist adviser to Health Boards and PFI participants, one of the primary remits of this role must be to support the Authorised Person (MGPS) in their day-to-day work activity by providing a technical advisory service. This can include validation of submitted design proposals for either new works or for modifying existing systems. The typical Authorised Person is likely to have limited design experience, largely due to lack of opportunity, and may only have covered design considerations briefly as part of their three-yearly refresher training course. It is imperative, therefore, that the Authorised Person can be supported in this regard by the appointed AE. There is also an element of surprise from some quarters on the realisation that the commissioning engineer / Authorised Person, when carrying out or witnessing the tests and signing off the contractor’s certificates, is not only approving the tests listed under the HTM standard, but has also, in effect, signed acceptance that the design of the system is in full compliance with the HTM. Although an omission from the HTM, reference to this requirement will be made in the contractor’s test certificates.

Unfamiliarity with engineering tests
Likewise with commissioning, and again usually through lack of opportunity, the typical Authorised Person may not be too familiar with the full range of engineering tests, and of the criteria which should apply to each. The AE must be able to accurately advise the Authorised Person of the relevant tests which should be performed, and of the parameters which apply. Too often, the Authorised Person can be led by the specialist contractor when tests are being performed.

The audit role is also important, but should not necessarily be the key focus of the AE role. Regular and effective audit will ensure that the organisation is satisfying its statutory obligations, as well as meeting the requirements of Part B of the HTM. An audit would typically include the following elements:

- The provision of Authorised Persons: sufficient complement for the site, appointed in writing by an “Executive Manager” of the organisation; re-assessment at three-yearly intervals; designation of a Co-ordinating Authorised Person (CAP); training requirements; permit activity for each AP, and maintaining site/system familiarity.
- The provision of Competent Persons: in-house or contractor staff; in-house CPs appointed by the CAP and training requirements.
- Operational policy: Content and accuracy of the MGPS operational policy document; has the document been signed off by the required signatories?

**Figure 1: Conventional health authority roles.**
Maintenance arrangements: PPM/ reactive maintenance arrangements; in- house/specialist contractor appointed, records readily available for reference.

Operation and maintenance manuals: Availability of O&M manuals for the MGPS plant/equipment installed.

Record/schematic drawings: Availability and accuracy of MGPS record drawings, availability of schematic drawings.

Permit-to-Work procedure: audit of completed permits, including correct assigning of the hazard level applied; evidence of works taking place without a permit; correct management of permit books, including numbers in use, and archiving arrangements.

Keys and key cabinets: identification of AVSU, LLV, LVA keys; security arrangements, accuracy of key register.

Review of the MGPS plant: Site survey of all relevant MGPS (DAVS, PLGS) plant; non-conformance issues with HTM 02-01 recorded, compliance action plan.

System modifications: changes made to the MGPS since the previous audit; planned plant replacement, system modifications.

General: AP consulted with respect to medical equipment purchase; quarterly testing of compressed medical air plant; written schemes of examination (PSSR 2000); availability of test equipment for use by the AP; availability of emergency kits; RIDDOR type incidents; NHS Estates Alert/Safety Action/Hazard notices issued, Medical Gases Committee established.

Audit results

The results of the audit should be compiled in a concise report, and issued promptly for action. The frequency of audit can be determined through an audit frequency risk assessment, which can then be reviewed at a later date once any recommendations have been actioned.

It is important that technical assistance to the Authorised Person is readily available. It is fortunate that we have in Scotland Authorising Engineers who are locally based. Although independent, they share a common bond by having close intercommunication with each other, thus ensuring an exchange of information to maintain a common direction.

With the Authorising Engineer being the specialist MGPS adviser to the board, the board will often seek a letter of reassurance from him or her that the actions necessitating from the audit, a number of which, involving the third source of supply, could be classed as relatively major projects involving a design element, are progressing in a positive manner. By seeking such reassurance, the board places the AE with direct continuing responsibility rather than the remoteness of merely carrying out an audit, which one might feel carried a burden for a certain amount of support without the hands-on responsibility.

An Authorising Engineer confident in his abilities should welcome such direct responsibility, with the knowledge that he or she is fulfilling an active and worthwhile role.

Value of a second opinion

Considering the importance of the Authorised Person role, and the level of responsibility that this can entail, support from the Authorising Engineer, or at least a second opinion, can often be valuable, as well as reassuring. There is, on occasion, the mistaken idea that the Quality Controller (Pharmacist), following purity tests, shares the responsibility with the AP for authorising the systems for use. Purity tests are a shared responsibility, with the QC carrying out the tests, witnessed by the AE/AP as appropriate to the size of project. The engineering validation and verification is not a shared responsibility. Only the AE/AP can authorise the systems for use, and there can be no dilution of this responsibility.

The relevant clauses of HTM 02-01 and the associated permit-to-work forms would tend to suggest that acceptance of test results by the specialist contractor’s Competent Person (MGPS) is sufficient and acceptable. Verification requires the Authorised Person to confirm the truth or accuracy of the results; and this can only be carried out by the actual witnessing of the tests. The Authorising Engineer may be able to advise on any local “house” rules that may be required to reflect particular site conditions or operational management arrangements.
Medical gas systems

The future
In Scotland, the role of Authorising Engineer (MGPS) has been practised since the initial Scottish Office directive with the 1980 Health Technical Memorandum 02-01 (HTM02-01). The experience gained throughout these years has provided the AE with the benefit, through practice, of experience of the problems faced by Health Boards, and the actions required to resolve such problems, and, importantly, the ability to offer guidance on the questions raised by the Authorised Person or the board. As a professional adviser to the board, although independent, the AE should recognise that the role is not that of an audit inspector, but a member of a team tasked with a duty of care. Each recognised Authorising Engineer in Scotland is a member of the Health Facilities Scotland MGPS Advisory Group, with the remit to develop rules and procedures and introduce safe systems of work with built-in contingency plans to ensure patient safety is never compromised. The Group is also collectively amending the HTM02-01 standard for use in Scotland.

As well as the AE providing specialist advice to the APs within the Health Boards or private sector, it has been proposed that, in Scotland, the AE(s) should also perform a similar assessment to that required of the AP assessment, on the competence of medical gas installation contractors, maintenance and manufacturing companies, and MGPS training providers. This would ensure that there is a consistent level of quality and control of medical gas service providers.

The AE has a pivotal role to play in all aspects of medical gases – as an advisor to all parties in the contract management, design, installation, validation, and management of MGPS, and in the preparation and update of guidance, as well as in policing the governance of the HTM. It is therefore important that the AE role is maintained and utilised for the correct reasons, and not diluted to merely an administrator role.

- Approved Authorising Engineers (MGPS) in Scotland are: Alex Black CEng, FIHEEM – Alex Black & Associates Ltd; Graeme Dunn BEng(Hons) CEng MCIBSE MIHEEM – Atkins (IHEEM registered), and Ian Sandford BEng (Hons) CEng MCIBSE MIHEEM – Hulley and Kirkwood (IHEEM registered).

About the authors

Graeme Dunn
Having graduated from the University of Strathclyde in 1992, Graeme Dunn commenced his healthcare engineering career with the Building Division of the Common Services Agency in Glasgow, which was subsequently taken over by WS Atkins in 1995. Following a five-year spell, back with the NHS, at Hairmyres Hospital in East Kilbride, he rejoined Atkins, and now works extensively as an Authorising Engineer (MGPS) from the company’s Glasgow office. As well as carrying out the duties of Authorising Engineer (MGPS) for a number of NHS clients and private healthcare providers throughout the UK, he also offers the full range of MGPS-related services, including design, installation, maintenance and verification, and general advice on meeting the operational management requirements of the relevant HTMs.

Graeme Dunn joined the IHEEM Register of Authorising Engineers for this discipline on its inception in 2009.

Ian Sandford
With over 23 years’ experience in the construction industry, and experience in the healthcare, industrial, education, commercial, and government agency sectors, Ian Sandford started his career in 1988 as a junior building services technician with Dinardo Partnership and gained a Diploma in Building Services Engineering. Moving to the Scottish health service in 1991, working with the Common Services Agency (Building Division) as a technical officer (Grade 3), he became heavily involved in medical gases, as well as continuing in mechanical building services engineering. In 1994 he transferred to WS Atkins, where he remained, as a senior mechanical engineer/project manager, until 1999.

Leaving consulting engineering that year, he became a project manager for medical gas contractor, Hospital Pipeline Installations, until 2002, before a short spell as a consultant for a design and build M&E contractor.

In 2003 he moved to Hulley and Kirkwood Consulting Engineers as a senior mechanical engineer, with subsequent promotions to principal engineer. Now medical gas consultant (associate) at Hulley SGS (Specialist Gas Services), he is co-author of the Scottish Health Technical Memorandum 02-01 Medical Gases, and is an IHEEM Scottish branch member, and a member of the Health Facilities Scotland National Advisory Group (medical gases). He is also an IHEEM (voluntary) registered Authorising Engineer (MGPS).

Alex Black
Following completion of a scientific instrument-maker apprenticeship in 1953 with Kelvin & Hughes, and national service in Egypt, Alex Black worked as a sales and controls engineer with the John Thompson Group, and as area manager with Drayton Castle, before joining the Western Regional Hospital Board in 1969 as Regional Sterilising Engineer.

He retired from the health service in 1994, but returned to join WS Atkins to re-establish the role of the Authorising Engineer in Scotland. During that period he also acted as the MOD AE in Northern Ireland, and, working with this article’s co-authors, produced the Safety Rules and Procedures MOD Document SR09. AE services were also required at the UN hospital in Palestine, necessitating regular visits over a nine-month period before problems of design and installation could be resolved.

On joining IHEEM (then The Institute of Hospital Engineering), he was accepted as a Fellow and Incorporated Engineer, later being granted Chartered status. In 2009 he received IHEEM’s John Bolton Memorial Award.

He is a past chairman, and remains a committee member of, the Scottish branch of IHEEM, is a member of the NHS Scotland Advisory Group, and the IHEEM AE (MGPS) Panel, and co-collaborator, along with Ian Sandford and Graeme Dunn, in amending the HTM 02-01 for adoption in Scotland. His company currently provides an Authorising Engineer (MGPS) and advisory service “to most Scottish boards”.

Graeme Dunn. Ian Sandford. Alex Black.