An Inspector calls

The UK needs to train an army of air conditioning inspectors to carry out the requirements of the EPBD. After a one-day training seminar, a dubious Mike Creamer reports back from the new front line

Most air conditioned public and commercial buildings in the country are now subject to mandatory inspections under the Energy Performance of Buildings Directive. This is going to be a colossal task.

It will require an army of inspectors, with experience of a wide range of equipment and technology, and fully conversant with the often complex relationship between plant performance, energy consumption, equipment design / maintenance, and of course occupancy comfort.

As someone with many years experience in this area, I recently decided to undertake the necessary steps to become an Air Conditioning Inspector, in order to qualify to carry out inspections. As a first step towards this, I, along with 30 or so other potential Inspectors, attended a one-day seminar to learn all about an Inspector’s essential duties.

In a nutshell, the main purpose of an inspection is to produce a reasonably accurate evaluation of a building’s air conditioning systems, with a view to issuing a Certificate describing the energy efficiency of the building.

As part of this, the Inspector must determine the building cooling load, match it against the system’s cooling capacity, and report on the adequacy, or otherwise, of such equipment to meet the cooling load. This applies to single and multiple air conditioning systems.

The F-GAS Regulation also requires regular inspections of the refrigeration circuit within certain Air Conditioning Systems to test for leakage of fluorinated greenhouse gas refrigerants.

As the day of the course approached, I looked forward to a detailed briefing on how Inspectors should go about their task. I anticipated they would be taught how to connect temperature and pressure sensors (or gauges), and current clamps, to different types of systems, in order to determine their current operating condition, efficiency, and so on. With recent developments in technology, it is now possible accurately to determine system cooling and heating capacity, heat of rejection, power input, and isentropic efficiency, COP, running condition, refrigerant charge status and many other parameters, in order to determine the operational efficiency of systems type running on any refrigerant.

I would then be able to use a CIBSE-based Heat Gain / Heat Loss Calculation Software package to accurately determine building load, matching this against the measured equipment cooling capacity in order to complete my task. The result would be a clear and accurate report for the building owner.

I was in for a major disappointment.

It turns out that the new breed of Air Conditioning Inspector is not required to go to any such lengths to fulfil the task. Instead, guided by TM44, they are advised to rely on indirect data, such as commissioning records (where they exist), nameplate data (when still intact), manufacturer's literature (if available) and other subjective physical observations/measurements in order to arrive at an assessment.

It strikes me that perhaps the reason for this approach is to allow Inspectors to come up with an opinion without detailed knowledge and experience of air conditioning systems, and without the essential tools one might reasonably expect for such work. And, you could add, without additional training such as Refrigerant Safe Handling Certification, PPE, and so on.

Anyone familiar with the basics of refrigeration theory knows that the cooling capacity, power input, and COP/efficiency of refrigeration and air conditioning systems varies greatly with ambient temperature and the thermal load at the evaporator. This is why manufacturers issue tabular or graphical data to show the performance and power input of their equipment over a wide range of specific condition combinations.

As a result, even with the best instrumentation available, it is not possible to determine the true peak cooling capacity of an air conditioning or refrigeration system unless the test is conducted at the design ambient temperature and under simultaneous full building load conditions - and only then with quite sophisticated equipment and a reasonable degree of knowledge.

Where evaporative condensers/cooling towers are fitted, the design ambient wet bulb and dry bulb temperature must also prevail at the time of the test, in order to determine cooling capacity and building load via the instrumentation.

As if this was not challenging enough, Inspectors are required to determine capacity and efficiency, without even the basic refrigeration tools such as pressure gauges. Indeed, the Inspector is also required to take running currents for compressors, fans, pumps, and so on; however, he would be ill-advised to do so if not electrically qualified in order to work safely within high voltage three-phase electrical panels.

Where the peak building load is concerned, if this cannot be determined from documentation, “Rules of Thumb” are recommended as a means to achieving this. I am sorry to rock the boat here, but having spent many years on the development of precision load calculation software, this is simply not good enough.

There are many factors to consider to derive a meaningful figure for load, as it is a function of solar movement, time lag, height correction, environmental mean radiant temperature calculations, dry bulb versus resultant calculations, latent gains, the associated psychometrics and numerous other factors. A so-called Rule of Thumb figure could wildly misrepresent the true and actual situation, and the whole basis of the calculation for the building could be, at best, inaccurate, and at worst completely misleading.

I have further serious concerns, particularly in relation to the refrigeration circuit and potential safety issues. However, this is too big a subject for

one column. I will return to them in the next instalment of… *An Inspector calls*.

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