Project Profile

Project Description:	**Gilbert Bain Hospital, LTHW System Upgrade**
Location:	Gilbert Bain Hospital, Lerwick, Shetland
Client:	NHS Shetland
Project Value:	£150K
Project Duration:	November 2012 - May 2014
Sector:	Healthcare

Callidus Design was appointed by NHS Shetland to retrospectively produce as-fitted drawings of the Low Temperature Hot Water System in the Gilbert Bain Hospital, Lerwick. The hospital complex has been extended in several phases over the last few decades and comprehensive as-fitted drawings of the entire hospital had never been created during those prior works. Once the existing system was fully documented, the distribution network was analysed to determine the root causes of overheating in some parts of the hospital and underheating in others. In addition, a comprehensive study was carried out to determine why the system Differential Temperatures (ΔTs) were so low.

The hospital is served from the District Heating System operated by SHEAP (Shetland Energy and Power Ltd) and as with all District Heating systems, the key in energy saving is to widen ΔTs as much as possible to minimise the hydraulic pumping costs. Before embarking on the project, the average ΔTs were in the region of only 2-3DegC. Having documented the whole of the LTHW system, the results of the analysis pinpointed the areas which were resulting in very low ΔTs which were reflected back onto the District Heating system. For each instance, a redesign of the local hydraulic circuit was carried out. In addition, all of the individual hydraulic circuits were converted from 3-port (constant volume) to 2-port (variable volume) circuits. In order to facilitate the variable volume, all of the original fixed speed pumps were replaced with inverter-driven pumps set for constant pressure control.

One negative aspect of widening ΔTs is the use of LTHW as the primary means of heating for Domestic Hot Water (DHW) Cylinders. The standard coils in these cylinders tend to be designed on a traditional 82/71DegC

temperature range and use multiple passes of primary water to raise the temperature of the Domestic Hot Water. The DHW Cylinders already installed were still in good condition and therefore their replacement was not necessary or warranted. Therefore, they were converted to a single pass, wide ΔT Primary Flow by the addition of an external heat exchanger and a small charging pump. With the heat exchange process taking place outside the cylinder the internal coil became redundant.

When all of the works were complete and commissioned, the ΔTs in each of the hydraulic circuits widened considerably, some to as much as 30DegC. The average ΔT reflected back onto the District Heating System widened to a more satisfactory 20DegC. The addition of Building Management System (BMS) sensors permitted the end users to monitor the ΔTs in each of the plantrooms around the hospital so that any circuits which started to exhibit lower ΔTs could be quickly identified and addressed to keep the hospital's LTHW system (and the District Heating System) working in an optimal manner.