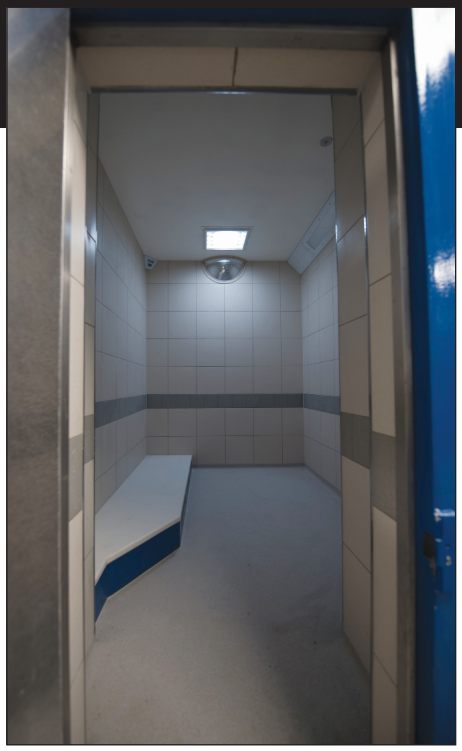
Light in dark places



When proposing plans for a much needed new police station in the centre of Cardiff, the building designs had to meet the demands for a modern police facility whilst containing the new building on a restricted city centre plot. The shape of the land dictated a tall building with office space on the upper levels, but that meant the custody suite had to be underneath, with no provision for natural light into the cells. With ordinary cell windows not an option, the challenge was to get the light into the cells by another method. But the provision of natural light into the cells at Cardiff was not going to be a 'run of the mill' piece of engineering.

The problems that needed to be overcome were huge from a technical, engineering and installation point of view. But without a solution to the daylight issue, the viability of the whole project looked to be in jeopardy.

The building designers looked to resolve this with the use of a series of Tubular Daylighting Devices (TDDs) to bring light down into the cells. Light had to be gathered at anytime of year and anytime during the day from a latitude of 51 degrees north. It then needed to be transmitted up to 30 meters in tubes, passed through an atrium roof and a concrete cell ceiling. It had to be turned through 180 degrees and sometimes divided between 3 cells. The tubes had to share the space in the ceiling void with all the other services, and whist still delivering an acceptable amount of light into each cell in line with legal requirements.

The contractor, in conjunction with the Cardiff Police Authority, then approached the UK's TDD suppliers to discuss and establish the viability of each manufacturers system, as to whether they could deliver on the challenge set by the buildings' requirements. Of all the system providers approached, only Solalighting, the UK suppliers of Solatube Daylighting Systems, offered a glimmer of hope to the contractor. All of the other suppliers approached insisted that it could not be done and was out of the operating range of any TDD available. In fact, the Solalighting team had their doubts and so insisted on some independent testing at the BRE (Building Research Establishment) to ensure the proposed systems were fit for purpose in a custody environment and would deliver the required level of natural light into the cells over the large distances involved before committing to the project.

The first problem to overcome was to gather the light. This was achieved by installing high efficiency, south facing reflective collectors. The Solatube domes were specially developed for northern latitudes using ultra clear plastic and a high efficiency reflective housing. This collector unit sits on top of the tube and is tilted south. The dome is designed to channel and reflect the maximum amount of light down into the tube, with minimal loss. The patented LightTracker reflector system is particularly effective during winter months, early morning and evening when the sun is low in the sky. It reflects and redirects the low angled light into the tube; this is light that would otherwise have passed straight through the dome and been lost. The domes are fixed with rivets for added security.

Once collected, the light has to travel through tubes to the cells below. The tubes are constructed from light-weight anodised aluminium that has been internally laminated with an ultra-thin film that reflects 99.7% of all light striking its surface. The film is called Spectralight Infinity and is the world's most reflective material. Its use is unique to Solatube and is 1.7% per bounce more efficient than its nearest rival. This may not seem like much of a difference, however when the light is being reflected well over 100 times on its journey to the cells, this difference equates to a huge increase in the available light to each cell.

The 530mm diameter tube sections are manufactured in standard 610mm lengths and are fully interlocking to enable rapid installation to the required length. Special bracketing to hold the tubes to the wall was developed for the Cardiff job, because of the unusual lengths involved.

Some of the TDDs are split into 3 branches before they reach the cells. This is achieved by utilising branch tubes laminated with the same Spectralight Infinity film. The branching can only be done, because the system is so efficient at transmitting the gathered light. It also enables smaller diameter tubes, as small as 250mm diameter, to be used on the branched sections. This enables less tubing to be needed from the roof and also uses less space in the crowded services area above the ceiling. The branched junction is sealed to prevent moisture and insects from gaining entry and affecting the reflective properties or to use the system to infest the building!

The light is then delivered into the cell through a square, high security double glazed Fresnel diffuser that spreads the light evenly into the cell and also reduces glare. The occupant sees light shining through each Fresnel lens, not dissimilar to the effect of a standard cell window.

The station came into operation in Autumn 2009, having been signed off by the home office as fit for purpose, meeting the light level requirements for compliance with European legislation. This was due in part to the innovative technology of the Solatube system, without which, the custody suite could not have been completed and the whole project would have needed to be redesigned.

To obtain further information or a brochure, please contact Solalighting directly on 01234 241466 or visit the website at www.solatube.co.uk