CASE STUDY

RADIANT SHINES IN CORPORATE HEADQUARTERS

When Schluter-Systems, a German-based company that makes membranes and insulated support products used in plumbing and hydronic projects, built its Canadian headquarters in Montreal, the company decided to put its engineering prowess to the test.

The 66,000 sq. ft. LEED Gold facility uses a combination of low and high inertia zones to balance comfort and costs. A high-inertia zone is used in the warehouse and workshop area, while a low-inertia zone encompasses the office, meeting rooms, lobby, and lunchroom.

The office area uses a hydronic radiant system throughout the surface of the ground floor, while the second and third floors are equipped with radiant on a 20-foot perimeter of the spaces.

Did you know?
The system at Schluter has more than eleven miles of radiant tubing laid in the slabs.

MECHANICALS ON THE PROJECT:
- Canadian Tunnel (passive geothermal) to precondition the fresh air. This alternates with a solar wall, as outside conditions warrant.
- Reverse-flow high-mass energy exchanger.
- Rainwater harvesting system.
- Ultra low-flush toilets.
- Greywater harvesting system.
- Waterless urinals.
- Battery-less, photovoltaic-powered motion-activated faucets and flush valves.

THE COMPOSITION OF THE LOW MASS FLOOR:
- A 4" concrete slab poured on a steel deck;
- A soundproofing membrane;
- Schluter's own Bekotec panels, which act as the piping support grids, insulation and over-pour leveling reference;
- HePex piping;
- A 3/4" thermal floor self-leveling over-pour;
- Schluter's Ditra uncoupling membrane; and
- A porcelain tile surface.
to address the solar heat gain absorbed by the floor and prevent it from being retransmitted to the space by convection.

The system is not actually trying to cool the space with the floor, but rather is preventing it from warming up. That may seem to be a subtle difference, but it is fundamental to the issue of comfort. The floor never drops below room temperature, but neither is there any gain.

In heating mode, the floors handle the majority of the load. The adjustment and trim capacity are taken care of by local heat pumps.

Local DDC controls maintain set points while supervising slab temperature and dew point conditions. Slabs are monitored to maintain a 2°C delta T above dew point temperature at all times. In heating mode, the slabs are kept at a minimum of 20°C in unoccupied periods. This is done to avoid cold mass effect in the morning, even though the air side has a lower unoccupied set point.

By contrast to the office areas, the warehouse and workshop floors have heavy-mass, high-inertia floors. This area is served by limited glazing (window openings) so most of the natural light is supplied by skylights that have very limited contribution to the space heat gain. As such, the load does not suffer rapid changes due to solar heat gain. Occupancy is stable as the plug load, which in turn means that fast response of the floors is not a requirement.

Due to the nature of their function, these floors are 12" thick and very heavy. Their high inertia allows for stable temperature conditions, and the heavy slab is able to store energy.

In hot summer conditions, if the outside temperature rises more than 25°C by 9 a.m., the warehouse slabs are cooled down to 18°C until noon, at which point the chilled water supply is cut and the mass of the slab is left to play its role.

This strategy frees capacity to actively serve the office side. By using the slab as thermal mass storage, it is possible to downsize the cooling plant by 20 per cent. Since the building uses a geothermal cooling plant, that downsizing represented a substantial initial capital cost reduction for the building.

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**CUSTOMIZED CONTROL**

Suppose during an unoccupied period, such as a Saturday morning, a member of the staff has to enter the premises. He enters the underground garage using an access card. This opens the garage door, disarms the intrusion system, lights up the garage, authorizes elevator operation, lights up the path to his sector, lights up his office or work area, and re-establishes occupied set points to normal comfort settings. Upon his departure, the system will automatically reverse it all, returning the building to its unoccupied settings.