

- Temperatures as high as 80 degrees F are needed to maintain proper comfort levels for occupants, most of whom are clad in swimming suits.
- Elevated corrosion potential due to the introduction of pool treatment chemicals carried to all areas of the building by the movement of air heavily laden with moisture. When this settles on internal surfaces and condenses, there is a potential for corrosion to occur.
- Provide long-term value and performance for the owner.

Thus, the roof system of the natatorium was designed with two purposes in mind. It had to do more than keep the harsh Iowa winter weather outside; it must also respond to these internal stresses successfully in order to achieve its intended purpose.

The following considerations were used in the design and specification of the roof system.

- Diminish the vulnerability of the metal joists, decking, shim plates, and fasteners to corrosion from airborne pool treatment chemicals, and oxidation resulting from the high moisture level inherent in the natatorium.
- Minimize the number of fastener penetrations through the structural decking to reduce thermal bridging from the interior to the exterior.
- Contain the moisture within the "shell" of the natatorium where it could be treated by the ventilation and dehumidification system.
- Reduce the visibility of fasteners in the interior areas.
- Avoid opportunities for chemical-laden moist air to condense and cause damage to the structure.
- Superinsulate the roof for energy efficiency and to reduce the potential for condensation on the metal surfaces.

The YMCA is a joint-use facility developed by the Davenport Community School District and the Scott County Family YMCA. Capital funding was provided by the school district and the operating funds for the facility are provided by the YMCA.

Corrosion Protection Measures

Considering the corrosive atmosphere of the natatorium, a special coating product was selected that had previously been used successfully in this type of environment to protect the structure. The Tnemec product, a 9-mil epoxy polyamide coating, is designed for use in harsh, corrosive environments. The product not only inhibits chemical corrosion, it also resists the passage of moisture. The steel joists, shim plates, and decking were coated on all sides and edges prior to the installation of the roof and insulation system.

As another layer of protection (and to minimize the visual impact of any anchoring penetrations), after the installation of the roof system, a second coat of the special coating was applied to the interior side of the steel decking and roof joists.

Roof Anchorage Considerations

Each metal anchor provides an opportunity for thermal transmittance to the exterior; therefore, considerable effort was made to minimize the quantity of these fasteners.

Thermal bridging goes both ways, depending on the relative indoor/outdoor temperatures.

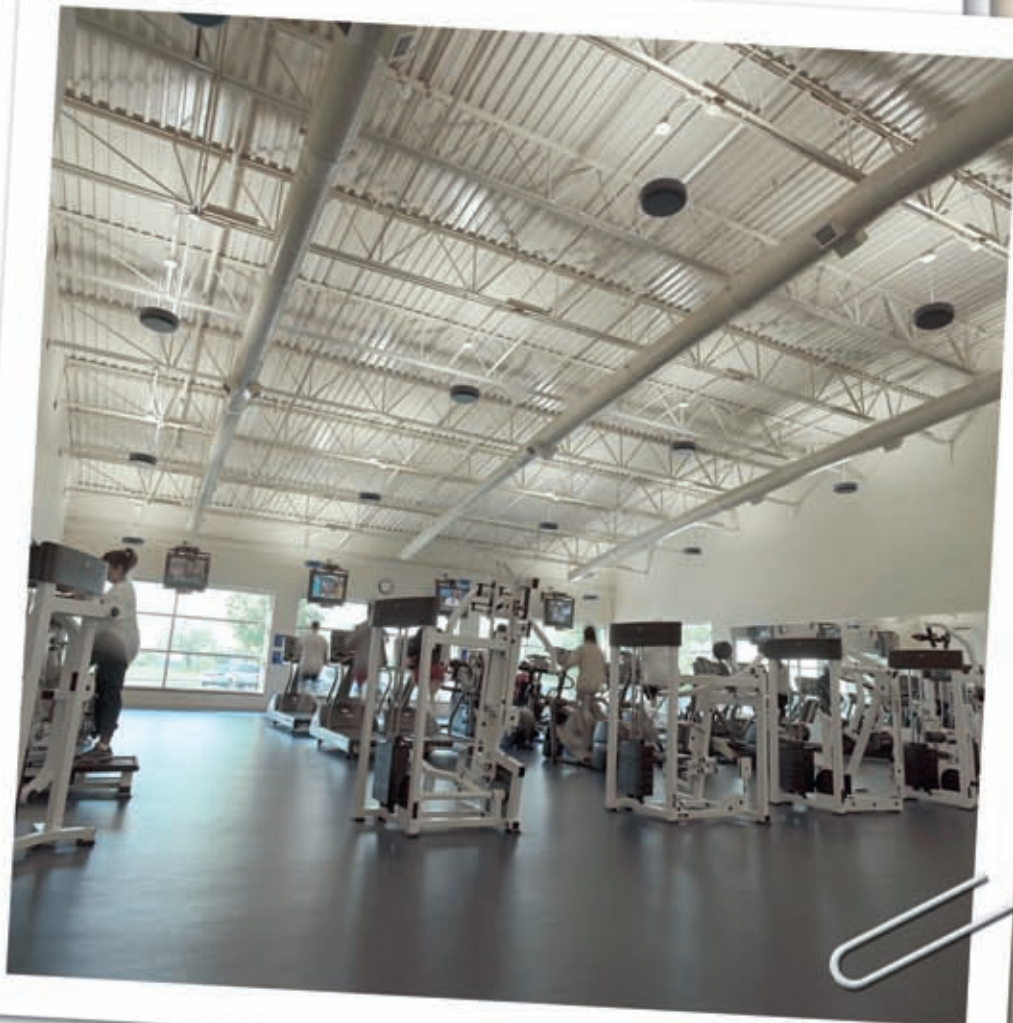
These fasteners were then topped with Neoprene-gasketed sealing caps to provide added sealing protection. All anchors were specified to be placed at the top flute of the corrugated metal deck, where the visual impact was diminished.

The metal roof system was installed according to UL 216A, using stainless steel fasteners and clips that provided the required uplift class of UL-90. This reduced the quantity of fasteners required to anchor the metal roof system to the galvanized deck to only one clip per four square feet (about half the norm).

Vapor Containment Measures

Careful attention was paid to the high humidity level in the atmosphere of the natatorium. The typical roof vapor retarder in the Midwest region is polyethylene sheeting with a perm rating of about .5.

For this project, however, that would not meet the needs to minimize vapor migration into the structure of the building. Instead, a





The YMCA's curved roof profile complements the recently-constructed auditorium (left). All roofs visible from the ground are metal finished to match the color of the roof on the auditorium addition.

self-adhering modified bitumen membrane vapor retarder was installed directly over the galvanized metal decking to further isolate the moisture-laden air from passing into the insulation and condensing. This material had a perm rating of 0.025, considerably less than the polyethylene. This greatly enhanced the ability of the design to keep the moist air inside the natatorium where it could be treated with the ventilation and dehumidification system.

Super Insulation Benefits

The super-insulated roof system provides long-term benefits to the owner, including improved energy efficiency and less opportunity for condensation to occur in the roof system. The 4.5 inches of polyisocyanurate insulation exceeded the energy code requirement by 36% at very little extra cost and added benefit to the owner.


In addition, the thicker insulation layer greatly reduced the potential for corrosive condensation to occur. This was of particular concern in the winter where there is a tendency for warm, moist, chemical-bearing air to travel to the dry exterior environment.

The insulation system was installed using one stainless steel fastener per four square feet to hold the insulation in place on the slope of the barrel-vaulted structural base during construction. The specifications required the contractor to penetrate the metal roof deck only at the top flute of the decking to reduce the visibility of anchors.

A self-adhering modified bitumen roof membrane was installed over the insulation system to protect the insulation from the

elements and to provide ice and water protection from moisture entering from the exterior, and condensation from under the metal roof.

Excellent Results Achieved

The roofs had two purposes: to protect the interior from the elements and to protect the roof system from internal corrosive forces, prolonging its performance and useful life. The owner received outstanding long-term value through the use of this roofing system. The attention to every detail of the roof system construction resulted in a symbiotic effect – a roof system that is far greater than the sum of its parts. 

DEDICATED TO BILL STEVENSON



This article is dedicated to William "Bill" John Stevenson III, PE, RRC, RRO, CDT, who died August 4, 2005, in a drowning accident. Bill was a 17-year employee of Shive-Hattery, where he established the Building Envelope Team in the West Des Moines, Iowa, office. He is survived by his wife of 25 years, Anita, and four children: Laura Stevenson of Chicago, Michael Stevenson of Iowa City, and Kayla and Erica Stevenson, at home. Shive-Hattery has established a memorial fund. Contributions may be directed to the Bill Stevenson Children's Scholarship Fund, c/o U.S. Bank, 520 Walnut Street, Des Moines, Iowa, 50309.

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