

THEORY & DESIGN OF STRUCTURES IV



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Stadium Roofs

STADIUM ROOFS

Stadiums for professional sports and world-class competition are increasingly technically complex and high profile. Project teams design and build these facilities under the glare of the media, on tight schedules, and with financing often dependent on the largess of voters.



STADIUM ROOFS

The addition of a roof to a stadium, along with the long-span structure required to support it and maintain clear sight lines from the stands to the playing field, compounds the pressures on the design and construction team responsible for an already challenging project. And an operable roof, which necessitates an enormous mechanical device at the top of the building, adds yet another layer of complexity. "Hire a good structural and mechanization consultant," advises one architect.



STADIUM ROOFS - SPORTS STADIUMS

The following is a list of covered sports stadiums, ordered by capacity; that is the maximum number of spectators the stadium can accommodate for a sports event. This is intended to include only stadiums that are used for sports traditionally held outdoors. It is split into two sub lists:

- *) Stadiums designed for field sports, such as baseball and any of a wide variety of football codes.
- *) Tennis stadiums (a traditional outdoor sport, but with a much smaller playing area)

Only domed and retractable roof stadiums are included, i.e. stadiums that cover both spectators and playing field. The stadiums are divided into current stadiums, closed stadiums, stadiums currently under construction, and planned stadiums.

Retractable roof

A retractable roof is a roof system designed to roll back the roof on tracks so that the interior of the facility is open to the outdoors.

Retractable roofs are sometimes referred to as *operable roofs* or *retractable skylights*. The term *operable skylight*, while quite similar, refers to a skylight that opens on a hinge, rather than on a track.

Retractable roofs are used in residences, restaurants and bars, swim centers, and other facilities wishing to provide an openair experience at the push of a button.

HISTORY

The United States Patent and Trademark Office (USPTO) shows that David S. Miller, founder of Rollamatic Retractable Roofs, filed a patent in August 1963 for a *movable and remotely controllable roof section for houses and other types of buildings. As Rollamatic was founded five years earlier, the first installation of a motorized retractable roof must be between 1958 and 1963.*



Shapes and sizes

While any shape is possible, common shapes are flat, ridge, hip ridge, barrel and dome.

A residence might incorporate one or more 3' by 5' retractables; a bar or restaurant a retractable roof measuring 20' by 30'; and a meeting hall a 50' by 100' bi-parting-over-stationary.



Sports venues

Stadium retractable roofs are generally used in locales where inclement weather, extreme heat, or extreme cold are prevalent during the respective sports seasons, in order to allow for playing of traditionally outdoor sports in more favorable conditions, as well as the comfort of spectators watching games played in such weather. Unlike their predecessors, the domes built primarily during the 1960s, 1970s, and early 1980s, retractable roofs also allow for playing of the same traditionally outdoor sports in outdoor conditions when the weather is more favorable.

Sports venues

Another purpose of retractable roofs is to allow for growth of natural grass playing fields in environments where extreme hot and/or cold temperatures would otherwise make installation and maintenance of such a field cost prohibitive. Installations throughout the world employ a variety of different configurations and styles.

Types of stadium retractable roofs

Architecturally speaking, retractable roofs vary greatly from stadium to stadium in shape, material and movement.

For example, Miller Park has a fan style roof, while Toyota Stadium in Japan has an accordionlike roof. Most retractable roofs are made of metal, while some, such as the roof of University of Phoenix Stadium, are made of water resistant fabric.

Although each retractable roof differs in these aspects, Safeco Field's roof is unique in that it is the only one in North America that does not form a climate controlled enclosure when in the extended position; rather, it acts as an "umbrella" to cover the playing field and spectator areas during inclement weather, with no side walls enclosing the stadium.

Miller Park



University of Phoenix Stadium



Alternatives to retractable roofs

Some modern athletic facilities are using affordable, less complex roof systems that resemble retractable roofs in appearance and effect. These roof systems, commonly referred to as open roofs, are constructed with similar materials as retractable roofs. Most open roof companies offer polycarbonate or tempered glass roofs for safer sports play and durability. Hinged at the structure's gutters, open roofs fully close and open by the mechanics of a rack and pinion system or a push/pull drive system.

Alternatives to retractable roofs

Comparable to the benefits of retractable roofs, open roof systems offer players yearlong usage, protection from inclement weather when needed, and the feeling of an outdoor environment. Open roofs are typically seen at smaller athletic venues such as country clubs and universities. Both retractable roof and open roof systems are also used in the construction of commercial greenhouses and garden centres for climate control purposes