# Baxter Laboratories Dining Hall, Deerfield, Illinois (USA)

Autor(en): **[s.n.]**

Objekttyp: **Article**

Zeitschrift: **IABSE structures = Constructions AIPC = IVBH Bauwerke**

Band (Jahr): **6 (1982)**

Heft C-23: **Selected works of Fazlur R. Khan (1929-1982)**

PDF erstellt am: **16.05.2024**

Persistenter Link: https://doi.org/10.5169/seals-17605

## 9. Baxter Laboratories Dining Hall, Deerfield, Illinois (USA)

| | |
|---|---|
| *Owner:* | *Baxter Travenol Laboratories, Inc., Deerfield, Illinois* |
| *Architect-Engineer:* | *Skidmore, Owings & Merrill, Chicago, Illinois* |
| *Contractor:* | *Morse/Diesel, Inc., Chicago, Illinois* |
| *Roof fabrication & erection:* | *Wendnagel & Co., Chicago, Illinois* |
| *Completion date:* | *1975* |

Baxter Laboratories Dining Hall (Fig. 1) is a two-story building used as employee cafeteria and lounge. It was designed as a cable-supported roof system in order to create large column-free spaces. The use of tension characteristic of steel cable permitted a light, thin, plate-like roof framing as shown in Fig. 2.

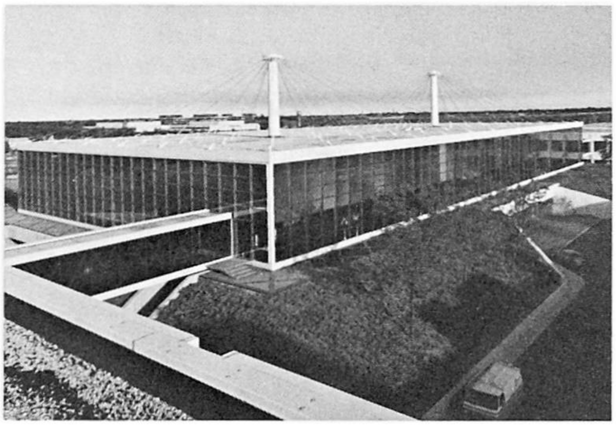

*Fig. 1 The suspended roof system for Baxter Laboratories Dining Hall*

The two masts supporting the deck, located symmetrically, create the balanced cantilever system. Thus, a strong suspended plane was created which offered a 144 ft. x 288 ft. open area required for use, with only 6.5 lbs. per sq. ft. of framing steel.

**Structural System**

A column-free space was the main requirement for Baxter Laboratories Dining Hall. The cable-supported roof system was selected due to its structural efficiency and unique architectural features. The system provides large column-free space and open perimeter where light window wall could be installed. Symmetric location of mast and use of natural load-flow mechanism through tension in cable limited the stress resulting in a highly efficient and a very light roofing system. The 48-1.375 in. dia. tension cables suspended from each mast support the roof deck at each node of the roof's 24 ft. framing grid (Fig. 3). The roof deck acts as compression chord and carries self-load between the nodes spaced 24 ft. on centers. The roof system is stiffened by 24-3/4 in. dia. lower cables which hold down the roof grid on its underside. This cable system acts as a stabilizer for the vertical dynamic oscillations under wind forces which induce uplift in the roof system. Another 36 lower cables run vertically at 24 ft. intervals around the building perimeter. The function of these cables is to minimize the framing edge vertical deflections under wind or unequal snow loads, and thus permit a practical window wall detail at this interface. These cables are attached to top of perimeter nodes of the roof frame and at the bottom to the building foundation. The perimeter cables are concealed in every fourth mullion of the curtain wall.

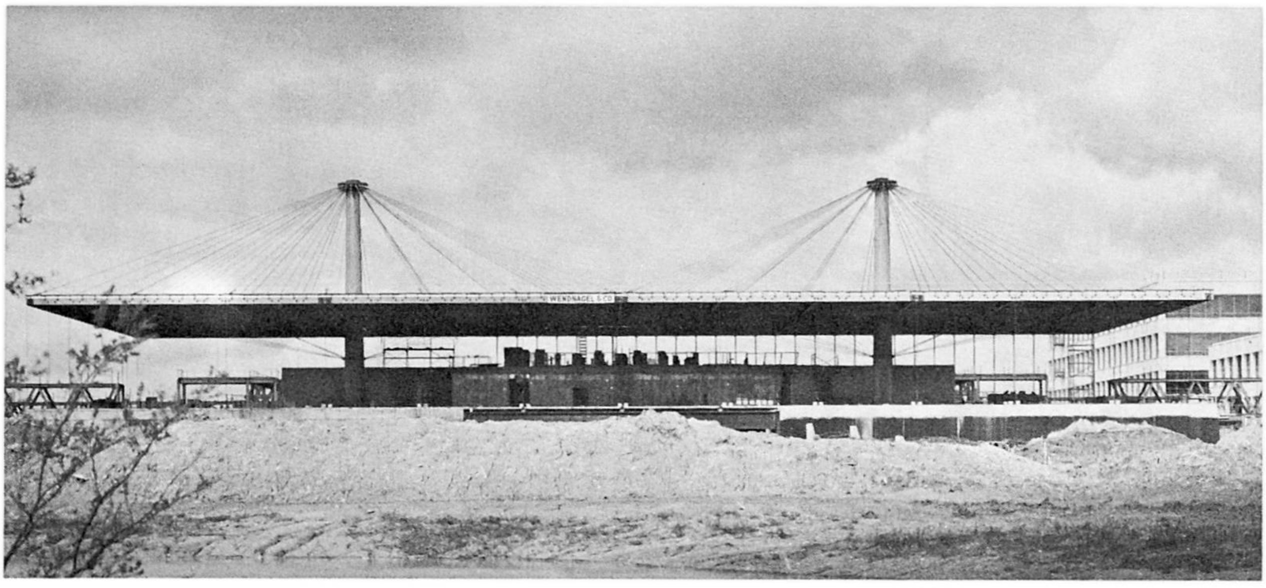

*Fig. 2 Roof under construction showing cable system*

The masts are located symmetrically from the roof perimeter to create a balanced cantilever condition and thus reduce cable stresses. The height of the masts was determined primarily by a length that would permit the cables to hang at angles which optimize their efficiency. The masts rest on 80 ft. (24.39 m) deep caissons and rise 35 ft. above the roof. The lower portion of each mast is a cast-in-place concrete cylinder 6 ft. (1.83 m) in diameter. At the second floor level, the mast continues upward as a steel shaft that tapers to a 3 ft. 9 in. (1.14 m) diameter at its top. This upper section is filled with concrete. Four roof drains are located inside each mast. By varying the length of the cables, the roof was pitched toward the masts.

All roof girders and diagonals are 18 in. (45.72 cm) deep steel sections and weigh about 6.5 lbs. per sq. ft. The roof framing has a 4-1/2 in. (11.43 cm) metal acoustical deck topped with tar and gravel. The framing is exposed internally. The deck is placed diagonally to the framing to increase the diaphragm stiffness and also to reduce the deck span.

***Slip joints*** – Movement between the roof and curtain wall is accommodated with vertical slip joints. These units, which contain fluorocarbon pads, are placed at the top of each mullion to allow vertical as well as a slight lateral movement.

***In-place fabrication*** – The roof fabrication was done in place, rather than at ground level, to provide greater control over critical tolerances. In-place fabrication was chosen in particular to avoid problems anticipated in the event any corrective work was required. During fabrication, the roof was supported by scaffolding columns at every node. Upper and lower cables then were installed and tensioned. Final tensioning of the upper cables raised the roof about 1/8 in. (3.2 mm), allowing the scaffolding columns to be easily removed. Tension in the cables varies from 70 to 90 ksi (482 to 620 MP).

Tension anchors that protrude through the roof and provide connection for the cables were shop fabricated and installed. Every arm had to be positioned at an angle that would transfer stresses in a straight line. This critical positioning was done more in the shop. Full penetration welds were made at the nodes.

The Baxter roof system is modular, in that each part can be reused in a variety of clusters to create large open spaces.

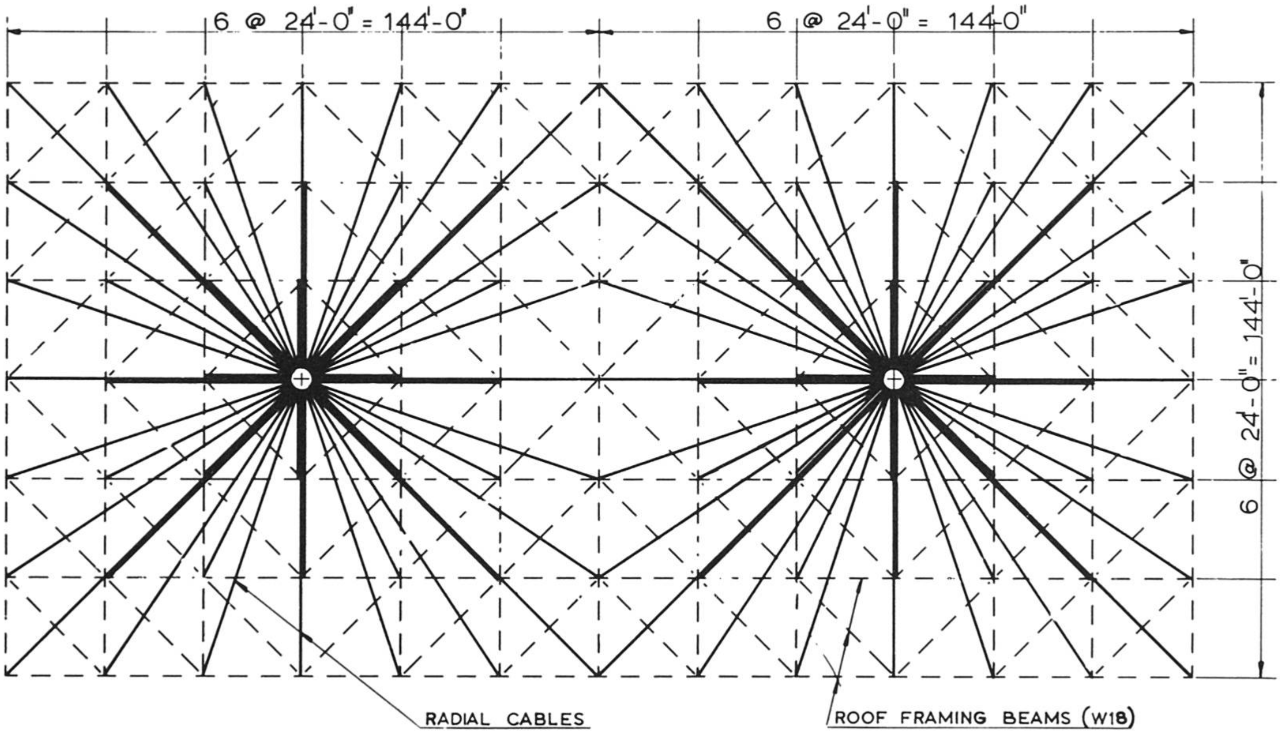


*Fig. 3 Roof framing and cable plan – Baxter Laboratories Dining Hall*