

STRUCTURAL solutions





Structuring UT's Unique Brain Performance Institute in Dallas

By Thomas Taylor, PE

The Brain Performance Institute™, part of the Center for BrainHealth® at The University of Texas at Dallas, delivers science-based innovations that enhance how individuals think, work, and live.

The institute opening in September, 2017 and is a one-of-a-kind facility. Here is a description of the structural challenges that exemplify how Datum's processes help drive creative solutions for unique circumstances.

- ↓ The architects envisioned a Live Lobby composed of exposed structural steel.
- ↓ The engineering complexity of an exposed steel structure exceeded the university's budget.
- ↓ Serious engineering and architecture discussions ensued to identify the best way to accomplish the vision and meet the budget.

Datum focused on three structural concepts that would contribute to accomplishing the goal. The following three structural solutions contributed to the successful completion of this project within the budget...while retaining the architects' vision.

Datum's Process and Solution for Funding the Live Lobby

- We devoted considerable attention to creating an economical structural solution for the three-story structure that wrapped around the side and rear of the lobby. This provided funds that could be transferred to the lobby project.
- Extensive coordination between the architect and Datum resulted in the most economical structural bay spacing for the three-story wrap-around which also worked well with the functional use of the space.

- The most economical roof joist spacing over the lobby was 10'-0" o.c. These joists were spaced to straddle the steel plate columns and to be supported on the connection beam between the plate columns to avoid costly connection details to the 2" face of the steel plate columns.
- The steel beams on the second and third floor, supported by the steel plate columns, were detailed to straddle the columns as well. This simplified and reduced the cost of the joist and beam support details for the roof and the floor.
- A composite steel floor and a bar joist roof were selected to be the most economical system for the wrap around building.
- THE RESULT: This attention to the cost of details and the reduction in steel tonnage provided funding for the higher cost Live Lobby.

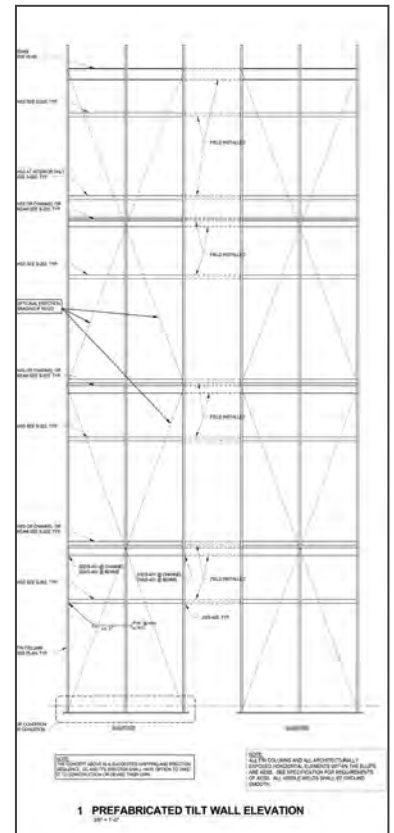
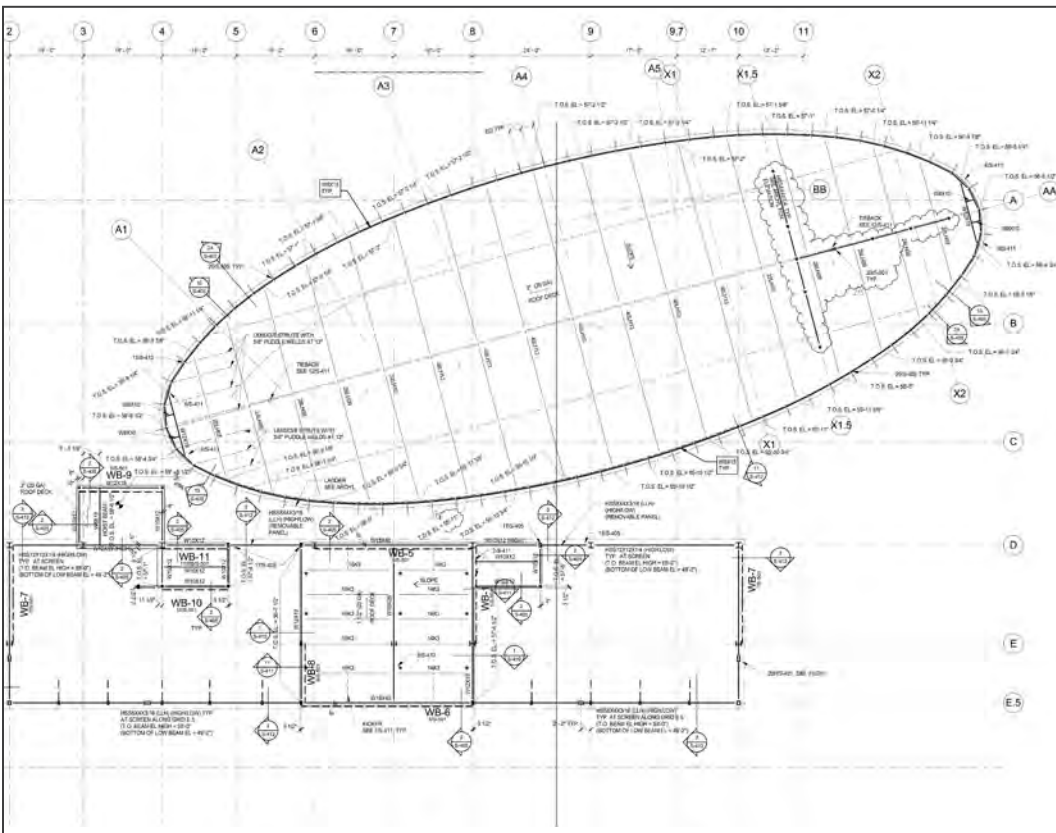
- Horizontal steel 4" x 4" x 1/2" tube struts were added to the structure at 12'-0" o.c. and welded to the vertical steel plate columns to reduce the unbraced length and twist of the columns.
- The architect needed to increase the plate columns to a 30" depth for sun shade and visual effect which helped the structural strength of the plates. However, the plates extended 12" beyond the supporting concrete foundation, creating an eccentric load that required additional structural analysis of the steel plate columns. Some of the columns are full height columns supporting the roof. Some support a second floor and third floor that surround the lobby.
- THE RESULT: This created numerous loading conditions for our engineers to resolve. Through research and analyses, we determined the most economical structural concept and the architect approved the appearance.

Datum's Process and Solution for Designing the Live Lobby

- Our engineers studied numerous ways to construct the perimeter columns of the lobby as single steel plates as opposed to built-up sections.
- We determined that steel plates would have to resist the wind and gravity loading on the wall with columns as slender as these 2" x 30" steel plate columns, spaced at 5'-0" o.c.
- We wanted to eliminate the added tonnage and the fabrication cost of creating built-up columns. Our research led to the following solution.

Datum's Process and Solution for Economical Fabrication/Erection for the Live Lobby

- The next pressing challenge was to determine the most economical way to fabricate and erect the steel plate column wall around the Live Lobby? The second part of this question was how to capture any savings for the owner from developing most cost-efficient.
- Often the bids reflect the best price available using traditional construction methods since the bid time does not allow for significant value engineering.
- Datum concluded that the most cost-effective solution was to prefabricate three columns connected together





in the plant and ship in 10'-0" wide sections. The sections were composed of the three steel plate columns and all of the horizontal struts and beams welded to the columns in the plant. This would leave only lifting, bracing, and attaching the three column panels in the field.

- Field connections were only 1/3 of the total connections, as 2/3 of the connections were more economically installed in the plant.
- Due to the geometry and curvature of the wall, some panels were constructed of two columns.
- To capture savings for the owner, we added details on the structural drawings showing the columns to be prefabricated into panels in the plant.
- This concept, a tilt wall system, was added as an option on our drawings to allow the steel fabricator/erector to search for less expensive methods that may better fit their capabilities. However, no other process was presented by the bidders
- **THE RESULT:** Our tilt wall solution articulated in the structural drawings allowed the owner to achieve significant savings.

