



ADF Engineering

PROBLEM SOLVED

PROJECT SHEET: Tubular Conveyor Gallery

CLIENT: Bulk Material Storage and Transload Facility

PROJECT: Tubular Conveyor Gallery consisting of thin wall steel shell

BACKGROUND: The client approached ADF Engineering to design a bulk material storage and transloading facility in the Chicago Area. As part of the project, our Structural engineers were tasked to design a conveyor bridge to transfer the product from the receiving tower to the dome type storage silo. The conveyor support bridge had several challenges.



CHALLENGES:

- Had to be free spanning (134') because intermediate supports would have interfered with emergency vehicle traffic.
- Despite being in Chicago area, it needed to be completely sealed weather-tight due to the product being extremely sensitive to moisture.
- Need to provide both personnel access to the dome headhouse as well as a trolley system to replace conveyor screws.
- Needed to support conveyor's heavy gravity and dynamic loads, resist high wind loads, and to be cost efficient to construct and maintain.

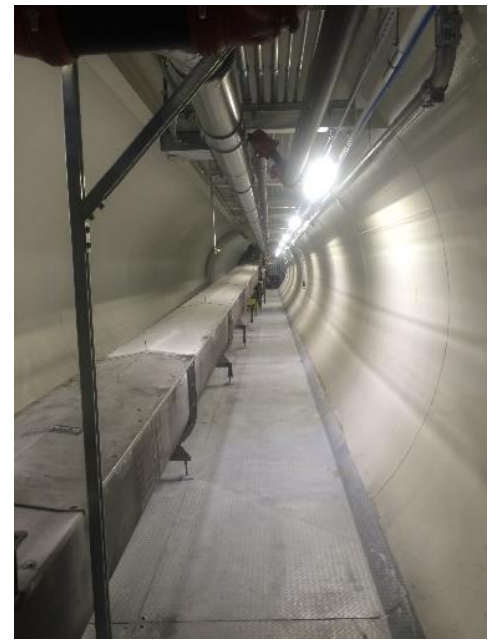
WORK COMPLETED:

This project was designed as a portion of a new facility design on an accelerated timeframe in order to complete construction to harvest the Fall crop. The design of the Tubular Conveyor Gallery included:

- Comparing options between an open box truss-type bridge with additional architectural panel attachments for weatherproofing vs a continuous tube steel shell structure. The Tube shell structure was selected based on the following considerations:
 - Fabrication & shipping costs – Tube was fabricated off site, on site assembly was limited to (2) bolted flange splices.
 - Installation costs – Tube was designed to be installed as a single lift.
 - Maintenance and durability – solid thin wall shell structure eliminates possible leaks due to flashing failure.
- Sizing of Tube diameter and thickness.
 - 12'-6" diameter selected based on required vertical clearance for trolley system as well as limiting overall deflection criteria for deflection sensitive screw conveyors.
 - Tube plate thickness selected for required bending strength. Thickness was reduced at the ends of the span to help reduce weight and material cost
 - Grade of steel was selected A36
- Design of ring stiffeners to resist shear stress, both during operation as well as while being lifted during installation.
- Connection design for both tower and silo end supports. Including additional stiffener rings & saddles, pinned type connections to resist lateral movement, and roller type connections with Teflon slide plates to allow for thermal expansion/contraction of the tube throughout the year.

SUMMARY:

Thin wall steel shell structures are an excellent alternative to a traditional box truss-type bridge. Their excellent watertight ability and strength can be a designer choice for long span conveyor bridges.



For additional information on design and application of large diameter ducts, shells, and stacks, please contact djacobs@adfengineering.com

A handwritten signature in black ink, appearing to read "Derek Jacobs".

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