NESTOR R. IWANKIW

Design of Steel Bins for Storage of Bulk Solids

by Gaylord & Gaylord, Prentice-Hall, 1984

The issues related to the successful design of steel bins, bunkers, silos and tanks for the storage of granular materials are of a rather specialized nature that go beyond the usual training and experience of most structural engineers. The type of stored bulk solid and its mechanical properties are important considerations which affect the functionality of various possible vessel sizes and shapes. And last but not least, the structural capacity of the various curved steel plate elements must be ascertained. With this range of technical questions, a single design guide has long been needed by the profession.

And now, after many years of dedicated research and writing effort, an authoritative text is available. Professors Edwin and Charles Gaylord are the co-authors of this complete and self-contained book which discusses basic concepts and terms for beginners as well as the necessary theory and equations for various design applications. Some of the developmental research for the text material was funded by the American Iron and Steel Institute (AISI). Numerical examples are interspersed to illustrate the recommended procedures.

The first few chapters address general background information on storage vessels and accessories, construction materials and properties of bulk solids. Functional and geometric bin considerations that affect material feeding and discharge rates and capacity, and loads, in particular those arising from the storage and movement of the granular materials, are then discussed. The sections on design of structural components cover steel beams, columns and stiffened or unstiffened plates for bins and support structures. Appropriate references to the AISI *Specification for the Design of Cold-Formed Steel Structural Members* and the AISC *Specification for the Design, Fabrication and Erection of Structural Steel for Buildings* are made. The chapter on structural design of bin roofs is significant because no relevant codes or specification currently exist except for limited information that may be referenced from containment vessel standards. The design of flat or curved plate elements is addressed for both self-supporting and supported spherical domes and conical roofs. A full chapter is devoted to the structural design of the steel bin itself, including a review of membrane theory of shells together with bending and shear edge effects. Foundations are the subject of the final chapter, which covers footings as well as piers and piles.

Overall, the book is well written and substantive. It presents the state of the art of steel bin design and deserves the attention of engineers practicing in this field.

Nestor R. Iwankiw is Assistant Director of Research/Engineering, AISC, Chicago, Illinois.