ASME SBS-2023

Structures for Bulk Solids

AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers

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The American Society of Mechanical Engineers

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FOREWORD

ASME was approached about developing a standard appropriate for structures for storage of bulk solids that operate at atmospheric pressure or very low internal gas pressure, where the primary loading of the structure was from storage of bulk solids versus gas or liquid pressure.

There was no comprehensive American standard for such metallic structures, and other standards for vessels or tanks for gas or liquid storage and containment did not have appropriate consideration of the loads and behavior of bulk solids. In some cases, these standards would not produce economical structures. Engineers designing bulk solids structures had to reference standards or references covering only certain aspects of the structures or loading, adapt portions of other codes and standards, or use various references, internal standards, or other sources.

ASME responded to this need for a recognized, more comprehensive standard by organizing a committee of knowledgeable parties. This included bulk solid structures users, manufacturers, fabricators, independent engineers, academics practicing in the field, and other appropriate interested parties, which became the Structures for Bulk Solids Committee.

A number of experts and knowledgeable interested parties have participated on the Committee over the development period, making important contributions leading to the inaugural Structures for Bulk Solids Standard. Some committee members have been active for the duration of the committee's operation; others participated and made significant contributions during their tenure with the committee. The efforts of all the contributing members and ASME Committee Secretaries and staff are appreciated and were important to bringing this Standard to publication.

While this Standard does include valuable information and requirements for designers, users, and fabricators of containers for storage of bulk solids that are within the scope of the Standard, it will not address every aspect of such structures and is not a replacement for education, experience, and the use of engineering judgment. The phrase "engineering judgment" refers to technical judgments made by designers experienced in the application of this Standard and referenced standards and knowledgeable about engineering principles involved in the design and function of such structures.

Reference and use of the Standard by appropriately trained engineers is part of the complete engineering design process and is not a substitute for such a process.

The Committee thanks ASME and the Board on Pressure Technology Codes and Standards for the longstanding support of the Committee during the development process.

This Standard was approved by the American National Standards Institute on May 30, 2023.

ASME SBS COMMITTEE
Structures for Bulk Solids

(The following is the roster of the Committee at the time of approval of this Standard.)

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General. ASME codes and standards are developed and maintained by committees with the intent to represent the consensus of concerned interests. Users of ASME codes and standards may correspond with the committees to propose revisions or cases, report errata, or request interpretations. Correspondence for this Standard should be sent to the staff secretary noted on the committee's web page, accessible at https://go.asme.org/SBScommittee.

Revisions and Errata. The committee processes revisions to this Standard on a continuous basis to incorporate changes that appear necessary or desirable as demonstrated by the experience gained from the application of the Standard. Approved revisions will be published in the next edition of the Standard.

In addition, the committee may post errata on the committee web page. Errata become effective on the date posted. Users can register on the committee web page to receive e-mail notifications of posted errata.

This Standard is always open for comment, and the committee welcomes proposals for revisions. Such proposals should be as specific as possible, citing the paragraph number(s), the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent background information and supporting documentation.

Cases

(a) The most common applications for cases are

(1) to permit early implementation of a revision based on an urgent need

(2) to provide alternative requirements

(3) to allow users to gain experience with alternative or potential additional requirements prior to incorporation directly into the Standard

(4) to permit the use of a new material or process

(b) Users are cautioned that not all jurisdictions or owners automatically accept cases. Cases are not to be considered as approving, recommending, certifying, or endorsing any proprietary or specific design, or as limiting in any way the freedom of manufacturers, constructors, or owners to choose any method of design or any form of construction that conforms to the Standard.

(c) A proposed case shall be written as a question and reply in the same format as existing cases. The proposal shall also include the following information:

(1) a statement of need and background information

(2) the urgency of the case (e.g., the case concerns a project that is underway or imminent)

(3) the Standard and the paragraph, figure, or table number(s)

(4) the edition(s) of the Standard to which the proposed case applies

(d) A case is effective for use when the public review process has been completed and it is approved by the cognizant supervisory board. Approved cases are posted on the committee web page.

Interpretations. Upon request, the committee will issue an interpretation of any requirement of this Standard. An interpretation can be issued only in response to a request submitted through the online Interpretation Submittal Form at https://go.asme.org/InterpretationRequest. Upon submitting the form, the inquirer will receive an automatic e-mail confirming receipt.

ASME does not act as a consultant for specific engineering problems or for the general application or understanding of the Standard requirements. If, based on the information submitted, it is the opinion of the committee that the inquirer should seek assistance, the request will be returned with the recommendation that such assistance be obtained. Inquirers can track the status of their requests at https://go.asme.org/Interpretations.

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Committee Meetings. The SBS Standards Committee regularly holds meetings that are open to the public. Persons wishing to attend any meeting should contact the secretary of the committee. Information on future committee meetings can be found on the committee web page at https://go.asme.org/SBScommittee.

Section 1
General Requirements

1-1 SCOPE

This Standard covers the requirements for vertical stationary containers used for the storage and processing of bulk solid materials at internal gage pressures not exceeding 15 psig (100 kPa) and external pressures, including wind pressure, not exceeding 1 psig (6.9 kPa) at temperatures up to 212°F (100°C).

1-1.1 General Requirements

This Standard contains requirements, prohibitions, and guidance for bulk solids containers, including materials of construction, solids-loading characteristics, design, fabrication, examination, testing, and overpressure protection. This Standard does not address all aspects of these elements. Those aspects that are not specifically addressed should not be considered prohibited, provided that activities not addressed are performed following recognized good engineering practices. Engineering practices shall be consistent with the philosophy of this Standard, and such judgments shall never be used to overrule the requirements or prohibitions of this Standard. Engineering requirements of this Standard, while considered necessary and adequate for safe design, generally take a simplified approach to the subject. A designer capable of applying a more rigorous analysis shall have the latitude to do so; however, the approach shall be documented in the engineering design and its validity accepted by the owner. The approach used shall provide details of design, construction, examination, inspection, and testing for the design conditions of Section 7, with calculations consistent with the design criteria of this Standard.

1-1.2 Jurisdictional Requirements

Laws or regulations issued by a municipality, state, provincial, federal, or other enforcement or regulatory body having jurisdiction at an installation may establish requirements for bulk solids containers within its jurisdiction. Such laws or regulations may require the use of this Standard for bulk solids containers or components outside its scope. These laws or regulations should be reviewed to determine size or service limitations of the coverage, which may be different than those given here.

1-1.3 Classes Not in Scope

The following classes of bulk solids containers are not included in the scope of this Standard:

(a) containers within the scope of the ASME Boiler and Pressure Vessel Code (BPVC).

(b) containers of noncircular cross section.

(c) containers with eccentric or side discharges or multiple discharge hoppers

(d) containers made from concrete, composite, thermoplastic, or nonmetallic materials. Acceptable metallic materials properties are given in Section 5. For materials not listed in Section 5, the mechanical properties from ASME BPVC, Section II, Part D shall be used.

(e) bulk solids containers used in transportation.

(f) containers that are integral parts of rotating or reciprocating mechanical devices where the primary design considerations and/or stresses are derived from the functional requirements of the device.

(g) containers whose primary function is the transport of material from one location to another within a system of which it is an integral part (e.g., piping, pneumatic, or other conveying systems).

(h) piping components such as the following:

(1) pipe, flanges, bolting, gaskets, valves, expansion joints, and fittings

(2) the pressure-containing parts of components such as strainers and devices that serve such purposes as mixing, separating, snubbing, distributing, and metering or controlling flow, provided that the pressure-containing parts of such components are generally recognized as piping components or accessories

(i) containers with an internal operating pressure exceeding 15 psig or subjected to an external pressure, including wind pressure, exceeding 1 psig (6.9 kPa).

(j) containers intended for human occupancy.

(k) containers where the principal cylindrical axis is not vertical.

(l) containers that contain substances declared lethal or highly toxic by the owner.

1-1.4 Bolted Containers Not Within Scope

Bolted metal containers storing agricultural products that satisfy all of the following criteria are not covered by this Standard: