

Guide for the Analysis, Design, and Construction of Elevated Concrete and Composite Steel-Concrete Water Storage Tanks

Reported by ACI Committee 371

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This guide presents recommendations for materials, analysis, design, and construction of concrete-pedestal elevated water storage tanks. Both the all-concrete tank and the composite tank, consisting of a steel water storage vessel supported on a cylindrical reinforced concrete pedestal, are included.

Concrete-pedestal elevated water storage tanks are structures that present special problems not encountered in typical environmental engineering concrete structures. This guide refers extensively to ACI 350 for design and construction of those components of the pedestal tank in contact with the stored water, and to ACI 318 for design and construction of components not in contact with the stored water. Determination of snow, wind, and seismic loads based on ASCE/SEI 7 is included. These loads will conform to the requirements of national building codes that use ASCE/SEI 7 as the basis for environmental loads or conform to the requirements of local building codes. Special requirements, based on successful experience, for the unique aspects of loads, analysis, design, and construction of concrete-pedestal tanks are presented.

Keywords: analysis; composite tanks; concrete-pedestal tanks; construction; design; earthquake-resistant structures; elevated water tanks; formwork (construction); load, dead; load, earthquake; load, live; load, snow; load, water; load, wind; load combinations; loads (forces); shear; shear strength; structural analysis; structural design; walls.

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Reference to this document shall not be made in contract documents. If items found in this document are desired by the Architect/Engineer to be a part of the contract documents, they shall be restated in mandatory language for incorporation by the Architect/Engineer.

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ACI 371R-08 supersedes ACI 371R-98 (Reapproved 2003) and was adopted and published August 2008.

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CHAPTER 1—GENERAL

1.1—Introduction

This document provides guidance for specifying, designing, and constructing elevated concrete and composite steel-concrete water storage tanks. Elevated tanks are used by municipalities and industry for potable water supply and fire protection. Commonly built sizes of elevated concrete and composite steel-concrete water storage tanks range from 500,000 to 3,000,000 gal. (1900 to 11,000 m³). Concrete pedestal heights range from 25 to 200 ft (8 to 60 m), depending on water system requirements and site elevation. The interior of the concrete pedestal may be used for material and equipment storage, office space, and other applications.

1.2—Scope

This document covers the design and construction of elevated concrete and composite steel-concrete water storage tanks. Topics include materials, construction requirements, determination of structural loads, design of concrete elements including foundations, design of concrete or steel tank components, geotechnical requirements, appurtenances, and accessories. Materials, design, fabrication, and construction of the steel vessel of composite steel-concrete tanks are addressed by applicable sections of AWWA D100.

Designs, details, and methods of construction are presented for the types of elevated concrete and composite steel-concrete water storage tanks shown in Fig. 1.1 and 1.2.

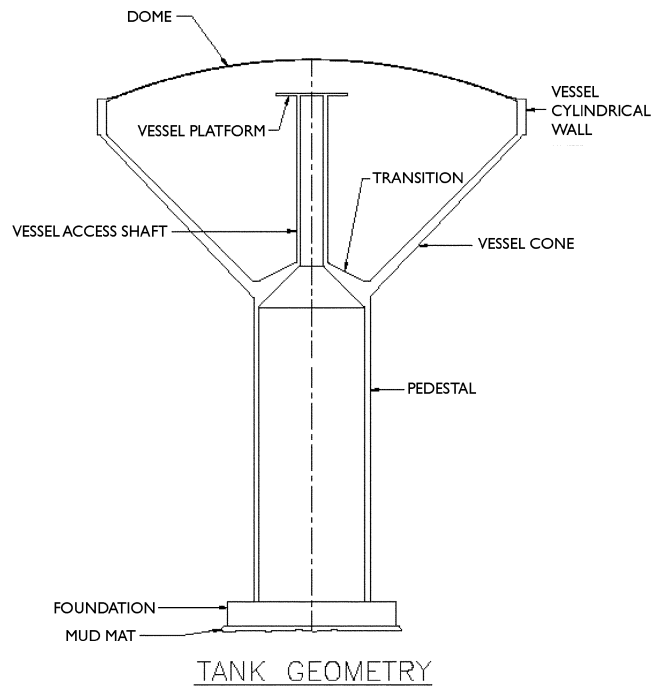


Fig. 1.1—Common configuration of elevated concrete tanks.

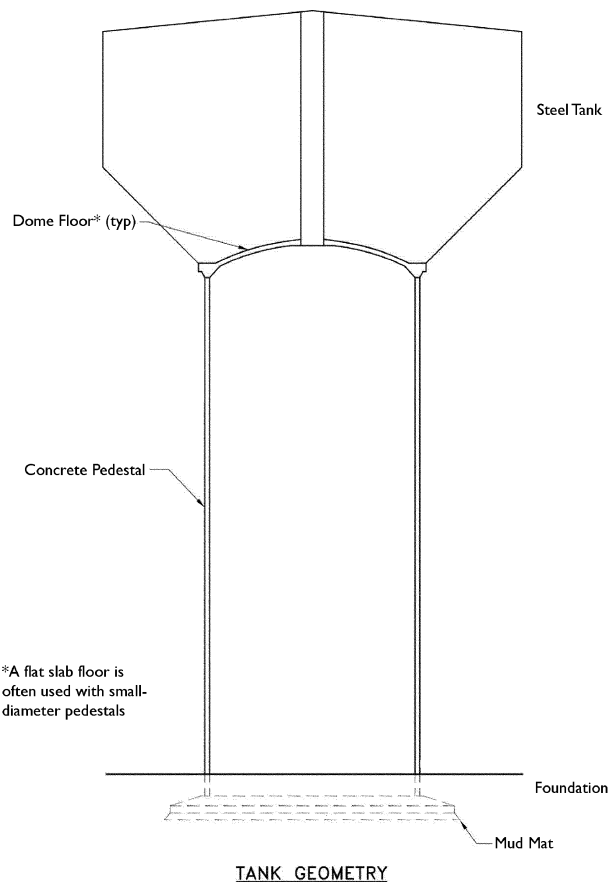


Fig. 1.2—Common configuration of elevated composite steel-concrete tanks.

This document may be used in whole or in part for other tank configurations; however, the designer should determine the suitability of such use for other configurations and details.