ACI 349-13

# Code Requirements for Nuclear Safety-Related Concrete Structures (ACI 349-13) and Commentary

An ACI Standard

Reported by ACI Committee 349

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*Ranjit L. Bandyopadhyay was a long-time member of ACI Committee 349 and the Committee Chair of ACI 349 at the time of his death in 2010. The committee expresses its appreciation for his friendship and leadership.



*This standard covers the proper design and construction of concrete structures that form part of a nuclear power plant and that have nuclear safety-related functions, but does not cover concrete reactor vessels and concrete containment structures (as defined by Joint ACI-ASME Committee 359).*

*The structures covered by the Code include concrete structures inside and outside the containment system.*

*This Code may be referenced and applied subject to agreement between the owner and the Regulatory Authority.*

*All notation sections have been removed from the beginning of each chapter and consolidated into one list in Chapter 2.*

*The format of this Code is based on the "Building Code Requirements for Structural Concrete (ACI 318-08)" and incorporates recent revisions of that standard.*

*The commentary, which is presented after the Code, discusses some of the considerations of ACI Committee 349 in developing "Code Requirements for Nuclear Safety-Related Concrete Structures (ACI 349-13)." This information is provided in the commentary because the Code is written as a legal document and therefore cannot present background details or suggestions for carrying out its requirements.*



**Keywords:** anchorage; authority having jurisdiction (AHJ); beam-column frame; beams; building codes; columns; composite construction; concrete cover; cracking (fracturing); creep; curing; deep beams; deflection; earthquake-resistant structures; floors; folded plates; footings; formwork; inspection; joints; joists; load tests; loads; mixture proportioning; modulus of elasticity; nuclear power plants; nuclear reactor containments; nuclear reactor safety; nuclear reactors; precast concrete; prestressed concrete; quality control; reinforced concrete; safety; serviceability; shear strength; shearwalls; shells; slabs; specifications; splicing; structural analysis; structural design; temperature; torsion; walls.


The materials, processes, quality control measures, and inspections described in this document should be tested, monitored, or performed as applicable only by individuals holding the appropriate ACI Certification or equivalent.


ACI 349-13 supersedes ACI 349-06, was adopted August 15, 2013, and published June 2014.

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## CODE

### INTRODUCTION

This Code covers the design and construction of concrete structures that form part of a nuclear facility and that have nuclear safety-related functions, but does not cover: i) Concrete reactor vessels and concrete containment structures, as defined by Joint ACI-ASME Committee 359; or ii) Steel-plate composite walls and steel-plate composite slabs, as defined by AISC-N690 Technical Committee 12.

The structures covered by this Code include concrete structures inside and outside the containment system.

This Code may be referenced and applied subject to agreement between the owner and the Regulatory Authority.

All notation sections have been removed from the beginning of each chapter and consolidated into one list in Chapter 2.

The format of this Code is such that it depends on the "Building Code Requirements for Structural Concrete (ACI 318-08) and Commentary" and any applicable errata issued up to September 2011, and should be used in conjunction with that Code and applicable issued errata.

The Commentary, which is presented after the Code, discusses considerations of ACI Committee 349 in developing, "Code Requirements for Nuclear Safety-Related Concrete Structures (ACI 349-13)." This information is provided in the Commentary because this Code is written as a legal document and, therefore, cannot present background details or suggestions for carrying out its requirements. For design of nuclear structures, in cases of conflict between this Code with other documents, except wherever this Code is in conflict with the specific requirements of the authority having jurisdiction (AHJ), ACI 349 shall govern.

The materials, processes, quality control measures, and inspections described in this Code should be tested, monitored, or performed as applicable only by individuals holding the appropriate ACI Certifications or equivalent.

## COMMENTARY

### INTRODUCTION

This Commentary discusses some of the considerations of Committee 349 in developing the provisions contained in "Code Requirements for Nuclear Safety-Related Concrete Structures (ACI 349-13)" hereinafter called the Code. The Code is based on "Building Code Requirements for Structural Concrete (ACI 318-08)," which is hereinafter called the Building Code. In preparing ACI 349-13, the committee has followed the text of the Building Code wherever appropriate.

Structural plain concrete, as described in Chapter 22 of ACI 318-08, is not endorsed for use in nuclear safety-related structures.

In the following commentary, all references to the Building Code and its commentary are to the 2008 revision unless specifically noted otherwise. Provisions of the commentary of ACI 318-08 apply except:

- The term "building official" is replaced with the term "licensed design professional";
- $\lambda$, the modification factor for lightweight concrete, is not applicable for ACI 349-13 structures. The value of $\lambda$ for ACI 349-13 structures is 1.0.

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