

October 31, 2002

Fall 2002 Convention of the American Concrete Institute

On October 27-29, 2002 at the Pointe South Mountain Resort, Phoenix, Arizona I attended several technical committee meetings of the American Concrete Institute (ACI). At the ACI 355, "Anchorage to Concrete," Sunday, October 27, I made a presentation to more than forty-five technical committee members and visitors. The presentation provided background information on U. S. Nuclear Regulatory Commission regulatory guides and a comparison of Draft Regulatory Guide DG-1099, "Anchoring Component and Structural Supports to Concrete," to ACI standard 349-01, "Code Related Concrete Requirements for Safety Related Concrete Structures, Appendix B, "Anchoring to Concrete," published by ACI in February 2001. DG-1099 was published for comment July, 2002, generally endorses Appendix B of ACI 349-01.

Other presentations made during the ACI 355 committee meeting were entitled: 1) Lessons Learned In Using The Concrete Capacity Design In Practice; 2) Grouted Anchor Tests at The Hanford Vitrification Facility; and 3) Side and Corner Breakouts for Welded Studs.

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**“ANCHORING COMPONENT AND STRUCTURAL
SUPPORTS IN CONCRETE”
(DRAFT REGULATORY GUIDE DG-1099)**

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**American Concrete Institute- Fall Convention
Phoenix, AZ**

October 27, 2002

BACKGROUND

Regulatory Guide (RG) is a document in which the NRC staff describes:

- **Methods acceptable for implementing specific parts of the Commission's regulations.**
- **Techniques used by the staff in evaluating specific problems or postulated accidents.**
- **Data needed by the staff in its review of licensing applications.**

RGs do not impose requirements! Methods, techniques, or data described in a guide are acceptable but not required, and a licensee/applicant is free to use any alternative as long as Commission's regulations are satisfied.

REGULATORY GUIDE FORMAT

Each regulatory guide deals with a specific, limited topic and is divided into the following sections:

- A. **Introduction** -- Specific regulations to which the guide is directed or related are identified, and the purpose of the guide stated.
- B. **Discussion** -- The subject addressed by the guide is outlined, and the basis or rationale for each of the major approaches that are being taken to solve the problem is stated.
- C. **Regulatory Position** -- Methods, techniques, or data acceptable to the staff for meeting the requirements of the Commission's regulations cited in the "Introduction" are described.
- D. **Implementation** -- This section states how NRC will use the regulatory guide; for example, to review programs submitted by reactor licensees.
- E. **Regulatory Analysis** -- evaluates the need, costs, and consequences of the proposed guidance.

GOAL OF DG-1099

Endorse ACI 349, Appendix B (February 2001).

Consolidate guidance, recommendations of:

- **Inspection and Enforcement Bulletin, 79-02, “Pipe Support Base Plate Design Using Concrete Expansion Anchors.”**
- **“Seismic Qualification of Equipment in Operating Plants” (Unresolved Safety Issue (USI) A-46.**
- **NUREG/CR-5563, “A Technical Basis For Revision To Anchorage Criteria.”**

SCOPE OF DG-1099

Draft Guide 1099 generally endorses ACI 349, Appendix B (Feb. 02):

- **Exception in the area of load combinations**
- **Provides supplemental recommendations - materials, installation, inspection**
- **Use of anchors in masonry walls**

SCHEDULE

Public Comment period ended October 25, 2002.

Issue Final Regulatory Guide fall 2003.

ACI Phoenix, AZ 11/02

COMPARISON OF DG-1099 AND ACI 349, Appendix B-February 2001

| CODE SECTION | Appendix B requirements | DG-1099 guidance | Regulatory Position | Comment |
|---|---|---|---------------------|---|
| B.0-Notation | Ok | No Change | 1.1 | ----- |
| B.1-Definitions | Ok | No Change | 1.1 | ----- |
| B.2-Scope B.2.2 | Section B.2.2 excludes adhesive, grouted, and direct anchors | Clarify scope; type of grouted anchor excluded | 1.1 | Section B.12 addresses grouted embedments |
| B.3-General requirements B.3.2 B.3.3 B.3.7 | B.3.2 Load Combinations; B.3.3 Testing; B.3.7 Material | Additional guidance for load combinations, testing, and materials | 1.2 | Reference ASTM E488; ACI 355 Provisional Test Method; (specify limits on anchor diameter and depth) |
| B.4-General requirements for strength of structural anchors | B.4.4 Load Combinations | See Reg. Guide 1.142 | 1.3 | Load combinations same as RG 1.142 and SRP 3.8.4 |
| B.5-Design requirements for tensile loading | OK | No Change | 1.4 | ----- |
| B.6-Design requirements for shear loading | OK | No Change | 1.4 | ----- |
| B.7-Interaction of tensile and shear forces | OK | No Change | 1.5 | ----- |
| B.8-Required edge distances, spacing, and thickness to preclude splitting failure | OK | No Change | 1.5 | ----- |
| B.9-Installation of anchors B.9.2 | B.9.2 says engineer should establish an inspection program to verify installation | Provides minimum guidelines for anchor installation | 1.6 | See SQUG (GIP) |
| B.10-Structural plates, shapes, and specialty inserts | OK | No Change | 1.7 | ----- |
| B.11-Shear capacity of embedded plates and shear lugs | OK | No Change | 1.7 | ----- |
| B.12-Grouted embedments B.12.3 grout in tension zone | Says grout must be tested to demonstrate strength | If grouting is the only option see B.12.3 & B.12.4 | 1.7 | U.T. tests show 40% reduction for grouted anchor in cracks |

| CODE SECTION | Appendix B requirements | DG-1099 guidance | Regulatory Position | Comment |
|--------------------------|---|--|----------------------------|---|
| B. 12.5 | Requirements of B.12.3 & B.12.4 may be waived if test data available | Presently not addressed | --- | ----- |
| Inspection | See B.9 | SQUG and other industry information | 2 | Aging degradation (corrosion, cracks, etc) |
| Quality Assurance | General | Reference to ASME NQA-2 | 3, 4, 5, 6 | ----- |
| Masonry | N.A. | General guidance provided | 7 | |

Notes:

1. Regulatory Guide 1.142, "Safety-Related Concrete Structures For Nuclear Power Plants," Rev. 2, 11/01.
2. NUREG-0800, "Standard Review Plan..." Section 3.8.4, "Other Seismic Category I Structures."
3. ASME NQA-2-1983, "Quality Assurance for Nuclear Power Plants," (including, NQA-2a-1985 addenda).