Judging Building Codes

Important Issues in Construction Defect Litigation

Kenneth B. Bondy
Consulting Structural Engineer

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History of Building Codes

- Society has always wanted building codes (remember Hammurabi?)
- Engineers have written those codes and allowed them to be adopted into laws.
  - Virtually every city, county, and state has adopted one.
- Structural engineering practice, to a greater degree than any other profession, is governed by laws.
- No other profession has its standard of care “legalized” to the extent that we engineers have.

Medicine

- Doctors are not regulated by a strict set of laws that state precisely what each doctor is to do for each patient in every possible situation.
  - Engineers are.
- Standard of care for doctors is established by what other doctors would do in similar circumstances.
- Medical standard of care allows for judgment.

Building Codes - Legalized Standard of Care for Engineers

- SE practice has not been significantly affected by the legislation of building codes
- Codes are written by engineers.
- Interpreted and enforced by building officials who are also engineers.

General Understanding Develops Over Time

- Between design professionals and building officials as to how code provisions are interpreted in each area
- Even if code wording is unclear
- Current codes clarify previous codes, so code language evolves in clarity

Building Official is Final Word (?)

- Somebody has to decide in a disagreement
- IBC 2000 Section 104
  - Duties and Powers of Building Official
    - ***"General**. The building official is hereby authorized and directed to enforce the provisions of this code. The building official shall have the authority to render interpretations of this code and to adopt policies and procedures in order to clarify the application of its provisions."*

What About Litigation?

- Code is interpreted in litigation by judges.
  - Building code is a law.
  - Only judges can rule on matters of law.
- Creates “double jeopardy” situation for all those responsible to building code.

Puts Tremendous Burden on Judges

- Judges are generally not engineers
- Judges are often reading the code for the first time
- Judge can over-rule the original interpretation of the code by the building official

Original Design of Building..

- Could be fully in conformance with existing commonly understood interpretations of the code at design time
- Judge could decide years later that code was violated
- Judge alone decides who is responsible for code violation (design professional, contractor, material supplier)

Danger Of Judges Interpreting Building Codes: A Striking Example

- In a recent California case owners of 40 homes built on soils containing high levels of sulfates sued the concrete material supplier for negligence and damages.
- “Bench Trial”, no jury.
- Case was similar to hundreds of other “sulfate” cases filed in California in the last ten years.

Plaintiff Alleges

- The w/cm ratio of the foundation concrete exceeded the limitation of 0.45 in the 1991 UBC “sulfate exposure table” (incorporated from ACI 318 Chapter 4 sulfate durability requirements for reinforced concrete.)

Defendants Argue…

- Sulfate durability table not applicable to residential foundation concrete.
  - Not normally specified by design professionals.
  - Not normally enforced by building officials.
  - Standard practice for sulfate durability (sulfate resistant cement) in residential foundation concrete established decades before first appearance of ACI 318 sulfate durability table in UBC.
  - Practice has been successful and cost-effective for the homeowner

Sulfate Litigation - A Major Industry in California

- Hundreds of cases since early 1990s have transferred billions of dollars between insurance companies, attorneys, and consultants
- Relatively little has actually gotten to the homeowner plaintiffs
- Rarely enough to do the repairs the plaintiff consultants allege are necessary
- In fact, repairs are virtually never done, leaving a large disclosure problem and diminution of value for the homeowner

Key Issue in This Case

- Difference between plain concrete and reinforced concrete
- ACI Code and all other model codes contain requirements for two categories of structural concrete
  - Plain concrete (Chapter 22 of ACI 318 code)
  - Reinforced Concrete (all other chapters of code)

Plain Concrete

- Developed in early 1970s by ACI Committee 318
- Pioneered by Harry Stavrides, ACI 318 member and Building Official of the City of Chicago
- Developed primarily for residential construction (foundations and basement walls) which serve a structural purpose but where more restrictive requirements for elevated reinforced concrete members are not required and performance has been satisfactory without them

Stavrides Pointed Out..

- Millions of one and two story single and multifamily homes exist throughout the country with foundation and basement wall concrete that is behaving functionally yet does not satisfy then-current ACI Code (1971,1977).
  - Minimum reinforcing requirements
  - Minimum durability requirements
  - Strength design

New Category of Structural Concrete Required

- Code category of “plain concrete” developed primarily to address residential foundation and basement wall concrete.

Cost But No Real Benefit

- To require the more restrictive requirements for elevated reinforced concrete members in typical residential construction would create an unnecessary cost burden for homeowners
  - Very low stresses, light applied loads, normally large dimensions established prescriptively
  - Can’t collapse – no life safety considerations
  - Possess durability (useful life) greater than materials they support
- It would add only cost, with little or no benefit, to typical residential concrete members.

Commercial Construction

- Tallest reinforced concrete building ever built in California (32 stories).
- The load on ***one column*** of this building equals the ***entire weight*** of 17 average-sized California single-family houses.
- Much ***heavier*** materials (concrete and steel) than used in residential construction.

Office Building, 3900 Alameda, Burbank

Commercial Construction

- Concrete floor members (beams and slabs) are ***elevated*** and span between columns and walls.
- If they were to fail, they could ***collapse and fall to the ground***, injuring or killing the building occupants.

Parking Structure, Bakersfield

Commercial Construction

- To protect life safety, building codes provide minimum requirements for size, concrete strength, durability, and reinforcing steel for reinforced concrete members in commercial construction.

Multistory reinforced concrete apartment building under construction in Honolulu.

Residential Construction

- Most single-family homes are built with wood stud and joist framing, exterior stucco walls, and interior gypsum wallboard.
- Loads on the foundation are much lighter, and concrete stresses much lower, than in commercial construction.
- ***Entire weight of a typical 2-story CA home could be supported, without failure, on one 8” diameter concrete core taken from its foundation.***

Residential Construction

- Concrete members (slabs and foundations) are built on the ground.
- They ***cannot collapse and fall to the ground***, they are never above the ground.

Concrete being placed in typical residential slab and footings.

“Plain Concrete” Codified by ACI 318

- First appeared in ACI 318-83
- Intended to recognize differences between residential and commercial construction
- Waived many requirements of reinforced concrete that were not necessary in plain concrete
- “Plain Concrete” category incorporated into Uniform Building Code in 1985

Plain Concrete in ACI 318

- First appeared in ACI 318-83 as a separate document, ACI 318.1-83, “Building Code Requirements for Structural Plain Concrete”
- Note that title of ACI 318-83 was “Building Code Requirements for Reinforced Concrete”
- Reinforced concrete requirements contained in ACI 318, plain concrete requirements in ACI 318.1

Single Document in 1995

- Plain concrete and reinforced concrete categories were both covered in a single code in ACI 318-95
  - Plain concrete contained in Chapter 22
  - Balance of code for reinforced concrete
- Title changed to "Building Code Requirements for Structural Concrete"

Limitations in Plain Concrete

- From ACI 318-02 Chapter 22, "Structural Plain Concrete"
  - Members that are continuously supported by soil or other structural members capable of providing continuous vertical support
  - Arched members under compression in all loading conditions
  - Basement walls braced at top and bottom
  - Pedestals

Plain Concrete in the 1991 Uniform Building Code

- Both plain and reinforced concrete covered in Chapter 26

- Definition:
  - PLAIN CONCRETE – *"Concrete that does not conform to definition of reinforced concrete"*

- Not a great definition (better in later editions) but clearly indicates that UBC intends plain concrete to be different from reinforced concrete.

Plain Concrete Intended to Apply to Typical Residential Construction

- Requirements for plain concrete contained in UBC 1991 Section 2622, "Plain Concrete"
- Section 2622 specifically permits the use of plain concrete for *"footings of Group R, Division 3 Occupancies constructed in accordance with Section 2517"*
- Group R, Division 3 Occupancy is *"Dwellings and Lodging Houses"*
- Section 2517 is *conventional, light-framed wood construction*

UBC 1991 Chapter 26

- Scope
  - *"Section 2601. The design of structures in concrete of cast-in-place or precast construction, plain, reinforced or prestressed, shall conform to the rules and principles specified in this Chapter."*

Normal Interpretation of Section 2601 (Reflects Intent of Writers of the Code)

- Chapter 26 contains requirements for ***all*** types of concrete, including plain and reinforced, each in clearly identifiable self-contained sections noting the differences between each type.

Actual Foundations in the Case

- Plain concrete foundations with post-tensioned reinforcement
  - Contained less than minimum amount of prestress force than required for prestressed concrete
  - Designed in accordance with code and standard practice as plain concrete
  - Clearly conformed to the intent of the code category of “structural plain concrete”

Published PTI Document

- Defendant (the concrete material supplier) attempted to introduce a published, consensus-based document written by the Slab-on-Ground Committee of the Post-Tensioning Institute stating that the specific type of foundation designed in the case was plain concrete
- Judge refused to admit it on the grounds it was hearsay.

Plaintiff Expert

- Testified that the foundations could not possibly be considered plain concrete because they contained anchor bolts.

Judge Decided it Didn't Matter

- Everything in Chapter 26 applies ***equally*** to plain and reinforced concrete

- Judge stated in his decision, *"by the plain, unambiguous words of the UBC [in Section 2601], Chapter 26 applies to all concrete, not just reinforced concrete"*

Everything in ACI 318 Applies Equally to Reinforced, Plain, Prestressed, Cast-in-Place, and Precast Concrete (decided the judge)

- In spite of numerous places in the code where it specifically states otherwise (exclusions at the start of most chapters).

Extraordinary Ruling

- Judge decided, in effect, that plain concrete does not exist as a category of structural concrete
- Puzzling, why would there be a necessity for two separate categories of structural concrete if all code requirements applied equally to both?
- Judge’s ruling means that all residential construction governed by UBC is illegal (minimum reinforcing requirements, etc.)

Ramifications of Judge's Interpretation

- Wiped out entire body of work by ACI Committee 318 in developing plain concrete category
- Interpretation was contrary to normal interpretation of design professionals and building officials in residential construction for previous 25 years in UBC jurisdictions
- Judge overruled decades of typical code interpretations by design professionals and building officials

Ramifications

- Taken to extreme by opportunistic attorneys, the judge's ruling has potential to bankrupt home-building industry.
- Judge's ruling means that most, if not all, California homes violate the Uniform Building Code.

Nonetheless

- Judge’s interpretation prevails
  - regardless of historical interpretation of the code and the intent of the writers of the code
- Code is a law
- Only judges can interpret laws

What Can Be Done?

- In this litigious age, scrutinize code wording for clarity so that even judges can't badly misinterpret the intent of the code writers
  - Plain concrete chapter currently being reviewed by Committee 318
- Limit authority of judges to second-guess Building Officials in litigation (by legislation)

Thank You!