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Current and Future ACI Documents

Structural Concrete in the Americas
Sixth International Workshop, 2010
March 19 - 20, Chicago, IL

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ACI Web Sessions

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ACI Conventions

ACI conventions provide a forum for networking, learning the latest in concrete technology and practices, renewing old friendships, and making new ones. At each of ACI's two annual conventions, technical and educational committees meet to develop the standards, reports, and other documents necessary to keep abreast of the ever-changing world of concrete technology.

With over 1,300 delegates attending each convention, there is ample opportunity to meet and talk individually with some of the most prominent persons in the field of concrete technology. For more information about ACI conventions, visit www.aciconvention.org.

ACI WEB SESSIONS

ACI Web Sessions

This ACI Web Session includes two speakers presenting at the Structural Concrete in the Americas Sixth International Workshop held in Chicago, IL, March 19th and 20th, 2010.

Additional presentations will be made available in future ACI Web Sessions.

Please enjoy the presentations.

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Advancing concrete knowledge

Current and Future ACI Documents

Structural Concrete in the Americas
Sixth International Workshop, 2010
March 19 - 20, Chicago, IL

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ACI Fellow **José (Pepe) Izquierdo-Encarnación** is Principal of the engineering services company, Porticus. After obtaining bachelor's and master's degrees in civil engineering, majoring in structures, from the University of Puerto Rico, Mayagüez, he started his career as a structural engineer, and later founded Izquierdo, Rueda y Asociados, serving as Principal for 15 years. In 2001, Izquierdo joined Gov. Sila M. Calderón's administration as Secretary of Transportation and Public Works for the Commonwealth of Puerto Rico. He has served five years on the ACI Board of Direction, including two with the Executive Committee as Vice President. Izquierdo has served on committees in all aspects of the Institute, participated in several Institute Task Groups, and served as President of the Puerto Rico Chapter.

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6th International Workshop on Structural Concrete in the Americas

Essential Requirements for Reinforced Concrete Buildings

ACI 314.1, Committee ACI 314

Eng. José (Pepe) Izquierdo Encarnación, BSCE, MCE, FACI
PORTICUS

American Concrete Institute, President 2003-2004
Professionals and Land Surveyors Institute of PR, President 1994-1996

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Main features

- The document is intended for the design and construction of the reinforced concrete structure of new low-rise buildings of restricted occupancy, number of stories and area.
- The document is a tool to meet the code, not a replacement of the code.

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Main features

- Small low-rise structures
- Simplified strength models and minimum dimensional requirements.
- Material and construction requirements aimed at the minimum strength grades.
- Self-contained -- loads, analysis, design, geotechnical and construction -- all in one!

ACI WEB SESSIONS

Main features

- Earthquake resistance through walls.
- Automatic Code compliance.
- Lots of figures.
- Order follows the design process.
- The document and a hand calculator are required!

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Content

- Introduction
- General requirements
- Definitions and nomenclature
- Structural system layout
- Loads
- General reinforced concrete requirements
- Floor system
- Solid slabs supported on girders, beams, joists, or reinforced concrete walls

ACI WEB SESSIONS

Content

- Girders, beams, and joists
- Slab-column systems
- Columns
- Lateral-force resistance
- Reinforced concrete walls
- Other structural members
- Foundations
- Drawings and specifications
- Construction
- References

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International implications

- Developed for the U.S. and international audience
- Has been used intensely overseas, especially in Latin America
- Is a vehicle to promote ACI 318 overseas

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Educational implications

- Has enormous potential as a companion for the first reinforced concrete course.
- Was initially tested at Purdue University while it was being developed.
- Has been used as additional in Code seminars.
- Students love it!

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Three great advantages

- Design checklists
- Concrete detailing
- Follows design process

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Design Checklist example: General structural drawings

- Complete and clear dimensions so that the building structure can be constructed without reference to other drawings;
- 15.2.1 The size and shape of all individual structural members, such as footings, columns, walls, beams, joists and slabs, in plan, section, elevation, or schedules, or in some combination;
- Elevations at the bottom of footings and walls, floor and roof levels, elevations of brick ledges on walls, steps in wall footings, flow lines for drainage structures;
- The location and details of construction joints;
- Reinforcing bar quantity or spacing, position, shape, and size. These are often listed in separate schedules for columns, beams, joists, and slabs;
- The location and length of all lap splices;

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CONCRETE DETAILING
7.9.3.2 - Reinforcement

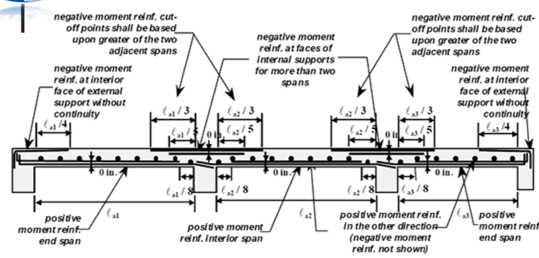

Fig. 7.22 — Reinforcement for two-way slabs supported by girders, beams, or reinforced concrete walls.

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Relationship with the Code

- The document was developed to be used as a vehicle to meet the design Code requirements in an easy, conservative, and simplified manner for buildings of limited area and height.
- It is made clear that the document does not constitute an alternative standard and it does not compete with the adopted code, but just helps with compliance to the code.
- It has not competed with 318 during the years since published.

ACI WEB SESSIONS

Mandatory language

- From its inception it was decided to develop the document in mandatory language.
- There were several reasons for this decision, but the most important was to stress that **the content of the document was not just a recommendation and that it should be followed to the letter.**
- This was the only way to be sure that the simplified procedures were applied properly to the structures and situations covered by the scope of the document.

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Mandatory language

If possible to revert the draft to mandatory language, as an added safeguard to prevent any misunderstanding by code adopting authorities and by users in general, we propose that a visible note is placed in the title page of the document stating something of the tone of:

“Warning —This document was drafted to constitute a vehicle for meeting the requirements of the documents it is based upon (ACI 318 and SEI/ASCE 7) and it was never intended for adoption as a Code or legal document by itself.”

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HISTORY

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ISO/TC 71 - 1995

ISO/TC 71 Plenary Meeting
San Francisco, August 21-22, 1995

PROPOSED TC 71/SC 5
UNIFIED DESIGN CODE FOR DEVELOPING COUNTRIES

INTRODUCTION

There has been frequent criticism that current reinforced concrete codes might be unnecessarily sophisticated for use in regions of the world where no advanced technology is available and engineering expertise is either not available, inexistent or of low quality. Although, most developing countries have adopted building codes based in world status documents, their use is limited to the larger cities where most well trained engineers reside. The need of having a document that could be employed in the design and construction of safe reinforced concrete structures of limited size is a world need. It has been proposed that ISO TC 71 establish a Sub Committee (SC 5) for the development of such a document.

ISO/TC 71 – SC 5, 1996

ISO - International Organization for Standardization

ISO/TC 71 - Concrete, reinforced concrete and pre-stressed concrete
SC 5 - Simplified Design Standard for Concrete Structures

Introduction

During the sixth plenary meeting of Technical Committee 71 of ISO which took place in San Francisco, CA, USA, in August 1995, time was devoted to the discussion of the urgent worldwide need of a simplified international design standard for concrete structures. The plenary meeting agreed that there was sufficient support to establish a new subcommittee within ISO / TC71 to be named SC 5 - Simplified Design Standard for Concrete Structures. Thus the plenary instructed the secretariat of TC 71 to pursue the establishment and approval of this new subcommittee by ISO Technical Management Board (TMB). It was proposed that the secretariat of this new subcommittee be carried by Colombia. ISO TMB by resolution 21/1996 ratified the decision of ISO/TC 71 of establishing *SC 5 - Simplified design standard for concrete structures*, and allocated the secretariat of this new subcommittee to ICONTEC (Colombia). ICONTEC nominated Mr. Luis E. García as chairman of SC 5.

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1996

ISO - International Organization for Standardization

ISO/Technical Committee 71 (ISO/TC 71)
Concrete, reinforced concrete and prestressed concrete

Subcommittee 5 (SC 5)
Simplified Design Standard for Concrete Structures

-DRAFT-

Description of the Design Procedure under the Intended Document

Instituto Colombiano de Normas Técnicas
ICONTEC

Bogotá, COLOMBIA
September 1996

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Publication in Colombia (2002) and ACI (2002)

The Publication of Essential Requirements for Reinforced Concrete Buildings is the result of a colaboration agreement between the American Concrete Institute and two Colombian organizations: Instituto Colombiano de Normas Técnicas y Certificación and Asociación Colombiana de Ingeniería Sísmica.

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Drafted in Colombia, reviewed by ACI before publishing in 2002

Icontec-AIS Joint Drafting Committee

The draft of the document was produced by a Joint Committee of *Icontec - Instituto Colombiano de Normas Técnicas y Certificación* (Colombian Institute for Technical Standards and Certification) and *AIS - Asociación Colombiana de Ingeniería Sísmica* (Colombian Association for Earthquake Engineering). The members of this Joint-Committee were:

Luis Enrique Garcia (Chairman)
Nélson Sánchez (Secretary)

Guillermo Alonzo
Gilberto Areiza
Omar Darío Cardona
Augusto Espinosa
Diego Jaramillo
José Miguel Paz
Marco Puccini
Roberto Rochel
Carlos Alberto Rodriguez
Daniel Rojas
Mauricio Sánchez
Jorge Segura
Pedro Theran
Luis Yamín

The following individual members of ACI offered useful comments and suggestions during the drafting of the document:

Sergio Alcocer
Shuaib Ahmad
John E. Breen
James R. Cagley
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Basile G. Rabbat
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Richard Stehly
James K. Wight
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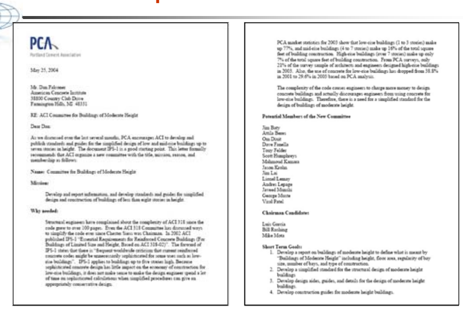
PCA Request for Comm 314



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…PCA Request for Comm 314

PCA market statistics for 2003 show that low-rise buildings (1 to 3 stories) make up 77%, and mid-rise buildings (4 to 7 stories) make up 16% of the total square feet of building construction. High-rise buildings (over 7 stories) make up only 7% of the total square feet of building construction. From PCA surveys, only 21% of the survey sample of architects and engineers designed high-rise buildings in 2003. Also, the use of concrete for low-rise buildings has dropped from 38.8% in 2001 to 29.6% in 2003 based on PCA analysis.

The complexity of the code causes engineers to charge more money to design concrete buildings and actually discourages engineers from using concrete for low-rise buildings. Therefore, there is a need for a simplified standard for the design of buildings of moderate height.

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Committee 314

- Two Chairpersons since its creation:
  - Luis E. García
  - JoAnn Browning
- Task Group A
  - Revision of IPS-1, Essential Requirements for Reinforced Concrete Buildings
  - Chairman: José (Pepe) Izquierdo

ACI WEB SESSIONS

REVISIONS: IPS-1 → 314.1

ACI WEB SESSIONS

Phase I Revision

- Consistency of nomenclature
- Units
- Definitions

ACI WEB SESSIONS

Phase II Revision

- Flowcharts for earthquake design
- Elevator shafts/openings design
- Details for earthquake design of columns
- Details for punching shear design
- Modifying shear wall nomenclature between various chapters

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Phase III Revision

- Compliance with 318-08
- Submit to TAC
- Translation to Spanish

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Phase IV Revision

- Follow ACI-318 code cycle

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IPS-1 Revisions
Phase I

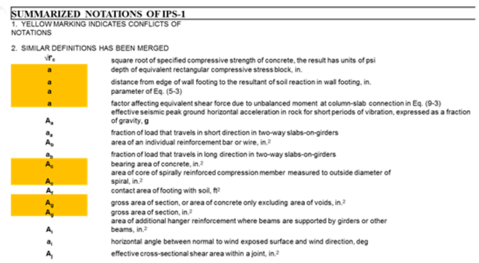
ACI WEB SESSIONS

Phase I Revision

- Consistency of Notations
- Units
- Definitions

ACI WEB SESSIONS

Notations



SUMMARIZED NOTATIONS OF IPS-1

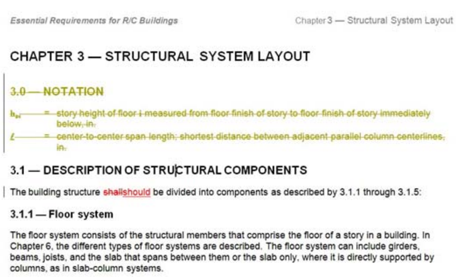
1. YELLOW MARKING INDICATES CONFLICTS OF NOTATIONS

2. SIMILAR DEFINITIONS HAS BEEN MERGED

$\sqrt{f'_c}$	square root of specified compressive strength of concrete, the result has units of psi
a	depth of equivalent rectangular compressive stress block, in.
a	distance from edge of wall footing to the resultant of soil reaction in wall footing, in.
a	parameter of Eq. (5-3)
a	factor affecting equivalent shear force due to unbalanced moment at column-slab connection in Eq. (9-3)
A_a	effective seismic peak ground horizontal acceleration in rock for short periods of vibration, expressed as a fraction of gravity, g
a_a	fraction of load that travels in short direction in two-way slabs-on-girders
A_b	area of an individual reinforcement bar or wire, in.^{2}
a_b	fraction of load that travels in long direction in two-way slabs-on-girders
A_c	bearing area of concrete, in.^{2}
A_c	area of core of spirally reinforced compression member measured to outside diameter of spiral, in.^{2}
A_f	contact area of footing with soil, ft^2
A_g	gross area of section, or area of concrete only excluding area of voids, in.^{2}
A_g	gross area of section, in.^{2}
A_i	area of additional hanger reinforcement where beams are supported by girders or other beams, in.^{2}
a_i	horizontal angle between normal to wind exposed surface and wind direction, deg
A_j	effective cross-sectional shear area within a joint, in.^{2}

ACI WEB SESSIONS

...Notations



Essential Requirements for R/C Buildings — Chapter 3 — Structural System Layout

CHAPTER 3 — STRUCTURAL SYSTEM LAYOUT

~~3.0 — NOTATION~~

~~h_{pi} = story height of floor i measured from floor finish of story to floor finish of story immediately below, in.~~

~~ℓ = center-to-center span length; shortest distance between adjacent parallel column centerlines, in.~~

3.1 — DESCRIPTION OF STRUCTURAL COMPONENTS

The building structure shallshould be divided into components as described by 3.1.1 through 3.1.5:

3.1.1 — Floor system

The floor system consists of the structural members that comprise the floor of a story in a building. In Chapter 6, the different types of floor systems are described. The floor system can include girders, beams, joists, and the slab that spans between them or the slab only, where it is directly supported by columns, as in slab-column systems.

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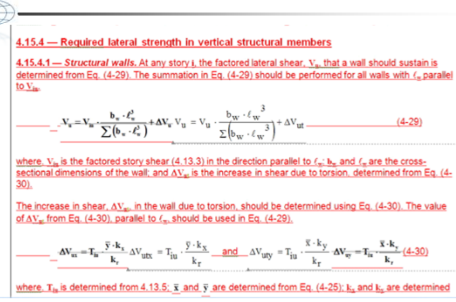
...Notations: Formula updates



4.15.4 — Required lateral strength in vertical structural members

4.15.4.1 — *Structural walls.* At any story i, the factored lateral shear, V_u, that a wall should sustain is determined from Eq. (4-29). The summation in Eq. (4-29) should be performed for all walls with ℓ_w parallel to V_{iu}.

$$V_u = V_{iu} \cdot \frac{b_w \cdot \ell_w^3}{\sum(b_w \cdot \ell_w^3)} + \Delta V_u \quad V_u = V_u \cdot \frac{b_w \cdot \ell_w^3}{\Sigma(b_w \cdot \ell_w^3)} + \Delta V_{ut} \qquad (4\text{-}29)$$

where, V_{iu} is the factored story shear (4.13.3) in the direction parallel to ℓ_w; b_w and ℓ_w are the cross-sectional dimensions of the wall; and ΔV_{ut} is the increase in shear due to torsion, determined from Eq. (4-30).

The increase in shear, ΔV_{ut}, in the wall due to torsion, should be determined using Eq. (4-30). The value of ΔV_{ut} from Eq. (4-30), parallel to ℓ_w, should be used in Eq. (4-29).

$$\Delta V_{ux} = T_{iu} \cdot \frac{\bar{y} \cdot k_x}{k_r} \quad \Delta V_{utx} = T_{iu} \cdot \frac{\bar{y} \cdot k_x}{k_r} \text{ and } \Delta V_{uty} = T_{iu} \cdot \frac{\bar{x} \cdot k_y}{k_r} \quad \Delta V_{uy} = T_{iu} \cdot \frac{\bar{x} \cdot k_y}{k_r} \qquad (4\text{-}30)$$

where, T_{iu} is determined from 4.13.5; $\bar{x}$ and $\bar{y}$ are determined from Eq. (4-25); k_x and k_y are determined

ACI WEB SESSIONS

Text Revisions

Bituminous, smooth surface	1.5
Liquid applied	1
Single-ply, sheet	0.7
Wood sheathing	3.0 (per in. thickness)
Wood shingles	3

4.5.3.2 — *Standing non-structural elements.* Standing non-structural elements ~~shall~~should include all construction material whose vertical dimension is substantially greater than the minimum horizontal dimension and are either free standing, supported by the vertical structural members or attached to them, or span vertically from floor to floor. These elements ~~shall~~should include, but are not to be limited to: facades, non-structural walls, partitions, wall coverings, veneer, architectural ornaments, windows, doors, and vertical ducts for services. In office buildings or other buildings where partitions will be erected or rearranged, provision for partition weight should be made, whether or not partitions are shown on the architectural drawings. Dead Load should be included as uniform vertical loads per unit area of horizontal surface in lb/ft^2.

Table 4.6 — Standing non-structural elements minimum dead loads - coverings for walls

Component	***Load (lb/ft^2) per ft^2 of vertical surface (multiply by the height of element in ft, to obtain line loads in lb/ft)***
Covering for walls	

Text revisions

Essential Requirements for R/C Buildings Chapter 7 — Solid Slabs on Girders, Beams, Joists, or Walls

7.3.5.3 — *Cut off points*. No more than one-half of the positive moment reinforcement required to obtain the required flexural strength at mid-span ~~It shall~~may be ~~permitted to~~ cut off~~,~~ at the locations indicated in 7.7 to 7.9 for each slab type~~, no more than one half of the positive moment reinforcement required to obtain the required flexural strength at mid-span~~.

7.3.5.4 — *Reinforcement splicing.* ~~It shall be permitted to lap splice t~~The remaining positive moment reinforcement may be lap-spliced between the cut-off point and the opposite face of the support.

7.3.5.5 — *Embedment at interior supports.* Positive moment reinforcement cut off at an interior support ~~shall~~should be extended to the opposite face of the support.

7.3.5.6 — *End anchorage of reinforcement.* Positive moment reinforcement perpendicular to a discontinuous edge ~~shall~~should extend to the edge of the slab and ~~shall~~should end with a standard hook.

7.3.6 — Negative moment reinforcement

7.3.6.1 — *Description.* Negative moment reinforcement ~~shall~~should be provided in the amounts and lengths required in Chapter 7, and ~~shall~~should comply with the requirements of 7.3.4, 7.3.6, and the particular requirements for each slab type as set forth in 7.5 to 7.9. The design moment strength of a section based on the provided area of negative moment reinforcement ~~shall~~should be equal to or greater than the required flexural strength.

Definitions

Crosstie — Continuous reinforcing bar having a 135° seismic hook at one end and a hook not less than 90° with at least a six-diameter extension at the other end. The hooks ~~shall~~should engage peripheral longitudinal bars. The 90° hooks of two successive crossties engaging the same longitudinal bar~~s~~ ~~shall~~should be alternated end for end.

Curing — Action taken to maintain moisture and temperature conditions in a freshly placed cementitious mixture to allow hydraulic cement hydration and (if applicable) pozzolanic reactions to occur so that the potential properties of the mixture may develop. ~~Curing is performed by keeping the concrete damp for a period of time, usually several days, starting from the moment it is cast, in order for the cement to be provided with enough water to harden and attain the intended strength.~~ Appropriate curing will greatly reduce shrinkage, increase concrete strength, and reduce surface cracking. Curing time will depend on temperature and relative humidity of surrounding air, the amount of wind, the direct sunlight exposure, the type of concrete mixture used, and other factors.

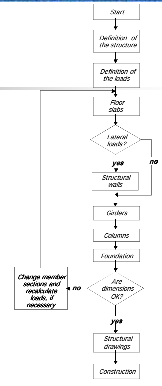
Curtain wall — Walls that are part of the façade or enclosure of the building that do not form part of the gravity load system. See also *partitions*.

Phase II - Revisions

Phase II Revision

- Flowcharts for earthquake design
- Elevator shafts/openings design
- Details for earthquake design of columns
- Details for punching shear design
- Modifying shear wall nomenclature between various chapters

Design with earthquake



Elevator and stair openings

7.9 — TWO-WAY SOLID SLABS SPANNING BETWEEN GIRDERS, BEAMS, OR REINFORCED CONCRETE WALLS

7.9.1 — Dimensional requirements

Two-way solid slabs supported on all edges ~~shall~~should comply with the minimum depth requirements of 6.5.4. In addition to the requirements of 7.9, two-way slabs ~~shall~~should comply with the general dimensional requirements set forth in 1.3 and the particular requirements of 6.1.2 for slab-on-girder systems. Ducts, shafts, and slab openings ~~shall~~should comply with the requirements of 6.8.

The following restrictions ~~shall~~should be in effect for the use of the procedure of 7.9:

(a) There are at least two spans;
(b) The span lengths ~~shall~~should be approximately equal, and the shorter of two adjacent spans ~~shall~~should not be less than 80% of the longer span (1.3);
(c) The supporting girders or beams ~~shall~~should be monolithic with the slab and ~~shall~~should have a total depth not less than 3 times the slab thickness;
(d) A slab with elevator and stair core openings shall be considered continuous if the floor slabs are supported on a continous beams around the opening, integrated into the core walls.
~~(d)~~(e) Loads are uniformly distributed; and
~~(e)~~(f) Unit live load, q_ℓ, does not exceed three times unit dead load, q_d.

The slab panel ~~shall~~should be divided, in both directions, into central and border regions. The central region ~~shall~~should be the central half of the panel, and the border regions ~~shall~~should be two, one-quarter regions adjacent to both sides of the central region (Fig. 7.14).

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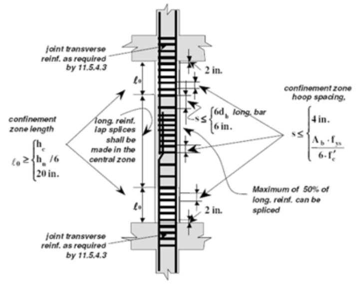
Columns splices for seismic zone



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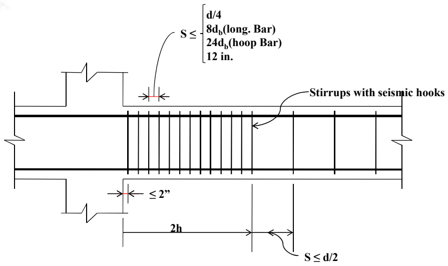
Transverse reinforcement for beams with seismic design



ACI WEB SESSIONS

Shear wall nomenclature

(a) An arbitrary origin location is assumed

(b) The lateral stiffnesses, k_x and k_y, of all ... Eq. (4-24a) and (4-24b), for both principal dire...

$$k_x = \frac{t_x^3 \cdot t_y}{h_{pi}} \quad \text{and} \quad k_y = \frac{t_y^3 \cdot t_x}{h_{pi}}$$

For structural walls with length of the walls parallel to the x axis:

$$k_x = \frac{b_w^3 \cdot \ell_w}{h_{pi}} \quad \text{and} \quad k_y = \frac{\ell_w^3 \cdot b_w}{h_{pi}} \qquad (4\text{-}24a)$$

Or, for structural walls with length of the walls parallel to the y axis:

$$k_x = \frac{\ell_w^3 \cdot b_w}{h_{pi}} \quad \text{and} \quad k_y = \frac{b_w^3 \cdot \ell_w}{h_{pi}} \qquad (4\text{-}24b)$$

Where b_w is the web width of section, or wall width, ; ℓ_w is the horizontal length of wall; and h_{pi} is the story height;

ACI WEB SESSIONS

Lateral loads

$$\sum_{i=1}^{n} (w_i \cdot h_i)$$

4.12 — SOIL WEIGHT AND LATERAL PRESSURE

The design of basement walls and similar approximately vertical elements below grade ~~shall~~should include the lateral pressure of adjacent soil following the requirements of Chapter 14.

4.13 — LATERAL FORCES

4.13.1 — General

The lateral forces prescribed in Chapter 4 should be used in design. The simultaneous occurrence of lateral forces with other forces and loads should be evaluated using the load combination requirements of 4.2. A continuous load path from the application point of the lateral force to the lateral force-resisting

45

ACI WEB SESSIONS

Wind Loads

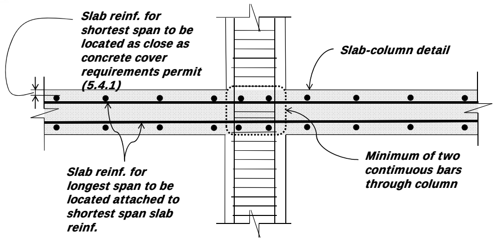
4.10.3.1 — *Pressure coefficients for a building.* The pressure coefficients in Table 4.14 ~~shall~~should be used for the computation of the wind forces on a building. It must be noted that coefficients reflect the direction of the force relative to the direction of the members; in terms of the building total load effect for vertical surfaces the absolute values should be added.

Table 4.14 — Pressure coefficients for the building as a whole

Type of surface	C_m *Total Building*	C_m *Windward*	C_m *Leeward*
Vertical surfaces			
Prismatic rectangular buildings	1.30	0.80	-0.50
Partially open surfaces (C_m *applies over gross area*)			
10% open	1.30	0.80	-0.50
20% open	1.20	0.75	-0.45
40% open	1.00	0.70	-0.30
60% open	0.80	0.60	-0.20
90% open	0.35	0.25	-0.10
Horizontal roof surfaces			
Enclosed buildings		-1.00	-0.65
Buildings with one or two open sides (C_m *applies over 1/3 of the roof area for windward*) (C_m *applies over 2/3 of the roof area for leeward*)		-1.50	-1.25
Sloping roof surfaces *Roof angle measured with respect to a horizontal line*			
0 - 15°		-0.70	-0.50
15 - 30°		-0.40	-0.50

ACI WEB SESSIONS

Slab column system reinf. Detail



ACI WEB SESSIONS

Phase III & IV

ACI WEB SESSIONS

Phase III Revision

- Compliance with 318-08, ASCE-7, IBC
- Committee aproved
  - First ballot was approved october 2008
- Submit to TAC - 2009
- Translation to Spanish – 318 S? Colombia?

ACI WEB SESSIONS

IPS-1 or 314.1

- The discussion if the document will be an update of IPS-1 or a new 314 document has a lot of implications.
- The agreement signed for the original IPS-1 can be updated having the Colombian institutions (AIS and Icontec) keep the copyright for the Spanish version and the clause on a joint update process be trim to be a review when 314 is finishing or have finished the update.
- By moving toward ACI 314.1, the IPS-1 name will be lost, yet we can try to get in the cover anyway such as "formerly published as IPS-1".
- It will be a ACI document, Colombia technical Societies will retain the Spanish copyright for the document.

ACI WEB SESSIONS

TAC Review process

- 11/02/09 TAC review group sent 150 pages of commentaries to 314.
- A meeting was held at the 2009 Fall Convention to discuss the multiple remarks because some of the comments of the reviewers were contradictory.
- TAC review accepted reorganizing the comments and issued an approval subject to properly answering TAC comments.

ACI WEB SESSIONS

...TAC Review Process

- Tony Nanni and Ken Bondy were very supportive of the review process. Three philosophical issues to be solved:
  - Mandatory or not mandatory. Dan Falconer explained that all other committee reports use the word *should* and there has been no problem with them.
  - Compliance with ASCE 7, IBC and 318. After a long discussion on this issue they agree that load tables, etc., should remain. We feel that by doing some more explaining and using the phrase: "this document is intended to comply" will satisfy them.
  - Contradictory remarks.

ACI WEB SESSIONS

...TAC Review Process

- Present status:
  - For solving all commentaries with IBC, ASCE 7 and 318, a new section was introduced.
  - There were 120 pages of commentaries related to definitions. It was solved by adopting 318 definitions. The main reason is that 314 is intended for Buildings, so it should follow such definitions. If there was no 318 definition, the definitions in CT were used. For terms not defined by ACI, 314 definitions remained.
  - All other TAC commentaries will be ready for an April 2010 committee ballot.
- TAC final review Summer 2010.

ACI WEB SESSIONS

TAC Comments Response

TAC Review: November 6, 2009 – New Orleans, LA
Document Title: "Guide to Essential Requirements for Reinforced Concrete Buildings" (ACI 314R)

No.	Pg #	Line #	G/E/P/S	TAC Comment	Committee Response
1.	0	0	.G	The committee must make clear in introductory material that this guide is not a code and is not deemed to satisfy ACI 318 and ASCE 7. As this guide will be used as a design aid, it is the licensed design professional's responsibility to ensure he/she has satisfied the requirements of ACI 318 and ASCE 7.	A new introduction and expanded explanation is introduced
2.	0	0	.G	This document was originally set up to be a code with a limited amount of commentary. As such, there was almost no explanation regarding how this document satisfied 318 or ASCE 7, it was simply stated. Because of this change of purpose, more explanatory information is needed to help the designer understand the assumptions behind the simplified approach. The committee is encouraged to greatly expand the "commentary" sections.	A new introduction and expanded explanation is introduced
3.	0	0	.G	This is a non-mandatory language document so it should be able to provide a lot of guidance to the reader. However, some sections (like Chapters 15 and 16) have a lot of explanation and guidance, while others are terse like Code language (for example parts of Chapter 13) with no explanation of why the provision is there or what options may be available. Even ACI 318 has the Commentary to explain many of the Code provisions. Add explanations on why some of the terse design recommendations are being made.	A new introduction and expanded explanation is introduced
4.	0	0	.G	The design rules given in the document suffer because there is a paucity of connection between these rules and the related 318 provisions. Suggestions for improvement: 1- Greatly expand the connection between 314R and 318. Provide explicit discussions on how various rules of 314R satisfy the intent of 318. 2- For multiple reasons, ACI 314R cannot state that engineers who design by 314R have satisfied all relevant ACI 318 and ASCE 7 code requirements.	A new introduction and expanded explanation is introduced that take into account item 1 and 2. For Item 3, the Committee feels it helps engineers in remote areas and foreign countries to have a guidance. Provisions are based on IBC.

Primary (P) comments identify technical issues that the committee must address before publication of the document. Editorial (E) comments identify editorial issues that the committee must address before publication of the document; and Secondary (S) comments identify technical or editorial issues that should be addressed either in this document or the next revision of the document.

ACI WEB SESSIONS

...TAC Review Process

- Some other good news about 314.1:
  - Both EAC and IC want to do a road show after publication. By having the English and Spanish version in both systems of units, it will apply to many countries and regions.
  - Committee 318S is willing to do the Spanish translation in order to maintain the standardized technical Spanish language approved for 318.

ACI WEB SESSIONS

The End

ACI WEB SESSIONS

ACI Fellow and Argentine native **Raul Bertero** holds a Ph.D. in Engineering from the University of Buenos Aires, an M.Sc. in Civil Engineering from the University of California at Berkeley, and a B.S. in Civil Engineering from the University of Buenos Aires. He has been a Professor of Civil Engineering at the University of Buenos Aires since 1983, and an independent consultant specializing in structural and earthquake engineering since 1993. Dr. Bertero has contributed to reinforced concrete seismic design, research, and education. He was one of the five members of the committee responsible for writing the reinforced and prestressed concrete Argentine code based on ACI 318 (2002). He has served as Secretary of the ACI Argentine chapter since 2002, and has published more than 50 papers and books.

ACI WEB SESSIONS

DIFFERENCES BETWEEN ACI 318-08 AND ARGENTINA ACI 318 BASED CODE

RAUL BERTERO

UNIVERSITY OF BUENOS AIRES
ARGENTINE CHAPTER

ACI WEB SESSIONS

DIFFERENCES BETWEEN ACI 318-08 AND ARGENTINA ACI 318 BASED CODE

Argentina is one of the few countries in the Americas that have changed from national and European to US based Codes.

ACI WEB SESSIONS

DIFFERENCES BETWEEN ACI 318-08 AND ARGENTINA ACI 318 BASED CODE

- Due to the strong influence of German and Italian engineers at the beginning of the XX century, Argentina used the German concrete code, DIN 1045, along that century.
- In the 90's it became clear that it was necessary to replace the old DIN 1045 by a code based on one of the two main world concrete code systems: Eurocode or ACI.
- After a long discussion, in 2002 the CIRSOC ("Centro de Investigación de los Reglamentos Nacionales de Seguridad para las Obras Civiles") adopted ACI 318 as the base code for the concrete building code in Argentina.

ACI WEB SESSIONS

DIFFERENCES BETWEEN ACI 318-08 AND ARGENTINA ACI 318 BASED CODE

1944 – National basic rules

1972 - INPRES

2000- Now
New Zealand Influence

SEISMIC
ZONE

25% country construction

XX century –
German/Italian practice

1978-CIRSOC

1978-2005
GERMAN - DIN 1045

NON SEISMIC ZONE

75% country construction

ACI WEB SESSIONS

DIFFERENCES BETWEEN ACI 318-08 AND ARGENTINA ACI 318 BASED CODE

- From the Argentine experience in adopting ACI code and Latin-American experience in recent earthquakes
- What should be considered by ACI to be more international, particularly for our countries?
  - Non seismic zones – ACI 318 USA – Argentina differences
  - Seismic zones – ACI 318 USA – Argentina differences
  - Seismic zones special needs
    - Essential facilities
    - Low-cost buildings
    - Non engineering or self construction

ACI WEB SESSIONS

DIFFERENCES BETWEEN ACI 318-08 AND ARGENTINA ACI 318 BASED CODE

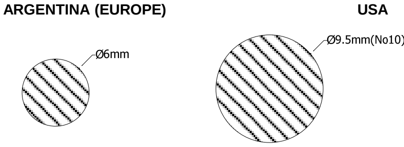
NON SEISMIC ZONE

A committee of experts was designated to adapt the ACI Code to the European construction practice prevalent in Argentina. The policy of the committee was to change as few items as possible. However, some changes had to be done due to the European tradition of using smaller bar diameters and bar spacing.

ACI WEB SESSIONS

Ties and stirrups minimum diameter

ARGENTINA (EUROPE) **USA**



2.5 Area

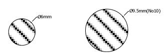
2.5 of ties volume increase to control buckling of main reinforcement in usual buildings

The experience of one century in Argentina was successful.

The economical impact of the change in diameter would have been large without a justification for that change.

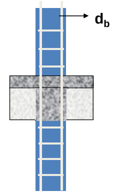
ACI WEB SESSIONS

Ties and stirrups minimum diameter – Impact on lateral reinforcement for compression members



ARGENTINA – ACI 318

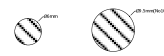
d_b	d_s
$\leq 16mm$	$6mm$
$\leq 25mm$	$8mm$
$\leq 32mm$	$10mm$
$> 32mm$	$12mm$



USA – ACI 318

d_b	d_s
$\leq 32mm$	$10mm$
$> 32mm$	$13mm$

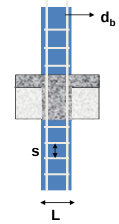
Ties and stirrups minimum diameter – Impact on lateral reinforcement for compression members



ARGENTINA – ACI 318

$$s \leq \begin{cases} 12d_b \\ 48d_s \\ L_{\min} \end{cases}$$

The DIN 1045 values were maintained

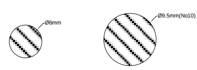


USA – ACI 318

$$s \leq \begin{cases} 16d_b \\ 48d_s \\ L_{\min} \end{cases}$$

Maximum bar spacing for main reinforcement

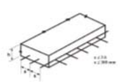
The maximum spacing was reduced due to the smaller diameters used in Argentina



ARGENTINA – ACI 318

USA – ACI 318

Walls and Slabs



Argentina: $s \leq \begin{cases} 2.5h \\ 300mm \\ 25d_b \end{cases}$ USA: $s \leq \begin{cases} 3h \\ 450mm \end{cases}$

Shear Reinforcement

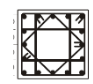
Argentina: $s \leq \begin{cases} d/2 \\ 400mm \end{cases}$ USA: $s \leq \begin{cases} d/2 \\ 600mm \end{cases}$

DIFFERENCES BETWEEN ACI 318-08 AND ARGENTINA ACI 318 BASED CODE

SEISMIC ZONE

NEW ZEALAND INFLUENCE

- Column Confinement



USA – ACI 318 $Ash \geq 0.3 \frac{s \; bc \; f'c}{fyt} \left(Ag / Ach - 1 \right)$

ARGENTINA – SEISMIC CODE

$$Ash \geq 0.30 \left(1.30 - \rho \frac{fy}{0.85 f_c'} \right) \frac{s \; bk}{fyt} \frac{Pu}{Ach} - 0.006 \, s \; bk$$

DIFFERENCES BETWEEN ACI 318-08 AND ARGENTINA ACI 318 BASED CODE

SEISMIC ZONE

NEW ZEALAND INFLUENCE - Column Confinement

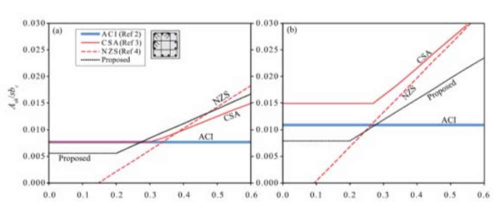


Fig. 1: Comparison of confinement provisions (per References 2, 3, and 4 and Eq. (3)) applied to a 24 x 24 in. (600 x 600 mm) column with A_g/A_{ch} = 1.3 and 12 No. 9 (No. 30M) bars: (a) f_c' = 5 ksi and $f_{yt} = f_{yl}$ = 60 ksi; (b) f_c' = 12 ksi, f_{yt} = 100 ksi, and f_{yl} = 75 ksi (1 ksi = 6.89 MPa)

Concrete International Dec 2009 - Kenneth J. Elwood et al

FROM RECENT EQS: SEISMIC ZONES SPECIAL NEEDS

- Essential facilities: hospitals, telecommunications, power, main bridges and highways
  - Not operational after the earthquake (even modern infrastructure)
- Low-cost buildings
  - Several buildings collapse due to professional ignorance or human errors
- Non engineering or self construction
  - Haiti (220,000 deaths) mostly in poor neighborhoods

FROM RECENT EQS: SEISMIC ZONES SPECIAL NEEDS

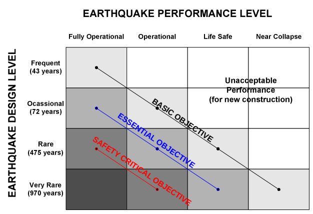
- **Essential Facilities**: Hospitals, telecommunications, power, main bridges and highways

TABLE 11.5-1 IMPORTANCE FACTORS

Occupancy Category	I
I or II	1.0
III	1.25
IV	1.5

Importance factor do not guarantee that the facility remain operational after the EQ

PERFORMANCE-BASED SEISMIC CODE



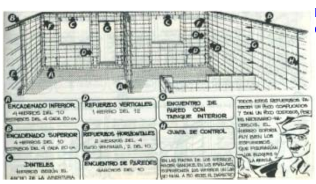
FROM RECENT EQS: SEISMIC ZONES SPECIAL NEEDS

- **Low-cost buildings:** It is necessary to provide standard engineers and architects with a very simplified code

To impulse the IPS1 "Requisitos Esenciales para Edificios de Concreto Reforzado"

FROM RECENT EQS: SEISMIC ZONES SPECIAL NEEDS

- **Non Engineering or self construction:** It is necessary to provide people with prescriptive and graphical guidelines



Haiti today: Reconstruction with same detailing (Eduardo Fierro presentation)

DIFFERENCES BETWEEN ACI 318-08 AND ARGENTINA ACI 318 BASED CODE

CONCLUSIONS AND RECOMMENDATIONS FOR A MORE INTERNATIONAL ACI CODE AND GUIDELINES

From the Argentine experience in changing from European/NZ to ACI Codes:

- ACI 318 should consider the use of smaller bar diameters (6mm and 8mm for ties and stirrups) and the possible effects on bar spacing
- ACI 318 should consider a new proposal for column confinement (dependency of axial load)

From Latin-American experience in recent earthquakes:

- There are urgent needs in seismic zones
  - Essential facilities................................. Performance-based Seismic Code
  - Low-cost buildings................................ Simplified Code - Impulse the Essential Requirements for RC Buildings
  - Non engineering or Self construction.... To develop Prescriptive recommendations (Graphical presentations like "comics")

Click on the text below to go to the web page.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