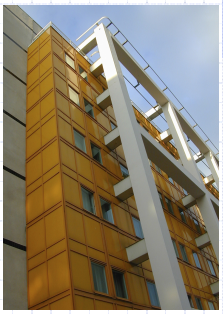
ASCE 7 – CHAPTER 13

ACKNOWLEDGEMENT
PHOTOS ARE FEMA PUBLICATIONS, SICHUAN EQ DAMAGE WEBSITE, AND CHRISTIAN UNIVERSITY OF INDONESIA TEAM OBSERVATION OF 2006 JOGJA EQ

ARCHITECTURAL COMPONENTS & WALL SEISMIC ANCHORAGE

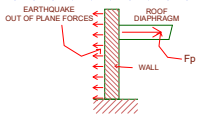
WIRA TJONG, S.E.



13.1.4 ARCHITECTURAL COMPONENTS GENERAL EXEMPTIONS

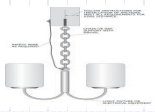
- FOR SDC **B:** ALL ARCH COMPONENTS WITH **Ip=1.0** EXCEPT **PARAPET**
- PARAPET TO BE CONSIDERED AS NONSTRUCTURAL WALLS

- REFER TO **SECTION 13.5.3** FOR OUT OF PLANE SEISMIC FORCES OF NONSTRUCTURAL EXTERIOR WALL/PANEL AND **SECTION 12.11** FOR FOR STRUCTURAL WALLS, SUCH AS BEARING OR SHEAR WALLS.



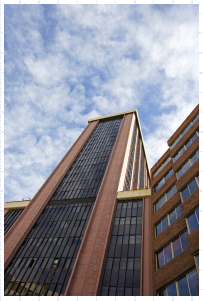
13.5 ARCHITECTURAL COMPONENTS

- **BRACING IS NOT REQUIRED FOR ARCHITECTURAL COMPONENTS SUPPORTED BY CHAINS OR SUSPENDED FROM STRUCTURE SATISFYING THE FOLLOWING REQUIREMENTS**
  - DESIGN LOAD = 1.4 OPERATING WEIGHT (W) + HORZ LOAD OF 1.4*W **SIMULTANEOUSLY**
  - CONSIDER SEISMIC INTERACTION/ CONSEQUENTIAL DAMAGE
  - CONNECTION TO STRUCTURE ALLOWS **360 DEG RANGE OF MOTION** IN HORZ PLANE



13.5.4/9 GLASS

- GLASS IN GLAZED CURTAIN WALLS/ STOREFRONT/ PARTITIONS
  - MINIMUM RELATIVE DISPLACEMENT
    - $D_{fall\ out}$ >= 1.25 I Dp
      - OR 0.5 IN [13 MM]
    - Dp = MAX DRIFT BETW FLOORS
    - I = BUILDING IMPORTANCE FACTOR
    - $D_{fallout}$ =
      - THE DRIFT CAUSING GLASS TO FALLOUT FROM CURTAIN WALL, STOREFRONT OR PARTITION PER AAMA 501.6 OR BY ENGINEERING ANALYSIS

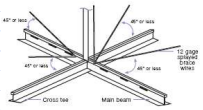


13.5.4/9 GLASS

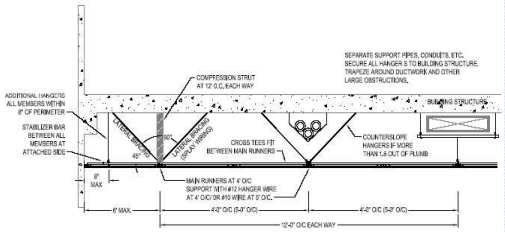
- EXCEPTIONS
  - GLASS WITH ENOUGH CLEARANCES FROM ITS FRAME
  - FULLY TEMPERED MONOLITHIC GLASS IN OC I, II, AND III LOCATED =< 10 FT [3 M] ABOVE WALKING SURFACE
  - ANNEALED OR HEAT STRENGTHENED LAMINATED GLASS IN SINGLE THIKCNESS WITH INTERLAYER >= 0.030 IN [0.076 MM], CAPTURED WITH GLAZING POCKET, AND SECURED TO A FRAME WITH PERIMETER SEALANT OF MINIMUM 0.5 IN [13MM] CONTACT WIDTH

13.5.6 SUSPENDED CEILING

- SEISMIC DESIGN PARAMETERS
  - Wp >= 4 PSF [19 N/M2]
  - Ap = 1.0 & Rp = 2.5



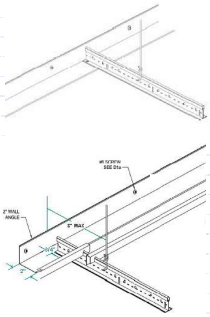
13.5.6 SUSPENDED CEILING BRACING



IN SDC C : DESIGNED PER ASTM C635/6 AND CISCA ZONES 0 -2

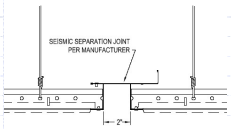
13.5.6 SUSPENDED CEILING

- **IN SDC D TO F : DESIGNED PER ASTM C635/6 AND CISCA ZONES 3 -4 WITH FOLLOWING AMENDMENTS**
  - **USE HEAVY DUTY T-BAR GRID SYSTEMS**
  - **WIDTH OF PERIMETER SUPPORTING CLOSURE ANGLE >= 2.0 IN [50 MM]**
  - **IN EACH DIRECTION, ATTACH ONE END OF THE GRID TO THE ANGLE**
  - **OTHER END TO HAVE 0.75 IN [20 MM] CLEARANCE FROM THE WALL AND FREE TO SLIDE ON THE ANGLE**



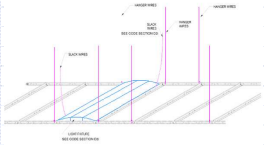
13.5.6 SUSPENDED CEILINGS

- **FOR AREAS > 1000 FT2 [92.9 M2], BRACE THE CEILING TO THE STRUCTURE EITHER BY SPLAYED WIRE OR RIGID BRACES**
- **FOR AREAS > 2500 FT2 [232 M2], BREAK THE CEILING INTO AREAS OF <= 2500 FT2 USING EXPANSION JOINT OR FULL HEIGHT PARTITION, UNLESS STRUCTURAL ANALYSES ARE PERFORMED**



13.5.6 SUSPENDED CEILINGS

- SPRINKLER HEADS AND OTHER PENETRATIONS TO HAVE 2.0 IN [50 MM] OVERSIZED RING, SLEEVE, OR ADAPTER FOR A FREE 1.0 IN [25MM] HORZ MOVEMENT THROUGH CEILING TILE UNLESS THE CEILING IS RESTRAINED BY RIGID BRACES
- CHANGES IN CEILING HEIGHT SHALL BE BRACED
- CABLE TRAY /CONDUITS TO BE SUPPORTED INDEPENDENTLY FROM THE CEILING
- SPECIAL INSPECTION OF CEILINC CONSTRUCTION IS REQUIRED

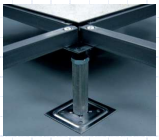


13.5.7 ACCESS FLOORS

- ACCESS FLOORS
  Ap = 1.0 & Rp =1.5

Wp =
SELFWEIGHT + 100% OF FASTENED EQUIPMENT
OR + 25% OF NON FASTENED EQUIPMENT

- SPECIAL ACCESS FLOOR –
  Ap = 1.0 & Rp = 2.5

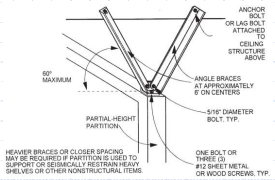


- ANCHORAGE PER ACI CODES APPENDIX D
- FLOOR STRINGERS TO CARRY AXIAL SEISMIC DRAG LOAD
- BRACING AND PEDESTAL SECTIONS PER ASTM STANDARDS
- FRICTION, ADHESIVE, & POWDER ACTUATED FASTENERS NOT ALLOWED

13.5.8 PARTITIONS

- INTERIOR PARTITIONS
  Ap = 1.0 & Rp =1.5 FOR UNREINFORCED MASONRY WALL
  Rp =2.5 FOR ALL OTHER PARTITIONS

- WALLS > 6 FT [1.8 M] SHALL BE BRACED TO THE STRUCTURE
- PARTITION BRACING TO BE INDEPENDENT OF CEILING BRACING
- BRACING IS NOT REQUIRED FOR WALLS SATISFYING ALL THE FOLLOWING
  1. HEIGHT <= 9 FT [2.7 m]
  2. LINEAR WEIGHT <= 10 LBS [0.479 kN] * HEIGHT
  3. PARTITION SEISMIC LOAD Fp <= 5 PSF [24 N/m2]



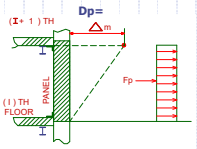
13.5.3 EXTERIOR PANELS

EXTERIOR NON- STRUCTURAL WALLS/PANELS SHALL BE DESIGNED FOR

$$Fp = 0.4\, a_p\, SDs\, Ip\, [1 + 2\,(hx/hr)]\, Wp/Rp$$

AND ACCOMMODATE MOVEMENT OF STRUCTURE BASED ON Dp [Δ_M IN UBC] AND TEMPERATURES CHANGES.

a. PANEL OR ELEMENT CONNECTION SHALL ALLOW FOR A RELATIVE MOVEMENT OF



- STORY DRIFT
  $Dp = \delta x_{(i+1)} - \delta x_i$
- ½ " [13 MM] WHICHEVER IS GREATER
- 2 X STORY DRIFT DUE TO WIND [97 UBC]

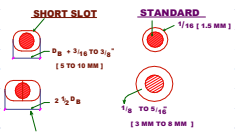
13.5.3 EXTERIOR PANELS

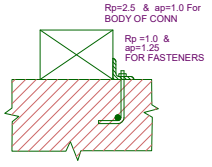
b. TO ALLOW DRIFT, PROVIDE SLIDING CONNECTION USING SLOTTED OR OVERSIZED HOLES, BENDING OF STEEL, ETC.

c. CONNECTING MEMBER HAS TO HAVE SUFFICIENT DUCTILITY AND ROTATION CAPACITY TO PRECLUDE BRITTLE WELD FAILURES

d. THE BODY OF CONNECTION SHALL BE DESIGNED USING

Rp = 2.5 [3.0 PER 97 UBC]
ap = 1.0



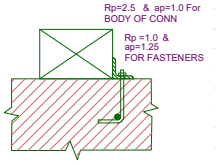


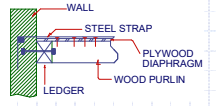
EXTERIOR PANELS

e. ALL FASTENERS SUCH AS BOLTS, WELDS & DOWELS SHALL BE DESIGNED USING

Rp = 1.0
ap = 1.25 [1.0 PER 97 UBC]

f. STRAP EMBEDDED IN CONCRETE OR MASONRY SHALL BE ATTACHED TO OR HOOKED AROUND REINF.





12.11 STRUCTURAL WALL ANCHORAGE

1. **OUT OF PLANE FORCE FOR ANCHORAGE TO ROOF AND FLOOR CONSTRUCTION**

A. FOR STRUCTURAL WALL

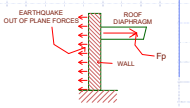
$$Fp = 0.4\ SDs\ I\ Wp$$
$$>= 0.10\ Wp$$

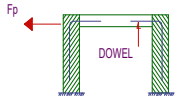
B. FOR CONCRETE OR MASONRY WALL SEE ABOVE AND

$$Fp >= 280\ LBS/FT\ [409\ KG/M]$$
$$Fp >= 400\ SDs\ I\ LBS/FT\ [0.584\ SDs\ I\ KG/M]$$

C. FOR CONCRETE /CMU WALLS LATERALLY SUPPORTED BY FLEXIBLE DIAPHRAGM IN SDC "C" TO "F"

$$Fp = 0.8\ SDs\ I\ Wp$$

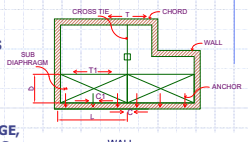


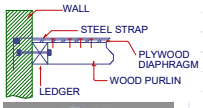


STRUCTURAL WALL ANCHORAGE

FOR SDC "C" TO "F",

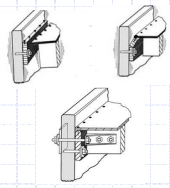
- **PROVIDE CONTINUOUS TIE OR STRUTS BETWEEN DIAPHRAGM CHORDS TO DISTRIBUTE/DEVELOP THE ANCHORAGE FORCES INTO THE DIAPHRAGM**
- **FOR STEEL ELEMENT OF THE ANCHORAGE, EXCEPT ANCHOR BOLTS OR REINFORCING STEEL, APPLY ADDITIONAL LOAD FACTOR OF 1.4**
- **METAL DECK DIAPHRAGM SHALL NOT BE CONSIDERED AS CONTINUOUS TIES IN THE DIRECTION PERPENDICULAR TO THE DECK SPAN**

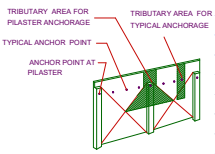




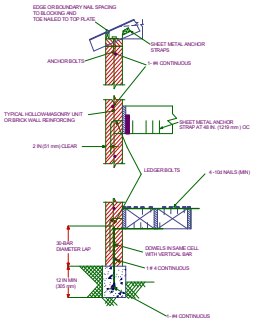
STRUCTURAL WALL ANCHORAGE

- **FOR WOOD DIAPHRAGM,**
  - **PROVIDE CONTINUOUS TIE**
  - **DO NOT USE TOE NAIL OR NAIL SUBJECT TO WITHDRAWAL**
  - **DO NOT USE WOOD LEDGERS/FRAMING IN CROSS GRAIN BENDING OR TENSION**
  - **DO NOT USE DIAPHRAGM SHEATHING AS TIES OR STRUTS**
- **EMBEDDED STRAPS SHALL BE HOOKED AROUND WALL REBAR**
- **ECCENTRICITIES SHALL BE CONSIDERED**
- **THE ANCHORAGE FOR PILASTER SHALL INCLUDE ADDITIONAL LOAD FROM THE WALL PANELS.**





WALL ANCHORAGE



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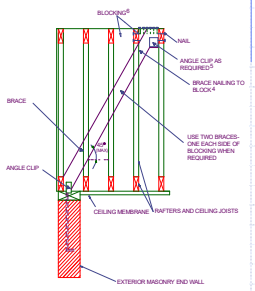

WALL ANCHORAGE

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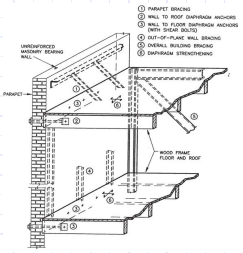

SAMPLE PROBLEMS