



# Building and Safety Division • Public Information

County of Ventura • Resource Management Agency • [http://www.ventura.org/rma/build\\_safe](http://www.ventura.org/rma/build_safe)  
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## REQUIREMENTS FOR STEEL MOMENT FRAMES IN LIGHT-FRAMED (FLEXIBLE DIAPHRAGM) LOW RISE BUILDING

### DESIGN PROCEDURE:

- Select a type of moment frame system from [OMF], [IMF] or [SMF]; use the specified seismic parameters accordingly from Table below.
- A redundancy factor,  $\rho=1.3$ , shall be used U.N.O. per ASCE 7-05.
- Check member stress/strength for load combinations of [ASD] or [LRFD] from List below.
- ASD LOAD COMBINATIONS:**
  - $(1+0.14SDS)D+0.7\rho E$
  - $(1+0.105SDS)D+0.525\rho E+0.75(L+Lr)$
  - $(0.6-0.14SDS)D+0.7\rho E$
  - $*(1+0.14SDS)D+0.7\Omega_o E$
  - $*(1+0.105SDS)D+0.525\Omega_o E+0.75(L+Lr)$
  - $*(0.6-0.14SDS)D+0.7\Omega_o E$
- LRFD LOAD COMBINATIONS:**
  - $(1.2+0.2SDS)D+\rho E+f1L$
  - $(0.9-0.2SDS)D+\rho E$
  - $*(1.2+0.2SDS)D+\Omega_o E+f1L$
  - $*(0.9-0.2SDS)D+\Omega_o E$

♦ **Note:**  $f1=0.5$  if  $L \leq 100$ psf
- ♦ **Note:** Where [ASD] is used, apply the allowable stress increase of 1.2 for all combinations with  $\Omega_o$  factor.  
 \*Load Combinations apply to column axial compressive and tensile strength check only, per AISC341-05, 8.3.
- Verify section compactness limits,  $\lambda_{ps}$  for [SMF],  $\lambda_p$  for [IMF] and  $\lambda_r$  for [OMF], per ANSI/AISC 341-05, 8.2a; 8.2b.
- Limit story drift angle  $\alpha$  of moment frame per criteria listed at Table below.
- Check  $P-\Delta$  effect by calculating the stability coefficient  $\theta$ , defined at ASCE 7-05, 12.8.7.
- Design [IMF] & [SMF] with a strong-column-weak-beam configuration per ANSI/AISC 341-05, 9.6; 10.6.
- Determine size of continuity plates for beam-to-column joint, per ANSI/AISC 341-05, 9.5, 10.5; 11.5.
- Determine thickness of doublers plate for beam-to-column joint per ANSI/AISC 341-05, 9.3, 10.3; 11.3.
- Design column base connection per criteria from ANSI/AISC 341-05, 8.5, 8.5a; 8.2b; 8.5c.
- For [IMF] & [SMF] beam-to-column connection shall be consistent with the pre-qualified connection designated in ANSI/AISC 358, and/or FEMA 350, and meet the minimum qualifying  $\theta_{SD}$ , strength degradation drift angle (i.e.  $\theta_{SD} = 0.04$  for [SMF];  $\theta_{SD} = 0.02$  for [IMF]).
- For [OMF] beam-to-column connection either FR or PR type shall meet the requirements of Sect. 11.2 in ANSI/AISC 341-05; the pre-qualified connection designated in ANSI/AISC 358, and/or FEMA 350 is also allowed.

### ♦Note: Applicable Building Codes

- 2007 CBC
- ASCE 7-05
- ANSI/AISC 341-05
- ANSI/AISC 358-05
- ANSI/AISC 360-05
- STEEL CONSTRUCTION MANUAL 9<sup>th</sup> EDITION
- STEEL CONSTRUCTION MANUAL 13<sup>th</sup> EDITION
- FEMA 350

### DESIGN PARAMETERS for STEEL MOMENT FRAMES

(All buildings in Occupancy Categories I, II, III)

BUILDINGS ASSIGNED TO SEISMIC DESIGN CATEGORY D AND E	PARAMETERS	1 story			2+ story		
		OMF	IMF	SMF	OMF	IMF	SMF
RESPONSE MODIFICATION COEFFICIENT	R	3.5	4.5	8	3.5	4.5	8
SYSTEM OVERSTRENGTH FACTOR	$\Omega_o$	2.5	2.5	2.5	2.5	2.5	2.5
DEFLECTION AMPLIFICATION FACTOR	$C_d$	3 <sub>3</sub>	4	5.5	3 <sub>3</sub>	4	5.5
REDUNDANCY FACTOR	$\rho_{s1}$	1.3	1.3	1.3	1.3	1.3	1.3
HEIGHT LIMIT	ft	65	65	NL <sub>46</sub>	35	35	NL <sub>46</sub>
WEIGHT LIMIT (Roof, dead load)	psf	20 <sub>48</sub>	20 <sub>48</sub>	NL <sub>46</sub>	35	35	NL <sub>46</sub>
WEIGHT LIMIT (Floor, dead load)	psf	0	0	0	35	35	NL <sub>46</sub>
WEIGHT LIMIT (Exterior Wall, dead load)	psf	20	20	NL <sub>46</sub>	20	20	NL <sub>46</sub>
CHECK P-Δ EFFECT IS NOT REQUIRED, If $\theta \leq 0.1$ , $\theta = (P_x \Delta) / (V_x h_{sx} C_d)$ <sub>41 44 47</sub>	Max $\theta$	0.1	0.1	0.1	0.1	0.1	0.1
MAX. AMPLIFIED STORY DRIFT ANGLE, $\alpha$ $\alpha = (C_d * \Delta_s / h_{sx})$ <sub>41 42 44 45</sub>	Max $\alpha$	0.02	0.02	0.02	0.02	0.02	0.02

### ♦Note:

- A redundancy factor,  $\rho=1.0$  shall be used for Drift Calculation,  $P-\Delta$  effects.
- For building comprising solely of moment frames the amplified story drift angle shall be limited to  $\alpha / \rho$ .
- Use  $C_d = 4$ , where a combination of plywood panel is utilized in the same direction of moment frame.
- $h_{sx}$  denotes Building Story Height.
- $\Delta_s$  denotes Story Drift under strength design seismic load, E.
- NL = Not Limited.
- $\Delta$  denotes Story Drift occurring simultaneously with design seismic load  $V_x$ .
- Weight limit is 35 psf for all one-story frames, which are 35 feet high and lower.