



CONCRETE SHEAR WALL PLAN REVIEW CHECKLIST

INFORMATION	PLAN CHECK NO.:	EXPIRATION DATE:	STATUS:
	PROJECT ADDRESS:		
	WORK DESCRIPTION:		
	APPLICANT'S NAME:	TEL. NO.:	
	ADDRESS:	EMAIL:	
INSTRUCTIONS	<p>Your application for a permit, together with plans and specifications, has been examined and you are advised that the issuance of a permit is withheld for the reasons hereinafter set forth. The approval of plans and specifications does not permit the violation of any sections of the Building Code or other local ordinances or state laws.</p> <p>In an effort to streamline the plan review process, please follow the steps outlined below to ensure that there is no delay in processing your application and reviewing your responses to these plan check comments.</p> <ul style="list-style-type: none"> Comments with circled item numbers apply to this plan check. Revised plans and calculations shall incorporate or address all comments marked on the original checked set of plans, calculations, and this plan review checklist. Provide a written response to each comment and show where and how it has been addressed. Identify the sheet number and detail or reference note on the revised plans where the corrections are made. Time spent searching for the corrected items on the revised plans or calculations will delay the review and approval process. Once all comments on the plans, calculations, and this checklist have been addressed, contact the plan check staff to schedule an appointment to review the changes made. 		
	PLAN REVIEWER: _____		TEL. NO.: (310) 285-
	ADDRESS: 455 N Rexford Drive, 1 st Floor Beverly Hills, CA 90210		
	EMAIL: _____		WEBSITE: www.beverlyhills.org
	<p>Should you have any questions or need clarification pertaining to the comments made on your project, you may contact the plan check staff by telephone from _____ to _____ M T W TH F.</p> <ul style="list-style-type: none"> Bring the original checked set of plans and calculations along with this checklist to the meeting. Do not schedule an appointment meeting with the plan check staff until all comments have been addressed. Incomplete, indefinite or faded drawings or calculations will not be accepted. 		
NOTE	<p>Numbers within the parenthesis () refer to the section of the applicable code. 2007 Edition of the California Building Code (CBC). Table (T). Los Angeles Regional Uniform Code Program (LARUCP). ASCE Minimum Design Loads for Buildings and Other Structures, Includes Supplement No. 1 and Errata (ASCE-7). ACI Building Code Requirements for Structural Concrete (ACI-318).</p>		



STRUCTURAL CALCULATION

A. GENERAL

- Design forces shall be in accordance with the Factored Load and Combinations specified in CBC 1605.2. (ASCE-7 Section 12.4.2.3 & ACI-318 Section 21.7.3)
- The R value used in determining the base shear for bearing wall system shall not exceed 5.0 for special reinforced concrete shear walls and 4.0 for intermediate precast concrete shear walls. (ASCE-7 T-12.2-1)
- In storage and warehouse occupancies, include a minimum 25% of the floor live load for the seismic dead load, W. (ASCE-7 Section 12.7.2.1)
- The shear strength reduction factor, "Φ" shall be per ACI-318 Section 9.3.4. Use $\Phi = 0.60$ unless nominal shear strength is greater than shear corresponding to the development of nominal flexural strength. (ACI-318 Section 9.3.4.)

B. SHEAR

- Wall shall have nominal shear strength per following formula: (ACI-318 Section 21.7.4.1)

$$V_n = A_{cv} (\alpha_c \sqrt{f'_c} + \rho_t f_y) \quad (21-7)$$

Where: $\alpha_c = 3.0$ for $h_w / \ell_w \leq 1.5$,
 $\alpha_c = 2.0$ for $h_w / \ell_w \geq 2.0$
 α_c varies linearly between 3.0 and 2.0 for h_w / ℓ_w between 1.5 and 2.0

- h_w / ℓ_w used in determining V_n for segments of a wall shall be the larger of the ratios for the entire wall and the segment of wall considered. (ACI-318 Section 21.7.4.2)
- Reinforcement ratio $\rho_t \geq \rho_t$, if height to length ratio < 2.0. (ACI-318 Section 21.7.4.3)
- Nominal shear strength, V_n , of all wall shall not exceed $8A_{cv}\sqrt{f'_c}$ for the entire building and $10A_{cv}\sqrt{f'_c}$ for individual wall pier. (ACI-318 Section 21.7.4.4)

C. FLEXURE AND AXIAL LOADS

- Shear walls subject to combined flexural and axial loads shall be designed in accordance with (ACI-318 Section 10.2 and 10.3) except that ACI-318 Section 10.3.6 and the nonlinear strain requirements of ACI-318 Section 10.2.2 shall not apply. The effects of openings shall be considered. (ACI-318 Section 21.7.5.1)
- Effective flange widths of flanged sections shall extend from the face of the web a distance equal to the smaller of 1/2 the distance to an adjacent wall web and 25% of the total wall height. (ACI-318 Section 21.7.5.2)

D. SPECIAL BOUNDARY ELEMENTS

Special boundary elements at the edges of structural walls are required per ACI-318 Section 21.7.6.2 and 21.7.6.3.

- Walls that are effectively continuous from the base of the structure to top of wall and designed to have a single critical section for flexure and axial loads shall meet the following: (ACI-318 Section 21.7.6.2)
 - Compression zones shall be reinforced with special boundary elements where:

$$c \geq \frac{\ell_w}{600(\delta_u / h_w)} \text{ and } \delta_u / h_w \geq 0.007(21-8)$$
 - Reinforcement shall extend vertically a maximum distance not less than the larger of ℓ_w or $M_u / 4V_u$.

- Structural walls not designed to the provisions of ACI-318 Section 21.7.6.2 shall have special boundary elements at boundaries and edges around the openings of the wall where the maximum extreme fiber compressive stress exceeds $0.2f'_c$. (ACI-318 Section 21.7.6.3)

E. WALL PIER

- Transverse reinforcement in wall piers, not designed as part of special moment frame, shall be designed to resist probable shear strength. (CBC 1908.1.8, ACI-318 Section 21.7.10.2)

STRUCTURAL DETAIL

F. REINFORCEMENT

- Longitudinal and Transverse reinforcement ratio, ρ_ℓ and ρ_t for shear wall shall not be less than 0.0025 (ACI-318 Section 21.7.2.1)



2. Reinforcement spacing each way in shear walls shall not exceed 18". (ACI-318 Section 21.7.2.1)
 3. Two curtains of reinforcement shall be used if the in plane factored shear force, V_u , exceeds $2A_{CV}\sqrt{f'_c}$. (ACI-318 Section 21.7.2.2)
 4. All continuous reinforcements in shear wall shall be anchored or spliced for f_y in tension in accordance with Chapter 12 of ACI-318, except: (ACI-318 Section 21.7.2.3)
 - a. The effective depth of the member referenced in 12.10.3 shall be permitted to be $0.8 \ell_w$ for walls.
 - b. The requirements of ACI-318 Section 12.11, 12.12, and 12.13 need not be satisfied.
 - c. At locations where yielding of longitudinal reinforcement is likely to occur as a result of lateral displacements, development lengths of longitudinal reinforcement shall be 1.25 times the values calculated for f_y in tension.
 - d. Mechanical splices of reinforcement shall conform to ACI-318 Section 21.2.6 and welded splices of reinforcement shall conform to ACI-318 Section 21.2.7.
 5. Two #5 bars shall be provided around all window and door openings. Such bars shall be extended to develop the bar beyond the corners of the openings but not less than 24", or be anchored to develop f_y in tension at corners of openings. (CBC 1914.3.7, ACI-318 Section 14.3.7)
 6. For wall piers and wall segments, spacing of transverse reinforcement with seismic hooks shall not exceed 6", and shall be extended beyond the pier clear height for at least 12". (CBC 1908.1.8, ACI-318 Section 21.7.10.2)
 7. Reinforcing bars used in shear wall shall comply with ACI 318-05, §21.2.5.
 8. Columns supporting discontinuous shear wall elements shall be reinforced in accordance with CBC 1908.1.12 and ACI-318 Section 21.4.4.5.
 9. Concrete structural wall reinforcement shall be terminated with required development length beyond the boundary reinforcing at the vertical and horizontal end faces of wall sections. (ACI-318 Section 21.7.2)
 10. Tilt-up panels shall be detailed to conform to requirements of special structural walls. (ACI-318 Section 21.2.1.4)
- H. SPECIAL BOUNDARY ELEMENTS**
1. Where special boundary elements are required, the following shall be satisfied: (ACI-318 Section 21.7.6.4)
 - a. The boundary elements shall extend horizontally from the extreme compression fiber minimum ($c - 0.1 \ell_w$) or $c/2$, whichever is larger.
 - b. In flanged sections, the boundary element shall include the effective flange width in compression and shall extend at least 12" into the web.
 - c. Transverse reinforcements shall be:
 - i. For spiral or circular hoops
 $(\rho_s \geq 0.12 f'_c / f_{yt})$ (21-2)
 - ii. For rectangular hoops
 $(A_{sh} \geq 0.09 s b_c f'_c / f_{yh})$ (21-4)
 - d. Spacing of transverse reinforcement shall not exceed the smallest of:
 - i. 1/4 of minimum member dimension,
 - ii. 6 bar diameter of longitudinal reinforcement,
 - iii. Minimum S_o spacing
 $(S_o = 4 + (14 - h_x) / 3)$ (21-5)
 - e. Horizontal spacing of crossies or legs of overlapping hoops, h_x , shall not exceed 14" o.c.
 - f. Special boundary element transverse reinforcement at the wall base shall extend minimum 12" into the footing or mat.
 - g. Horizontal reinforcement in the wall web shall be anchored to develop f_y within the confined core of the boundary element.
 2. Where special boundary elements are not required by ACI-318 Section 21.7.6.2 or 21.7.6.3, the following shall be satisfied:
 - a. If longitudinal reinforcement ratio at wall boundary exceeds $400/f_y$, the boundary transverse reinforcement shall satisfy ACI-318 Section 21.4.4.1(c), 21.4.4.3, and 21.7.6.4(a). The maximum longitudinal spacing of transverse reinforcement in the boundary shall not exceed 8".
 - b. V_u exceeding $A_{cv}\sqrt{f'_c}$ shall have horizontal reinforcement terminating at the edges of shear wall with a standard hook engaging edge reinforcement or "U" stirrup of the same size and spacing as, and spliced



to, the horizontal reinforcement. (ACI-318 Section 21.7.6.5)

- d. Reinforcement anchorage length, location and length of lap splice.
- e. Type and location of mechanical and/or welded splices of reinforcement.

STRUCTURAL NOTES

I. GENERAL NOTES

The following general structural notes shall be made part of the construction documents.

1. Construction documents shall include the following information as applicable to the project:
 - a. Specified concrete compressive strength.
 - b. Specified grade of reinforcement.
 - c. Size and location of structural elements, reinforcement and anchors.

2. Minimum compressive strength for concrete shear wall is $f'_c = 3000$ psi. (ACI-318 Section 21.2.4.1)
3. Continuous Special Inspection by a registered deputy inspector is required for concrete strength $f'_c > 2500$ psi. (CBC 1704.4)

J. ADDITIONAL WRITTEN COMMENTS

No.	Comment	Code Sec. No.