Supplemental Plan Check List for Concrete Shear Wall (2014)

Plan Check : _____

PCIS Application number: _____

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If you have any questions or need clarification on any plan check matters, please contact a plan check supervisor or call our Customer Hotline at (213) 482-0056

For instruction and other information, read the master plan check list attached.

Reference code is Building Code Requirements for Structural Concrete (ACI 318-11) and Commentary unless otherwise noted in plan check list.

Obtain the following Information Bulletins, Affidavits or Forms from our web site (www.ladbs.org)

PLAN DETAILS

1. Longitudinal and Transverse reinforcement ratio, ρ_l and ρ_t for shear wall exceeding $A_{cv}\,\lambda\sqrt{f'_c}$ shall not be less than **0.0025** *(ACI 318-11, §21.9.2.1)*

2. Reinforcement spacing each way in shear walls shall not exceed **18"** *(ACI 318-11, §21.9.2.1)*

3. Two curtains of reinforcement shall be used if the in-plane factored shear force, V_u, exceeds $2\,A_{cv}\,\lambda\sqrt{f'_c}$. *(ACI 318-11, §21.9.2.2)*

4. All continuous reinforcements in shear wall shall be anchored or spliced for f_y in tension in accordance with Chapter 12 of ACI 318-11. *(ACI 318-11, §21.9.2.3)*

5. Not less than two **#5** bars shall be provided in wall having two layers of reinforcement in both direction and one #5 bar in walls having a single layer of reinforcement in both directions shall be provided around all window and door and similar sized openings. Such bars shall anchored to develop fy in tension at the corners of the openings. (ACI 318-11, §14.3.7)

6. Where special boundary elements are required, the following shall be satisfied *(ACI 318-11 §21.9.6.4)*:

   a. The boundary elements shall extend horizontally from the extreme compression fiber minimum **(c-0.1 lw**) or **c/2**, whichever is larger.

   b. In flanged sections, the boundary element shall include the effective flange width in compression and shall extend min. **12"** into the web.

   c. Transverse reinforcements shall be:

      i. For spiral or circular hoops, per Eq 21-3 $\left(\rho_s \geq 0.12\, f'_c / f_{yt}\right)$

ii. For rectangular hoops, per Eq 21.4 and Eq 21.5

$$(A_{sh} \geq (0.3sb_c f'_c/f_{yt})[(A_g/A_{ch})-1]) \text{ and } (A_{sh} \geq 0.09sb_c f'_c / f_{yt})$$

d. Spacing for transverse reinforcement shall not exceed the smallest of:

- □ **1/4** of minimum member dimension,
- □ **6** bar diameter of the smallest longitudinal reinforcement
- □ Minimum S_o spacing per Eq. (21-2) $(S_o= 4+(14-h_x)/3)$

e. Horizontal spacing of crossties 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 support.

g. Horizontal reinforcement in the wall web shall be anchored to develop f_y within the confined core of the boundary element..

7. Where boundary zone detail are not required by ACI 318-11, §21.9.6.2 or §21.9.6.3, the following shall be satisfied:

a. If $\rho_l < 400/fy$, the boundary transverse reinforcement shall satisfy §21.6.4.2 and 21.9.6.4(a). The maximum longitudinal spacing of transverse reinforcement in the boundary shall not exceed **8"**.*(ACI 318-11 §21.9.6.5)*

b. V_u exceeding $A_{cv} \lambda \sqrt{f'_c}$ shall have horizontal reinforcement terminating at the edges of shear wall with the a standard hook or "U" stirrup of the same size and spacing as, and spliced to, the horizontal reinforcement. *(ACI 318-11, §21.9.6.5)*

8. Walls and portions of walls with $P_u > 0.35P_o$ shall not be considered to contribute to the calculated strength of the structure for resisting earthquake- induced forces. Such walls shall conform to the requirements of ACI 318 Section 21.13. *(LABC 1905.1.12, ACI 318-11, §21.9.4.6)*

CALCULATIONS

General

1. Design forces shall be in accordance with the Factored Load and Combinations specified in *§91.1605.2 of LABC* and *§12.4.2.3 of ASCE 7-10 §21.9.3 of ACI318-11.*

2. The **R** value used in determining the base shear shall not exceed **5.0** for special reinforced concrete shear walls and **4.0** for ordinary concrete shear walls**.** per *T12.2-1 of ASCE 7-10.*

3. In storage and warehouse occupancies, include a minimum **25%** of the floor live load for the seismic dead load, **W**. *(ASCE 7-10, §12.7.2.1)*

4 The shear strength reduction factor, **"φ"** shall be per §9.3.4 of ACI 318-11.

Shear

5. Wall shall have a nominal shear strength per following formula:

$$V_n = A_{cv} [\alpha_c \lambda \sqrt{f'_c} + p_t f_y]. \qquad \textit{(ACI318-11 Eq21-7)}$$

Where : α_c **=** 3.0 for $h_w / \ell_w \leq 1.5$,

α_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 *(ACI 318-11, §21.9.4.1)*

6. $\mathbf{h_w} / \ell_w$ used in determining $\mathbf{V_n}$ for segments of a wall shall be the larger of the ratios for the entire wall and the segment of wall considered. *(ACI 318-11, §21.9.4.2)*

7. Reinforcement ratio $\boldsymbol{\rho_l} \geq \boldsymbol{\rho_t}$, if height to length ratio < **2.0**, *(ACI 318-11, §21.9.4.3)*

8. Nominal shear strength, $\mathbf{V_n}$, of all wall shall not exceed $\mathbf{8\ A_{cv}\sqrt{f'_c}}$ for the entire building and $\mathbf{10\ A_{cv}\sqrt{f'_c}}$ for individual wall pier. *(ACI 318-11, §21.9.4.4)*

Flexure and axial loads

9. Shear walls subject to combined flexural and axial loads shall be designed in accordance with (ACI 318-11, §10.2 and §10.3) except that §10.3.6 and the nonlinear strain requirements of §10.2.2 shall not apply. The effects of openings shall be considered. *(ACI 318-11, §21.9.5.1)*

10. Effective flange widths of flanged sections shall extend from the face of the web a distance equal to the smaller of **½** the distance to an adjacent wall wed and **25%** of the total wall height *(ACI 318-11, §21.9.5.2)*

Boundary elements

11. Special boundary elements at the edges of structural walls are required per §21.9.6.2 and §21.9.6.3 of ACI 318-11.

12. 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 318-11 §21.9.6.2):*

    a. Compression zones shall be reinforced with special boundary elements per (Eq 21-8)

    $$C \geq \frac{\ell_w}{600\,(\delta_u / h_w)}$$ Where $\boldsymbol{\delta_u / h_w}$ **shall not be taken less than 0.007**

    b. Reinforcement shall extend vertically a maximum distance not less than the larger of ℓ_w or $\mathbf{M_u / 4V_u}$ **.**

13. Structural walls not designed to the provisions of 21.9.6.2 shall have special boundary elements at boundaries and edges around the openings of the wall where the maximum extreme fiber compressive stress exceeds **0.2 f'$_c$**. *(ACI318-11 §21.9.6.3)*

NOTES ON PLANS

□ 1. Minimum compressive strength for concrete shear wall is **f'$_c$ = 3000 psi**. *(ACI 318-11, §21.1.4.2)*

□ 2. Continuous inspection by a deputy inspector shall be required. *(*LABC §*91.1705.3)*

□ 3. Reinforcing bars used in shear wall shall comply with ACI 318-11, §21.1.5

ADDITIONAL CORRECTIONS	**Code Sec. No.**