Supplemental Plan Check List for Concrete Shear Wall (2020)

Plan Review Date: _____

Plan Check #: _____ Permit Application Number:_____

Job Address: _____

Plan Check Engineer: _____ Phone: _____ Email: _____

Your feedback is important, please visit our website to complete a Customer Survey at www.ladbs.org/LADBSWeb/customer-survey.jsf.

If you have any questions or need clarification on any plan check matters, please contact your plan check engineer and/or his or her supervisor.

For instructions and other information, reference the project general correction sheet.

Reference code is Building Code Requirements for Structural Concrete (ACI 318-14) and Commentary unless otherwise noted in plan check list.

Obtain Information Bulletins, Affidavits or Forms from our web site at www.ladbs.org.

PLAN DETAILS

1. Longitudinal and Transverse reinforcement ratios, ρ_l and ρ_t for V_u exceeding $A_{CV}\lambda\sqrt{f'_C}$ shall not be less than 0.0025. (18.10.2.1)

2. Reinforcement spacing each way in shear walls shall not exceed 18" (18.10.2.1)

3. At least two curtains of reinforcement shall be used in a wall if $V_u > 2A_{CV}\lambda\sqrt{f'_c}$ or $h_w/l_w \geq 2.0$ in which h_w and l_w refer to height and length of entire wall, respectively (18.10.2.2)

4. Reinforcement in structural walls shall be developed or spliced for f_y in tension in accordance with Sections 25.4, 25.5, and (a) through (c):

   (a) Longitudinal reinforcement shall extend beyond the point at which it is no longer required to resist flexure by least $0.8l_w$ except at the top of a wall.

   (b) 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.

   (c) Mechanical splices of reinforcement shall conform to 18.2.7 and welded splices of reinforcement shall conform to 18.2.8.

5. If in-plane $V_u \leq 0.5V_c$, minimum ρ_l and minimum ρ_t shall be in accordance with Table 11.6.1. These limits need not be satisfied if adequate strength and stability can be demonstrated by structural analysis. (11.6.1)

6. If in-plane $V_u \geq 0.5V_c$, (a) and (b) shall satisfied:

   (a) ρ_l shall be at least the greater of the value calculated by Eq. (11.6.2) and 0.0025, but need not exceed ρ_t required by 11.5.4.8 $\rho_l \geq 0.0025 + 0.5(2.5 - h_w / l_w)(\rho_t - 0.0025)$

   (b) ρ_t shall be at least 0.0025 (11.6.2)

7. Walls or wall piers with $h_w/l_w \geq 2.0$ that are effectively continuous from the base of structure to top of wall and are designed to have a single critical section for flexure and axial loads shall satisfy (a) and (b) or shall be designed by 18.10.6.2:

   (a) Compression zones shall be reinforced with special boundary elements where

$$c \geq \frac{\ell_w}{600(1.5\delta_u/h_w)} \quad , \delta_u/h_w \geq 0.005$$

   and c corresponds to the largest neutral axis depth calculated for the factored axial force and nominal moment strength consistent with the direction of the design displacement δ_u. Ratio δ_u/h_w shall not be taken less than 0.005.

   (b) Where special boundary elements are required by (a), the special boundary element transverse reinforcement shall extend vertically above and below the critical section at least the greater of l_w and $M_u/4V_u$ except as permitted in 18.10.6.4(g). (18.10.6.1)

8. Where special boundary elements are required, the following per 18.10.6.4 shall be satisfied:

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

   (b) Width of the flexural compression zone, b, over the horizontal distance calculated by 18.10.6.4(a), including flange if present, shall be at least $h_u/16$.

   (c) For walls or wall piers with $h_w/l_w \geq 2.0$ that are effectively continuous from the base of structure to top of wall, designed to have a single critical section for flexure and axial loads, and with $c/l_w \geq 3/8$, width of the flexural compression zone b over the length calculated in 18.10.6.4(a) shall be greater than or equal to 12 in.

   (d) In flanged sections, the boundary element shall include the effective flange width in compression and shall extend at least 12 in. into the web.

   (e) The boundary element transverse reinforcement shall satisfy 18.7.5.2(a) through (e) and 18.7.5.3, except the value h_x in 18.7.5.2 shall not exceed the lesser of 14 in. and two-thirds of the boundary element thickness, and the transverse reinforcement spacing limit of 18.7.5.3(a) shall be one-third of the least dimension of the boundary element.

   (f) The amount transverse reinforcement shall be in accordance with Table 18.10.6.4(f)

   (g) Where the critical section occurs at the wall base, the boundary element transverse

reinforcement at the wall base shall extend into the support at least l_d in accordance with 18.10.2.3, of the largest longitudinal reinforcement in the special boundary element. Where the special boundary element transverse reinforcement shall extend at least 12 in. into the footing, mat, or pile cap, unless a greater extension is required by 18.13.2.3.

(h) Horizontal reinforcement in the wall web shall extend to within 6 in. of the end of wall. Reinforcement shall be anchored to develop f_y within the confined core of the boundary element using standard hooks or heads. Where the confined boundary element has sufficient length to develop the horizontal web reinforcement, and $A_s f_y/s$ of the horizontal web reinforcement does not exceed $A_s f_{yt}/s$ of the boundary element transverse reinforcement parallel to the horizontal web reinforcement, it shall be permitted to terminate the horizontal web reinforcement without a standard hook or head.

9. Where boundary zone details are not required by 18.10.6.2 or 18.10.6.3, the following shall be satisfied:

(a) If $\rho_l > 400/f_y$, the boundary transverse reinforcement shall satisfy Section 18.7.5.2(a) through (e) over the distance calculated in accordance with 18.10.6.4(a). The longitudinal spacing of transverse reinforcement in the boundary shall not exceed the lesser of 8in. and 8 d_b of the smallest primary flexural reinforcing bars, except the spacing shall not exceed the lesser of 6 in. and $6d_b$ within a distance equal to the greater of l_w and $M_u/4V_u$ above and below critical sections where yielding of longitudinal reinforcement is likely to occur as a result of inelastic lateral displacements.

(b) V_U exceeding $A_{CV}\ \lambda\ \sqrt{f'_C}$ in the plane of the wall shall have horizontal reinforcement terminating at the edges of structural walls with standard hooks engaging the edge reinforcement or "U" stirrups of the same size and spacing as, and spliced to, the horizontal reinforcement, and enclosing the edge reinforcement. (18.10.6.5)

CALCULATIONS

General

1. Design forces shall be in accordance with the Factored Load and Combinations specified in 1605.2 of the 2020 LABC, 12.4.2.3 of ASCE 7-16, and 18.10.3 of ACI318-14.

2. The R value used in determining the base shear shall not exceed 5.0 for special reinforced concrete shear walls for bearing wall systems, 6.0 for special reinforced concrete shear walls for building frame systems,and 4.0 for ordinary reinforced concrete shear walls per T12.2-1 of ASCE 7-16.

3. The shear strength reduction factor, "ϕ" shall be per 21.2.4.

Shear

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

$$V_n = A_{CV}\,[\alpha_c\ \lambda\ \sqrt{f'_C} + p_t\ f_y\,] \qquad \text{(Eq 18.10.4.1)}$$

Where : α_c= 3.0 for $h_w/l_w \le 1.5$,

α_c= 2.0 for $h_w/l_w \ge 2.0$

α_c= Varies linearly between 3.0 and 2.0 for h_w/l_w between 1.5 and 2.0

(18.10.4.1)

2. 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. (18.10.4.2)

3. Reinforcement ratio $\rho_l \geq \rho_t$, if height to length ratio < 2.0. (18.10.4.3)

4. Nominal shear strength, V_n, of all wall segments sharing a common lateral vorce, shall not exceed $8A_{CV}\sqrt{f'_C}$, and for any individual wall pier, shall not exceed $10A_{CV}\sqrt{f'_C}$. (18.10.4.4)

Flexure and axial loads

1. Shear walls subject to combined flexural and axial loads shall be designed in accordance with 22.4. The effects of openings shall be considered. (18.10.5.1)

2. Effective flange widths of flanged sections shall extend from the face of the web a distance equal to the lesser of 1/2 the distance to an adjacent wall web and 25% of the total wall height. (18.10.5.2)

Boundary elements

1. Special boundary elements at the edges of structural walls are required per 18.10.6.2 and 18.10.6.3.

2. Walls or wall piers with $h_w / l_w \geq 2.0$ 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 *(18.10.6.2):*

   a. Compression zones shall be reinforced with special boundary elements per

   (Eq 18.10.6.2)

$$c \geq \frac{\ell_w}{600(1.5\delta_u/h_w)} \quad , \delta_u/h_w \geq 0.005$$

   b. Transverse reinforcement shall extend vertically above and below the critical section at least the greater of l_w and $M_u / 4V_u$ except as permitted in 18.10.6.4(g).

3. Structural walls not designed to the provisions of 18.10.6.2 shall have special boundary elements at boundaries and edges around the openings of the wall where the maximum extreme fiber compressive stress exceeds $0.2\ f'_C$. (18.10.6.3)

NOTES ON PLANS

1. Minimum compressive strength for concrete shear wall is $f'_C = 3000$ psi. (18.2.5.1 and Table 19.2.1.1)
2. Continuous inspection by a deputy inspector shall be required. (LABC 1705.3)

3. Reinforcing bars used in shear wall shall comply with (18.2.6.1 and 20.2.2)

ADDITIONAL CORRECTIONS	Code Sec. No.

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