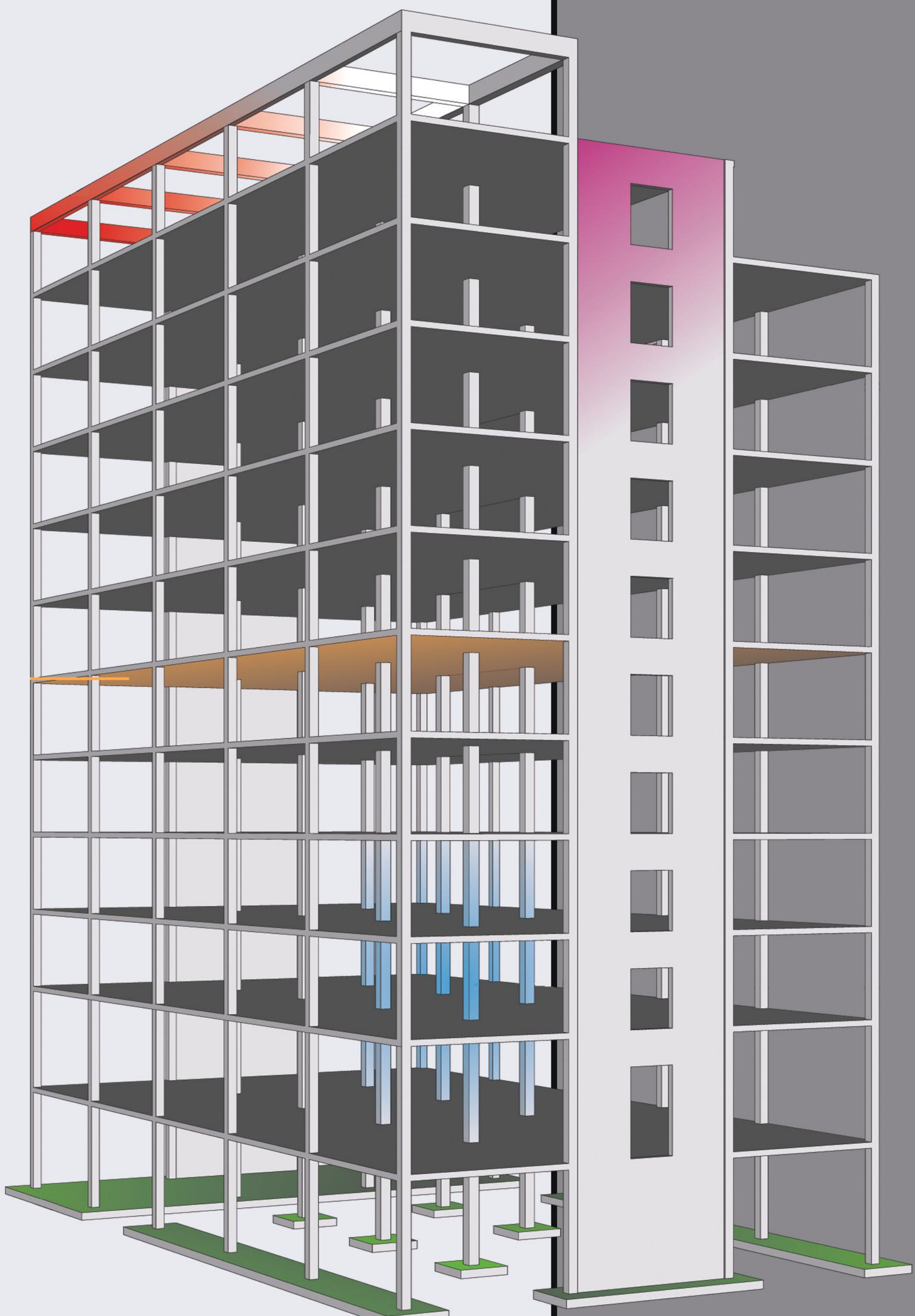
CSA A23.3-24 Code Revisions

StructurePoint

CONCRETE SOFTWARE SOLUTIONS

Impact on SP Software



CSA A23.3-24 Code Revisions

Impact on StructurePoint Software

Version: March-12-2026

General Themes & Summary

The 2024 edition places greater emphasis on explicit definitions, realistic analysis assumptions, and improved alignment with current research and practice. Most changes with software impact affect the design of beams, slabs, columns, and walls, while foundation elements are comparatively less affected.

Some of the significant changes are:

- Confinement spirals and regular spirals are explicitly distinguished for compression members, providing clearer detailing options
- Reinforcement stress determination is clarified through the introduction of f_{yg} and tabulated limits for higher-strength reinforcement
- Crack-control requirements are refined when moment redistribution is used, requiring calculation of steel stress rather than simplified assumptions
- Deflection provisions are revised by replacing the Branson effective moment of inertia with the Bischoff–Scanlon formulation and restoring the full modulus of rupture in cracking calculations
- Size effect in two-way (punching) shear is reorganized and explicitly expressed through the size effect factor, λ_s
- Criteria defining deep flexural members are expanded, resulting in broader application of deep-member design provisions
- Column slenderness provisions are substantially revised, including updated equations, limits, and moment sign conventions
- New case is introduced for slenderness calculations where both top and bottom moments being considered as equal to $M_{2,min}$
- Biaxial shear interaction requirements are formally introduced for members subjected to shear in two orthogonal directions

- Shear resistance reduction due to terminated flexural reinforcement is narrowed to cases where a significant portion of reinforcement is curtailed
- New transverse reinforcement spacing requirements across member width are introduced for wide members
- Tension development-length provisions are modified with revised equations, reorganized modification factors, and new confinement requirements for higher-strength reinforcement
- New geometric criterion is introduced for designating a column as a corner column
- New requirement for the design of bearing walls under clause 10 is introduced
- New requirement for the slenderness design of bearing walls and shear walls is introduced
- Modifications are made to Load Factors for Snow and Wind in Table C.1 a) and Table C.1 b)

Chapter 7: Details of Reinforcement

1. Confinement spiral reinforcement and regular spiral reinforcement categories are introduced

CSA A23.3-24, 7.6 treats spiral reinforcement as two distinct categories, namely, confinement spirals per ***7.6.4*** and regular spirals per ***7.6.5***.

CSA A23.3-19, 7.6.4 titled as "Spirals for compression members" is now renamed as "Confinement spirals for compression members" in ***CSA A23.3-24***. Only modification there is that the maximum clear spacing between turns of confinement spirals has been increased from 75 mm to 100 mm.

CSA A23.3-19, 7.6.5 titled as "Ties for compression members" is now renamed as "Ties and regular spirals for compression members" in ***CSA A23.3-24***.

This gives an option to the user to utilize spirals that are not satisfying ***CSA A23.3-24, Equation 10.7*** (i.e. ρ_s ratio) as regular spirals that are treated equivalently to ties. Regular spirals can be utilized in non-seismic regions where improved ductility may not be required.

This change affects spColumn implementation.

Chapter 8: Design – Limit states, load combinations, and material properties

1. Reinforcement stress value determination is modified with introduction of f_{yg} and new table

CSA A23.3-24, 8.5.1 states that the design calculations for ultimate limits states shall be based on f_y, f_y', f_{yt}, f_{yh} or f_{yv} as applicable, taken as the lesser of the following:

a) the newly introduced notation, f_{yg}, that is the minimum yield strength for the grade of reinforcement as specified in the applicable material standard; or

b) the value of maximum reinforcement stress permitted for design calculations as specified in newly introduced ***Table 8.5.1*** for the associated usage and application.

CSA A23.3-24, 8.5.1 mandates that reinforcement stress for design calculations cannot be taken greater than f_{yg}. For reinforcing steel grades higher than Grade 400, ***Table 8.5.1*** introduces permissible design stress values as limits according to the usage and applicability which will result in reinforcement stresses for design be lower than actual f_{yg}.

The reinforcement stress input range across StructurePoint Software are between 400 MPa $\leq f_{yg} \leq$ 500 MPa (i.e. Grade 400 to Grade 500) for ***CSA A23.3-24*** and prior. Therefore, no software revision is required. Grade 400 is the standard "normal strength" and Grade 500 is the standard "high-strength" reinforcing steel grade utilized in Canada. Although reinforcing steel grades higher than Grade 500 may become increasingly available and be utilized especially for structures in seismic regions to resolve the congestion issues in shear wall of high-rise buildings, limitations introduced for its utilization in ***Table 8.5.1*** and various other clauses affirms that the range allowed StructurePoint Software is indeed cautiously prudent.

This change does not affect the software implementation.

Chapter 9: Structural analysis and computation of deflections

1. When moment redistribution is utilized, the more detailed '*z*' factor determination is required

CSA A23.3-24, 9.2.4 states that the crack control parameter, z, shall be determined for all cross-sections where moments have been reduced by moment redistribution. In this determination, the stress in the steel reinforcement at specified loads, f_s, shall be computed using the cracked moment of inertia for the moment determined by linear elastic analysis without moment redistribution.

CSA A23.3-19 did not specify any specific treatment regarding the computation of the crack control parameter, z, and ***clause 10.6.1*** provided a practical option of $f_s = 0.60\ f_y$ in lieu of detailed computations. Currently, spSlab and spBeam programs utilize $f_s = 0.60\ f_y$ for the determination of 'z' factor.

This revision requires more accurate determination of 'z' factor if moment redistribution is performed. The revised criteria will impact the spacing of bars in flexural tension zones.

This change affects spSlab and spBeam implementation.

2. Effective moment of inertia, I_e equation is revised

CSA A23.3-24, 9.8.2.3 has introduced new effective moment of inertia, I_e, equation (***Equation 9.1***). The Branson equation (***CSA A23.3-19, Equation 9.1***) is replaced with the effective moment of inertia approximation developed by Bischoff and Scanlon (***CSA A23.3-24, Equation 9.1***). This change aligns ***CSA A23.3-24*** with ***ACI 318-19***.

The Branson equation has been shown to underestimate deflections for members with low reinforcement ratios, which often occurs in slabs, and did not consider the effects of restraint. For members with greater than 1% reinforcement and a service moment at least twice the cracking moment, there is little difference between deflections calculated using the former and the ***CSA A23.3-24*** provisions.

This change affects the software implementation.

3. Modulus of rupture value is no longer reduced for cracking moment calculation

CSA A23.3-24, 9.8.2.3 has removed the ***CSA A23.3-19*** statement of "f_r shall be taken as half the value given in ***Equation 8.3***" The modulus of rupture, f_r, utilized in cracking moment, M_{cr}, equation (***CSA A23.3-24, equation 9.2***) is now to be taken as full the value given in ***Equation 8.3***. This change aligns ***CSA A23.3-24*** with ***ACI 318-19***.

With this change, M_{cr} in ***CSA A23.3-24*** shall be double the value that of ***CSA A23.3-19***. This leads to the member is being treated as 'less cracked', having higher I_e, and experiencing smaller deflection.

This change affects the software implementation.

Chapter 10: Flexure and axial loads

1. c/d equation is revised to utilize f_{yg} in Equation 10.5 instead of f_y

CSA A23.3-24, Equation 10.5 replaces f_y with the newly introduced f_{yg}.

The implementation adopted above for ***CSA A23.3-24, 8.5.1*** do not necessitate any change in notation when performing c/d calculation per ***Equation 10.5***.

This change does not affect the software implementation.

2. New deep flexural member consideration criteria is established

CSA A23.3-24, 10.7.1 now considers flexural members as deep flexural members:

- If a clear span, l_n, does not exceed 4d.
- If a significant concentrated load exists within a distance of 2d from the face of the support

And considers cantilevered flexural members as deep flexural members:

- If the clear span does not exceed 2d.

The new criteria introduce in ***CSA A23.3-24*** concerning the definition of the deep flexural member shall qualify wider set of models as deep flexural members in comparison to ***CSA A23.3-19*** and prior.

This change affects spSlab and spBeam implementation.

3. The confinement spiral reinforcement term is introduced for compression members

CSA A23.3-24, 10.9.4 explicitly states that ***Equation 10.7*** is for newly introduced "confinement spiral reinforcement" and now features f_{yh} instead of f_y.

This change does not affect the software implementation.

4. The maximum factored axial load resistance, $P_{r,max}$ clause is modified

CSA A23.3-24, 10.10.4 explicitly states that ***Equation 10.8*** is for newly introduced "confinement spiral reinforcement" category. And the column with "regular spiral reinforcement" shall now utilize ***Equation 10.9***.

This change affects spColumn implementation.

5. Clause 10.15.2 is renamed as "Consideration of slenderness" with substantial revisions

In ***CSA A23.3-24, clause 10.15.2***, the following revisions are made:

- ***Equation 10.16*** is modified as:

$$\frac{kl_u}{r} \leq \frac{15+10\left(M_1/M_2\right)}{\sqrt{P_f/\left(f_c' A_g\right)}}$$

- Upper limit for kl_u/r is spelled out as 40.
- The requirement that "M_1/M_2 is not taken as less than -0.5" for M_1/M_2 in ***Equation 10.16*** is removed.
- The sign convention for M_1/M_2 has been updated so that M_1/M_2 shall be taken as negative if bent in single curvature and as positive if bent in double curvature. This results in a sign convention change from ***CSA A23.3-19***.
- M_1/M_2 shall be taken as 1.0 if M_2 is less than $M_{2,min}$" statement is removed.

These changes substantially affect spColumn implementation.

6. C_m factor equation is revised

In ***CSA A23.3-24, clause 10.15.3.2***, ***Equation 10.21*** is modified as:

$$C_m = 0.6 - 0.4\frac{M_1}{M_2}$$

This change affects spColumn implementation.

7. New case is introduced where both top and bottom moments being considered as equal to $M_{2,min}$

For a compression member bent in single curvature in a given load combination, if both top and bottom first-order moments are less than or equal to $M_{2,min}$, then, ***CSA A23.3-24, 10.15.3.4*** requires both top and bottom moment being considered as $M_{2,min}$ for slenderness calculations.

The clause prevents unconservative designs by ensuring minimum bending due to imperfections is always considered, even when structural analysis predicts very small end moments.

This change affects spColumn implementation.

Chapter 11: Shear and torsion

1. The f_{yt} term is introduced instead of f_y in Equation 11.1

CSA A23.3-24, Equation 11.1 now features f_{yt} instead of f_y and is allowed to be as high as 500 MPa for usage in shear and torsion calculations.

This change does not affect the software implementation.

2. The reduction of shear resistance criterion is revised

CSA A23.3-19, 11.2.13.1 stated that terminating longitudinal reinforcement in flexural tension zones affect the shear resistance adversely and shall need to be taken into account.

CSA A23.3-24, 11.2.13.1 limits this requirement by specifying that the reduction of shear resistance need to be considered only when 25% or more of the area of flexural tension reinforcement is terminated in flexural tension zone.

The revision introduces a quantitative threshold for reinforcement termination. Minor reductions in reinforcement area are no longer required to trigger a shear resistance reduction.

This revision impacts spBeam / spSlab implementation.

3. The special member type criterion is now applicable only if f_{yg} does not exceed 500 MPa

CSA A23.3-24, 11.3.6.2 now explicitly states that its provisions can be utilized if the yield strength of the longitudinal reinforcement, f_{yg}, does not exceed 500 MPa.

This change does not affect the software implementation.

4. Thin walls resisting out-of-plane shear are added to special member types for shear design

CSA A23.3-24, 11.3.6.2 a) expands the list of special member types for which the values β = 0.21 and θ = 42° may be used. The revision adds walls resisting out-of-plane shear with an overall thickness not greater than 350 mm to this category.

In ***CSA A23.3-19***, this category included slabs, footings, thin beams, concrete joists, and beams cast integrally with slabs, but did not include walls.

This revision impacts spWall implementation.

5. New β equations are introduced for longitudinal reinforcement having f_{yg} greater than 400 MPa in simplified method

CSA A23.3-24, 11.3.6.3 a) states that for longitudinal reinforcement having f_{yg} greater than 400 MPa, β cannot be taken as 0.18 but the following newly introduced equation to be used:

$$\beta = 0.4 / \left(1 + f_{yg} / 320\right)$$

Similarly, ***CSA A23.3-24, 11.3.6.3 b)*** states that for longitudinal reinforcement having f_{yg} greater than 400 MPa, β cannot be taken as in ***Equation 11.9a*** but the newly introduced ***Equation 11.9b*** as shown below to be used:

$$\beta = \frac{520}{\left(1 + f_{yg} / 320\right)\left(1{,}000 + d_v\right)}$$

The new equations introduced in ***11.3.6.3 a)*** and ***b)*** for longitudinal reinforcement having f_{yg} greater than 400 MPa yield smaller β values as compared to 0.18 and ***Equation 11.9a*** respectively. Therefore, the shear resistance attributed to the concrete, V_c is reduced when f_{yg} greater than 400 MPa is utilized.

This change affects the software implementation.

6. New spacing of transverse reinforcement across the member width is introduced

CSA A23.3-24, Clause 11.3.8.4 introduces new spacing of transverse reinforcement across the member width as not exceeding d_v or 600 mm.

This change improves shear behavior of wide beams that require stirrups by providing multiple stirrup legs. This new criterion affects the determination of the number of legs across the width of a wide beams in design.

This change affects the software implementation.

7. Revisions are made to the equations regarding shear-torsion crushing check

CSA A23.3-24, 11.3.10.4 b), ***Equation 11.19*** is modified as follows:

$$\sqrt{\left(\frac{V_f - V_p}{b_w d_v}\right)^2 + \left(\frac{T_f p_c}{0.85\alpha_T A_c^2}\right)^2} \le 0.25\phi_c f_c'$$

with α_T taken as $1.0 - 0.005 f_c'$.

The equation above is utilized for the cross-sectional dimensions to avoid crushing for sections other than box sections. ***Equation 11.18*** which is for box sections is modified as well, however, it is outside of the software scope.

In ***Equation 11.19***:

- A new factor α_T is introduced
- p_c replaces p_h
- A_c replaces A_{oh}
- 0.85 replaces factor 1.7

The torsional stress component used in the crushing check is revised to include the concrete-strength-dependent factor α_T. This factor reduces stress as concrete compressive strength f_c' increases.

This change affects the software implementation.

8. New requirements for biaxial shear are introduced

CSA A23.3-24, 11.3.11, states that members subjected to shear forces in two orthogonal axes of the cross-section, x and y, shall satisfy the following conditions.

- Uniaxial - Along x-axis:

$$\frac{V_{fx}}{V_{rx}} \leq 1.0$$

- Uniaxial - Along y-axis:

$$\frac{V_{fy}}{V_{ry}} \leq 1.0$$

- New interaction equation for Biaxial shear check:

$$\frac{V_{fx}}{V_{rx}} + \frac{V_{fy}}{V_{ry}} \leq 1.5$$

This change requires designers to check a biaxial shear interaction when significant shear forces occur in both orthogonal directions, such as in transfer slabs, pile caps, footings, and heavily loaded beams or walls. Designs that previously satisfied independent shear checks in each direction may now require additional shear reinforcement or increased member dimensions to satisfy the interaction limit.

This change affects the software implementation.

Chapter 12: Development and splices of reinforcement

1. Tension development length equation is modified

CSA A23.3-24, 12.2.2 revises the tension development-length provisions by replacing the older area-based bond model in ***CSA A23.3-19*** with a diameter-normalized expression and a simplified confinement term.

CSA A23.3-19, Equation 12.1 relied on A_b and a confinement factor tied to tie yield strength; ***CSA A23.3-24, Equation 12.1*** removes this dependence and defines K_{tr} purely through actual transverse reinforcement geometry, while also enforcing clearer limits on spacing and confinement effectiveness.

These modifications reflect current bond research, close loopholes that allowed unconservative reductions in l_d, and result in more uniform, predictable anchorage requirements. In practice, designers should expect development lengths that are less sensitive to tie strength assumptions and more closely aligned with measurable confinement detailing.

This change affects the software implementation.

2. Modification factors for development of bars in tension is reorganized and a new factor for reinforcement grade is introduced

CSA A23.3-24, 12.2.4 reorganizes the modification factors for tension development into a unified table, ***Table 12.2***, and introduces a new factor, k_g, for reinforcement grade.

CSA A23.3-19, 12.2.4 considered factors for bar location, coating, concrete density, and bar size, and capped the product k_1k_2 at 1.7; these remain largely intact in 2024 Edition but are now presented tabularly.

The main technical addition in ***CSA A23.3-24*** is the reinforcement grade factor, k_g. The k_g factor is equal to 1.0 for bars with $f_{yg} \leq 400$ MPa and it defined as f_{yg} / 900 + 0.56 for $f_{yg} > 400$ MPa. This linear adjustment accounts for higher-strength reinforcement by increasing the required development length as reinforcement yield strength increases.

This change affects the software implementation.

Chapter 13: Two-way slab systems

1. Two-way shear size effect now expressed as λ_s

In ***CSA A23.3-19, 13.3.4***, size effect in two-way shear was written as a conditional multiplier on v_c: if the effective depth used in punching (two-way) shear, d, exceeded 300 mm, then the v_c from Eqs. 13.5–13.7 was multiplied by 1,300 / (1,000 + d). For footings/mats, that multiplier did not need to be applied when the distance from the point of zero shear to the face of the column/pedestal/wall was less than 2d.

In ***CSA A23.3-24, 13.3.4***, the same idea is reorganized and made explicit as a named size-effect factor λ_s:

$$\lambda_s = \min\left(1, \frac{1,300}{1,000 + d}\right)$$

Except for the design of footings or mat foundations where the distance from the point of zero shear to the face of the column, pedestal, or wall is less than 2d, the value of the size effect factor, λ_s, may be taken as 1.0.

Although this rewrite has no numerical impact, it still affects software as the new size effect factor, λ_s, is to be implemented.

2. New geometric criterion is introduced for designating a column as a corner column

CSA A23.3-24, 13.3.6 adds a new geometric criterion in order to be able to utilize the alternative method for factored shear resistance determination of slabs in the vicinity of corner columns. The column is now considered a corner column if it is having an exterior overhang not exceeding one effective depth ($\leq d$).

This change affects the software implementation.

Chapter 14: Walls

1. New requirement for the design of bearing walls under clause 10 is introduced

CSA A23.3-24, 14.2.3 provides specific design requirements for bearing walls designed using ***Clause 10***. The clause states that the general design principles of ***Clause 10.1*** shall apply. Bearing walls shall be designed for the factored axial load and the factored weak axis moment as specified in ***Clause 10***. A factored strong axis moment, if present, shall be included in the design.

Additionally, bearing walls shall satisfy the slenderness requirements of ***14.3***. The resistance requirements of clauses ***10.10.1***, ***10.10.2*** and ***10.10.4*** needs to be satisfied as well.

This change does affect the software implementation.

2. New requirement for the slenderness design of bearing walls and shear walls is introduced

CSA A23.3-24, 14.3 states that bearing walls and shear walls shall satisfy the slenderness requirements of ***Clauses 10.13*** to ***10.16*** inclusive, except as permitted in ***Clause 14.3.5***, and satisfy the additional requirements of ***Clauses 14.3.2*** to ***14.3.4*** and ***14.3.6***.

This change imposes more requirements for bearing walls and shear walls as listed below in addition to chapter 10 requirements.

- ***CSA A23.3-24, 14.3.2*** states that the factored weak axis moment for slenderness design shall not be less than $M_{2,min}$ except as permitted in ***Clause 14.3.3***, and shall act in conjunction with strong axis bending, if present.
- ***CSA A23.3-24, 14.3.3*** states that for a tension-controlled wall subjected to strong axis bending and axial load, a minimum weak axis moment of 0.75 $M_{2,min}$ may be used for the slenderness design if wall thickness, t, is less than or equal to 300 mm.

- ***CSA A23.3-24, 14.3.4*** states that for a compression-controlled wall subjected to strong axis bending and axial load, it shall be permitted to consider slenderness effects on a reduced length of wall, such that the resultant axial force representing axial load, P_f, and strong axis moment, M_{fs}, acts at the center of the reduced length of wall.
- ***CSA A23.3-24, 14.3.5*** lists several conditions that if any of them is satisfied, then, the slenderness requirements of ***Clauses 10.13*** to ***10.15*** inclusive need not apply for a tension-controlled wall subjected to strong axis bending.
- ***CSA A23.3-24, 14.3.6*** outlines requirements for flanges or cross walls of a wall.

This change does affect the software implementation.

Annex C (Informative)

1. Modifications to Load Factors for Snow and Wind in Table C.1 a) and Table C.1 b)

CSA A23.3-24, Annex C modifies the load factors for snow and wind loads for load combination cases involving them in ***Table C1 a)*** Load combinations without crane loads for ultimate limit states and in ***Table C.1 b)*** Load combinations with crane loads for ultimate limit states.

In ***CSA A23.3-24***, the load factors for snow and wind are reduced in related load combinations as compared to ***CSA A23.3-19***.

These revisions shall result in more favorable governing design forces. As a result, designs based on ***CSA A23.3-24*** may produce slightly more economical reinforcement or member sizes, particularly in regions where snow or wind previously governed the load combinations.

This change affects the software implementation.