STRUCTURAL/ARCHITECTURAL COORDINATION CHECKLIST

Do you often hear the following question from architects: "What information do you need from us?"

To assist in organizing the large information exchange between architects and structural engineers, SE University has compiled a General Structural/Architectural Coordination Checklist. Items on this Checklist are intended to be questions to pose to architects and key points to consider when reviewing architectural drawings or models during the schematic and design phases of a project.

The Checklist is divided into 4 Sections:

A. Exterior Wall Design (Docx Version / PDF Version)
B. Secondary Element Design (Docx Version / PDF Version)
C. Architectural Plans and Sections (Docx Version / PDF Version)
D. Architectural General Notes (Use same link as Architectural Plans and Sections)

The full checklist is included in this document
To access these topics separately, use the links above

Stair and elevator coordination items are not included in this checklist. Please refer to SEU Elevator Checklist and SEU Stair Checklist.

In addition to tracking coordination items, SE University hopes this checklist will help engineers build good habits when developing and checking your designs. It is essential to remember to 'close the envelope' in our building design to avoid costly mistakes. A building is not only the framing but also the details that pull the building together. Although it is not possible to issue a perfect set of drawings, we strive for that on every project.

Vince Lombardi states "Go back to the job of making the corrections and forming the habits that will make your goal possible."

This checklist is intended to serve as an overall starting point for your design coordination efforts as the SER. Please customize as required to meet the needs of your specific project. Do you have additional items to include as part of this checklist? We welcome your feedback! Please email Cathleen Jacinto at Cathleen.Jacinto@LearnWithSEU.com.

Helpful Resource:

AISC Design Guide 3 – Serviceability Design Considerations for Steel Buildings

A. Exterior Wall Design

Overall Layout and Geometry

1. Request an exterior wall section from the architect early in the project to begin coordination.
2. Define the Structural Engineer of Record (SER) scope and design responsibility for the exterior wall system.
    a. Will the exterior wall system be proprietary and designed by a subcontractor including any connections to the base structure? i.e. Curtainwall system and its connections designed by curtainwall manufacturer
    b. Will the exterior wall system be partially designed by the SER? i.e. CMU load-bearing wall by SER and brick veneer specified by the architect.
    c. Will a steel girt or cold-formed metal stud backup system be required to support the exterior wall? If so, who will design this? If it is to be shown on architectural drawings, will the SER be required to provide member sizes, layout, and connections or connection reactions? If it will be shown on structural drawings, confirm this scope is considered early in the project during the contract development phase.
3. What is the anticipated weight of the exterior wall system?
4. What is the full construction of the exterior wall, including all layers? What will the total thickness of the exterior wall construction be? Examples include:
    a. 3/8" thin brick veneer + 1/2" exterior plywood + 7/8" metal panel + vapor retarder + insulation + 5 1/2" wood stud framing + 1/2" gypsum board
    b. 4" exterior brick wall + 2" airspace + 8" load-bearing CMU wall + 1 1/2" insulation board + 1/2" interior gypsum board = 16" total exterior wall construction
5. Does the exterior wall span horizontally to vertical supports or span vertically to horizontal supports?
6. What will support the exterior wall?
    a. If floor framing beams are intended to support the exterior wall, confirm the architectural details reflect this accurately.
    b. If exterior wall systems are intended to directly connect into concrete or composite slabs:
        i. Confirm the cantilevered slab edges are adequate to transfer all anticipated loads (gravity, lateral, and moment due to eccentricity).
        ii. Will the exterior wall or wall studs stop / start at the slab edge, or will the slab edge laterally brace a continuous wall?

A. Exterior Wall Design (continued)

Overall Layout and Geometry (continued)

iii. Confirm the slab edge detail shows adequate reinforcement.

iv. Check the architectural exterior wall support detail is consistent with structural.

7. What is the eccentricity of the exterior wall to its support?
8. How will the exterior wall and its supports be laterally braced?
   a. In a steel structure in which the exterior wall will be supported or braced by perimeter spandrel beams, confirm the spandrels can accommodate the exterior wall load and its eccentricity.
      i. If wide-flange spandrel beams are utilized and an eccentric exterior wall load is applied to the spandrel that induces torsion:
         1. Show intermediate transverse kickers (say, at third points along the beam span) to brace the spandrel beams. This provides a load path to transfer the forces due to the additional moment into the floor diaphragm.
         2. Ensure any kickers are located above ceiling elevation.
         3. The exterior wall load is often applied to the bottom flange of the spandrel beam (common for precast panels). If this is the case, also consider a near full-height stiffener plate connection to the kicker to engage the full height of the beam in resisting torsion due to a large eccentricity.
      ii. If steel connections are being designed by others and you have bracing beams to brace the spandrel beam, indicate the design axial reaction and/or moment the bracing beam-to-spandrel beam connection is required to transfer through the connection.
   b. Carefully consider exterior wall support adjacent to an interior floor opening such as at stairs, elevators, or atriums. Many times kickers cannot be provided to exterior supports to transfer the lateral load into the diaphragm. Atypical exterior wall support framing or reinforcement may be required at these conditions to transfer out-of-plane loading.
9. Are additional kickers and kicker support framing required to support parapets?

A. Exterior Wall Design (continued)

Exterior Wall Support Structural Design

10. Design Loading:
    a. Design exterior wall structural elements and supports for Components and Cladding (C&C) wind loading pressure per governing building code. Check that any connections for the exterior wall support utilize the appropriate tributary area.
    b. If the exterior wall system participates in the lateral load resisting system for the structure, design for MWFRS wind loading as well as Components and Cladding loading per governing building code (i.e. CMU shear walls).
    c. If there is a parapet, confirm parapet wind pressures are considered (typically much higher than enclosed wall C&C pressures), and the load path is transferred to your base structure.
    d. Confirm both dead load and lateral load paths transfer appropriately through to the base structure supporting the exterior wall.
        i. Did you consider both an in-plane and out-of-plane lateral reaction due to wind at the exterior wall supports as necessary, particularly at the base?
11. Design for serviceability. Determine the required deflection and drift criteria for the exterior wall system.
    a. It is prudent to confirm the exterior wall serviceability criteria with the architect, exterior wall consultant, and owner. Refer to IBC 2012 Table 1604.3 for serviceability limits. Another helpful reference in determining serviceability limits is the AISC Design Guide 3 Appendix titled Summary of Serviceability Considerations. This Design Guide contains tables summarizing recommended deformation criteria for various cladding elements.
12. Confirm that loading, strength, and serviceability criteria in the architectural Specification for the exterior wall system are consistent with your structural design for the support of the exterior wall. Coordinate this Spec with the architects as they often initiate development of the exterior wall Specification.

A. Exterior Wall Design (continued)

Exterior Wall Detailing

13. Confirm exterior wall location, thickness, and limits are consistent between structural and architectural drawings, particularly on the ground floor or foundation wall plan.
    a. Do foundation wall and pier sizes and locations agree with the exterior wall location and thickness per architectural drawings?
14. Are wall openings shown in architectural elevations consistent with structural design for the exterior concrete or masonry wall?
15. Confirm final architectural wall sections are consistent with structural drawings.
16. If there are steel vertical supports or girts for the exterior wall, consider the following:
    a. Are the top and bottom connections detailed to match the design restraints of the vertical support? i.e. If the vertical is designed as a pin or roller at the top, is there a beam shown at the top of the vertical support to laterally brace it?
    b. Is the vertical support intended to only transfer exterior wall loads and not floor loading from above? If so, confirm the connection between the floor framing above to the top of the vertical support is vertically slotted or provides vertical movement so when the floor framing deflects, it does not impose load on the vertical post.
17. Coordinate the base detail and support for the exterior wall with architectural drawings.
    a. If your project utilizes a steel frame, coordinate the exterior wall base detail at column base plates and foundation piers. Will notching of the exterior wall or foundation wall be required around base plates?
    b. Coordinate required concrete curbs at the base of the exterior wall with the architect.
        i. What are the required height and width of curb?
        ii. Detail curb reinforcement to resist anticipated lateral out-of-plane wall loading.
18. Where frost heave is a concern and a foundation wall is required to support exterior wall, confirm thickness of foundation wall is adequate to support full width of exterior wall.
19. If you have vertical steel posts supporting exterior wall, check that you have provided adequate width for the supporting structural beam below to support the post width and its base plate.

A. Exterior Wall Design (continued)

Exterior Wall Detailing (continued)

20. At the top of the exterior wall at each level, consider if movement needs to be allowed for exterior wall supports. Will you need to show vertically slotted connections to ensure the upper floor / roof does not load any secondary vertical posts intended to only support exterior wall loading?
21. Check Top of Parapet and Top of Wall elevations on architectural drawings are consistent with design assumptions for wall dead load, wind load, and unbraced length.
22. Check that any secondary structural elements such as column steel stiffeners or connection plates do not interfere with cladding connections. This should also be coordinated and reviewed in the shop drawing phase to mitigate field issues.
23. Consider adding a note to provide weep holes in any closed sections (HSS) that could be exposed to the exterior to minimize water accumulation within closed section.
24. Is every exterior wall condition shown on plan addressed structurally? Is a detail provided for atypical conditions on architectural or structural drawings that would deviate from the typical exterior wall condition?
25. For any exposed exterior concrete walls, is the concrete finish noted and coordinated in structural and architectural drawings or specifications?
26. Check that all information noted as 'See Structural' on architectural wall drawings are noted on structural drawings.
27. For concrete and masonry walls, coordinate control joint locations with the architect. It is recommended that structural wall control joints be shown on structural drawings, and any veneer control joints be shown on the architectural drawings.

B. Secondary Elements

The range of design responsibility for the Structural Engineer of Record (SER) with respect to secondary structural elements discussed herein varies amongst projects. Defining and documenting the limits of scope of work early on will help support the detailing and coordination effort throughout construction.

1. Check architectural drawings for the secondary elements summarized below. Confirm support for these items are consistent with structural design and the load path transfers correctly to the base structure:
    a. Loose lintels
    b. Door frames, including roll-up doors
    c. Intermediate levels
    d. Railing
    e. Interior partition walls
    f. Fall protection
    g. Ladders
    h. Access hatches
    i. Walkways
    j. Canopies
2. Loose Lintels:
    a. Confirm SER design responsibility for the following items and determine if these items will be shown in architectural or structural drawings:
        i. Lintel plan location
        ii. Lintel details
        iii. Lintel member sizes
        iv. Lintel connection details (steel-to-steel, bearing details, etc)
    b. Review architectural plan, elevations, and door schedules to confirm door and window widths are consistent with assumed lintel spans.
    c. Confirm height of wall above lintels is consistent between architectural drawings and structural calculations.
        i. Check top of floor or roof elevations in architectural plans and sections are consistent with structural design assumptions. It is prudent to round up conservatively as elevations change during the design phase.

B. Secondary Elements (continued)

ii. Check bottom of lintel elevation or top of door / window elevations in architectural sections and schedules are consistent with structural design assumptions.

d. Determine wall weight by coordinating wall thickness and material with architects.

e. Check that lintel width is adequate to support full width of wall. Is an additional steel plate or angle required to support an additional exterior wall layer, i.e. face brick?

f. Coordinate lintel support details with architectural drawings.

i. If lintel is to bear on CMU wall, ensure 8" minimum bearing length is provided.

3. Railings:

a. Confirm SER design responsibility for the following items and determine if any of these items are required on structural drawings.

i. Railing posts

ii. Railing post base plates

iii. Railing horizontal rails

iv. Railing panels

v. Railing support for posts (typically designed by the SER)

vi. Railing connection details

b. Determine maximum railing height.

c. Determine rail loading criteria.

i. Determine railing dead load.

ii. Consider railing horizontal live load per governing building code to be applied at the worst-case location (top rail).

iii. Consider lateral wind loading (components and cladding pressure) applied to any external panels and rails.

4. Interior partition walls:

a. Confirm support for walls are designed for interior pressure per governing building code.

b. Confirm any interior CMU partition walls are adequately supported. Additional beams are often required to support interior CMU walls so as to meet maximum vertical deflection of L/600 or 0.3 in per ACI 530-05 Section 1.10. Check with per your governing masonry code.

B. Secondary Elements (continued)

c. For interior CMU non-structural partition walls, check that dowels are shown in structural or architectural drawings into the composite or concrete slab directly below the wall.

d. Provide thickened slab-on-grade detail or grade beam as required for ground level CMU walls.

5. Fall Protection:

It is assumed for the purposes of this document that fall protection elements (davit posts and tieback anchors as necessary) are proprietary and designed by a fall protection contractor. Load requirements for the design of its structural supports are to be provided by the fall protection or window-washing consultant or manufacturer. It is often necessary to locate additional structural steel elements at the davit posts and tieback anchors to support the loads.

a. Confirm SER design responsibility for the davit post base plate design. Will the SER provide base plates or will the fall protection contractor?

b. Confirm a beam is provided at each davit post and tie-back anchor post location. Coordinate with architectural drawings.

c. At the support for the davit post, consider the following loads that include, but are not limited to:

i. Vertical operating load with a safety factor

ii. Vertical dead load due to the davit

iii. Consider an eccentricity to the vertical loads (typically a large eccentricity depending on your project). This eccentricity is typically assumed applied in any location about the axis of the post centerline.

d. At the support for the davit tieback, consider the following loads that include, but are not limited to:

i. Horizontal load including a safety factor acting in any lateral direction at the top of the tieback post. The tieback post is commonly 2'-6" max height, but confirm with your project requirements.

e. Confirm the width of the supporting member designed by SER is adequate to accommodate the davit post base plate and tieback post base plate.

6. Canopies:

a. Verify canopy structure dimensions.

b. Verify canopy roof material.

c. Provide minimum clearance to bottom of canopy structure. Consider potential for emergency vehicles.

B. Secondary Elements (continued)

d. Coordinate expansion joint locations, if required for long canopies.

e. Consider all appropriate loading conditions including but not limited to unbalanced live or roof live load as required, flat snow plus snow drift as required, unbalanced snow loading as required, and wind loading in all directions as required.

f. Check local building code for minimum design live loading that may be required for canopies.

g. Verify required vertical deflection and lateral drift criteria for canopies.

7. Check that all information noted as 'See Structural' on architectural drawings are noted on structural drawings.

C. Architectural Plans and Sections

Request an architectural progress set 1 to 2 weeks prior to a deadline to perform a drawing and specification coordination review.

1. Overall structural building dimensions should match architectural drawings.
2. Will future expansion need to be considered?
3. If your project impacts an existing structure, request existing structural and architectural drawings. If existing drawings are not available, add a Note to your drawings for the Contractor to verify existing assumptions.
4. Coordinate column and shear wall orientation and locations.
5. Coordinate column gridlines.
    a. Identify areas where column gridlines will not follow a typical bay size.
6. Provide top of structural slab elevations.
7. Provide top of finished floor elevations.
8. Provide top of exterior grade elevations.
    a. Will basement or retaining walls be needed?
9. What is maximum allowed depth of floor framing for each floor or space?
    a. Provide maximum interior vertical clearance height allowed on each floor. Alternately, provide minimum bottom of structural framing elevation at each floor.
10. Provide occupancy types for all floor areas. Interior room drawings showing room labels will help to identify required loading.
    a. The use of the word 'storage' in a room requires a minimum of 125 psf (light storage) and a maximum of 250 psf (heavy storage). Refer to IBC 2012 Table 1607.1. Request architects to distinguish between light or heavy storage use of a room.
11. Provide weight of floor finishes. Alternately, provide floor finish material and thickness so weight can be calculated.
12. Provide weight of any additional superimposed dead loading.
    a. Provide weight of any interior partition walls. If interior CMU walls will be used, see Item 4.b in the Secondary Element Checklist.
13. Where are slab depressions or raised slabs required? Are slab trenches required?
14. Coordinate fire rating to finalize slab types.
15. Coordinate slab or deck floor openings with architectural drawings. Confirm a detail is provided to show required reinforcement for opening sizes shown on plan.

C. Architectural Plans and Sections (continued)

16. Coordinate slab edge locations with architectural drawings.
    a. Confirm structural slab edge detail is consistent with architectural edge detail.
    b. Confirm your typical details address slab edge cantilever spans consistent with slab edge locations shown on structural and architectural plans. Check that both slab edge pour stop / support details and any concrete slab edge reinforcement details address cantilever spans.
17. Confirm top of foundation elevations are consistent with top of ground floor slab elevations per architectural drawings and site grades shown on civil drawings.
18. Consider dropping footings at the perimeter to accommodate water lines, sewer lines, and utilities.
19. Is a foundation pit required for any below-grade elements such as an escalator pit, equipment room, etc? Drop column footings adjacent to pits as needed to avoid undermining.
20. Will you utilize a floating slab-on-grade (isolation joint provided with adjacent foundation) or will the slab-on-grade be integral to the foundation?
21. For steel columns bearing on pier foundations, confirm top of pier elevation is set such that anchor rods do not project into the finished floor or concrete topping slab.
22. Coordinate slab construction joint and control joint locations with architect. Confirm architectural drawings, structural drawings, General Notes, and specifications are consistent. Concrete or composite slab construction joints are typically placed within the middle third of the slab span.
23. Where the top of slab elevation varies from typical, indicate top of concrete or steel beam elevation.
24. How will roof drainage be addressed? Typically, roofs slope a minimum of 2 percent.
    a. In a steel frame structure, will the T/roof steel elevation remain constant while roof insulation thickness varies, or will the T/roof steel elevation slope? Show T/roof steel elevations on plan. If steel will slope, show high and low elevation workpoints on plan.
25. Check if skylights are shown on architectural roof plans.
    a. If so, coordinate with architect if skylight framing is proprietary or is to be shown on architectural or structural drawings.
    b. Confirm structural framing supporting the skylight considers appropriate snow loading. If the top of skylight elevation is higher than adjacent roof framing, include snow drift loads.
    c. Confirm structural framing supporting the skylight is designed for appropriate deflection per skylight cladding requirements.

C. Architectural Plans and Sections (continued)

26. Coordinate expansion joint locations with the architect. Confirm expansion joint detail in architectural drawings is consistent with structural design.
27. If steel bracing will be utilized:
    a. Coordinate bracing locations and geometry to ensure bracing does not conflict with doors, windows, suspended ductwork, or other architectural or MEP items.
    b. If connections are designed by others, provide appropriate connection forces including but not limited to:
        i. Brace forces
        ii. Axial forces in beams within the braced frame
        iii. Horizontal axial transfer forces (or pass-through forces) in beams adjacent to the braced frame that drag the pass-through force through the floor framing system.
        iv. Vertical transfer forces that may occur locally in beams (that act as a shear in beams) that receive chevron or cross braces.
    c. If angle or channel bracing is used, clarify orientation of bracing (flanges inward or outward) so as to avoid conflict with cladding or other architectural elements.
    d. What will be the fireproofing method for bracing?
28. Are vertical deflection limits for floor framing within any limits required for suspended architectural elements, i.e. ceiling tile material?
29. Review architectural interior spaces and room names to identify loading as required by governing building code.
    a. Confirm loading diagrams with architects, particularly rooms of higher loading (i.e. file closets, storage, etc).
30. Do steel column splices conflict with architectural elements?
31. Coordinate required concrete curbs with the architect.
    a. Will curbs be shown in architectural or structural drawings?
    b. Confirm if a curb reinforcement detail will be required on structural drawings.
    c. What are the required curb height and width of the curb?
    d. Typically, contractors prefer to drill and epoxy dowels for concrete curbs into the supporting slab. Consider showing dowels if the curb will not see lateral loading.
32. Is drainage required at foundation walls, i.e. waterproofing or a drainage protection board? Structural drawings can reference architectural details for more information as coordinated with architects.

C. Architectural Plans and Sections (continued)

33. Coordinate underslab drainage, if required per geotechnical report.
34. Is a vapor retarder required below slab on grade?
35. Where changes in slab elevations occur and the top of your supporting beam is higher than the low slab, confirm the depth of the beam supporting this slab elevation change is adequate to accommodate the slab thickness of the lower slab and any additional lower slab support structural element (i.e. a steel angle connected to the web of the steel support beam).
36. Check that all information noted as 'See Structural' on architectural drawings are noted on structural drawings.
37. Confirm north arrow on structural drawings is consistent with architectural.

D. Architectural General Notes

1. Check that governing building code and material code titles and editions are consistent between structural and architectural General Notes and Specifications.
2. If loading criteria is shown in architectural General Notes, check for accuracy. Below is a list of possible criteria that may need a check:
   a. Check snow loading criteria
   b. Check seismic loading criteria
   c. Check wind loading criteria
   d. Check live loading criteria
   e. Check geotechnical design criteria (allowable bearing pressure, active/passive earth coefficients, etc).
3. If included in architectural General Notes, check structure type (structural gravity and lateral systems) indicated is correct.
4. Check special / third party inspection requirements.
5. Check occupancy and construction type are consistent with structural assumptions.
6. If a structural sheet list is included, check sheet numbers and titles for accuracy.