

structural practices

Design/Coordination Reviews

By Ronald F. (Rawn) Nelson, S.E.



Third Party Reviews

Over 30 years of experience observing, making and correcting mistakes have contributed to my consideration of *Design & Coordination Reviews* as an integral, but often ignored, step in providing an economical set of construction documents. A *Design & Coordination Review* does not provide “Value Engineering,” offering what could be considered more cost effective systems, but obvious over-designs should be mentioned.

Design & Coordination Reviews are intended to catch mistakes before they get to the field. Most design firms, architectural and engineering, have quality control (QC) programs. In-house reviews by a party not connected with the project are one way to go. But, independent third parties, with the appropriate experience, will always find additional coordination type mistakes.

Immediate Cost Savings

This coordination of all disciplines (or almost all) has been shown to save money for everyone involved. The costs savings have typically exceeded 5 to 10 times the fees for performing a *Design & Coordination Review*. These savings are real construction dollars.

The timing of the review plays a large part in the recognition of savings. It has been difficult to perform reviews on pre-permitted plans. They are not always complete, and the reviewer is noting items of which the design team might already be aware. Bid sets are usually closer to the pre-permit set than to a construction-ready set. But if you wait for the permitted set, it is possible the contractor is going to consider any changes as an extra cost, even if the changes are just coordination corrections.

What are “Design & Coordination Reviews?” They are intended to be independent third party coordination reviews of a set of construction documents. If anyone in the construction industry thinks a set of drawings are issued for construction without mistakes, that is their first misconception.

For the purposes of this article, a “Peer Review” would be for Building Code Compliance and/or structural calculation accuracy. While a “Peer Review” for code compliance and calculation accuracy is important, it does not take into account two significant questions:

1. Can the structure be erected from the documents presented without major change orders from the field?
2. Is the design in the structural calculations the same as what is shown in the construction documents?

Who are the Clients?

Most often the clients are developers or owners. But architects and structural engineers have also retained third parties to provide *Design & Coordination Reviews* on their projects. It would seem that a fair distribution of the cost would be to have the architect, engineer and owner/developer share in the fee. But we all know things aren’t always fair.

Some Typical Quotes

Construction Consultants for Developers:

- “An ounce of prevention is worth a pound of cure.”
- “These reviews are helpful to all parties – the owner, contractor and the design team architect and engineers.”

Architects:

- “Because we know what we want in our heads, when we communicate that idea on our drawings that is what we see. Another set of eyes helps evaluate if we made it clear.”

Engineers:

- “An additional set of eyes reviewing the plans is always valuable.”
- “We are often so rushed that we don’t have time to do all the QC we would like. But we are so close to it we probably wouldn’t see all the errors.”

Conclusion

Design & Coordination Reviews should be done on all projects, regardless of size. A third party reviewer is going to see things those who prepared the documents don’t. These Reviews will save construction dollars.



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Typical Review List

The following list represents some of the things that should be included in a *Design & Coordination Review*. This list is not meant to be all-inclusive but should provide a good place to start.

1. Horizontal Dimensions

- a. Coordinate civil, architectural & structural plan dimensions & grids at all levels
- b. Check totals at dimension strings
- c. Does perimeter of slab match on architectural and structural
- d. Check opening locations (floors, roofs & walls)
- e. Are structural elements located?
 - 1.) Footings
 - 2.) Off grid/dimension framing
- f. Coordinate control/construction joints with architectural control/construction joints.
- g. Depressed/raised floor/roof locations
- h. Stair & ramp locations

2. Vertical Dimensions

- a. Coordinate architectural & structural plans, all levels
- b. Coordinate architectural elevations with architectural wall sections
- c. Check totals at dimension strings
- d. Check opening locations
- e. Check roof & floor elevations
- f. Does everything fit (no unwanted interferences or overlaps)?

3. Roof/Deck - Drainage/Slope

- a. Minimum slope along water path
- b. Valleys and ridges conflicting with structural members
- c. Drains and overflows at low points

4. Details

- a. Do structural elements fit within architectural elements (walls, ceilings, openings, finishes, other clear heights, etc.)? Include bolt head, tail and nuts.
- b. Does detail apply to location referenced?
- c. Is reference to correct detail?
- d. Is reference in correct location?
- e. Do sections match architectural?
- f. Are detail and section references oriented in the correct direction for the view drawn?

5. Coordination with Other Disciplines

- a. Mechanical
 - 1.) Equipment loads
 - 2.) Opening locations
 - a.) Through framing members
 - b.) Through roof/floors
 - c.) Through walls
 - 3.) Platforms/pads
 - 4.) Trench drains
 - 5.) Floor sinks
 - 6.) Piping supports (vertical & lateral)
 - 7.) Pipe routing
 - a.) Walls
 - b.) Foundations
- b. Electrical
 - 1.) Equipment loads
 - 2.) Platforms/pads
 - 3.) Site element footings
 - a.) Lighting
 - b.) Gates
- c. Civil
 - 1.) Design & detailing of retaining walls
 - 2.) No footings beyond property lines
 - 3.) Are there surcharge loads?
 - a.) On building elements from retaining walls
 - b.) On retaining walls
 - 4.) Interior/exterior elevation coordination with structural elements
 - a.) Considerations at landscaped areas
 - b.) Footings not exposed
- d. Landscape
 - 1.) Above grade planters
 - 2.) Trees interfering with structure
 - 3.) Irrigation lines through structural elements
 - 4.) Depth of footings adjacent to landscape areas
- e. Interiors
 - 1.) Support of special items
 - 2.) Guard rail post support
- f. Elevators
 - 1.) Shaft foundations
 - 2.) Support beams, vertical rails and reactions loads
 - 3.) Elevator equipment room loads
 - 4.) Openings

6. Structural Design

- a. Check Applicable Loads
 - 1.) Live Loads
 - 2.) Dead Loads

- 3.) Seismic Loads
- 4.) Wind Loads
- 5.) Other Loads
 - a.) Snow
 - b.) Impact
 - c.) Other
- 6.) Mechanical
- 7.) Elevators
- 8.) Special Loads
 - a.) Heavy filling
 - b.) Planters
 - c.) Folding/suspended partitions
 - d.) Curtain walls
- b. Roof/Floor Framing
 - 1.) Do plans agree with calculations
 - a.) Span dimensions
 - b.) Member size
 - c.) Member location
 - 2.) Are the correct loads used?
 - 3.) Are connections detailed?
 - 4.) Are axial loads included?
 - 5.) Do details on drawings match details in calculations?
- c. Columns/Base Plates
 - 1.) Do plans agree with calculations
 - a.) Column heights
 - b.) Column/base plate size
 - c.) Column/base plate location
 - 2.) Are the correct loads used?
 - 3.) Do details on drawings match details in calculations?
- d. Foundations
 - 1.) Do plans agree with calculations
 - a.) Footing size
 - b.) Footing location
 - 2.) Are the correct loads used?
 - 3.) Do details on drawings match details in calculations?
 - 4.) Are footings properly located below grade?
 - 5.) Do footings cross property lines?
- e. Lateral
 - 1.) Are correct loads used?
 - 2.) Are lateral loads distributed properly?
 - 3.) Is the lateral load path complete?
 - a.) Drags/chords
 - b.) Connectors
 - c.) Shear transfer
 - d.) Shear walls, frames, etc.
 - 4.) Do details and drawings match details in calculations?
 - 5.) Are irregularities taken in to account?