THE CONSTRUCTABILITY REVIEW PROCESS

KEYS TO MAXIMIZING THE BENEFITS
MODERATOR

Jeremy Gomolijak

CONSTRUCTION MANAGER
CAPITAL PLANNING, DESIGN & CONSTRUCTION

- Construction Manager for California State University, Office of the Chancellor, supporting 23 campuses in Northern & Southern California
- 17 Years of Construction Management Experience
- Job Order Contracting for LA County - Internal Services Department and City of Long Beach
- Grade Separations for Orange County Transportation Authority (OCTA), City of Fullerton and Port of Los Angeles
- Heavy Civil Projects for Oakland International Airport and Bay Area Rapid Transit
- Construction Management Certificate from California State University East Bay
PRESENTERS

PETER KOVACS, AIA, CDT, LEED AP
MANAGING PRINCIPAL

- Managing Principal for Driver Consulting Group, a firm that specializes in construction support services
- 23 years of experience focused on Constructability Review and Construction Quality Control
- Performed Constructability Reviews on over 700 projects
- Licensed California Architect, Construction Document Technologist, LEED AP
- Previous roles include Senior Plans Examiner and Director of Quality Control for C.W. Driver

MARK VERRENGIA, PE, CCM
SENIOR PROGRAM MANAGER, R&D CONSTRUCTION

- Program Manager overseeing Planning, Design, Construction and Commissioning of Research & Development Labs at Rivian Automotive
- 9 years of Public Works and Transportation Design Consultant Experience
- 7 years of Public Works Construction and Project Management
- 7 years of Grade Separation RE Experience
- Expert Witness and Part-time Lecturer
- Licensed Civil Engineer, Certified Construction Manager, LEED AP
OBJECTIVES

- WHAT IS A CONSTRUCTABILITY REVIEW?
- BENEFITS
- CONSTRUCTABILITY REVIEW PROCESS / EXAMPLES
- ASSEMBLING A REVIEW TEAM
- TOOLS AND REPORTS
- REVIEW MILESTONES
- ROLE OF THE DESIGN TEAM
- APPLICATIONS FOR VARIOUS DELIVERY METHODS
- EXPECTATIONS
WHAT IS A CONSTRUCTABILITY REVIEW?

REVIEW OF A PROJECT’S PLANS AND SPECIFICATIONS BEFORE CONSTRUCTION TO IDENTIFY ERRORS AND OMISSIONS THAT WOULD NORMALLY CAUSE ISSUES OR DELAYS DURING CONSTRUCTION.
BENEFITS

SIGNIFICANTLY REDUCE...

- CHANGE ORDERS
- RFI’S
- COST OVERRUNS
- SCHEDULE DELAYS
- DISPUTES & LITIGATION
IMPACT ON CHANGE ORDERS

STUDY SHOWED 65% REDUCTION IN CHANGE ORDERS

CHANGE ORDER %

YEAR 1

- PROJECTS WITH CONSTRUCTABILITY REVIEW: 7.2%
- PROJECTS WITHOUT CONSTRUCTABILITY REVIEW: 2.1%

YEAR 2

- PROJECTS WITH CONSTRUCTABILITY REVIEW: 9.7%
- PROJECTS WITHOUT CONSTRUCTABILITY REVIEW: 4.2%

YEAR 3

- PROJECTS WITH CONSTRUCTABILITY REVIEW: 7.6%
- PROJECTS WITHOUT CONSTRUCTABILITY REVIEW: 2.3%
All disciplines are systematically reviewed against each other to verify coordination at all points of interface.
EXAMPLES

INTERDISCIPLINARY COORDINATION

“LOCATION OF ROOF ACCESS LADDER WILL CONFLICT WITH DUCTWORK ABOVE. COORDINATE WITH SHEET M1.07U.”
“FULL HEIGHT INTERIOR PARTITIONS WILL NOT WORK WITH RETURN AIR PLENUM SYSTEM.”
EXAMPLES

INTERDISCIPLINARY COORDINATION

“POWER IS MISSING TO WATER COOLER”
EXAMPLES

INTERDISCIPLINARY COORDINATION

"DIAGONAL BRACE FRAMES ARE PASSING DIRECTLY THROUGH DOOR OPENINGS"
EXAMPLES
INTERDISCIPLINARY COORDINATION

ARCHITECTURAL vs. MECHANICAL

“HALLWAY FROM BEDROOM TO BATHROOM. DROPPED CEILING REQUIRED FOR MECHANICAL DUCT CLEARANCE IS MISSING. SEE PLAN 1/M-512 AND SHEET S-412.”
Plans are reviewed to uncover potential weaknesses in the design and detailing to ensure the project can be constructed to the desired budget, timeframe and level of quality.
"ELEVATOR OVERRUN ENCLOSURE AND SKYLIGHT ARE TOO CLOSE TO EACH OTHER. FLASHING CANNOT BE INSTALLED AS DESIGNED."
“HOW IS DRYWALL INSTALLED BEHIND STRUCTURAL STEEL COLUMNS?”
Construction documents are reviewed to verify scope of work is clear and consistent, increasing the chances of more accurate and timely bids from trade contractors.
“PROVIDE DETAILING OF ROOF OVERHANG. HOW IS IT ATTACHED TO THE STRUCTURE?”
EXAMPLES

BID-ABILITY

CLARIFY "DRAWINGS BY OTHERS" THAT WILL ADDRESS WATERSTOPS?

STRUCTURAL
EXAMPLES

BID-ABILITY

KEYNOTES

1. Restroom to meet all health and ADA codes.
2. Cabinetry, counter tops, plumbing and appliances purchased and installed by contractor.
3. Soffit above.
4. Transom window above.
5. Decorative ceiling wood beams.
6. "Phanawall" operable glass wall system.
7. Wall finish to match finish of interactive media wall.
8. 10'6" full height frameless tempered glass window.
9. 9'-0" full height solid door in stained veneer finish.
10. Interactive leasing wall by owner.
11. Decorative brick wall - coverage: 1/6-30%, 1/7-30%, 1/8-30%.
12. Lit signage by signage consultant.
13. Build-out wall around column.
15. Stone table by contractor.
16. 36" x 48" inside clear space ventilated closet.
17. Wall mounted keetrack system by owner.
18. Cabinetry for closets.
19. 36" file drawers below by contractor.
21. Wall framed mirror.
22. Decorative ceiling below soffit at low ceilings extended out at high ceilings suspended and supported by structural rod / cables.
23. TV & or A/V equipment by owner, installed by contractor.
24. Niche in wall for TV, contractor to verify TV size prior to niche construction.
25. Decorative wood planes on walls.
27. 8'-0" full height frameless tempered glass door.
28. 8'-0" full height frameless tempered glass windows.
29. Omitted.
30. 6" thick popped out wall molding with strip lighting behind.
31. Omitted.
32. Full height open shelving by contractor.
33. TV wall with drop down media screen by landscape architect.
34. Refer to landscape for all outdoor areas.
35. Built-in full height open cabinet.
36. Dropped ceiling in tile finish - see id cadi for more info.
37. Wall in tile finish with recessed linear lighting - see id cadi for more info.

ARCHITECTURAL

Several keynotes indicate "by contractor", "by owner", "by landscape architect", etc., but most of them do not indicate who it is "by". The responsibility of these items can be confusing. We suggest having a general note that indicates all work to be done by contractor unless noted otherwise on keynotes. Typ throughout id sheets.
1. GENERAL: THIS WORK IS SUBJECT TO THE PROVISIONS OF DIVISION I OF THE SPECIFICATIONS AND THIS CONTRACTOR SHALL BE RESPONSIBLE FOR ALL REQUIREMENTS THEREUNDER AFFECTING HIS WORK IN ANY WAY.

2. SCOPE: THE WORK COVERED BY THIS SECTION INCLUDES ALL LABOR, MATERIALS, EQUIPMENT, TRANSPORTATION AND OTHER ITEMS NECESSARY FOR AND REASONABLE INCIDENTAL TO THE PROPER AND SATISFACTORY INSTALLATION OF THE HEATING, AIR CONDITIONING, AND VENTILATING SYSTEMS SHOWN ON THE DRAWINGS AND SPECIFIED HEREIN.

3. CODES: ALL HEATING, AIR CONDITIONING, AND VENTILATING WORK SHALL CONFORM TO THE LATEST REQUIREMENTS OF THE N.F.P.A., LATEST BUILDING & MECHANICAL CODES AND ANY OTHER LEGALLY CONSTITUTED BODY HAVING JURISDICTION THEREOF.

4. PERMITS: THE OWNER SHALL OBTAIN AND PAY FOR ALL FEES, PERMITS, AND LICENSES REQUIRED FOR THE INSTALLATION OF THE WORK.

5. SUBMITTALS: WITHIN 30 DAYS AFTER THE AWARD OF THE CONTRACT AND BEFORE THEIR PURCHASE, THE CONTRACTOR SHALL SUBMIT TO THE ARCHITECT SIX BOUND BOOKLETS CONTAINING A COMPLETE LIST OF MATERIALS AND EQUIPMENT BEING FURNISHED, TOGETHER WITH ALL CATALOG DATA, MANUFACTURERS NAMES AND ADDRESSES AND OTHER DATA NECESSARY TO EVALUATE THE MATERIAL AND EQUIPMENT.

1.07 MISCELLANEOUS:

A. Permits and Fees: Arrange, apply and pay for all necessary permits, inspections, examinations and fees or charges required by public authorities having jurisdiction.

B. Locations and Accessibility: Contractor shall fully inform himself regarding peculiarities and limitations of spaces available for installation of work under this section. Valves, motors, controls and other devices requiring service, maintenance and adjustment shall be placed in fully accessible positions and locations. Provide access doors where required in ductwork or construction whether specially detailed or not, and render all such devices accessible.

C. Scaffolding: Furnish all scaffolding, rigging and hosting as required for the proper execution of the work.

“NOTE 4 ON SHEET M-1 INDICATES THAT PERMITS ARE THE OWNER’S RESPONSIBILITY. PARAGRAPH 1.07-A DIRECTS THE CONTRACTOR TO APPLY FOR AND PAY FOR ALL NECESSARY PERMITS, INSPECTIONS, ETC. WHICH IS CORRECT?”
All building systems are independently reviewed for design integrity, coordination and completeness.
### CLC PANEL SCHEDULE

**Voltage**: 120/208Y/120 Volt

<table>
<thead>
<tr>
<th>Description</th>
<th>Volt-Amperes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECL-113</td>
<td>1000</td>
</tr>
<tr>
<td>ECL-113</td>
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<tr>
<td>ECL-113</td>
<td>500</td>
</tr>
<tr>
<td>ECL-113</td>
<td>1000</td>
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</table>

**Spare Circuits**: 13, 15, 17

**Crossed Out Circuits**: 19, 21, 23

Diffs from Sheet EP-103 indicating use at mechanical units RTU-2 and RTU-3.

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### Electrical Roof Plan

![Electrical Roof Plan Diagram](image)

**Spare Circuits**: 13, 15, 17

**Crossed Out Circuits**: 19, 21, 23
SEVERAL DUCTS ARE MISSING SIZES. TYPICAL THROUGHOUT PLAN.
A THOROUGH CONSTRUCTABILITY REVIEW IS EXTREMELY TIME CONSUMING. PROJECT TEAMS ARE TYPICALLY JUGGLING MANY THINGS AT ONCE, MAKING IT A CHALLENGE TO DO IT PROPERLY.

EFFECTIVE ON SMALL / SIMPLE PROJECTS

BROAD RANGE OF EXPERIENCE AND VARIETY OF ROLES CAN BE A BENEFIT TO THIS METHOD

ALTHOUGH TEAM MAY HAVE DECADES OF CONSTRUCTION EXPERIENCE, THEY ARE USUALLY LIMITED ON CR EXPERIENCE
REVIEW TEAM
CM / THIRD PARTY REVIEW FIRM

- SUGGESTED FOR MEDIUM TO LARGE SCALE PROJECTS
- THE WORKLOAD IS SPREAD ACROSS MULTIPLE SPECIALISTS, RESULTING IN A THOROUGH REVIEW AND ACCEPTABLE TIMEFRAMES
- LOOK FOR TEAMS WITH ACTUAL CR EXPERIENCE...THE MORE, THE BETTER
- TYPICALLY MORE COSTLY, BUT THE PAYBACK DURING CONSTRUCTION IS MUCH GREATER
## Constructability Review Checklist

<table>
<thead>
<tr>
<th>Date</th>
<th>NA</th>
<th>General</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Sheet Index – Sheet numbers and titles are coordinated with actual sheets</td>
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<tr>
<td></td>
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<td>Sheet Index – All sheets listed on the index are in the set</td>
</tr>
<tr>
<td></td>
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<td>Sheet Index – All sheets in the set are listed in the index</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Date</th>
<th>NA</th>
<th>Civil - General</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Property line and limits of construction are clearly shown and coordinated with other disciplines</td>
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<td></td>
<td></td>
<td>All necessary details are provided</td>
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<tr>
<td></td>
<td></td>
<td>Is there a list of abbreviations?</td>
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<tr>
<td></td>
<td></td>
<td>Are actual north and plan north shown on the drawings?</td>
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<td></td>
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<td>Are general notes provided and do they apply to the project?</td>
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<tr>
<td></td>
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<td>Are all buildings shown on plans and correctly located</td>
</tr>
<tr>
<td></td>
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<td>Drawing scale is identified</td>
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<tr>
<td></td>
<td></td>
<td>Is there a graphic symbol legend</td>
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<tr>
<td></td>
<td></td>
<td>All detail references are complete and correct</td>
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<tr>
<td></td>
<td></td>
<td>Horizontal controls are adequate to locate buildings and other site features. Dimensions should originate from benchmark.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Date</th>
<th>NA</th>
<th>Civil - Geod.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>New and existing grades are identified</td>
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<tr>
<td></td>
<td></td>
<td>Building pad elevations are called out and coordinated with Architectural Floor Plans and Structural Foundation Plan</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Manholes indicate invert elevations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Site contours are coordinated with Landscape Plans</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Location of catch basins, area drain, trench drains, etc. are coordinated with Architectural Site Plan. Verify grades and slopes to drains. Verify storm drain piping slope is identified and in the correct direction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Site structures shown on civil drawings match Architectural. Structural and Landscaping drawings and details do not conflict (i.e. retaining walls, ramps, ballasts, flag poles, lamp poles, dumpster pads, mechanical and electrical equipment pads, mow areas).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Date</th>
<th>NA</th>
<th>Civil - Paving</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Streets, sidewalks, curbs, curb cuts, and handicap approaches are coordinated with Architectural Site Plans and Landscape Plans. Phasing and specifications are identified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Area drains, trench drains, catch basins, etc. are shown and specifications are identified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>New driveways, sidewalks or other site improvements do not conflict with existing: power/telephone poles, street signs, driveway inlets, valve boxes, manhole covers, fire hydrants, etc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Handicap is dimensioned and grades information is provided on all curves.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Date</th>
<th>NA</th>
<th>Civil - Utilities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Piping site and type is provided at new storm drain, sewer line, water supply, etc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Points of connection (sewer, storm drain, gas) are coordinated with Plumbing Plans</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Piping materials are included and coordinated with Specifications.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>All existing underground utilities are shown</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Electrical points of connection (power, data, phone, etc.) are coordinated with Electrical Plans</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Electrical equipment (duct banks, transformers, etc.) is coordinated with Electrical Plans.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Points of connection for irrigation lines are coordinated with Landscape Plans</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Invert elevations provided at all utility points of connection and are coordinated with finish grade (new lines have sufficient cover).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Utilities and equipment such as power, telephone, communication lines, water, sewer, gas, storm drains, fuel lines, grease traps and fuel tanks are free of interferences above and below grade.</td>
</tr>
</tbody>
</table>
REDLINED PLANS
<table>
<thead>
<tr>
<th>No.</th>
<th>Sheet or Spec</th>
<th>Location or Clarification</th>
<th>Comment</th>
<th>Priority</th>
<th>Architect Response</th>
<th>Back Check Notes</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>351</td>
<td>S211</td>
<td>On Gridline 10, west of X2</td>
<td>What is bridge framing? Typical at Sheets S221C, S231, S241, S251.</td>
<td>High</td>
<td></td>
<td></td>
<td>Open</td>
</tr>
<tr>
<td>353</td>
<td>S211</td>
<td>Intersection of Gridlines X1 &amp; Y4.6</td>
<td>Referenced Detail 0/50.0 does not exist.</td>
<td>Med</td>
<td></td>
<td></td>
<td>Open</td>
</tr>
<tr>
<td>354</td>
<td>S211</td>
<td>South of Gridline 11</td>
<td>Need to provide details for connections of HSS outriggers to concrete and HSS columns. What are HSS beam/HSS column connection details? What are HSS beam/concrete wall details?</td>
<td>Med</td>
<td></td>
<td></td>
<td>Open</td>
</tr>
<tr>
<td>355</td>
<td>S212</td>
<td>Framing Plan Notes</td>
<td>Note 13. Referenced Detail 6/57.1 is not applicable for 5x nailing on HSS column. Should this be Detail 17/57.17. Typical at Sheets S232, S233, S242, S252.</td>
<td>Med</td>
<td></td>
<td></td>
<td>Open</td>
</tr>
<tr>
<td>356</td>
<td>S212</td>
<td>Framing Plan Notes</td>
<td>Note 15. Referenced Detail 4/56.4 is not applicable for soft framing. Should this be Detail 18/56.27. Typical at Sheets S222, S223, S242, S252.</td>
<td>Med</td>
<td></td>
<td></td>
<td>Open</td>
</tr>
<tr>
<td>357</td>
<td>S212</td>
<td>Plan southwest</td>
<td>Floor opening is missing for pool equipment exhaust shaft. See Sheet A212 and Plan 5M-3. Typical at Sheets S222 (A222), S232 (A233), S242 (A243), S252 (A252).</td>
<td>High</td>
<td></td>
<td></td>
<td>Open</td>
</tr>
<tr>
<td>358</td>
<td>S212</td>
<td>North of Gridline Y1</td>
<td>Concrete Wall W-6 does not match Sheet S202A indicating W-10.</td>
<td>High</td>
<td></td>
<td></td>
<td>Open</td>
</tr>
<tr>
<td>209</td>
<td>S212A</td>
<td>Intersection of Gridlines H &amp; A</td>
<td>Floor opening is missing for mechanical shaft. See Plans 1 &amp; 2M-4 and Sheet A213. Typical at Sheets S222 (A222), S233A (A233), S243A (A243), S253 (A253).</td>
<td>High</td>
<td></td>
<td></td>
<td>Open</td>
</tr>
<tr>
<td>360</td>
<td>S213A</td>
<td>On Gridline 3, west of A</td>
<td>Seismic separation is missing from Sheet A213. Typical at Sheets S222A (A222A), S233A (A233A), S243A (A243A), S253 (A253A).</td>
<td>High</td>
<td></td>
<td></td>
<td>Open</td>
</tr>
<tr>
<td>361</td>
<td>S214A</td>
<td>Star 3</td>
<td>Floor opening configuration at landing does not match Sheet A214.</td>
<td>High</td>
<td></td>
<td></td>
<td>Open</td>
</tr>
<tr>
<td>362</td>
<td>S214A</td>
<td>Plan east</td>
<td>On Gridline 10.1. Floor opening is missing for mechanical shaft. See Plan 8M-5. Typical at Sheets S222A, S224A, S244A, S254.</td>
<td>High</td>
<td></td>
<td></td>
<td>Open</td>
</tr>
<tr>
<td>363</td>
<td>S214A</td>
<td>Right of Gridline R, between 0.2 &amp; 10.1</td>
<td>Two (2) floor openings does not match Plan 2M-4 indicating one (1) opening at intersection of Gridlines H &amp; B. Typical at Sheets S224A, S234A, S244A, S254.</td>
<td>High</td>
<td></td>
<td></td>
<td>Open</td>
</tr>
<tr>
<td>364</td>
<td>S214A</td>
<td>Intersection of Gridlines H &amp; A</td>
<td>Floor opening is missing for exhaust duct shaft. See Plan 5M-11. Typical at Sheets S224A, S234A, S244A, S254.</td>
<td>High</td>
<td></td>
<td></td>
<td>Open</td>
</tr>
<tr>
<td>365</td>
<td>S214A</td>
<td>South of Gridline 10.1, west of A</td>
<td>Verify floor opening is required. Appears that mechanical shaft does not go below Level 2. See Plan 6M-11.</td>
<td>High</td>
<td></td>
<td></td>
<td>Open</td>
</tr>
</tbody>
</table>
REVIEW MILESTONES

100% DD REVIEW

DESIGN TEAM CORRECTIONS

50% CD REVIEW

DESIGN TEAM CORRECTIONS

90-95% CD REVIEW

DESIGN TEAM CORRECTIONS

BACK CHECK

- GOOD VALUE ON LARGE/COMPLEX PROJECTS
- FOCUSED ON MAJOR COMPONENTS
- EARLY IDENTIFICATION OF IMPORTANT ISSUES THAT MAY REQUIRE REDESIGN
- 2 TO 3 WEEK REVIEW TIME
REVIEW MILESTONES

- **100% DD REVIEW**
  - Good starting point for most projects
  - Complete review of the entire project
  - Due to lack of detail, cannot be as thorough as 90-95% CD review
  - Identify hundreds of issues early
  - 2 to 4 week review time

- **50% CD REVIEW**

- **90-95% CD REVIEW**

- **BACK CHECK**

Design Team Corrections
REVIEW MILESTONES

100% DD REVIEW

DESIGN TEAM CORRECTIONS

50% CD REVIEW

DESIGN TEAM CORRECTIONS

90-95% CD REVIEW

DESIGN TEAM CORRECTIONS

BACK CHECK

- MOST IMPORTANT REVIEW ON ALL PROJECTS (UNLESS BID OCCURS AT EARLIER DESIGN PHASE)
- COMPLETE REVIEW OF THE ENTIRE PROJECT
- EXTREMELY THOROUGH REVIEW IS POSSIBLE
- DESIGN TEAM NORMALLY HAS TIME TO RESOLVE ISSUES BEFORE BID
- 3 TO 4 WEEK REVIEW TIME
UNRESOLVED ISSUES WILL LIKELY SHOW UP DURING CONSTRUCTION, CAUSING RFI’S, CHANGE ORDERS, OR DELAYS

1 TO 2 WEEK REVIEW TIME
ROLE OF THE DESIGN TEAM

- RESOLVE ISSUES AFTER EACH REVIEW
- PROVIDE RESPONSES TO EACH COMMENT
- PROVIDE CLARIFICATION AS NEEDED
DELIVERY METHODS

- **DESIGN-BID-BUILD**: Most common form of procurement for public agencies, although there are movements towards lease-lease back, multi-prime, etc.
- CONTRACTOR NOT INVOLVED UNTIL PROJECT IS BID AND AWARDED
- LOW BID TYPICALLY WINS MAJORITY OF BID PROJECTS
- OFTEN, THE BIDDER WHO MISSES THE MOST, WINS THE PROJECT...THEREFORE, IS CHANGE ORDER HUNGRY
- UNLESS A DILIGENT BIDDER IS INTERESTED IN SUBMITTING PRE-BID RFI'S, CONFLICTS, ERRORS AND OMISSIONS ARE NOT FOUND...UNTIL THE AWARDED CONTRACTOR STARTS UP
- CONSTRUCTABILITY REVIEWS ARE EXTREMELY CRITICAL WITH DESIGN-BID-BUILD
- THIS DELIVERY METHOD IS MOST PRONE TO CHANGE ORDERS. OWNERS SHOULD KEEP AN INTERNAL CONTINGENCY OF 5-10%.
- CONSTRUCTABILITY REVIEWS CAN MITIGATE MANY OF THE ISSUES. OWNERS SHOULD USE INTERNAL STAFF OR THIRD PARTY TO CONDUCT REVIEW AND NOT RELY ON THE DESIGN TEAM
## Delivery Methods

<table>
<thead>
<tr>
<th>Method</th>
<th>The Most Common Form of Procurement for Private Clients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design-Bid-Build</td>
<td>CONTRACTOR IS SOMETIMES INVOLVED DURING PRECONSTRUCTION. IF SO, THEIR CONSTRUCTABILITY REVIEW IS CRITICAL.</td>
</tr>
<tr>
<td>Negotiated/GMAX</td>
<td>THE CM SHOULD OVERSEE THIS PROCESS AND REVIEW ALL DOCUMENTS SINCE NOT ALL CONTRACTORS PUT IN THE BEST EFFORT</td>
</tr>
<tr>
<td>Design-Build</td>
<td>PRECONSTRUCTION FEE CAN OFTEN GO TO THE CONTRACTOR WITH IT BEING RETURNED OR PRORATED SHOULD THEY BE AWARDED THE CONTRACT</td>
</tr>
<tr>
<td>CM@Risk</td>
<td>THE CONSTRUCTABILITY REVIEW MAY NOT CAPTURE ALL ISSUES, BUT SHOULD MITIGATE MANY. OFTEN A CONTINGENCY WITH THE CONTRACTOR SHOULD COVER E&amp;O.</td>
</tr>
</tbody>
</table>
DELIVERY METHODS

- DESIGN-BID-BUILD
- NEGOTIATED/GMAX
- DESIGN-BUILD (CM@RISK)

OWNER HAS ONE CONTRACT WITH THE DESIGN-BUILD TEAM (CONTRACTOR OR ARCHITECT LED)

THE OWNER’S RISK IS LIMITED WITH DESIGN-BUILD

REGARDLESS OF THE DELIVERY METHOD, ALL PROJECTS CAN BENEFIT FROM THE CONSTRUCTABILITY REVIEW PROCESS

CONSTRUCTABILITY REVIEWS ARE EXTREMELY IMPORTANT TO THE DESIGN-BUILD TEAM, SINCE THE CONTRACT AND ARCHITECT ARE WORKING TOGETHER AND BOTH ARE MUTUALLY LIABLE FOR THE SUCCESS OF THE PROJECT
THE CM@RISK DELIVERY METHOD HAS THE ADVANTAGE OF REDUCING RISK TO THE OWNER, BUT NOT ALL RISK.

CONTINGENCIES THAT CAN COVER CHANGE ORDERS RESULTING FROM POOR PLANS ARE LIMITED AND ANY OVERRUNS WILL STILL FALL ON THE OWNER.

DURING THE CONSTRUCTABILITY REVIEW, THE CM CAN REQUEST VALUABLE FEEDBACK FROM SUBCONTRACTORS.

THE CM FIRM IS TYPICALLY INVOLVED EARLY IN THE DESIGN PROCESS AND SHOULD PERFORM CONSTRUCTABILITY REVIEWS AT VARIOUS STAGES DURING DESIGN.
EXPECTATIONS

- NOT ALL ISSUES WILL BE FOUND
- CHANGE ORDERS AND RFI’S WILL NOT BE ELIMINATED
- DESIGN CHANGES AFTER REVIEW(S) WILL ALSO CAUSE ISSUES
- EXPECT 50%-75% FEWER CHANGE ORDERS & RFI’S

![Graph showing diminishing returns with a 3-4 week sweet spot](image-url)
ANY QUESTIONS?