

What is a Construction Document Coordination Review Why do one?

(The Value of a Construction Document Coordination Review)

**RMA Webinar
June 25, 2015**



What is a Construction Document Coordination Review?

and Why do one?

- Owners **do not** have an unlimited budgets
- Construction **is not** an exact science
- Design Teams **can not** produce perfect documents
- Coordination Reviews **reduce** Change Orders, RFI's and Time Extensions
- As one client said: "Coordination Reviews are **good insurance** for a **SUCCESSFUL PROJECT**"
- Construction Reviews **pay for themselves**

In this webinar you will learn:

- ✓ What a Coordination Review is
- ✓ Why you should do a Coordination Review
- ✓ Results of Independent Coordination Reviews
- ✓ Coordination Reviews and BIM
- ✓ How do you proceed
- ✓ Examples
- ✓ In-House Reviews and Spot Checks you can do

RMA Webinar

Thursday June 25, 2015

12:00 pm Arizona Time

1:00 pm Colorado Time

Presented by:

Dick Wallace, Architect,
President

RediCheck West, Inc.
Manitou Springs, Colorado
1-800-889-3168



Webinar Presenter

Richard C Wallace, AIA
Owner, RediCheck West, Inc.



Licensed Architect, State of Colorado - 1973

Member of the **RediCheck Associates** network of the eight
Review Firms authorized to perform third party reviews using the
RediCheck System of Interdisciplinary Coordination Review™

Bachelor of Architecture, Iowa State University
Member: American Institute of Architects
RMAPPA

1991 to Present President RediCheck West, Inc.
Manitou Springs, CO 80829
1-800-889-3168



RediCheck Project Team

- **RediCheck West, Inc.** Established in 1991
- **8 Associate Offices in the RediCheck System**
- **\$20 + BILLION in Construction has been Reviewed System wide**
- **RediCheck West Project Team:**
 - Richard C Wallace, AIA, Owner, – (42 years in design and construction)
 - Richard A. Keetch, Architect - Architectural Reviewer – (36 years in design and construction)
 - Barbara Lewis, PE - Structural Reviewer – (32 years in design and construction)
 - Scott France, PE - Mechanical Reviewer – (45 years in design and construction)
 - Paul Roberts, CPD - Plumbing & Fire Protection Reviewer – (45 years in design and construction)
 - Paul Fewell, Electrical Reviewer – (30 years in project management and construction)
 - Access to other RediCheck Reviewers, each averaging 25-30 years in the design and construction field - reviewing, designing and administering construction projects



What is and Why is a RediCheck Coordination Review Unique?

- ✓ A **RediCheck Review** is an independent Coordination Review –
– a proofreading of construction documents – to identify errors, inconsistencies and missing information that may lead to Change Orders, RFI's and/or time delays.
- ✓ 1st System Specifically Designed to Find and Correct:
 - ✓ Coordination Discrepancies **Within** each Discipline
 - ✓ Coordination Issues and Discrepancies **Between** Disciplines
- ✓ Proven on over \$20 Billion in Projects Reviewed
- ✓ Systematic, Disciplined Review Process by **Trained Specialists**
- ✓ **RediCheck Review is ALL we do**
- ✓ Recognized by the AIA (American Institute of Architects)
- ✓ Recognized by the ACEC (American Consulting Engineers Council)



A Few RediCheck Clients

- ✓ Arizona State University
- ✓ Colorado School of Mines
- ✓ Montana State University
- ✓ Mesa State College
- ✓ Northern Arizona State University
- ✓ University of Colorado
- ✓ University of Colorado at Colorado Springs
- ✓ University of Montana
- ✓ University of New Mexico



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What is a Construction Document Coordination Review and Why do one?

- **What is a Construction Document Coordination Review?**
- Why do a Coordination Review ?
- Results of Independent Coordination Reviews
- Coordination Reviews and BIM
- How do you proceed?
- Examples
- In-House Reviews and
Spot Checks you can do yourself



What is a Construction Document Coordination Review ?

- A systematic proofreading of Drawings and Specs

- with the intention of discovering inconsistencies, errors and missing information that may lead to Change Orders, RFI's and/or time delays

.....SO they can be corrected

BEFORE bidding rather than during construction.

- A way YOU can add to the quality of your projects.
- A way YOU can control your construction costs.
- A way YOU can identify potential Change Orders out there.
- A way to keep your projects on schedule and within budget
- A proof-reading of your project by
Experienced Professionals

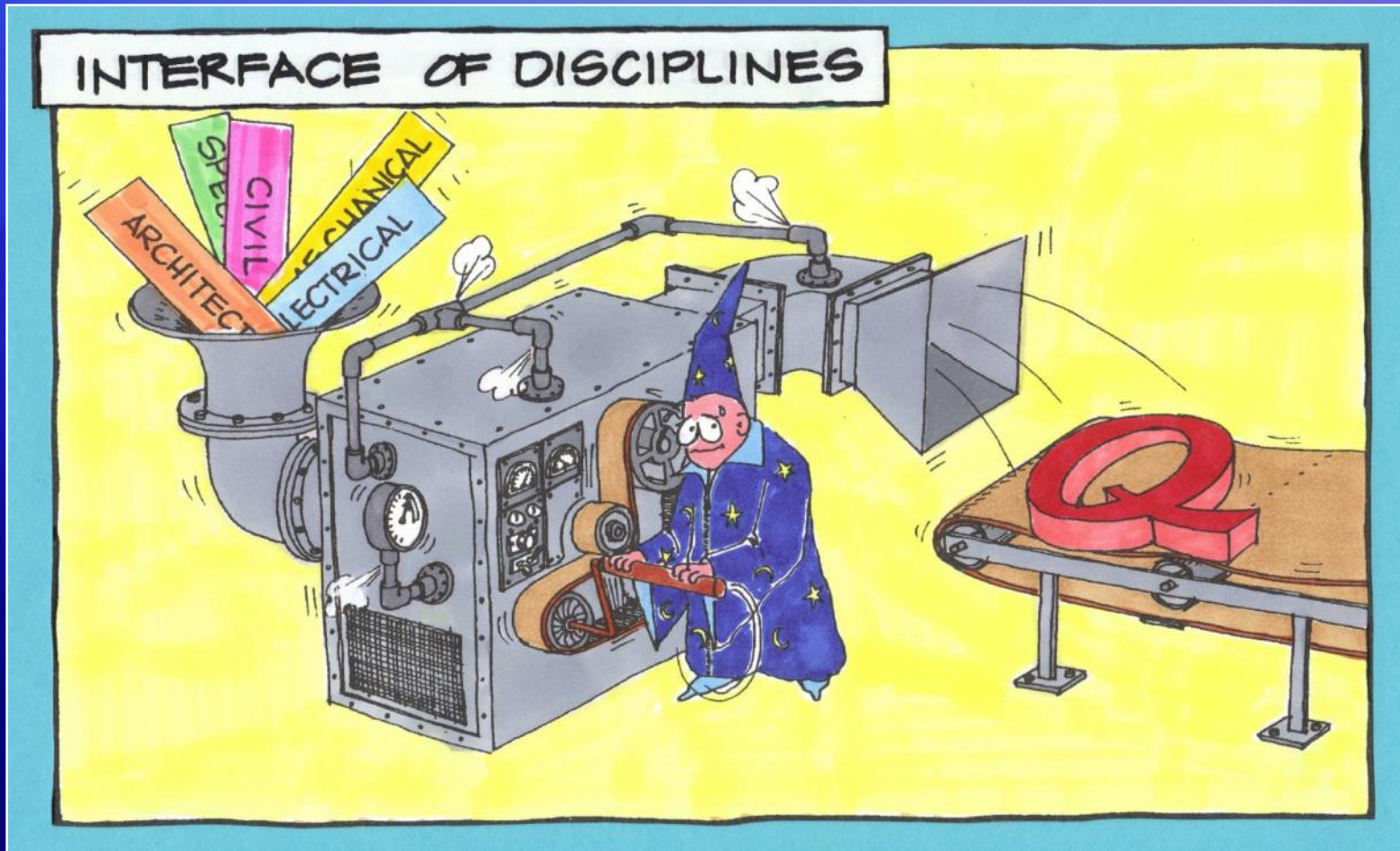


How A Construction Document Coordination Review Works

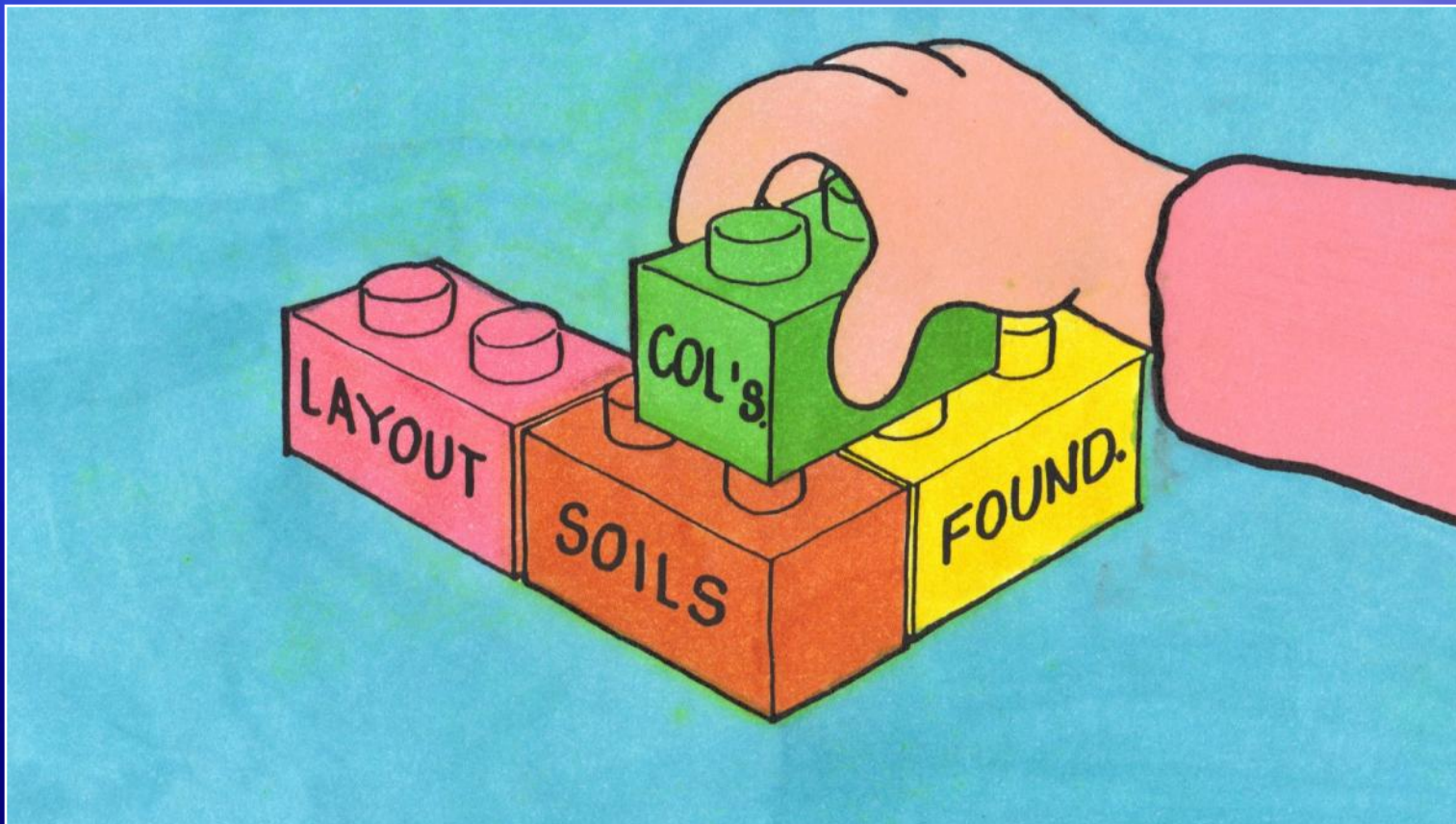
- Uses a Highly Structured Checklist as a starting point.
- Follows the Sequence of Construction
- Overlays Critical Drawings
- Verifies Notes, Sections, and Details
- Compares disciplines for consistency and agreement
- Notes Any Obvious Technical Mistakes
- Compares drawings with specifications
- THEN, the team's experience
from conducting reviews kicks in



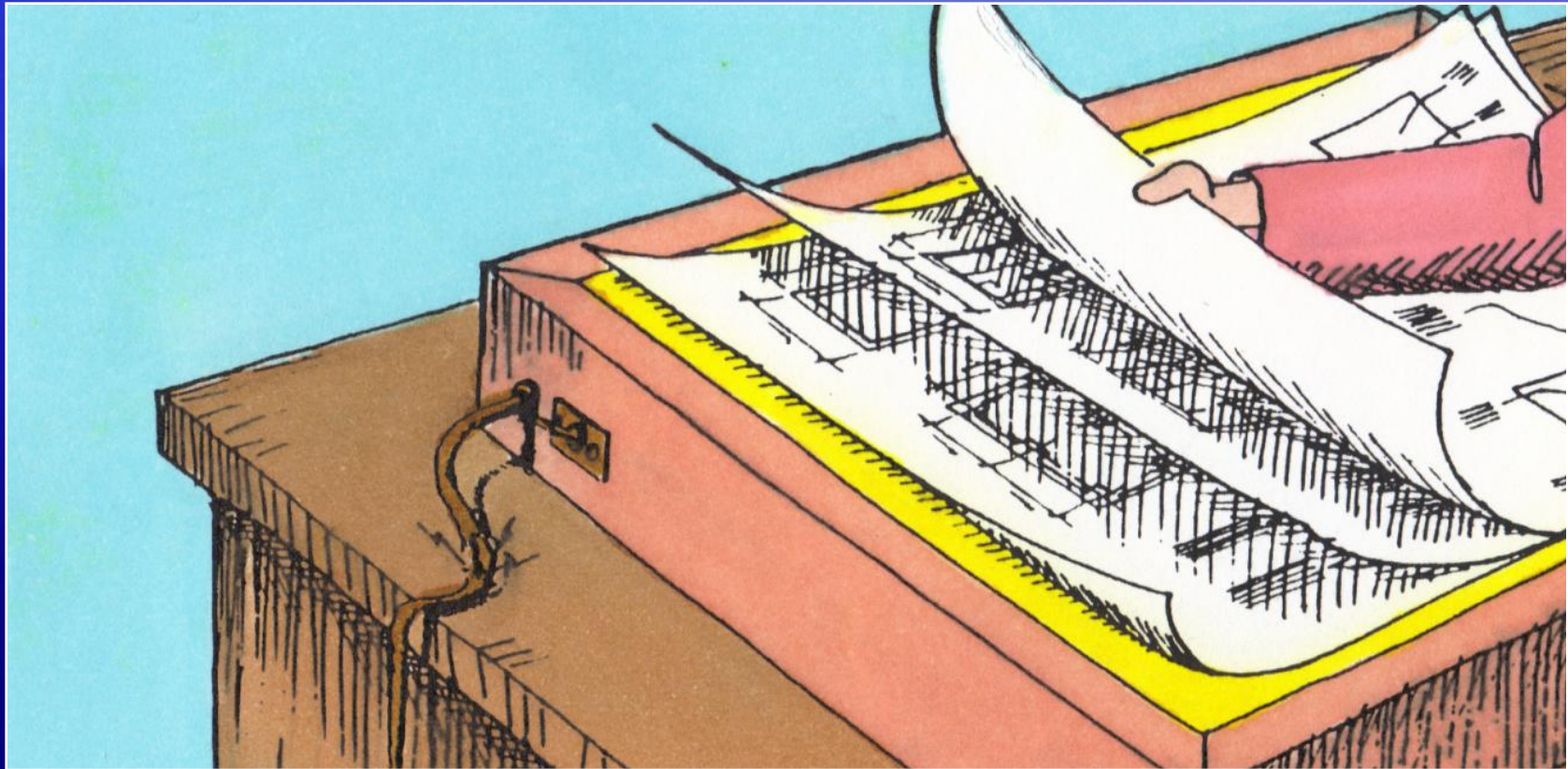
The Secret to Quality Drawings



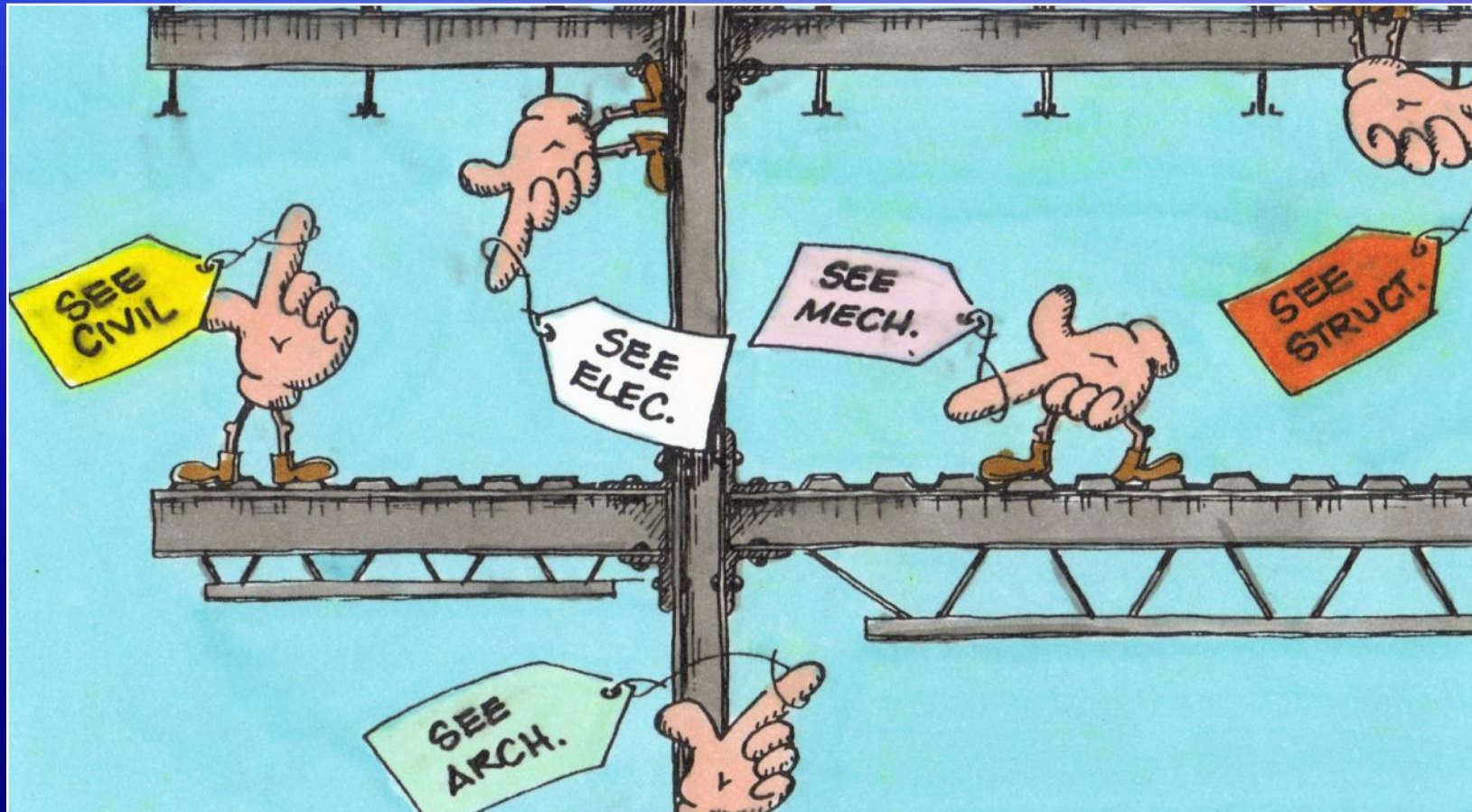
**A good Construction Document Coordination Review
Follows the Sequence of
Construction**



**A good Construction Document Coordination Review
Coordinates the Interface of
Disciplines**



A good Construction Document Coordination Review Verifies Multi-Story – Multi Discipline Interface



A Question not to ask.....



A good Construction Document Coordination Review will provide useable Review Deliverables

- **Scanned reviewed documents in pdf format**
 - Hard copy of drawings can be returned if you want them
- **Electronic pdf of the reviewed Specifications**
- **A Detailed Review of Drawings and Specifications will:**
 - **Make it easy** to understand comments & use drawings
 - **Link comments** across disciplines - double noted
 - **Prioritize discrepancies** – more significant items are red flagged
 - **Highlight** what appears to be properly coordinated with other portions of the drawings and/or disciplines
 - **Make it easy to understand** the issues and make corrections
 - * **Work off marked-up** electronic scans of drawings
 - * **Distribute pdf** copy of reviewed documents





What is a Construction Document Coordination Review and Why do one?

- What is a Coordination Review?
- **Why do a Construction Document Coordination Review ?**

And, Why to NOT do a Coordination Review

- Results of Independent Coordination Reviews
- Coordination Reviews and BIM
- How do you proceed?
- Examples
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On some projects,
The train wreck is waiting to happen



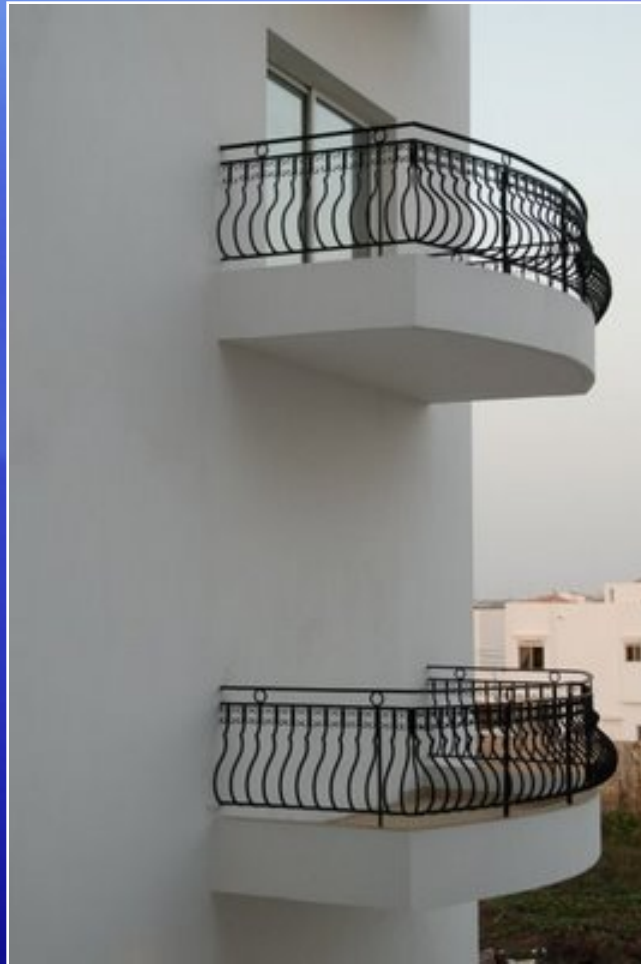
BUT, You do have a choice.....



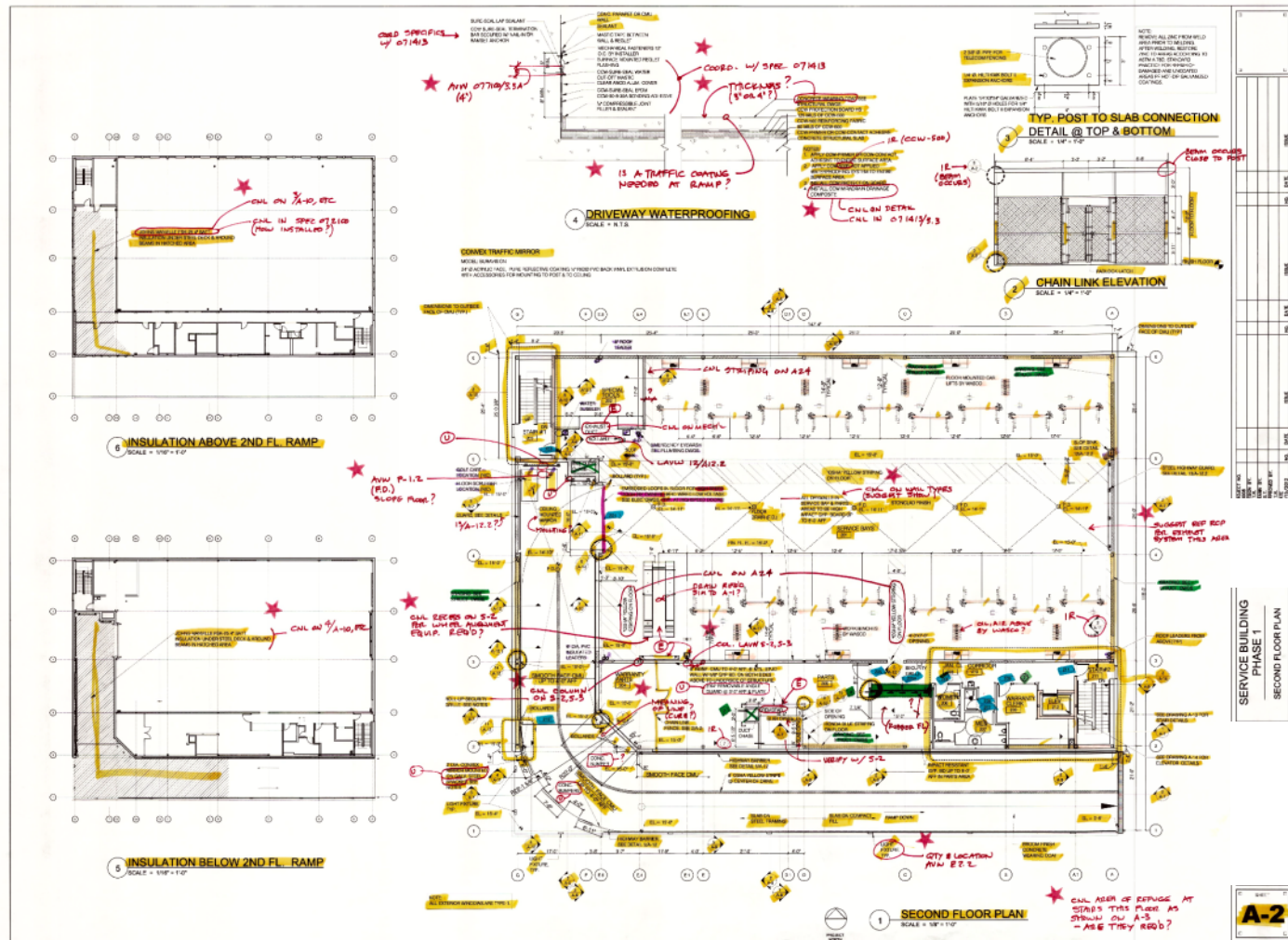
You can hope it works.....



You can try to book the Room with the best view.....



OR.....Before You Build It.... You Can Coordinate It!



You Know The Problem!

- Construction documents that are not fully coordinated **will probably lead to :**
 - Change Orders
 - RFIs
 - Disputes
 - Delays
 - Litigation



Change Orders

- Construction change orders can add **4 – 8%** direct cost to the construction project.
- RFIs add an additional indirect overhead burden
 - For the Contractor, Architect AND the Owner
- Disputes and litigation add both direct and indirect costs.
- Any or All of these can add time to the schedule.



Reasons for Change Orders

- Unforeseen Conditions
- Owner Requested Changes
- Design (Technical) Changes and/or Errors
- Coordination Errors and Omissions
Can account for 50% of the Change Orders on a project



Why Does the Problem Exist Given the Technology and Talent Available?

- **Education:** Coordination Not taught in Schools
- **Misconception:** Belief it is included in QA
(“we do that”.....
BUT NOT to the detail of a full Coordination Review?)
- **Human Nature:** Pride
(I don’t need anyone to check MY drawings)
- **Economics:** There is never enough time or fee for the design team to do a comprehensive Coordination Review
- **Design teams produce:**
“industry standard” drawings



It All Gets Found.....

Sometime during the project!

- Contractors and Subs know their contracts and how to get paid for Changes
- Seminars / Courses
 - “Contractor’s Course on Construction Claims”
 - “Advanced Course on Construction Claims”
- Books
 - Contractor’s Guide to Change Orders



How a Construction Document Coordination Review Will Benefit Your Construction Projects

- **Save your project time and money:**

- Reduced Change Orders
- Reduced Requests for Information (RFIs)
- Reduced Conflict between all parties
- Improved Completion Time
- Improved Efficiency / Reduced OH Costs
- Less Staff Time Administering Projects
- More Accurate & reliable GMP & Bids
- Smaller contingency
- AND, Some coordination issues don't show up until after occupancy, when things do not work as intended



Why do a Construction Document Coordination Review ?

- Plans are not being reviewed, like they used to be!
- Just **good insurance** for a successful project.
- Often times, Owners and/or Contractors do not have staff with **expertise to review the plans to the detail an outside firm does.**
- **Reduce your staff time** administering a project.
 - handle more projects with less overhead.



Why NOT do a Construction Document Coordination Review?

- You have an Unlimited budget
- Construction is an EXACT science
(your contractor won't charge for differences in bids and actual construction)
- The Design Team will produce perfect drawings
(they guarantee plans have no issues or additional costs)
- You are being given the building and an unlimited maintenance budget so you have no cost exposure



Common Questions about a Construction Document Coordination Review

- **Am I already paying the Architect to coordinate construction plans?**

Yes, Architectural firms will include a quality assurance review, BUT, it is typically done during the design phase and is focused on technical issues. Usually the Architect requires each design team member to review his own specific drawings. If a coordination review is performed, it is usually only within each discipline instead of across disciplines.

An effective review requires a team of trained professionals, with experience in detailed coordination reviews, to check a considerable amount of information in a short time. Design firms do not have the available personnel, in sufficient numbers, to perform a Coordination/Constructability Review in the time allowed. Plus, using a third-party review can reveal discrepancies overlooked by the design team.



Common Questions about a Construction Document Coordination Review

- **Why should I pay for an independent Coordination Plan Review?**

The principal stakeholders in a project, the owner, designer, and builder all have a vested interest in keeping costs down.

A Coordination Review has proven that for every dollar spent, many times that in construction costs are saved. This is potentially up to a 3,000% return on your investment. Coordination errors and omissions can account for 50% of the change orders on a project.

All of the stakeholders benefit by avoiding these unproductive change orders.

The Engineering News Record, in their January 27, 2003 publication, reported that a Coordination Review of MIT's Stata Center in Cambridge, MA, is "saving millions of dollars in fixes and lots of time." David Lewis, a senior project manager for Stata's construction said, "We have virtually no changes."



Common Questions about a Construction Document Coordination Review

When should I have the Coordination Review performed?

The optimal time to conduct a Coordination Review is when you have 95% construction documents. However, clients have had Reviews well after construction has started, and have been able to save millions of dollars.

Can I afford a Coordination Review on my budget?

You already have a contingency fund set aside (typically 4% to 8% of your construction cost), because you've been conditioned to "expect" change orders. On an average size project (\$10 to \$12 million), a Coordination Review costs around 0.2% (two-tenths of one percent) of the construction cost.

A Coordination Review is only a fraction of your contingency fund.

A small, but smart, investment compared to the savings you will realize.

One client said:

"It is good insurance for a successful project."



Common Questions about a Construction Document Coordination Review

Do I need a Coordination Review if we are using BIM and other software tools?

In short, yes! The technological advances in recent years, such as Building Information Modeling (BIM), are moving in the right direction concerning document coordination and increased efficiencies. However, **BIM is still evolving and not working to its full potential.**

We have checked numerous projects produced with BIM software and have found little changes in the types and quantity of discrepancies. This may be due to a **false sense of security** that the software and concept provides. Are all members of the design team using BIM and/or tools that are compatible? What is the experience level of the personnel using the newest software tools?

The most technologically savvy clients have found Coordination Reviews to be a valuable supplement to the Design Team.



Common Questions about a Construction Document Coordination Review

**I have a CM/GC or CMAR for the project,
do I need a Coordination Review?**

A Construction Manager's job is to manage and construct the project. While a "coordination review" is sometimes included in pre-construction services, it is not done to the depth of an Independent Coordination Review, and may not be done on the final construction documents – just the time that coordination errors can cause Change Orders, RFI's and time delays.

We have performed coordination reviews for many Construction Managers who value a well coordinated set Drawings and Specifications and who realize they do not have the expertise, or resources, to perform a thorough coordination review.

A CMAR or CM project budget typically carries a contingency to cover "unforeseen costs" to the project, so they are not passed on to the Owner.

A Coordination Review will identify items that can be corrected on paper, rather in the field for additional costs, and not taken out of the contingency. That contingency can, many times, be returned to the Owner.



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- **Results of Construction Document
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 - Coordination Reviews and BIM
 - How do you proceed?
 - Examples
 - In-House Reviews and
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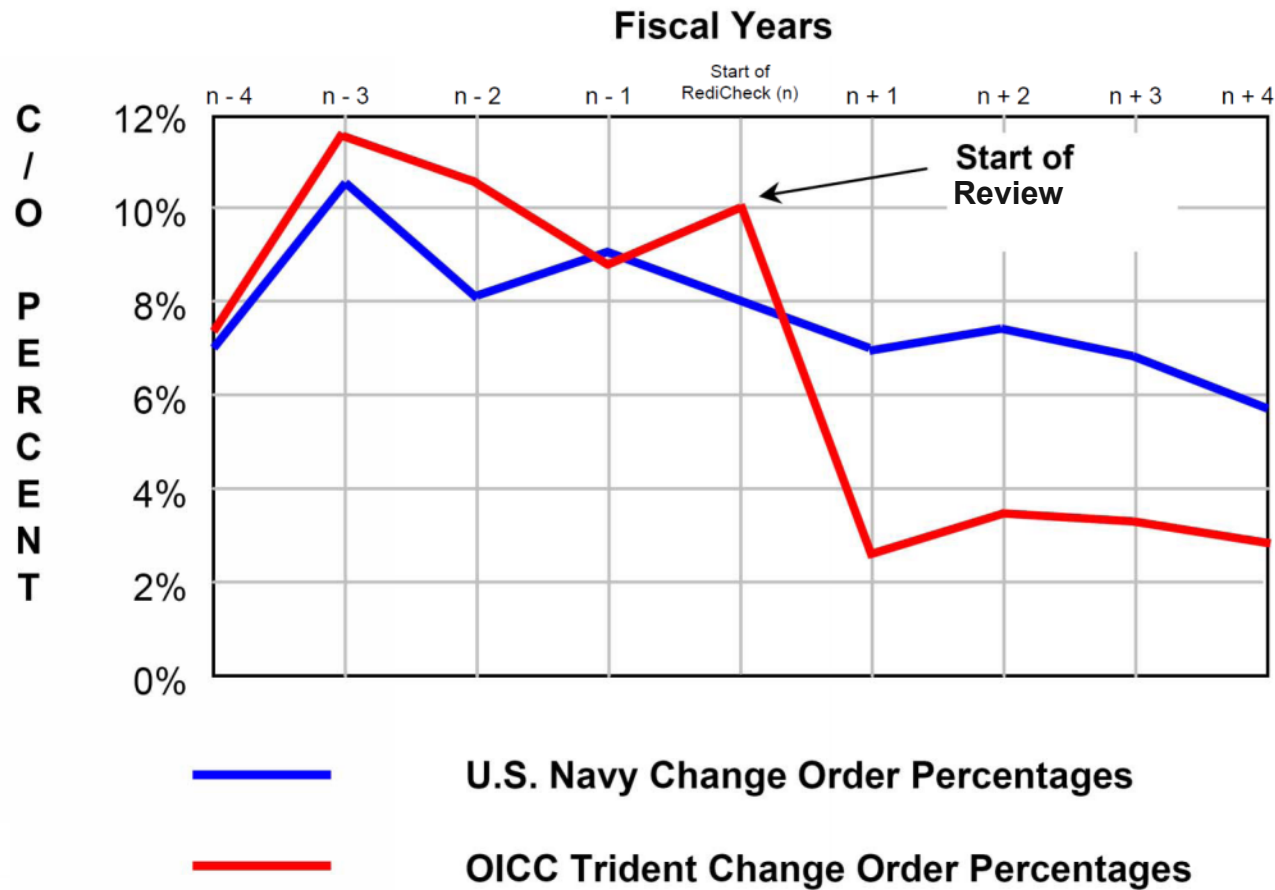
Study of an Independent Review on a \$52 M Project with



- U. S. Cost was hired to estimate the value of the Independent Coordination Review that was performed on the drawings
- Conclusions:
 - 630 RFIs were Avoided
 - 215 Change Orders were Avoided
 - Estimated Savings was \$597,000
- Return on Investment was **700%**
on the fee of \$67,000 invested



Proven Cost Benefit of an Independent Review



Study of In-House Reviews

**One Government Agency Studied
52 projects where their Engineers were
trained and performed coordination reviews.**

- **Findings:**
 - 1. Saved an estimated \$703,850 in avoided change orders.**
 - 2. Savings of **over \$1,300 for every man hour** invested in the reviews.**
 - 3. Reviewers were trained in the Coordination Review Process**



Savings versus Cost

- The larger and more complex the project – the higher the savings potential !
- Savings = 2% to 4% of Construction Cost
- Review Cost = .002 x Construction Cost
(that's two tenths of one percent - .2%)
- Think **Return on Investment**
Potential return on Investment as High as 3,000%



What Owners Say

“...your Constructability Reviews have been a tremendous asset to our facilities construction program.”

*Capital Projects Office
University of Washington*



What Owners Say

"...pay attention - because since using your review the past few years, our change order rate has dropped significantly".

Chief Architect, Connecticut Dept of Public Works
**Debriefing a Coordination Review of the new State
Medical Laboratory Project**



What Owners Say

"...(your review was) well received by all of our architects and engineers and is without a doubt a worthwhile investment."

"Your service produces, in the end, a better, more coordinated set of construction documents, which result in significant savings."

Anthony Arnold PE, Director Facilities Planning & Construction, City of Virginia Beach



What Owners Say

"(your review) is saving millions of dollars in fixes and lots of time. We have virtually no change orders..."

Dave Lewis, Senior PM for MIT's \$130M STATA Center



What Owners Say

“I would, without reservation, **recommend this approach for any project or facilities manager contemplating a construction project.”**

*Department of Facilities Management
University of Colorado*



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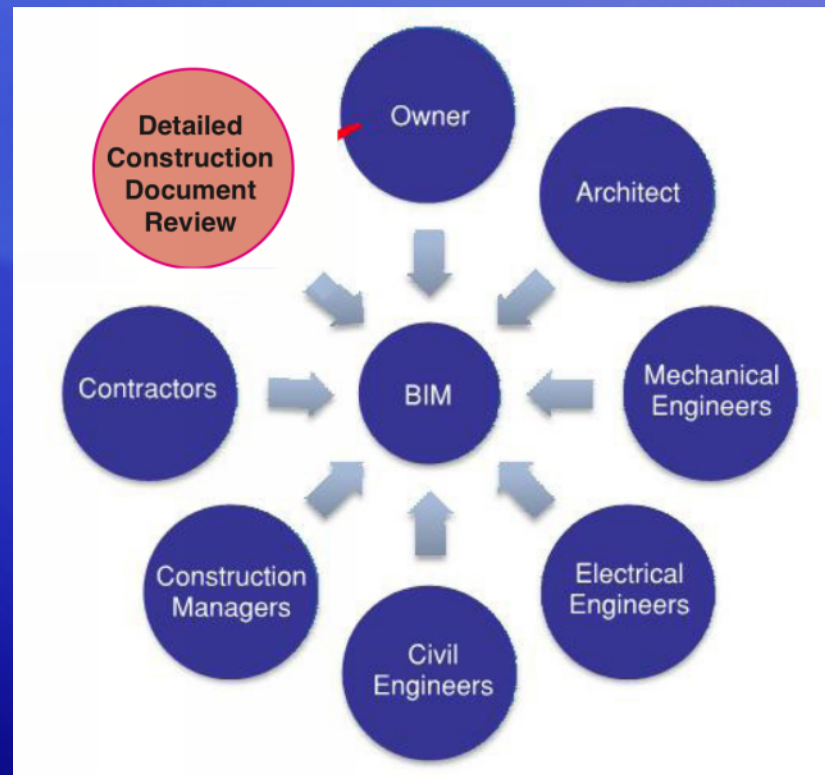
- **Construction Document**

Coordination Reviews and BIM

- How do you proceed?
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A Coordination Review Compliments the BIM model



BIM

(Building Information Modeling)

(Building Information Management)

- **BIM is a powerful and effective process that is becoming the standard for design.**
- Most large design firms and large projects are incorporating some level of BIM
- It does include the ability to perform clash detection.
- A Coordination Review is a tool to help complete the BIM experience, by closing the final exposures.
- Coordination Reviews compliment BIM
- BIM is still evolving...and is not yet working up to its full potential
- BUT..... BIM Often creates a **false sense of security**
 - **Critical issues can be missed or overlooked**
 - Omissions, Constructability, Spec Coordination (Alternates, Phasing, Materials), Drawing Coordination (Door Schedule, HP/Voltage/Phase, etc.)



BIM Like Any Process Has Limits

BIM is still evolving...and is not yet working up to its full potential

- New technologies tend to be used by younger personnel less experienced in actual construction
- Everybody on the design team needs to be using BIM
 - Food Service, Lab, Civil, all MEP disciplines?
- BIM Often creates a false sense of security
 - Omissions? BIM cannot do clash detection for what is not shown.
 - Constructability?
 - Spec Coordination (Alternates, Phasing, Materials, Installation Details)?
 - Drawing Coordination (Door Schedule, HP/Voltage/Phase, All Schedules, etc.)?



A construction Document Coordination Review Compliments the BIM model

- Long standing clients **continue** to send BIM projects to review and continue to believe an independent coordination review is value added.
- **Most projects** today utilize some form of BIM.
- **Reviews continue to find** significant coordination problems. More than enough to result in a large Return on Investment.



What one Client said about BIM

.....Even though all design disciplines used building information modeling (BIM)....., **(the Coordination) review proved to be invaluable as the final coordination.**

.....At this time in the design and construction industry solely relying on BIM is still too risky.....

Thank you for your degree of professionalism, reliability and **overall positive influence to the project's bottom line."**

Project Manager, Perkins+Will Architects



A Construction Document Coordination Review Fills The Gaps

- Approximately 50% to 70% of a Coordination checklist items may not be confirmed by BIM/clash software (Revit, ArchiCAD, Navis Works, etc)
 - Are all details accurate & complete?
 - Are all schedules accurate and complete?
 - Do Fire rating for doors, walls agree with schedules, with Mechanical, Electrical and Life Safety plans
 - Do motor requirements on Mechanical match Electrical
 - Is there any inadvertently omitted information?
 - Are there items missing between disciplines?
(structural elements, electrical support, specified items, etc.)
 - Are Specs fully coordinated with drawings?



RediCheck Review Compliments BIM

	CIVIL/LANDSCAPE		RCS	BIM	
		Preliminary			
1		- Scan drawings and Spec Div. 01 (Scope of Work, Alternates, Phasing, Unit Prices, and Allowances) to become familiar with the project.	X		
2		- Crosscheck Title Sheet with Civil/LS drawings for sheet nos. and titles.	X	X	1
3		- Verify Spec. Table of Contents is consistent with Civil/LS sections.	X		
		Architectural, Structural and MEP Cross-check			
4		- Limits of work, clearing, grading, sodding and seeding as shown on Civil drawings are consistent with site plans of other disciplines.	X	X	2
5		- Spot elevations at slab corners match arch. elevations and floor plans.	X	X	3
6		- Building footprint and location are consistent with all site plans.	X	X	4

289		- Demolition work matches new work. Cross-check with appropriate other disciplines (Mechanical equipment, EWC, etc.).	X		
290		- Items not demolished are shown as "EXISTING" on new plans.	X		
291		- Existing to remain and new work clearly identified.	X		
292		- Conduit lines not reused are abandoned or removed.	X		
293		- Salvaged items are clearly identified.	X		
294		- Phasing is clear, logical, and coordinated with other disciplines.	X		
			Total Items Checked by RediCheck	294	
			Total Items Checked by BIM		73
			Total % that BIM can catch	25%	

*BIM Clash Detection reviews
approximately 25% of the items on the
RediCheck Review Checklist*



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See how to save without adding cost to the project



How YOU can incorporate a Review into your projects?

- **Try** a coordination review on one project
- **Add** the review to your Construction Schedule
- **Review projects prior to bidding**
- Review each bid package as it comes out to make sure it fits on, and within, the previous one
- Review a project after bidding or award, prior to construction, to find out early on what will cause problems and create change orders which lets you **address them NOW**.
- Review a project if it starts to have problems, so you know what else is hidden in the plans.
- **Reduce final contingency** based on findings
- Identify **your school** as being **pro-active** in controlling construction costs



When/How to incorporate a Review into your projects?

- **At the beginning of a project, indicate that a Coordination Review is planned** – at the 90% to 95% completion of Construction Documents
- **Identify a budget** line item for the Coordination Review
- **Identify the Review time** frame in every schedule
- **Allow time** in the schedule for addressing Comments
- If there is not time before bidding, consider a review during the bid period
 - Then, negotiate with the selected bidder to confirm/clarify any change in bid due to the Review BEFORE signing a contract



The Coordination Review Process

- **Contact review firm when you know a project is coming up** -
 - With project cost, type/description of project, approximate start date of construction
 - They should then give you a budget review cost and an approximate time frame
- **Keep them updated** as to scheduling
- **Contact them when you know the approximate number of drawings**
 - in EACH DISCIPLINE - in the final drawing set.
 - design team should be able to give you an estimate
 - They should prepare a PROPOSAL for your approval
- **Keep them updated** as to scheduling and number of drawings
- **When project is ready for review**
 - Send them a link to download a combined, searchable set of Drawings and Specs
 - They can print drawings for their reviewers to use
- **When finished**, they can scan the drawings and upload them to our site for your download
- Depending on scheduling, they may also present findings thru a Go-To-Meeting debrief



Invest Money You Already Have!

Typical \$10,000,000 project with pre-qualified bidders

5.00% Contingency (set aside for change orders)	\$ 500,000
0.22% Independent Coordination Review Fee	\$ 22,000
4.78% Remaining Contingency	\$ 478,000

Historically, a Coordination Review can cut change orders by 50%

Review Cost = \$22,000 - Saving = \$250,000 ($\$500,000/2$)

Typical return on Investment of approx. 1,000%



Invest Money You Already Have!

Typical \$100 million project with 1,000 Drawings

5.00% Contingency (set aside for change orders)	\$ 5,000,000
Cost for Coordination Review	\$ 135,000
Remaining Contingency	\$ 4,865,000

Historically, a Coordination Review can cut change orders by 50%

Review Cost = \$135,000 - Saving = \$2,500,000 ($\$5,000,000/2$)

Typical return on Investment of approx. 1,800%



After a Coordination Review

- **Make sure the comments are addressed**

Some comments may have already been addressed by the Design Team

BUT, many comments WILL need to be addressed to avoid problems and questions during construction

- Consider a BackCheck of the Coordination Review documents to confirm that the comments have been addressed



Hindrances to a Review

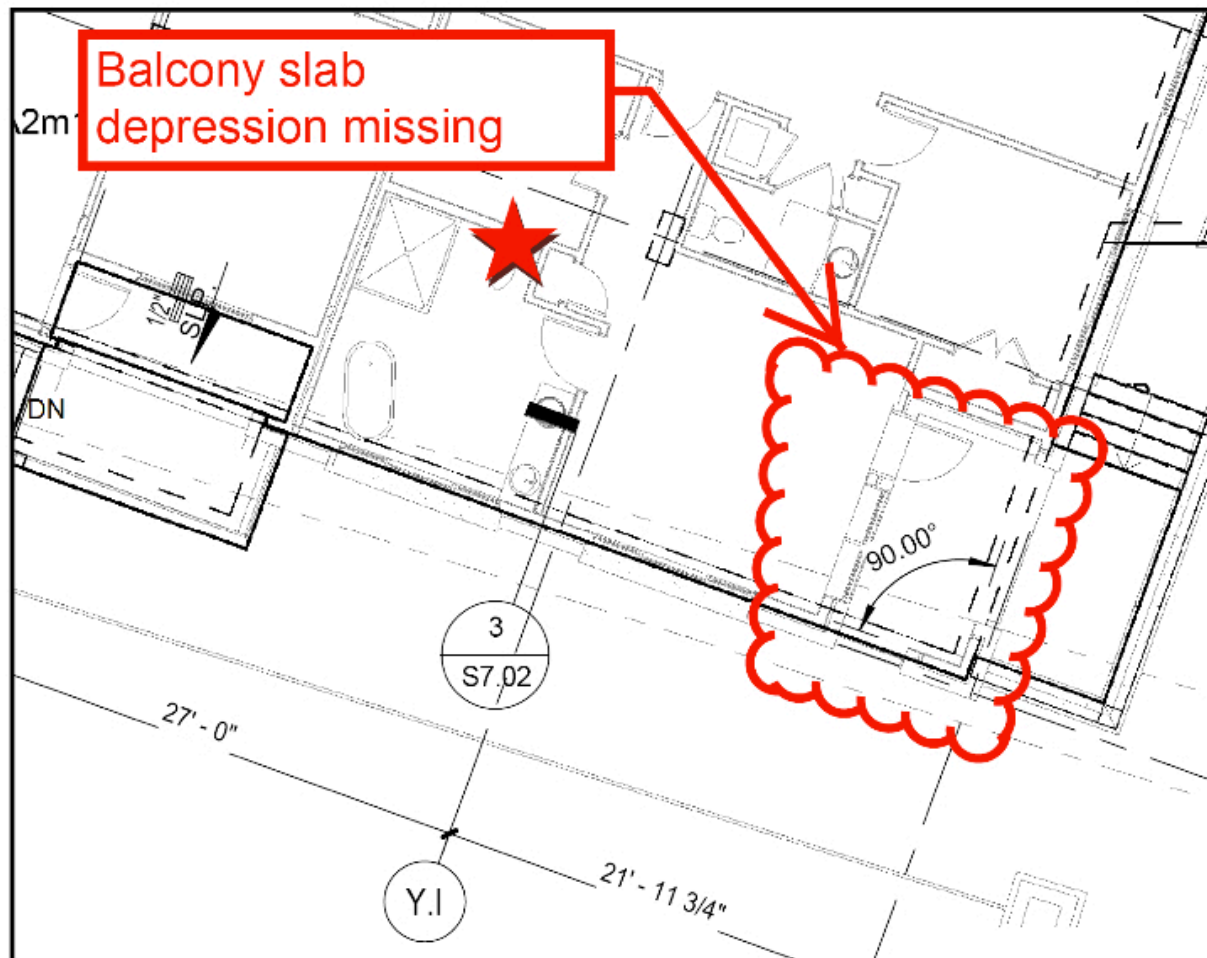
- **There is no money**
 - Allocate a portion of your contingency
- **There is no time**
 - Make time, if no review, there will be time to administer the problems!
- **The Construction Manager does this**
 - Do they do a Coordination Review by experienced professionals?
 - Do they have a Documented record of cost savings?
 - Do they give you a Deliverables you can use and keep?
- **I have no risk, this is a CMAR project**
 - Is the contingency larger to cover Changes due to drawing inconsistencies?
 - Does the Owner receive all of the unused contingency?
 - Are all reductions in the contingency documented? Could they have been avoided by an Construction Document Coordination Review?



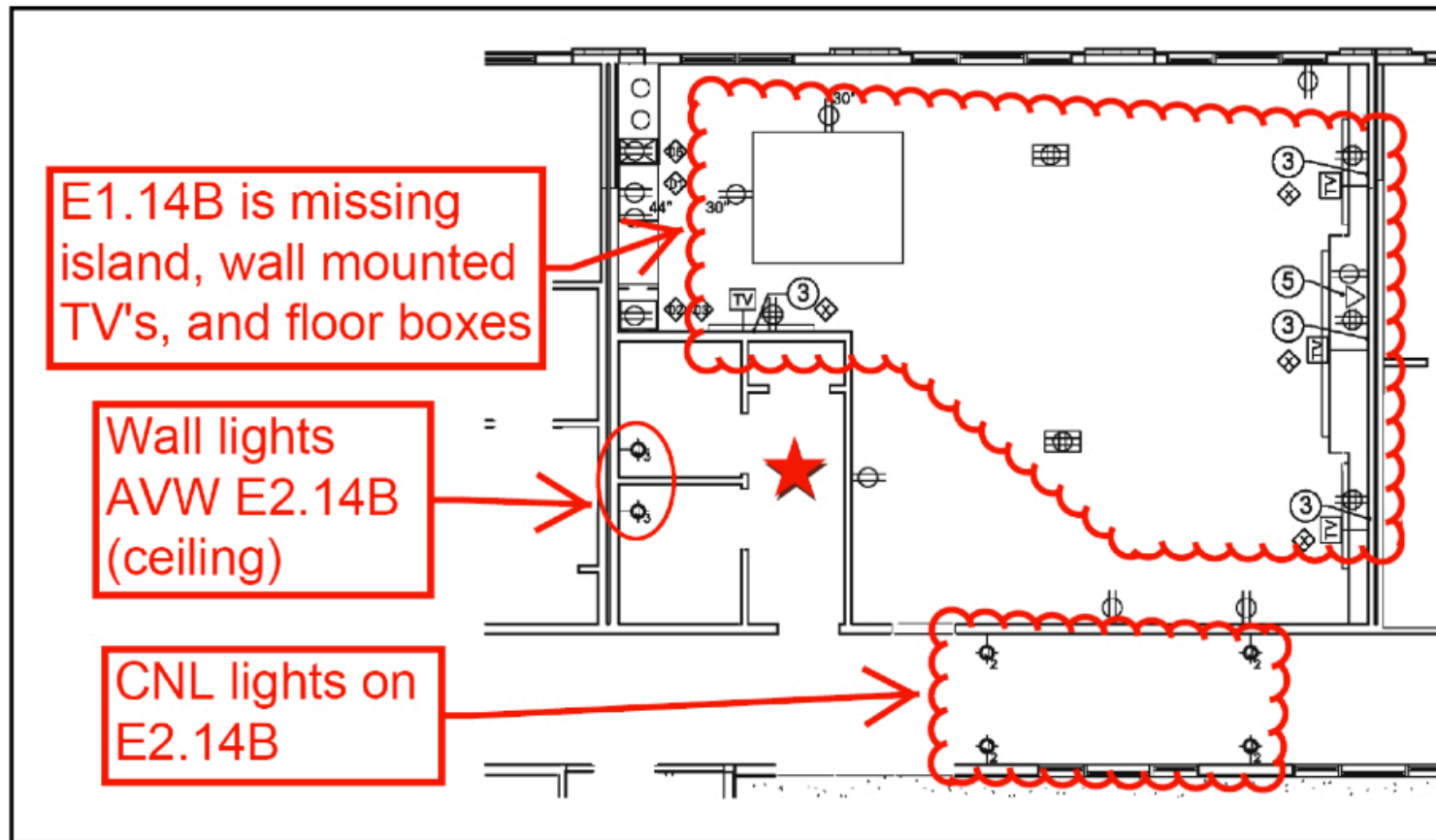
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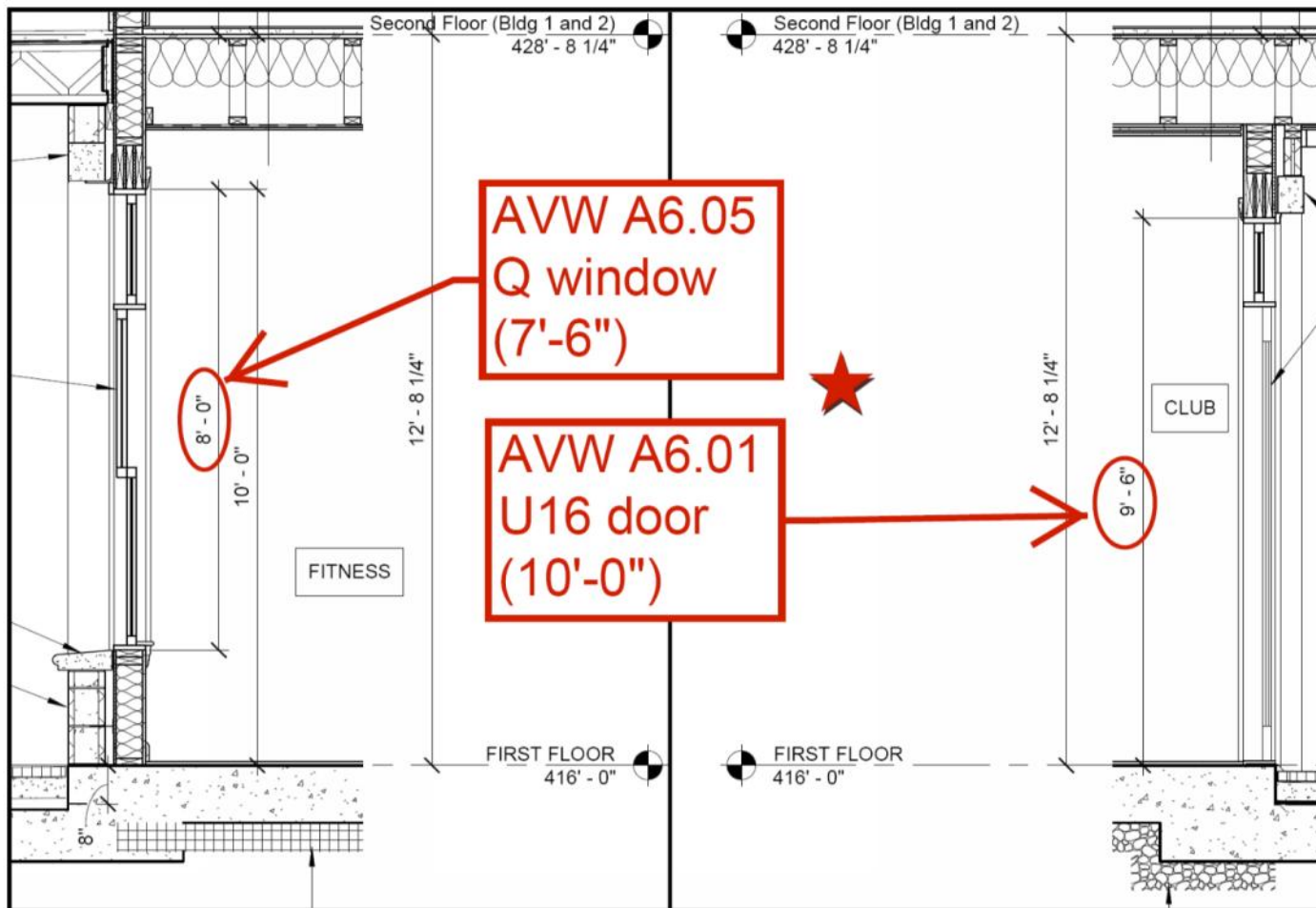




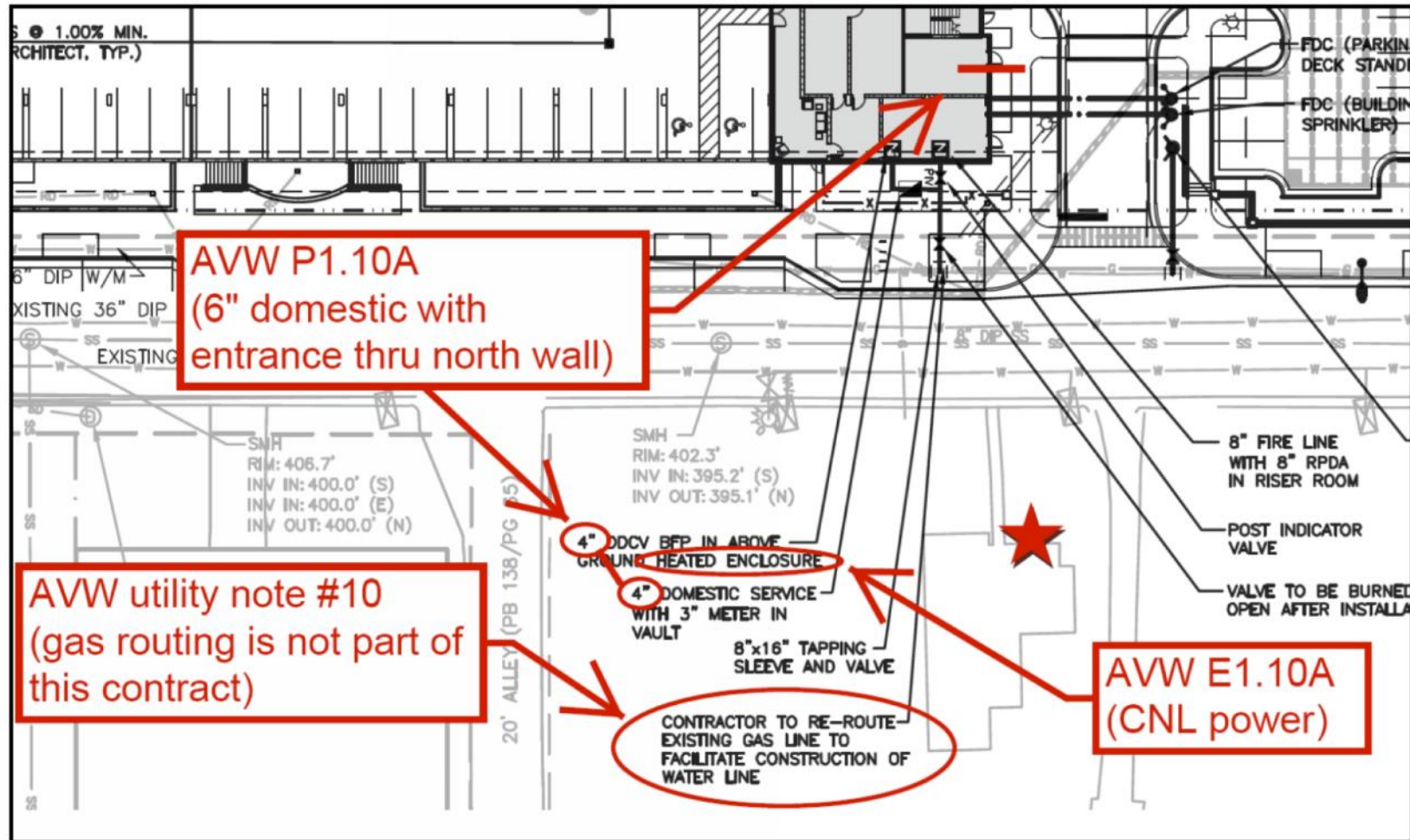
Drawing S1.12A



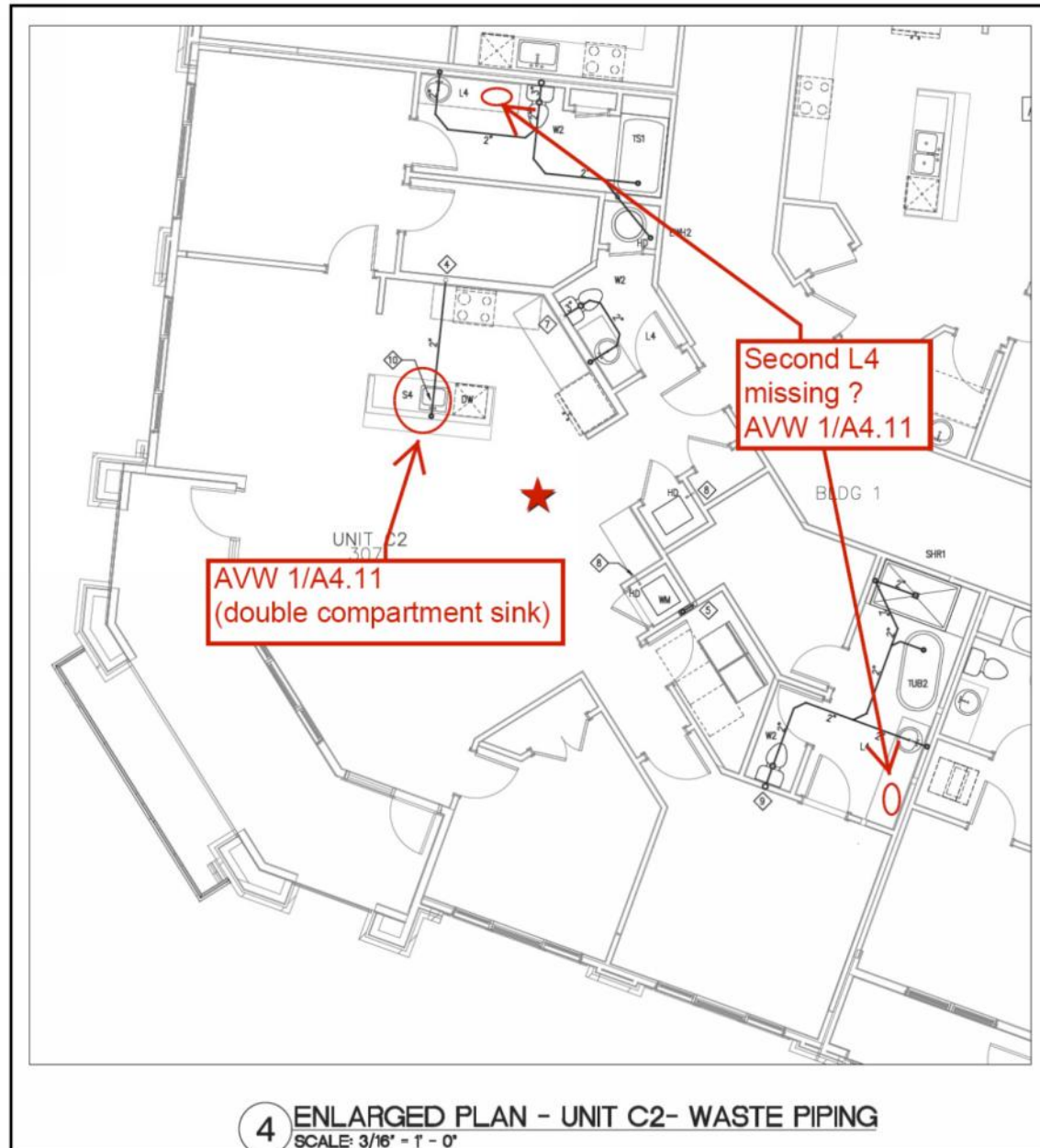
Drawing ID 5.01 – Party Room – Power & Communication Plan



Sections 2 and 3/A3.17

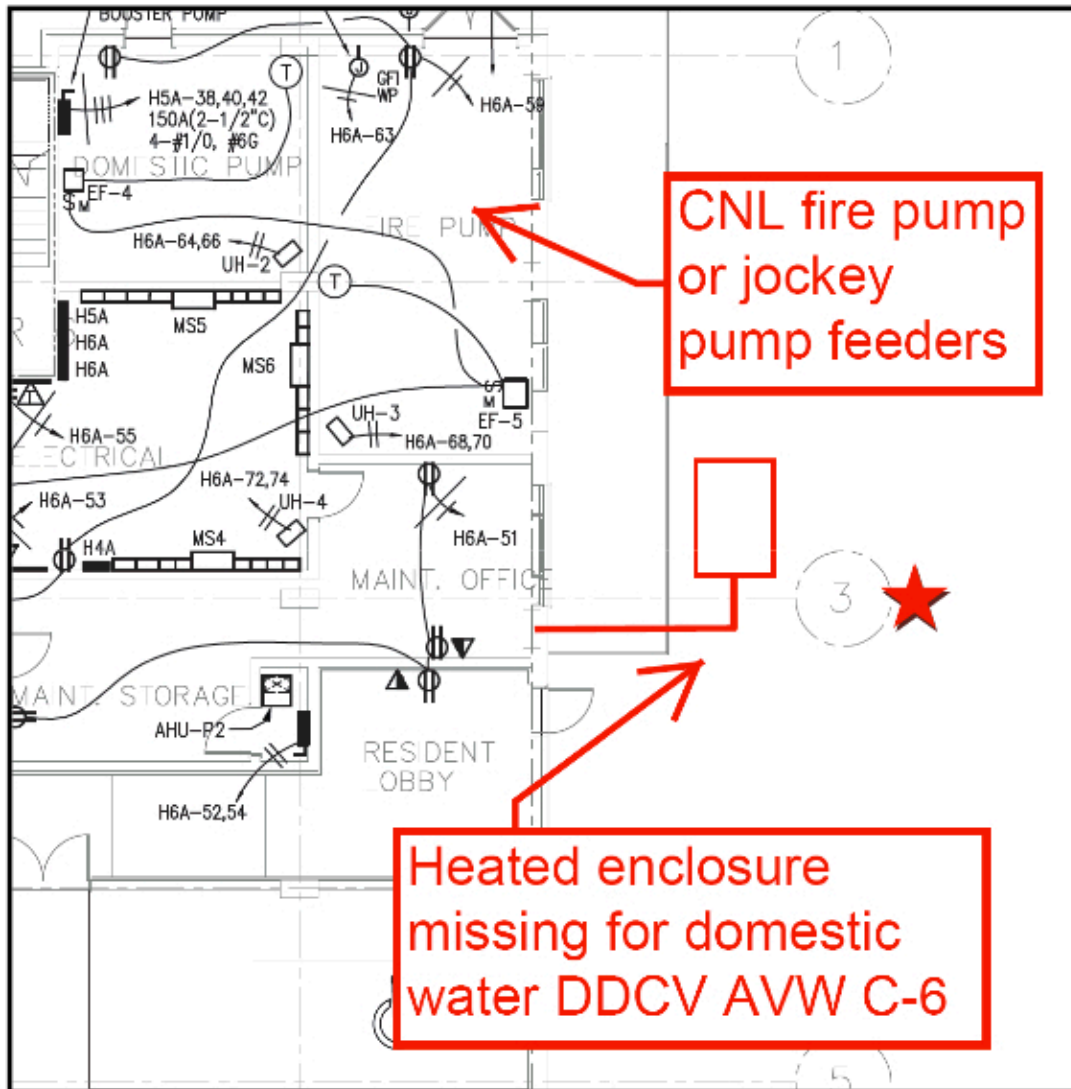


Drawing C-6

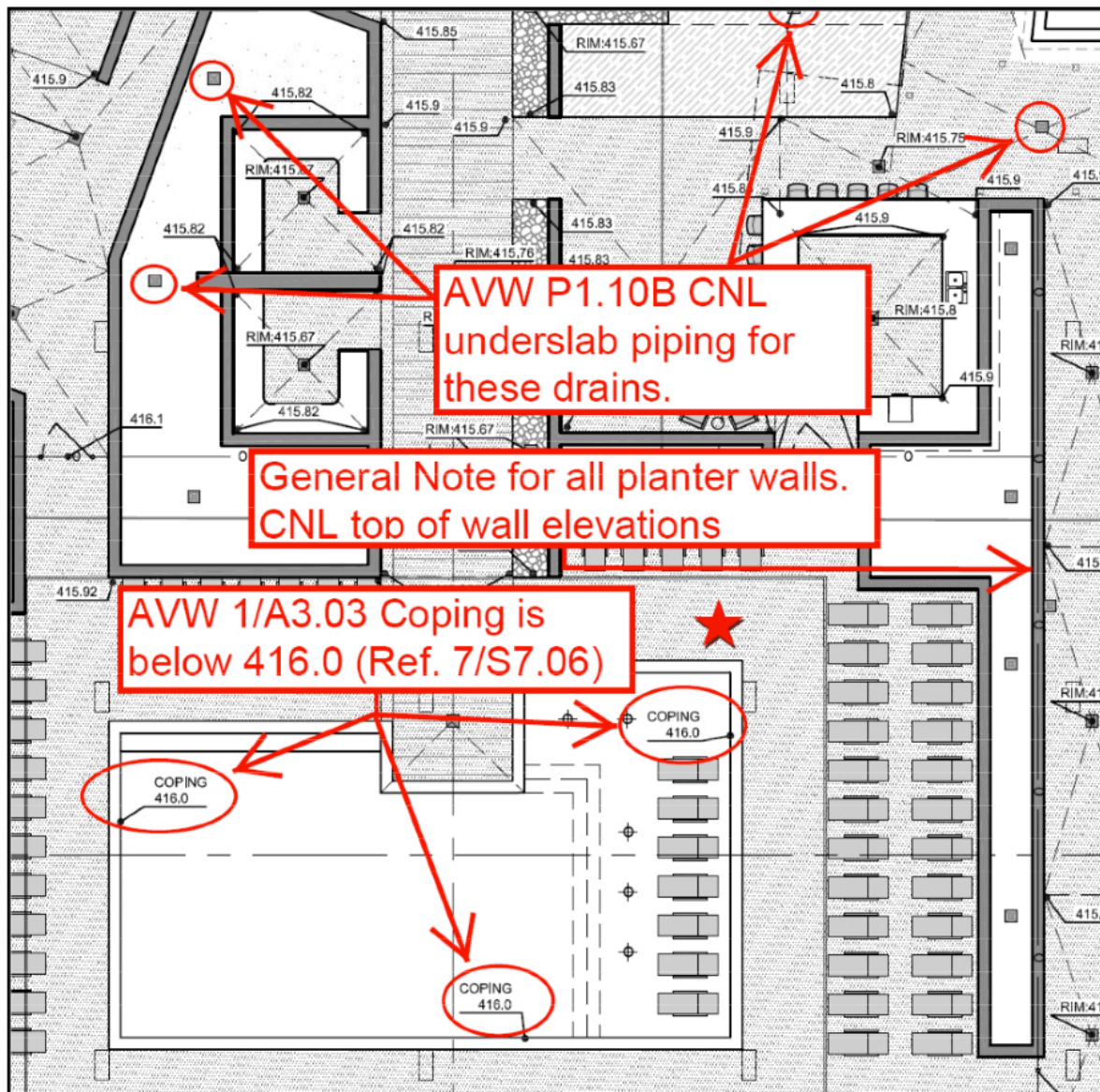


Enlarged Plan 4 / P4.03





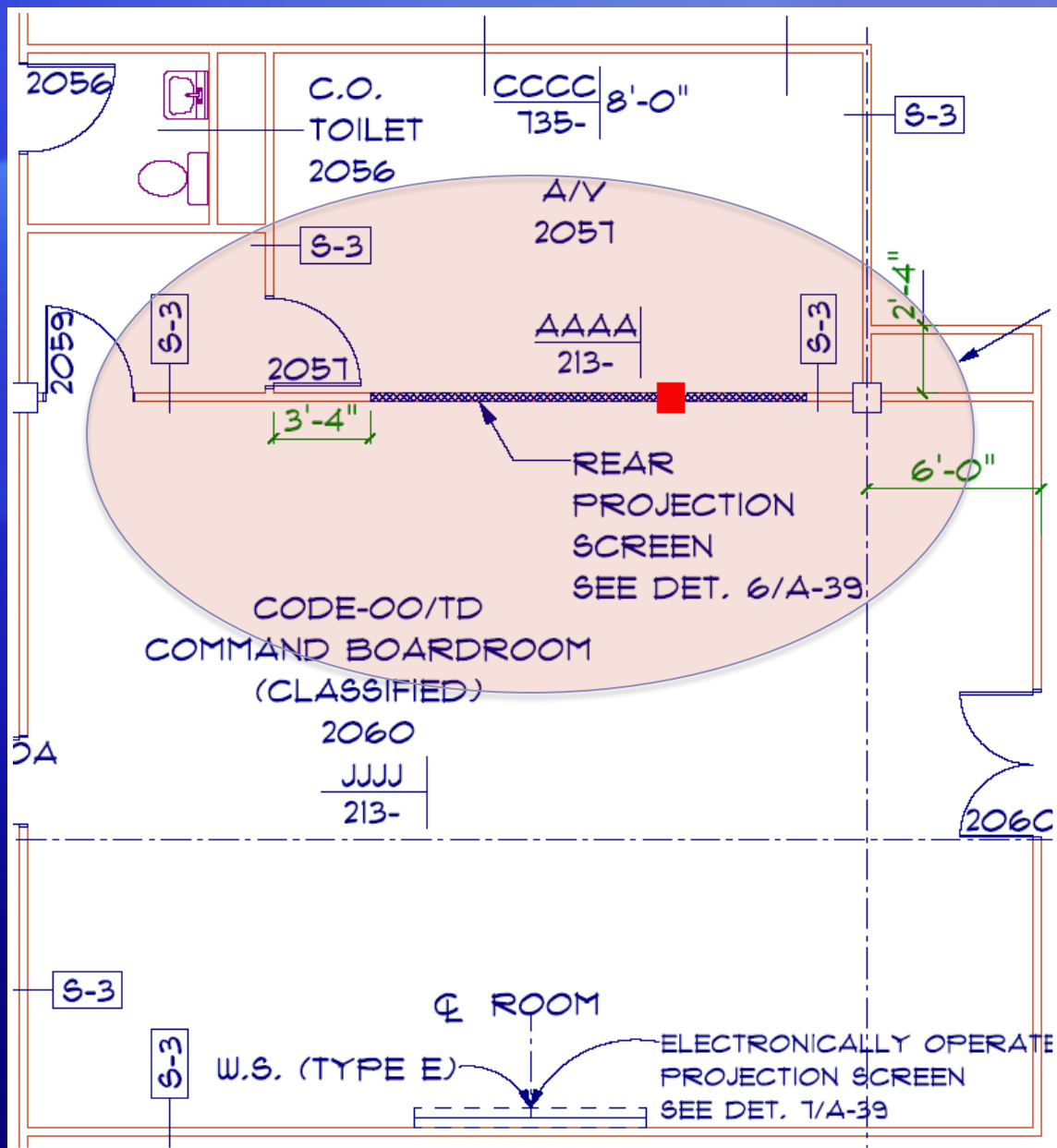
Drawing E1.10A



Drawing SD1.20 – Grading Plan







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Suggestions for an Effective, Structured, Systematic and Disciplined In-House Review Process

- **Establish a Standard Operating Procedure**
- **Have a Checklist**
- **Select the Right Personnel**
- **Link Comments Across Disciplines**
- **Have Useable Deliverables**
- **Allow Adequate Time for your Staff's Review**
- **Consider an Independent Review?**



Select the Right Personnel

- Engineers
- Architects
- Personnel with Construction Experience
- Train them
- Filter out reviewer's desire to redesign it
- Create a Separate Team that has not worked on the project they are reviewing



Don't be interrupted by everything!
Don't start and stop



Develop a Checklist

- **Start with an established list of your items**
- **Keep it focused on items with a high payback potential from your experience**
- **Tailor it to your needs**
- **Keep it simple**
- **Include all disciplines**
- **Identify both Inter- and Intra-Discipline items**



Spot Check a Project

- A Spot Check Will help you Quickly Assess Quality of the Documents
- Use on Completed Documents
- Top items for a **Spot Check** Checklist :



Top Items for a Spot Check

- **Civil**

- Underground utilities match MEP
- Building footprint Matches Architectural
- FFE matches Architectural

- **Structural** –

- Column grid lines, columns locations, perimeter of slab match Architectural
- Slab elevations match Arch Finished Floor Elevations

- **Architectural** –

- Wall ratings and door ratings match Code Plans
- Building elevations match floor plans,
- RCPs match lighting plans and mechanical diffuser layouts.

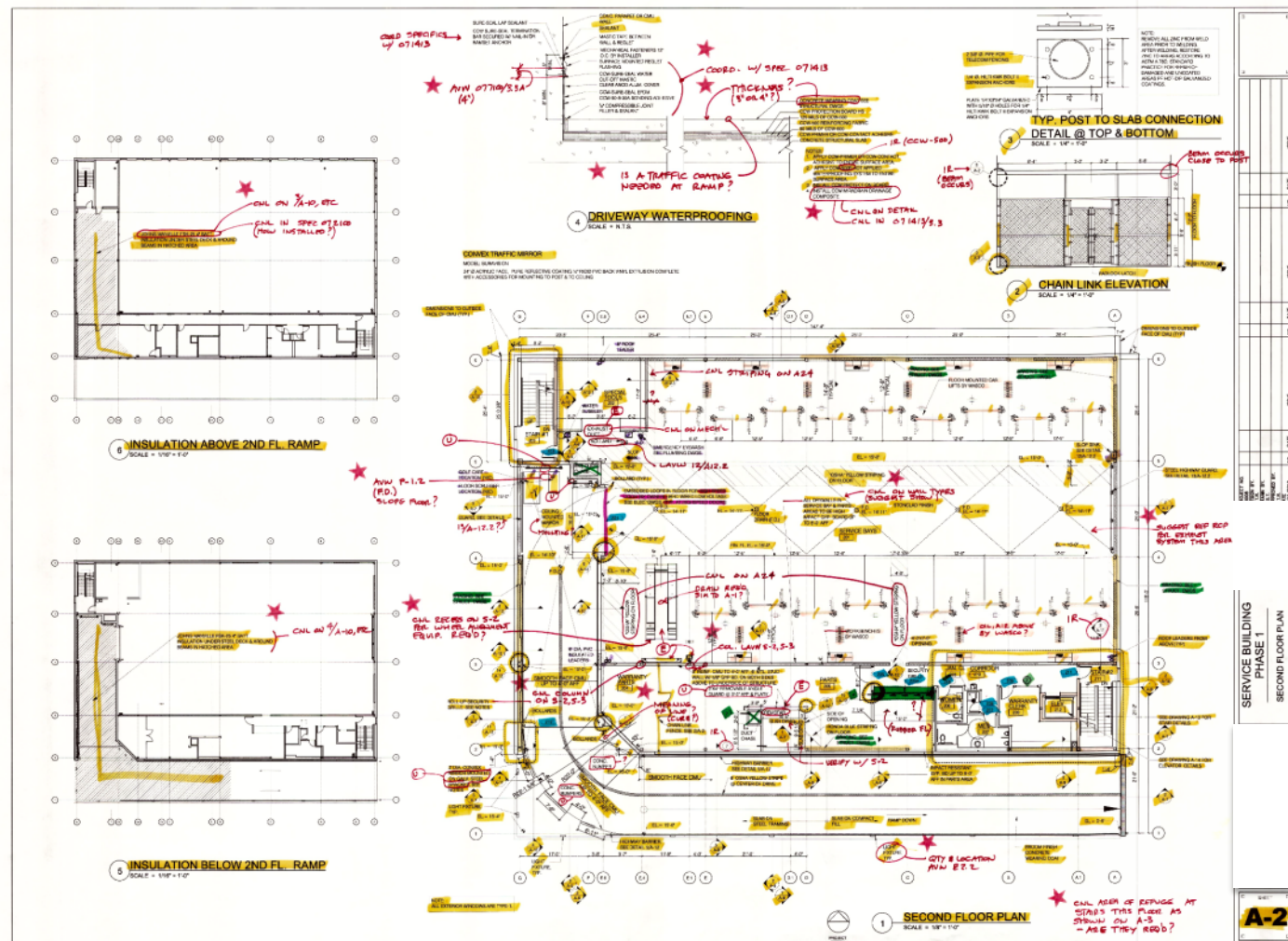


Top Items for a Spot Check

- **Mechanical** –
 - Duct slab openings match Structural
- **Plumbing**–
 - Plumbing fixtures match Architectural drawings, elevations and fixture schedule
 - Electrical connections exist for pumps, EWC, etc.
- **Electrical** –
 - Major equipment Voltage/HP/Phase matches Mechanical
- **Specs** –
 - Alternates and phasing of construction match intent and are consistent



Before You Build It.... Coordinate It!

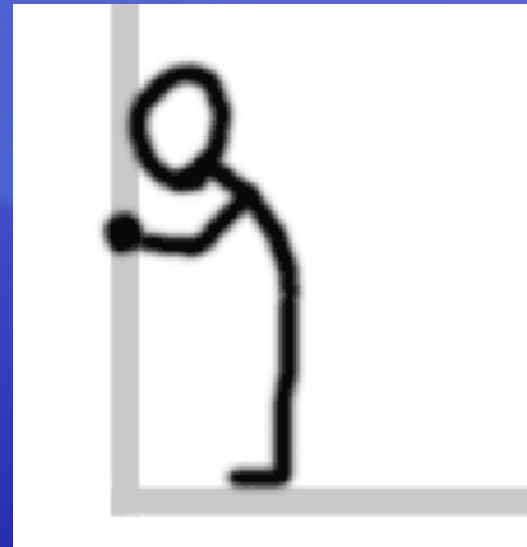


What are the goals of a Construction Document Coordination Review ?

YES:



NO:



I should
have done a
Coordination
Review

Questions?



Before You Build it,

Review It !