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STRUCTURAL ENGINEERING

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# SE APPRENTICE

Lecture Four - Contract Documents

## Contract Documents

- What do we mean by Contract Documents?
  - ▣ The drawings and specifications that we prepare are most of the contract between the owner and construction team for the construction of the building
  - ▣ So, our work includes analyzing and designing the building structure and preparing contract documents that are a legal document for the work that the owner expects from the contractor
  - ▣ Contract documents are mostly made up of drawings and specifications

2

## Purpose of Drawings

- What is the purpose of the Drawings?
  - ▣ They visually show what the contractor is to build
  - ▣ They show the building in the completed state
  - ▣ Means and Methods are the contractor's responsibility (How the building gets built)
  - ▣ They are required by the Building Code
    - The code is specific about the information that it requires

3

## Purpose of Drawings

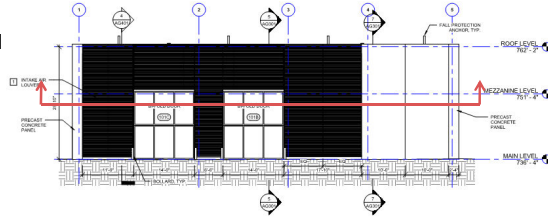
- What is the purpose of the Drawings?
  - ▣ They provide information about the building for future use (material and loading information, vertical expansion capabilities....)
  - ▣ They show design intent. They do not show a level of detail that shows all quantities and actual sizes of pieces of material.

4

## How We Convey Information

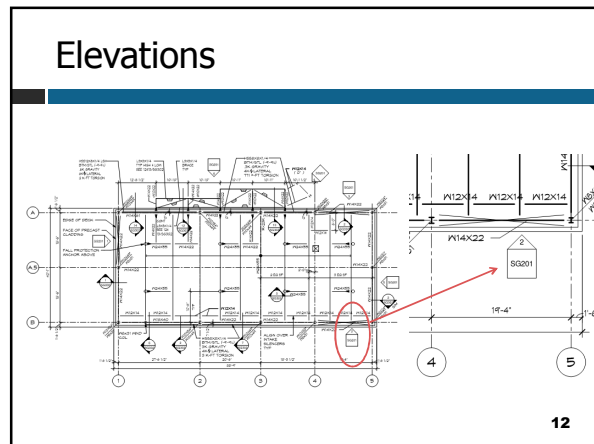
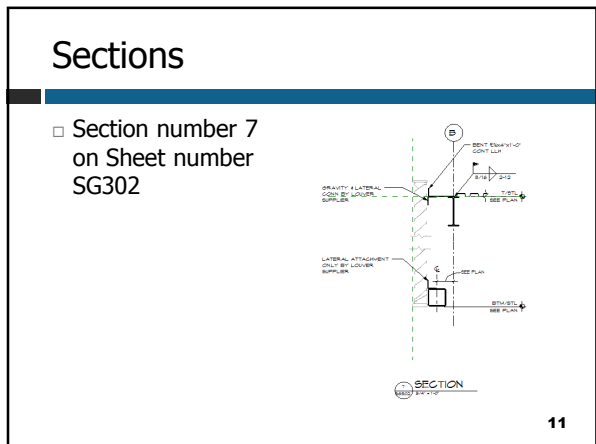
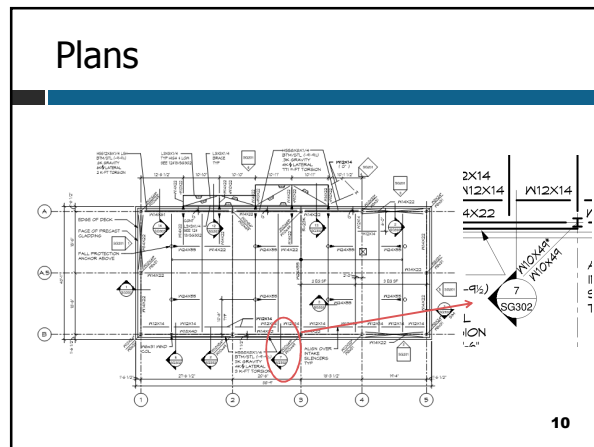
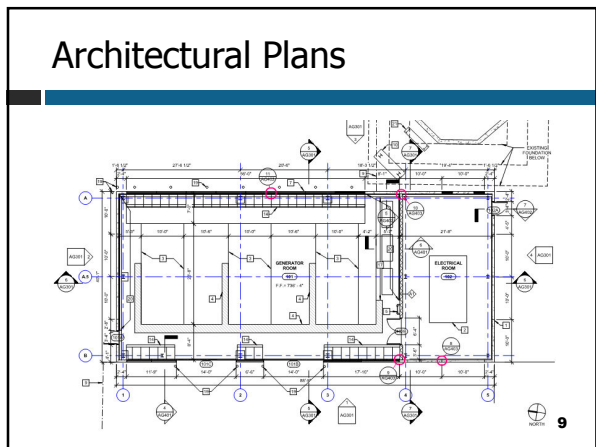
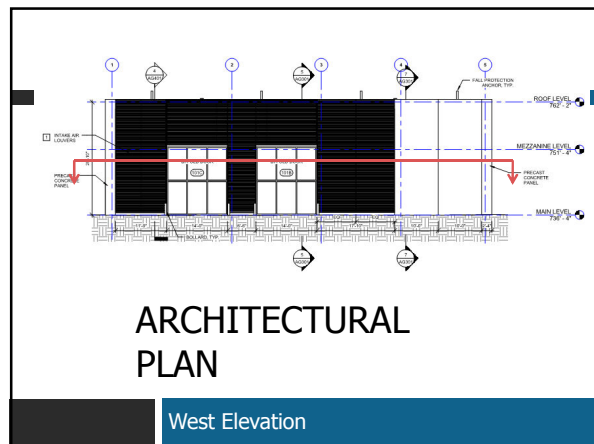
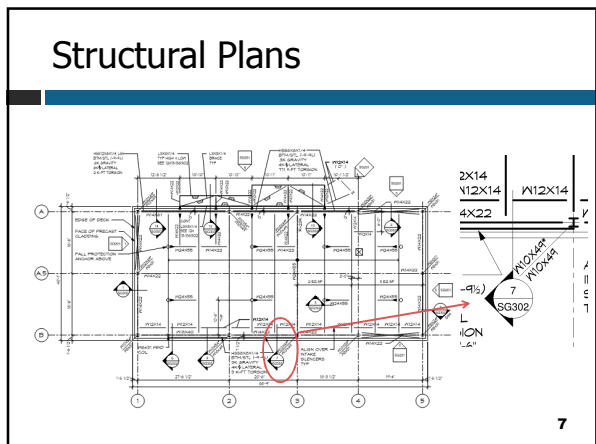
- Drawings or "Plans"
  - ▣ Plans
  - ▣ Sections, Details & Elevations
  - ▣ General Notes
  - ▣ Schedules
- Specifications

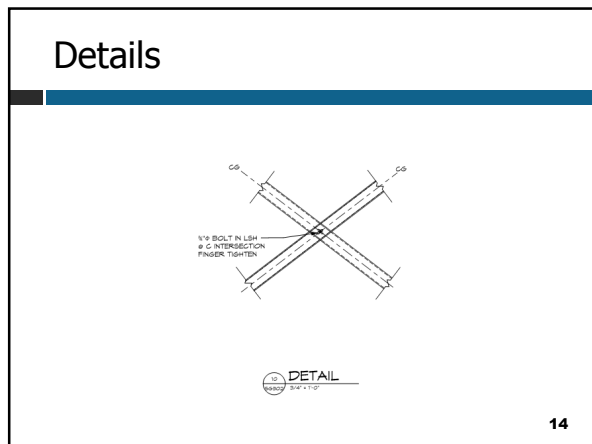
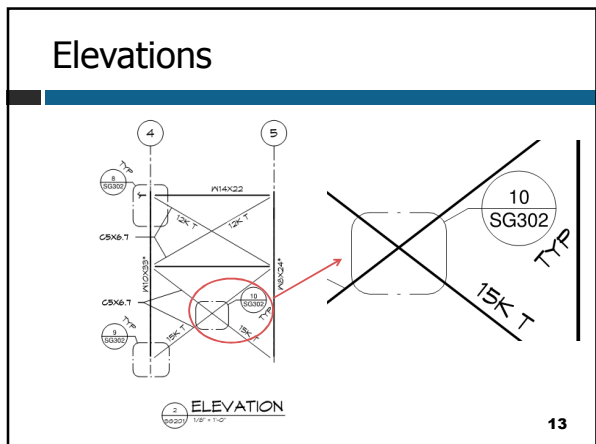
5



**STRUCTURAL PLAN**

West Elevation





### Schedules

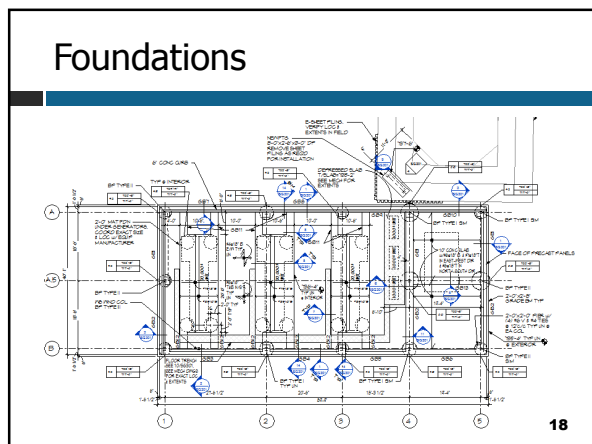
CAISSON SCHEDULE	
DIAMETER	REINFORCING
3'-6"	(7) #8V, #4 TIES @ 18" c/c
4'-0"	(7) #10V, #4 TIES @ 18" c/c
5'-0"	(9) #11V, #4 TIES @ 18" c/c

NOTE:  
 1) CONTRACTOR MAY UTILIZE LARGER DIAMETER CAISSONS FOR SIZES SHOWN. SUBMIT PROPOSED SIZES FOR REVIEW.  
 2) PROVIDE #4 REINFORCING FROM CAISSON TO GRADE BEAM.  
 3) THERE IS NO CLASH PERMITTED BETWEEN SCHEDULES.  
 4) VERTICAL REINFORCING NEED ONLY EXTEND 3 TIMES THE CAISSON DIAMETER OR 10'-0" WHICHEVER IS GREATER INTO THE CAISSON.

- ### Scales
- Architectural Scale
    - Plans
      - 1/8"=1'-0", 3/16"=1'-0", 1/4"=1'-0"
    - Sections & Details
      - 3/4"=1'-0", 3/8"=1'-0", 1/2"=1'-0"
    - Elevations
      - 1/8"=1'-0", 1/4"=1'-0", 1/2"=1'-0", 3/4"=1'-0"
  - Civil Scale
    - 1" = 20'

### What Information We Convey

- What information needs to be included?
- Where does that information belong?



## Foundations

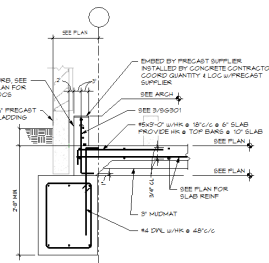
- DESIGN LIVE LOAD: 100 PSF OR EQUIPMENT WEIGHT.
- VERIFY LOCATIONS OF COLUMNS, WALLS, OPENINGS, MEP EQUIPMENT, ETC. WITH ARCHITECTURAL AND MEP DRAWINGS BEFORE PLACING FOUNDATIONS.
- 6" STRUCTURAL SLAB ON 3" MID MAT EXCEPT AS NOTED. SEE MEP FOR LOCATIONS AND QUANTITIES OF BEEVES THROUGH SLAB.
- TOP OF SLAB ELEVATION "36'-4" EXCEPT AS NOTED.
 

A	B
C	D

 AS CAISSON DIAMETER IN INCHES.  
 B: TOP OF CAISSON CUT OFF ELEVATION  
 C: BOTTOM OF CAISSON BEARING ELEVATION. BOTTOM BEARING ELEVATION FOR ESTIMATING PURPOSES ONLY. BOTTOM OF CAISSON TO EXTEND TO SHALE OR CLAY SHALE MATERIAL, MEETING DESIGN BEARING CAPACITY.  
 D: MATERIAL AND CAPACITY SHALL BE FIELD VERIFIED BY AN INDEPENDENT TESTING AGENCY SPECIALIZING IN SOILS INVESTIGATIONS.
- INFORMATION FOR THE EXISTING BUILDING HAS BEEN TAKEN FROM DRAWINGS AND HAS NOT BEEN VERIFIED IN THE FIELD. CONTRACTOR SHALL VERIFY ALL RELEVANT CONDITIONS AND DIMENSIONS OF EXISTING CONSTRUCTION BEFORE PROCEEDING WITH THE WORK.
- ELEVATIONS SHOWN ON PLAN ARE TOP OF THE FOOTING OR SLAB.
- INDICATES TOP OF FOOTING OR GRADE BEAM ON PLAN.
- INDICATES SLEEVE FOR MEP. SEE MEP AND SITE UTILITY DRAWINGS FOR EXACT SIZE, ELEVATION & LOCATION.
- ALL EXTERIOR FOOTINGS AND GRADE BEAMS TO EXTEND MINIMUM OF 2'-0" BELOW FINISHED GRADE.
- DO NOT BACKFILL AGAINST THE FOUNDATION WALLS UNTIL BOTH LEVELS OF THE FLOOR SLABS ARE IN PLACE OR PROVIDE TEMPORARY SUPPORT. WHERE FILL IS ON BOTH SIDES OF A WALL, INSTALL THE FILL UNIFORMLY ON BOTH SIDES OF THE WALL.
- REFERENCE: GENERAL STRUCTURAL NOTES - SG201, GRADE BEAM SCHEDULE - SG101, CAISSON SCHEDULE - SG101.

19

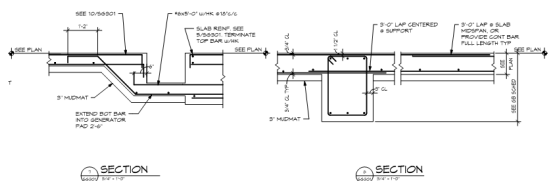
## Foundations



Section 1/SG301

20

## Foundations

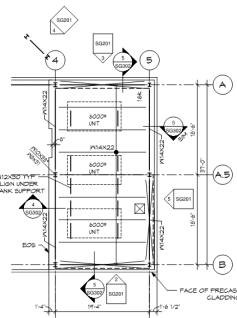


Section 7/SG301

Section 8/SG301

21

## Floor Framing



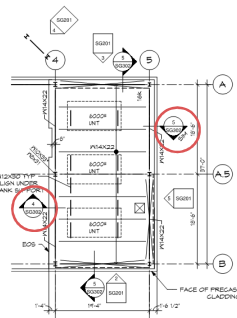
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## Floor Framing

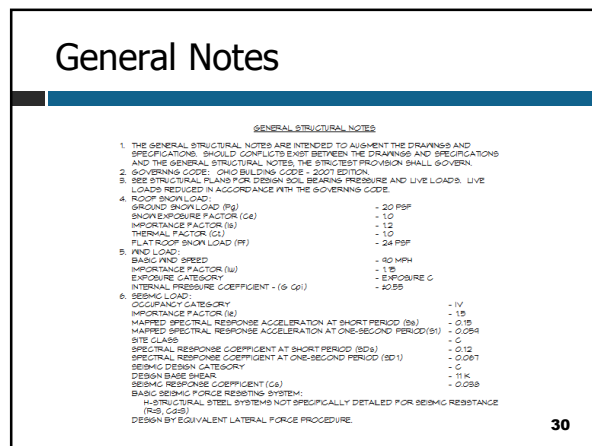
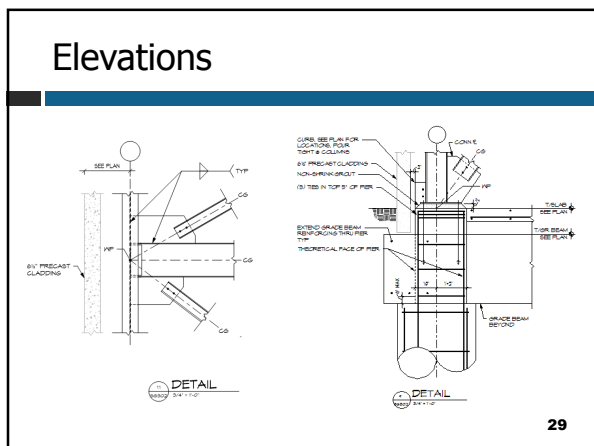
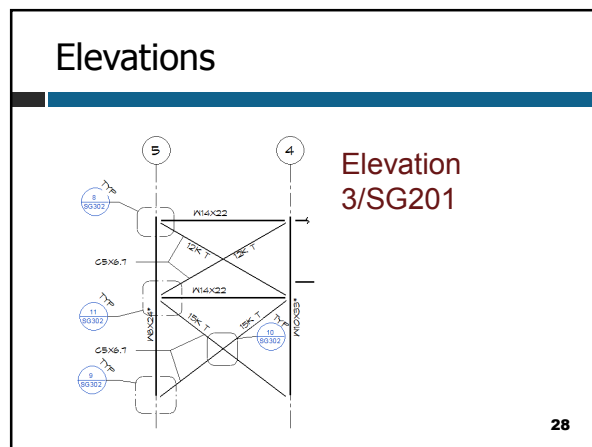
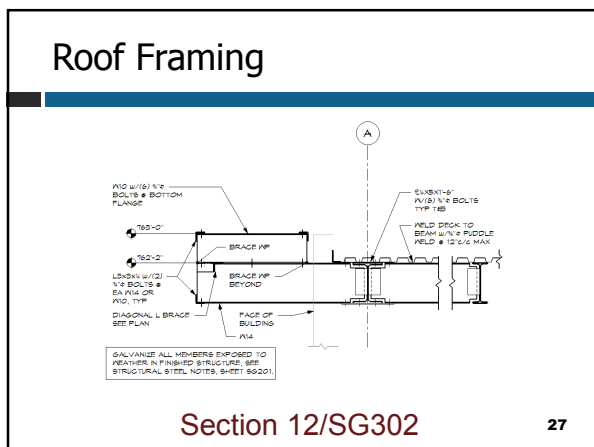
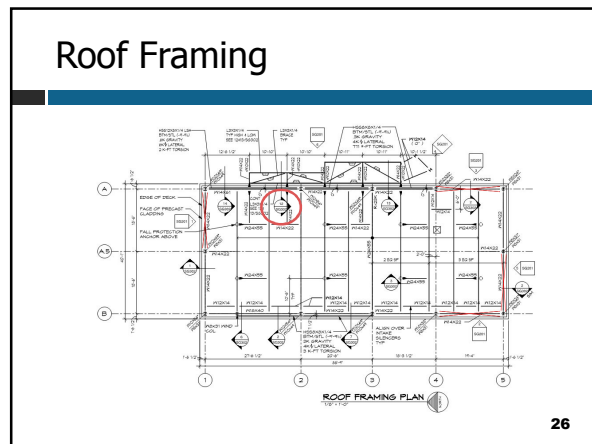
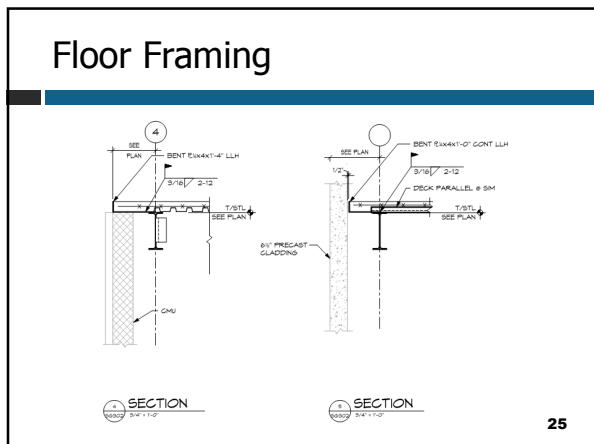
- DESIGN LIVE LOAD: 100 PSF.
- TOP OF STEEL ELEVATION "31'-0" EXCEPT AS NOTED THIS ( ).
- FLOOR CONSTRUCTION: 4" CONCRETE ON 1 1/2"x22 GAGE NON-COMPOSITE METAL DECK W/6X6-W2.5X10.9 WWR.
- 20K  
INDICATES BEAM REACTION IN KIIPS. SAME BOTH ENDS EXCEPT AS SHOWN.
- 20K  
INDICATES CONNECTION FOR A MINIMUM OF 10 KIIPS WHERE NO REACTION IS SHOWN.  
INDICATES BEAM UNFACTORED LATERAL REACTION AND DIRECTION IN KIIPS.
- INDICATES A FRAMED OPENING ON PLAN. PROVIDE FRAME USING L5X5 1/2X1/2 LVL ON ALL SIDES. CONTRACTOR COORDINATE OPENING SIZES WITH MECHANICAL AND ARCHITECTURAL REQUIREMENTS. FRAMES ARE REQUIRED AT ROOF DRAINS. SEE ARCHITECTURAL AND MECHANICAL DRAWINGS FOR NUMBERS AND LOCATIONS.
- INDICATES ALTERNATE COLUMN SIZE FROM FABRICATOR'S INVENTORY LIST. MAY BE USED AT FABRICATOR'S OPTION.
- BEAMS ARE UNIFORMLY SPACED BETWEEN COLUMNS OR INTERSECTING ORDERS UNLESS NOTED OTHERWISE.
- REFERENCES: GENERAL STRUCTURAL NOTES - SG201.

23

## Floor Framing



24



## General Notes

- Typically one "general note section" for each Masterformat Division (type of work)
- Reference Standards governing execution for the specific type of work
- Specifies Materials
- Performance requirements
- Details of construction not shown on plans
- General instructions

31

## Contract Documents

- The Contract Documents describe the proposed construction....
  - The Project Resource Manual: CSI Manual of Practice
    - Contracting requirements
    - Specifications
    - Contract Drawings

32

## "The Front End"

- Conditions of the Contract (General Conditions & Supplementary Conditions)
  - Conditions of the contract define the basic rights, responsibilities and relationships of the parties involved in the performance of the contract.
    - The Project Resource Manual: CSI Manual of Practice

33

## General Conditions

- Generally based on an AIA document – Describe administrative provisions
  - Defines architects & engineer's CA responsibilities
    - Acting as Owner's Representative
    - Site Visits
    - Authorizing contractor payments based on work complete
    - Preparing change orders
    - Reviewing shop drawings

34

## Supplementary Conditions

- Modify General Conditions for specific project conditions
  - Insurance requirements
  - Progress payments
  - Wage rate requirements
  - Equal Employment Opportunity Requirements
  - Liquidated damages
  - Retainage
  - Tax-exempt status of owner

35

## Specifications

- Specifications define the requirements for products, materials, and workmanship upon which the contract is based and requirements for administration and performance of the project.
  - The Project Resource Manual: CSI Manual of Practice

36

## Specifications

- Organized into Divisions under the Masterformat system
  - ▣ Div 1: General Requirements
  - ▣ Div 2: Existing Conditions
  - ▣ Div 3: Concrete
  - ▣ Div 4: Masonry
  - ▣ Div 5: Metals
  - ▣ Div 6: Wood, Plastics & Composites

37

## Specifications

- Each Division is divided into Sections
  - ▣ 03 30 00 Cast-in-Place Concrete
  - ▣ 03 30 01 Cast-in-Place Concrete Site
  - ▣ 03 33 10 Site Architectural Concrete
  - ▣ 03 36 00 Precast Concrete Panels Finishing
  - ▣ 03 41 00 Precast Structural Concrete
  - ▣ 03 45 00 Precast Architectural Concrete

38

## Specifications

- 3 Parts
  - ▣ Part 1 General
    - ▣ Administrative & procedural items specific to that section
  - ▣ Part 2 Products
    - ▣ Describes products, materials, equipment, fabrications, mixes systems and assemblies that are required
  - ▣ Part 3 Execution
    - ▣ Describes installation or application including preparatory actions and post installation cleaning and protection.

39

## Specifications

- Descriptive Specification
  - ▣ A detailed, written description of the required properties of a product, material, or piece of equipment and the workmanship required for its installation
- Performance Specification
  - ▣ Specifies the required results – the contractor chooses the materials and methods used to achieve the required result

40

## Hiring Contractors

- The owner needs to hire a contractor to build the building. How is this done?
  - ▣ They can negotiate the cost with the contractor
    - ▣ Design Assist
  - ▣ They can bid the project to contractors

41

## Bidding Process

- Advertisement for bids
  - ▣ Public Notice or Invitation
- Bidding Period- Usually 2 to 4 weeks
  - ▣ Questions during bidding
  - ▣ Request for Information (RFI)
- Addenda
  - ▣ Revisions to Contract Documents after they are issued for bidding
- Bids are reviewed by the owner
  - ▣ Award of contract/notice of intent

42

## CA Services

- We typically provide services during construction –Contract Administration (CA)
- Services include:
  - ▣ Review of specified submittals
  - ▣ Review of testing reports and initiation of any action that is required
  - ▣ Site visits during construction to determine if the work is generally in accordance with the Contract Documents

43

## CA Services

- We typically provide services during construction
- Services include:
  - ▣ Preparation of Bulletins
  - ▣ Respond to RFIs
  - ▣ Help identify & resolve construction errors

44

## CA Services

- What we are not obligated to do:
  - ▣ Tell the contractor how to build the building. Sequencing, temporary bracing, material quantities, etc are all their responsibility
  - ▣ Inspect all of the construction for compliance with the documents.

45

## CA Services

- Bulletins
  - ▣ After the contract is awarded to the contractor, any revisions to the contract are bulletins
  - ▣ Revised contract documents are issued with the revisions identified
  - ▣ The contractor responds with a revised cost for the work
  - ▣ The owner has to accept the proposed cost. Some negotiation usually takes place

46

## CA Services

- RFIs
  - ▣ Formal process for contractor to ask questions about the intent of the Contract Documents
  - ▣ They are not a replacement for a Bulletin
  - ▣ If the RFI results in the need to revise the Contract Documents, a Bulletin has to be issued

47

## CA Services

- Submittals are usually required to be submitted
  - ▣ They are the process that allows the owner to see what the contractor is planning to use
  - ▣ They help to protect the owner from unnecessary risk
  - ▣ They allow us to see if the contractor interpreted our drawings correctly
  - ▣ They show a level of detail not shown on the contract documents

48



## CA Services

- Some typical submittals that we request
  - ▣ Concrete mix design
    - We want to see evidence that the proposed mix has consistently performed on past projects
  - ▣ Structural steel shop drawings
    - These are used for the fabrication of the steel pieces. They show sizes, actual lengths, size and locations of holes and pieces that will be shop welded

49

## Questions?

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50

## Which University is the answer to this session's challenge question?

- Missouri University of Science & Technology
- University of Arkansas
- University of Texas at El Paso
- Virginia Tech