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Non-Proprietary Slide Presentation

Structural Design of Auxiliary Building Floors (WEC LAR-90)

Purpose and Meeting Agenda

Meeting Purpose

- Provide an overview of WEC LAR-90 – Structural Design of Auxiliary Building Floors
- Receive and address Staff feedback

Agenda

- LAR Overview
- Background Information
- Problem Statement
- Issue Resolution
- Licensing Basis Impact
- LAR Supporting Calculations and Schedule

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LAR Overview

LAR Overview

The LAR Includes the Following Change Activities:

1. Finned Floor Steel Plate Design Variations
2. Application of Design Details to Other Locations
3. Finned Floor Steel Plate Panels
4. Relocate HVAC Penetrations
5. Design of Floor to Wall Connection
6. Design of Concrete on Steel Plate Floors and Floor to Wall Connection
7. Update MCR Ceiling Design Summary
8. Fire Protection Reinforcement
9. Precast Panel Width and Stirrups

Licensing Impact

- Tier 2 - Subsection 3.8.4.1.2 & 3.8.4.4.1
- Tier 2* - Subsection 3H.5.3.1, 3H.5.4, Table 3H.5-13, Figure 3H.5-8, & Figure 3H.5-9 Sheet 1-3

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Discussion of each Change Activity is provided on the following slides

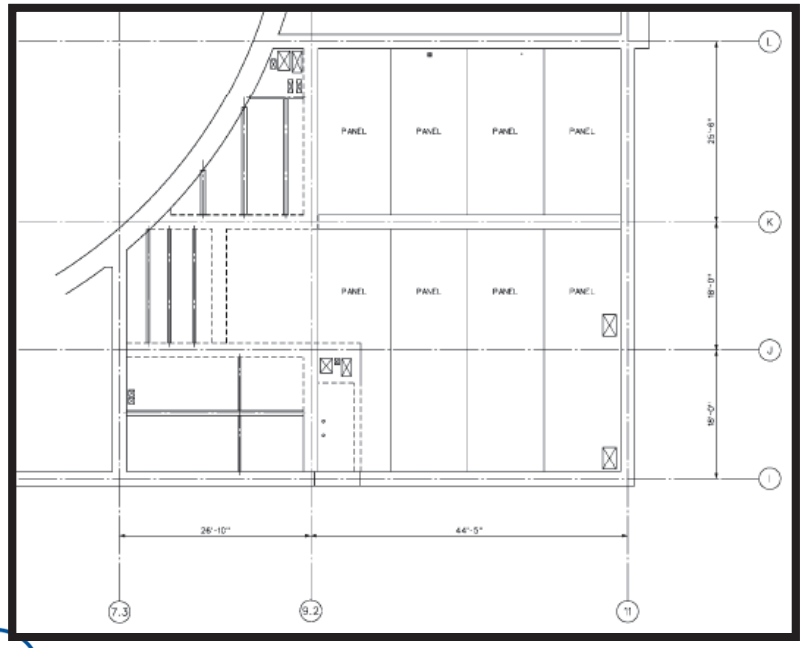
Background Information

Background

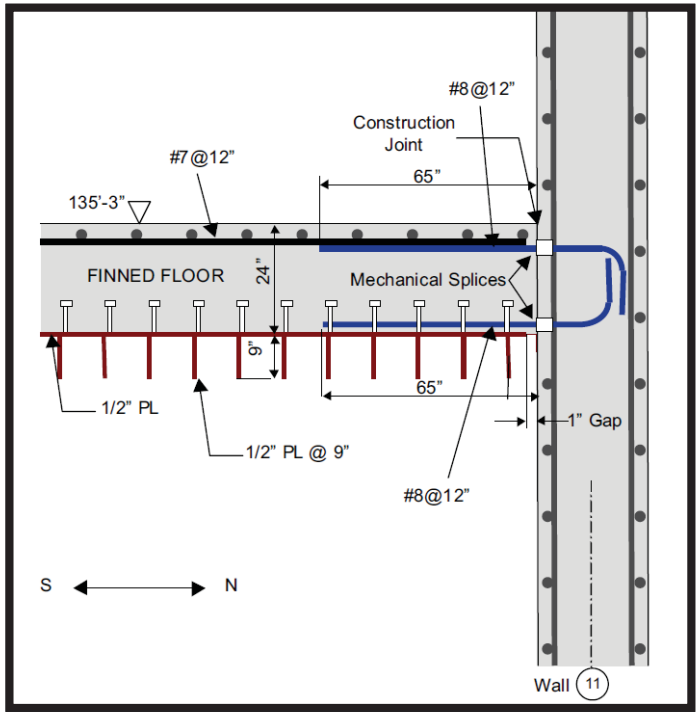
- The ceiling of the Main Control Room (floor at elevation 135′-3″), and the instrumentation and control rooms (floor at elevation 117′-6″) are designed as finned floors.

- Finned floors are constructed with cast-in-place concrete over a steel plate ceiling stiffened with fins welded to the plate.

Existing Figure 3H.5-9, Sheet 1



Existing Figure 3H.5-9, Sheet 2



Background

- A finned floor consists of a 24-inch-thick concrete slab poured over a stiffened steel plate ceiling.
- The fins, welded to stiffen the steel plate, are half inch by 9 inch rectangular sections perpendicular to the plate.
- The fins are exposed to the environment of the room and enhance the heat absorbing capacity of the ceiling.
- Designed as reinforced concrete slabs in accordance with ACI Standard 349.
- The finned floor structures are evaluated for the load combinations listed in Tables 3.8.4-1 and 3.8.4-2.
- The Main Control Room ceiling finned floor (critical section) design summary is shown in Table 3.H.5-13.
- For positive bending, the steel plate is in tension. The steel plate with fin stiffeners serves the function of bottom rebar.
- For negative bending, the potential for buckling due to compression in this element is checked by using the criteria of AISC N690.

Change Activity 1

Change Activity No. 1
Finned Floor Steel Plate Design Variations

Issue Description

- UFSAR Figure 3H.5-9 shows a critical section and is identified as "**typical**" of the finned floor design.
- Figure is based on the detail design of the floor above the MCR
- The design details of the floor above the instrumentation and control rooms vary from that shown
- Changes are proposed to explain the variances

Proposed Change

- Specify that the design details at locations other than above the Main Control Room and near penetrations and other interferences may vary from that shown in UFSAR Figure 3H.5-9.
  - Design remains in conformance with the design and analysis requirements found in ACI 349 and AISC N690
- Revise the critical section figure, UFSAR Figure 3H.5-9, to add notes about variations in the finned floor design and code requirements involved in the variations.
- The information added does not change the compliance of the finned floor design with codes and standards, including ACI 349 and AISC N690.
- The variations in the structural design details have no impact on passive heat sink function of the fins.

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Change Activity No. 1
Finned Floor Steel Plate Design Variations

Licensing Basis Impact

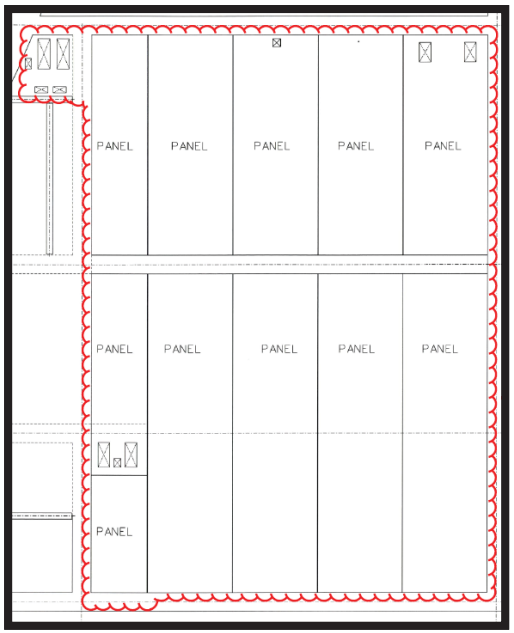
- Revise first paragraph of UFSAR Subsection 3H.5.4 to identify variations in design in other sections and variations in the area of openings and interferences.

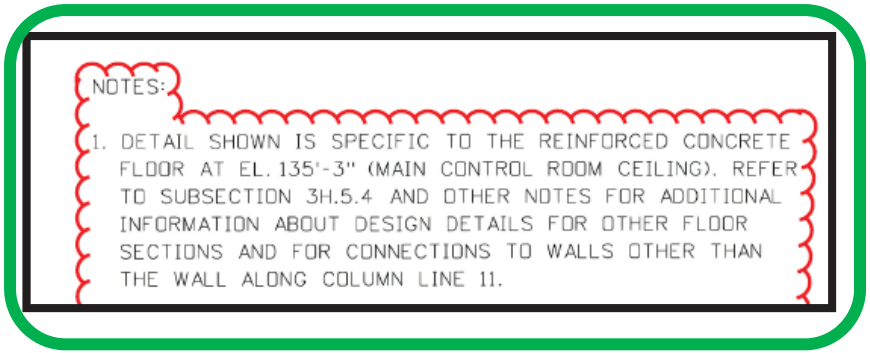
[The ceilings of the main control room and the instrumentation and control rooms in the auxiliary building are designed as finned-floor modules. A typical floor design is shown in Figure 3H.5-9. A finned floor consists of a 24-inch-thick concrete slab poured over a stiffened steel plate ceiling. The fins, welded to stiffen the steel plate, are half inch by 9 inch rectangular sections perpendicular to the plate. Shear studs are welded on the other side of the steel plate, and the steel and concrete act as a composite section. Figure 3H.5-9 shows the finned floor above the main control room and the connection of the floor to the wall on column line 11. The finned floors above the instrumentation and control rooms are similar, but differ with some design details, such as the size and spacing of reinforcement and the design elements used in the connection of the floor to the wall. Penetrations and other interferences may cause localized variances with the design details shown in the figure. The fins are exposed to the environment of the room and enhance the heat-absorbing capacity of the ceiling. Several shop-fabricated steel panels, cut to room width and placed side by side perpendicular to the room length, are used to construct the stiffened plate ceiling in a modularized fashion. The stiffened plate with fins is designed to withstand construction loads prior to concrete hardening.

Change Activity No. 1
Finned Floor Steel Plate Design Variations

Licensing Basis Impact

- Change to UFSAR Figure 3H.5-9, Sheet 1 to add notes to the figure:
  - State that the section shown is a specific location and other locations will have variations in design details.





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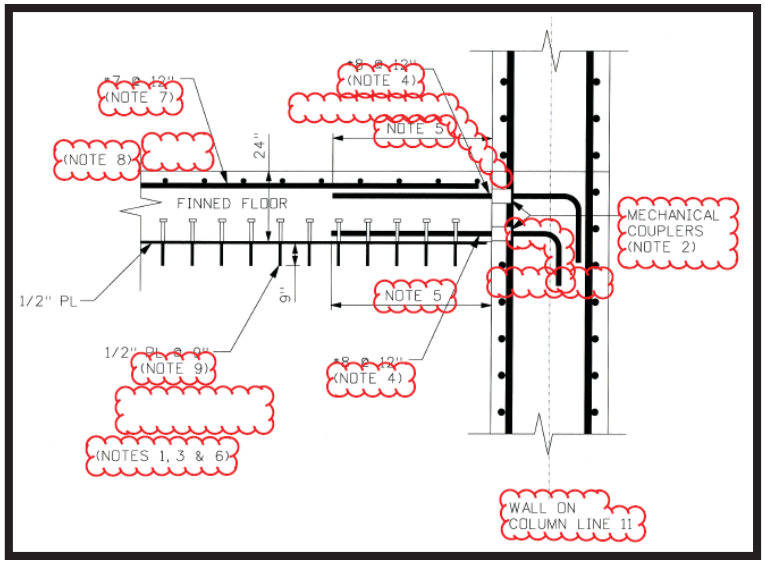
Change Activity No. 1
Finned Floor Steel Plate Design Variations

Licensing Basis Impact

- Change to UFSAR Figure 3H.5-9, Sheet 2 to add notes to the figure:
  - State that the section shown is a specific location and other locations will have variations in design details.
  - State that headed reinforcement may be used.
  - Identify the requirements for development of headed reinforcement.
  - Identify the code requirements for reinforcement bar size and spacing



1. DETAIL SHOWN IS SPECIFIC TO THE REINFORCED CONCRETE FLOOR AT EL 135'-3" (MAIN CONTROL ROOM CEILING). REFER TO SUBSECTION 3H.5.4 AND OTHER NOTES FOR ADDITIONAL INFORMATION ABOUT DESIGN DETAILS FOR OTHER FLOOR SECTIONS AND FOR CONNECTIONS TO WALLS OTHER THAN THE WALL ALONG COLUMN LINE 11.

2. THE DEVELOPMENT OF THE FLOOR REINFORCEMENT IN THE WALLS CAN BE HEADED REINFORCEMENT INSTEAD OF STANDARD HOOKS.

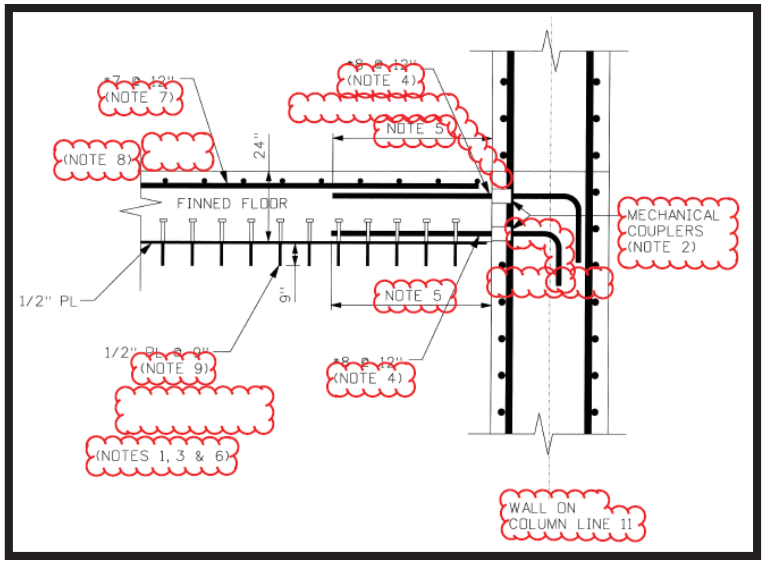
3. REFER TO SUBSECTION 3.8.4.4.1 FOR THE REQUIREMENTS FOR DEVELOPMENT OF HEADED REINFORCEMENT.

4. REINFORCEMENT SIZE AND SPACING FOR CONNECTING DOWELS ARE BASED ON THE REQUIREMENTS IN ACI 349 AND ACI 318-11, SECTION 12.6. THE RANGE OF REINFORCEMENT SIZE AND SPACING FOR THE CONNECTING DOWELS VARIES FROM #8@12" TO #11@12". FOR THE SECTIONS ON ELEVATION 117'-6" SOME CONNECTING DOWELS RUN INTO ADJACENT REINFORCED CONCRETE FLOORS INSTEAD OF CONNECTING TO HOOKS OR HEADED REINFORCEMENT IN THE WALL. WHERE FINNED FLOORS ARE ADJACENT TO THE REINFORCED CONCRETE PORTION OF THE SHIELD BUILDING WALL THE FLOOR REINFORCEMENT CONTINUES INTO THE WALL INSTEAD OF USING SEPARATE CONNECTING DOWELS.

Change Activity No. 1
Finned Floor Steel Plate Design Variations

Licensing Basis Impact

- Change to UFSAR Figure 3H.5-9, Sheet 2 to add notes to the figure:
  - State that the reinforcement shown is for locations away from obstructions.
  - State that the design of the fins varies at locations near obstructions and due to attachments to the fins and floor plates.



7. THE REINFORCEMENT SHOWN IS FOR LOCATIONS AWAY FROM OPENINGS, PENETRATIONS, EMBEDMENTS, AND OTHER OBSTRUCTIONS. THE RANGE OF REINFORCEMENT SIZE AND SPACING VARIES FROM #7@12" TO #11@6".

9. THE DESIGN OF THE FINS VARIES AT LOCATIONS NEAR OPENINGS, PENETRATIONS, AND OTHER OBSTRUCTIONS AND DUE TO ATTACHMENTS TO THE FINS AND FLOOR PLATES.

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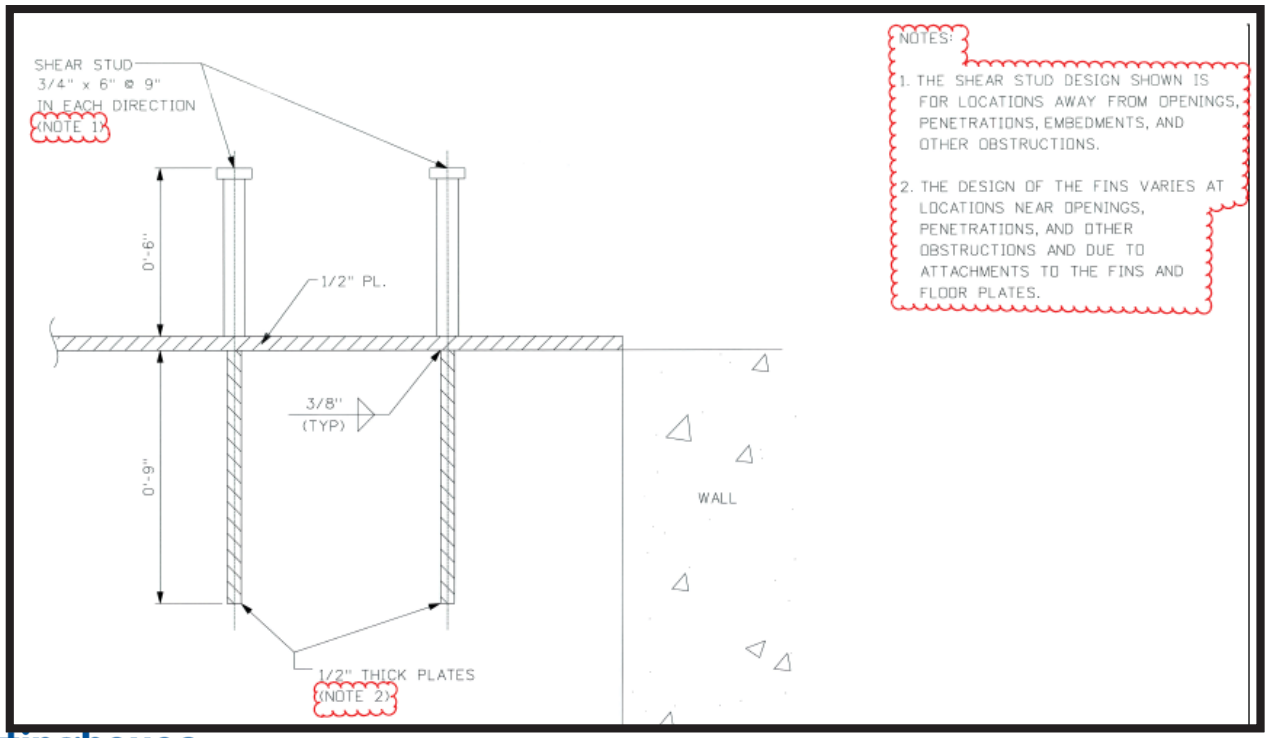
Change Activity No. 1
Finned Floor Steel Plate Design Variations

Licensing Basis Impact

- Change to UFSAR Figure 3H.5-9, Sheet 3 to add notes to the figure:
  - State that the shear stud design shown is for locations away obstructions.
  - State that the design of the fins varies at locations near obstructions and due to attachments to the fins and floor plates



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Change Activity 2

Change Activity No. 2
Application of Design Details to Other Locations

Issue Description

- The text in UFSAR Subsection 3.8.4.1.2 describes the finned floors in the Auxiliary Building and could be interpreted to indicate that UFSAR Figure 3H.5-9 is also typical of the details for the ceiling of the instrumentation and control rooms (floor at Elevation 117′-6″).
- The design of the finned floor at El. 117'-6" does not exactly match the design details shown in the figure.
- Changes to the text in UFSAR are needed to acknowledge the variances.

Proposed Change

- Revise the text in UFSAR Subsection 3.8.4.1.2 to allow variation in design details for locations other than the floor above the Main Control Room.
- Revise UFSAR Figure 3H.5-9 Sheet 2 to remove elevation designation.
- The Auxiliary Building floors designed as finned floors continue to maintain compliance with codes and standards, including ACI 349 and AISC N690.

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Change Activity No. 2
Application of Design Details to Other Locations

Licensing Basis Impact

- Revise the seventh paragraph of UFSAR Subsection 3.8.4.1.2 to identify variations in design in other sections:

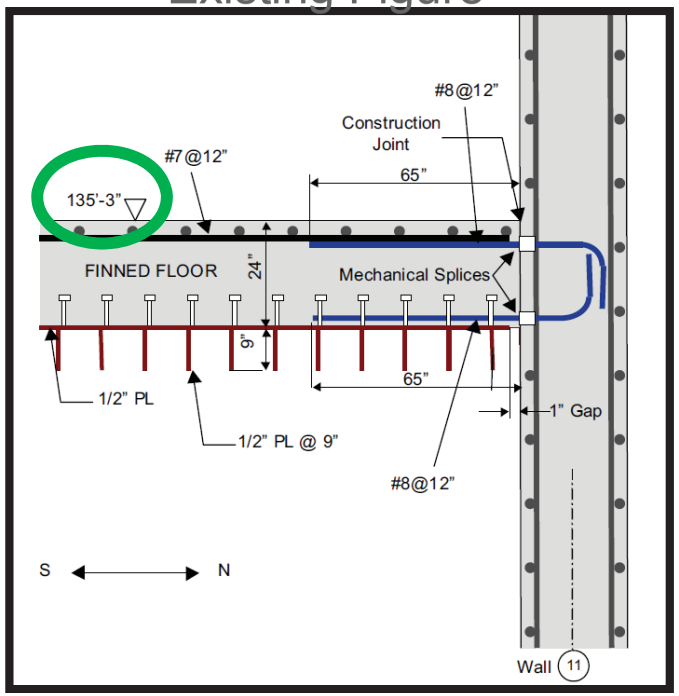
> The ceiling of the main control room (floor at elevation 135'-3"), and the instrumentation and control rooms (floor at elevation 117'-6") are designed as finned floor modules (Figure 3H.5-9). A finned floor consists of a 24-inch-thick concrete slab poured over a stiffened steel plate ceiling. The fins are rectangular plates welded perpendicular to the plate. Shear studs are welded on the other side of the steel plate, and the steel and concrete act as a composite section. Figure 3H.5-9 shows the finned floor above the main control room and the connection of the floor to the wall on column line 11. The finned floors above the instrumentation and control rooms are similar, but differ with some design details, such as the size and spacing of reinforcement and the design elements used in the connection of the floor to the wall. Penetrations and other interferences in the floors and adjacent walls may cause localized variances with the design details shown in the figure. The fins are exposed to the environment of the room, and enhance the heat-absorbing capacity of the ceiling (see Design Control Document (DCD) subsection 6.4.2.2). Several shop-fabricated steel panels, placed side by side, are used to construct the stiffened plate ceiling in a modularized fashion.

Change Activity No. 2
Application of Design Details to Other Locations

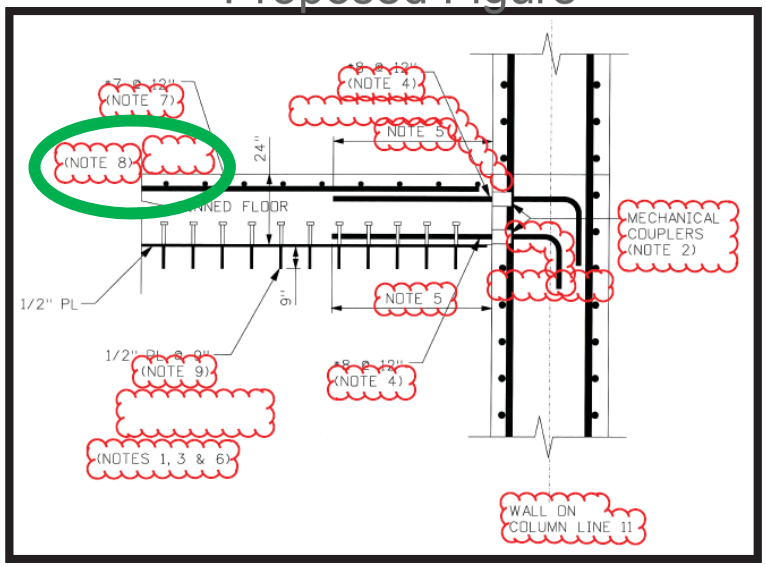
Licensing Basis Impact

- Figure 3H.5-9, Sheet 2 - Remove designation of 135′-3″ elevation; replace with Note 8

Existing Figure



Proposed Figure



8. THE ELEVATION OF THE TOP OF CONCRETE IS BASED ON LOCATION AND DESIGN REQUIREMENTS FOR THE FLOORS.

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Change Activity 3

Change Activity No. 3
Finned Floor Steel Plate Panels

Issue Description

- UFSAR Figure 3H.5-9 (Sheet 1 of 3) shows four finned floor steel plates (panels) between Column Lines 9.2 and 11 from Column Lines I to L.
- It is proposed that the number of plates between Column Lines 9.2 and 11 be increased to facilitate fabrication and construction.

Proposed Change

- Add information to UFSAR Subsection 3.8.4.1.2 to note that the number of panels may vary.
- Revise UFSAR Figure 3H.5-9, Sheet 1 to increase the number of panels to five and add a note that the number of the panels will vary at other locations.
- The change and variation in number and width of panels does not change the compliance of the finned floors design with codes and standards, including ACI 349 and AISC N690.
- The variations in the number and size of the panels have no impact on passive heat sink function of the fins.

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Change Activity No. 3
Finned Floor Steel Plate Panels

Licensing Basis Impact

- Revise the seventh paragraph of UFSAR Subsection 3.8.4.1.2 to identify variations in the number and size of the steel plates

> Several shop-fabricated steel panels, placed side by side, are used to construct the stiffened plate ceiling in a modularized fashion. The number of panels used is determined by the size of the room and fabricator capabilities. The stiffened plate is designed to withstand construction loads prior to concrete hardening.

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Change Activity No. 3
Finned Floor Steel Plate Panels

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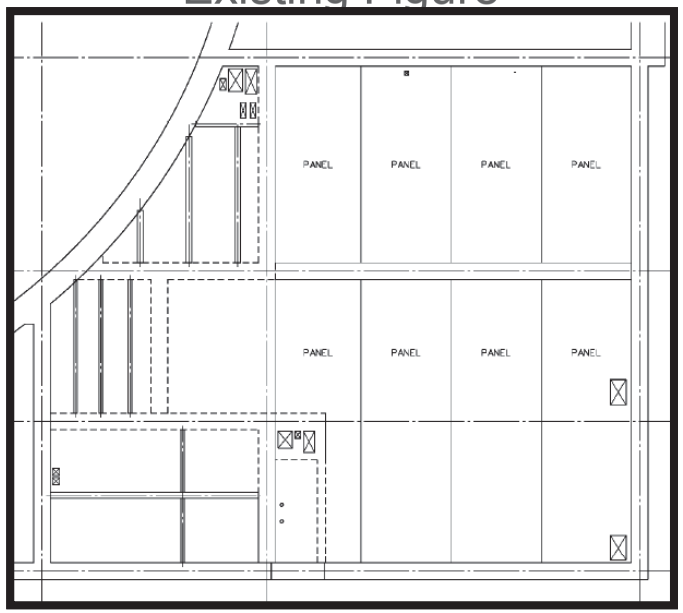
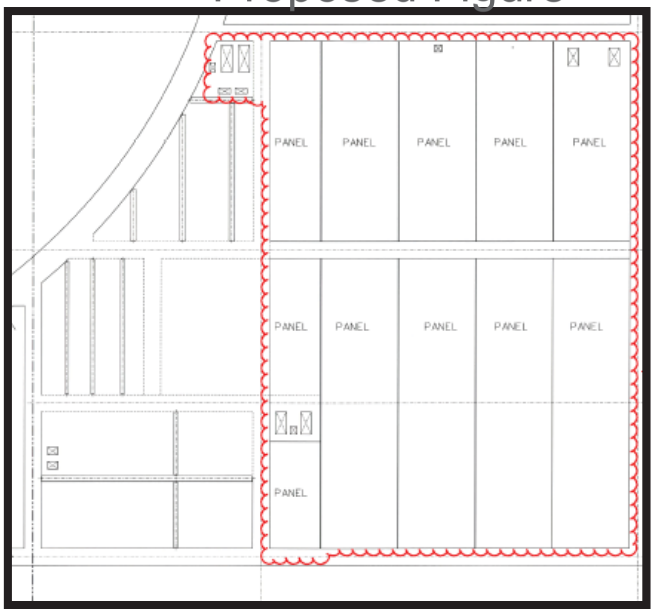
- Revise Figure 3H.5-9, Sheet 1 to show five finned floor steel plates between Column Lines 9.2 and 11 from Column Lines I to L.

Existing Figure



Proposed Figure



2. THE NUMBER OF STEEL PANELS USED TO CONSTRUCT THE FLOOR IS DETERMINED BY THE SIZE OF THE ROOM AND FABRICATOR CAPABILITIES.

Change Activity 4

Change Activity No. 4
Relocate HVAC Penetrations

Issue Description

- Openings for HVAC ducts in the ceiling of the Main Control Room are shown in the finned floor critical section figure UFSAR Figure 3H.5-9 Sheet 1.
- A proposed change relocates these openings on the figure because of rerouting of the HVAC ducts.
- The openings are moved out of the floor above the Main Control Room to the floor above another room within the control room envelope.
- In addition openings shown on the left side of the figure adjacent to Column Line 9.2 are reconfigured because of final design changes in routing.

Proposed Change

- Revise UFSAR Figure 3H.5-9, Sheet 1 to show the openings for HVAC ducts in the relocated position.
- The relocated penetrations and the reconfigured openings adjacent to column line 9.2 have no adverse impact on the finned floor design and evaluation.
- The structural evaluation of the floor includes the relocated and reconfigured openings and is in compliance with ACI 349 and AISC N690.

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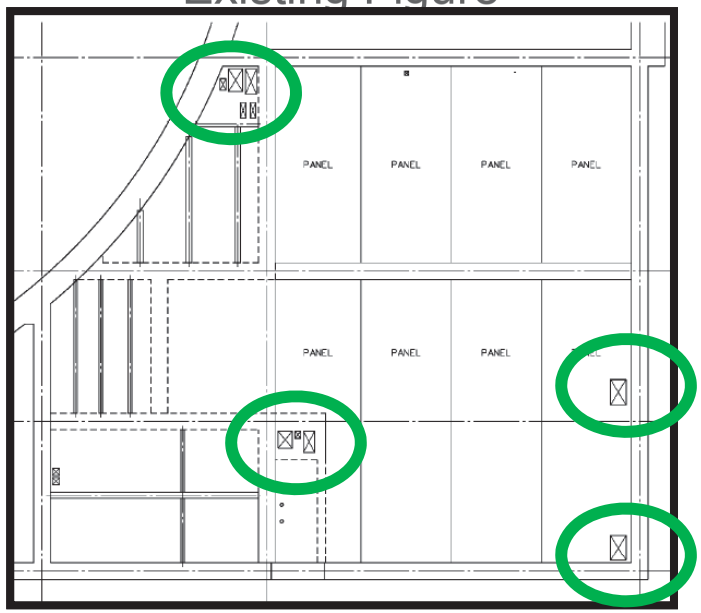
Change Activity No. 4
Relocate HVAC Penetrations

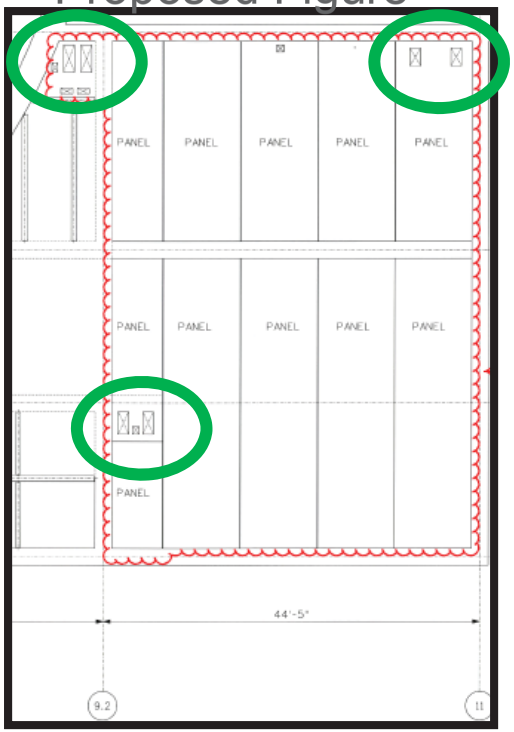
Licensing Basis Impact

- Revise Figure 3H.5-9, Sheet 1 to move the rectangular openings for HVAC ducts from along Column Line 11 near Column Lines I and J to along Column Line L near Column Line 11

Existing Figure



Proposed Figure



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Change Activity 5

Change Activity No. 5
Design of Floor to Wall Connection

Issue Description

- Proposed design changes are identified to the detail reinforcement design of the finned floor to wall connection shown in UFSAR Figure 3H.5-9 Sheet 2 to be consistent with common AP1000 construction practice.

Proposed Change

- Revise UFSAR Figure 3H.5-9 Sheet 2 to show the proposed detail reinforcement design of standard hooks both turning down in the wall.
- Remove the designation of the construction joint shown between the floor and wall and the gap between the steel plate and the wall because these elements may vary based on fabrication considerations and construction sequence.
- The North – South designator is removed as it is not needed.
- The designation of Wall 11 is changed to “Wall on Column Line 11” instead of using the drafting convention currently shown because the current designation may be confusing.
- The term “mechanical splice” is change to “mechanical coupler”

Additionally, the following slides provide a detailed discussion of changes to the floor to wall connection

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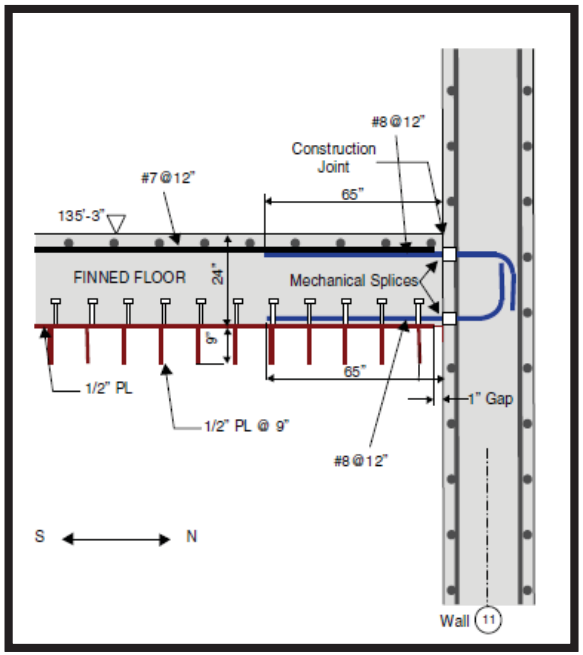
Background

- The Auxiliary Building finned floor in the main control room at elevation 135′-3″ is identified as a critical section and described in UFSAR Section 3H.5.4
- A typical floor design is depicted in UFSAR Figure 3H.5-9
- The connection of the module floor to wall consists of reinforcing bars developed in the module floor and anchored in the wall
- The upper reinforcing bars in the connection region are lap spliced with the top layer of reinforcing bars in the module floor
- The lower reinforcing bars at the connection are arranged within the matrix of shear studs connecting the module floor bottom plate to the surrounding reinforced concrete walls



Auxiliary Building Finned Floor
Figure 3H.5-9 (Sheet 2 of 3)

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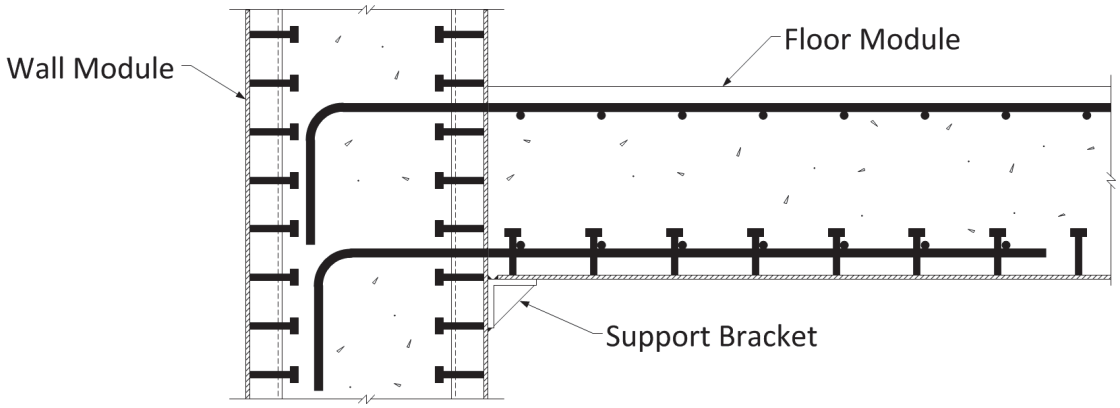
Background

- The module floor steel plate serves the function of bottom reinforcement as described in UFSAR Section 3H.5.4
- Forces that develop in the module floor bottom plate from design loads are transferred to the lower reinforcing bars in the connection region by means of the studs attached to the bottom plate
  - In a manner similar to that which occurs in a conventional bar-to-bar non-contact lap splice
- Other Auxiliary Building module floor to wall connections (e.g. CA20 floors) follow the same methodology as described for the finned floor critical section
- The CA20 floors also utilize seat angles under the module floor bottom plate at the connection to the wall
- The seat angles are designed for construction and service loading conditions
  - Construction load during concrete placement
  - In-plane and out-of-plane shear demand
  - Tension demand due to membrane and flexural loading



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Technical Description

a,c

Technical Description

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Technical Description

a,c

Code Evaluation

a,c

Code Evaluation

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Code Evaluation

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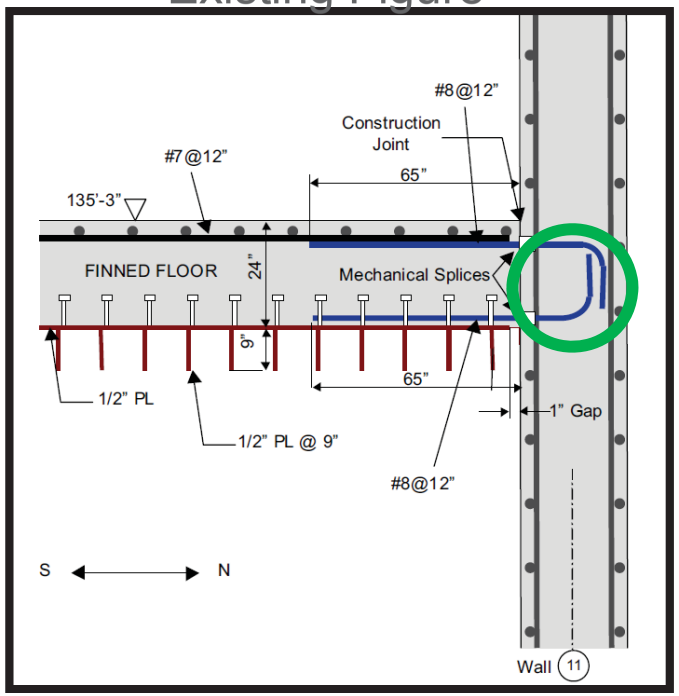
Change Activity No. 5
Design of Floor to Wall Connection

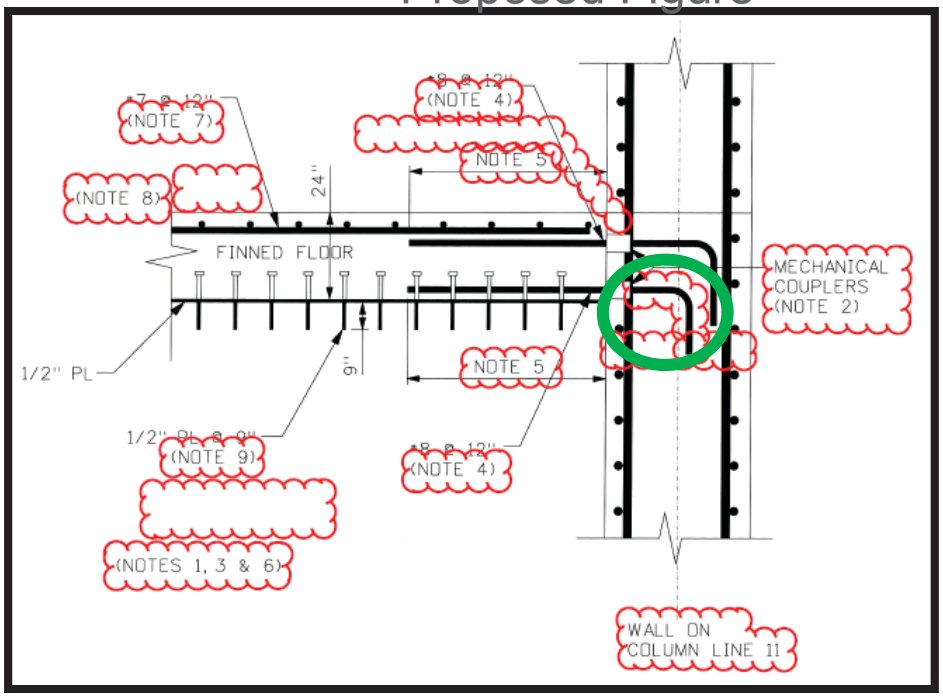
Licensing Basis Impact

- Figure 3H.5-9, Sheet 2
  - Revise figure to show both hooks in wall turned down

Existing Figure



Proposed Figure



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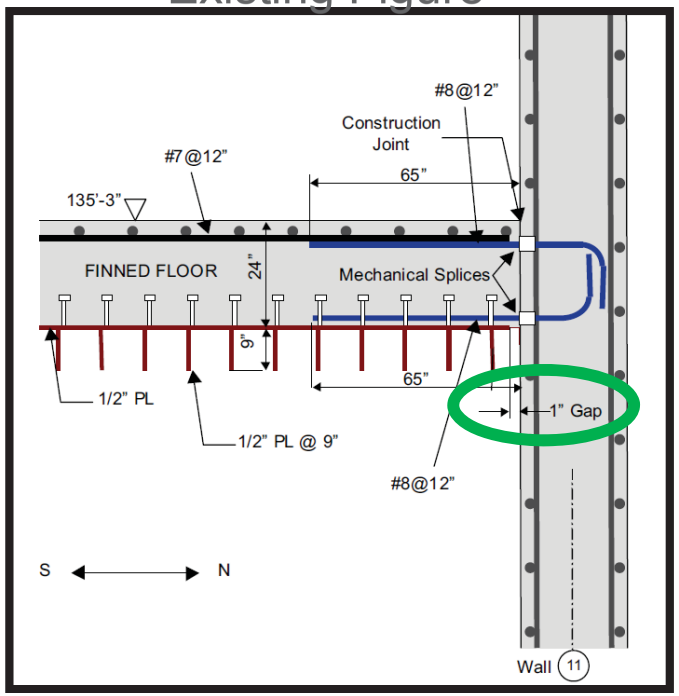
Change Activity No. 5
Design of Floor to Wall Connection

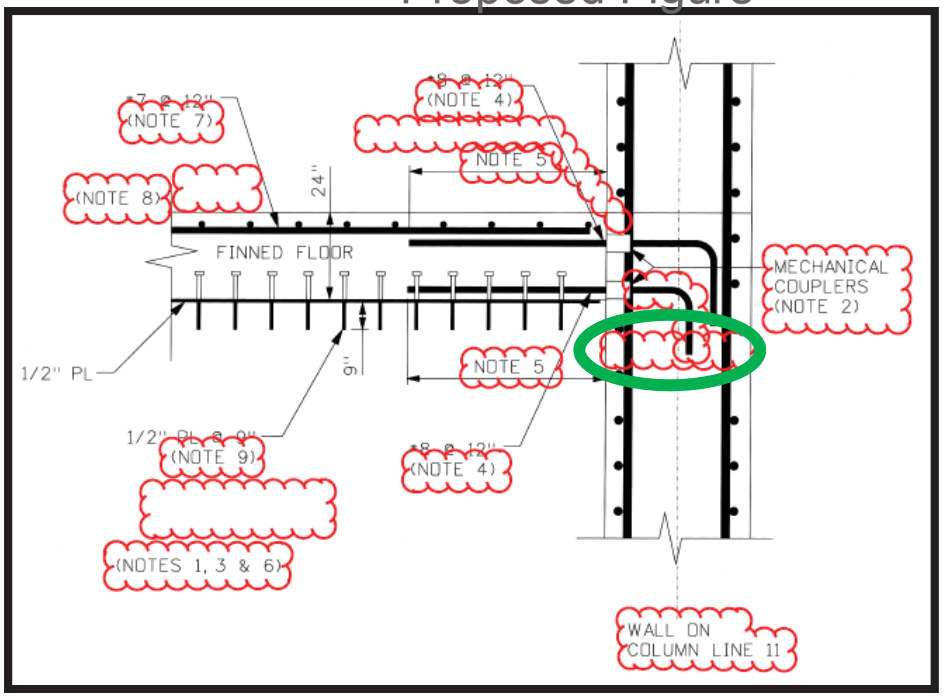
Licensing Basis Impact

- Figure 3H.5-9, Sheet 2
  - Remove information on gap between steel plate and wall

Existing Figure



Proposed Figure



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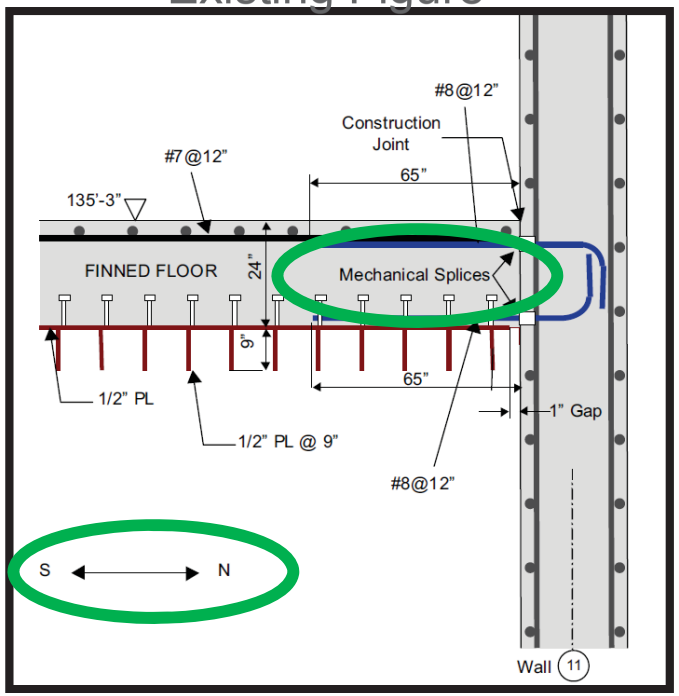
Change Activity No. 5
Design of Floor to Wall Connection

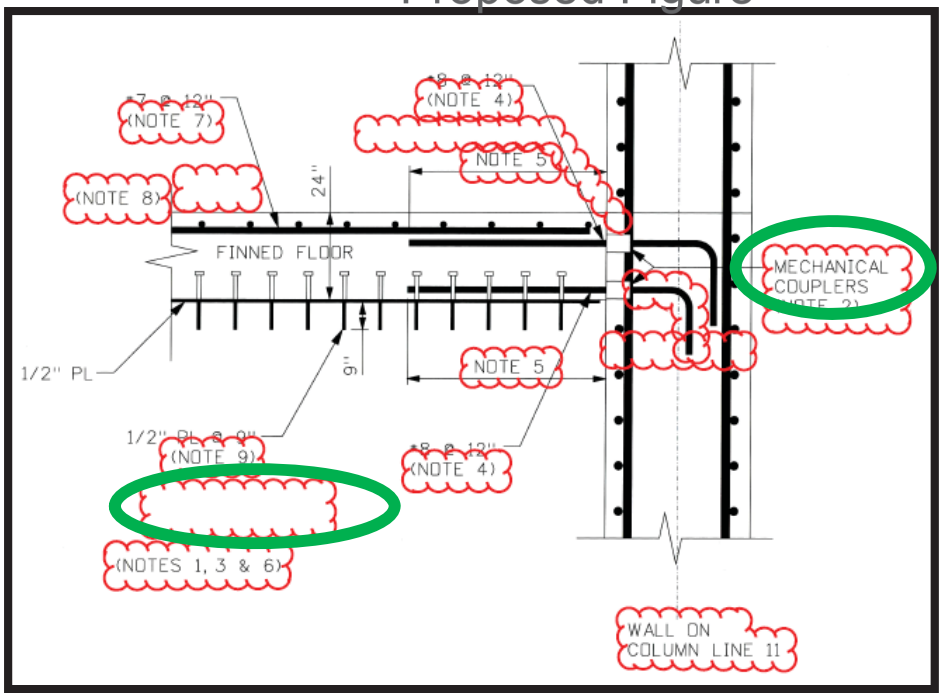
Licensing Basis Impact

- Figure 3H.5-9, Sheet 2
  - Remove North – South designator
  - Replace the term “Mechanical Splices” with “Mechanical Couplers”

Existing Figure



Proposed Figure



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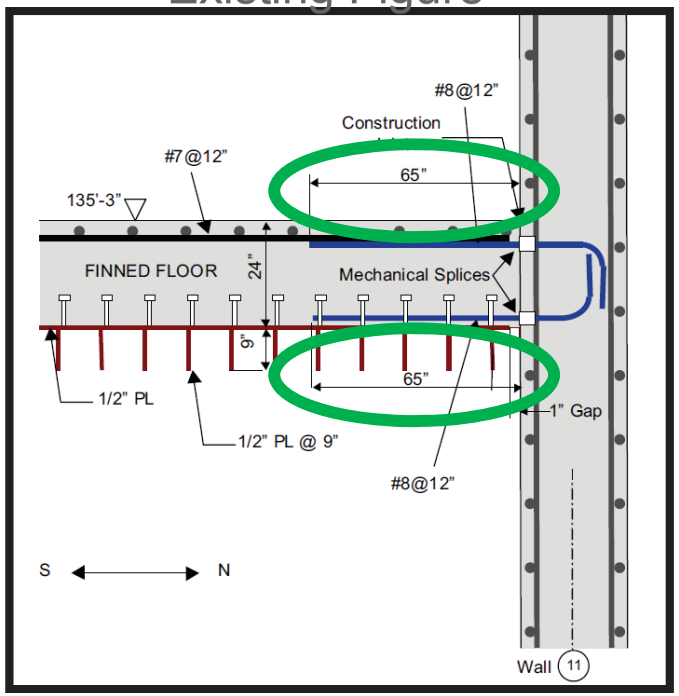
Change Activity No. 5
Design of Floor to Wall Connection

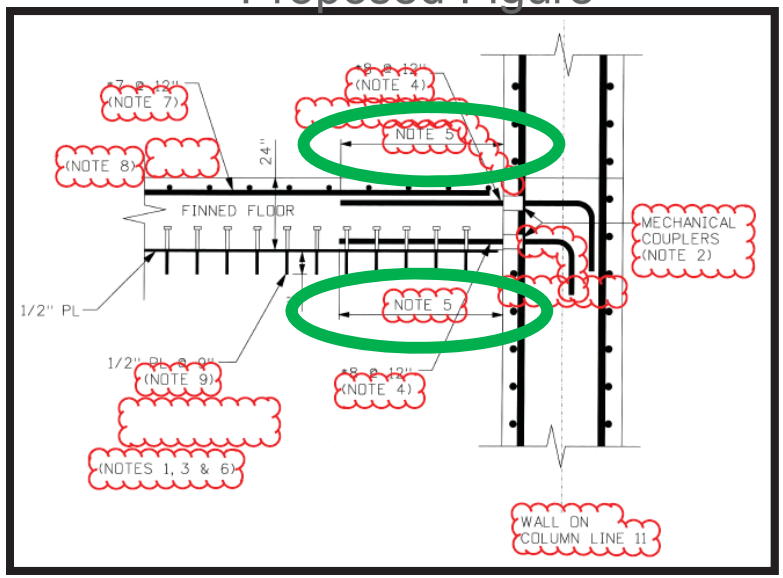
Licensing Basis Impact

- Figure 3H.5-9, Sheet 2
  - Remove size of splice length; replace with Note 5

Existing Figure



Proposed Figure



5. SPLICE LENGTH IS THE LONGEST OF A) ACI 349 REQUIREMENTS FOR SPLICE LENGTH, B) LENGTH TO INCORPORATE SUFFICIENT SHEAR STUDS TO DEVELOP THE CAPACITY OF DOWEL, PER AISC N690 SHEAR STUD CAPACITIES, OR C) LENGTH TO INCORPORATE SUFFICIENT SHEAR STUDS TO DEVELOP THE DEMAND IN THE BOTTOM PLATE, PER AISC N690 SHEAR STUD CAPACITIES.

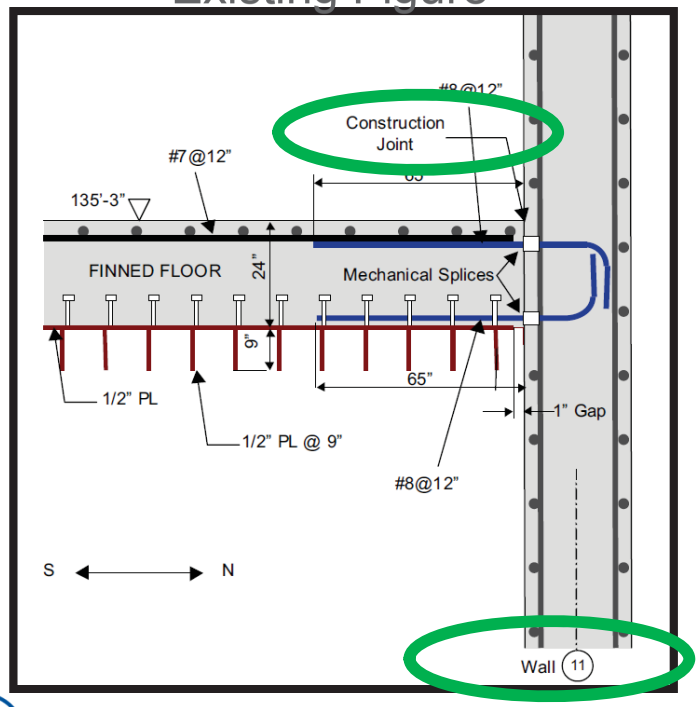
Westinghouse

Change Activity No. 5
Design of Floor to Wall Connection

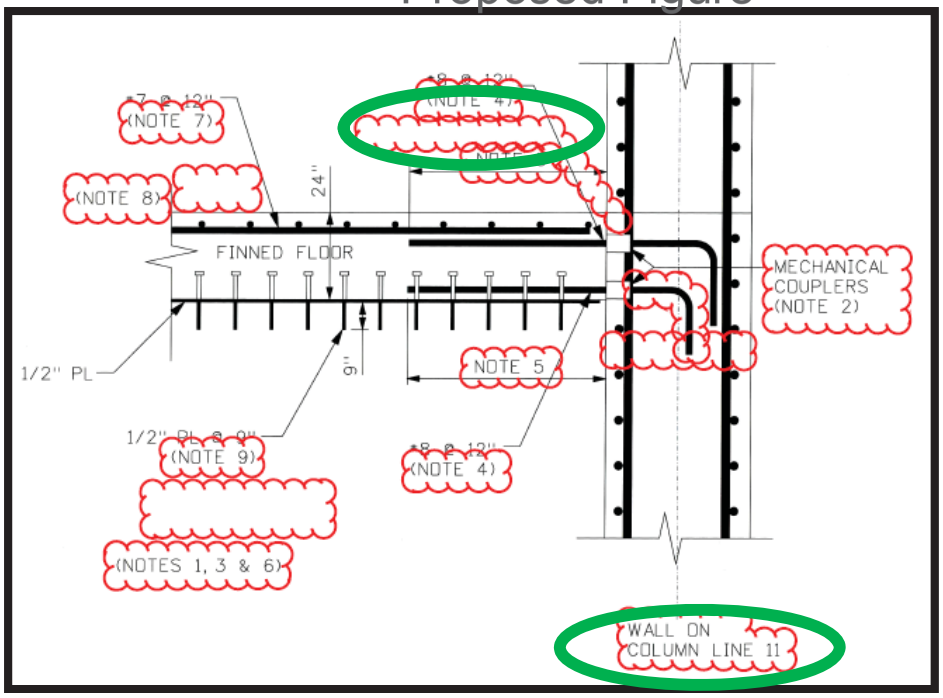
Licensing Basis Impact

- Figure 3H.5-9, Sheet 2
  - Remove size of splice length; replace with Note 5
  - Revise wall designation to say “Wall on Column Line 11”

Existing Figure



Proposed Figure



Change Activity 6

Change Activity No. 6
Design of Concrete on Steel Plate Floors

Issue Description

- UFSAR Subsection 3.8.4.4.1 provides design information for Seismic Category I structures other than the containment internal structures and the containment vessel
- For CA20 floors, Subsection 3.8.4.4.1 refers to the design methodology for the finned floors described in UFSAR Subsection 3H.5.4 and does not directly address the CA20 module floors or their design requirements for the connection of the slab to the SC wall module.
  - The discussion provided is applicable to the design methodology for bending in the floor

Proposed Solution

- Add information, applicable to CA20 floors, about floor to wall design conformance with ACI 349 requirements for length of dowel, ACI 349 Appendix B requirements for shear stud strength, and AISC N690 requirements for shear stud capacities.
  - This code applicability information applies to the floor to wall connection for both finned floors and concrete on steel plate floors without fins.
  - Specifying the appropriate code provisions for development length and dowel length that provide criteria used for the connection design will clarify the application of ACI 349 requirements.
  - Analysis was completed for the floor-to-wall connection to confirm that ACI code provisions are appropriate for developing capacity between the wall dowels and steel plate.
  - The floor to wall connection design information added does not change the compliance of the concrete on steel plate floor design with codes and standards, including ACI 349 and AISC N690.
- Add text to state that the methodology is similar to that described in Subsection 3H.5.4.
- Revise the existing last paragraph of UFSAR Subsection 3.8.4.4.1, to remove the reference to control room ceiling and stiffeners.

Westinghouse

Change Activity No. 6
Design of Concrete on Steel Plate Floors

Licensing Basis Impact

- Revise last paragraph of Subsection 3.8.4.4.1 to
  - Remove the reference to control room ceiling and stiffeners.
  - Add text that the methodology is similar to that described in Subsection 3H.5.4.
  - Add information about floor to wall design conformance with ACI 349 requirements for length, ACI 349 Appendix B requirements for shear stud strength, and AISC N690 requirements for shear stud capacities.

The concrete floors on steel plates, including the ~~control room ceiling and the~~ floors in the CA20 module, are designed as reinforced concrete slabs in accordance with ACI-349. The steel panels are designed and constructed in accordance with AISC-N690. For positive bending, the steel plate is in tension and the steel plate ~~and stiffeners~~ serves as the bottom reinforcement. For negative bending, compression is resisted by the concrete and steel ~~stiffened~~ plate and the tension by top reinforcement in the concrete. This methodology is similar to that described for the control room ceiling in Subsection 3H.5.4. The connection of the floor to the wall satisfies ACI 349 requirements in Sections 12.2, 12.15, and 21.5.4 for the development length and non-contact reinforcement bar splices. The design of the connection satisfies ACI 349, Appendix B requirements for shear stud strength and AISC N690 requirements for shear stud capacity.

Change Activity 7

Change Activity No. 7
Update MCR Ceiling Design Summary (Table 3H.5-13)

Issue Description

- FSAR Table 3H.5-13 includes design information for the finned floor critical section
- Changes to equipment weight and location of equipment in the rooms above the finned floors, the seismic analytical model for other sections, and seismic loads as a result of cumulative changes to the structures have resulted in small changes in the table.
- The presentation of the information in the table is confusing without familiarity of the evaluation

Proposed Change

- Update UFSAR Table 3H.5-13 to reflect the revised design and calculation
- Reformat and revise the information in the table to present the information in a more understandable manner
- Remove the calculational results for max. bending moment and max. shear force.
  - The acceptance criteria used to evaluate the floor design is the criteria in ACI 349.
- Add values to the table for reinforcement to resist negative bending
- Add a statement that excludes reinforcement and studs in the area of penetrations, openings, or other obstructions.
- Correct the designation of the area in the table title.
- Revise Subsection 3H.5.4 by changing the table reference from “3.H.5-13” to “3H.5-13”.

Westinghouse

Change Activity No. 7
Update MCR Ceiling Design Summary (Table 3H.5-13)

Licensing Basis Impact

- Table 3H.5-13

Existing Table

Table 3H.5-13
Design Summary Of Floor At Elevation 135′-3″ Area 1 (Main Control Room Ceiling)

The design of the bottom plate with fins is governed by the construction load.
For the composite floor, the design forces used for the evaluation of a typical 9-inch-wide strip of the slab are as follows: Maximum bending moment=+35.0 (-24.4) kips-ft Maximum shear force=22.3 kips
The design evaluation results are summarized below: (1) • [*The actual area of the tension steel is 9.0 in^2 (Min.),*]* which provides a design strength of 518.5 kips-ft bending moment capacity. • [*The design shear strength is 23.22 kips.* • *The shear studs are spaced a maximum of 9 inches c/c, in both directions.*]* The calculated required spacing is 9.06 inches.

Note:

Change Activity No. 7
Update MCR Ceiling Design Summary (Table 3H.5-13)

Licensing Basis Impact

- Table 3H.5-13

Proposed Figure

Table 3H.5-13

DESIGN SUMMARY OF FLOOR AT ELEVATION 135′-3″
AREA 2 (MAIN CONTROL ROOM CEILING)

The design of the bottom plate with fins is governed by the construction (wet concrete) load.

For the floor, the evaluation considers a 9-inch-wide strip of the slab.

The key structural capacities of the floor are as follows:(1)

- [*The actual area of the tension steel (bottom plate and fins) is 9.0 in^2 (Min.), except in the area of penetrations, openings, or other obstructions,*]* which provides a positive bending moment capacity of 518.5 kips-ft per 9-inch width.
- Reinforcement to resist negative bending at the floor-to-wall interface is #7@12″ (Min.), which provides a design strength of 58 kips-ft.
- [*The design shear strength, not reduced for in-plane axial forces, is 23.22 kips.*
- *The shear studs have a design spacing of 9 inches c/c, in both directions except in the area of penetrations, openings, or other obstructions.*]* The calculated maximum spacing is 9.06 inches.

Change Activity No. 7
Update MCR Ceiling Design Summary (Table 3H.5-13)

Licensing Basis Impact

- Revise Subsection 3H.5.4 by changing the table reference from “3.H.5-13” to “3H.5-13”.

> *The main control room ceiling fin floor is designed for the dead, live, and the seismic loads. The design summary is shown in Table ~~3.H.5-13~~ 3H.5-13.*

Change Activity 8

Change Activity No. 8
Fire Protection Reinforcement

Issue Description

- The AP1000 fire hazard analysis credits the floors above the instrumentation and control rooms as 3-hour fire barriers.
- Additional bottom layer reinforcing steel is required in the floors at the 117′-6″ elevation to maintain the structural integrity of the fire barrier during a fire event due to potential deterioration of mechanical properties of exposed steel fin plates during the fire.
- This reinforcement is not shown or described in the UFSAR text or figures.

Proposed change

- Additional bottom layer reinforcing steel is added to the floor to maintain the structural integrity of the floor in the event of a fire in the room below.
- The reinforcement satisfies ACI 349 requirements, including cover requirements to protect the reinforcement.
- The addition of bottom layer reinforcing steel does not impact the passive heat sink function of the finned floor.
- There is no impact on the fire rating of the floor from the additional reinforcement.

Westinghouse

Change Activity No. 8
Fire Protection Reinforcement

Licensing Basis Impact

- Revise the seventh paragraph of UFSAR Subsection 3.8.4.1.2 to add reference for reinforcing for fire barrier structural integrity.

The stiffened plate is designed to withstand construction loads prior to concrete hardening. Additional bottom layer reinforcing steel is provided where needed to maintain the structural integrity of the fire barrier during a fire event due to potential deterioration of mechanical properties of exposed steel fin plates during the fire.

Change Activity No. 8
Fire Protection Reinforcement

Licensing Basis Impact

- Revise sixth paragraph of UFSAR Subsection 3H.5.4 to add reference to reinforcing for fire barrier structural integrity.

Minimum top reinforcement is provided in the slab in each direction for shrinkage and temperature crack control. In addition, top reinforcement located parallel to the stiffeners is used as tension reinforcement in negative bending. The stiffened plate provides crack control capability for the bottom of the slab in the transverse direction. Additional bottom layer reinforcing steel is provided in the finned floors at elevation 117'-6" where needed to maintain the structural integrity of the fire barrier during a fire event due to potential deterioration of mechanical properties of exposed steel fin plates during the fire.

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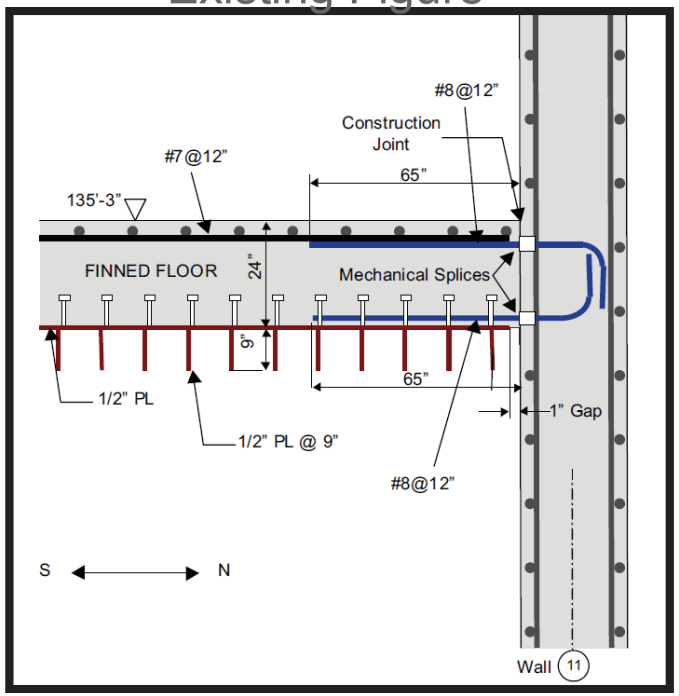
Change Activity No. 8
Fire Protection Reinforcement

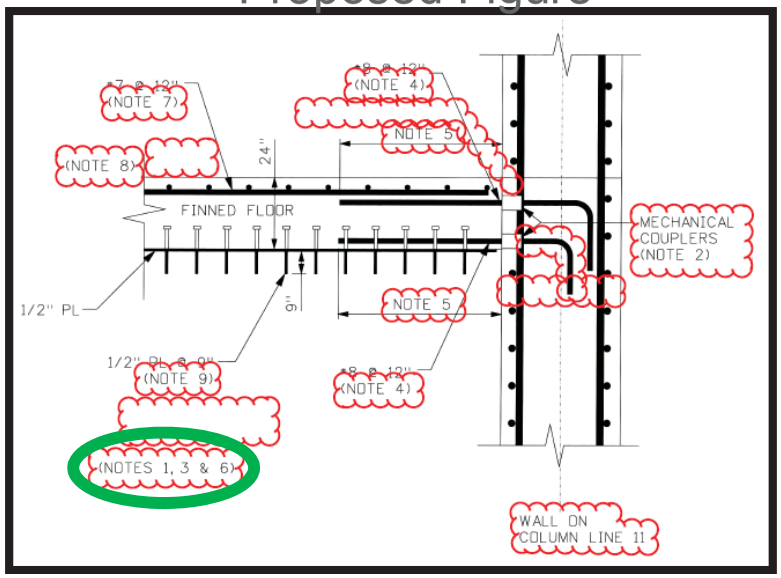
Licensing Basis Impact

- Figure 3H.5-9, Sheet 2
  - Add note to discuss bottom layer reinforcing steel provides for structural integrity of the fire barrier.

Existing Figure



Proposed Figure



6. ADDITIONAL BOTTOM LAYER REINFORCING STEEL IS PROVIDED IN THE FINNED FLOORS AT ELEVATION 117'-6" WHERE NEEDED TO MAINTAIN THE STRUCTURAL INTEGRITY OF THE FIRE BARRIER.

Change Activity 9

Change Activity No. 9
Precast Panel Width and Stirrups

Issue Description

- Subsection 3H.5.3.1 describes and UFSAR Figure 3H.5-8 shows the design of the critical section for reinforced concrete floors constructed of cast-in-place concrete over precast panels
  - Current UFSAR width of the precast concrete panels is 5′-11”
  - Proposed to change the width of the panels to 6′-4 ½″ to fully cover the room below
- Figure 3H.5-8 shows three double stirrups connecting the precast panel to the cast-in-place concrete.
  - The proposed design change for this section proposes to add a single stirrup for the wider panel to satisfy ACI 349, Chapter 17 requirements and the orientation of the hooks on the top of the stirrup being in the plane of the stirrup to facilitate fabrication.

Proposed Change

- Revise UFSAR Subsection 3H.5.3.1 and UFSAR Figure 3H.5-8 to show the width of the precast panels to be 6′-4 ½″.
- Revise UFSAR Figure 3H.5-8 Section C to show three double stirrups and one single stirrup connecting the precast panel and cast-in-place concrete.
- Revise UFSAR Figure 3H.5-8 Sections C and F to show the hooks on the stirrups to be in the plane of the bends to make them double hooks.

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Change Activity No. 9
Precast Panel Width and Stirrups

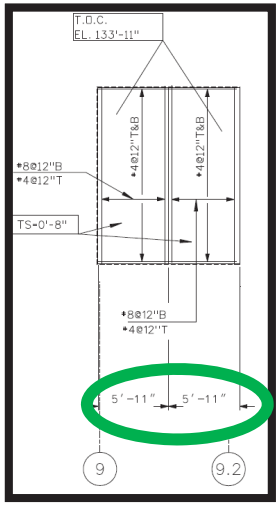
Licensing Basis Impact

- UFSAR Subsection 3H.5.3.1
  - Revise to show the width of the precast panels to be 6′-4 ½″.

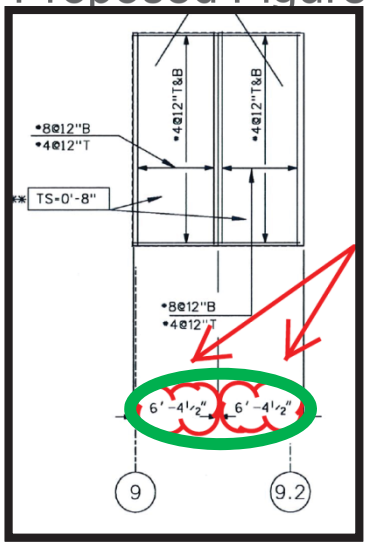
The two precast concrete panels, each ~~5′-11″~~ 6′-4½" wide and spanning over 16′-0" clear span, are installed to serve as the formwork.]*

- UFSAR Figure 3H.5-8
  - Revise to show the width of the precast panels to be 6′-4 ½″.

Existing Figure



Proposed Figure

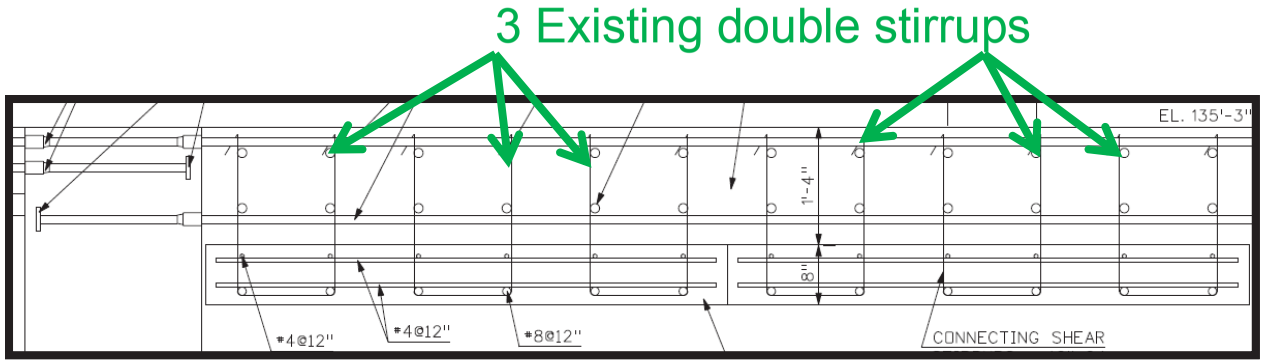


Change Activity No. 9
Precast Panel Width and Stirrups

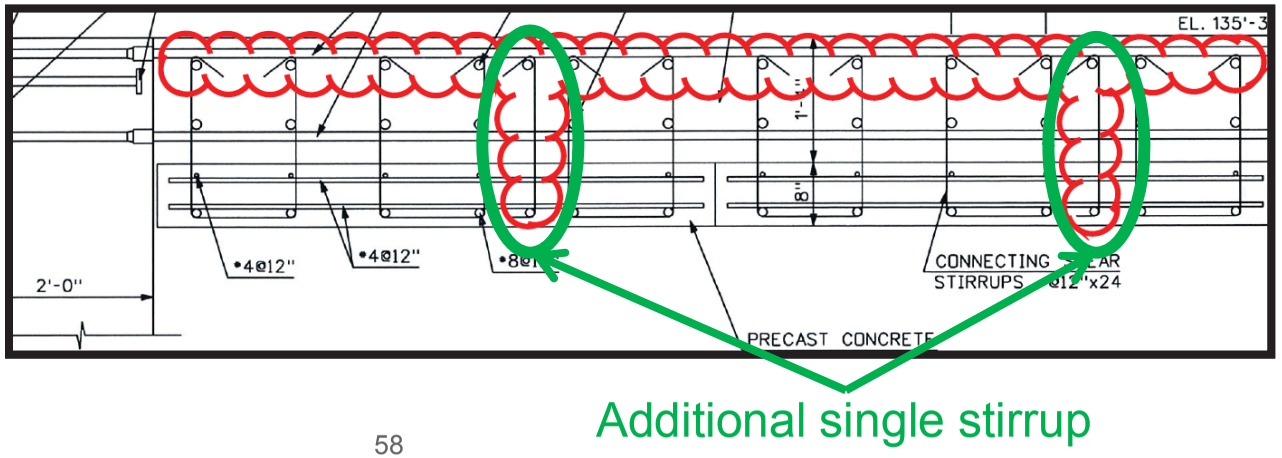
Licensing Basis Impact

- UFSAR Figure 3H.5-8
  - Revise Section C to show three double stirrups and one single stirrup connecting the precast panel and cast-in-place concrete.

Existing Figure



Proposed Figure

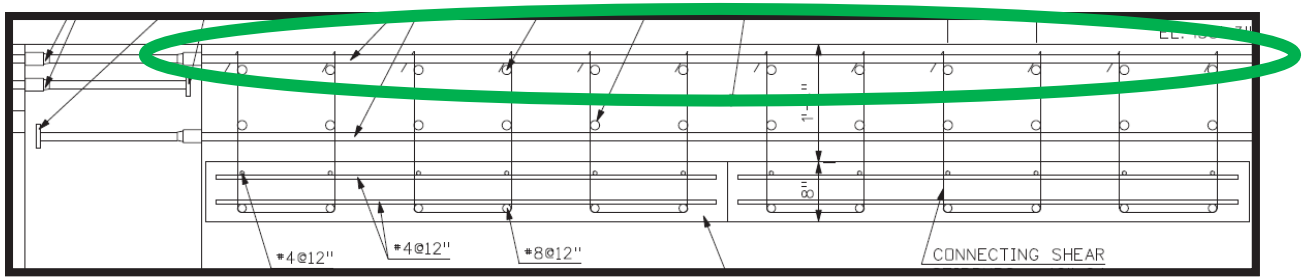


Change Activity No. 9
Precast Panel Width and Stirrups

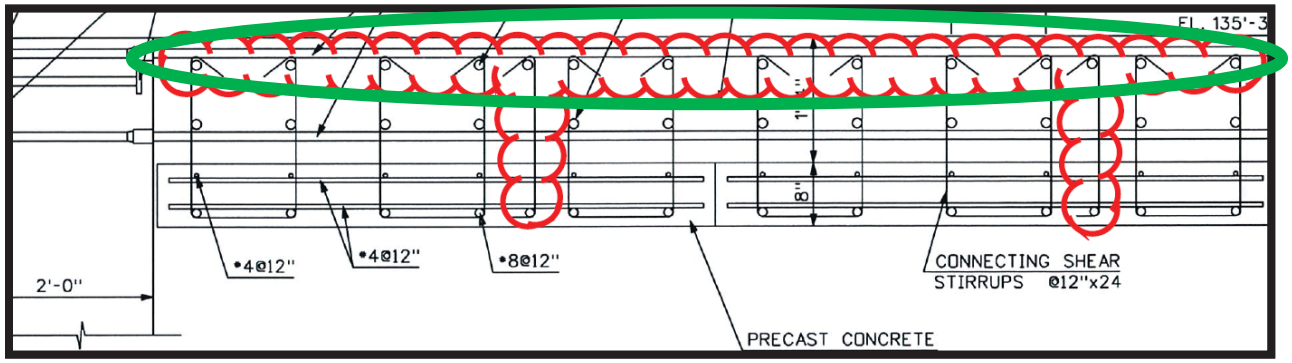
Licensing Basis Impact

- UFSAR Figure 3H.5-8
  - Revise Sections C and F to show the hooks on the stirrups to be in the plane of the bends to make them double hooks.

Existing Figure



Proposed Figure



LAR Supporting Calculations and Schedule

Calculations

a,c

LAR Timing

a,c

Questions/Discussion