



**Albertson Engineering Inc.**

March 9, 2021

Robert Evans  
Donovan Construction  
514 S. 32<sup>nd</sup> Street  
Rapid City, SD 57783

RE: Masonic Lodge Roof Repairs – Phase 1  
Structural Recommendations  
Albertson Engineering File #2021-060

Robert,

Thank you for the opportunity to be of service to the Masonic Lodge and to Donovan Construction. As requested, we have completed our concept review and design for the repair of the roof. Per our discussions and per our proposal, this report serves to complete Phase 1 – Concept Services which involved preliminary design of several options so that costs/timelines for repair can be determined by Donovan Construction. Please note that our services and scope are limited to the repairs of the trusses themselves. An evaluation of the framing of the remaining building has not been completed. No warranty or guarantee of condition of the remaining building at-large is implied.

As outlined within our proposal, we have explored four (4) possible repair options with regard to repairing the two existing roof trusses that have failed. In addition, we have reviewed the remaining two trusses to the north with regard to any possible need of repair. The following summarizes our recommendations for each truss. For purposes of reference, each truss has been labeled starting with Truss 1 being the truss closest to the stage area, and Truss 4 being the truss closest to Main Street. For purposes of description, this report will refer to Main Street as being north. The following is recommended:

Truss 1 & Truss 2: Truss 1 and Truss 2 are the trusses that have experienced structural failure and are currently shored. These trusses need to be vertically jacked back into place as much as able, and then replaced with new support framing consisting of one of the following repair options:

- Option 1 – W-Beam: Provide a new W27x84 steel beam below the existing wood trusses.

**Albertson Engineering Inc.**  
**Rapid City**  
3202 West Main, Suite C  
Rapid City, SD 57702  
605-343-9606

**Sioux Falls**  
315 North Main Avenue, Suite 200  
Sioux Falls, SD 57104  
605-343-9606

**Winner**  
201 S. Monroe St., Suite 203A  
Winner, SD 57580  
605-343-9606

- Beam to be spliced at roughly third-points using bolted field splice connections. Field splices will require slip critical connections with direct tension washers or equal to verify the bolts have been pretensioned.
  - Beams to be supported at each end on the existing brick wall with a seat angle assembly that will be notched slightly into the existing wall for bearing, with pull-out resisted by providing thru-bolts that will pass through the entire brick wall. Exterior plate washers and nuts will remain exposed on the exterior face of wall.
  - Beams are to be set slightly below the existing truss with 2x nailers pre-attached to the steel beam. Wood blocking spacers/shims will then be provided at roughly 2'-0" on center to engage the existing truss.
  - Both roof and ceiling framing can remain largely in-place during repairs, with a new soffit framed around the new beam as required to aesthetically cover the framing.
- Option 2 – P/E Wood Girder Trusses: Provide a new (2) ply girder truss on each side of the existing roof truss.
    - Girder truss depth to be field verified to match the depth from bottom of roof joists to bottom of existing wood truss.
    - Girder trusses to be field spliced at roughly the third points. All field splicing to be done from one side only, with field splice designed by the truss manufacturer.
    - Ceiling framing to either be shored and then suspended from the new girder truss or alternately removed and replaced in its entirety.
    - Blocking and thru-bolts to be provided at the bottom of the truss to engage and carry the existing truss.
    - Trusses will need to be supported each end with a seat angle assembly similar to that described for the steel beam option.
    - Please note that we have been working directly with Black Hills Truss & Components and have verified that this is a viable repair option. Please contact Tom Watson at their office here in Rapid City for additional information if needed.
  - Option 3 – Steel LH Joists: Provide a new 36LH10 joist on each side of the existing roof truss.
    - LH joists to be field spliced at roughly the third points, with splices designed by the steel joist manufacturer.
    - Ceiling framing to either be shored and then suspended from the new steel joists with the use of hangers and continuous 2x blocking, or alternately removed and replaced in its entirety.
    - New intermittent bent plate angle hangers and thru-bolts to be provided at the bottom of the joist to engage and carry the existing truss.
    - Joists to be supported each end by cutting out a pocket and bearing the joists directly on the existing brick walls.
  - Option 4 – Custom HSS Truss: Provide a new custom steel tube truss on each side of the existing roof truss.
    - Custom truss to be fabricated from HSS members in three pieces that will then be field spliced with the use of bolted connections. Bolted connections to again use slip critical connections having direct tension indicators or other measures to ensure that pretensioning of bolts has occurred.
    - Ceiling framing to either be shored and then suspended from the new custom truss with the use of hangers and continuous 2x blocking, or alternately removed and replaced in its entirety.



- A continuous angle and thru-bolts will be provided at the bottom to engage and carry the existing truss.
- HSS truss to be supported each end with a seat angle assembly similar to that described for the steel beam option.

Building sections and a general section for each of the repair options above have been provided as attachments to this report to further describe the work entailed. Please consult these drawings for additional information.

Truss 3: The existing third truss was field inspected to determine if any distress could be observed. No splitting or other signs of broken members were observed. However, it was noted that the diagonal members of the truss on the far east end did appear to be bowing. Because this occurs in the same vicinity within the truss as the trusses that failed, it would be our recommendation that Truss 3 be strengthened as follows:

- Provide new ½ plywood sheathing on each side of the truss for the first bay of the truss on each end. Solid blocking should be provided between the diagonal members and between the outer ply and the wood sheathing such that the sheathing can be nailed off to the diagonals. Any splices in the sheathing (vertical or horizontal) will need to be blocked. Perimeters of the sheathing should be nailed to existing framing at 3” on center full perimeter, and 12” on center in field.
- Please note that this will effectively cut-off any ‘passing thru’ the attic space from south to north. Each end can still be accessed from their respective ends, but passing from one end to the other will no longer be available.
- Also note that the existing ‘hidden room’ in the attic space on the south side of this truss at the east end will need to be removed in its entirety to get this sheathing installed.

Truss 4: The existing fourth truss was field inspected to determine if any distress could be observed. This truss was modified in the addition that provided the stage and fly tower roof, dated 1959. Plans for modifications of this truss have been provided. No splitting or other signs of distress were observed within this truss. It is our opinion that this truss could remain as is without any additional repair work.

General: While in the attic space it was observed that several areas appeared to have been used for storage in the past, within many areas of miscellaneous old items still remaining within the space. We would recommend that all old miscellaneous items that are current stored within the attic space be removed to help alleviate any additional loading to the trusses.

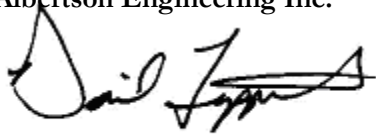
To supplement these recommendations, we have provided redline mark-ups on an existing building section from the plans dated 1959. This, in addition to the repair drawings for the various options that were previously referenced, should help to firm up both repair costs as well as a timeline for completing the repairs. We are prepared to move into Phase 2 services and provide final construction drawings once you have determined which repair option you and the Owner would like to proceed with.



We appreciate the opportunity to be of service to you. Should you have any questions or need any additional information, please do not hesitate to contact our office.

Sincerely,

**Albertson Engineering Inc.**

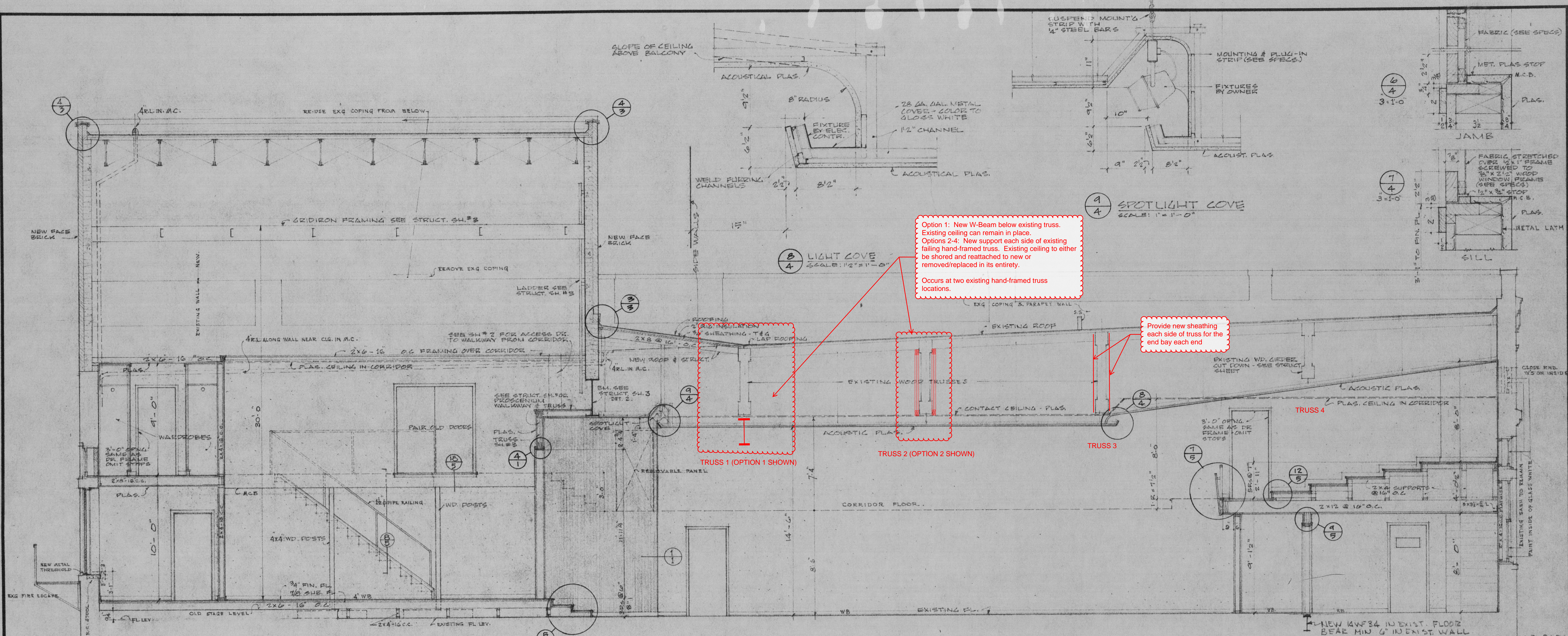
A handwritten signature in black ink, appearing to read "David Leppert". The signature is stylized and written in a cursive-like font.

David Leppert, PE  
Principal

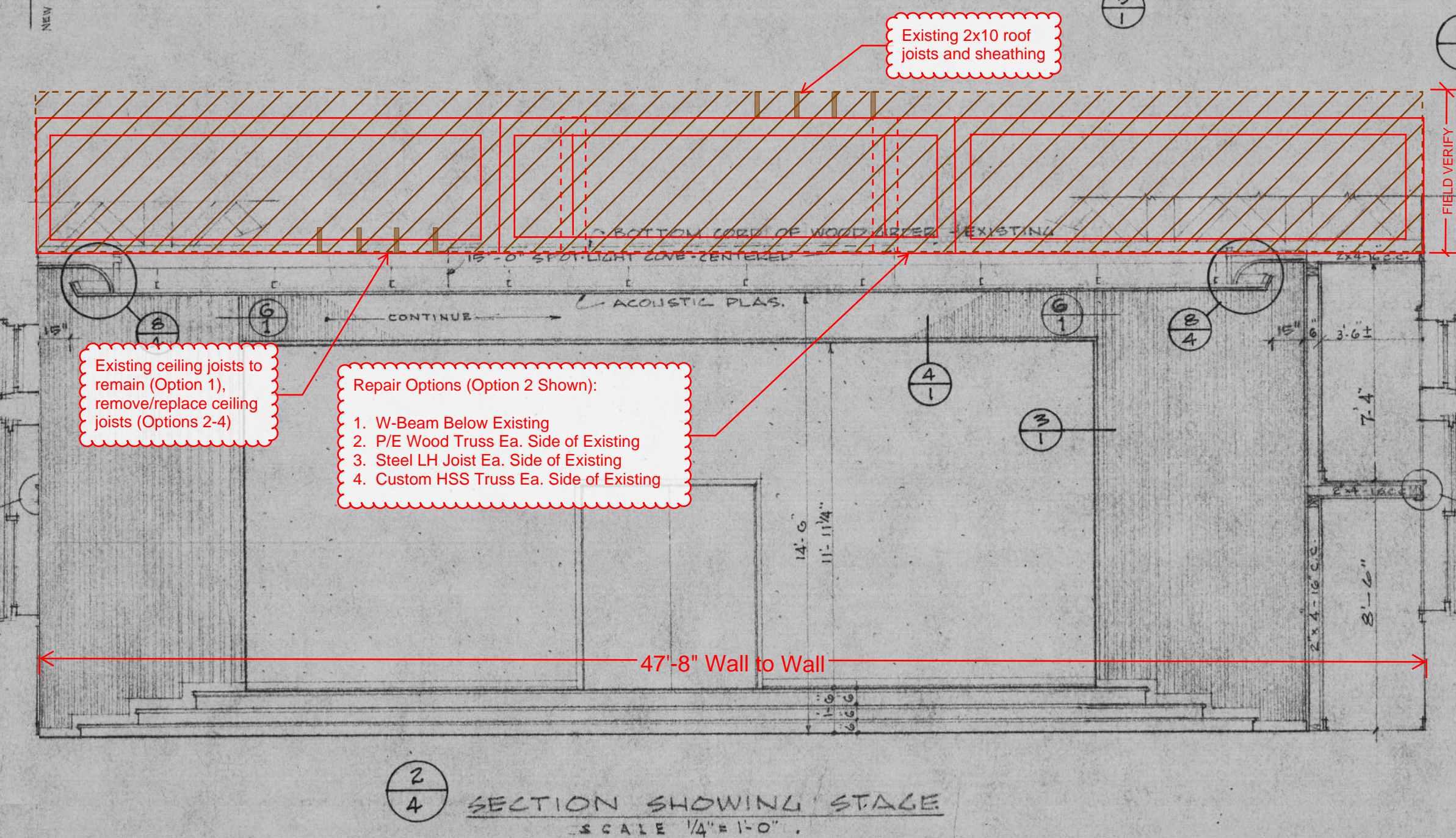
Cc: File



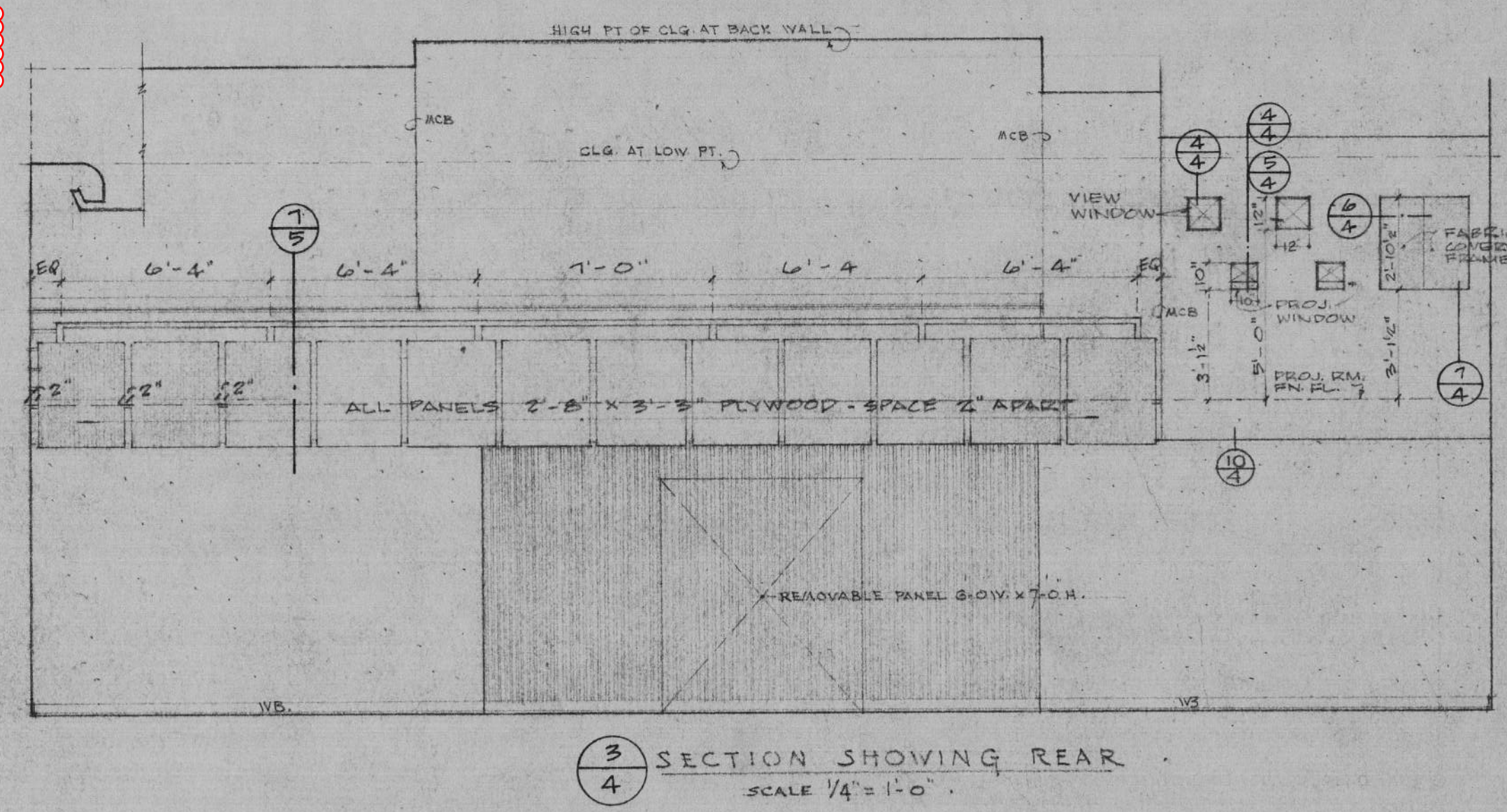




1  
4 LONGITUDINAL SECTION  
SCALE 1/4" = 1'-0"

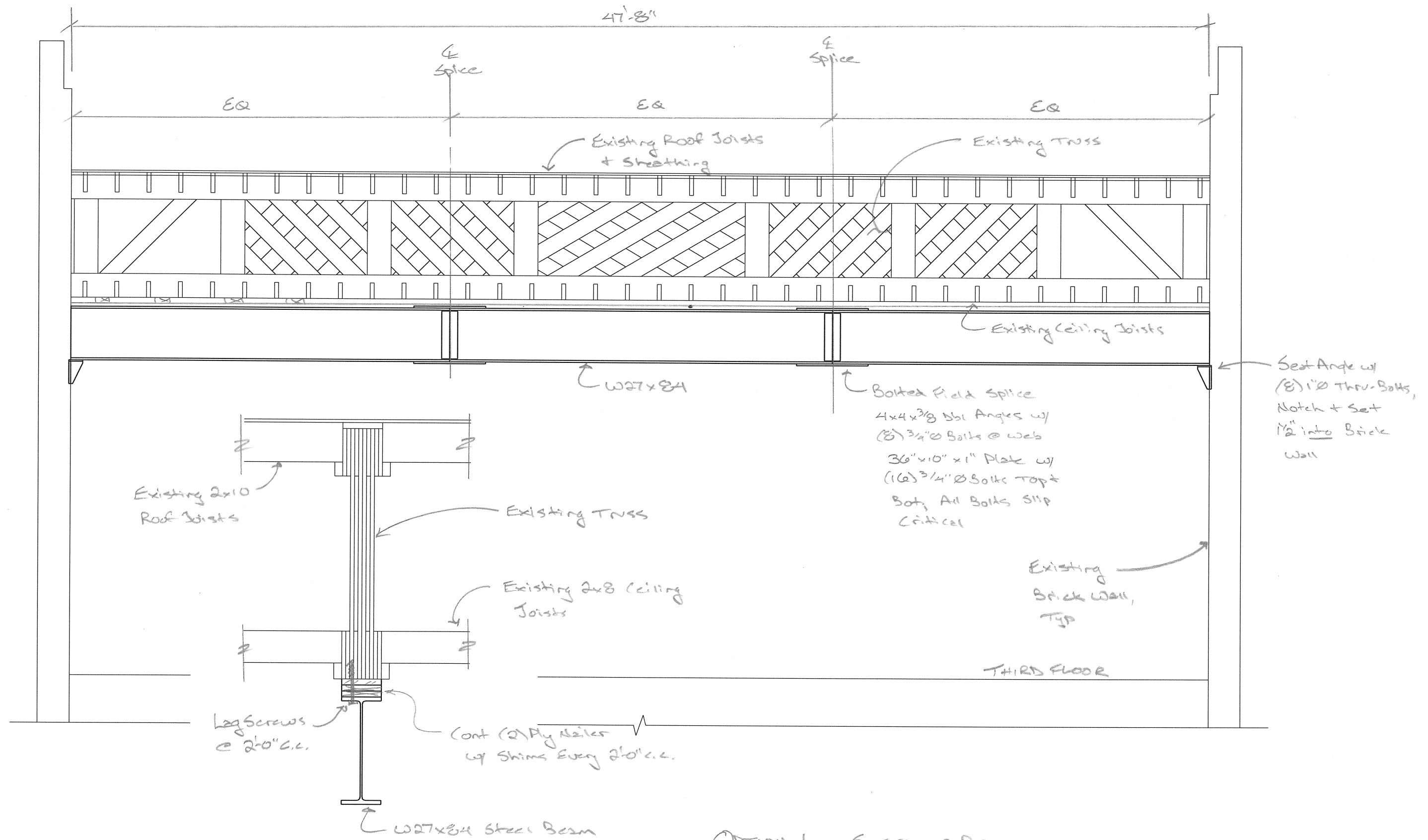


2  
4 SECTION SHOWING STAGE  
SCALE 1/4" = 1'-0"



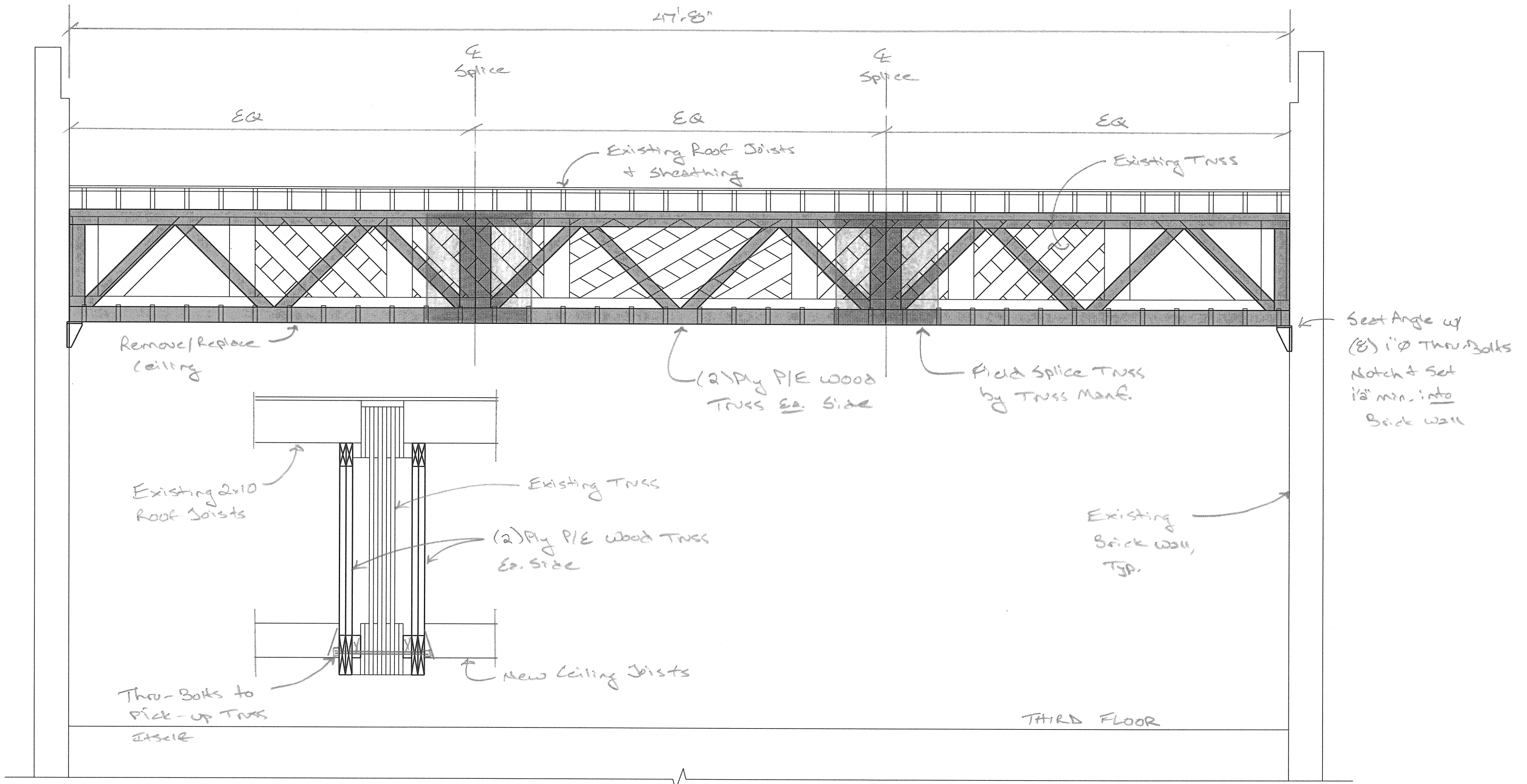
3  
4 SECTION SHOWING REAR  
SCALE 1/4" = 1'-0"



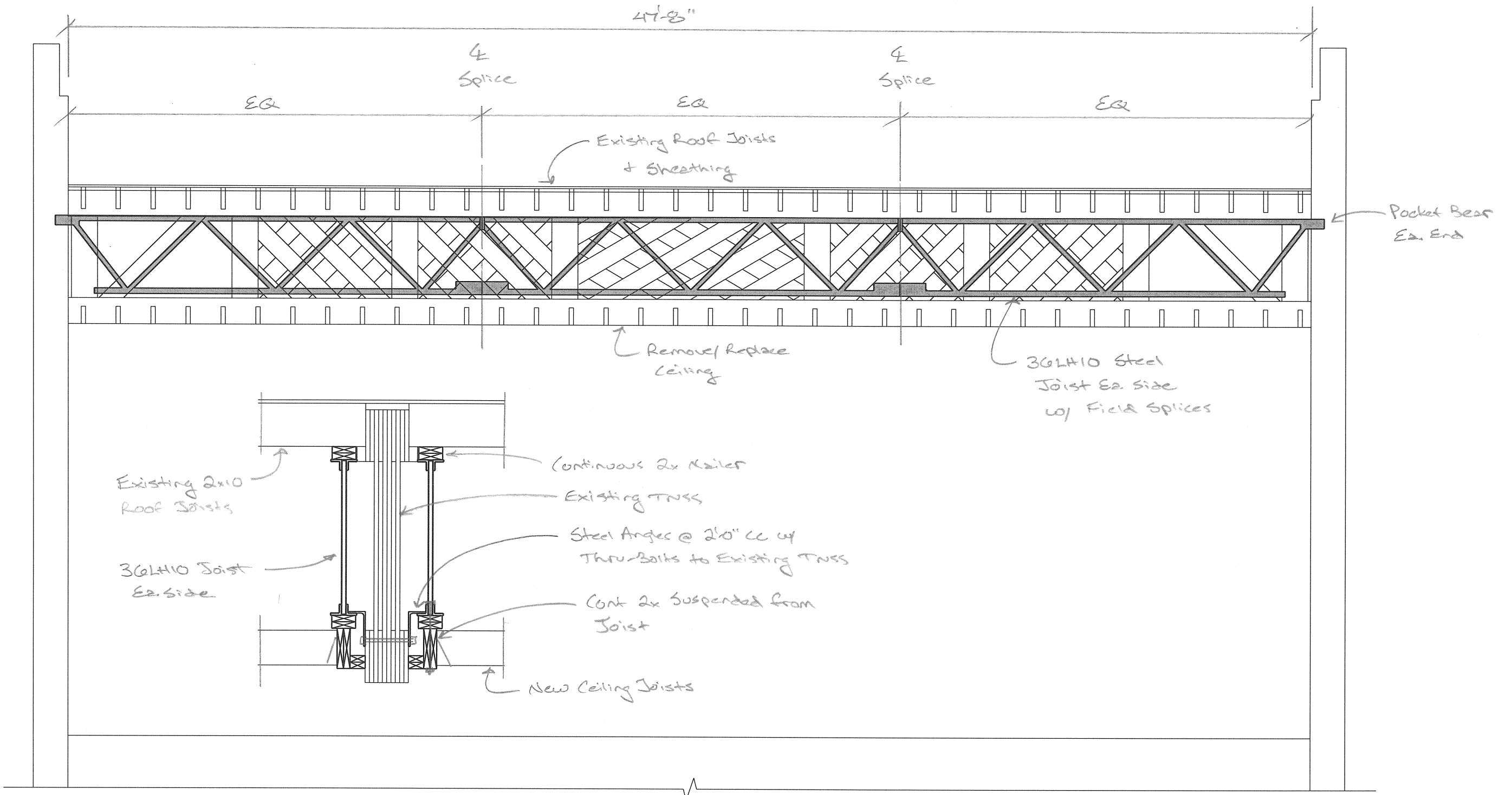


OPTION 1 - STEEL W-BEAM

1/4" = 1'-0"



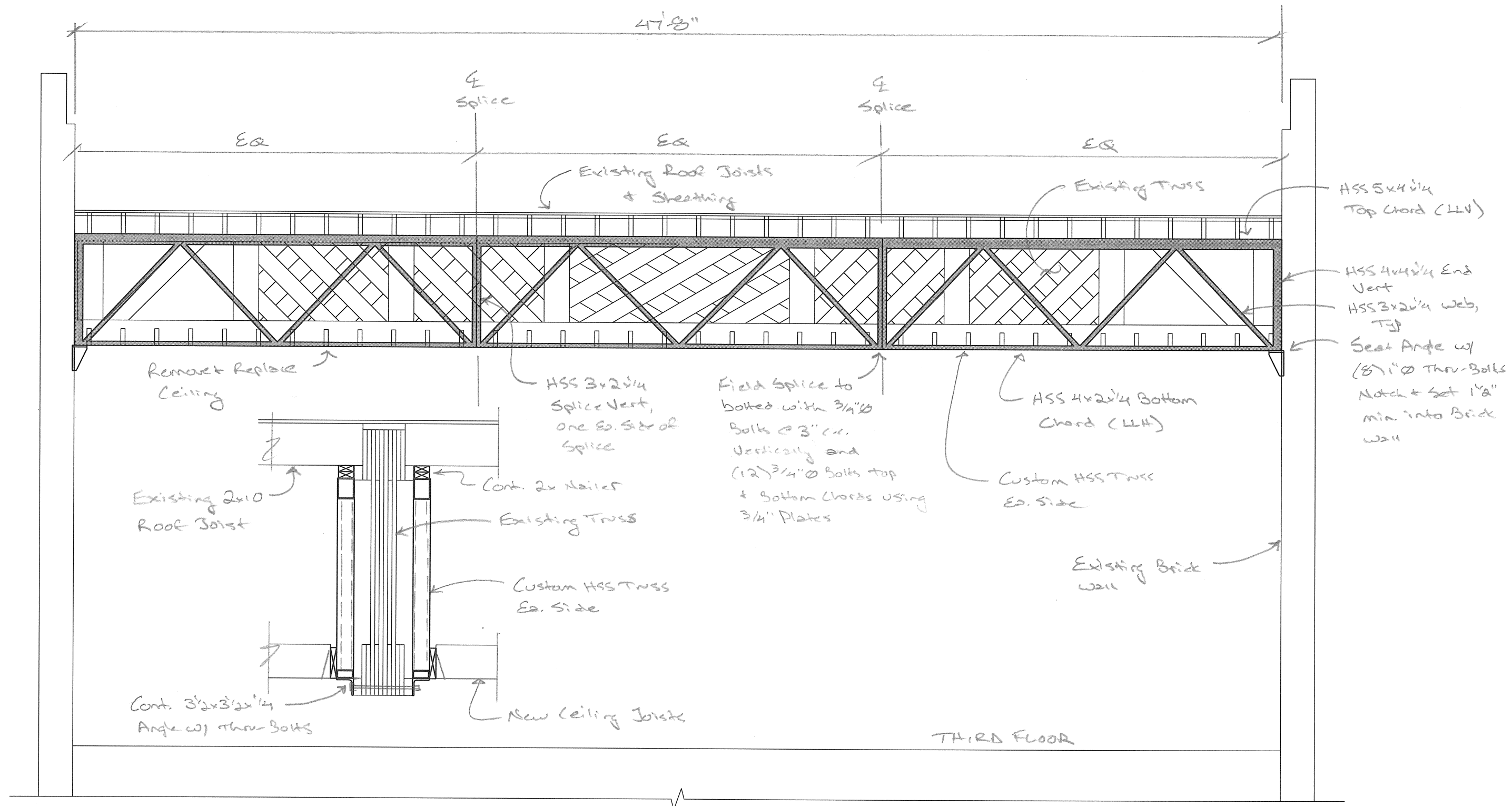
OPTION 2 - P/E WOOD TRUSS  
 1/4" = 1'-0"



OPTION 3 - STEEL "BAR" JOIST

1/4" = 1'-0"





OPTION 4 - CUSTOM HSS TRUSS

1/4" = 1'-0"