Norton & Schmidt

Consulting Engineers, LLC
Established 1967
Kansas City • Atlanta

August 10, 2016

Mr. Brad Heise
PHOENIX RENOVATION AND RESTORATION, INC.
16250 Foster
Overland Park, Kansas 66085

RE: STRUCTURAL REVIEW – AUTOMOBILE INTO BLDG. **JOB #2016-1282**
1160 ~~1184~~ **NE DOUGLAS STREET**
LEE'S SUMMIT, MISSOURI

Dear Mr. Heise,

Refer to my report dated July 13, 2016 for the background on this project. After the roof structure was lifted and stabilized, and after some sheathing was removed to allow inspection of the interior connections, I made a second site visit on August 3, 2016 to evaluate the structure and make additional structural repair recommendations. This letter is a summary of my recommendations.

Rafters
The rafters are 6" cold form steel (CFS) C-shapes at 16". The rafters themselves were not damaged and can be re-used. Some inboard and outboard connections have been damaged and will need to be repaired. At the inboard end each rafter is connected to a wall stud with two screws. At several rafters the screws were sheared in two and the roof has fallen up to 2". This is apparent from the photographs. I recommend these rafters be lifted to their original location (using the existing top of drywall as a guide) and attached with (2) #10 screws. Faces of rafters and wall studs must be tight together, and screws must be long enough to penetrate minimum 3 threads through the connected faces. In addition, I recommend that all remaining rafter-to-stud connections within the affected area (approximately 40' of roof), regardless of whether the original screws appear to have been damaged, be secured with (2) additional #10 screws.

Ceiling joists
The ceiling joists are 3½" CFS C-shapes at 16" attached to CFS track at both the building wall and the steel HSS beam. All joists and track can be re-used. I recommend attaching each joist to the track with two #8 screws – one in each flange.

Some ceiling joists are not seated fully into the track at the building wall. See photo. This may be the result of the collapse, and this condition may be corrected after final adjustments are made on the position of the roof, as described below. If this is not corrected after final adjustments, the ceiling joists should be attached to the track with 54 mil steel clip angles with two #10 screws in each leg.

Fascia
The fascia is framed with 6" CFS C-shapes @ 16" and was originally plumb. At the center of the affected area, where the masonry column was destroyed, the distortion in the fascia is greatest and the top of the fascia leans outward approximately 1½". This distortion should be corrected as described below, and after the fascia is in proper position all fascia-to-rafter connections should be secured with two #10 screws. These screws are in addition to the existing screws.

Distortion
The roof has been lifted back to approximately its original location, but some additional adjustment is necessary for proper alignment. Some rafters have dropped and the fascia is not plumb at this time. I recommend removing some sheathing – both OSB roof sheathing and gyp board ceiling – before trying to re-position the structure. I do not think it is necessary to remove all the sheathing. I think it will be most beneficial to remove sheathing at the CFS connections. I think the sheathing in the field of the framing members can remain and it will serve to keep the C-shapes in proper alignment. I approve of how this has been done at the ceiling where a narrow strip of drywall ceiling has been removed along the building wall. Be careful when removing the roof sheathing to not damage the flashing at the building wall.

Screws should not be installed until the roof, ceiling, and fascia are properly aligned.

Aluminum storefront system
The north door to this vacant tenant space cannot be opened at this time. It appears the door is stuck in the frame, and the jamb (latch side) of the frame may be under compression. The space has reportedly been vacant since the building was damaged by a tornado in July 2015. It is not known when the door began having problems. It seems unlikely that the collision on July 12, 2016 caused the malfunction because a steel beam is located over the storefront system to prevent any load on the door frame. I recommend contacting a supplier/installer of such storefront glazing systems for repair recommendations.

Steel beams
The 2 steel roof beams (HSS 8x6) that dropped have been lifted to approximately their original positions. Based on laser measurements we took on August 3, 2016 the beams are ¾" out of alignment at this time. At the missing column, the north and south beams are 1" and ¼" too far to the east, respectively. Both steel beams can be re-used. These beams should be re-positioned prior to re-connecting all the CFS members.

The south beam was damaged by the collision when the anchor bolt was pulled through the bottom flange. I recommend the distorted flange be heated and pounded in so it will sit flush on the masonry. See the attached detail for a connection that does not require welding.

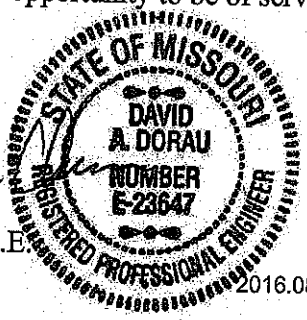
At the north end of the north beam and at the south end of the south beam the anchor bolts were probably bent and stretched when the roof collapsed. The prying action on the anchor bolts probably yielded the steel, resulting in some minor loosening of this connection. I recommend tightening up this connection by tightening the nuts at these 2 anchor bolt connections. If the

nuts cannot be tightened I recommend the connections be shimmed as necessary and then welded tight to eliminate any slop. Any shims used should be steel.

Masonry columns
I recommend the load-bearing, masonry column be re-constructed to match the existing columns. Refer to the attached detail. The original construction did not include anchor rods between the masonry column and the footing, and my calculations show that no anchor rods are necessary because of the great weight of the masonry column and the minor uplift loads here.

Thank you for this opportunity to be of service. Please call me if I can assist you further.

Sincerely,



David A. Dorau, P.E.
Principal

2016.08.10

encl. photos (4), details (3)

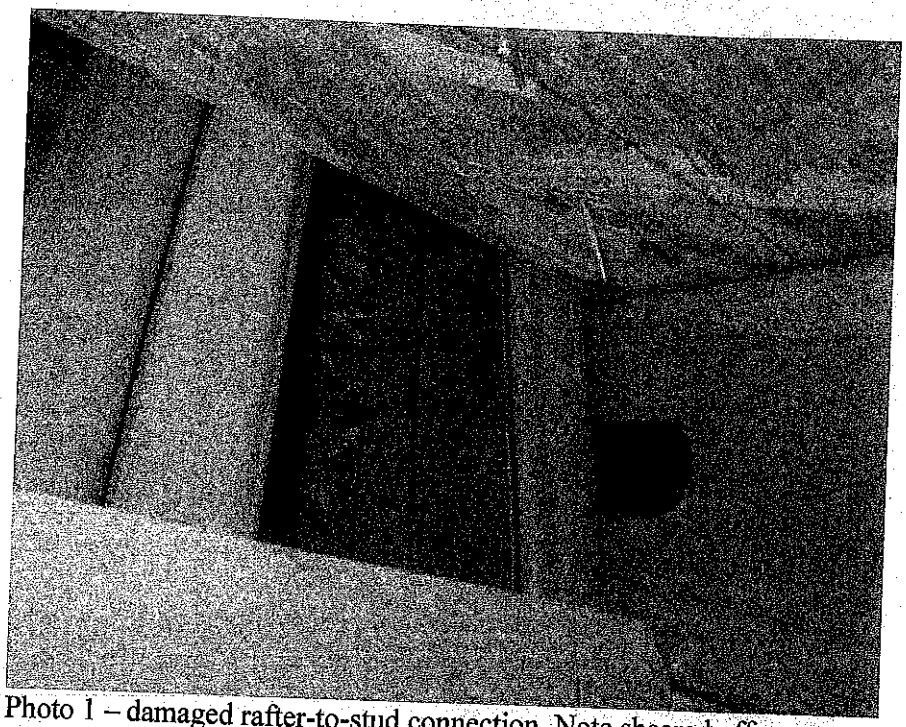


Photo 1 – damaged rafter-to-stud connection. Note sheared off screws. Note rafter is pushed ¾" into drywall.

Photo 2 – damaged rafters (foreground) and undisturbed rafters (background). Note the gap between drywall and studs that is present in background but not in foreground.

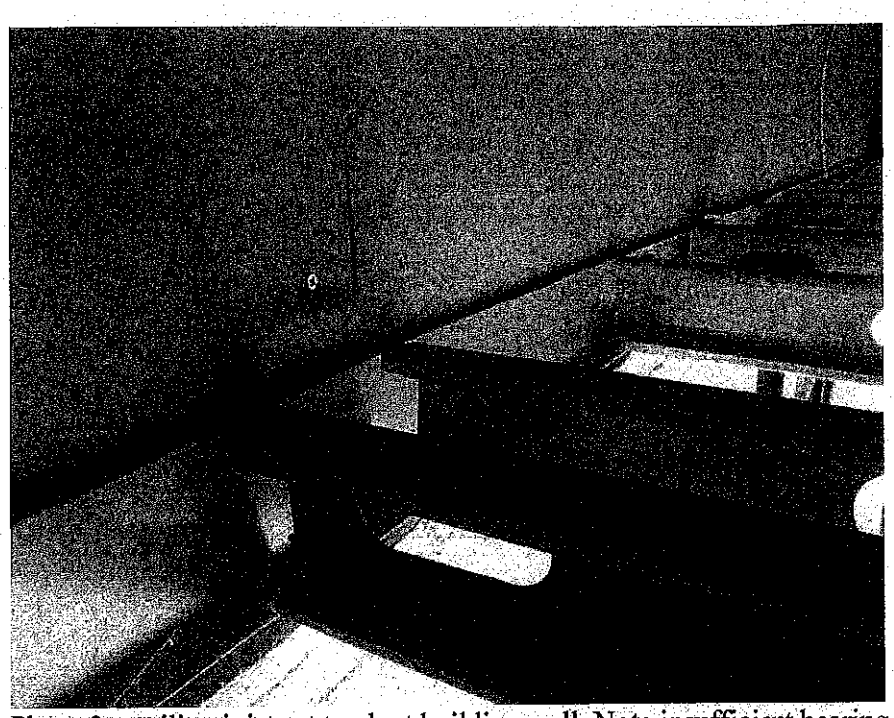


Photo 3 – ceiling joists at track at building wall. Note insufficient bearing. Note screws were not installed in both flanges.

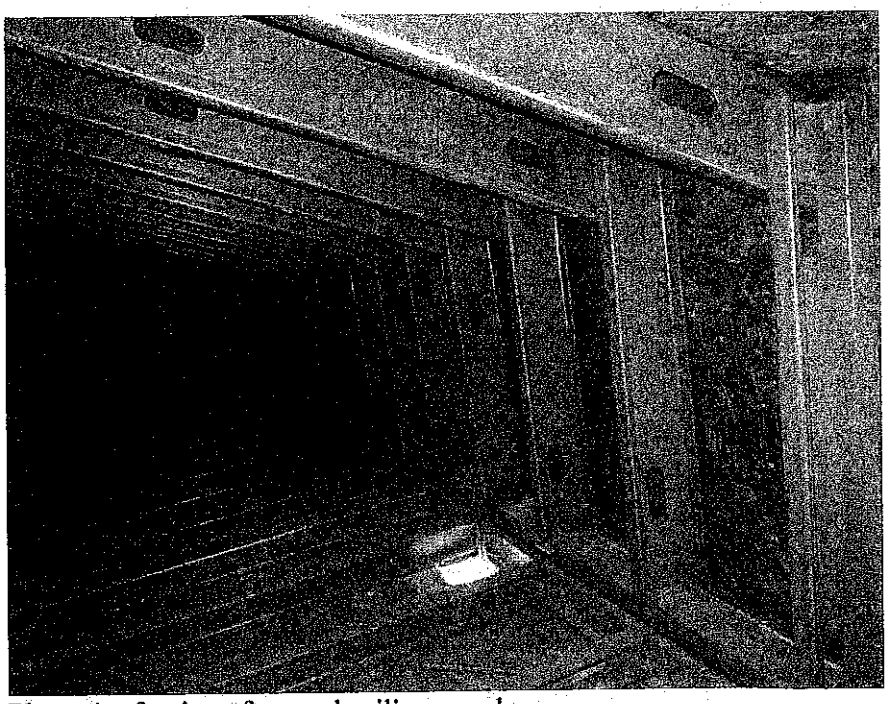


Photo 4 – fascia, rafter, and ceiling members

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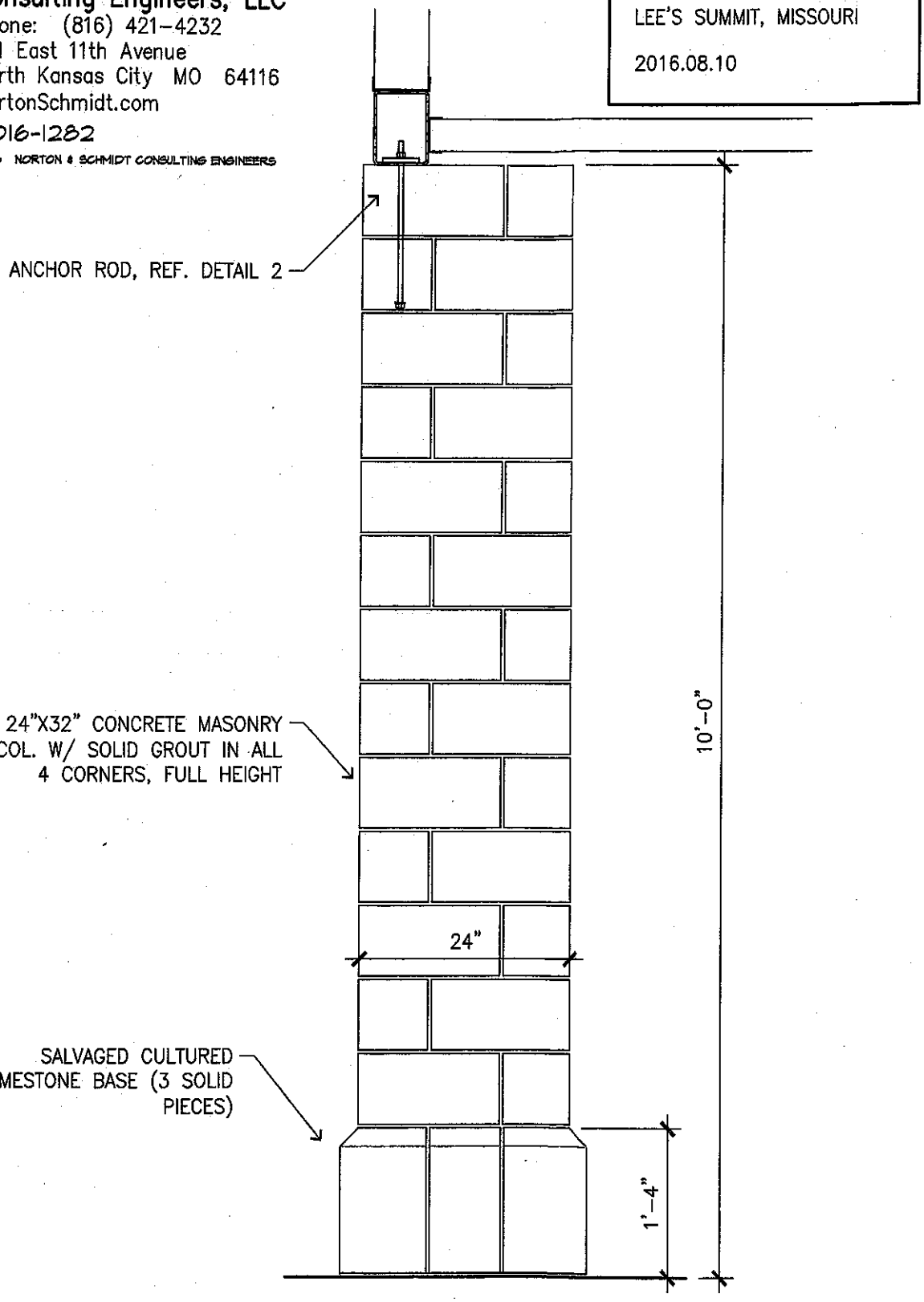

1 MASONRY COLUMN - ELEVATION

SCALE: 3/4" = 1'-0"

DETAILS 016

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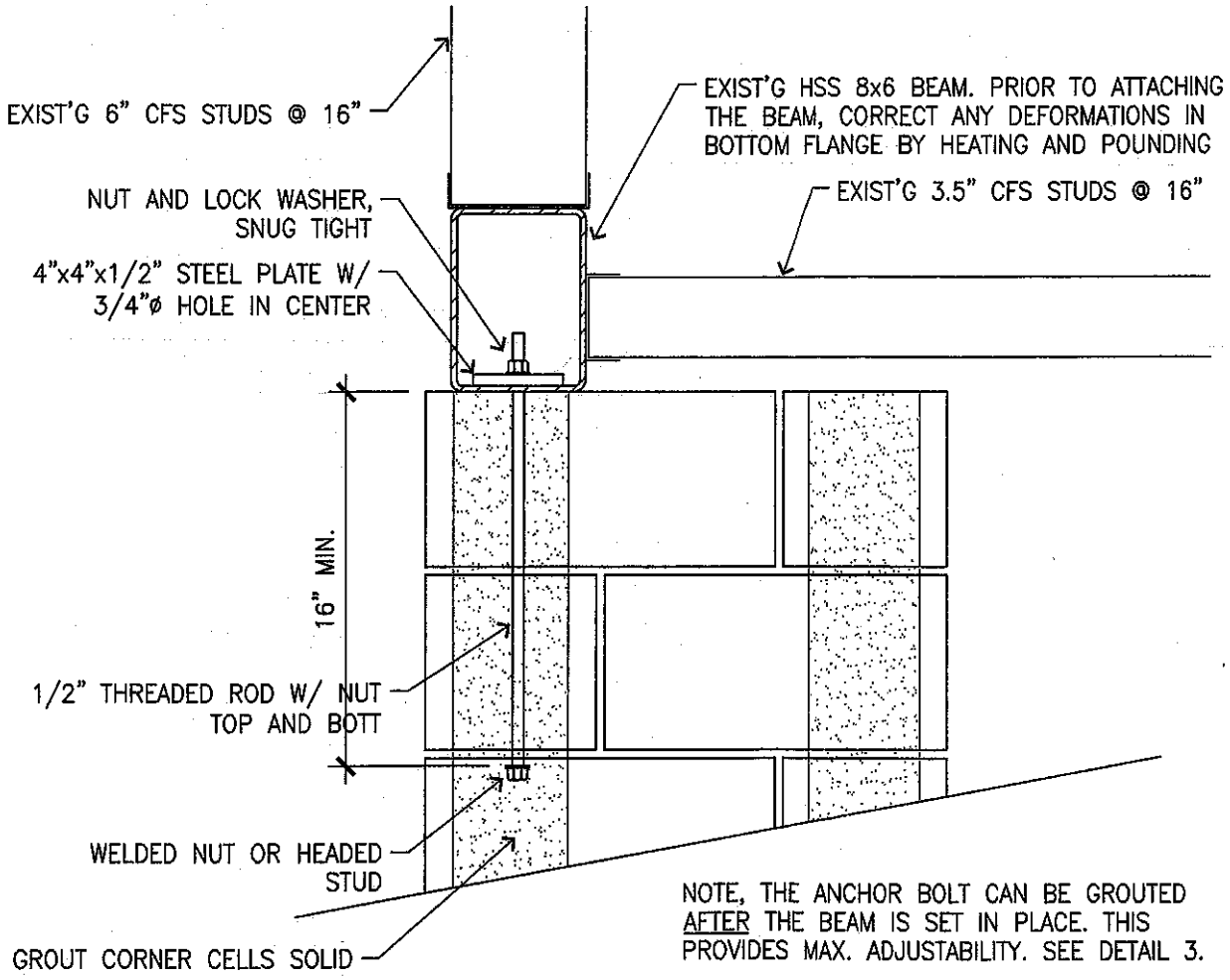

2 BEAM CONNECTION DETAIL

SCALE: 1 1/2" = 1'-0"

DETAILS 008

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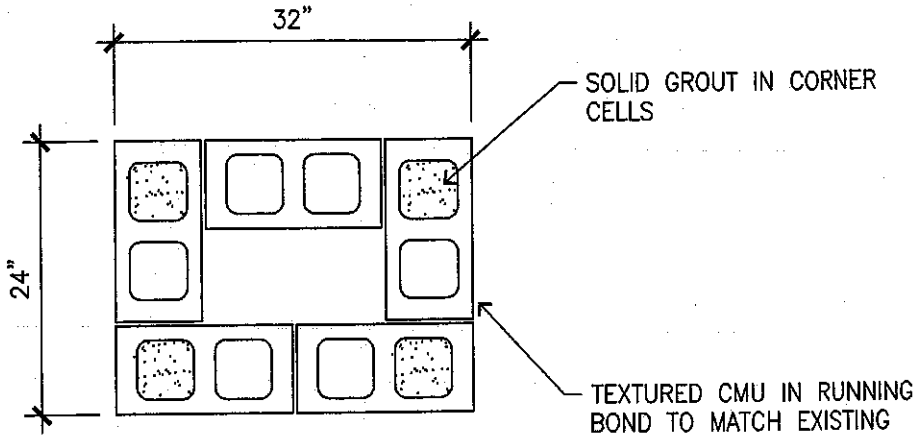
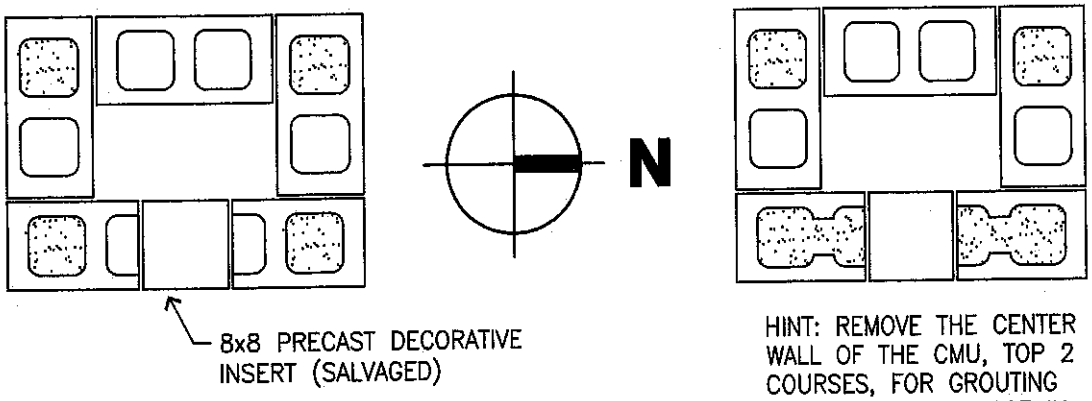


STANDARD



HINT: REMOVE THE CENTER WALL OF THE CMU, TOP 2 COURSES, FOR GROUTING AFTER THE BEAMS ARE IN PLACE.

DECORATIVE

3 MAS. COL – CROSS SECTIONS

SCALE: 3/4" = 1'-0"

DETAILS 016