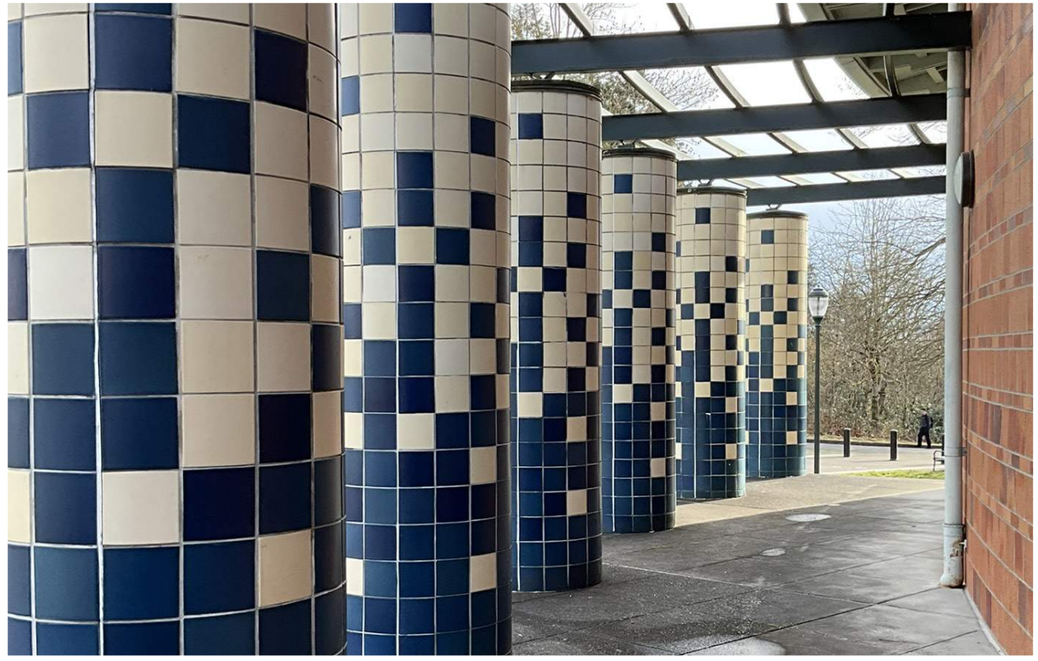

DENGERINK TILE COLUMN REPAIR

WASHINGTON STATE UNIVERSITY - VANCOUVER
C/O FACILITIES SERVICES, CAPITAL
P.O. BOX 641150
PULLMAN, WA 99164-1150

CONDITION ASSESSMENT
APRIL 2025

DRAFT

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INTEGRITY | STEWARDSHIP | BALANCE | LEADERSHIP

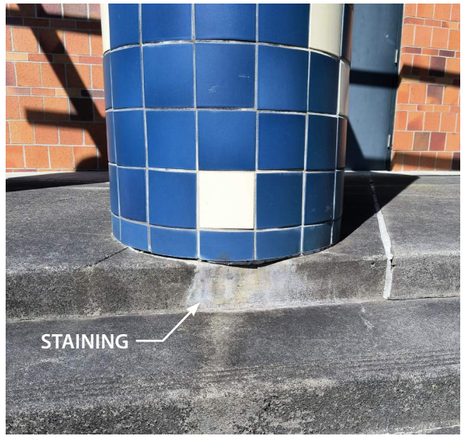
PETER MEIJER ARCHITECT, PC

◀ *Figure 1: (L) Central steel tube protrusion above column cap.*

◀ *Figure 2: (R) Column cap edge, sealant joint, and drip flashing.*

◀ *Figure 3: (L) Column tile profile showing the tile is radiused.*

◀ *Figure 4: (R) Square column tile measurement.*



◀ *Figure 5: (L) Concrete staining directly below overhanging purlin above.*

◀ *Figure 6: (R) Tile substrate thickness.*

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Figure 7: Twelve tiled columns located at the Dengerink Administration Building.

Figure 8: Twelve tiled columns located at the Dengerink Administration Building.

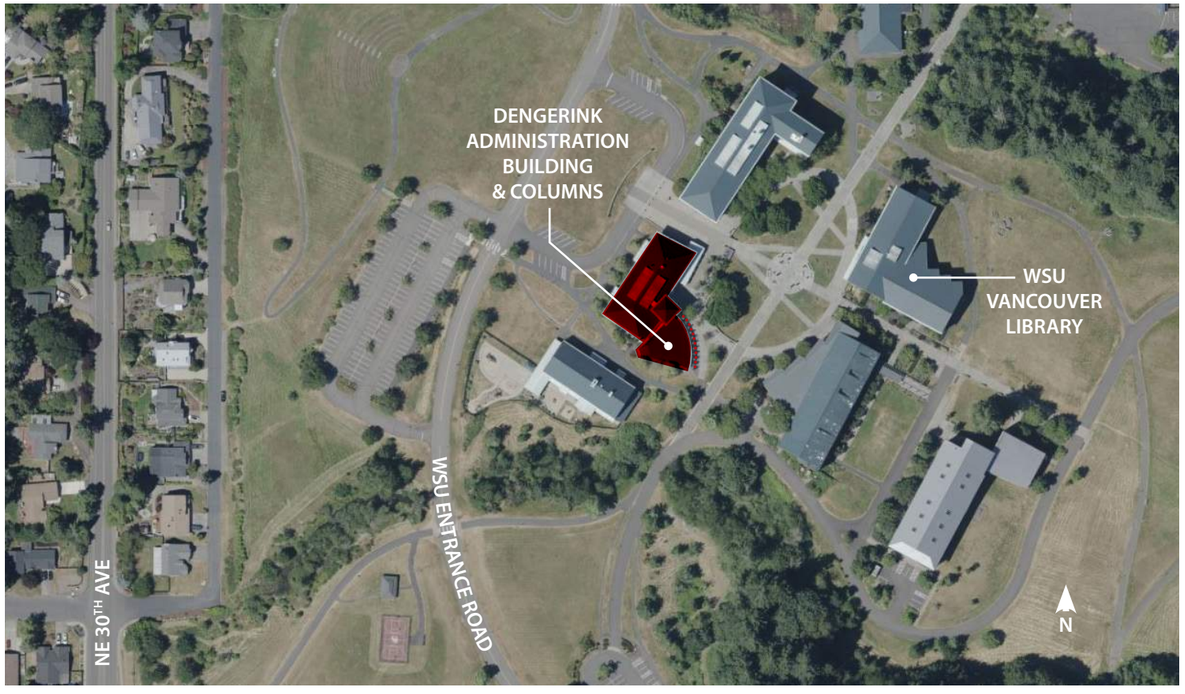


Figure 9: Aerial map of the WSU Vancouver Campus.

Executive Summary

General Scope

Washington State University (WSU) retained Peter Meijer Architect, PC (PMA) to provide a condition assessment of the tiled columns located at the exterior of the Dengerink Administration Building. The assessment and report include the following tasks:

- Review existing building construction documents related to the column design.
- Provide an initial site visit and assessment of existing conditions, limited to the columns.
- Provide options and recommendations for repairing and preparing the columns for a new art installation.
- Provide long-term solution recommendations to better protect the art installation.

The condition assessment was conducted by PMA over two site visits. The first visit was on February 4, 2025 and the weather was partly sunny and 55 degrees Fahrenheit. The second visit was on April 18, 2025 and the weather was sunny and 65 degrees Fahrenheit.

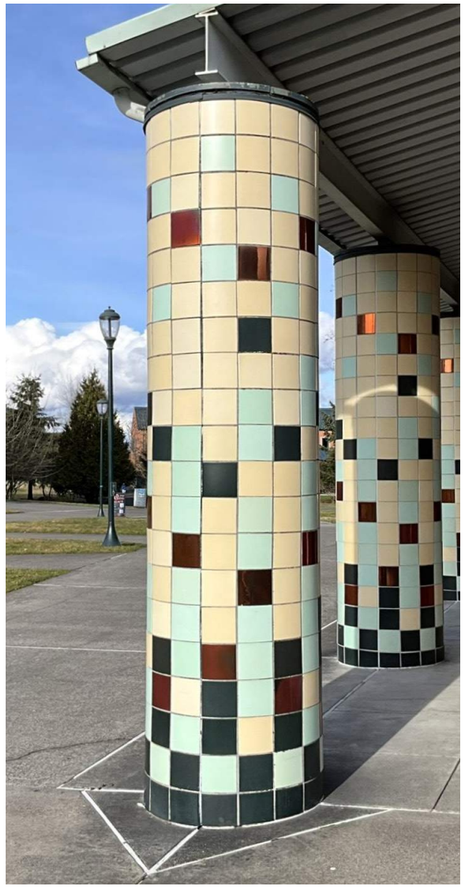
Existing Conditions

"Dengerink" Columns

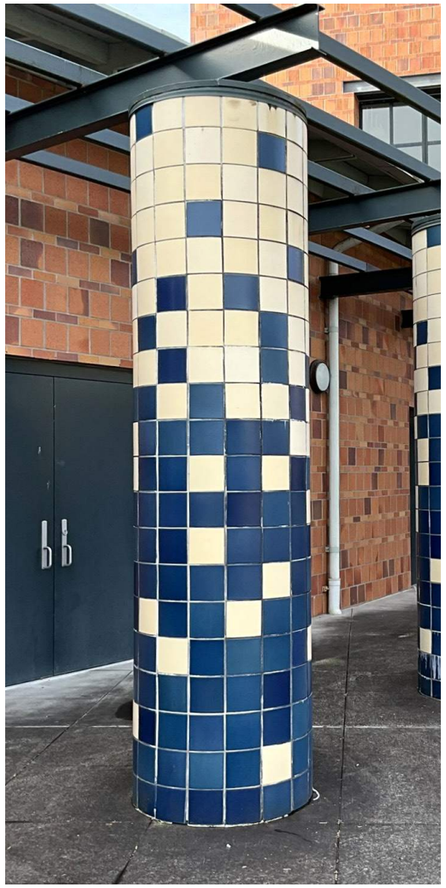
The assessed columns are located at the Dengerink Administration Building, west of the Firstenburg Family Fountain quad on the south side of WSU's campus. The twelve (12) columns are arranged in an arc along the east façade of the buildings south lecture hall (see Figures 7-9). Each column is approximately 10'-0" in height and 2'-7" in diameter (see 1/G-01 and 5/G-01).

According to existing construction documents, the columns are structurally comprised of a central steel tube anchored at the base in a concrete footing (see 2/G-01) and at the top to a steel trellis (see 3/G-01). The steel trellis structure is comprised of twelve (12) I-beam shaped purlins radiating out perpendicular from the east façade of the building, tied together by five equally spaced rows of tube steel running parallel to the building façade (see 1/G-01). The purlins align with the vertical centerline of each column, extending past the centerline by 2'-0". Each purlin is attached to each central steel column via a welded bent plate shaped similar to a hat channel (see Figure 16).

◀ *Figure 10: Seven tiled columns located at the WSU Vancouver Library.*



◀ *Figure 11: (L) WSU Vancouver Library tiled column.*



◀ *Figure 12: (R) Dengerink Administration Building tiled column.*

Existing Conditions

PMA accessed two columns' caps and assessed the detailing and condition of the cap sheet metal (see Figure 13). PMA observed each column cap is comprised of four (4) sheet metal quadrants, sealed with a backer rod and sealant at the seams between each quadrant and between the sheet metal and central steel tube (see 5/G-01 and Figures 14 & 24), which protrudes approximately 1-1/2" above the cap (see Figure 1). At the outer edge of each column the quadrants of sheet metal terminate at a joint between the sheet metal and drip edge flashing transition at the top of the tile (see 4/G-01 and Figures 2 & 17). The joints between each cap quadrant and the joints between pieces of drip edge flashing are staggered (see Figure 15).

Each column is tiled with twenty (20) rows and sixteen (16) columns of six (6) inch square radiused front-face matte glazed tiles (see Figures 3, 4 & 12). The tiles are comprised of varying shades of blue and off-white arranged in a pixelated gradient from blue at the bottom of each column to off-white at the top. The tile are set in a layer of grout skimmed onto a substrate layer of cement mortar on metal lathe; PMA confirmed the thickness of the grout, cement mortar, and metal lathe combined is approximately 2" (see Figure 6). The substrate sub-structure is comprised of steel stud outer framing and horizontal steel angles (every 3'-0" vertically) built out from the central steel column (see 5/G-01). PMA confirmed the steel stud substructure; the bottom tracks were installed over an isolation base material visible between the concrete pavers and tracks (see Figure 26). Each column has two vertical control joints (see 5/G-01).

Columns Comparison

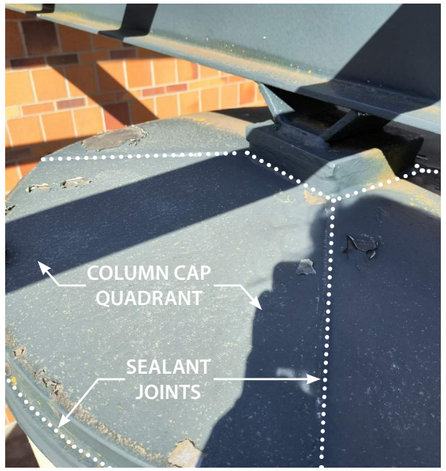
There are seven (7) columns of similar construction and tile work located at the west façade of the WSU Vancouver Library building entry on the east side of the quad. Notably, the tiles on these columns are not spalling off. PMA briefly assessed these "Library" columns to help make determinations as to why the "Dengerink" Administration Building columns have tile failure, and made the following observations when comparing the two sets of columns, compiled in the table below.

The most notable, visible difference in construction method between the two sets of columns is that the "Library" columns have a full roof, whereas the "Dengerink" column tops are exposed with only an open trellis overhead (see Figures 10-12). This difference in exposure between the two sets of columns most likely accounts for the various observed failures of the "Dengerink" columns assembly. Other contributing factors are discussed in the next section.

Deficiencies

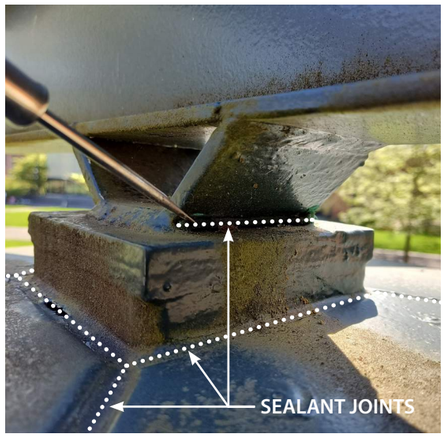
Given PMA's observations of the existing condition of the "Dengerink" columns, and compared with the existing condition of the "Library" columns, PMA found that there are four factors likely responsible for the existing damaged condition of the "Dengerink" columns: water intrusion, movement, installation means & methods, and non-standard detailing. Water intrusion is the highest likely cause of deterioration, while the other factors are contributing.

	"Library" Columns (no visible damage) ***(not in scope – for comparison only)***	**"Dengerink" Columns (damaged)**
Year Constructed	c. 1994-1996	c. 1994-1996
Roof / Covered	Yes, full roof	No, open trellis
Top Connection	Small, continuous I-beam with welded bent plate connection	Small, continuous I-beam with welded bent plate connection
Ground Condition	Concrete pavement with regularly spaced control joints centered on columns	Concrete pavement with irregularly spaced control joints relative to columns
Tile Type / Construction	Unknown	Mfr: unknown; Product: unknown; Matte glazed; 6" square ,radiused tile set in grout on cement mortar / metal lath substrate
Probability of Physical Impact (by person or object)	High; located at entry	Medium; not along major path of travel; located at lecture hall exits
Wind-driven Rain Exposure	High	High
Water Exposure at Ground Level	Moderate; tiles meet concrete but at least 50% of each column has cover provided by roof	High; tiles meet concrete and are exposed to water on all sides
Location of Most Tile Damage	None observed	Lower half of columns, typically facing away from building



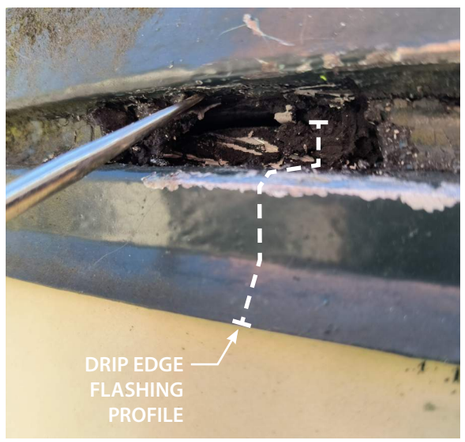
◀ *Figure 13: (L) Overall column cap and trellis connection.*

◀ *Figure 14: (R) Quadrants of column cap.*



◀ *Figure 15: (L) Staggered joints of column cap and drip edge flashing.*

◀ *Figure 16: (R) Sealant at welded joint; dirt build-up from water running over cap.*



◀ *Figure 17: (L) Sealant joint between cap and drip edge flashing; flashing leg turned up at back of joint.*

◀ *Figure 18: (R) Efflorescence staining at repointed tile joints.*

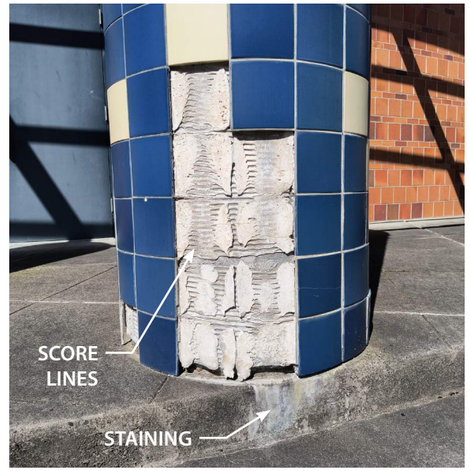


Figure 19: (L) Scoring lines in exposed grout where tiles have fallen off. ▶

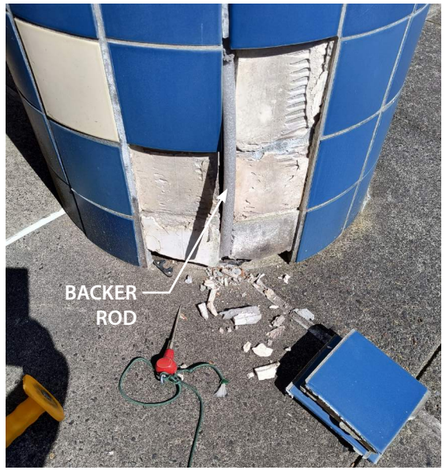


Figure 20: (R) Backer rod at vertical control joint between tiles; tile spacer at ground. ▶

Figure 21: (L) Spalled tile glaze. ▶

Figure 22: (L) Light fixture mounted atop steel trellis. ▶

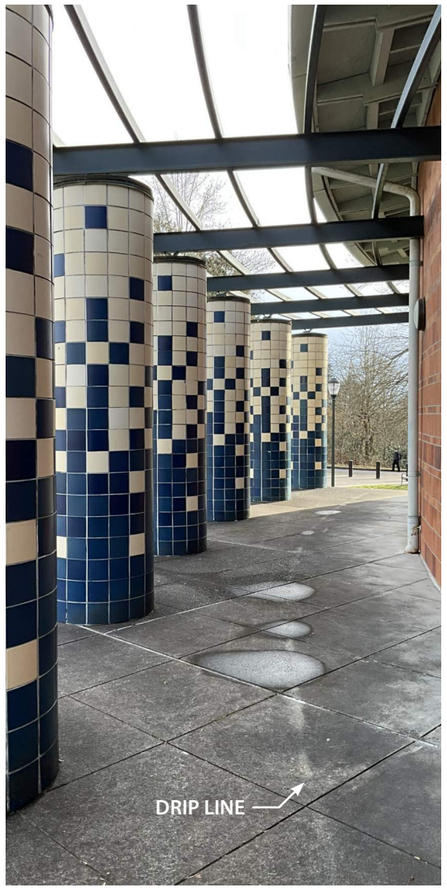
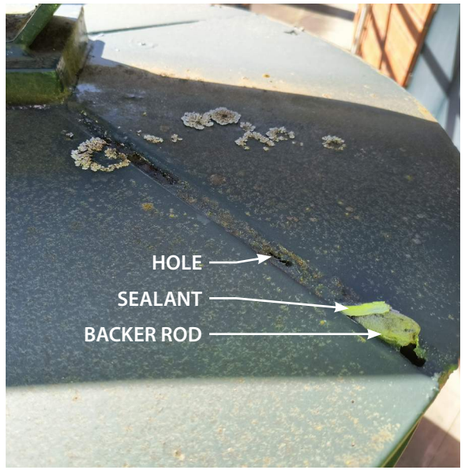
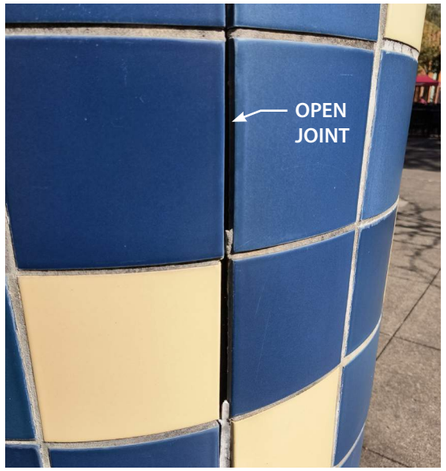


Figure 23: (R) Drip line on concrete below gutter. ▶



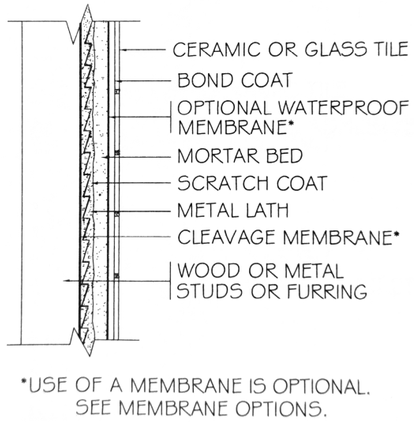


◀ *Figure 24: (L) Open sealant joint at column cap with backer rod exposed.*

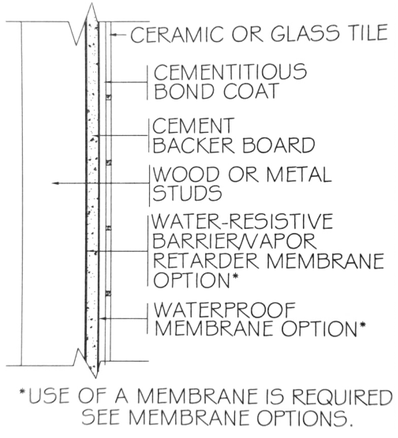
◀ *Figure 25: (R) Open vertical joint at column face between tiles.*

◀ *Figure 26: (L) Isolation base material laid below steel framing tracks at ground level.*

◀ *Figure 27: (R) Corrosion of framing tracks and base of steel studs. Corrosion was not observed on visible areas of studs above ground level.*



TCNA: Interior Tile Assembly Detail



TCNA: Exterior Tile Assembly Detail

◀ *Figure 28: (L) TCNA Interior Tile Assembly Detail.*

◀ *Figure 29: (R) TCNA Exterior Tile Assembly Detail.*

Deficiencies

Water intrusion can lead to damage when water that enters a structure becomes trapped and/or reaches materials that were not designed to be wetted or to mitigate water. Based on PMA's observations, water intrusion is likely occurring at the following locations:

- Open joints at sky-facing sheet metal caps (see Figure 24)
- Wind-driven rain at open joints between tiles (see Figure 25)
- Capillary action at ground level drawing water up into the tile substrate (see Figures 19 & 27)
- Additional water dripping from the steel trellis structure, as evidenced by staining (see Figures 5, 16 & 19)
- Water trapped within column due to a lack of weeps and/or the use of excessive sealant as evidenced by efflorescence (see Figure 18)

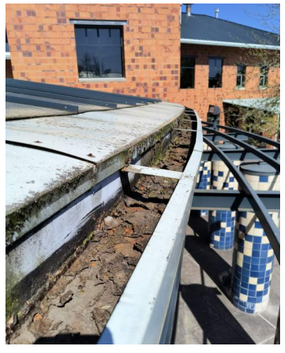
Movement, installation means & methods, and non-standard exterior tile assembly detailing all contribute to creating conditions that allow for additional water intrusion and lead to visible deficiencies such as failed sealant and cracked or missing tiles.

Movement includes structural, thermal, and impacts from people or objects. The expansion and contraction of the steel and metal framed structure may have contributed to existing damage by shifting and cracking the tile substrate which is tied directly to the metal framing. It should also be noted that the original tile details (see 4 & 5/G-01) do not identify control joints between any tiles, although control joints were incorporated into the tile installation as evidenced by backer rods installed at vertical joints (see Figure 20). A lack of adequate control joints could contribute to undue pressure between tiles, causing cracking and spalling (see Figure 21). Any cracking or spalling of tiles and substrate allows for water intrusion which further degrades these materials.

Installation means & methods may contribute when the improper installation of one or more components leads to failure. In multiple locations where tiles are missing, visible scoring can be observed in the grout which suggests that the tiles were not fully adhered to the substrate when applied (see Figure 19). Water intrusion behind tiles that were not fully adhered may have contributed to them falling off.

Non-standard detailing refers to exterior tile design details that do not reflect industry standards. PMA referenced industry standard tile detailing provided by the Tile Council of North America (TCNA), an American National Standards Institute (ANSI) accredited standards developing organization. When comparing the "Dengerink" columns details to TCNA's standard interior (see Figure 28) and exterior (see Figure 29) tile assembly details, the existing column assembly detailing (see 4 & 5/G-01) more closely matches TCNA's interior assembly, which is not designed for exterior weather exposure. Although the cement mortar generally appears intact where exposed, upon removing some cement mortar at the base of a column, PMA was able to observe portions of fully corroded bottom track steel framing, and portions of highly corroded metal lath (see Figure 27). This corrosion demonstrates that water is becoming trapped in the columns and causing the degradation of structural and tile assembly materials. This is further supported by the presence of efflorescence at some joints that appear to have been repointed (see Figure 18). PMA also confirmed the existing tile assembly does not include a water-resistant barrier, a key component of water mitigation in exterior tile assemblies.

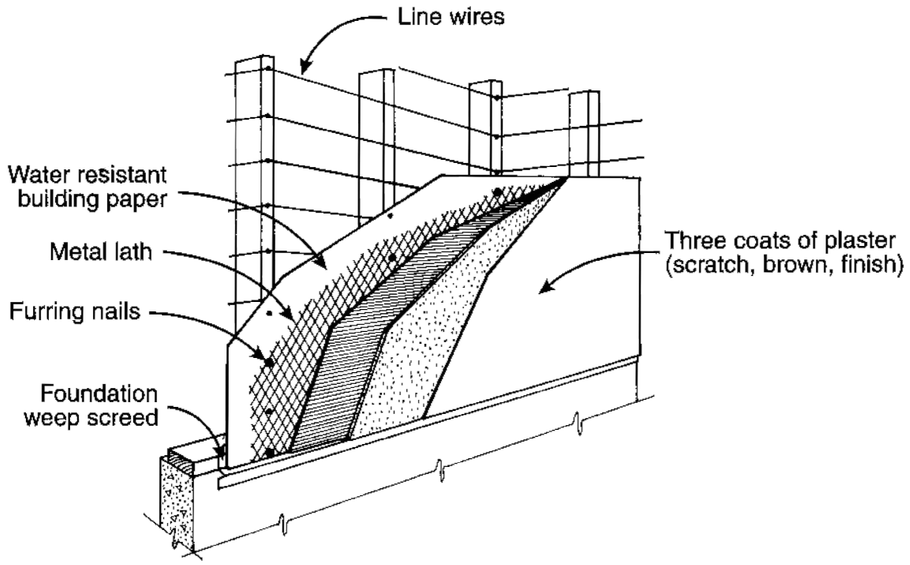
Unrelated to the "Dengerink" columns, PMA noticed the adjacent gutter system of the auditorium roof appears to be leaking as evidenced by a semi-continuous drip-line on the concrete directly below the gutter (see Figure 23). PMA visually assessed the gutter and confirmed it is not filled with debris (see Figures 30-32), but was unable to confirm where the gutter is leaking from given the dry conditions during both site visits.



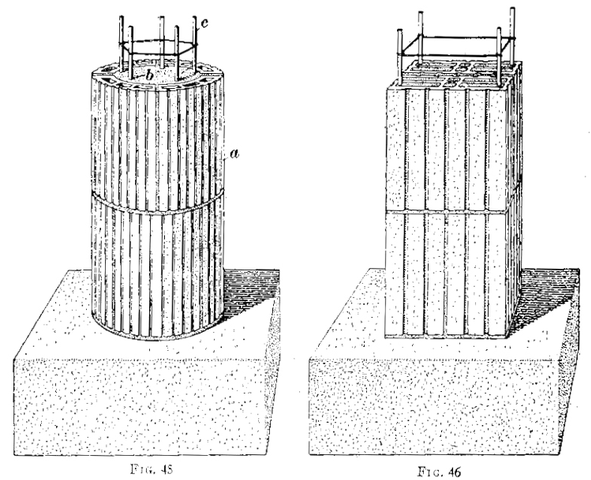
◀ *Figure 30: (L) Roof gutter, looking south.*

◀ *Figure 31: (C) Roof gutter, looking north.*

◀ *Figure 32: (R) Side and bottom of gutter.*



◀ *Figure 33: Example of a stucco assembly over studs. (Portland Cement Plaster / Stucco Manual, 5th Ed., 2007)*



◀ *Figure 34: Example of hollow clay tile columns. (Hollow Tile Construction and Stucco Finish, 1924)*

Recommendations

Below PMA has provided recommendations for either repairing or rebuilding the "Dengerink" columns, depending on the goals and needs of WSU. Conceptual options for a new partial or full roof over the columns, and options for improving the existing column cap detail, are also included and may be combined with either the repair or rebuild recommendations for a holistic solution. In general, **PMA recommends providing a roof over the columns and repairing the column caps, and can assist WSU in determining whether to repair or rebuild the substrate and substructure of the columns.**

Repair

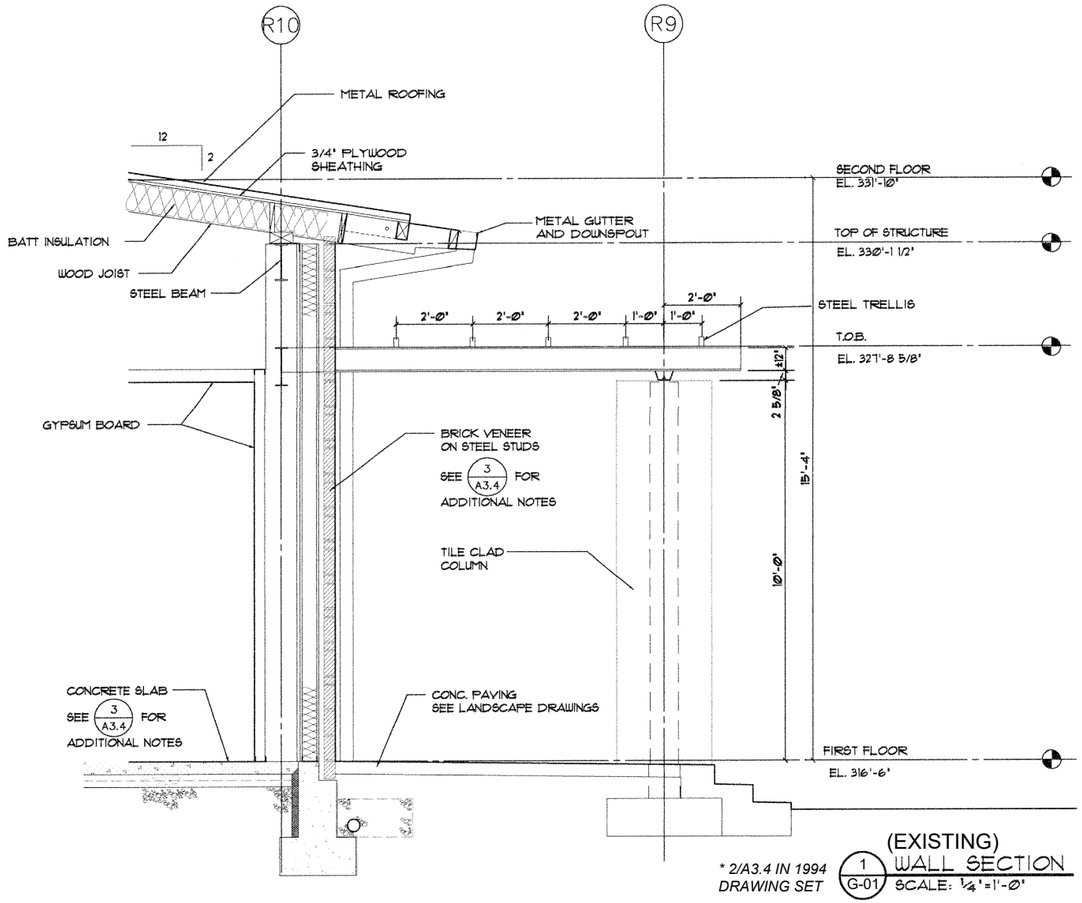
- Remove all existing tile from columns.
- Assess whether to repair or replace cement mortar substrate depending on condition of substrate, condition of sub-structure, and construction costs to repair or replace one or both. Demolition of substrate and framing to allow for rebuilding the columns may be more cost efficient than repair.
- If repairing: provide repairs to cement mortar substrate and prepare substrate to accept new artwork. Substrate should be smooth and acceptable for specified art.
- If rebuilding: see next section.
- Provide column cap repairs if new roof will be installed. Replace column caps with a more resilient design if there will be no roof.

Rebuild

- Remove all existing tile, substrate, and framing material from columns, leaving only central structural steel tube intact.
- Rebuild the columns using one of the following material methods:
  - Stucco: Rebuild a new steel stud substrate sub-structure, with base tracks raised off of ground level to protect from moisture, and install a new stucco assembly. The stucco will provide an appropriate substrate for new paint or tile art. This option is most similar to the existing construction and the least expensive. (See Figure 33)
  - Pre-cast or Hollow-Tile Blocks: Rebuild each column out of pre-cast or hollow-tile blocks which will provide a durable, smooth substrate for art. This option is simple to install and has a high degree of longevity. (See Figure 34)
  - Concrete: Pour solid concrete columns, which will provide a durable, smooth, appropriate substrate for most art. This option is most expensive, but has the most longevity.
  - Metal: Re-frame each column to accept a metal panel or steel shell design. This option is similar in expense to stucco, but may limit artistic options due to the thermal changes inherent to metal.
- Provide column cap repairs if new roof will be installed. Replace column caps with a more resilient design if there will be no roof.

Roof Options

- Option 1 - Full Roof: Provide a new roof structure tied into existing steel trellis. PMA recommends isolating the new roof from the existing building wall. The option shown slopes the new roof towards the building and terminates under the eave of the existing roof, clear of the exterior wall, with a rear gutter tied into the existing downspout system for water management. Many design options are possible and can be determined based on WSU's preferences. Provide repairs to existing column caps. Note there is an existing light fixture on top of the trellis that will require relocation. (See 1, 4 & 5/A-01)
- Option 2 - Partial Roof: Provide a new partial roof structure tied into existing steel trellis, but located only overhead of the columns. The option shown matches the existing roof slope. Many design options are possible and can be determined based on WSU's preferences. Provide repairs to existing column caps. Note there is an existing light fixture on top of the trellis that will require relocation. (See 2, 4 & 5/A-01)
- Option 3 - Column Cap Only (No Roof): Provide a new column cap of a more resilient design (see 3/A-01). Conceptual variants of the column cap design are also provided. (See 2 & 3/A-02)
- Option 4 – Art Installation: Given the extensive repairs or rebuilding required to prepare the "Dengerink" columns for new art, WSU has an opportunity to integrate more complex and/or interactive art into one or more of the columns. This concept demonstrates an example of interactive art. (See 1/A-02)



* 2/A3.4 IN 1994 DRAWING SET

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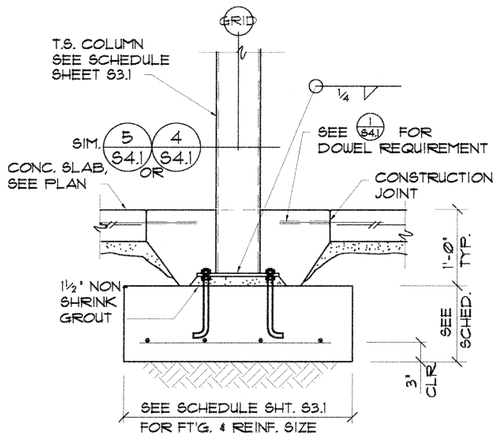

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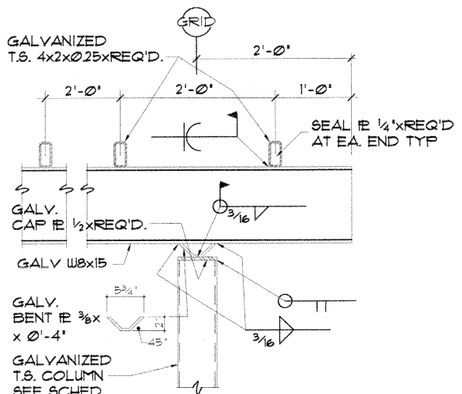

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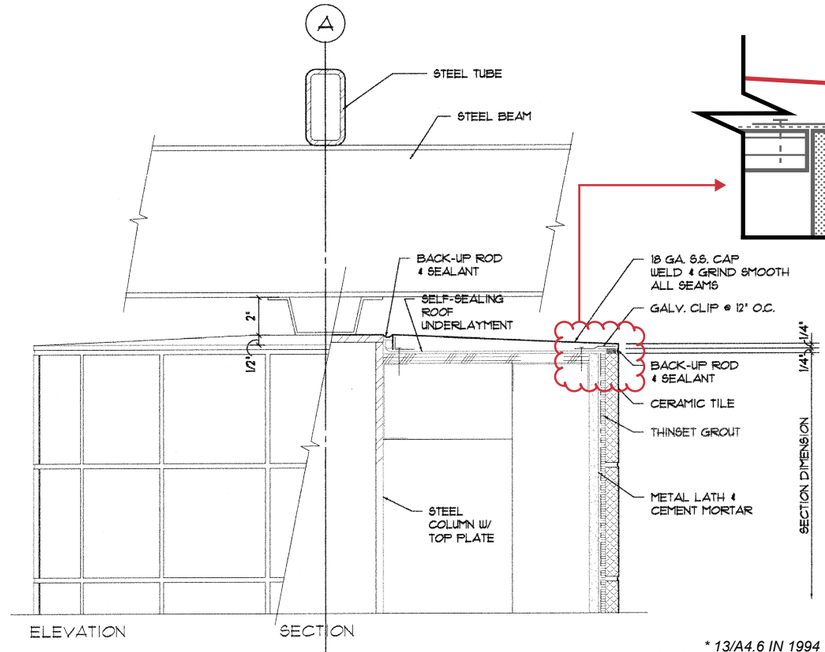

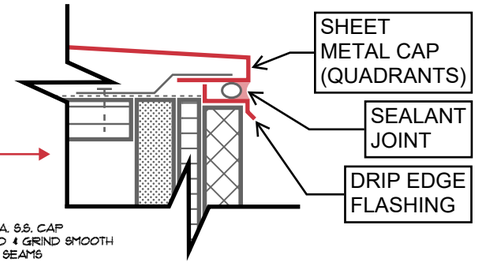

4 / G-01 TRELLIS & COLUMN - ELEVATION & SECTION (EXISTING)
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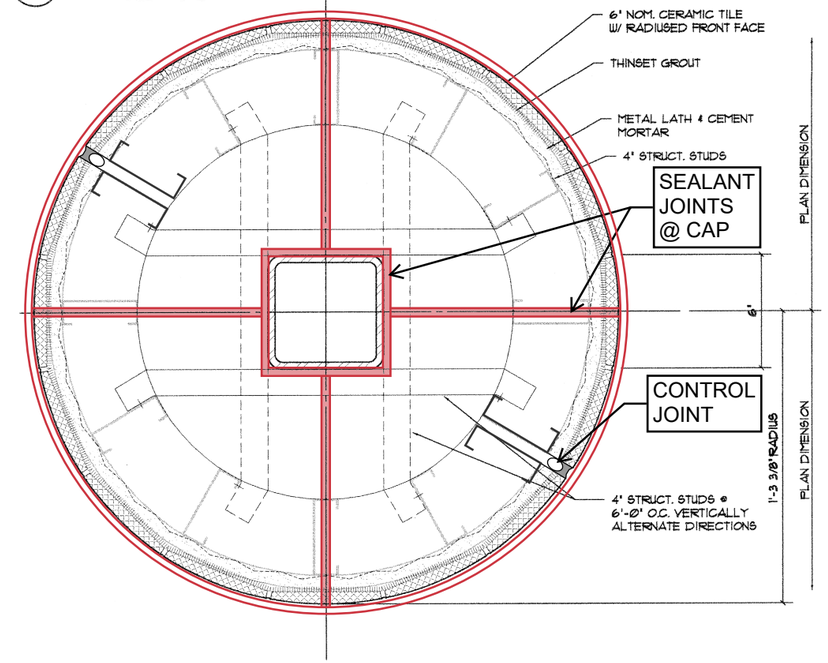
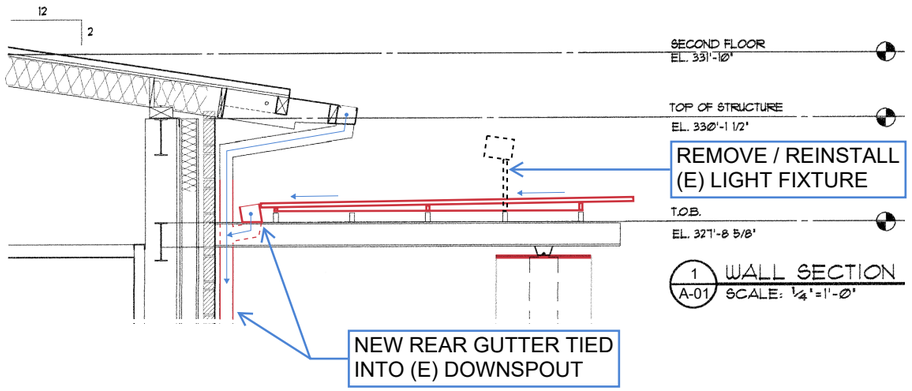


5 / G-01 TILE COLUMN (EXISTING)
SCALE: 1-1/2" = 1'-0"
* 15/A4.6 IN 1994 DRAWING SET

5/G-01 DRAWING NOTE: SEALANT JOINTS AND CONTROL JOINTS AS SHOWN ARE NOT PART OF ORIGINAL DESIGN; JOINTS ARE SHOWN TO REFLECT EXISTING CONDTIONS.

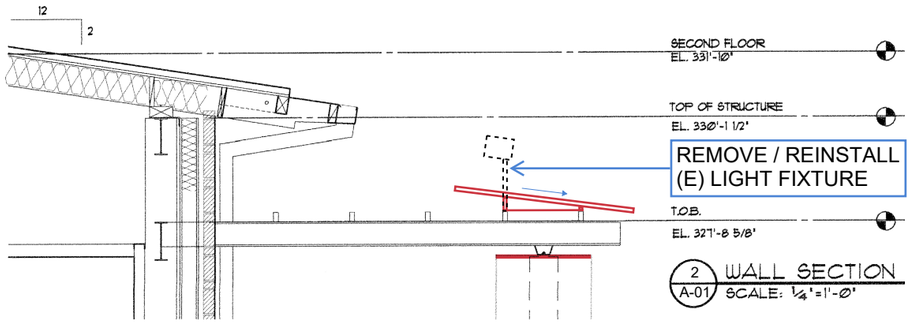
GENERAL NOTE: DETAILS FROM EXISTING DRAWING SET ARE PROVIDED FOR REFERENCE ONLY AND MAY NOT MATCH BUILT CONDITIONS. ALL EXISTING CONDITIONS SHOULD BE VERIFIED IN FIELD.

Appendix



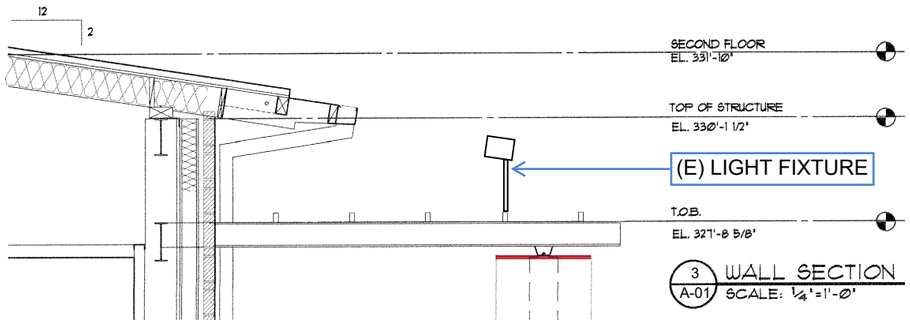
1 A-01 WALL SECTION
SCALE: 1/4"=1'-0"

OPTION 1: FULL ROOF
- new full roof install over top of columns and trellis
- roof slope towards building with rear gutter tied into existing downspouts (final design to be determined by WSU preference)
- column cap repair (see 4 & 5/A-02)



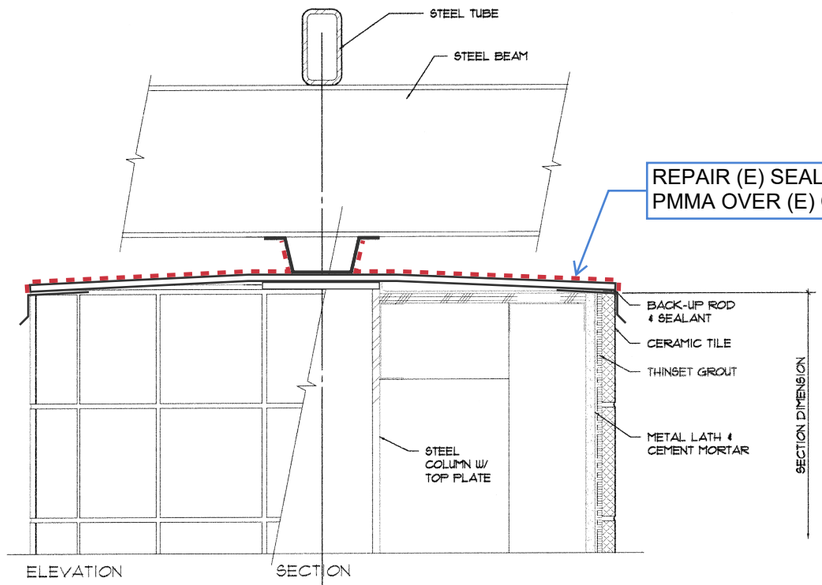
2 A-01 WALL SECTION
SCALE: 1/4"=1'-0"

OPTION 2: PARTIAL ROOF
- new partial roof install over top of columns and half of trellis
- roof slope matches existing roof slope (final design to be determined by WSU preference)
- column cap repair (see 4 & 5/A-02)

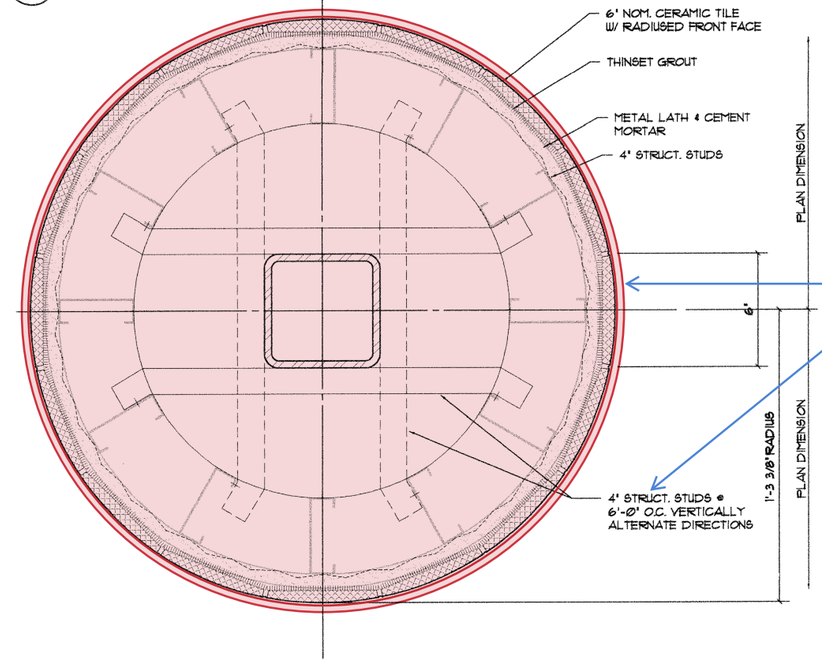


3 A-01 WALL SECTION
SCALE: 1/4"=1'-0"

OPTION 3: COLUMN CAP ONLY (NO ROOF)
- new column cap design to mitigate sky-facing water intrusion issues
- for conceptual variants, see details 2 & 3 on A-02



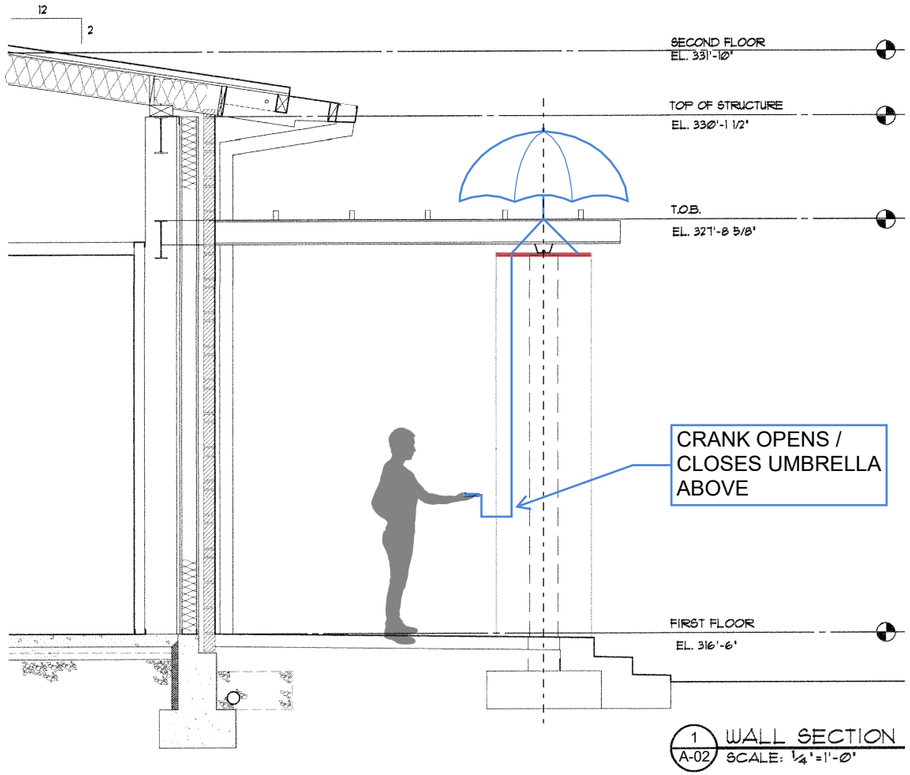
4 A-01 TRELLIS & COLUMN - ELEVATION & SECTION
SCALE: 3" = 1'-0"



5 A-01 TILE COLUMN
SCALE: 3" = 1'-0"

GENERAL NOTE:
DETAILS ARE NOT FOR CONSTRUCTION; SKETCHES CONVEY CONCEPTUAL OPTIONS FOR WATER MITIGATION AT SKY-FACING PORTION OF COLUMNS.

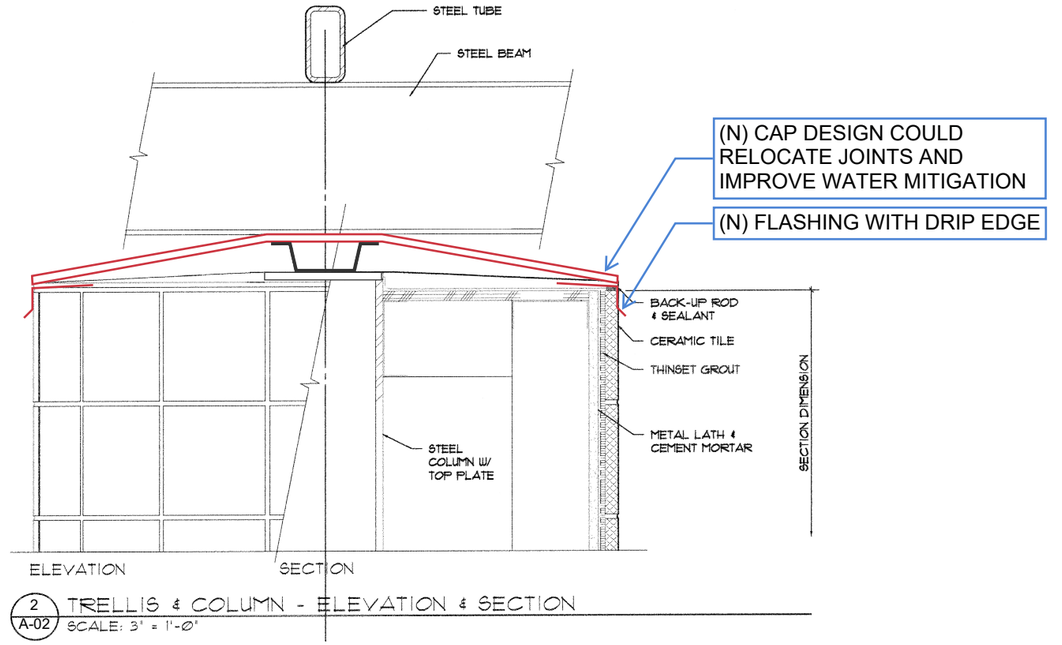
Appendix



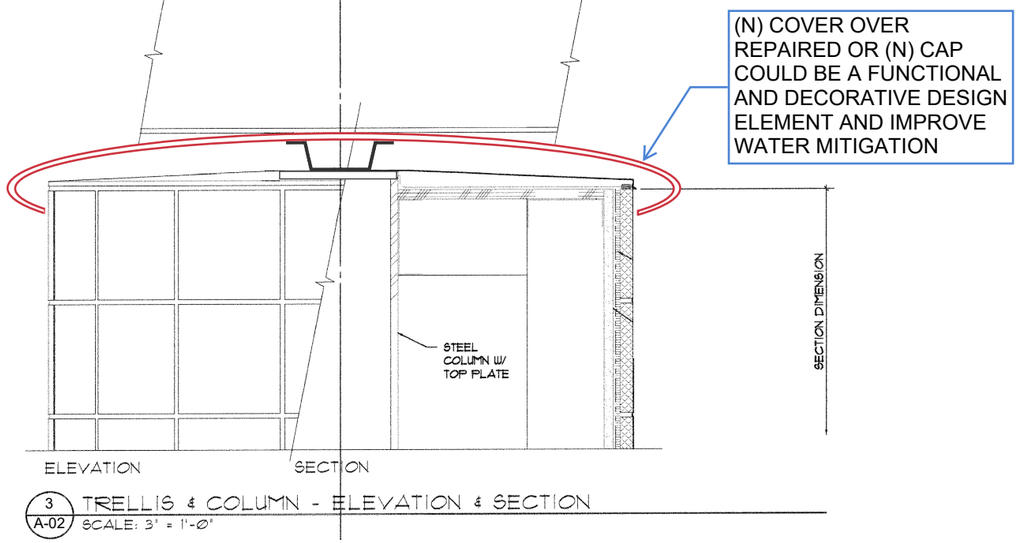
1 A-02 WALL SECTION
SCALE: 1/4" = 1'-Ø"

OPTION 4: ART INSTALLATION
- given the extensive repair and/or rebuild required to prepare the columns for new art, there is an opportunity to integrate more complex and/or interactive art
- this concept demonstrates an example of interactive art wherein a passerby may choose to open or close an umbrella for the column via a simple crank mechanism

GENERAL NOTE: DETAILS ARE NOT FOR CONSTRUCTION; SKETCHES CONVEY CONCEPTUAL OPTIONS FOR WATER MITIGATION AT SKY-FACING PORTION OF COLUMNS.



2 A-02 TRELLIS & COLUMN - ELEVATION & SECTION
SCALE: 3" = 1'-Ø"



3 A-02 TRELLIS & COLUMN - ELEVATION & SECTION
SCALE: 3" = 1'-Ø"