CopelandBEC Engineering Study Addenda, Notes, and Errata

From: Sharon Britton and John Patrick
Date: Oct. 8, 2022

Comments/replies from CopelandBEC on 10/11/22 are in red.

Thank you to the Board and to Copeland BEC for giving us the opportunity to review the Bay Square Building Condition Assessment. We were both former Bay Square board chairs during periods of major renovations, and through our participation hope to inform the process by filling in gaps with information and details that may not be well documented and also by asking questions concerning conditions about which either one or both of us have knowledge and experience.

Many thanks to Copeland for submitting such a thorough and thoughtful assessment and analysis of existing conditions, and for examining in more detail those areas of the building where we have known concerns or questions. This report will stand as a very helpful roadmap and prioritized schedule for addressing deficiencies in the years ahead.

Most surprisingly helpful is your "Project Background and Document Review" section which offers a cohesive picture of the building's original structural design and subsequent efforts to repair former deficiencies. This timeline is particularly helpful given that we have recently lost a reliable source of our long-term institutional memory with the retirement of our former superintendent Joe Andrade.

Below we list a few recommended items; omissions, corrections and clarifications, and a few questions:

OMISSIONS -- **Most, if not all items below are undocumented as noted:**

- 2016 – Extensive pool & spa renovation – old stucco removed and pool and spa both completely relined, leaks mitigated, coping replaced, some drain modifications to meet code and some plumbing work performed in pool room and spa. This work was performed by Weston and Sampson of Boston, and was, in our judgment, substandard and involved litigation.
- Oct. 2017 – Exterior vertical and horizontal expansion joints replaced throughout the building by CCI Building Restoration and Waterproofing, North Hampton, NH. Contract was for $107,000. Omitted from this work was the lower southeast wall which is well overdue for attention.
- May, 2018, replacement of caulking on pool deck and patio and around planters by CCI of North Hampton, N.H.
- June 2018 – Also, by CCI, a variety of miscellaneous waterproofing and concrete reconstruction projects, the largest of which was reconstruction of deteriorated steps located at the northwest side of the building leading down to Bay Street. Details of various projects are included below. Complete contract $27,800.

Work Area - Outdoor stairs from front of building to Bay Street:

1. Replace concrete stairs with 3000 psi concrete with a broom finish
2. Repair both sides of brick knee wall along the stairs
3. Refasten the handrail
4. Repoint mortar joints as needed on the capstones of knee wall

Work Area - Units PH3, PH4, PH5, PH6:

1. Repair and/or replace the capstones as needed
2. All capstones will receive LCC flashing

Work Area - Front entrance:

Repair trip hazard at the front entrance. Grind down approximately 8'

Work Area - Front door of C-3 and loading dock:

1. Replace a 3' and a 6' metal threshold

Work Area – East Side:

1. Repair capstone and install stainless steel pins

- 2021-2022 - Waterproofing , deck-caulking work to repair leak the along base of wall at west end of the pool deck to correct leaking into a unit below. Work done by Allstar Waterproofing of Stoughton.

CORRECTIONS/CLARIFICATIONS:

Page 6, last paragraph – Bay Square has 114 units (110 residential, 3 commercial, one [G1] garage unit)

Page 9 - Please correct stated American Leak Detection findings. Note: Report did not include a Legend or Key Plan for windows. Will add leaks at L4 (and C-7?), C1-5 and C3-4 to report
Leaks detected in windows at G-4, L-1 (Window tested and not found to be leaking but spray test on outside masonry wall below window revealed water infiltrating interior wall cavity through bricks well below window.) Leaks also found in L-4, L-5, L-6 and C1-5 and C3-4. Fixed window in residential unit 105 tested and found not to be leaking. SB has provided key plan for windows.

(Note: only shorter fixed glass windows with areas of internal wall beneath were tested. Full length windows that sit on granite sills were not tested. Additional review of fixed windows and masonry recommended as indicated in report
Legend: G=gym, L=Lobby, C1= Dumpling House and U-Break-I Fix; C2= Language Institute, (not tested); C3=California Cryobank.

Page 10: Re. "Mr. Andrade indicated that there are no known active or ongoing water leaks into the building," we believe that JA was referring only to exterior envelope leaks, as he was aware of some water infiltration into the pool room and east wall of the upper lower garages and Green Street garage from above.

Page 12: Please note restoration of first floor west side balcony (104-105). Unit 104-105 noted as replaced in 2017 (all work included Bituthene per plans) This was done a with a Bituthene membrane vs. Sarnafil, as site conditions required this. Work done by Alpha Waterproofing of Somerville as part of planter restoration project.

Page 16: Note: The brick size noted here may be incorrect; pool wall brick used was cored Utility 3-5/8" x 3-5/8" x 11-5/8", rather than: "The brick is a "Norman" sized (3-5/8" x 2-1/4" x 11-5/8") clay brick veneer." Noted height of brick 3-5/8" which is a Utility Brick, will correct in report.

QUESTIONS:

Page 11. Report mentions replacement of roofing for nine "small balconies". Are these the small penthouse balconies and does the "nine" include the balcony associated with the Penthouse machine room? Just want to know if that penthouse balcony has been replaced. Nine included the mechanical penthouse balcony. Joe Andrade indicated that balcony membrane was replaced when we inquired.

Page 14. "Condition of existing balcony roof/waterproofing systems flashings and roof drains is unknown." (What should we conclude from this finding? Do these need systematic review or do we assume they are functioning unless problems arise and will be replaced when they reach their life expectancy?) Access to majority of balconies and terraces was limited in assessment. Reference Page 33 of Discussions, Conclusions and Recommendations – Additional terrace and balcony review is recommended to check visible flashings, random areas of pavers supports/roof membrane and internal drains under pavers.

Page 20. North elevation, fifth floor sealant issue. Owner has been complaining about leaking at this slider. Please explain recommended approach here. Can't we just remove and reinstall the slider correctly, or is there another issue that needs addressing? This area was added while we were performing our assessment on site and not included as a focus area in the scope of work. Reference Page 21 and defects observed in area. This can be included in additional areas of review.

Page 25. Please explain what was done in Water Test 1 and 2 and what were the findings. Which windows were chosen for testing and why? Water test 1 & 2 results as listed – no leaks detected. Extensive water testing was not included in this initial assessment. Additional review recommended.

Page 33. Since "further review" of East wall is needed for "pursuant masonry restoration/ repair design and repairs" should we work on ivy removal in the interim? This can be discussed at meeting.

Page 35. Does the 2017 expansion joint replacement alter recommendations for timing of control joint sealant replacement specified here? Possibly. Life expectancy of sealant depends on product (urethane or silicone) product data/documentation?

Page 36. What does the following consist of: “additional review with vertical access to review representative quantities of the window sill pan sealant terminations at the jambs and leading edges of the aluminum flashings” Lift access? Is this necessary to determine if there should be an organized attempt to repair failed window sealant joints? Representative information and further sealant cuts/review of joint/sill pan design needed to confirm scope of work and recommended repair method/design. Aerial lift will be required.

Page 38: A1 - Priority Areas and Cost Estimates—Please explain what these cost estimates include and do not include: In instances where further engineering investigation is needed, do cost estimates include the development of RFPs to address each project? Also what engineering investigation is required for the limited jobs of repairing the first floor drains and addressing the roof skylights? Item A1 is structural scope recommended by Tripi Engineering – reference Appendix C – report - Scope can be clarified in meeting. Various scope of work items listed (aside from additional engineering review) will require some level of engineering design, bid and construction administration with fees TBD. Garage drains at first floor are two drain areas that require a contractor to remove loose/cracked/damaged concrete (small scope and back check of work to confirm that hazard has been addressed). Roof skylights include specifying OSHA compliant fall hazard skylight cages with contractor bid/pricing and oversight. This can be discussed further at the meeting.

Roof anchors can be left in as a placeholder, but if we can access the sides of the building using the kind of roof overhang staging used recently to wash windows, we might not opt to install roof anchors. We originally sought out roof anchor bids because it appeared at the time that this might be the only option (besides full staging) we could use to meet OSHA standards for crews working on the sides of the building tethered from the roof. Apparently, the industry has since figured out a safe alternative. Reference A1 and Appendix C for additional information on roof anchor review and recommendation.

Page 40 – PRIORITY 2 - B1 Terrace (lobby) waterproofing. How do you waterproof behind the planters without disturbing the membranes and waterproofing inside the planters? Can this be done from inside the lobby rather than dismantling the planters? Item B1 applies to Unit 106 terrace. Additional review recommended at Masonry and fixed windows will address this aspect. In general, waterproofing of a back-up wall in an exterior cavity wall cannot be performed from the interior.

Page 41 - PRIORITY 3 - Upper Garage – can we wait 5 years to do the upper garage? Item was placed at Priority #3 however; this item can be moved up in priorities timeframes.

Bay Square Condominiums

950 Massachusetts Avenue
Cambridge, MA

Building Condition Assessment

CopelandBEC Project# 22024

September 28, 2022

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Executive Summary

Copeland Building Envelope Consulting (CopelandBEC) was tasked by Thayer & Associates, Inc. in c/o Bay Square Condominium Association (T&A-BSCA) to perform a condition assessment study of the building envelope and structural systems at the Bay Square Condominiums. The condominium building/complex was constructed around 1988-1989 and occupies approximately half of a city block located on Massachusetts Avenue in Cambridge, Massachusetts.

The building has had various periodic building envelope work and upgrades (known from 2002 to as recent as 2021). Some building envelope systems have yet to be upgraded and other upgraded systems have aged and now require either maintenance work or upgrading. Many of the original building envelope systems appear to correlate to the specific areas where the client has requested we conduct additional review, typically at areas where past or ongoing water leakage is reported to occur. Please refer to the following report for detailed information on all systems. In summary, we recommend further investigation (for condition assessment, scope of work, priorities and budget costs) of the following building components and systems:

- structural areas including pool equipment room, garage areas, loading dock driveway and loading and other areas (Reference Appendix ‘D” for additional information)
- selected fixed aluminum windows and associated masonry through-wall flashings (review and consider potential window replacement due to being original to 1989 building)
- safety and make safe recommendations
- various building envelope repairs for leaking areas, further review and selected repair design

Our assessment includes the following building envelope systems, summarized recommendations and approach methodology:

<u>Roofing</u>

- low slope roofs - repairs and upgrades for existing systems to assist in systems reaching life expectancy
- steep-slope roofs - Repairs and upgrades for existing systems to address conditions causing masonry staging and deterioration and assist in roof systems reaching life expectancy

- balconies and terraces - Replacement of Unit 106 original 1989 systems with upgrades to restore waterproofing and address leaking into garage area(s) - general review of balconies and terraces for existing conditions and required maintenance

Exterior Walls

- masonry restoration work to address masonry staining, mortar joint deterioration and excess water infiltration/cycling - restoration and maintenance
- masonry control joint sealant replacement (near-term and mid-term)- restoration and maintenance
- window pan sealant removal and replacement - restoration and maintenance
- fixed aluminum window and/or wall flashing repairs - to address current leaking

Parking Garages, Loading Dock/Driveway and Pool Equipment Room Area

- concrete repairs, plumbing systems replacement and protective coating systems - restoration and maintenance
- structural concrete evaluation and repairs - restoration and maintenance

As indicated, please refer to our report for additional information and order-of-magnitude cost estimates for recommended items. Please also note that items have been set in priority areas on fundamental requirements and may be modified based on further detailed evaluation items, available capital and other T&A-BSCA needs and decisions.

We look forward to reviewing the report with T&A-BSCA to take the next steps for the property.

Introduction

Copeland Building Envelope Consulting (CopelandBEC) was tasked by Thayer & Associates, Inc. in c/o Bay Square Condominium Association (T&A-BSCA) to perform a condition assessment study of building envelope and structural systems at the Bay Square Condominiums located at 950 Massachusetts Avenue in Cambridge, Massacussets. Our assessment was conducted in general accordance with the applicable procedures defined in ASTM E2018-2015 Standard Guide for Property Condition Assessments: Baseline Property Condition Assessment Process.

Our assessment includes a review of available documents relating to the building's envelope and structural systems as provided by T&A-BSCA.

We performed an on-site assessment of the building's visible building envelope and structural systems to document existing conditions and identify areas of deterioration. Our assessment included a visual assessment of exterior building walls from grade using binoculars, accessible roof areas, representative and accessible interior spaces, and parking garage areas.

As requested by T&A-BSCA, we also include a more detailed review of the following specific areas of building envelope concern per T&A-BSCA's March 15, 2022 Request for Proposal (RFP):

- first floor fixed-glass windows (commercial units on Mass. Ave. and back of building lobby and gym)
- first floor wall between lobby and patio
- water infiltration into the upper parking garage (east elevation)
- east foundation wall
- pool equipment room at upper parking garage level (under pool at patio/plaza)

Project Background & Document Review

We understand that the existing 7-story residential condominium building consists of 109 units and was constructed in 1988/1989. The large urban site occupies approximately half of a city block located on Massachusetts Avenue in Cambridge, Massachusetts. The building includes three ground floor commercial tenant units and a small on-grade fenced-in plaza at the building's north elevation (Massachusetts Avenue), and a private exterior patio/plaza area with a pool and planters at the south elevation of the site. The building includes a two-level enclosed parking garage at the lower levels of the building with access provided via Bay Street on the building's west elevation. A cast-in-place driveway and loading dock integrated with a concrete

retaining wall is located at the northeast corner of the site with driveway access from Massachusetts Avenue.

The building is a steel framed structure with exterior brick veneer walls and precast stone elements at limited wall areas . Fenestrations include “punched” sliding windows, storefront fixed style fixed windows with storefront entrances. The majority of the residential units include sliding exterior doors with Juliet style guardrails. Some residential units at various building levels and elevations include balconies or rooftop terraces. The building includes a steep slope mansard style roof at the perimeter of the building’s upper floor level with low slope membrane roofs at central roof locations.

T&A-BSCA provided the following documents to CopelandBEC for review with our our noted pertinent information as follows:

- Limited original design drawings prepared by Unihab Design Inc. and dated February 23, 1987. Drawings include mechanical floor plans and a set of structural drawings.
    - structural drawings indicate that the floor design for the lower garage is a reinforced 6” thick concrete slab-on-grade
    - upper garage floor design is a 14” deep x 6” wide x 36” long cast-in-place reinforced concrete rib/beam system with a 4” thick concrete topping slab (total 18” deep) floors supported by reinforced concrete columns
    - exterior walls at the upper garage wall design is a 10” wide, cast-in-place reinforced concrete wall and at the lower garage is a 15” wide wall
    - the 3rd, 4th, 5th 6th and 7th (penthouse) floor levels are designed with 2”-20 GA. composite galvanized metal deck with 3-1/4” lightweight concrete supported by structural steel columns
    - the roof level (above the 7th floor) is designed with 2”-20 GA. composite galvanized metal deck with a sloped lightweight concrete (2-1/2” minimum to 5” maximum) supported by structural steel columns
- Certified Deed Floor Plans dated March 19, 1989 -CADboston, Boston, MA
    - floor plans utilized for building components and features reference in report

- Masonry repairs drawings (elevations/details) dated November 22, 2002, by CBI Consulting Inc., Boston, MA.
    - scope of work on the drawings included masonry repairs, exterior sealant removal and replacement at floor brick relieving angles, control joints, overlay joints at windows and doors, roof/masonry metal flashing upgrades at dormer rising walls and loading dock repairs and coating
- Bay Square renovations drawings (windows/sliding doors replacement and limited masonry repairs) dated September 30, 2013, by Davis Square Architects, Cambridge, MA.
    - scope of work on the drawings included window removal and replacement with fiberglass framed windows, new aluminum sill pans and selected door removal and replacement. Scope included targeted acrylic domed skylight replacement (2 of 6 total skylights) and small areas of miscellaneous, randomly located masonry repairs at the exterior wall areas
    - scope of work included trimming existing window flanges, preparation work and sealants at window perimeters
    - windowsill pans were noted to be set in bead of sealant to brick rowlock sills
    - sill pan detail at brick jambs not indicated
- Window sill detail shop drawing submittal dated August 22, 2014, reviewed by Building Restoration Services Corp., Boston, MA and David Square Architects, Cambridge, MA.
- Installation shop drawings submitted dated August 14, 2014, from Architectural Support Services; reviewed by Building Restoration Services Corp. Boston, MA and David Square Architects, Cambridge, MA.
- Planters and deck repair drawings and project manual dated December 21, 2017, by CBI Consulting Inc., Boston, MA.
    - Drawing scope included planter waterproofing repairs with associated planter wall cap flashing and masonry repairs. Project included converting a portion of the east planter into a terrace area with new waterproofing, pedestal supports and precast concrete pavers.

- proposal from American Anchor, Foxboro, MA dated January 2, 2018 for installation of AN.163-BTRA1414 Toggle Anchor Pinching Concrete Deck
- project specification for Tieback and Lifeline Anchor dated May 4, 2018, by General Safety Services, Canton, MA
- bolt-through Roof Anchor Detail dated June 24, 2021 by Cliff Hangers, Boston, MA and review dated July 12, 2021, by SGH, Waltham, MA
    - Document review revealed extensive anchor layout, noted bolt-through connections, structural scope not included, proposed costs provided.
- various roof anchor proposals and specifications varied in anchor installation methods, anchor quantities and layouts
- capital Needs Assessment and Replacement Reserve Analysis Report dated October 5, 2021, by On-site Insight, Boston, MA
- leak detection report for grade level windows at lobby, gym/fitness room and commercial units (No Date on Report-T&A-BSCA indicated date of April 2022) by American Leak Detection, Boston, MA
- exterior wall/window leak testing at lobby, commercial spaces and gym resulted in window leaks in windows L1, L5, L6, C3, and C4. Exterior wall review with moisture meter at areas adjacent to windows revealed signs of moisture at windows G4

CopelandBEC met with Mr. Joe Andrade who has been the Facilities Manager/Superintendent for the building since 1989. Mr. Andrade indicated/reported that several building envelope restoration and repair projects have occurred at the building since 1989, and to his recollection, approximate dates and other project information are generally as follows:

- 2002-2003 - limited facade and steep slope roof repairs were performed on the building
- 2008-2010 - parking garage repairs including miscellaneous concrete repair and traffic coating application at the upper parking garage level
- 2009 - the main low slope roofs were removed and replaced with Sarnafil PVC membrane roof systems, including at the following roofs; seventh floor main, cooling tower, penthouses, second floor at the southwest side of the site, and at the small sixth balconies

- 2012-2015 - miscellaneous concrete repairs at the loading dock driveway and loading dock bumper wall
- 2013 - renovations including window replacement, select door and skylight replacement, and a limited quantity of localized masonry repairs
- 2013 - roof terraces with green roofs were removed and replaced at the sixth floor level at Units 613 and 608
- 2017 - planter restoration at seven exterior planters at the patio/plaza and pool area - the planter at the east side of the pool area was split into two sections with the Northern end being converted into more plaza space with concrete pavers on pedestals
- 2018 - limited pool plumbing and pool stucco finish restoration work
- 2020 - roof terraces at sixth floor level at Units 606 and 607 (south elevation) were removed and replaced
- 2021 - roof terraces at sixth floor level at Units 615 and616 and the 2nd floor main entrance portico/balconies (for Units 202 and 203) (north elevation) were removed and replaced
- 2022 - lobby renovations including limited exterior wall remediation and back-up wall sheathing removal replacement

As indicated by the significant list of restoration and repair projects since 2002, the T&A-BSCA has been periodically active in building envelope repairs (particularly roofing) at the building. Mr. Andrade indicated that there are no known active or ongoing water leaks into the building and noted the facility has an active annual roofing inspection and maintenance program with M.J. Ambrose Enterprises for the various roof systems of the building. It was reported that an area of roof penetration flashing associated with the new hot water mechanical systems venting in 2021 was performed by M.J. Ambrose Enterprises at the 7th floor roof area. Miscellaneous plumbing repairs for the drain systems of the parking garage have also been ongoing periodically in 2020-2022.

Field Observations

John Karman and Kiran Sam Thomas from CopelandBEC visited the Bay Square Condominium building on July 12, 2022, August 4, 5, and 12, 2022, to participate in a preliminary site review meeting with T&A-BSCA and to conduct a building envelope and structural assessment. We performed our visual review from grade, plaza, and accessible roof areas. We conducted our assessment from accessible areas with the

aid of binoculars and an aerial drone equipped with a camera to provide a closer review at building envelope locations not directly accessible for a hands on review.

While on-site on August 5, 2022, we met with our structural sub-consultant Mr. Matt Tripi and James DeSelle of Tripi Engineering Services, Inc. (TES) who conducted the structural portion of the building assessment. TES also performed a second site visit on August 29, 2022, to complete the structural field review. We also met with our aerial photography sub-consultant Mr. John Francis of Prime Aerial Photography for an aerial drone survey equipped with an on-board camera to review the exterior walls and steep slope mansard roof areas of the building.

Our observations are outlined below, generally separated based on building components. **Please also reference Appendix 'C' for floor plans with building systems locations including roofs, balconies, terraces, plaza/patio and parking garage areas.**

Roofing

The building's roofing systems consist of both low-slope membrane roof systems and steep slope shingle systems. The steep slope roof systems include mansard style shingle roofs with dormers at the entire perimeter of the 7th floor and at the lower 2nd floor portion of the building. There are numerous low-slope roofs (some used as terraces and balconies) at multiple levels of the building that vary in size and types of overburden. The roofs were reportedly replaced at various times from 2009 up to as recently as 2020. The low slope roof areas, locations and general roof information is as follows:

- main roof (with cooling tower and two elevator penthouses) - above the 7th floor - replaced in 2009 - exposed roof membrane
- small balconies - nine total - above 6th floor - replaced in 2009 - precast concrete roof paver overburden
- large roof terraces - six total - above 5th floor - replaced in 2013, 2020 and 2021 - green roofs at terraces at Unit 613 and 608 - precast concrete roof paver overburden at the balance of large terraces
- lower roof (southwest building) - above 2nd floor - replaced in 2009 - exposed roof membrane - roof area includes two small balcony areas with precast concrete paver overburden at Unit 207 and 208
- small balconies - two total - above first floor (entrance portico) - replaced in 2021 - precast concrete paver overburden

- medium roof terraces - four total - above upper garage level - Unit 104 and 105 replaced in 2017, Unit 106 original to 1989 building, planter converted to terrace area at east side replaced in 2017

7th Floor Low-slope Roof

- L-shaped, 7th floor, low-slope roof area includes two, 1-story brick penthouses at the east and west side of the roof area with low-slope roofs that drain onto the main roof via scuppers and downspouts (Photo 1)
- roof system terminates to penthouses with base wall flashing (varies in height from 5" to 8") and two-piece metal through-wall/counterflashing, signs of past through-wall flashing height modifications were observed at various areas of the penthouse walls
- a cooling tower roof is adjoined to the west roof penthouse with brick masonry and louver screen walls (inside surfaces of screen walls waterproofed with EPDM roof membrane)
- existing low slope roofing systems are adhered PVC membrane systems manufactured by Sarnafil, Inc. in Canton, MA. The roof assembly likely includes an adhered roof cover board over the roof insulation (roof surface is firm underfoot and no fastener distribution plates were observed telegraphing through the roof membrane). The roof system includes mechanically fastened batten strips at the roof perimeter areas
- pvc walkway pads at select areas of the roof
- roof system perimeter includes varying parapet heights (+/-24" high at west side of roof area and +/- 6" high at east side of roof area) with continuous aluminum edge metal that transitions from the top of the parapet wall to the steep-slope mansard roof system
- roof system includes mechanically fastened batten strips at the roof perimeter areas
- roof drainage is provided by approximately ten internal roof drains with strainer baskets in approximately 4'x4' sumps (1 drain at east side of roof was observed to be an insert style, retrofit roof drain)
- roof accessories include mechanical rooftop equipment, exhaust fans, skylights, roof hatches, mechanical flues, plumbing vent pipes and other items

We observed the following roof/rooftop conditions and defects:

- ❖ existing acrylic domed skylights installed on the roof (6-total) may not be equipped per OSHA approved fall protection.
- ❖ general dirt and organic build-up on white reflective roof membrane surfaces in random locations and at internal roof drains (Photo 2)
- ❖ delaminated roof membrane at three roof drain sumps
- ❖ an insert type roof drain is installed at the northeast side of the roof area
- ❖ computer/data cabling laying directly on roof membrane surfaces (unattached) (Photo 3)
- ❖ loose laid rubber mats are being used as walkway pads on the west side roof area
- ❖ missing/incorrectly placed, splash blocks (without protective slip sheets at penthouse downspouts)
- ❖ cracked brick at corner of the west roof penthouse screen wall (Photo 4)

2nd Floor Low-slope Roof (southwest building)

- rectangular shaped, 2nd floor low-slope roof area with adhered PVC membrane roof system similar to the 7th floor low-slope roof, except the roof does not include mechanically fastened batten strips at the roof perimeter areas (Photo 5)
- roof system perimeter includes +/-24” high parapet height at south, east, and west sides of the roof area with continuous aluminum edge metal that transitions from the top of the parapet wall to the steep-slope mansard roof system
- north side of the roof perimeter meets 7-story building with +/- 10” high base wall flashing and two-piece metal through-wall/counterflashing
- roof area includes two exterior terraces for Unit 212 and 213 with precast concrete pavers and railing systems set on the roof surfaces
- terrace areas include pipe railings at perimeters
- roof drainage is provided by two internal roof drains with strainer baskets (roof drains include 4 ft. square insulation sumped areas)
- roof accessories include mechanical rooftop equipment, exhaust fans, skylights, roof hatches, mechanical flues, plumbing vent pipes and other items

We observed the following roof/rooftop conditions and defects:

- general dirt and organic build-up on white reflective roof membrane surfaces in random locations and at internal roof drains
- delaminated roof membrane at the two roof drain sumps (Photo 6)
- two exterior terraces for Unit 212 and 213 with precast concrete pavers - pavers could possibly be set directly on the PVC roof membrane without roof membrane protection
- organic growth at perimeter areas of balcony precast pavers (Photo 7)
- balcony railing post bases loosely set (without fasteners) on small 5/4" pressure treated roof blocking with welded walk pad under blocks (one observed to be missing (Photo 8)

Roof Terraces and Balconies

The building includes numerous balconies and roof terraces at various locations of the building. Reference Appendix 'C'' for various floor plans that illustrate balcony and roof terrace locations. Access to large terraces and small balconies was limited. Our review included the upper roof levels and drone survey only. The large terraces and balconies include precast concrete roof paver overburden and green roofs at the large terraces at Unit 613 and 608 at the South elevation of the building.

We observed the following terrace and balcony conditions and defects:

- large terraces include round copper through-wall emergency overflow scuppers with square shaped flanges (that appear to have been recently installed due to the red copper finish) at exterior face of brick veneer walls
- a precast paver was noted to be missing at the north elevation balcony (mechanical room) at the 6th floor level
- condition of existing balcony roof/waterproofing systems, flashings and roof drains is unknown

7th Floor Steep-slope Roof

The 7th floor roof is a mansard style, steep sloped roof with 22"/12" pitch at the perimeter of the building (Photo 9). The roof includes hipped peaks at the corners and an octagonal turret with a copper cap at the north side of the roof area. Numerous roof accessories included:

- gable style dormers with soldered, flat seam copper roofs and vertical "cheek" wall flashing
- skylights
- mechanical louvers
- copper clad eave/fascias, open coated copper gutters (in selected perimeter areas) with internal drain leaders, continuous transition coated copper cap flashing
- three-pipe snow rails located at selected areas of the roof perimeter

We observed the following roof/rooftop conditions and defects:

- ❖ the synthetic/composite slate shingle roof appears to be in good overall condition
- ❖ three missing and three loose slate shingles were observed, along with several chipped slates were noted
- ❖ several copper bib flashing pieces that had slipped down from under shingle coursing from previous slate repairs
- ❖ small quantities of replaced shingles (with what appeared to be natural slate shingles) at localized locations around the east elevation skylights and at other random roof locations (Photo 10)
- ❖ coated copper extension “kick-out” flashing appears to have been installed to the existing at eave and wall cap transition metal areas of steep slope roof adjacent to the 6th floor, masonry balcony and copper clad dormer rising walls
- ❖ it appeared that some solder joints have been repaired in the coated copper, continuous transition cap flashing (Photo 11)
- ❖ surface rust on the 3-pipe snow rail brackets (typical at majority of brackets), pipe couplings with small amounts of rust staining at slate shingles (Photo 12)
- ❖ a section of pipe appears to have been added to the top pipe rail and attached to balcony rising wall at north elevation (adjacent to turret roof) - also noted hanging wire lights
- ❖ minor amounts of debris was observed in the gutters on the north elevation.

2nd Floor Steep-slope Roof

The 2nd floor roof is a mansard style, steep sloped roof with 22”/12” pitch at the perimeter of the building. Numerous roof accessories included:

- gable style dormers with soldered, flat seam copper roofs and vertical "cheek” wall flashing
- copper clad eave/fascias and continuous coated copper transition/cap flashing

We observed the following roof/rooftop conditions and defects:

- ❖ the synthetic/composite slate shingle roof appears to be in good overall condition.
- ❖ there are approximately 4-5 missing shingles, all located at the southwest hip area of the roof (reportedly caused by a tree limb that fell and hit the hip roof surface) (Photo 13)
- ❖ roof areas did not include any snow rails, gutters or “kick-out” flashing (Photo 14)

Exterior Walls - Masonry/Cladding

The exterior walls are clad with brick masonry veneer and precast concrete “cast stone” accent units at various areas of the exterior walls. The brick is a “Norman” sized (3-5/8” x 2-1/4” x 11-5/8”) clay brick veneer with standard sized 3/8” mortar joints with a concave joint profile. Continuous galvanized coated, steel relieving angles are located at each floor level, slightly set back in a reveal joint aligned with the punched window and door head locations.

We observed the following general exterior masonry wall conditions and defects:

- ❖ exterior brick masonry veneer walls appear to be in overall good structural condition with no major brick cracking, spalling or systemic “out-of-plane” brick or cast stone elements noted in our visual assessment for the grade and roof levels
- ❖ signs of through-wall flashing, and weep holes were noted at the brick relieving angles at lower floor level wall areas and above window/door head openings as well as at some lower brick veneer wall-to-foundation areas at the east elevation
- ❖ random isolated locations of brick and cast stone staining, typically at areas directly below mansard roof edge/dormer rising wall interface areas

- areas of deteriorated mortar joints (associated in many instances with concentrated masonry staining locations
- general staining at cast stone elements

East Elevation: The east elevation at the grade level (at the North end/Massachusetts Avenue) includes a reinforced, cast-in-place concrete, loading dock driveway with a below grade areaway with steel grating and access hatch (likely an access point for the building's electrical service). The elevated loading dock with reinforced, cast-in-place concrete walls, stairs, and deck surface with protective traffic coating membrane.

We observed the following general exterior loading dock concrete slab and wall conditions and defects:

- concrete cracking (with failed sealant) and random concrete spalls at the loading dock driveway and wall areas
- exposed rebar and concrete spalling at the underside of the cantilevered reinforced concrete driveway structure
- spalled and cracked concrete at loading dock walls and stairs – repairs at north facing dock wall include installed weep holes at base of wall (Photo 18)
- aged/worn/grease stained traffic membrane at the loading dock surfaces
- a poorly retrofit trench drain over a circular floor drain at the exterior side of the loading dock double doors
- concrete cracking (with failed sealant) at the loading dock wall areas
- surface rust on the door, failed sealant joint at the threshold and poor weatherstripping

The brick masonry exterior wall (approximately two-stories in height) at the east elevation that abuts the 551 Green Street and 940 Massachusetts Avenue properties is in fair condition with the following specific observations and defects noted:

- top of brick veneer wall includes a wide, continuous cast stone/concrete wall cap
- the lower portion of the brick veneer wall (closest to Green Street) includes a planter (without plantings) with a continuous coated copper coping cap

- thru-wall flashing with 1/4" diameter weeps holes spaced at typically spaced 3’-0” o.c. with some inconsistent, wider weep hole spacing observed
- approximately 20-25% of the wall area is covered in ivy growth (Photo 15)
- 551 Green Street residents have installed wall trellis promoting additional ivy growth on the masonry wall (Photo 16)
- general mortar wear and deterioration at brick veneer mortar joints (approximately 25-35% of wall areas) – more precise quantities should be confirmed as ivy growth partially inhibited wall area review
- several areas of carbonate and efflorescence staining on brick veneer wall, with areas concentrated at north side of wall and at upper wall areas just below concrete wall caps
- areas of brick coring residue and staining on brick veneer wall surfaces adjacent to copper through-wall scuppers (at terraces at east side of building at 1st floor level – Unit 106 and adjacent to gym locker rooms) (Photo 17)
- large 13” wide x 16” deep cast stone concrete wall cap laterally displaced (approximately ½”) at the wall cap of the terrace parapet for Unit 106
- bond failure/cracking at mortar joints between cast stone wall caps at parapet (with substantial organic growth on cast stones)
- existing cracks with aged/failed sealant and spalled concrete in concrete loading dock driveway

South Elevation: The south elevation along Green Street is approximately 2-stories high at the east end, approximately 3-1/2-stories high at the west end and 7-stories at the main building elevation where the following specific observations and defects noted:

- several areas of carbonate and efflorescence staining on the brick veneer wall, with areas concentrated at the pool planter wall and along the upper wall areas, just below the copper coping wall caps (Photo 19)
- concentrated locations of brick and cast stone staining typically at areas directly below mansard roof edge/dormer rising wall interface areas – some mortar joint deterioration in stained areas is likely (no gutters were observed at the roof edge locations of the mansard roof at the south elevation) (Photo 20)
- white staining located under Juliette balcony area at 5th floor level (main building)

- general staining at cast stone elements

West Elevation: The west elevation along Bay Street ranges from approximately 3-1/2-stories at the south side to approximately 8-stories high at the north end where the following specific observations and defects noted:

- concentrated locations of brick and cast stone staining typically at areas directly below mansard roof edge/dormer rising wall interface areas – some mortar joint deterioration in stained areas is likely (no gutters were observed at the roof edge locations of the mansard roof at the South end 2nd floor level, 5th floor level and of the west elevation) (Photo 21)

- the cornerstone tablet at the 1st floor level (corner of Bay Street and Green Street) is missing from the exterior wall

- small, exposed areas of the steel relieving angles over the windows at the lower levels of the exterior wall have peeling paint, exposing the galvanized steel angles (Photo 22)

- heavy organic growth/rust staining at some cast stone sills of the windows and mechanical louver opening

North Elevation: The north elevation along Massachusetts Avenue (and a portion of the West elevation exterior wall) is approximately 7-stories high the following specific observations and defects noted:

- concentrated locations of brick and cast stone staining typically at areas directly below mansard roof edge/dormer rising wall interface areas – some mortar joint deterioration in stained areas is likely

- spalled, cracked and peeling areas of stucco finishes at the main entry portico soffit (Photo 23)

Sealants

General Description:

The exterior masonry veneer walls include sealant joints (for masonry crack control) typically located horizontally and vertically at the exterior walls. Horizontal joints are located at the continuous steel relieving angles at each floor level, slightly set back in a reveal joint aligned with the punched window and door head locations. Vertical joints are aligned with the punched openings (and window perimeter sealants), periodically along the exterior walls and at inside corners of the building walls.

Sealant joints are located at the perimeters of the concrete/cast stone wall elements-to-brick veneer as well as between the cast stone elements. Some cast stone elements have mortar joints. The windows and doors are fitted with sealant joints at the perimeters. Sealant joints have also been installed at the metal flashings-to-brick interface areas at the upper roof perimeter areas.

We observed the following exterior sealant conditions and defects:

- the exterior sealants appear to be in overall good condition with no systemic sealant failure noted at the exterior masonry control joints or window and door perimeters in our visual assessment for the grade and roof levels
- aged and failed vertical masonry control joint sealants were identified the brick masonry exterior wall (approximately two-stories in height) at the east elevation that abuts the 551 Green Street (Photo 24)
- existing cast stone/concrete wall elements included failed or cracked mortar joints at the perimeters and between the units at the east elevation that abuts the 551 Green Street (Photo 25)
- small amounts of randomly located sealant joint failure at the masonry control joints were observed
- failed sealant joints at the window sill aluminum pans at the turn-up adjacent to the brick jambs at the punched window openings were noted at the north elevation 5th floor level (likely a typical systemic defective condition)

Windows

General Description:

The windows at the 2nd through 6th floors are fiberglass framed, sliding operable windows with insulated glass set in “punched” openings in the exterior brick veneer walls. The windows include aluminum sill pans with perimeter sealant joints. The windows at the lobby areas, commercial units and gym at the 1st floor level are storefront style, fixed aluminum frame windows (aluminum or mill finish color) with manufacturer sub-sill or sill receptors and insulated glass.

We observed the following window conditions and defects:

- the fiberglass windows, (reportedly installed in 2013) appear to be in overall good condition. Please note that the unit review was limited to visual review from the exterior in limited locations due to limited access

During our field assessment, T&A-SBCA facilities staff informed CopelandBEC that they have received reports of water leaking (typically in wind driven rain events) at the living room sliding door head/ceiling area and bedroom ceiling area in Unit 504 (located at the north elevation at the east side of the main building entrance). At the time of the reported leak, T&A-SBCA facilities staff had a vendor on site cleaning windows with an aerial lift. CopelandBEC performed a brief review of the exterior wall and window areas at and above the 5th floor level sliding door head and observed the following conditions and defects:

- areas of sealant failure were noted at the brick jamb locations of the aluminum window sill pans at the sixth floor window sill pan – the sealant joint design at the sill pan-to-brick jamb surfaces is deficient (Photo 26)
- at the larger 3-unit windows (approximately 8-feet in length), we noted that the aluminum window sill pan was flexible and the seal to the brick sill rowlock course was questionably back sealed to the brick surface
- areas of the window head flashing along the steel relieving angle and weep holes at the window opening corner were sealed above the bedroom window (T&A-BSCA facilities indicated to CopelandBEC that a contractor had been tasked to perform remedial work at the exterior wall areas in an attempt to address the leaking) (Photo 27)
- the storefront style, fixed aluminum frame windows on the first floor are aged, but appear to be in good condition
- our visual review of the interior areas around the fixed aluminum windows did note some areas of gypsum board defects at the gym and lobby/hall areas indicating a potential leak history (Photo 28)

Doors

General Description:

There are several types of doors installed throughout the building. The main entrance doors are medium stile, aluminum framed, storefront style doors with insulated glass. The doors for the lobby, commercial units and gym on the 1st floor are storefront style, narrow stile, aluminum frame doors (aluminum color) with insulated glass. The terrace doors at the 2nd through 6th floors are fiberglass framed, sliding operable doors with insulated glass set in “punched” openings in the exterior brick veneer walls. The doors include aluminum sill pans with perimeter sealant joints. The majority of the sliding doors include Juliet style banister railings fixed to the exterior

walls. Some sliding doors lead to balconies or larger roof terraces at various locations of the building.

The exterior double doors at the loading dock and passage doors at various areas at the east, west, and south elevations are solid metal panels doors. The parking garage doors are overhead style, aluminum doors are located at the west and south elevations.

We observed the following door conditions and defects:

- the exterior fiberglass doors appear in good condition. Please note that the review of the units was limited to visual review from the exterior in some locations due to limited access
- the aluminum storefront doors appear to be in good condition with no apparent defects noted
- the solid metal panel doors appear to be in good-to-fair condition – the double loading dock doors are in fair condition with aged/worn hardware, thresholds, weather stripping and finish condition (Photo 29)
- the parking garage overhead doors are in varying condition - the overhead doors at the upper garage appear to be aged and the lower garage appear to have been recently replaced - the garage door at the Green St. garage also appears to be aged

Parking Garage Areas

General Description:

The building includes three enclosed parking interior parking garages located below the first floor level with ventilation and sprinkler systems. They consist of the upper level garage, the lower level garage, and the Green Street garage (also located at the lower level). The upper and lower garage areas have dedicated entrance and exit overhead doors. The smaller, Green Street garage has a single overhead door. The upper and lower level garages are accessed from the Bay Street elevation and the Green Street garage is accessed from Green Street elevation. The garage areas include concrete floor slabs, the upper level being a reinforced, cast-in-place concrete “waffle” slab (elongated pan) supported by reinforced concrete columns and the lower levels are reinforced concrete slab-on-grade floors.

Lower Level Parking Garage

The concrete slab-on-grade floor slab has an uncoated, broom finish surface with 1/4” wide sawcut joints, typically spaced at approximately 9’ x 9’ to 14’ grid spacing.

The floor slabs are typically sloped to 11” diameter surface drains with grates. The garage floor drainage includes an 11” wide trench drain that spans across the full width of the entrance traffic lane (approximately 21’-0”) at the southwest side of the garage floor. Two 11” wide trench drains span across the entrance and exit traffic lanes at the exterior sides of the overhead garage doors. The ceilings at the lower level are exposed, reinforced concrete, elongated “waffle” slabs with flat slabs at column and perimeter areas.

We observed the following garage conditions and defects:

- areas of shallow surface delamination (approximately 1/4”- 3/8” depth), located at both the traffic lanes and some parking stalls generally at the southwest portion of the garage (closest to the garage entrance) but with random spalls in other locations of the garage slab (Photo 30)
- slab cracking with “rout & seal” sealant repairs at various areas of the floor slabs (Photo 31)
- random areas of cracking at the elongated “waffle” style, reinforced concrete slab ceiling (or upper level floor) - **additional review of select cracking by a structural engineer is recommended**
- the garage floor drains appear to be original to the 1989 garage and are in fair-to-poor condition with cracked strainer grates, corroded bowl and base assemblies, old leader seal connections and debris within the drains
- damaged misc. metal floor caps (Photo 32)
- concrete damage consisting of spalling and cracking around upper level garage floor drains (Photo 33) - **existing cracked and partially spalled overhead concrete at the two floor drains is a safety hazard and “make safe” action to remove the cracked concrete is recommended**
- several areas of concrete cracking at the garage wall and upper level floor slab located at the east end of the garage - with signs of previous negative side remedial waterproofing repairs (chemical grout injection). (T&A-SBCA facilities staff reported active leak area - see water testing section of this report) (Photo 34)

Green Street Parking Garage

The smaller Green St. garage includes a concrete slab-on-grade floor slab with an uncoated, broom finish surface with 1/4” wide sawcut joints. The floor slab is typically sloped to one surface drain with a grate.

We observed the following garage conditions and defects:

- cracking at the concrete waffle slab ceiling with water leakage and accumulation on the garage floor slab at the southwest area of the garage believed to be from the pool equipment room (located directly above the garage at the upper level) (Photo 35)
- hairline cracks to moderate step cracking on concrete block walls
- uncoated concrete floor slab with minor slab cracking and defects
- aged, worn surface floor drain at the floor slab (Photo 36)

Upper Level Garage

The reinforced concrete elongated “waffle” floor slab is coated with what appears to be a urethane traffic coating with 1/4” wide sawcut control joints, typically spaced at approximately 9’ x 9’ to 14’ grid spacing. The floor slabs are typically sloped to 11” diameter surface drains with grates. One 11” wide floor drain is located at the exit traffic lane at the exterior side of the overhead garage door. The corresponding entrance side of the upper garage is sloped away from the overhead door and does not include a surface drain. The ceilings are suspended ceilings with gypsum panels covering the reinforced concrete, elongated “waffle” slabs.

We observed the following garage conditions and defects:

- the existing urethane traffic coating is aged and worn, with areas noted to be worn to base coat and bare concrete, significant aggregate loss in the top coat and numerous areas of delaminated coating in both drive lanes and parking stalls (Photos 37, 38 and 39)
- several areas of the floor slab are missing sawcuts around the columns at the northwest side of the garage resulting in minor amounts of uncontrolled slab cracking (sealed with sealant)
- in general, the garage floor drains appear to be original to the 1989 garage and are in fair-to-poor condition with cracked strainer grates, corroded bowl and base assemblies, old leader seal connections and debris within the drains (Photo 40) - a small number of floor drains were reported to have been replaced
- exterior wall and 1st floor slab (ceiling) cracking with signs of remedial past chemical grout injection repair are located at the east side of the garage (under the Unit 106 terrace) (Photo 41)

- ❖ signs of past overhead concrete repairs at the limited exposed areas of the 1st floor reinforced concrete slab

Review of Specific Areas of Building Envelope

We also performed a more detailed review of the following specific areas of building envelope, which included limited water testing. Our observations, notes are as follows:

First Floor Fixed-glass Windows and Exterior Walls (south elevation)

Multiple fixed windows have been reported to experience active leaks on the first floor of the south elevation, including the lobby windows/wall areas (at east and west sides of the exterior storefront door leading to the patio), lobby hall (west side) and Gym (east side). Several areas of minor interior gypsum board and paint damage were observed.

The lobby windows/wall area (at east and west sides of the exterior storefront door leading to the patio) include removal access panels just below the windows – review of the interior wall area at the access panels revealed a 6” exterior steel stud wall without wall sheathing or a weather resistant (or air/vapor moisture barrier) at the cavity side of the back-up wall (reportedly removed due to organic growth identified during a recent 2022 lobby renovation project). The majority of exterior wall areas are located adjacent to patio planters with waterproofing membrane applied to the exterior masonry walls. A small segment of the exterior brick veneer walls are exposed above the waterproofing just below the cast stone window sill elements

Limited Water Testing at 1st Floor Window: limited programmatic water penetration resistance testing was performed at one fixed aluminum storefront window with insulated glass (G-3) at the South elevation of the gym.

Associated testing information and results are as follows:

Water Test No. 1

- interior and exterior areas of windows including associated sealants and interior finishes were reviewed with no apparent defects visible
- interior finishes were partially removed at the west side sill/jamb area at the interior wall for leak testing observation
- exterior window and associated perimeter sealants were isolated with 6 mil polyethylene and industrial grade adhesive tape

Water was applied to masonry wall, cast stone sill areas adjacent to the window with calibrated wand at 7 PSI pressure for 20 minute duration. No leaking was observed at this leak test location.

Water Test No. 2

- 6mil polyethylene and industrial tape were removed from the exterior window and associated perimeter sealants

Water was applied to the window, perimeter sealants, masonry wall, cast stone sill areas adjacent to the window with a calibrated wand at 7 PSI pressure for 20 minute duration. No leaking was observed at this water test location.

First Floor Fixed-glass Windows and Walls (Cryogen) (north elevation)

- leaking windows and/or associated wall area including the surrounding gypsum board finishes, have been reported to be experiencing active leaks on the first floor north elevation, specifically at the Cryogen storefront window and wall area
- no apparent window or sealant defects were observed
- mortar joints cast stone/concrete sill elements under the window are cracked/failed
- efflorescence at brick veneer surfaces was observed at the base of the wall, just above the concrete sidewalk slab.
- no exterior masonry wall through-wall flashing, or weep holes were observed at the base of the exterior brick veneer wall and the abutting concrete sidewalk slab (under the window)
- soil partially removed at the west end of the concrete sidewalk revealed brick veneer extends below the sidewalk slab
- a continuous sealant joint noted to be in good condition, was observed at the concrete sidewalk to the face of the brick veneer
- slope readings of the concrete sidewalk with a digital level indicated the slab was marginally pitched away from the building (less than 1/8”/foot) in both the south-to-north direction and the east-to-west direction

Water Infiltration into the Upper Parking Garage (east elevation)

Water leaks have been reported at the upper parking garage east wall and adjacent garage ceiling area after rain events (generally taking some time to infiltrate after the

events). Review of the wall and ceiling areas revealed cracking in several locations of the wall and ceiling. Past signs of negative side remedial repairs with injection ports and an unidentified injection material residue were observed (likely a chemical grout) with random locations of efflorescence and water staining on the concrete wall and ceiling surfaces. Review of the building configuration above the upper parking garage water infiltration areas at the east elevation revealed they are under the exterior terrace at Unit 106 and parapet wall.

Our general observations and defects of the Unit 106 terrace and wall are as follows:

- the existing EPDM (rubber) membrane terrace waterproofing and 12” x 12” x 2-¼” thick exposed aggregate precast pavers are original to the building, constructed in 1989
- significant weed growth at overburden surfaces and perimeter areas (Photo 42)
- aged, unadhered EPDM membrane flashing at perimeter
- failed sealant and openings at continuous aluminum termination bar (without counterflashing) (Photo 43)
- the inside surface of the parapet wall is uncoated/bare concrete with numerous cracks (and signs of moisture at cracks)
- unadhered, exposed rubberized asphalt composite sheet flashing with open seams used as wall cap flashing under cast stone/concrete caps (Photo 44)
- large 13” wide x 16” deep cast stone concrete wall cap laterally displaced (approximately ½”) at wall cap at Unit 106 terrace parapet
- bond failure/cracking at mortar joints between cast stone wall caps at parapet (with substantial organic growth on cast stones) (Photo 45)
- numerous defects along the east facing surface of the brick veneer wall includes areas of efflorescence, carbonate build-up, mortar joint deterioration and failed brick masonry control joint sealants

Limited Water Testing at Unit 106 Terrace and Wall Areas: limited programmatic water penetration resistance testing was performed at the terrace and associated walls at the east elevation of the building – associated testing information and results are as follows:

Water Test No. 3

Terrace and associated wall areas were reviewed with multiple apparent defects visible. Areas for leak testing observation were located at the upper parking garage

area- east end - walls: unfinished with bare/exposed concrete with overhead and vertical wall cracking observed.

Water was applied to the horizontal surface of the terrace (at north side of terrace drain) adjacent to the existing wall crack in the parking garage wall and ceiling with calibrated wand at 7 PSI pressure for approximate 60 minute duration. No leaking was observed at this water test location.

Water Test No. 4

Water was applied to the horizontal surface of the terrace (at South side of terrace drain) adjacent to existing wall crack in parking garage wall and ceiling with calibrated wand at 7 PSI pressure for approximate 20 minute duration. No leaking was observed at this water test location.

Water Test No. 5

Water was applied to the inside vertical surface of the terrace parapet wall (at north side of terrace drain) adjacent to existing wall crack in parking garage wall and ceiling with calibrated wand at 7 PSI pressure for approximate 20 minute duration. No leaking was observed at this water test location.

Water Test No. 6

Water was applied to the inside vertical surface of the terrace parapet wall (at north side of terrace party wall and inside face of east parapet wall - northeast corner of terrace) adjacent to the existing wall crack in the parking garage wall and ceiling. The water test was performed with a calibrated wand at 7 PSI pressure for a duration of approximately 14 minutes. Water leakage was observed at the crack (and a missing injection port) in the concrete wall, approximately 2’-0” from the concrete floor slab above.

Water Test No. 7

Water was applied to the outside vertical surface of the terrace parapet wall (exterior face of the east parapet masonry wall) on the south side of the terrace drain, adjacent to the existing crack in the parking garage wall and ceiling. The water test was performed with a calibrated wand at 7 PSI pressure for an approximate duration of 20 minutes. No leaking was observed at this water test location.

Pool Equipment Room at Upper Level Garage (under pool at patio)

We observed the following pool equipment room conditions and defects:

- active leaking was reported by facilities at the perimeter walls of the cast-in-place, reinforced concrete pool structure (and one reported active leak at the pool plaza deck)
- numerous makeshift leak diverters are attached to the walls directing moisture into collection barrels and buckets (Photo 46)
- active leak sources appear to be originating from pool circulation piping penetrations at the pool walls (significant carbonite build-up and staining observed), concrete cold joints at lower/bottom slab near pool drainage piping (Photo 47)
- reported active leak at electrical conduit penetration through pool plaza deck at South side of pool area (note plaza deck waterproofing is unknown and will require additional investigation)
- moisture leakage on the pool equipment room wall deposit onto the floor slab, resulting in the leak migrating into the Green Street parking garage area below, at the west side of the garage (Photo 48)

Discussion, Conclusion & Recommendations

Based on our review of the available documents, the date of construction and our observations, the building is reinforced cast-in-place concrete at the lower floors and a steel frame structure with composite steel deck and lightweight concrete floor/roof slabs at the upper floors.

The exterior walls are cavity wall construction with steel stud exterior back-up walls, brick veneer with some precast concrete elements. Please reference Appendix 'D' for the TES structural assessment report of the building. The building has had various periodic building envelope work and upgrades (from 2002 to as recent as 2021) as per the available documentation, reported upgrades and our observations. Some building envelope systems have yet to be upgraded and other upgraded systems have aged and now require either maintenance work or upgrading.

Many of the original building envelope systems appear to correlate to the specific areas requested by the client (reported as leak areas) for more detailed review in our assessment. These include the Unit 106 terrace waterproofing, the east elevation concrete/masonry east garage exterior wall, the fixed, aluminum storefront window and the pool room (all of which are original to the 1989 building and likely sources of interior leaks).

Due to the findings in the leak test reports for the fixed aluminum windows provided for review (and the limited time for extensive water testing in this general

assessment), we recommend further investigation of selected fixed aluminum windows and the adjacent associated masonry through-wall flashings to determine the required scope of work and budget estimates for remedial repairs to address the window and/or potential wall leaking.

Due to the history of leaking at the pool equipment room and the prolonged water infiltration through the walls and concrete floor slab, both Tripi Engineering Services and CopelandBEC recommend further evaluation of the water leaking and material testing of selected locations of concrete at the pool equipment room. Additional evaluation of various concrete cracking at the garage and loading dock/driveway areas is also recommended.

Our discussions, conclusions and recommendations for the specific building envelope systems are provided below. Please reference the Order-of-Magnitude Cost Estimate on (page 32) for additional information for the recommended work in each category:

Roofing

Low Slope Roofs (Main 7th Floor Roof and 2nd Floor Roof)

The existing low slope roofing systems at the above referenced locations are an exposed, white reflective, PVC membrane system manufactured by Sarnafil, Inc. which were installed in 2009 and are approximately 13-years old. Additional research with the manufacturer confirmed that the roof systems are registered with a 20-year, manufacturer's warranty. In general, the PVC roof systems are in generally good condition aside from some localized observed defects and conditions. The roofs require targeted upgrades and maintenance work to assist with the systems meeting useful life expectancy.

7th Floor Main Roof

We observed certain roof conditions and defects with the 7th floor roof that need to be addressed. We recommend various maintenance type repairs to the existing 7th floor main low slope roof as follows:

- ★ existing skylight review and installation of OSHA compliant fall protection cages (6-total included)
- ★ roof membrane cleaning to renew the reflective/emissivity qualities of the white roof membrane
- ★ repair of the delaminated roof membrane at the roof drain sump areas
- ★ prepare and paint the corroded, exposed areas of the roof drain assemblies

- ★ remove the existing roof drain insert at the northeast side of the roof area (non-code compliant and can result in roof system damage if the seal fails), provide and install a new roof drain
- ★ provide and install new data cable support trays and sleepers to raise and secure the data lines currently loosely laid and unattached at the roof surface
- ★ remove loose laid rubber mats at the west side of the main roof, supply and install manufacturer walkway pads hot-air welded to the roof membrane

Regular timely maintenance and periodic inspection of the roof will significantly increase the service life of the roof.

2nd Floor Low-slope Roof (southwest building)

We observed certain roof conditions and defects with the 2nd floor roof that need to be addressed. We recommend various maintenance type repairs to the existing 2nd floor, low slope roof as follows:

- ★ roof membrane cleaning to renew the reflective/emissivity qualities of the white roof membrane
- ★ repair of the delaminated roof membrane at the roof drain sump areas
- ★ prepare and paint the corroded, exposed areas of the roof drain assemblies
- ★ remove the precast concrete pavers and clean the roof membrane at the roof terrace areas - clean the concrete pavers of organic growth and reinstall with a protective drainage mat to provide positive drainage at the terrace area and protect the roof membrane - remove, modify and reinstall the existing terrace railings to the concrete roof deck (currently unattached) and install manufacturer approved roof assembly materials and PVC membrane boot flashing with terminations

Regular timely maintenance and periodic inspection of the roof will significantly increase the service life of the roof.

Proposed roof Anchor Review

T&A-BSCA had requested that CopelandBEC and TES review the proposed roof anchor Bolt-Through Roof Anchor Detail dated June 24, 2021 by Cliff Hangers, Boston, MA and review dated July 12, 2021, by SGH, Waltham, MA. Our cursory review of the proposed approach revealed levels of structural roof modifications that are not provided. Proposed costs seem high but the modifications and anchor layout may be the basis of the proposed cost. Further review is required to review potential options, possibly

with other roof anchor vendors. Please reference Appendix ‘D’ for structural engineer report and related information.

Steep Slope (Mansard) Roofs

The steep slope, simulated slate shingle roofs are original to 1989 building (approx. 32-years old). We performed our review from the main roof level and with the assistance of a drone with an onboard camera. The existing systems are generally in good condition aside from some random shingle and roof accessory defects. The steep slope roofs require upgrades and maintenance work to assist with the systems meeting useful life expectancy.

We recommend various maintenance type repairs to the existing steep slope roof systems as follows:

- ★ random shingle repairs to replace missing and broken shingles and re-secure loose shingles
- ★ preparation of rust and corrosion at snow rail brackets and installation of protective coating
- ★ cleaning of rust stains from roof shingle surfaces
- ★ miscellaneous targeted snow rail repairs and general inspection
- ★ cleaning and inspection of roof gutters and associated metal flashings/seams and general conditions
- ★ please note that a close-up review of the roof systems will likely indicate an increased scope of work for the roof repairs

Regular timely maintenance and periodic maintenance of the roofs will significantly increase the service life of the roof.

Terraces and Balconies

Various terrace and balcony upgrades were initiated by T&A-BSCA and performed over an extended time frame (from 2009 to 2021). Unit 106 terrace waterproofing and associated overburden is original to the 1989 building. The inside surfaces of the parapet walls are uncoated/unprotected concrete walls with noted cracks and other defects. Our limited water testing resulted in leaks through the concrete wall defects and into the walls at the upper garage at the east elevation.

We recommend various maintenance type repairs to the existing terraces and balcony systems as follows:

- ★ complete removal of the Unit 106 terrace systems and replacement with metal wall cladding and metal wall cap upgrades
- ★ due to lack of access to numerous balconies and terraces during our assessment, additional balcony and terrace systems review with targeted overburden removal to inspect drains, flashings and general membrane conditions is recommended

Exterior Walls

As indicated in our observations, the exterior brick masonry veneer walls appear to be in overall good structural condition with no major brick cracking, spalling or systemic "out-of-plane" brick or cast stone elements noted in our visual assessment for the grade and roof levels. Various areas of masonry efflorescence and carbonate staining (a form of hardened lime concentration on the masonry surfaces) and localized areas of mortar joint deterioration within those areas were noted at various locations of the exterior brick veneer masonry walls. It appears that concentrated areas of water are cascading off of the mansard roof areas on the brick veneer walls (especially at roof perimeter areas without gutters).

The repair documents revealed the design of metal "kick-out" flashings at the mansard roof areas in some mansard roof eave areas without gutters to address the run-off in the 2002 exterior wall project. Further random masonry repairs were part of the exterior work which included the window and slider door replacement in 2013. It is unknown if the 2002 work was successful in deterring the masonry staining and repairs. Some elevations of the building did not include perimeter gutters or kick-out flashing upgrades which we have observed exterior wall staining and mortar joint deterioration.

The east elevation lower exterior masonry veneer walls are in fair-to-poor condition with worn/deteriorated masonry joints, masonry staining and ivy growth. Masonry wall caps and questionable wall cap flashings at other areas of the building masonry walls may be contributing to the east wall masonry problems and leaking into the upper garage areas in that correlating area. We recommend various maintenance type repairs to the exterior wall systems as follows:

- ★ further review with pursuant masonry restoration/repair design and repairs are recommended

Masonry/Cladding

Masonry is a porous material and can essentially act like a sponge, absorbing water during precipitation events. In prolonged events, the water actually penetrates through the single layer of the brick veneer walls. The wall design includes a cavity

(approximately 1” to 2” in width) with a back-up wall, in this case, steel studs with exterior gypsum sheathing. A vapor and moisture barrier is affixed to the back-up wall to inhibit moisture penetration to the interior, with through-wall flashings in conjunction with weep holes through the brick veneer at each floor level and over the door and window openings of the exterior walls for the excess water to exit the wall cavities. The back-up wall with vapor and moisture barrier at the south lobby wall at the south lobby wall in limited areas has been removed and needs to be replaced. Excess moisture held within the wall cavity can result in corrosion to concealed metal wall components. Based on the general lack of reported interior leaking, it does not appear that the existing cavity walls and flashings are systemically defective.

Efflorescence is the deposition of soluble salts from within the masonry on the exterior surface of the masonry. The salts are carried to the surface by moisture migration through the porous masonry. In some cases, excess water exposure from defective cap flashings at the top of walls or clogged wall cavities with mortar droppings inhibit water from exiting the cavity wall freely. To eliminate the efflorescence, the source of moisture must be eliminated. The efflorescence and carbonate staining are signs of excessive, concentrated moisture exposure both within the cavity wall and on the masonry surfaces. The brick mortar joint deterioration is another result of excessive/concentrated water exposure, especially at areas directly below mansard roof edges/dormer rising wall interface areas. The concentrated run-off is due to the lack of hung gutters in some perimeter roof areas above the walls. Excessive water exposure to the masonry may be due to the inefficiency of the existing remedial kickout flashing as well.

Adding gutters and downspouts to the building at select locations will help to control the roof run-off and reduce the amount of water draining over the facade of the building. The service life for gutters and downspouts, if properly designed and maintained, are expected to be 20 years or more, depending on the gutter product/material chosen.

We recommend various maintenance type repairs to the existing exterior masonry walls as follows:

- ★ repointing areas of deteriorated mortar joints
- ★ targeted restoration cleaning and general overall exterior wall cleaning
- ★ review existing kick-out flashing for performance and potential modifications
- ★ masonry control joint removal and replacement
- ★ review, prepare and coat exposed miscellaneous steel elements

- ★ consider the addition of continuous gutters at selected exterior roof/wall areas

Loading Dock and Concrete Driveway

We observed certain conditions and defects at the loading dock and concrete driveway area on the east elevation side that needs to be addressed. We recommend additional review and various maintenance type repairs which are as follows:

- ★ additional review and concrete repairs at the areas of cracking and spalling at the loading driveway slab, driveway structure spalls and wall cracks, loading dock walls and stairs
- ★ removal and replacement of the aged/worn/grease stained urethane traffic coating at the loading dock surfaces
- ★ repairs at north/east facing walls including installed weep holes at the base of the wall
- ★ remove and replace damaged loading dock surface floor drain and accessories
- ★ remove and replace loading dock door due to surface rust, poor weatherstripping and failed sealant joint at the threshold
- ★ concrete repairs including crack rout & seal, concrete spall repair and heavy duty hybrid traffic coating system at the concrete driveway (located over occupied interior electrical room and other space below)
- ★ concrete spall and crack repairs to the cantilevered reinforced concrete driveway structure and walls (adjacent to neighboring “Door Store” property)

Sealants

The sealants are in good condition as it appears that the original sealants have been replaced at various times. Based on the documentation and our observations, it appears that the masonry control joints and various metal flashing-to-masonry joints were removed and replaced in 2002 and the window and terrace door perimeter sealant joints were removed and replaced during the fenestration replacement project in 2013. Although the existing masonry control joint sealants are in good condition, they are quickly reaching or exceeding the life expectancy and should be removed and replaced in the near term (best performed with other masonry restoration work that require vertical access for cost efficiency purposes).

At the east elevation lower wall areas, it appears the masonry control sealant joints are original to the 1989 building and are in fair-to-poor condition.

We recommend various maintenance type repairs which are as follows:

- ★ removal and replacement of the control joint sealants is recommended (with the recommended masonry restoration work)
- ★ removal and replacement of the masonry control joints at all elevations in mid-term timeframe (with the recommended masonry restoration work)

Fenestration

The windows of the building are primarily “punched” style windows with aluminum sill pans and sealant joints installed at the perimeters. At the commercial units and gym area on the 1st floor are fixed aluminum frame windows (aluminum or mill finish color) with manufacturer sub-sill or sill receptor and insulated glass. T&A - SBCA facilities staff has reported that unit windows and doors were removed and replaced in 2013 and are generally in good condition. Several random doors may be original to the building as residents had opted not to replace them. Accessories such as the aluminum sill pans and sealant terminations (at the masonry jamb locations) appear to be questionable in design with failed/open joints observed.

Storefront windows are original to the 1989 building. Based on previous testing and reported leaks, the storefront windows may have accessory defects at the sill receptor end dams. Leaks at the windows may also be related to defective masonry flashings. Our field assessment was limited to visual review without test cuts. Due to time limitations, extensive water testing at the windows was not possible.

We recommend of associated window conditions additional review (some requiring vertical access as follows:

- ★ additional review with vertical access to review representative quantities of the window sill pan sealant terminations at the jambs and leading edges of the aluminum flashings
- ★ additional review of the fixed aluminum windows and associated masonry

Parking Garages

The parking garage areas have reportedly not had upgrades since 2008-2010. The upper garage coatings are worn, (in some traffic lane areas to bare concrete) with significant aggregate loss in the top coat and random areas of delaminated coating. The garage drains (all levels) and associated piping have had some random repairs but are essentially original to the 1989 building and require removal and replacement. The lower garage level and Green Street garages include uncoated slab-on-grade floors with localized slab cracking and other concrete defects.

- ★ a more detailed garage evaluation for all garage areas with a field concrete sounding review of concrete conditions for concrete repairs, traffic coating removal/replacement and systems installation with plumbing upgrades is recommended

Lower Level and Green Street Parking Garage

The lower level garage has been identified to have shallow surface delamination, minor slab cracking and other concrete defects in random areas. These random areas will require a location survey and repair design with details to be developed and issued for a contractor to bid the garage repairs. The smaller Green Street garage has similar conditions and similar review and repair work. We recommend the following general scope of work and repairs at the garage area:

- ★ concrete repairs at the shallow delamination and spalling at the garage floor surfaces level and at the spalled overhead areas of the upper level garage floor drains
- ★ rout & seal repairs at the slab cracking
- ★ remove and replace aged, damaged garage floor drains and miscellaneous metal floor caps
- ★ installation of a suitable traffic coating system (hybrid system)

Upper Level Parking Garage

The upper level garage has been identified to have an aged traffic coating system with areas of worn and delaminated coating, likely slab cracking (under the coating) and other major/minor defects in random areas. These random areas will require a location survey and repair details to be performed for a contractor to price the repairs. We recommend the following scope of work and repairs at the garage area:

- ★ concrete repairs at the areas of spalling at the garage floor surfaces level
- ★ rout & seal repairs at the slab cracking
- ★ remove and replace aged, damaged garage floor drains and miscellaneous metal floor caps
- ★ installation of a suitable traffic coating system (hybrid system)

Next Steps

After T&A - BSCA review of the report, participate in a review meeting to clarify the report findings, recommendations, priorities, order-of-magnitude (OM) pricing and next steps.

CopelandBEC (and our structural engineering sub-consultant - Tripi Engineering Services) recommend performing additional review of selected structural components (reinforced concrete structure at pool room area) in order to identify existing conditions/define recommended repair scope of work (both immediate and term repairs) and to develop documents for the repairs.

CopelandBEC recommends performing additional review of exterior fixed aluminum window components and associated masonry through wall flashing conditions at selected windows and various exterior wall areas to identify representative existing conditions and define the recommended repair scope of work to address the leaking.

After completion of additional review items, define and update the recommended scope of work, prioritization and OM pricing.

In summary, the primary scope of work per priority repair areas at this time with order-of-magnitude budgets are as follows:

Priority Areas and Order-of-Magnitude Cost Estimate[1]

This section provides priority areas with order-of-magnitude cost estimates to quantify expected building envelope repair costs for Immediate (0-6 months), 1-4 years, 5-10 years and 11-15 years. Priorities have been provided as a starting point based on conditions and available information.

Please note that for the Priority #1 - Immediate (0-6 months) includes required additional review (with contractor assistance) in several areas to develop and define the required scope of work and estimated budgets for the structural systems and building envelope.

CopelandBEC (and our structural sub-consultant - Tripi Engineering Services, Inc.) recommend both the review of the reinforced concrete structural components of the pool room area including material testing as well as review of various concrete cracking. **Note: Existing cracked and partially spalled overhead concrete at the two floor drains is a safety hazard and "make safe" action to remove the cracked concrete is recommended.**

[1] Subtotals and Order-of-Magnitude total do not include inflation, material cost increases, or TBD items. TBD items are not included in construction contingency estimates.

The overall scope of Priority #1 items will provide information necessary to identify typical existing conditions, design scope of work, and budget projections to address structural areas of the pool equipment room and leaking conditions at or adjacent to fixed windows. Priority categories, items, description & ranged budget estimate costs at this time are as follows:

Priority #1 - Immediate-Term (less than 6 months)		
Item	**Description**	**Estimated Cost ($USD)**
A1	Additional Structural Engineering Review (SER): (See Appendix C for report item numbers in list below - A1 only)) ● Pool area & Green Street Garage (items 1 & 2): $30,000-$40,000 ● Lower and Upper Garages (item 3): $25,000-$35,000 ● Loading Dock Area (item 4): $14,000-$17,000 ● Roof Area (item 5): no additional review $0 ● Roof Anchors (item 6): $4,000-$6,000	$73,000-$98,000
A2	Additional Building Envelope Review (BER): Field assessment at selected fixed aluminum windows and associated exterior masonry wall areas. Includes additional cost of $10,500-$14,500 for qualified contractor assistance[2].	$16,500-$22,950
A3	Immediate Steep Slope Roof Repair: Mansard roof shingle repair at 2nd fl. SW corner hip roof to address safety hazard(s) and potential leak areas related to loose and missing shingles. **(Repairs proposed by Contractor 9/22 - confirmed repairs completed**).	Cost for repair direct to T&A - BSCA
A4	Lower level Garage Make Safe Work: **Safety Hazard, Initiate "Make Safe" Repairs ASAP** at existing cracked and partially spalled overhead concrete at the two lower level floor drains.	$1,200 - $1,560
A5	7th Floor Main Roof Skylight Fall Protection: **Safety Hazard, Initiate "Make Safe" Repairs ASAP.** Existing acrylic domed skylights require fall protection rating (includes supply and installation of external fall protection cages on 6-total skylights).	$9,000 - $11,700
A6	Garage Concrete Wall/Ceiling Chemical Grout Injection: Upper garage eastern wall and ceiling areas (approx. 24 lf. wall and 30 lf. ceiling) ($55.00 - $65.00/lf. + general conditions)	$2,500 - $3,250
A7	Building Envelope and Structural Engineering Fees	TBD
A8	Priority #1 Construction Contingency (20%)	$20,440 - $27,490
	Priority #1 Estimate Subtotal/Budget:	**$122,640 - $164,950**

[2] Contractor assistance to provide window/wall openings and patching, as needed for BER. Scope of repair work, priority level and associated costs TBD

Priority #2 - Near-Term (1-4 years)		
Item	**Description**	**Estimated Cost ($USD)**
B1	Exterior Terrace Waterproofing Removal and Replacement: Includes waterproofing system, overburden, wall cladding, and coated copper parapet wall coping caps ($30/sf.-$40/sf.)	$26,500 - $34,500
B2	Targeted Fixed Aluminum Window Repairs: **Based on BER findings and recommendations.**	TBD
B3	Pool Equipment Room Structural Repairs: **Based on SER findings and recommendations.**	TBD
B4	7th Floor General Maintenance Repairs at low slope PVC roofs: ● roof drain sump, roof drain cleaning, prep and paint (8-total) ● roof drain insert removal and new roof drain (1-total) ● roof accessories (additional data cable support trays, sleepers, walkway pads, and other misc. items)	$26,200 - $34,050
B5	2nd Floor General Maintenance Repairs at low slope PVC roofs: ● roof cleaning (2,250 sf.) and roof drain sump repairs (2-total), ● upgrades to roof balcony/terrace concrete pavers (drainage mat, railing modifications/attachment, and roof flashing).	$10,800 - $14,050
B6	Mansard steep slope shingle roof & accessory repairs: ● shingle and snow rail repairs (as needed) ● snow rail bracket preparation/coating.	$40,000 - $52,000
B7	Lower Garage Repairs (+/- 27,200 sf.): ● concrete repairs - rout and seal cracks, and concrete spall repair ● drain/accessories removal and replacement ● installation of hybrid traffic coating system (concrete deck)	$315,000 - $409,500
B8	Green Street Garage Repairs (+/- 2,750 sf.): ● concrete repairs - rout and seal cracks, and concrete spall repair ● drain/accessories removal and replacement ● installation of hybrid traffic coating system (concrete deck)	$28,000 - $36,400
B9	Loading Dock & Concrete Driveway/Structure (+/- 1,600 sf.): ● concrete repairs - rout and seal cracks, and concrete spall repair ● drain/accessories removal and replacement ● installation of hybrid traffic coating system (concrete deck) ● garage door replacement Not included: additional repairs required by item A1 findings	$32,000 - $41,600
B10	Building Envelope and Structural Engineering Fees	TBD
B11	Priority #2 Construction Contingency (20%)	$95,700 - $124,420
	Priority #2 Estimate Subtotal/Budget:	**$574,200 - $746,520**

Priority #3 - Mid-Term (5-10 years)		
Item	**Description**	**Estimated Cost ($USD)**
C1	Upper Garage Repairs (+/- 26,000 sf.): ● concrete repairs - rout and seal cracks, and concrete spall repair ● drain/accessories removal and replacement ● Installation of hybrid traffic coating system (concrete deck)	$230,750 - $300,000
C2	Simulated slate shingle roof repairs and maintenance: (average $3,000/year over 5 years)	$15,000 - $19,500
C3	Exterior Masonry Wall Repairs & Maintenance: ● targeted brick repointing and restoration cleaning ● brick masonry sealant control joint control replacement ● targeted restoration cleaning Phased approach (north and east elevations)	$96,850 - $125,900
C4	Exterior Masonry Wall Repairs & Maintenance: ● targeted brick repointing and restoration cleaning ● brick masonry sealant control joint control replacement ● targeted restoration cleaning Phased approach (south and west elevations)	$122,500 - $159,250
C5	Building envelope and structural engineering fees	TBD
C6	Priority #3 Construction Contingency (20%)	$93,020 - 120,930
	Priority #3 Estimate Subtotal/Budget:	**$558,120 - $725,580**

Priority #4 - Long-Term (11-15 Years)		
Item	**Description**	**Estimated Cost ($USD)**
D1	7th Floor Main & Penthouse PVC membrane roof (10,200 sf. x $35/sf.): ● remove and replace ● through-wall flashing repairs at tapered roof insulation	$357,000 - $464,100
D2	2nd Floor Main & Penthouse PVC membrane roof (2,250 sf. x 30/sf.): ● remove and replace ● tapered roof insulation	$67,500 - $87,750
D3	Simulated slate shingle roof repairs & maintenance: (average $3,000/year over 5 years)	$15,000 - $19,500
D4	Priority #4 Construction Contingency (20%)	$87,900 - $114,540
D5	Building envelope engineering fees	TBD
	Priority #4 - Long-term Estimate Sub-total/Budget:	**$527,400 - $685,540**

Order-of-Magnitude Total Budget:	**$1,782,360 - $2,322,590**

The above-described priorities, scope of work, and Order-of-Magnitude Cost Estimates includes building envelope and structural repairs/replacement and restoration only based on the general assessment and the information available at this time. The priorities do not include HVAC, electrical, plumbing systems (other than systems noted), site improvements or other capital needs for the building or property. The recommended repairs are not intended to address all areas of building envelope deterioration at the property as more detailed review and evaluation will be required. Instead, its intent is to address and repair selected priority repair areas to address systems to reach their expected serviceable life. Ongoing repairs and maintenance will still be required throughout the property no matter which option is implemented.

We look forward to reviewing the assessment report with the T&A- BS trustees.

Respectfully,

John M. Karman
Senior Project Manager
Copeland Building Envelope Consulting, Inc.

Appendix A

Photo 1: 7th floor low-slope roof

Photo 2: organic build-up on white reflective roof membrane surfaces in random locations

Photo 3: computer/data cabling laying directly on roof membrane surface (unattached)

Photo 4: cracked, chipped bricks at corner of the west roof penthouse screen wall

Photo 5: 2nd Floor Low-slope Roof area

Photo 6: delaminated roof membrane at the roof drain sump and rusted roof drain components

Photo 7: organic growth at perimeter areas of balcony precast pavers

Photo 8: balcony railing post bases loosely set (without fasteners) and missing small 5/4” pressure treated roof sleeper block with welded walk pad

Photo 9: mansard style steep sloped roof

Photo 10: replaced shingles (with what appeared to be natural slate shingles) at localized locations around skylights

Photo 11: repaired solder joint in the copper, continuous transition cap flashing

Photo 12: surface rust on the 3-pipe snow rail bracket (typical at majority of the brackets)

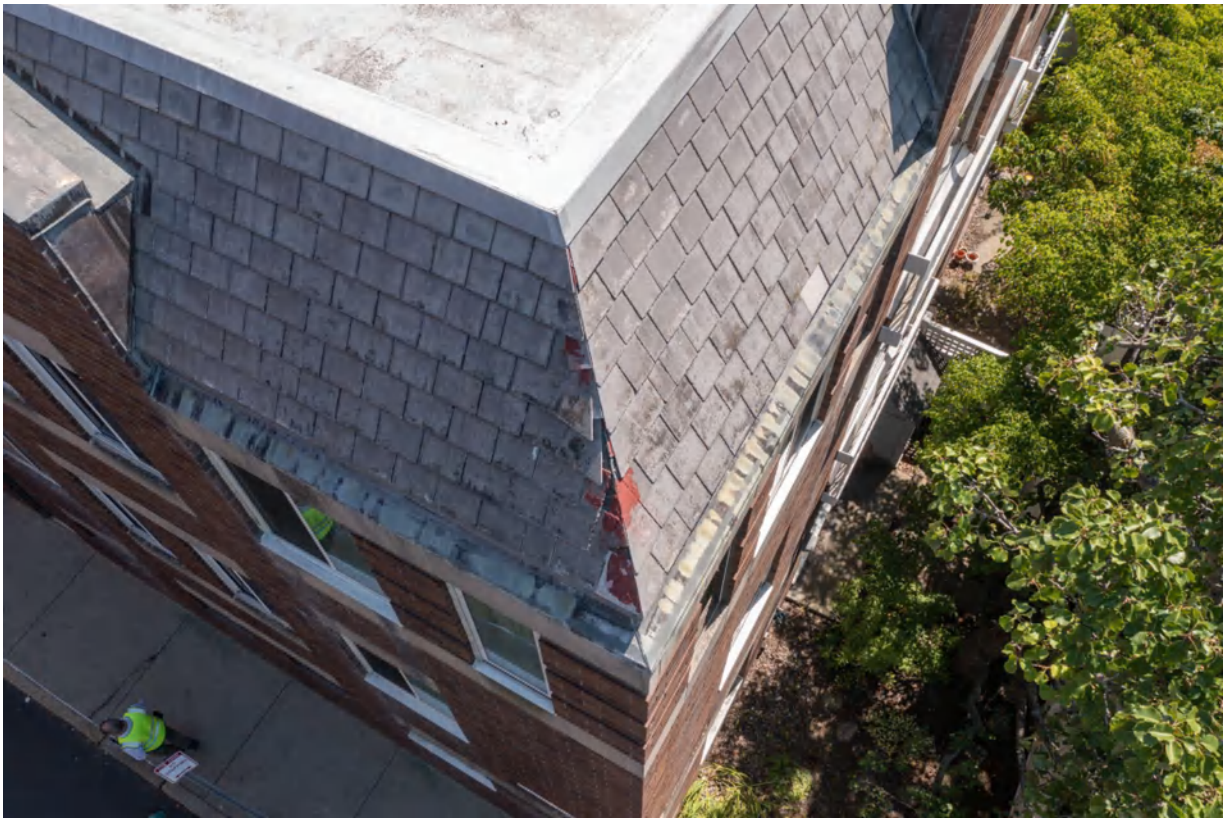


Photo 13: damaged/missing shingles at the southwest hip area of the steep sloped mansard style roof from reported tree impact

Photo 14: no snow rails, gutters or "kick-out" flashing at the mansard style, steep sloped roof on the south elevation

Photo 15: ivy growth on wall at east elevation

Photo 16: wall trellis' installed promoting additional ivy growth on the masonry wall

Photo 17: residue and staining on brick veneer wall surface adjacent to copper thru-wall scupper

Photo 18: spalled concrete at loading dock stairs

Photo 19: areas of heavy carbonate and efflorescence staining on brick veneer wall, at the pool planter wall

Photo 20: staining on brick veneer wall and cast stones directly below mansard roof edge/dormer rising wall interface areas - roof edge without gutters

Photo 21: brick and cast stone staining at areas directly below mansard roof edge/dormer rising wall interface areas and below roof edges without gutters

Photo 22: exposed areas of the galvanized steel relieving angles over the windows and failing joint sealant

Photo 23: peeling stucco finish at the main entry portico soffit reported from previous balcony leaks (waterproofing/roof above now replaced)

Photo 24: failing control joint at the east elevation wall that abuts the 551 Green Street

Photo 25: failing mortar joint at transition of brick veneer and concrete wall the east elevation

Photo 26: failed sealant joint at the windowsill aluminum pans at the turn-up to the brick jambs at 6th floor level - north elevation

Photo 27: sealed weep hole at bedroom window header and relieving angle at 5th floor north elevation at unit #501

Photo 28: window sill at lobby hall area where facilities staff reported of water leaking history

Photo 29: failing threshold sealant at loading dock doors & aged retrofit trench drain

Photo 30: shallow concrete surface delamination at lower level garage parking stall

Photo 31: slab cracking with “rout & seal” sealant repair observed on floor slabs at parking stall

Photo 32: heavily rusted floor metal cap & concrete cracking/spalling

Photo 33: concrete damage consisting of spalling and cracking around upper level garage floor drain - Fall hazard to recieve “make-safe” action

Photo 34: signs of previous negative side remedial waterproofing repairs at garage wall on the east end

Photo 35: cracking at the concrete waffle slab ceiling with water leakage staining

Photo 36: aged/damaged surface floor drain at the slab-on-grade floor slab

Photo 37: delaminated urethane traffic coating at the upper level garage

Photo 38: worn out/delaminated urethane traffic coating at upper level garage parking stall

Photo 39: worn out/delaminated urethane traffic coating at the upper level garage driveway entrance

Photo 40: severely rusted/aged garage floor drain (appears to be the original to the 1989 garage)

Photo 41: grout injection ports from remedial repairs in the past at ceiling of Upper Garage

Photo 42: weed growth at the overburden surfaces and perimeter areas of Unit 106 terrace - original 1989 construction

Photo 43: failed sealant at continuous aluminum termination bar (without counterflashing)

Photo 44: uncoated/bare concrete with cracking and unadhered rubberized asphalt sheet flashing with open seams used as wall cap flashing

Photo 45: bond failure/cracking mortar joint between cast stone wall caps

Photo 46: heavy carbonate staining on concrete pool walland leak diverters attached to the wall directing active leak to collection bucket

Photo 47: leak source appears to be from cold joint at the pool wall and lower slab

Photo 48: active leak at conduit penetration through bottom slab of the pool

Appendix B

1. Limited Original Design Drawings dated February 23, 1987; Developers - Unihab Design Inc., Cambridge, MA. - Drawings included Mechanical Floor Plans and a full set of structural drawings

2. Certified Deed Site Plan dated February 10, 1989 - Medford Engineering & Survey, Medford, MA

3. Certified Deed Floor Plans dated March 19, 1989 -CADboston, Boston, MA

4. Masonry Repairs Drawings (Elevations/Details) dated November 22, 2002, by CBI Consulting Inc., Boston, MA

5. Bay Square Renovations Drawings (Windows/Sliding Doors Replacement and Limited Masonry Repairs) dated September 30, 2013, by Davis Square Architects, Cambridge, MA.

6. Window Sill Detail Shop Drawing Submittal dated August 22, 2014, reviewed by Building Restoration Services Corp., Boston, MA and David Square Architects, Cambridge, MA

7. Installation Shop Drawings Submittal dated August 14, 2014, from Architectural Support Services; reviewed by Building Restoration Services Corp. Boston, MA and David Square Architects, Cambridge, MA

8. Planters and Deck Repair Drawings and Project Manual dated December 21, 2017, by CBI Consulting Inc., Boston, MA

9. Proposal from American Anchor, Foxboro, MA dated January 2, 2018. for installation of AN.163-BTRA1414 Toggle Anchor Pinching Concrete Deck

10. Project specification for Tieback and Lifeline Anchor dated May 4, 2018, by General Safety Services, Canton, MA

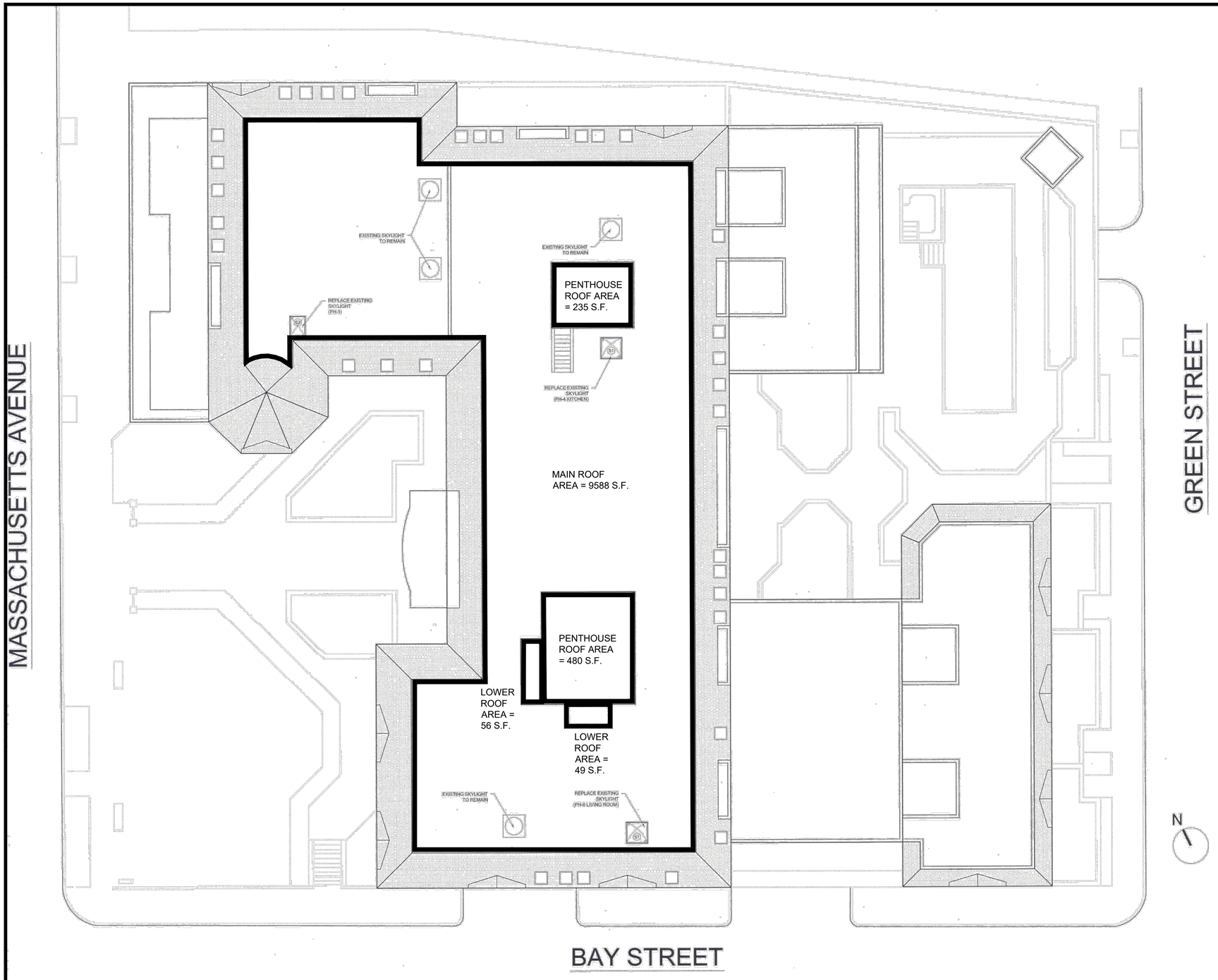
11. Bolt-Through Roof Anchor Detail dated 24th June 2021 by Cliff Hangers, Boston, MA and review dated July 12, 2021, by SGH, Waltham, MA

12. Capital Needs Assessment and Replacement Reserve Analysis Report dated October 5, 2021, by On-Site Insight, Boston, MA

13. Leak Detection Report for grade level windows at lobby, gym/fitness room and commercial units (No Date on Report-T&A-BSCA indicated date of April 2022) by American Leak Detection, Boston, MA

Appendix C (attached)

Appendix D (attached)



DO NOT SCALE DRAWINGS.

NOTES:
REPLACE FIXED SKYLIGHTS AT FLAT ROOF AS SHOW
DRAWINGS. ASSUME 3 TOTAL.

REPLACE ALL OPERABLE SKYLIGHTS AT MANSARD R

No.	REVISIONS/SUBMISSIONS

DAVIS SQUARE ARCHITECTS
240A Elm St.
Somerville, MA 02144
617.628.5700
www.davissquarearchitec

Consultant

Project
BAY SQUARE CONDOMINIUM
950 MASSACHUSETTS AVENUE CAMBRIDG

Title
ROOF PLAN

Designed	
Checked	
Project No.	13015.00
Scale	AS NOTED
Date	09/30/13

Drawing No. A

COPE LAND
building envelope consulting
43 BROAD STREET, #B303
HUDSON, MA 01749
www.copelandbec.com

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STAMP

DATE	REVISION

Bay Square Condominium
Cambridge, Massachusetts

MAIN ROOF PLAN - APPENDIX 'C'

DRAWN BY
WTB

CHECKED BY
MC

DRAWING SCALE
NTS

PROJECT NUMBER
22-024

DATE ISSUED
SEPT 2022

BE1-01

A-1 ROOF PLAN
3/32" = 1'-0"

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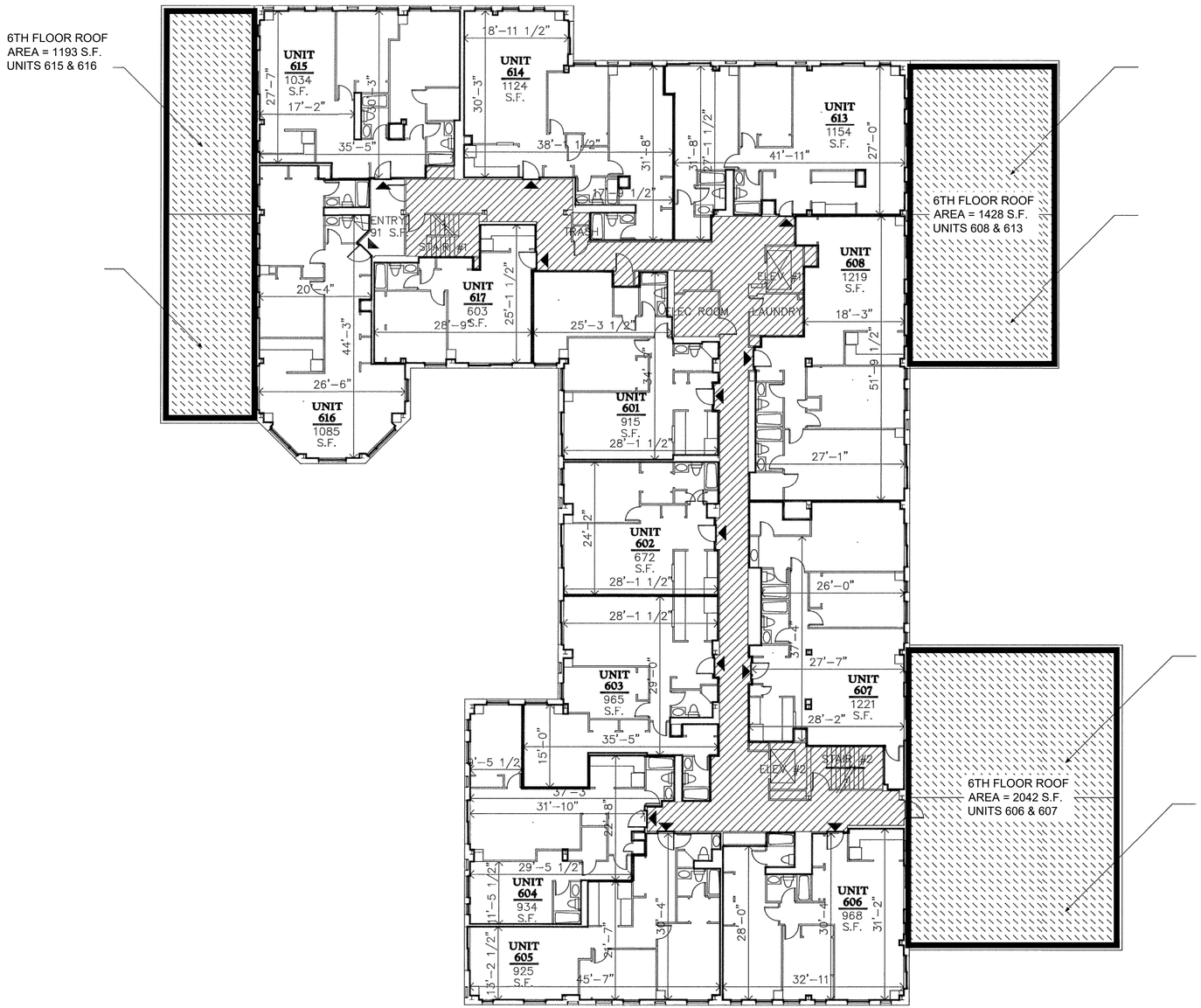

SIXTH FLOOR PLAN

PLAN NORTH

Architect's stamp

3-19-23
Date

I certify that this plan fully accurately depicts the layou location, unit numbers and dimensions of the units as I further certify that this pl has been prepared in confor with the rules and regulatio the Registry of Deeds of the Commonwealth of Massachus This building has not a nam

REGISTRY USE ONL

BAY SQUARE CONDOMINIUM
950 Massachusetts Avenue

0 2 4 6 8 10
Scale in Feet

Legend
- Roof Area
- Common area
- Unit demising
- Main entrance

Sheet numbe
8
of Nine

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SIXTH FLOOR PLAN - APPENDIX 'C'

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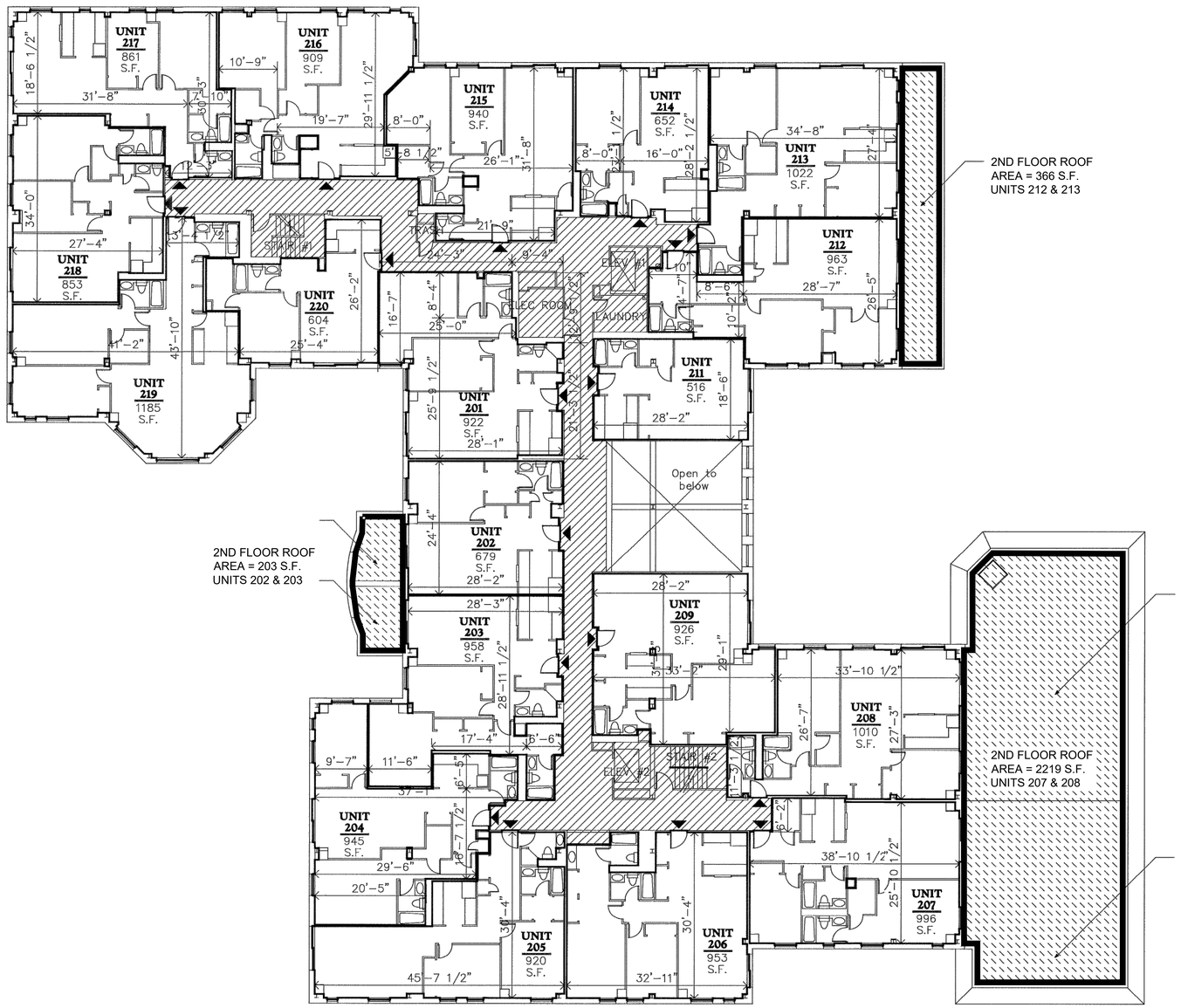
DRAWING SCALE
NTS

PROJECT NUMBER
22-024

DATE ISSUED
SEPT 2022

BE1-02



SECOND FLOOR PLAN

PLAN NORTH

Architect's stamp

3-19-89
Date

I certify that this plan fully and accurately depicts the layout, location, unit numbers and dimensions of the units as built. I further certify that this plan has been prepared in conformity with the rules and regulations of the Registry of Deeds of the Commonwealth of Massachusetts. This building has not a name.

REGISTRY USE ONLY

BAY SQUARE CONDOMINIUM

950 Massachusetts Avenue
Cambridge, Massachusetts

0 2 4 6 8 10
Scale in Feet

Legend

- Roof Area
- Common area
- Unit demising line
- Main entrance

Sheet number
4
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SECOND FLOOR PLAN - APPENDIX 'C'

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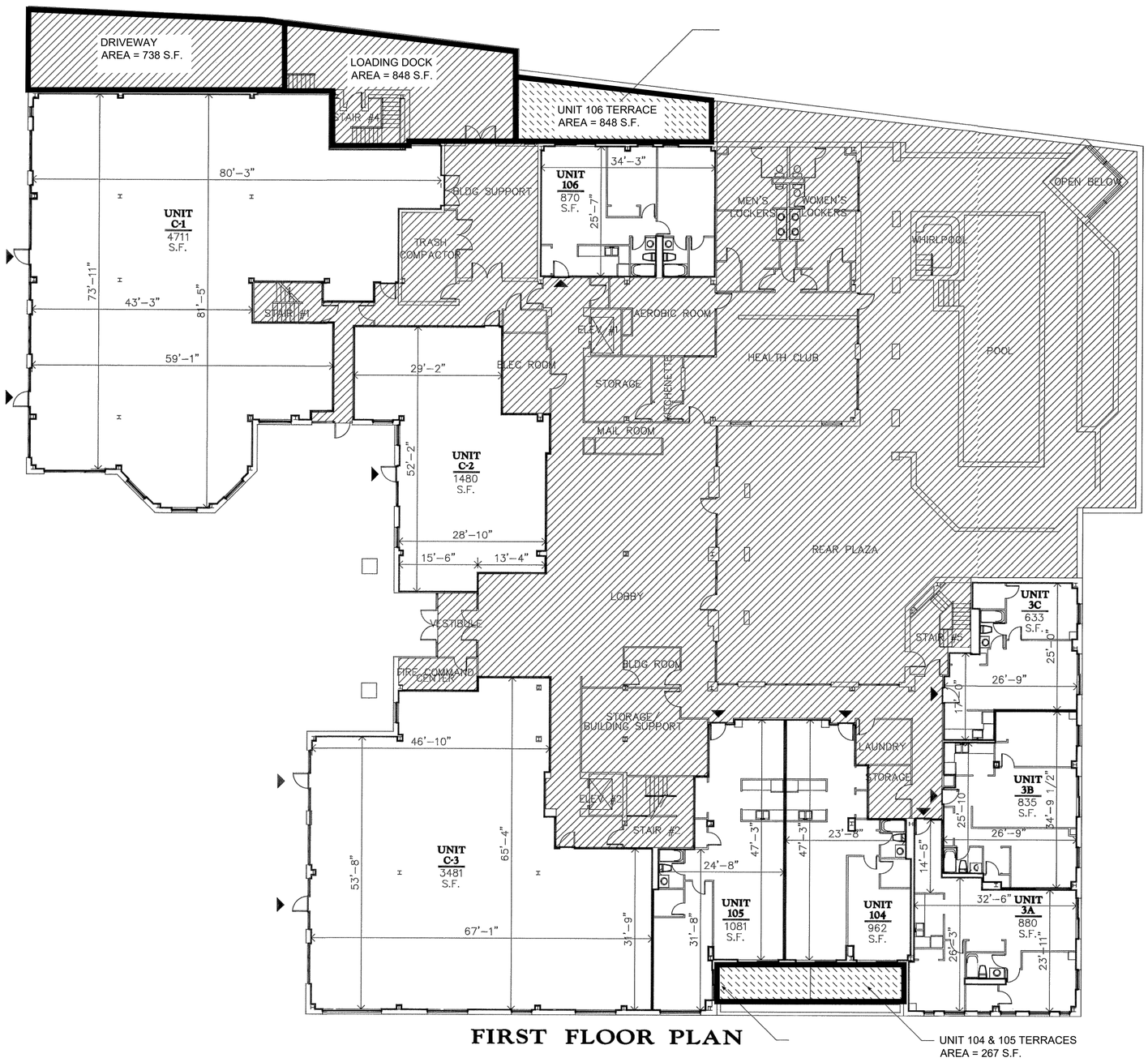
DATE ISSUED
SEPT 2022

BE1-03



FIRST FLOOR PLAN

UNIT 104 & 105 TERRACES
AREA = 267 S.F.

PLAN NORTH

Architect's stamp

3-19-89
Date

I certify that this plan fully and accurately depicts the layout, location, unit numbers and dimensions of the units as built. I further certify that this plan has been prepared in conformity with the rules and regulations of the Registry of Deeds of the Commonwealth of Massachusetts. This building has not a name.

REGISTRY USE ONLY

BAY SQUARE CONDOMINIUM

950 Massachusetts Avenue
Cambridge, Massachusetts

0 2 4 6 8 10
Scale in Feet

Legend

- Roof Area
- Common area
- Unit demising line
- Main entrance

Sheet number
3
of **Nine**

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STAMP

DATE	REVISION

Bay Square
Condominium
Cambridge, Massachusetts

FIRST FLOOR PLAN - APPENDIX 'C'

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MC

DRAWING SCALE
NTS

PROJECT NUMBER
22-024

DATE ISSUED
SEPT 2022

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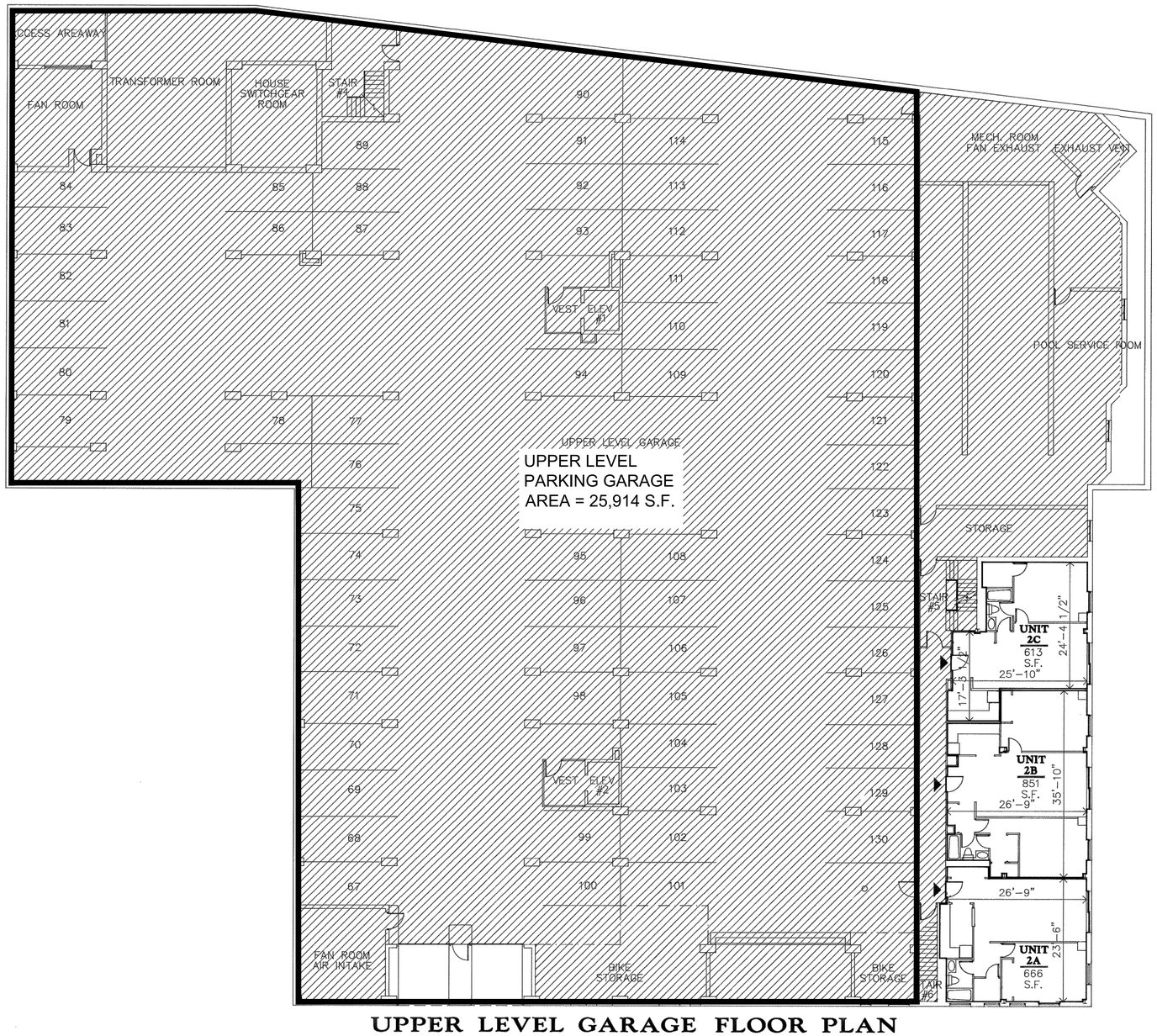

UPPER LEVEL GARAGE FLOOR PLAN

PLAN NORTH

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43 BROAD STREET, #B303
HUDSON, MA 01749
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Bay Square Condominium
Cambridge, Massachusetts

UPPER LEVEL GARAGE PLAN - APPENDIX 'C'

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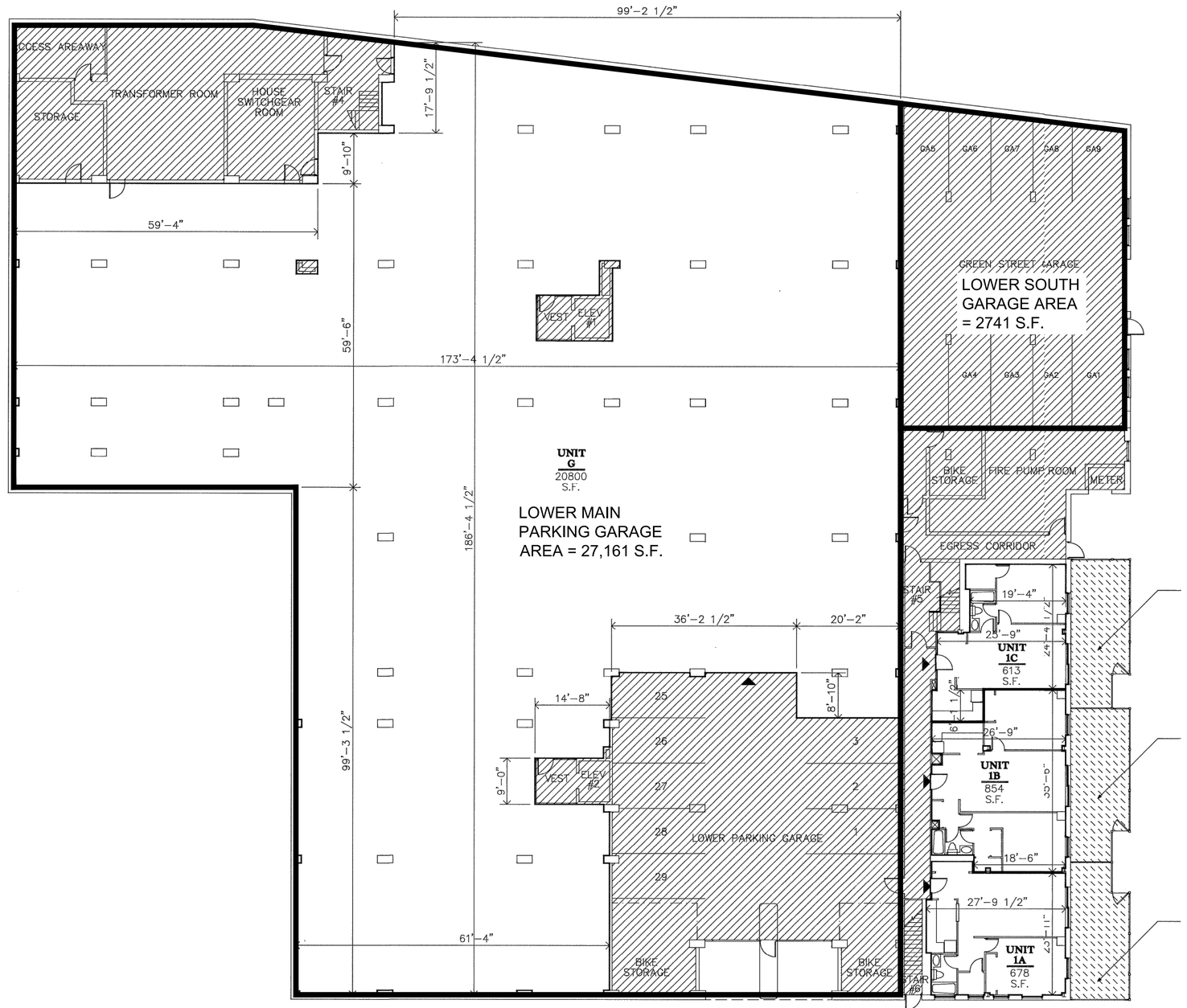

LOWER LEVEL GARAGE FLOOR PLAN

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Condominium
Cambridge, Massachusetts

LOWER LEVEL GARAGE PLAN - APPENDIX 'C'

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PROJECT NUMBER
22-024

DATE ISSUED
SEPT 2022

BE1-06

TRIPI ENGINEERING SERVICES, LLC
433 Main Street, Suite 4
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www.tripiengineering.com

September 28, 2022

Copeland Building Envelope Consulting (CBEC)
Attn: Mr. John Karman
43 Broad Street, #B303
Hudson, MA 01749

Project: 220083.00 – Bay Square Condominium – 950 Massachusetts Avenue, Cambridge, MA

Subject: High-Level Structural Condition Assessment of Building and Review of Roof Structure for Roof Anchors Proposed by Others

Dear Mr. Karman:

As requested, we visited the above site in August and September of 2022 to observe and preliminarily assess visible and accessible structural elements of the building. We performed this work pursuant to our May 3, 2022, consulting agreement. Selected field observations and our related structural engineering opinions / recommendations are presented below.

EXECUTIVE SUMMARY

Our "high-level" structural condition assessment included limited walkthroughs of the common areas at each floor of this 9-story (includes below-grade parking levels) condominium building, but was predominantly focused on visible / accessible structural elements in six areas: 1) the Pool Area; 2) Green Street Garage (beneath the Pool Area); 3) the Lower Level Garage; 4) the Upper Level Garage; 5) the Loading Dock Area at the east side of the building; and 6) visible / accessible portions of the Roof. Our scope of work also included a "high-level" structural review of the roof structure for the potential installation of roof anchors and of currently proposed roof anchor details presented by others.

Our structural condition assessment did not reveal major signs of impending structural failure, but we did observe several conditions which should be further investigated, and some conditions that should be promptly addressed, including:

- Prompt survey / removal / stabilization of overhead spalled concrete at the Garage Areas.
- Additional investigation of concrete deterioration at the Pool Area and Green Street Garage.
- Additional investigation of concrete deterioration at the main Garage Areas.
- Survey / repair / maintenance of the concrete at the Loading Dock Area on the east side of the building.
- Repair / maintenance of fireproofing at limited areas where missing at the Roof Level.

Our review of the roof structure for installation of roof anchors generally revealed that:

- The building has several "jogs" in layout, changes in height, and roof-top projections that make the layout of roof anchors a challenge. The layouts prepared by others that we reviewed as part of this effort appear to provide access to several, but not all portions of the building, and each plan appears to cover different areas.

- Most areas of the main roof structure are constructed of concrete slabs on metal deck supported by structural steel beams, a construction type that in many ways is favorable for the installation of roof anchors.
- The limited thickness of the roof deck, in our opinion, makes the use of certain types of anchors inappropriate. Proper anchorage could include direct fastening to structural steel or the use of anchors that include anchor plate / reinforcement beneath the roof deck.
- Preliminary rough estimates of costs related to anchor installation (prepared by others) that we reviewed as part of this effort appear high, and in our opinion, detailed review of the proposed anchorage details and related costs to determine whether there are more cost-effective solutions is warranted.

REVIEWED DOCUMENTS

The following documents were provided to us for review as part of this effort:

1. Original building structural design drawings prepared by Unihab Design Inc. (Bay Square Associates, 50 Church Street, Cambridge, MA), dated 1987.
2. Design drawings for miscellaneous repairs and maintenance items on elevations, sealant replacement, flashing replacement, concrete repairs at loading docks prepared by CBI Consulting, dated November 2002.
3. Bid set drawings for door and window replacement prepared by Davis Square architects, dated 2013.
4. Design drawings showing proposed alterations to planters and a related Project Manual for Planters and Deck Repairs prepared by CBI Consulting, dated December 21, 2017.
5. American Leak Detection Report dated early 2022 (based upon date on invoice), indicating leaks at Windows C3-4 and C1-5 and Windows L4, L5, L6, L7. March 17, 2022
6. Roof anchor proposal from American Anchor, Foxboro, MA, dated January 2, 2018.
7. Roof anchor project specification from General Safety Services, Canton, MA, dated May 4, 2018.
8. Roof anchor plan and details from Cliff Hangers, Boston, MA, dated June 24, 2021, with Simpson Gumpertz & Heger (SGH) review comments dated July 12, 2021.

DESCRIPTION OF STRUCTURE

The following is a general description of the building structure based upon our review of information that was provided to us and our direct observation of visible / accessible building structural elements:

1. The foundation system consists of shallow, cast-in-place concrete isolated footings at column locations and strip footings beneath perimeter walls. General notes on structural drawings indicate that footings are sized based upon a soil bearing capacity of 4 tons per square foot (8,000 pounds per square foot).
2. The Lower Garage Floor slab is an approx. 6-inch thick, cast-in-place concrete “paving slab” (non-structural) with wire mesh reinforcement.
3. The Upper Garage Floor and Lobby Level Floor Slabs generally are conventionally reinforced, cast-in-place concrete joist / rib slab systems, formed by metal pans. The overall slab structure is 20 inches thick, consisting of a 6-inch thick, slab on 14-inch deep, joists (“ribs”) spaced at approx. 3 feet on center. Portions of each floor are solid, 8-inch thick, conventionally reinforced concrete slabs, and the framing at the southwest corner of each

floor consists of composite concrete slab on metal deck and structural steel framing (beams and girders). The Lobby Level slabs are thicker at some portions of the Pool Area.
4. Typical upper floor construction (Floors 2 through 7) consists of 5¼-inch thick (overall thickness) lightweight concrete slabs on 2-inch thick, composite metal deck supported by steel beams and girders designed to act compositely with the concrete floor slabs. Framing bay sizes (i.e., column spacings) vary significantly from location to location, but many bays are approx. 27 feet by 27 feet measured in plan.
5. The Roof Level Framing also consists of composite concrete slab on metal deck construction. The drawings indicate that the metal deck itself is 2-inch thick, and the overall slab thickness varies from 4½ to 7-inches thick.
6. Building columns are conventionally reinforced, cast-in-place concrete at the lower two levels and structural steel above.
7. The building relies upon field-welded steel moment frames for lateral load resistance in all directions.

SELECTED FIELD OBSERVATIONS

The following are selected observations from our field visits on August 5 and 29, and September 26, 2022 (Refer to referenced photographs):

General
1. The building is a 7-story brick-clad structure with two additional stories of parking below grade.
2. The Plaza Level is at street grade on the Massachusetts Avenue (Mass Ave.) side of the site, and site grades slope downward significantly moving away from Mass. Ave., making the Plaza Level two stories above grade at the back of the building.
3. The uppermost level is used for storage and as a Mechanical Penthouse. The exterior “walls” of this level are steeply sloped roof elements.
4. Portions of the back of the building step down two stories, and there are exterior spaces and a Plaza-Level Pool and hot-tub located at the southeast section of the building, above the parking levels.
5. There is an openair loading dock structure along the east side of the building, accessible from Massachusetts Avenue.
6. A general walkthrough of Floors 2 through 6 revealed few areas where the structure was exposed to view or could be readily observed. We did not observe overt signs of significant distress in finish materials or existing building elements that would suggest signs of underlying structural problems at these levels.

Pool Area (At Plaza and Level Below)
7. The approx. 15-foot wide by 60-foot long, pool is located at Plaza Level at the back-left (southeast) corner of the building (Photos 1-01 through 1-03). Water levels in the pool are maintained at a depth of approx. just over 4 feet.
8. There is a small hot tub located at the northeast corner of the pool (Photos 1-02 and 1-03).
9. The pool deck generally appeared sound and there are sealed joints and repair / sealed cracks at some locations (Photo 1-04).
10. Observations at the Upper Garage Level (i.e., the floor level below the pool) in the Pool Area revealed:

a. The pool is supported by a conventionally reinforced, cast-in-place rectangular concrete enclosure structure (similar to a "concrete bathtub") which is supported by continuous, 10 to 12-inch thick, approx. 53-feet long, concrete walls (Photo 1-05 and Figure 1) along the north and south edges of the pool, which are supported by concrete beams, columns, and six concrete footings at the Green Street Garage Area at the Level below.
b. Portions of the concrete enclosure structure and supporting walls below are moisture-stained and there are areas of significant surface deterioration / spalling (Photo 1-06 through 1-08 and 1-15 through 1-18), particularly along the north edge of the pool.
c. Efflorescence / salt leaching is visible at several areas, mostly corresponding to locations of penetrations for the pool piping system (Photos 1-08, 1-15, 1-16, and 1-17).
d. Hammer sounding the walls (Photo 1-07) generally revealed the that underlying concrete is sound, but the outer approx. ½ to 1-inch thick, layer at the surfaces is deteriorated in several areas.
e. Hammer sounding the underside of the concrete enclosure (Photos 1-09 through 1-14) generally revealed that the concrete is sound, but there are isolated spalls in some areas (Photos 1-11 through 1-13), and some areas where the outer approx. ½-inch of the concrete surfaces is soft / deteriorated (Photo 1-14). There is evidence of leaks around pipe penetrations at some locations (Photo 1-10), and the leaks have deteriorated the concrete floor structure below (Photos 1-09 and 1-10).
f. Moisture staining and salt leaching is present at the top and bottom of the approx. 10-inch thick, pool enclosure bottom slab along much of the length of the pool (Photo 1-18, white arrows).
g. Similar conditions are present beneath the hot tub area (Photos 1-19 through 1-21), with active leaching / dripping observed at some locations.

Green Street Garage Area (Beneath Pool)

11. The area referred to as the "Green Street Garage" is the small parking area at the southeast corner of the lowest level of the building, which is accessible through the overhead doorway off of Green Street (Photo 2-01). The space is located at the Lower Garage Level and is directly below the Pool Area.
12. The exterior wall and floor above this garage space are constructed of conventionally reinforced, cast-in-place concrete (Photo 2-02). Similar to the rest of the building, the floor structure above is a concrete joist ("rib") slab system created using metal pan forms (Photo 2-03). The joists span in the north-south direction and are supported at two locations above the garage space by large, integrally placed concrete girders (Photo 2-03 is looking north, parallel to joists, white arrows show supporting girders spanning in the east-west direction). Photo 2-04 shows one of the concrete girders bearing on top of a cast-in-place concrete column inside the Green Street Garage. According to the original structural drawings, these girders also align with and support the pool enclosure support walls at the level above (Photo 1-05). Figure 1 shows an excerpt from the original drawing set with the pool enclosure support walls and concrete girders below.
13. There are several cracks and signs of moisture staining / salt leaching through the joist slab system (Photos 2-03, and 2-05 through 2-09, red arrows).
14. There are diagonal and vertical cracks in the concrete walls of the garage that appear to have been previously injected with some repair material at some time during the life of the building (Photos 2-10 and 2-11, red arrows). Markings on the wall next to one of the cracks are dated September 1996 (Photo 2-11).

Lower Level Garage

15. The Lower Level Garage is accessed primarily through the overhead doors along Bay Street (Photo 3-01).
16. Based upon review of drawings and confirmed by field observations, the floor of the Lower Level Garage is a cast-in-place concrete slab-on-grade “pavement slab” (which is essentially a non-structural element with respect to vertical loads).
17. The floor structure above the Lower Level Garage is a concrete joist / rib slab system, with the joists spanning in the north-south direction (Photos 3-02 and 3-03, white arrows). The concrete ribs are supported by integrally placed concrete girders (Photo 3-03 red arrow) and cast-in-place concrete columns below (Photo 3-03 blue arrow).
18. Several of the joists and the floor slab above are cracked, and some of the cracks show evidence of salt leaching (Photos 3-04 through 3-07). At some locations, the slab crack appears to extend across several joists (Photo 3-06).
19. Some portions of the floor above are solid, conventionally reinforced concrete slabs instead of rib slabs (Photo 3-08). We observed cracks (Photo 3-08 red arrows) and areas of hairline crazing / staining (Photo 3-08 white arrow) at some portions of the flat slab.
20. Slab deterioration and heavy spalling is present at some of the building drains (Photos 3-09 and 3-10).
21. There are diagonal and vertical cracks in the concrete walls of the garage that appear to have been previously injected with some repair material at some time during the life of the building (Photos 3-11).
22. Some evidence of moisture / efflorescence (Photo 3-03) and / or leakage from above (Photo 3-12) was observed at some of the columns within the Lower Level Garage.
23. There are several cracks, weathered / deteriorated / spalled areas, and open / deteriorated joints throughout the garage floor slab (Photos 3-13 through 3-16).

Upper Level Garage

24. The floor surface of the Upper Level Garage has an elastomeric coating that is warn in several areas (Photo 4-01).
25. The floor structure above the Upper Level Garage is similar to the floor structure below (i.e., a concrete joist / rib slab system, with the joists spanning in the north-south direction, Photo 4-01). The concrete ribs are supported by integrally placed concrete girders and cast-in-place concrete columns below (Photo 4-01). Much of the structure above the Upper Level Is concealed by a drop panel ceiling (Photo 4-02).
26. Similar to the floor below, there are several diagonal and vertical cracks in the concrete walls of the Upper Garage Level (Photos 4-03 through 4-06). We measured typical crack widths ranging from 0.01 to 0.05 inches (Photo 4-04). Many of the cracks were previously injected (Photos 4-07 and 4-08).
27. Staining and efflorescence are present on the foundation walls at some locations corresponding to piping and drains from above (Photos 4-09 through 4-11).
28. Some portions of the floor above are solid, conventionally reinforced concrete slabs instead of rib slabs (Photo 4-12). We observed previously injected cracks (Photo 4-12 through 4-16) and areas of staining (Photo 4-16) at several locations, typically along the east edge of the garage. Some of the cracks appear to have fresh efflorescence and active drips / leaks (Photos 4-17 through 4-19). At some locations, cracks extend from the floor slab onto the concrete ribs and girders below (Photo 4-20, red arrow).

29. Removing the ceiling tiles at a few locations revealed that the concealed construction above is similar to the construction elsewhere in the garage (i.e., a concrete joist / rib slab, Photo 4-21).
30. The floor drains at this Level are typically corroded, and the coating is worn around the drains (Photo 4-22).

Loading Dock Area

31. The loading dock structure along the east side of the building consists of a lower section at sidewalk grade along Massachusetts Avenue (Photo 5-01) and an upper section at the Plaza Level (Photo 5-02). Portions of the dock floor are metal bar grating (Photos 5-01 and 5-15a, red arrows) and support conditions beneath the grating could not be directly observed.
32. The loading dock is located right along the property line, and a portion of the dock structure "cantilevers" over a lower area along the eastern edge of the property which abuts the back yard of the adjacent site to the east (Photo 5-03).
33. Portions of the cantilevered concrete wall are heavily weathered and there is corroded, exposed rebar at the bottom of the wall (Photo 5-04).
34. The cast-in-place concrete loading dock structure shows signs of weathering and there are several cracks in the walls of the dock that have previously been repaired by routing out and filling them with sealant (Photos 5-01, 5-02, 5-05 through 5-09). Many of the sealant repairs show signs of adhesive failure (i.e., the sealant is no longer well bonded to the concrete, Photos 5-06 and 5-08, red arrows).
35. Some of the cracks have not been repaired / fully repaired (Photo 5-10).
36. There are several cracks and spalls in the concrete floor slabs and at the dock stair (Photos 5-11 through 5-15). Some weathered / freeze-thaw deteriorated concrete is present in the sidewalk along the west edge of the dock (Photo 5-11, red arrow).
37. Portions of the dividing wall between the upper and lower sections of the dock are heavily weathered and cracked. Staining / efflorescence is visible at many of the cracks, and the perimeter dock angles are lightly to moderately corroded (Photo 5-15, white arrows).

Roof Area

38. The upper roof is generally open, with several small pieces of equipment / vents throughout (Photos 6-01 and 6-02). There are mechanical rooms / structures near the east and west sides of the building that project up above the main roof structure.
39. There are low roof patio and rooftop garden areas over the stepped down portions of the building on the south side (Photos 6-03 and 6-04).
40. Very few structural elements are exposed to view above the roof. Minor paint chipping and some corrosion are present on some of the diagonal bracing members in the mechanical rooms / structures above the main roof (Photos 6-05 and 6-06).
41. The main roof structure generally consists of fireproofed structural steel beams supporting a cast-in-place concrete slab on composite metal decking (Photos 6-07 through 6-09). We measured an approx. 2-inch thick, concrete topping over an approx. 5¼ thick (total thickness) concrete slab on metal deck at one location where the edge of slab is exposed (Photo 6-09), but the thicknesses appear to vary.
42. The spray-applied fireproofing is missing at several locations throughout the mechanical areas below the main roof (Photo 6-10, white arrow).
43. Some minor structural modifications were made to the main roof framing sometime after the original building construction, apparently to accommodate mechanical equipment and

penetrations. Some of the steel framing installed as part of these modifications does not appear to be fireproofed (Photo 6-11, white arrows).

REVIEW OF ROOF STRUCTURE AND PROPOSED ROOF ANCHORS

Our review of the review structure, based upon information gathered from the original building drawings and limited field observations of visible structure, revealed:

1. The building has several "jogs" in layout, changes in height, and roof-top projections that make the layout of roof anchors a challenge. The layouts prepared by others that we reviewed as part of this effort appear to provide access to several, but not all portions of the building, and each plan appears to cover different areas. A detailed review of layouts and proposed anchorage is beyond the scope of this "high-level" review, but general comments on each of the proposals that we reviewed follow:
    a. June 24, 2021, Cliffhangers Roof Anchor Layout and Details with July 12, 2021, review comments by SGH.
        i) The layout calls for 83 individual anchors, at locations shown by Cliffhanger's drawing, presumably located at locations required to safely access faces of building below.
        ii) In general, the proposed anchor layout appears to cover most areas.
        iii) The anchor detail shown on the drawing reports a fracture load of 5,000 pounds and a rated load of 1,250 pounds.
        iv) The roof anchor specified is a "Bolt-Through Roof Anchor" consisting of a 3½" (nominal) diameter steel pipe with welded base plate, and through bolts extending through the roof deck and anchored to steel channels to be installed beneath the deck.
        v) A preliminary cost estimate (by others) shown in some correspondence related to the proposed roof anchor installation included significant costs for "roof anchor strengthening," at 30 locations, but based upon the information provided to us, it's not clear what strengthening is specified.
    b. January 2, 2018, American Anchor Proposal
        i) The layout calls for 49 roof anchors but does not appear to cover as many areas as the Cliffhangers proposal.
        ii) The roof anchor specified is a Blind Concrete Roof Anchor (BCRA), which may not be appropriate for installation on this concrete slab on metal roof deck roof. Details of how the "toggle bolt" interacts with the "flutes" (i.e., profile) of the metal deck would need to be carefully reviewed.
    c. GSS Corporation Specification (no date on document, May 4, 2018, date on one sketch):
        i) The layout includes 47 roof anchors but does not appear to cover as many areas as Cliffhangers proposal.
        ii) Adhesive anchors are specified, which may be not appropriate for installation on this concrete slab on metal roof deck roof as the required anchor embedment shown is deeper than the thickness of the existing structural slab.
2. Most areas of the main roof structure are constructed of concrete slabs on metal deck supported by structural steel beams, a construction type that in many ways is favorable for the installation of roof anchors, but there are also limitations due to the thickness and profile of the deck.
    a. We analyzed selected, typical portions of the roof deck / beams (based upon information gathered from the original drawing set), and we find that these typical areas have adequate capacity to safely support roof anchors if properly detailed and installed.

b. Proper anchorage detailing could include direct fastening to structural steel beams, or anchors that include anchor plates / reinforcement beneath the roof deck.

OPINION / RECOMMENDATIONS

Based upon our field observations and follow-up review, our structural engineering opinions / recommendations are as follows:

1. Pool Area
   a. In general, we did not observe any areas of immediate / impending structural failure, but some deterioration / distress was observed. The observed deteriorated concrete (spalls / softened surface areas) appears to be the result of water / moisture and possibly chemicals leaking into the concrete structure and does not appear to be the result of deficiencies with the original design.
   b. Additional investigation should be performed to gain a better understanding of the observed behavior and to develop repairs / strengthening as required. The recommended additional review should include:
      i. Investigate / "track down" sources of moisture and extents of piping that contribute to the observed conditions.
      ii. Sample concrete at areas of observed distress / deterioration as well as an area where no distress is observed (for comparison).
      iii. Locally probe to determine conditions of the steel reinforcement ("rebar") in areas of cracks / distress.

2. Green Street Garage
   a. The observed cracks in the floor slab above the Green Street Garage appear to be related in part to moisture / water leaking from the Pool Area above, but normal concrete shrinkage and building settlement / movement may also play some role.
   b. Additional investigation should be performed to gain a better understanding of the observed behavior and to develop repairs / strengthening as required. The recommended additional review should include:
      i. Map out / locate cracks relative to concentrated load locations from Pool construction above.
      ii. Investigate / "track down" sources of moisture / water that contribute to the observed conditions.
      iii. Sample concrete at areas of observed distress / deterioration as well as an area where no distress is observed (for comparison).
      iv. Locally probe to determine conditions of the steel reinforcement ("rebar") in areas of cracks / distress.

3. Lower and Upper Garage Areas
   a. **The spalled concrete areas observed at the Lower Garage at several pipe penetrations represent potential drop hazards which should be addressed immediately by locally removing the spalls and / or providing additional hanger supports to properly support the pipes.** Localized concrete repairs at some of these locations will likely be required. A detailed survey (Upper and Lower Garages) should be performed to identify all spall locations and develop appropriate repair details.
   b. The observed cracks in the floor slab above the Upper and Lower Garage appear to be related in part to moisture / water leaking from the floor above, but normal concrete shrinkage and building settlement / movement may also play some role.

c. Additional investigation should be performed to gain better understanding of observed behavior and to develop repairs / strengthening as required. The recommended additional review should include:
   i. Map out / locate cracks relative to concentrated load locations from construction above.
   ii. Investigate / "track down" sources of moisture / water that contribute to the observed conditions.
   iii. Sample concrete at areas of observed distress / deterioration as well as an area where no distress is observed (for comparison).
   iv. Locally probe to determine conditions of the steel reinforcement ("rebar") in areas of cracks / distress.
d. The existing floor coating on the upper surface of the Upper Garage floor should be assessed / repaired / replaced as required to mitigate moisture intrusion.
e. Cracks and spalls in the Lower Garage floor slab should be repaired to mitigate moisture intrusion. A properly applied floor coating could also be considered.

4. Loading Dock Area
   a. The observed cracks in the dock walls are likely related to the following mechanisms:
      i. Tensile stresses that developed in the top edges of the walls due to the cantilevered construction.
      ii. Moisture ingress due to the exterior exposure
      iii. Normal concrete shrinkage
      iv. Temperature changes due to the exterior exposure
   b. Additional review should be performed and repairs should be designed to address the cracked / deteriorated concrete and the spalled concrete / exposed rebar areas.
   c. The concrete should be sampled to determine chloride content (e.g., due to the presence of de-icing salts).
   d. The grating supports should be inspected to confirm condition and adequacy for supporting wheel loads. This will require temporarily removing the gratings so that direct observations can be made and may require removal and reinstallation of a selected number of anchors (typically two to three per grating area).

5. Roof Area
   a. The observed structural elements at the roof level are generally serviceable and, at the locations observed, are generally consistent with the sizes / details shown on the original design drawings.
   b. The beam fireproofing must be maintained to provide adequate resistance to / protection from fire. Missing fireproofing should be restored.
   c. Minor corrosion on some exposed portions of beams were observed at some locations. Steps should be taken to confirm that any moisture ingress is mitigated, and then the steel should be cleaned and prepared and then recoated / fireproofed.
   d. Exposed steel with minor chipped paint and corrosion at rooftop penthouses (e.g., the diagonal braces) should be cleaned / prepared and recoated.

6. Roof Anchors
   a. In general, the Cliffhangers / SGH approach to the roof anchors seems reasonable, but the extent of the proposed roof reinforcement is unknown, and costs seem high.
   b. We recommend that a detailed structural peer review of the proposed roof anchor solution be performed, and / or that similar solutions be priced with additional vendors.

LIMITATIONS

1. The scope of this report is limited to those specific structural elements / conditions observed, as indicated in this report. Any comments, figures, or photographs included in this report that pertain to other building systems or conditions are included only to describe the effect(s) that those systems / conditions may have on the structural elements / conditions that are included in our scope of work. No part of our assessment or this report should be construed to imply that every structural component or condition was observed, or that every possible structural defect or deficiency was discovered. All components and conditions which by the nature of their location are concealed or camouflaged are excluded from the scope of our work.
2. Our investigation and this report are not any form of written or implied warranty or guaranty.
3. Nothing in this report should be construed as a drawing or specification for construction or repair work. Recommendations related to any construction / repairs included in this report are conceptual in nature and are not final recommendations related to specific scopes of work. Should you / others decide to perform any construction or repair work related to our recommendations, such work should be designed by licensed professionals, reviewed by applicable regulatory entities (e.g., the local Building Department), and should be performed by licensed / qualified contractors.

Sincerely yours,

J. Matthew Tripi, PE
Principal

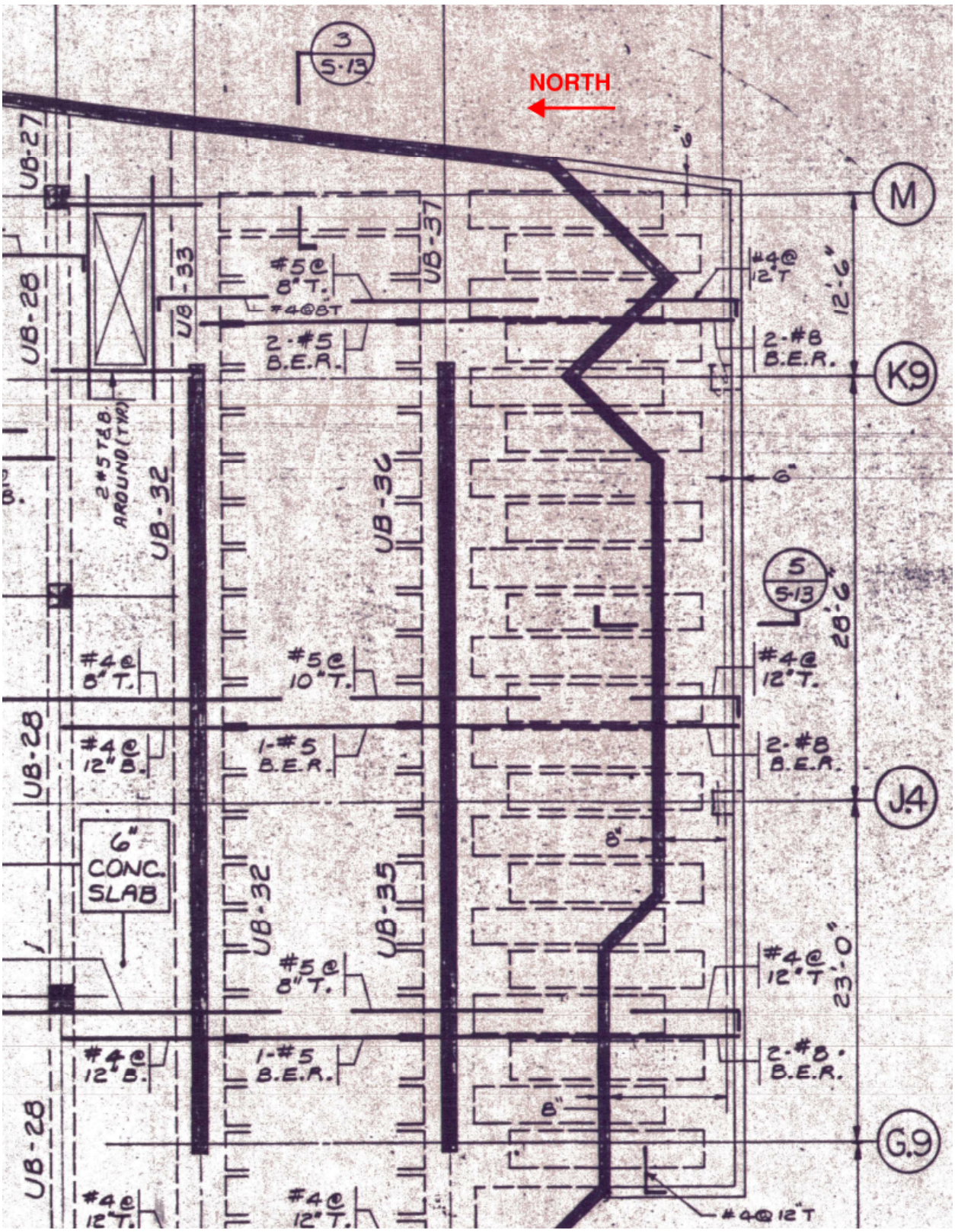

Figure 1 – Excerpt from Upper Garage Floor Framing Plan (i.e., framing above Green Street Garage). Long dark straight lines in east-west direction are the pool support walls. Beams labeled “UB-32, UB-35 and UB-36” are the supporting concrete girders.


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Photo 1-01
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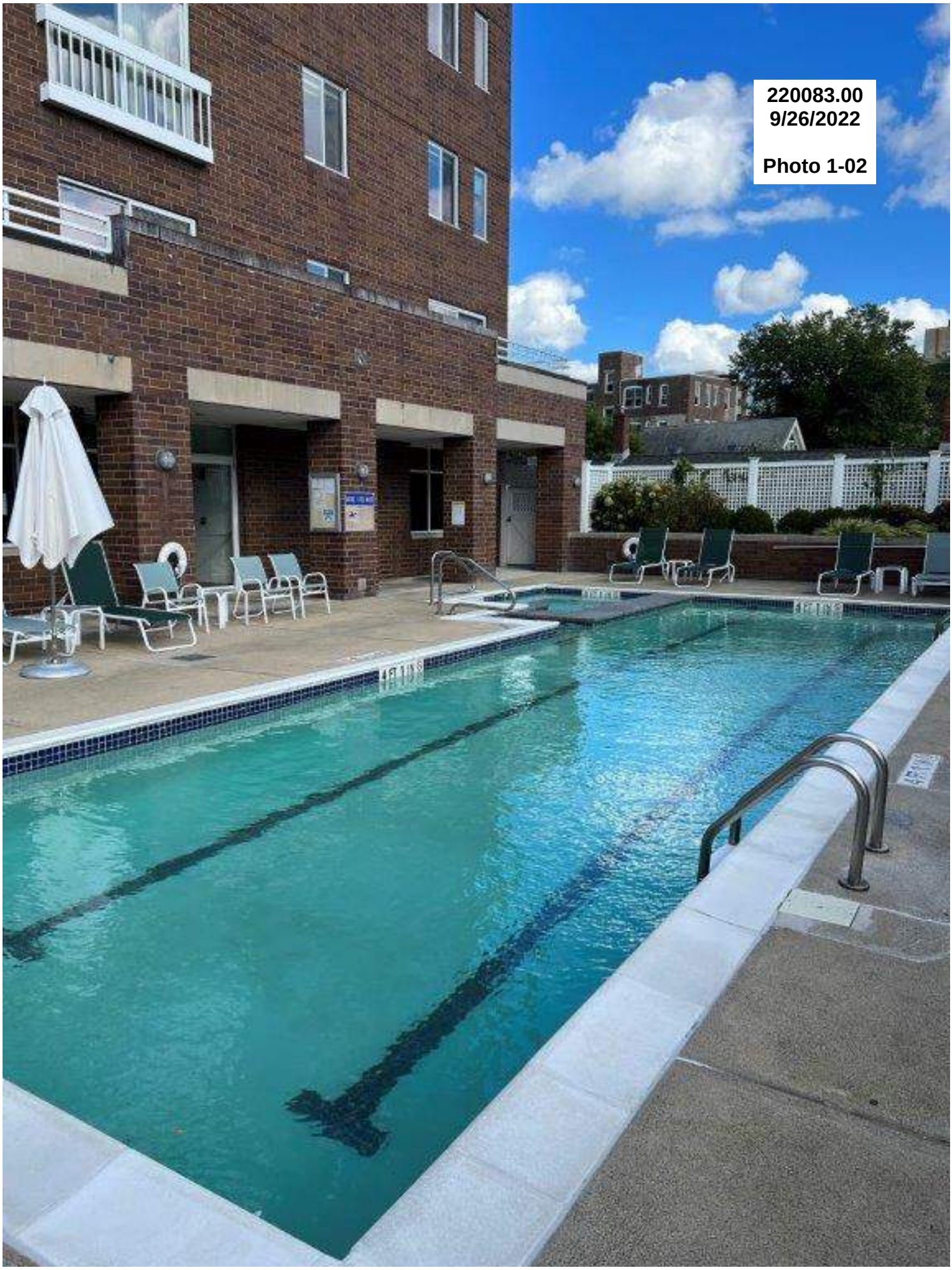
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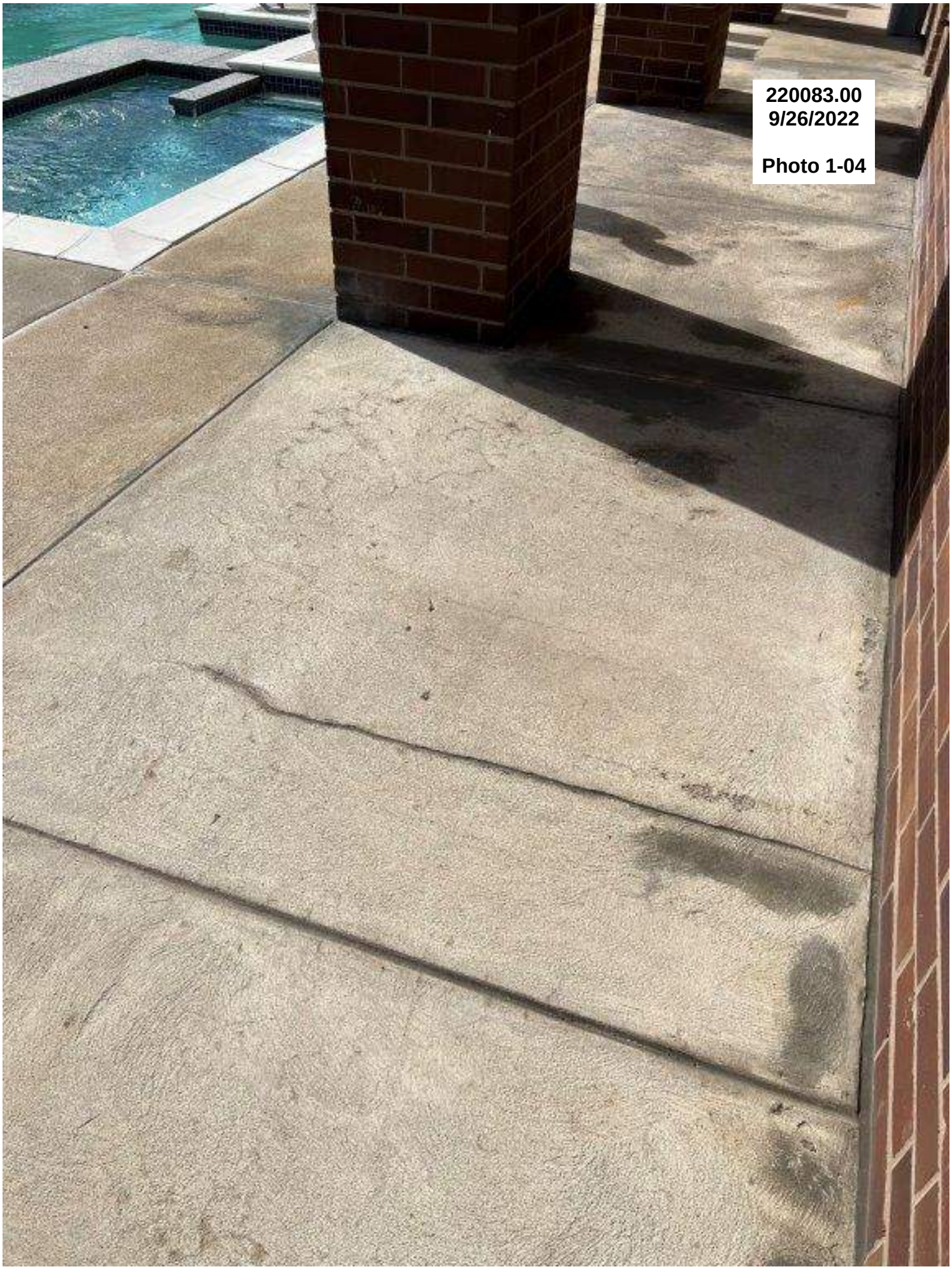
9/26/2022
Photo 1-03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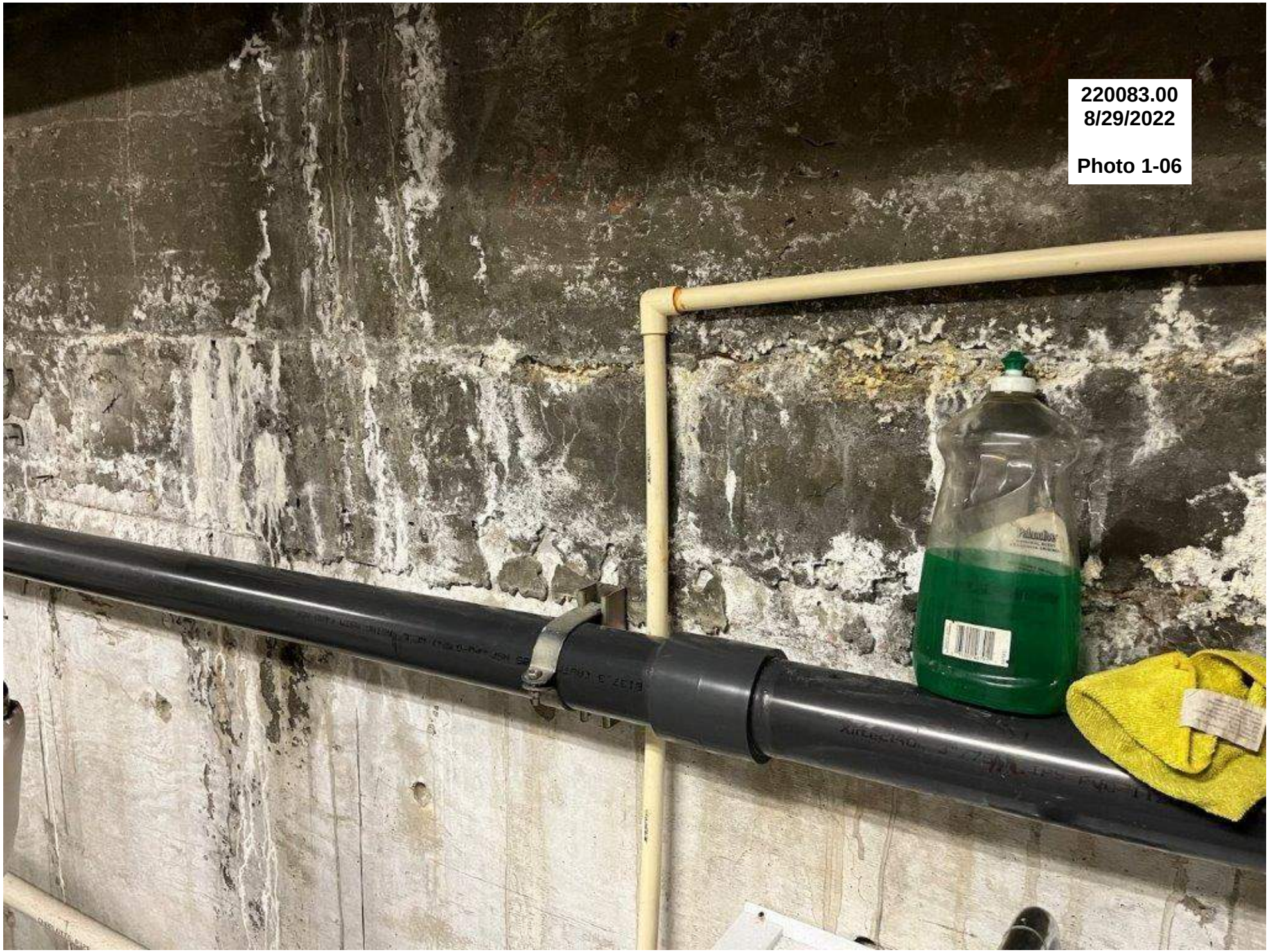
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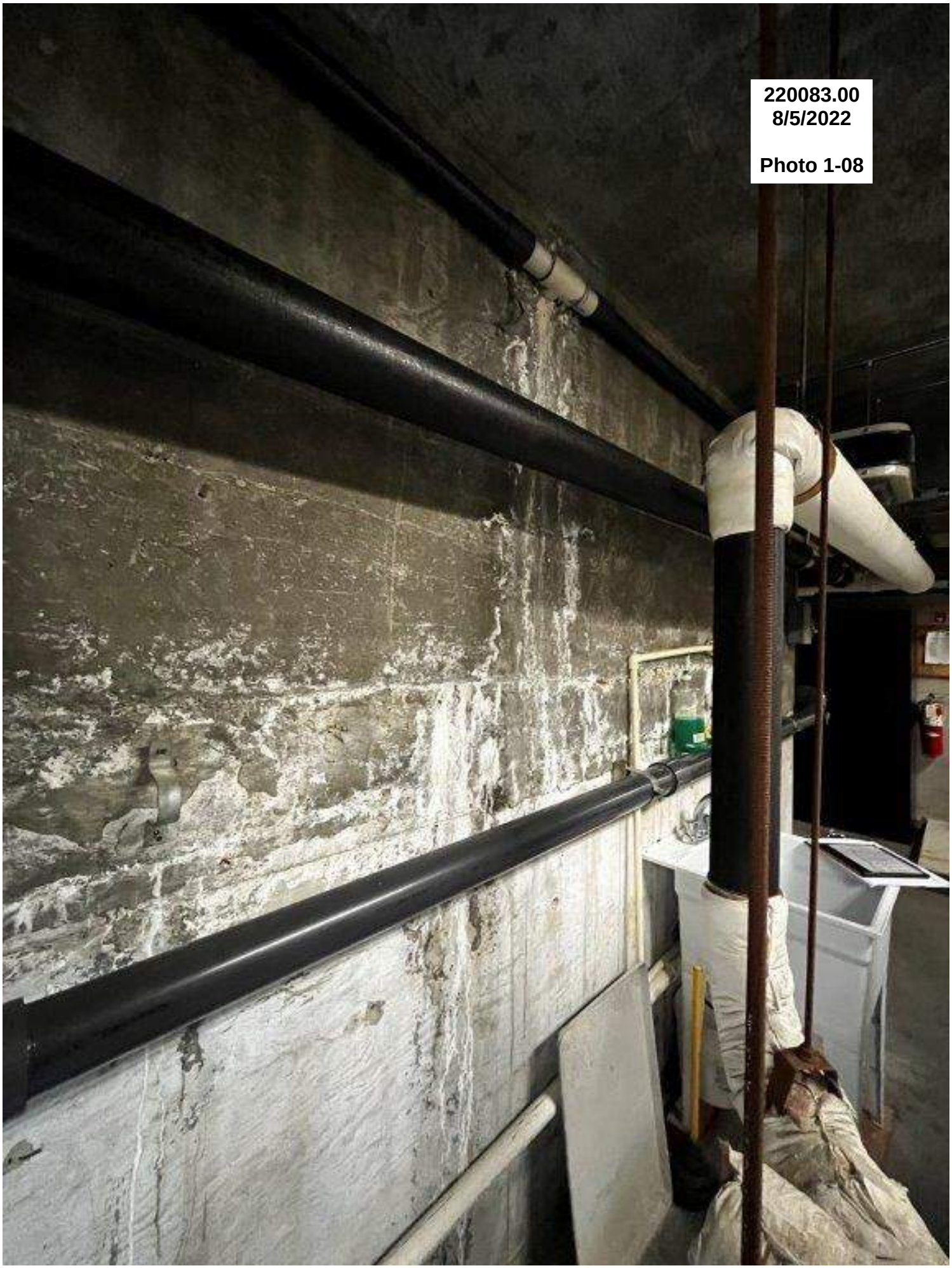
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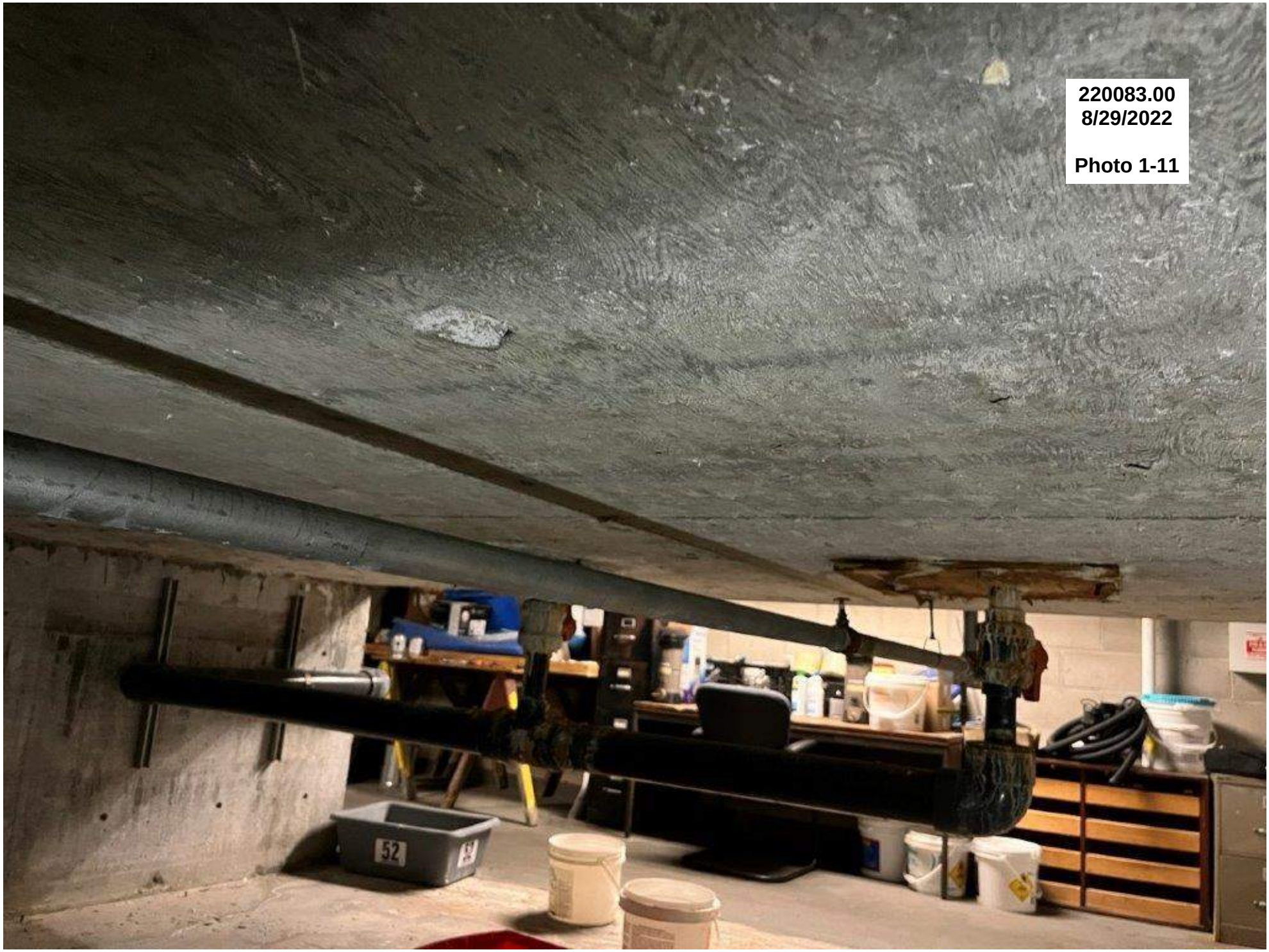
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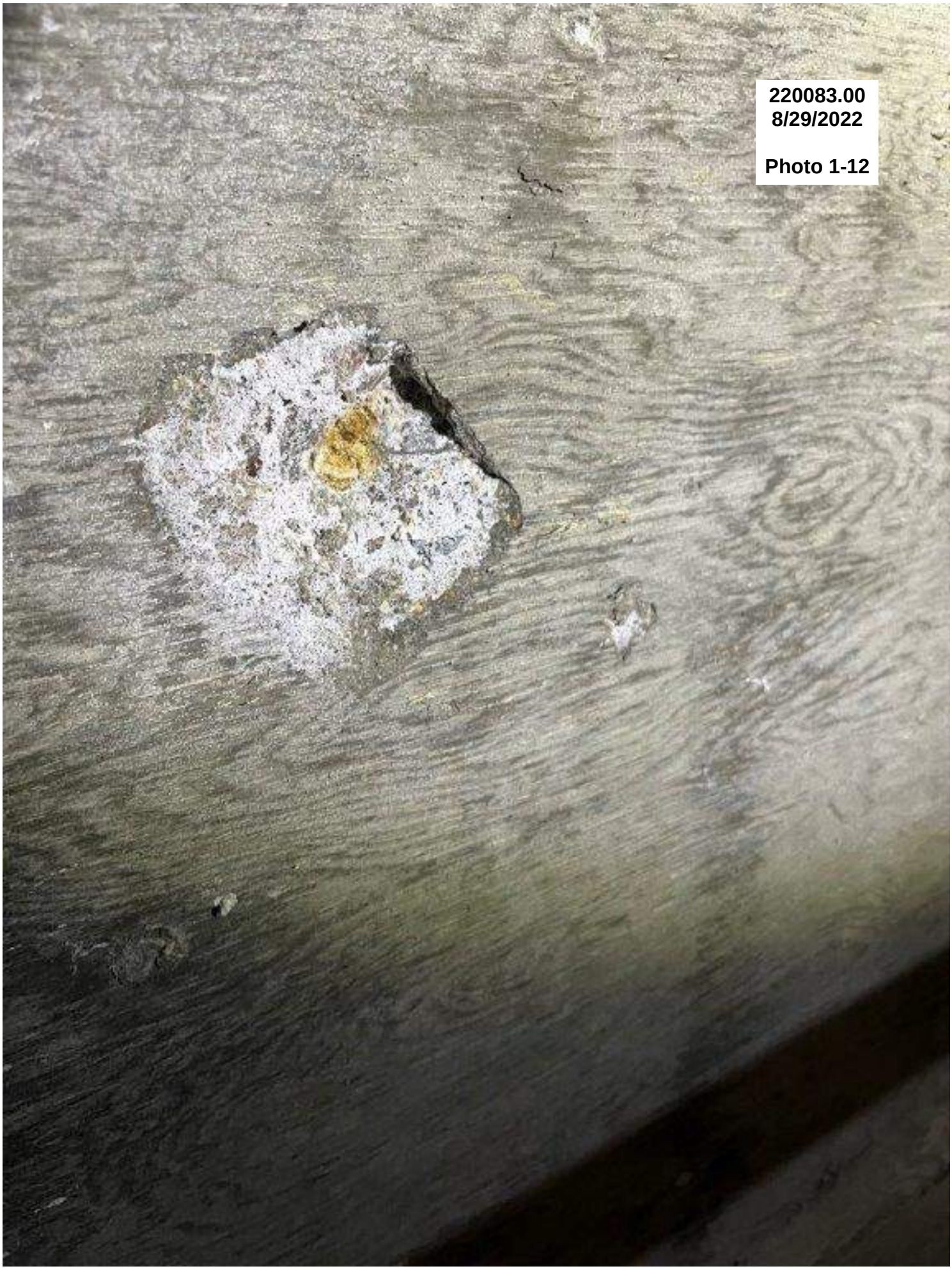
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Photo 1-13


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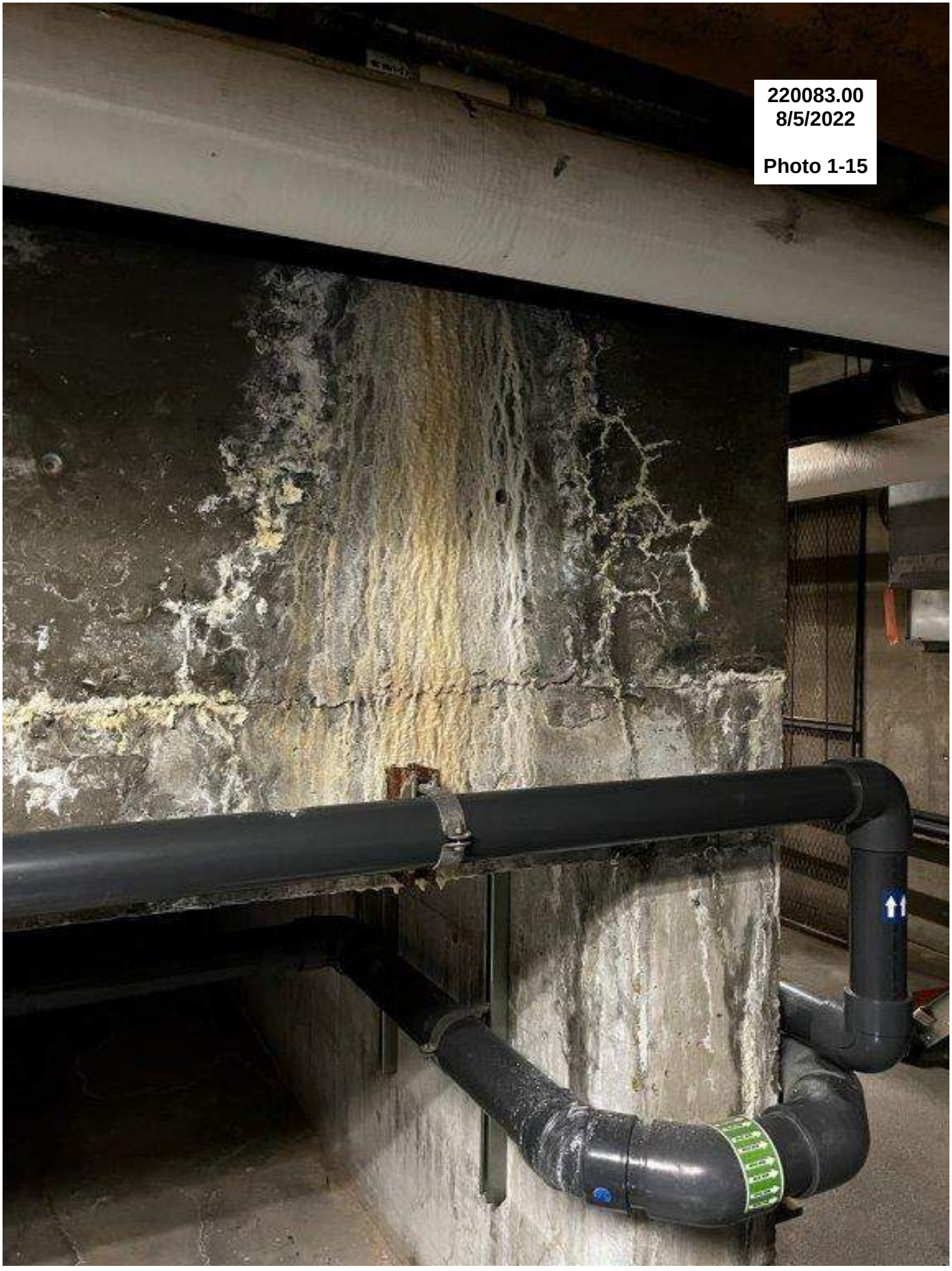
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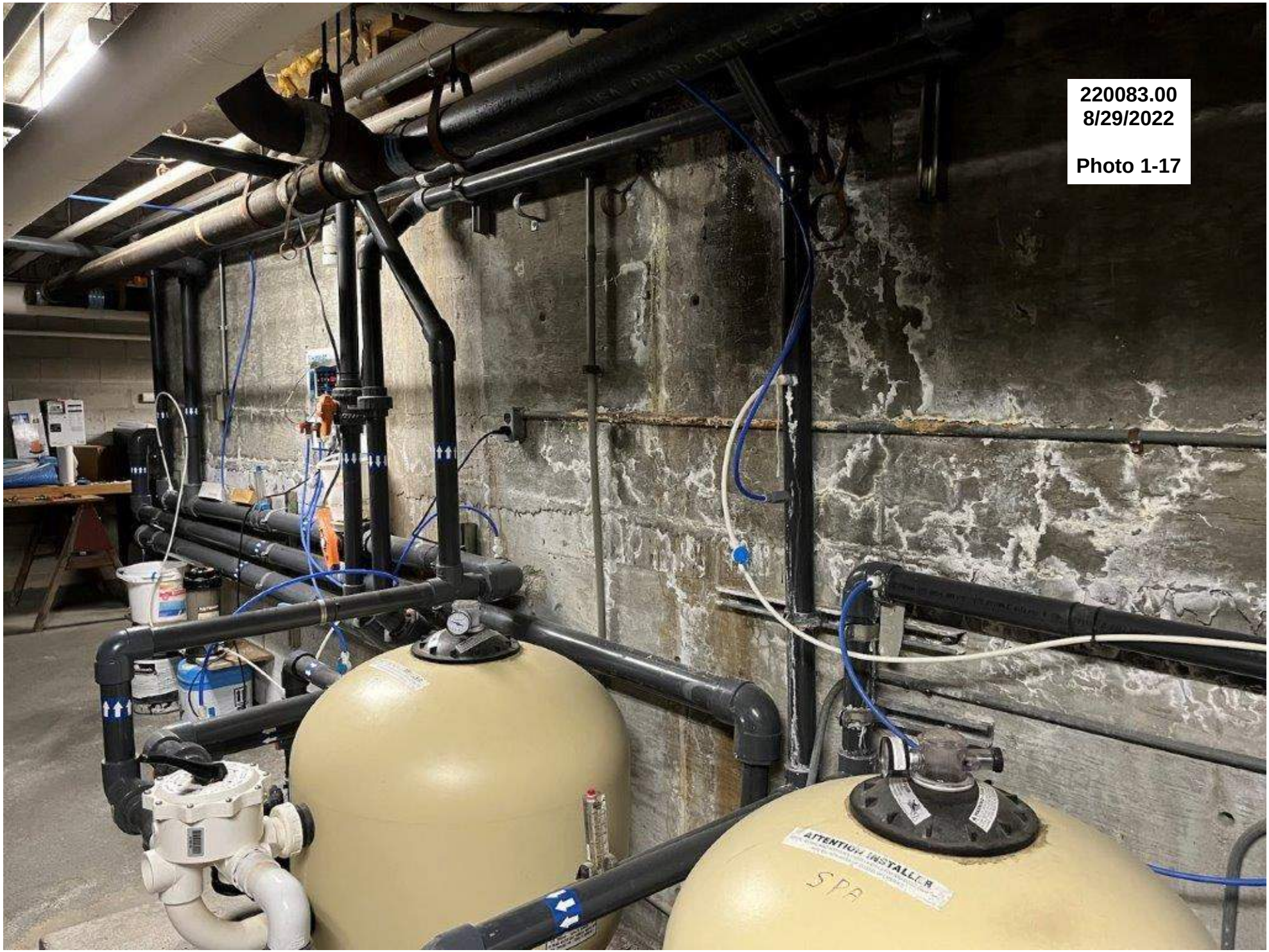
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Photo 1-17
ATTENTION INSTALLER
SPA


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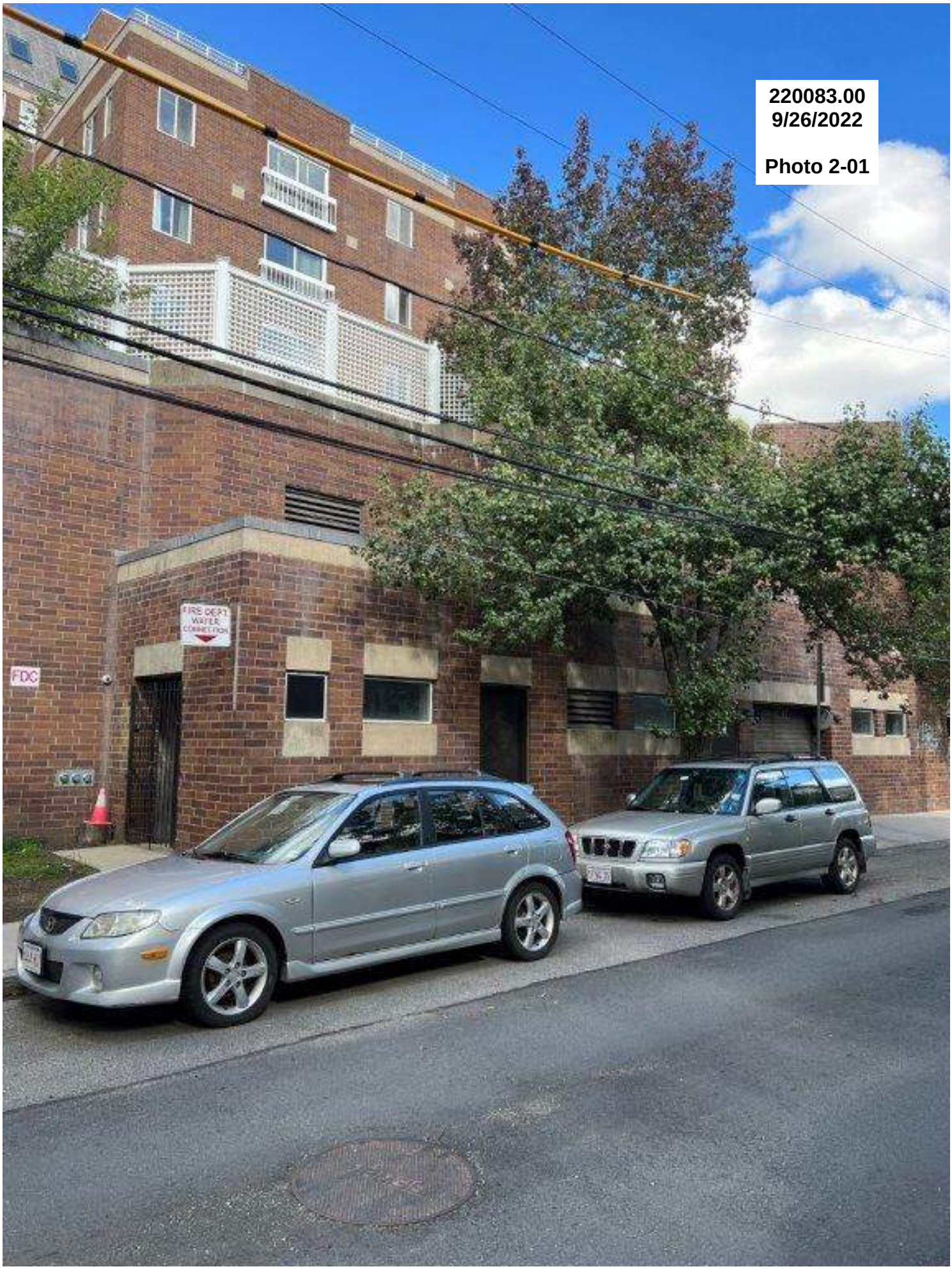
8/29/2022
Photo 1-18
Ex fan
PF 2


220083.00
8/5/2022
Photo 1-19


220083.00
8/5/2022
Photo 1-20


220083.00
8/5/2022
Photo 1-21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FIRE DEPT
WATER
CONNECTION
FDC


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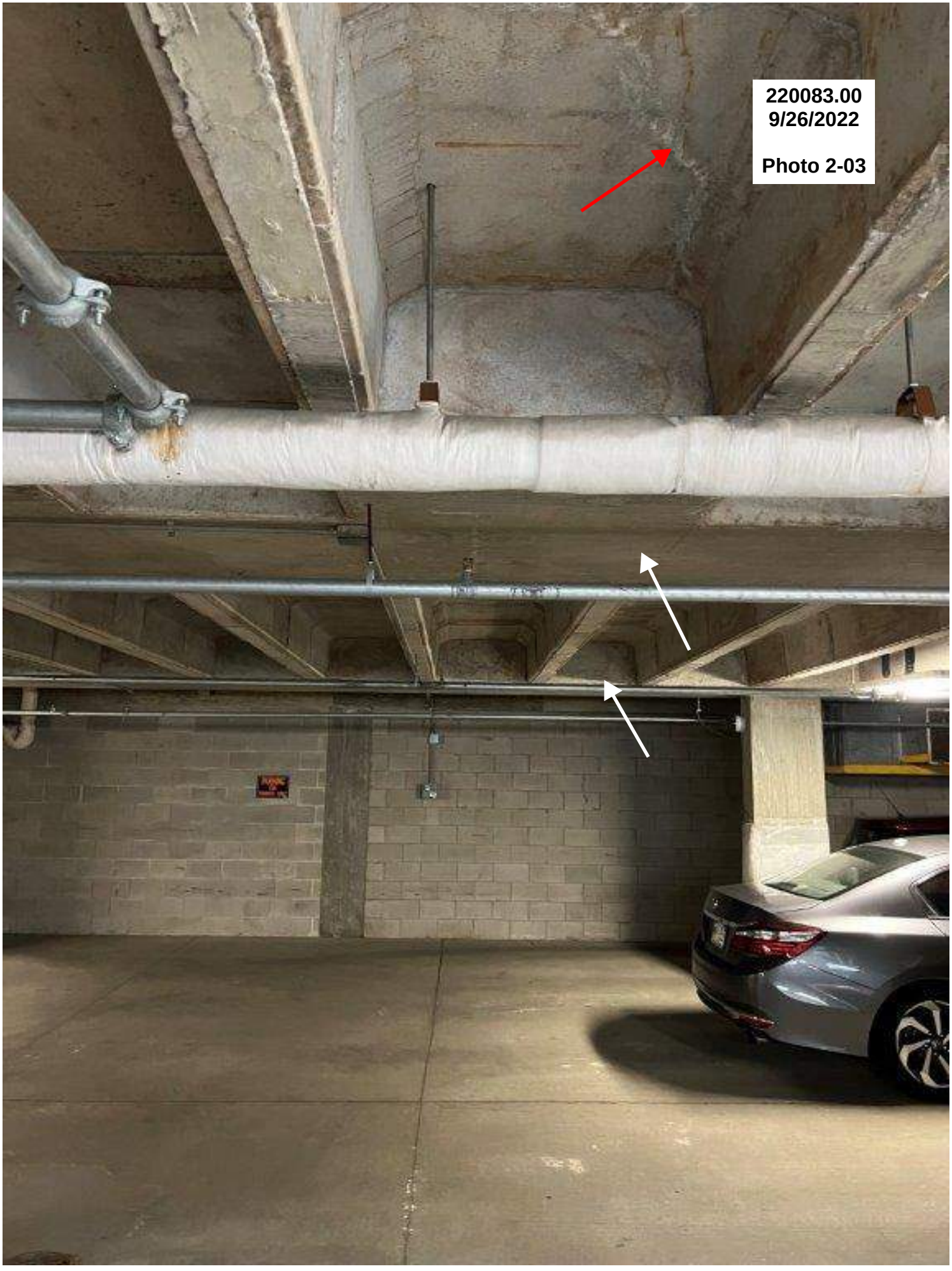
9/26/2022
Photo 2-02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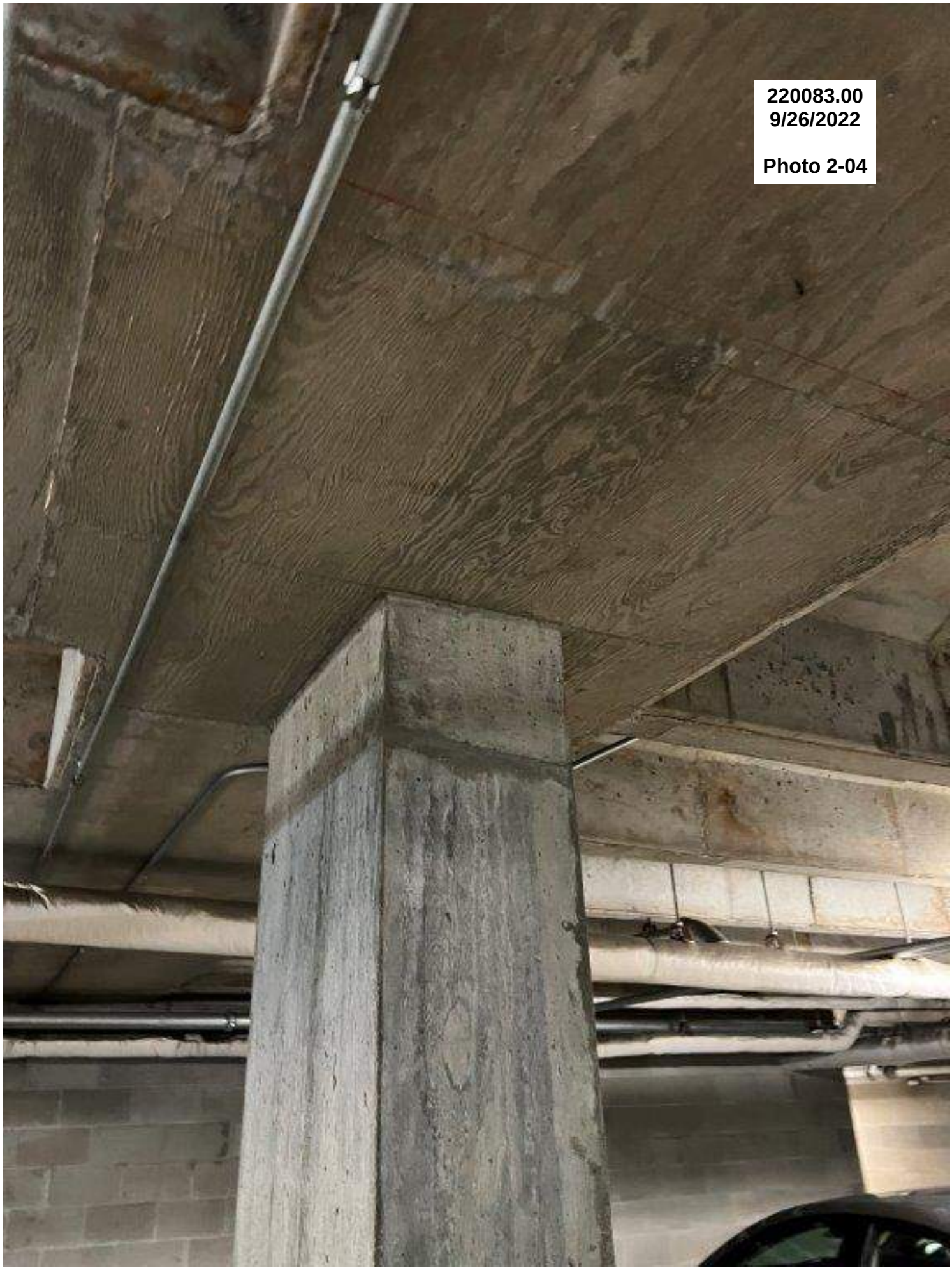
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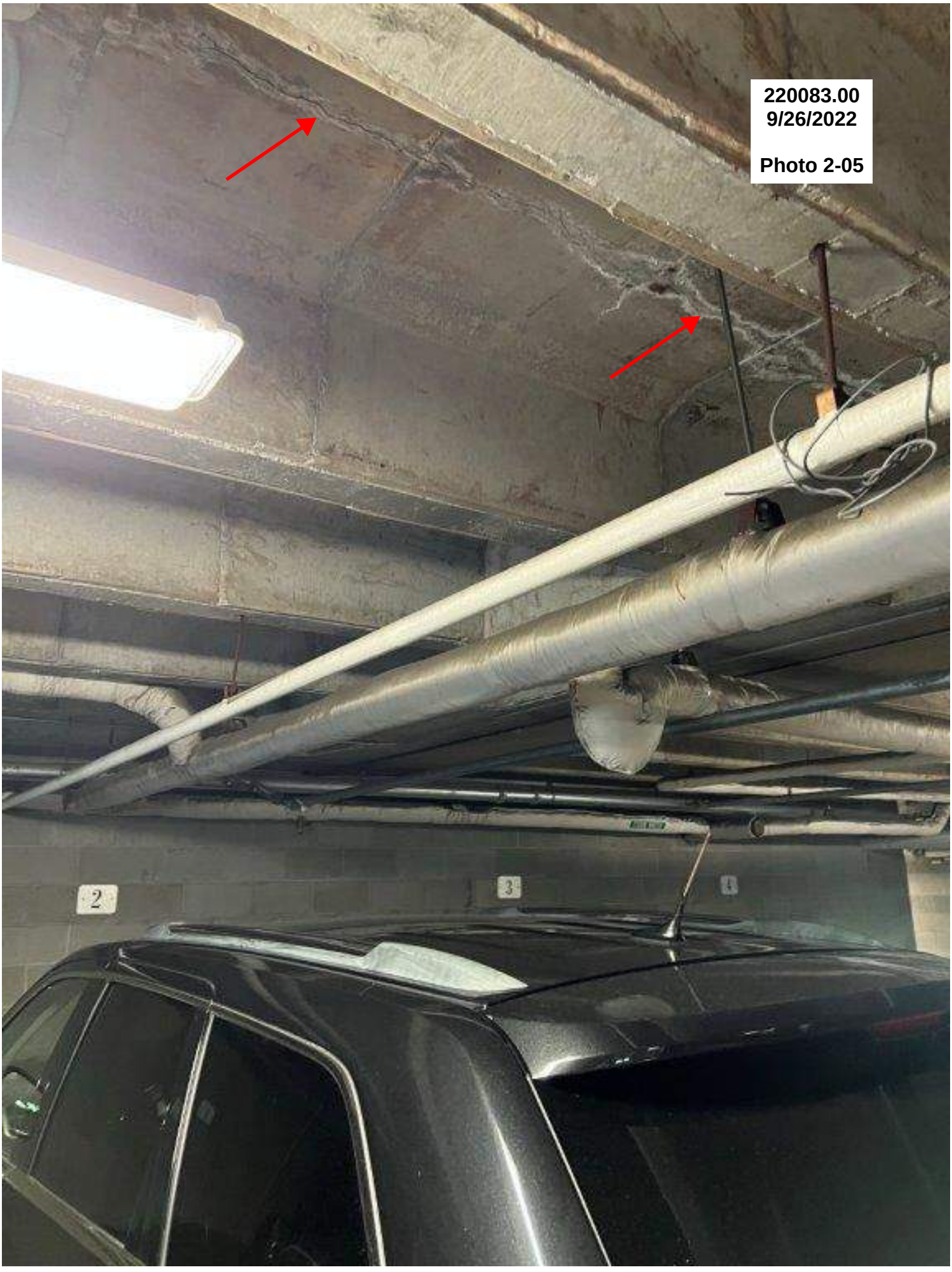
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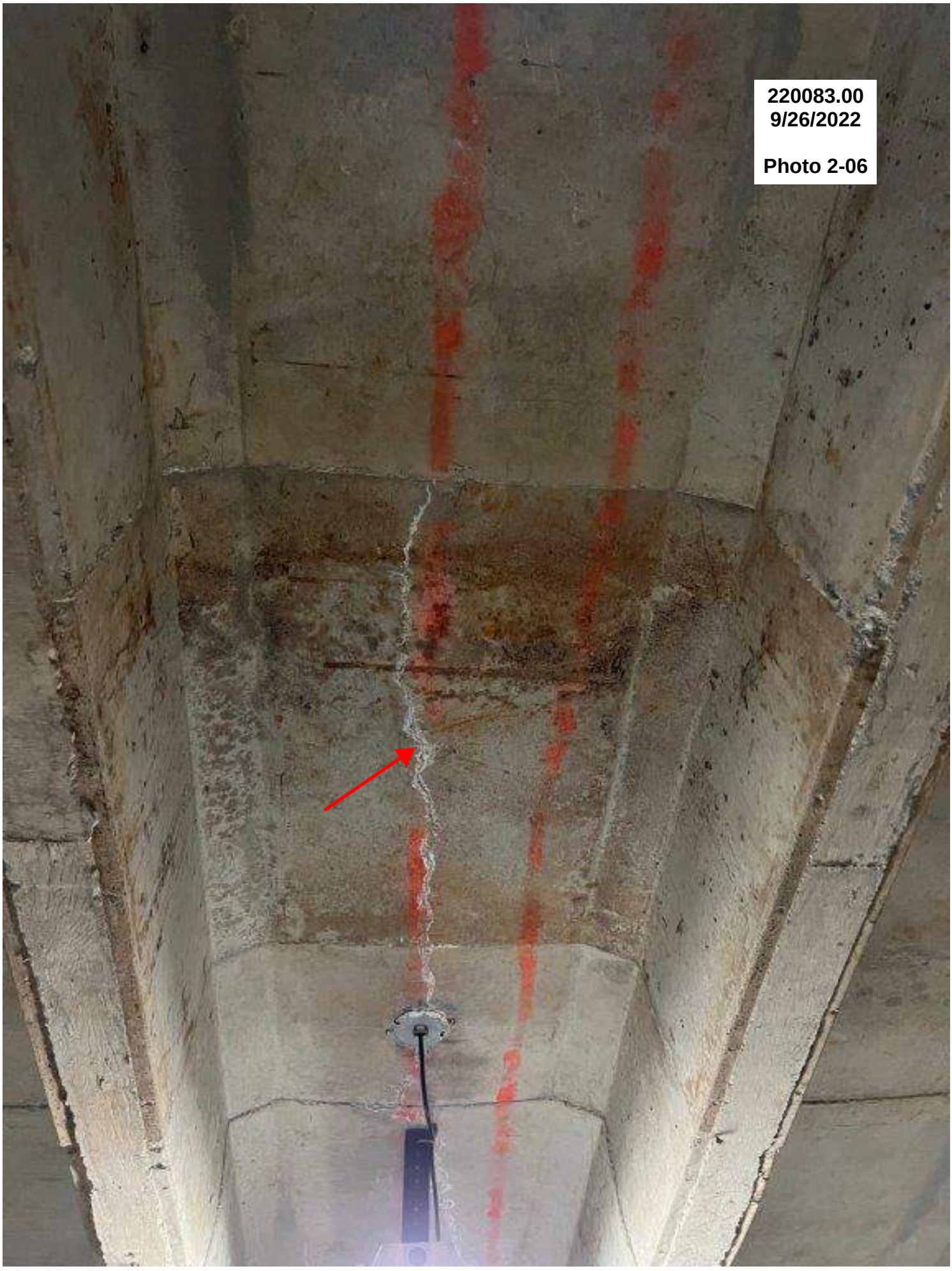
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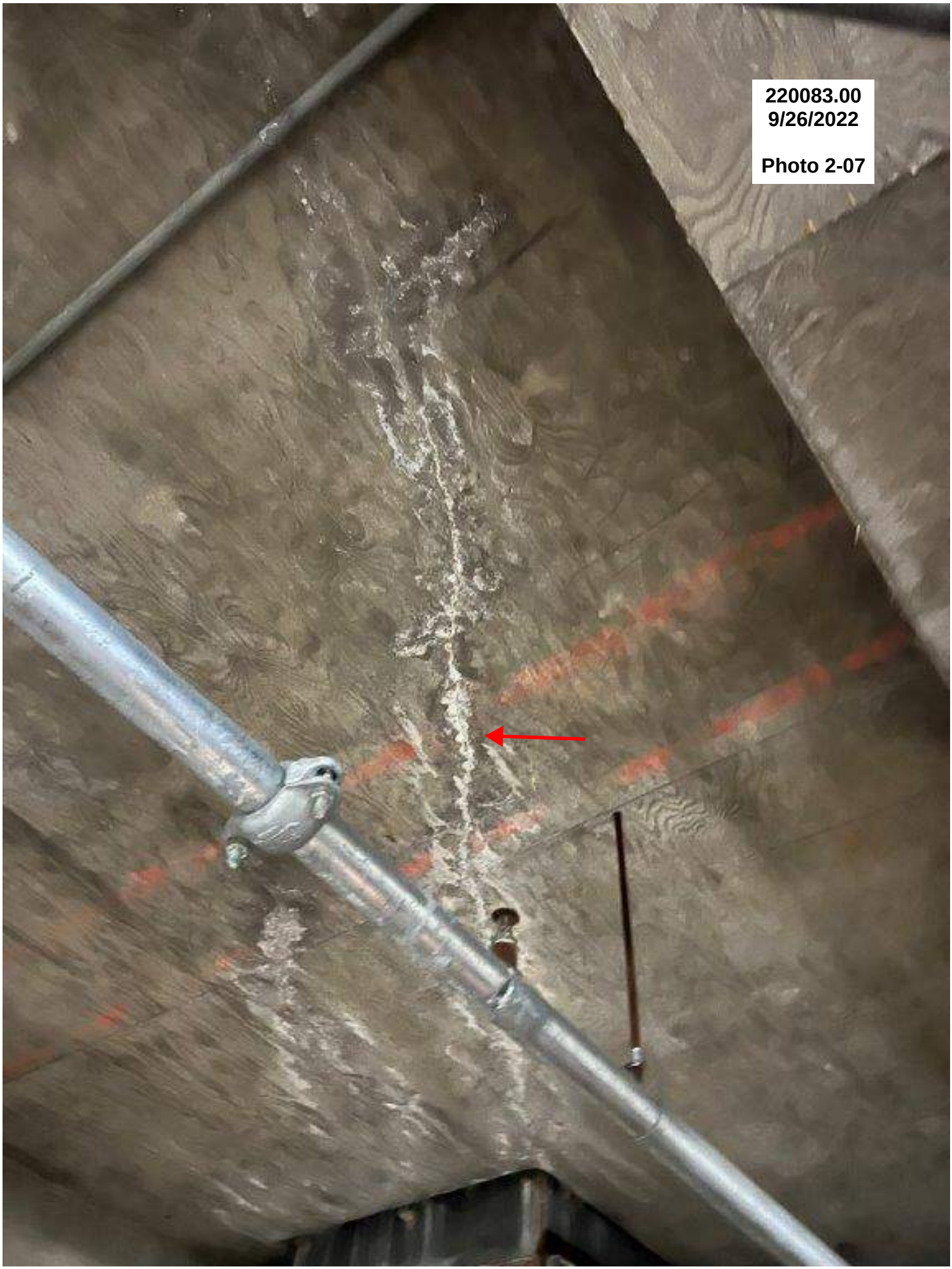
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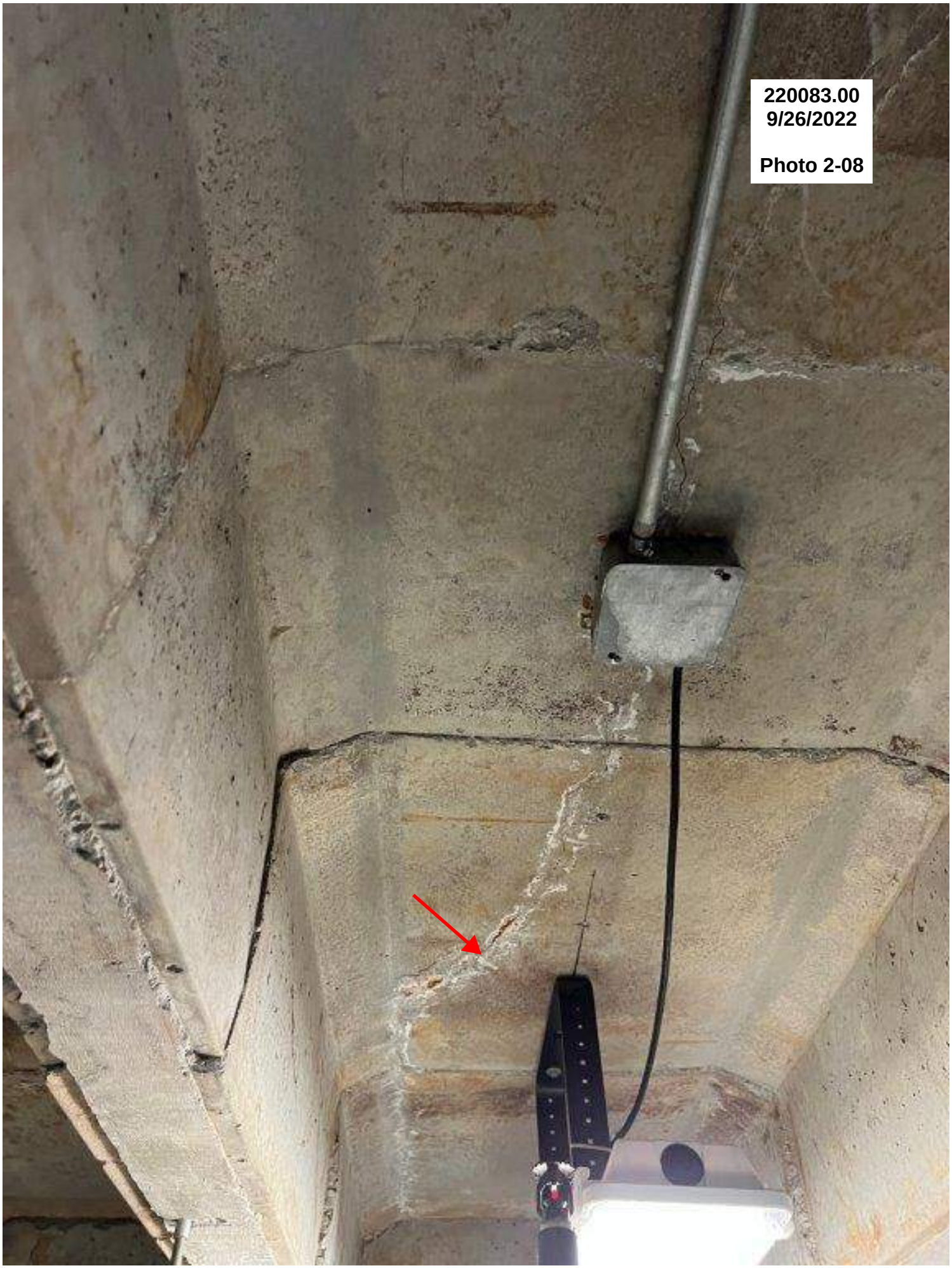
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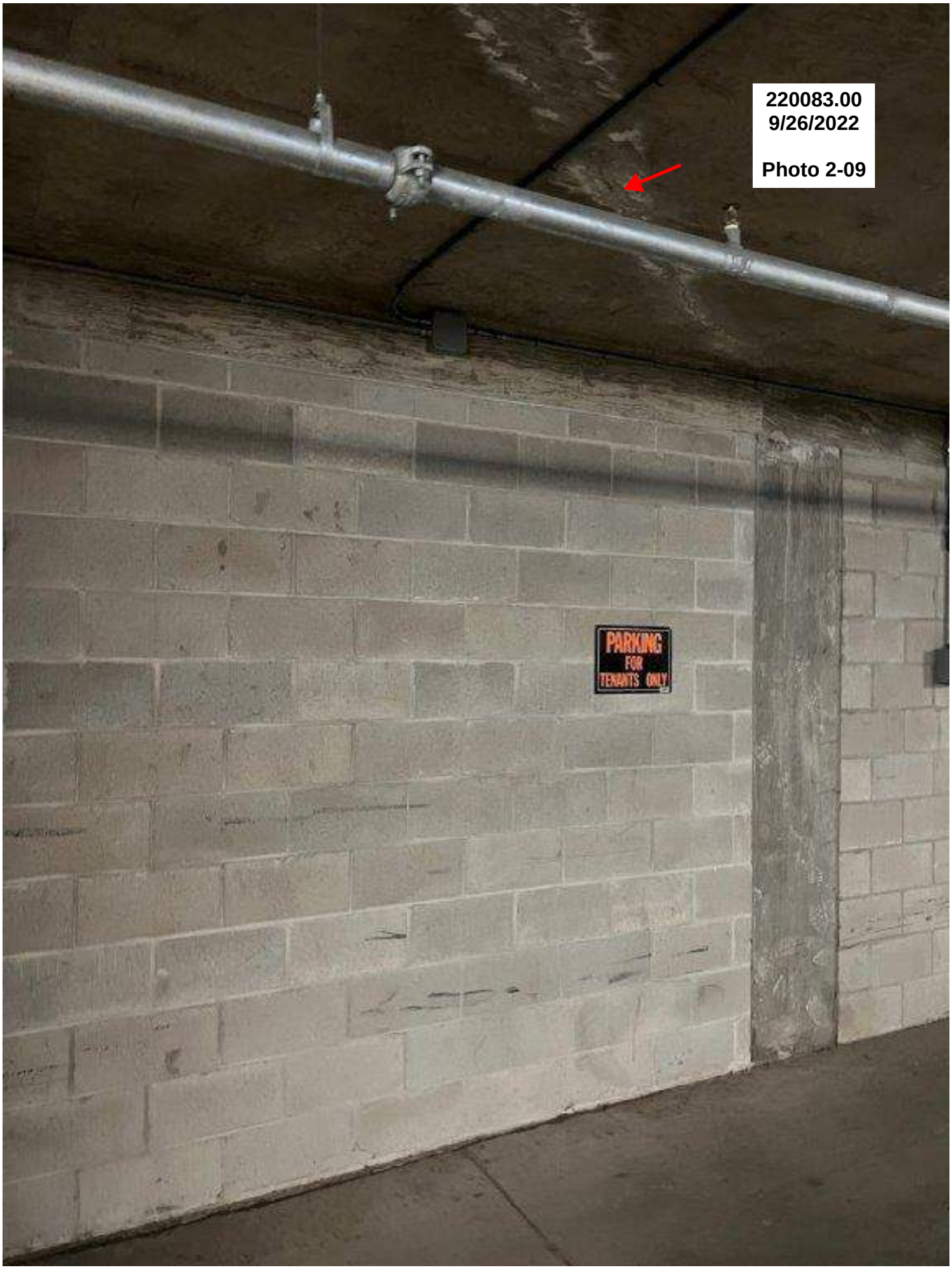
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Photo 2-09
PARKING
FOR
TENANTS ONLY


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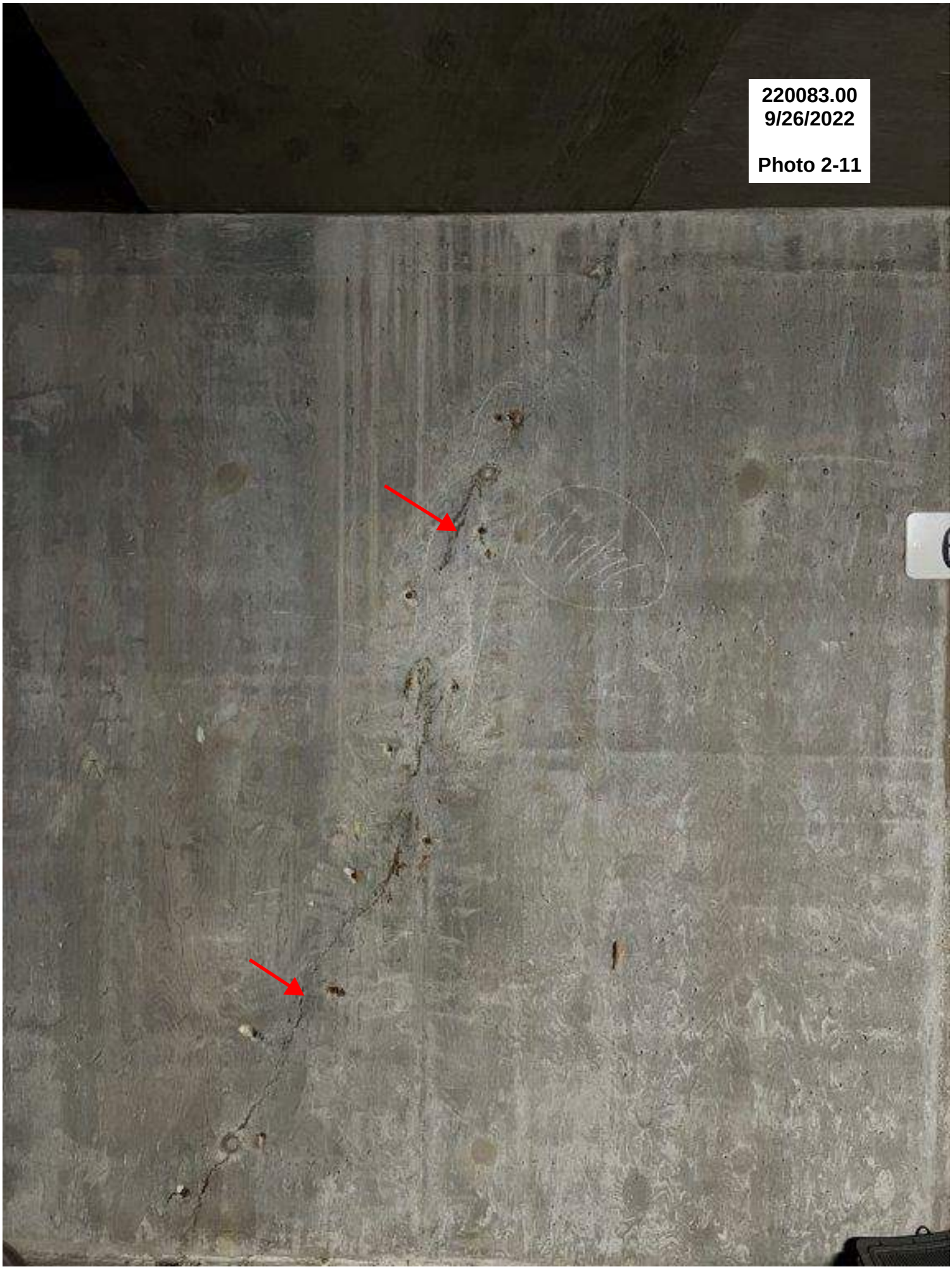
9/26/2022
Photo 2-10
6
7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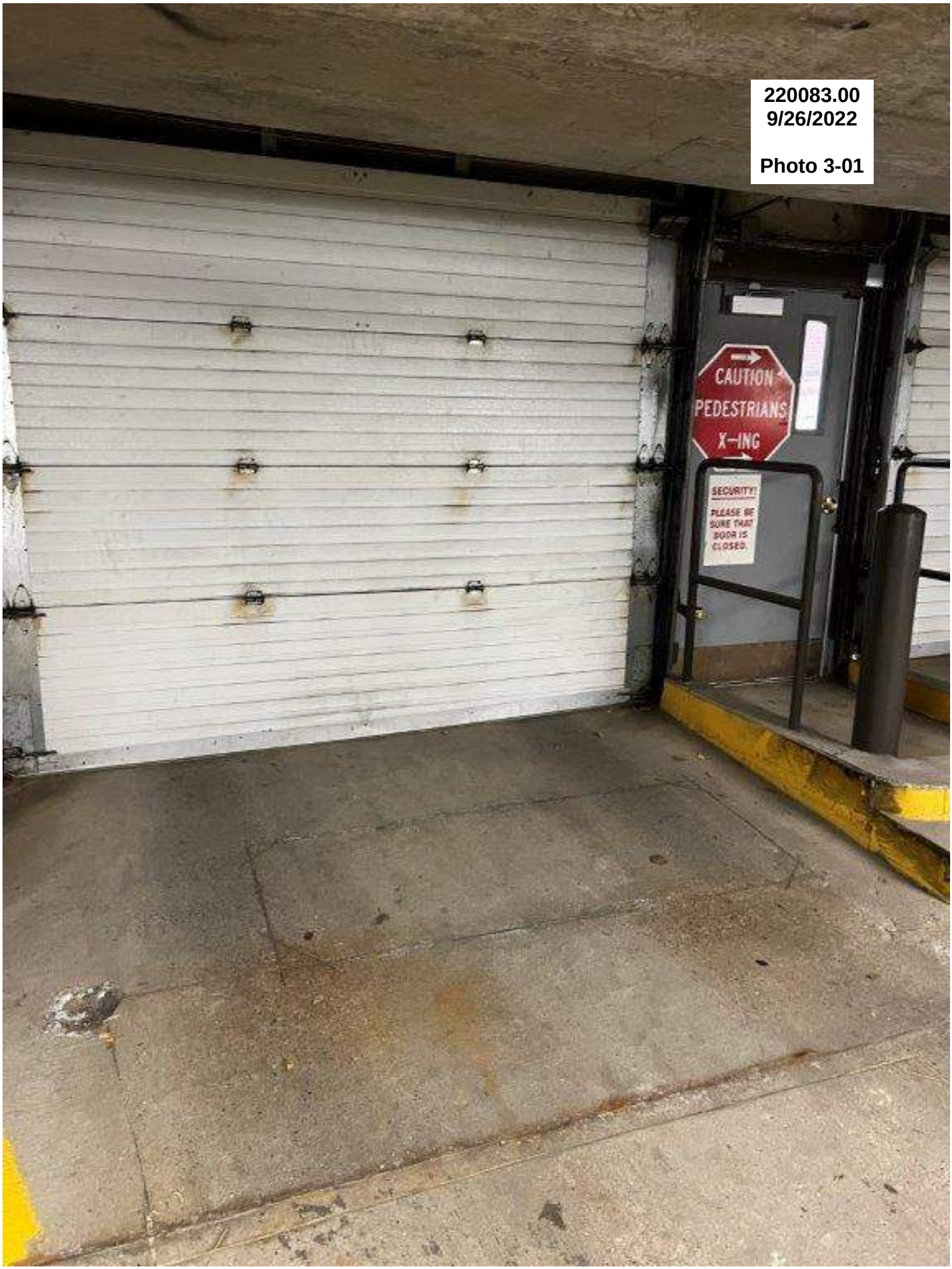
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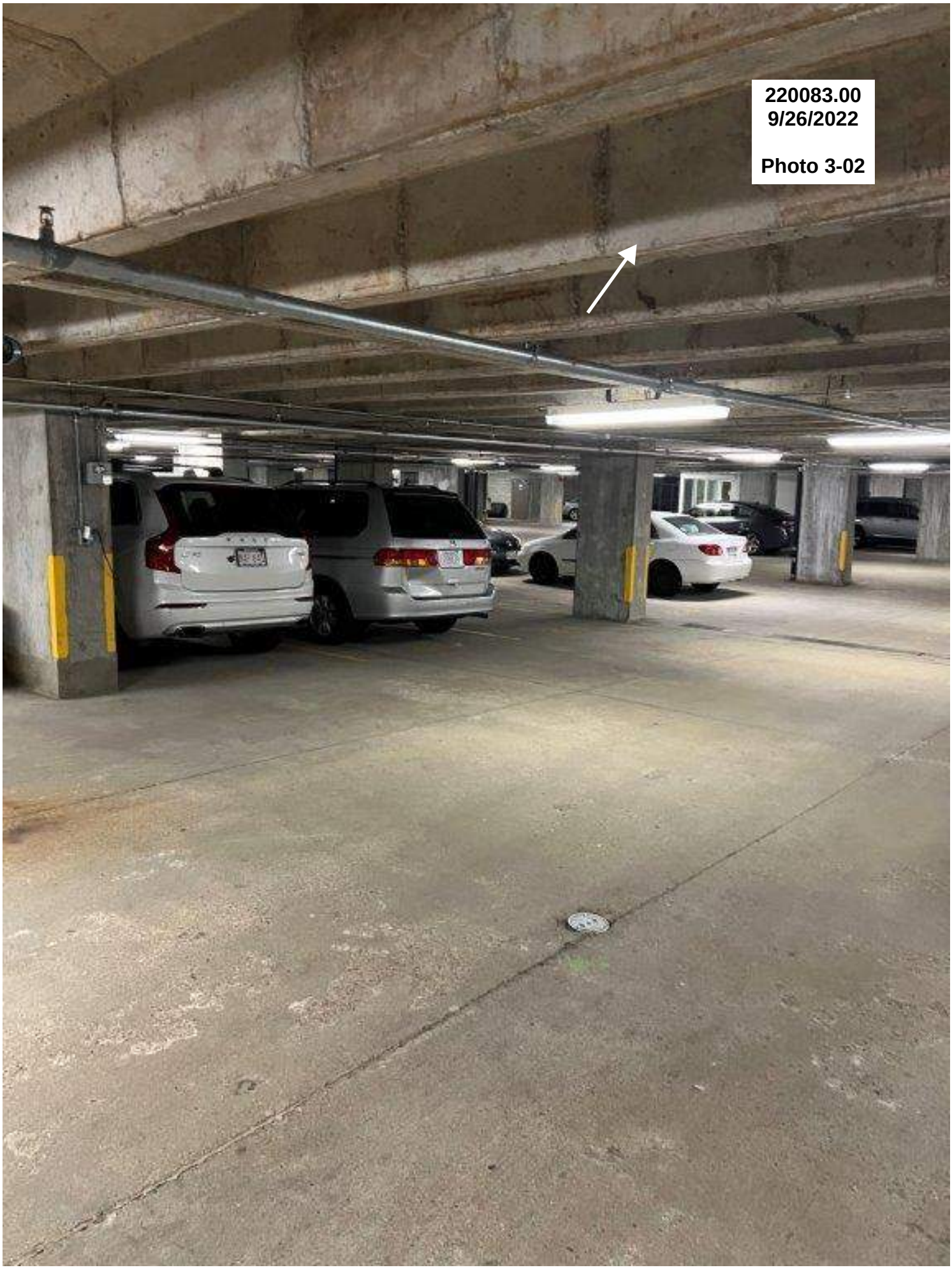
Photo 3-01
CAUTION
PEDESTRIANS
X-ING
SECURITY!
PLEASE BE
SURE THAT
DOOR IS
CLOSED.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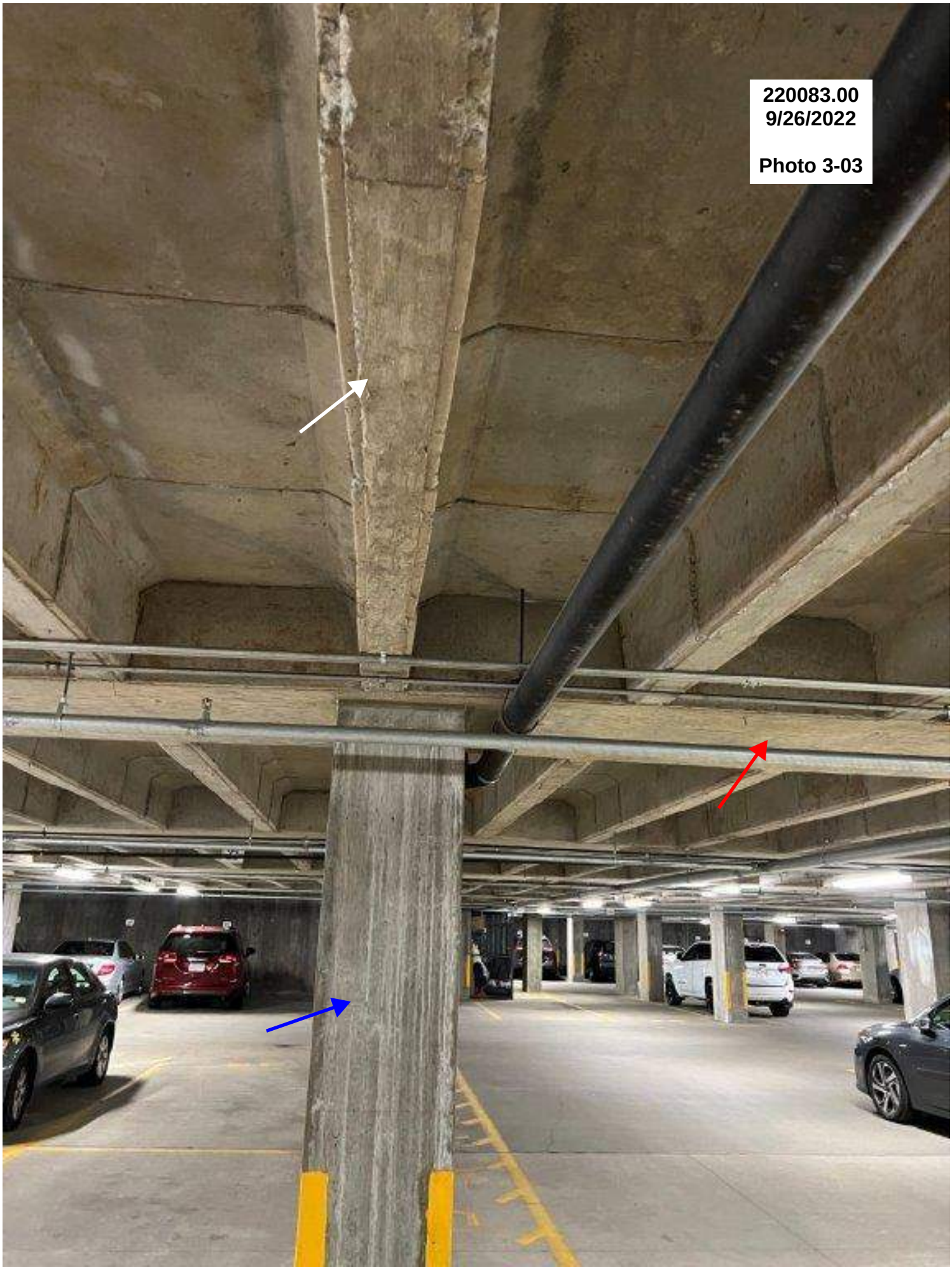
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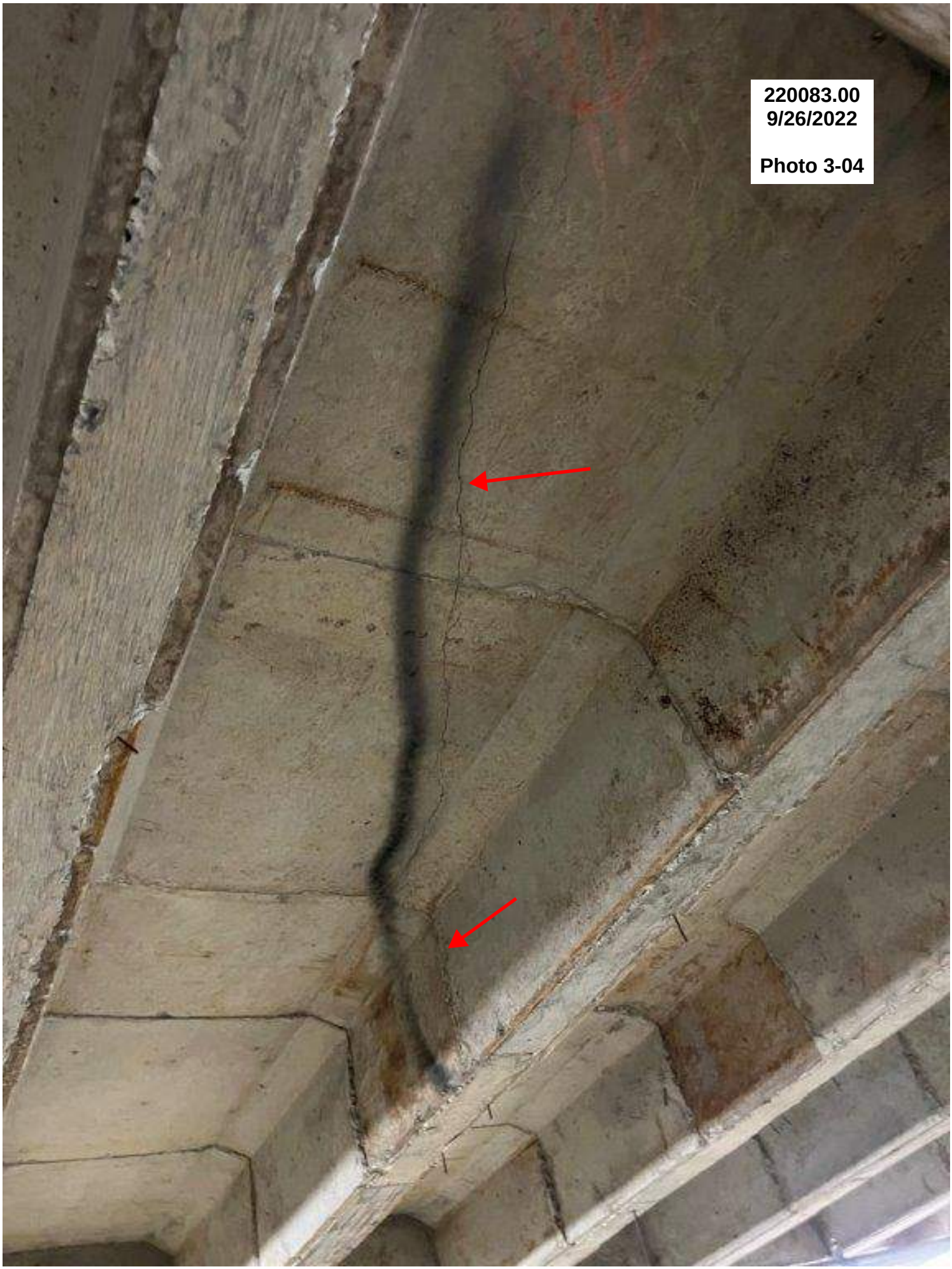
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Photo 3-04


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9/26/2022
Photo 3-05

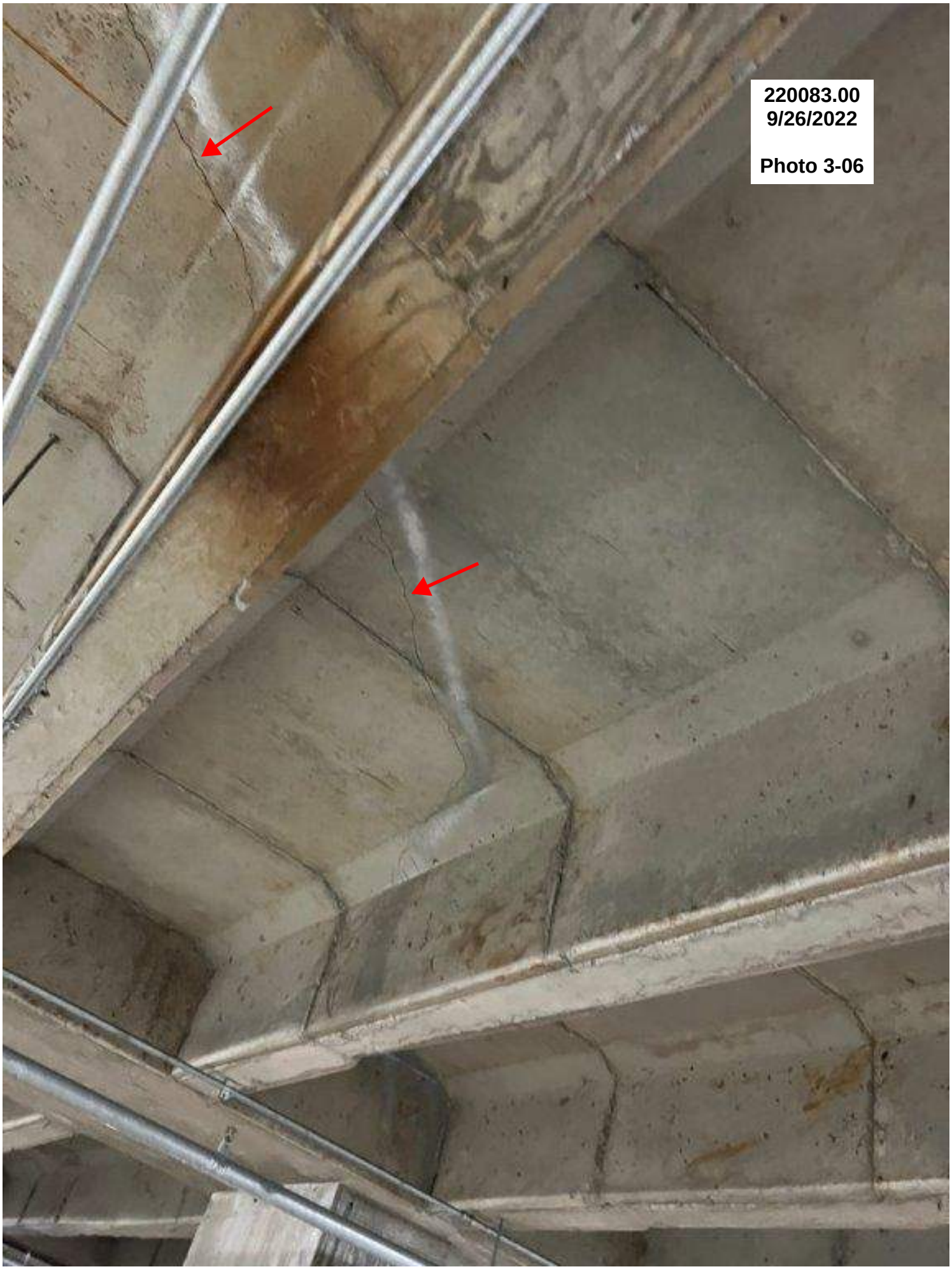
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Photo 3-06


220083.00
9/26/2022
Photo 3-07


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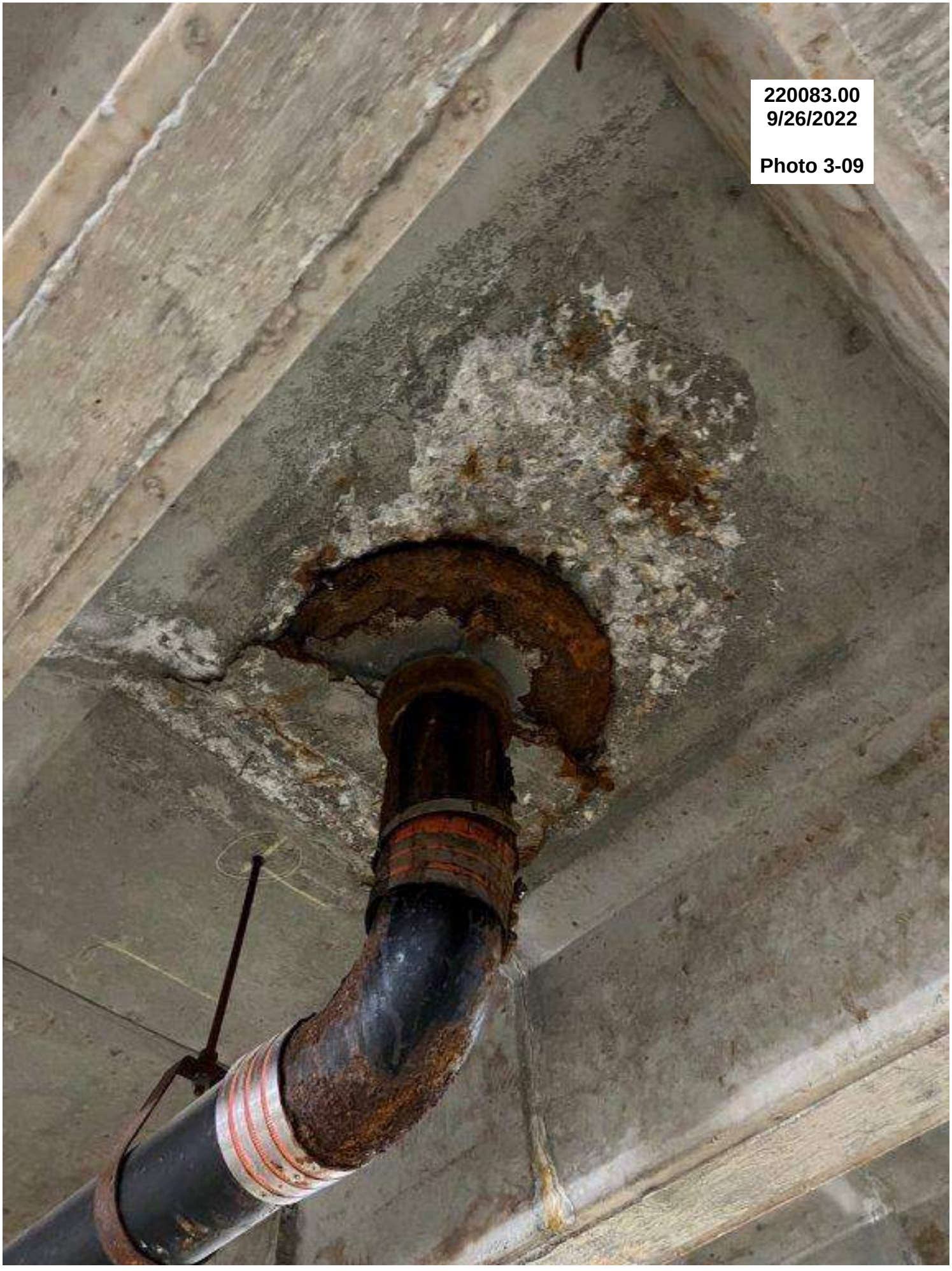
Photo 3-08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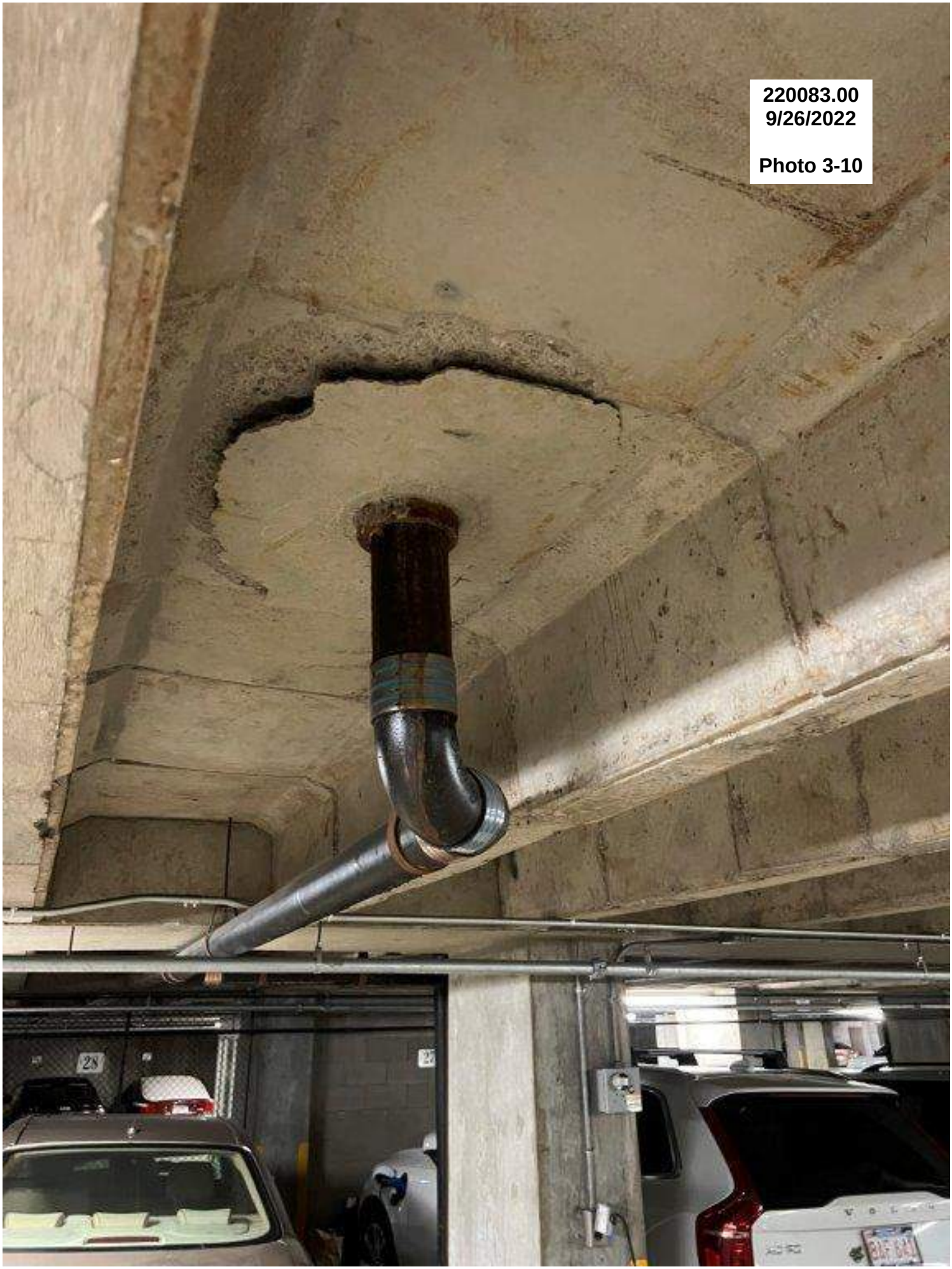
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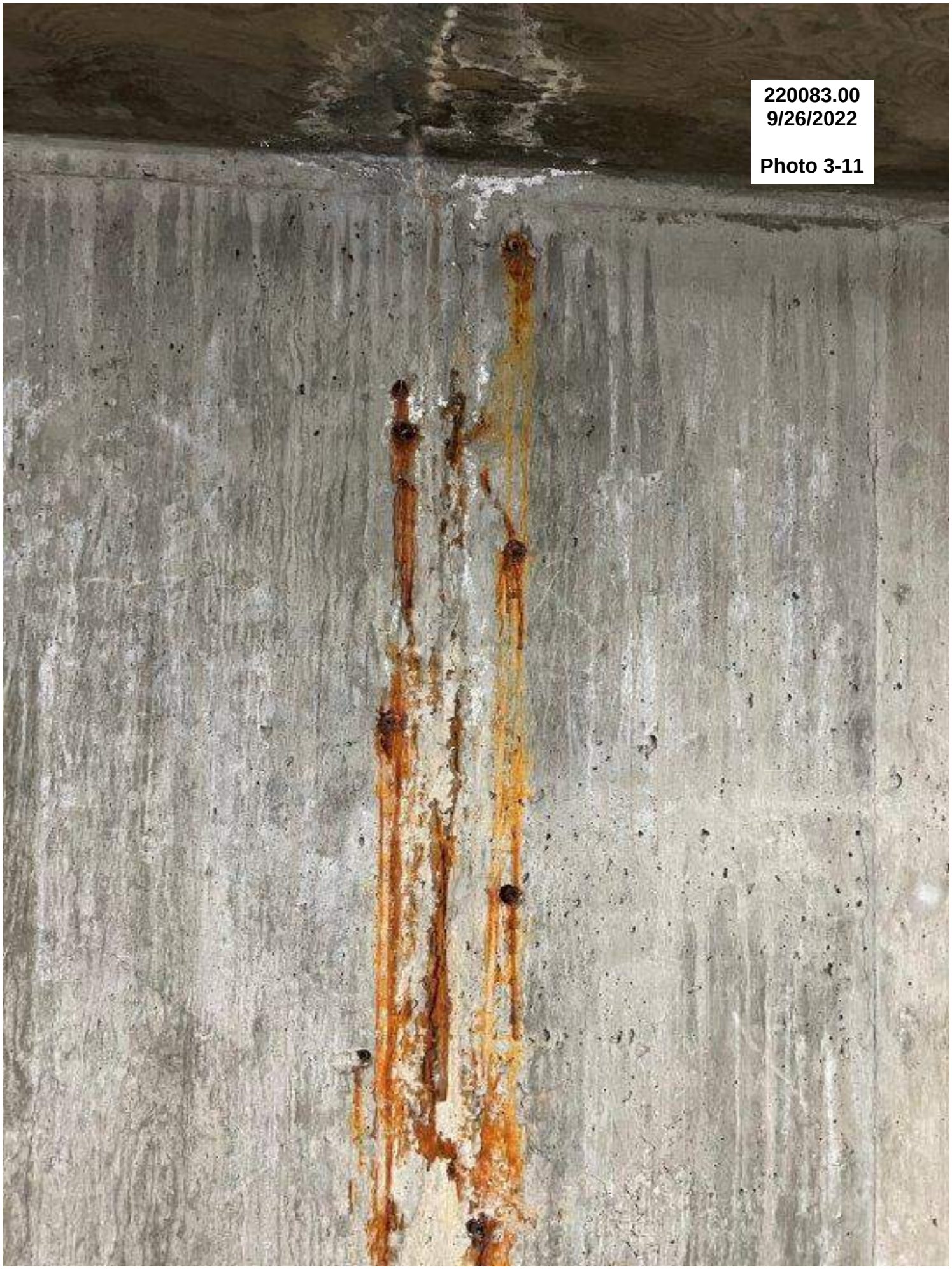
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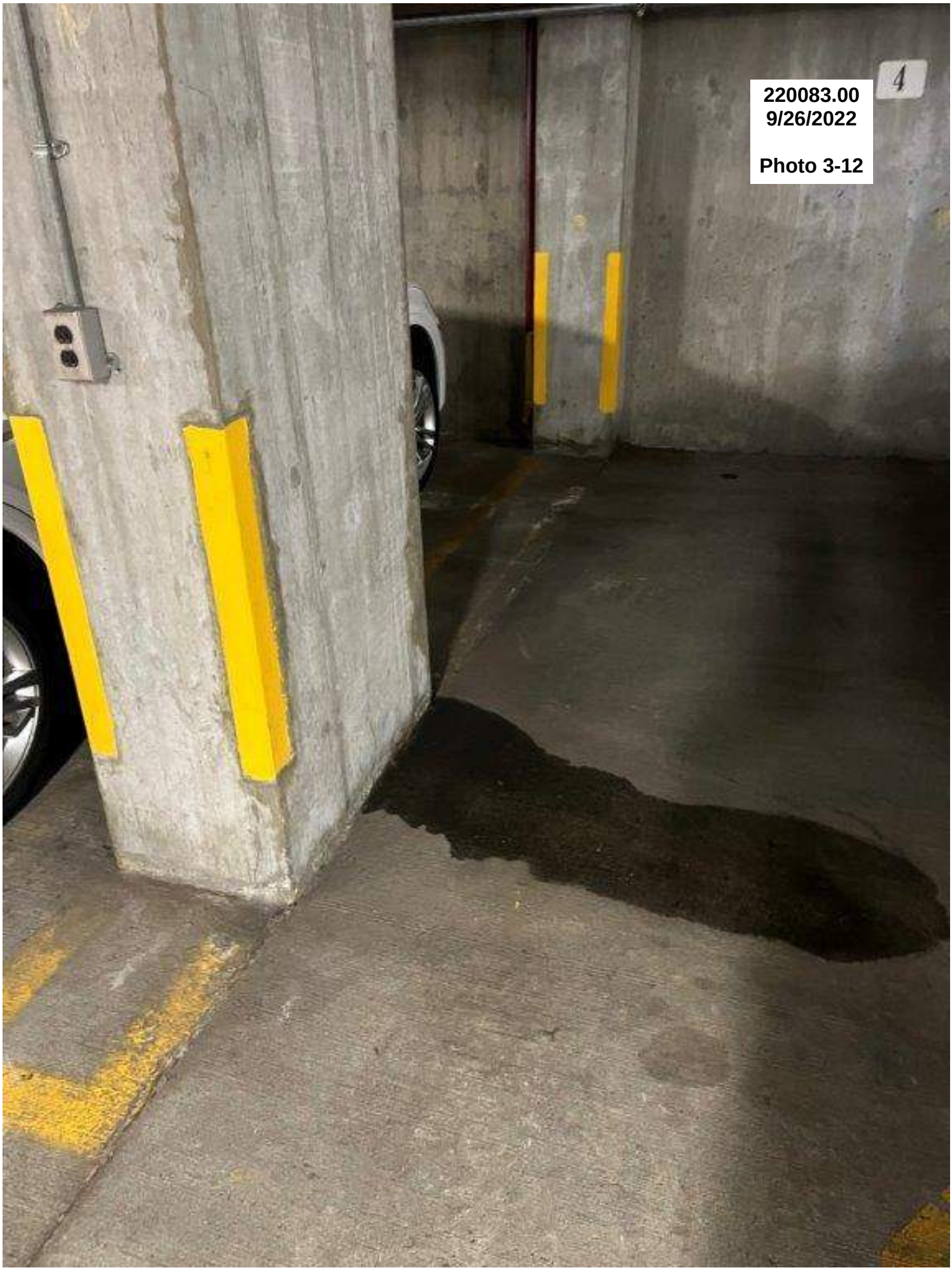
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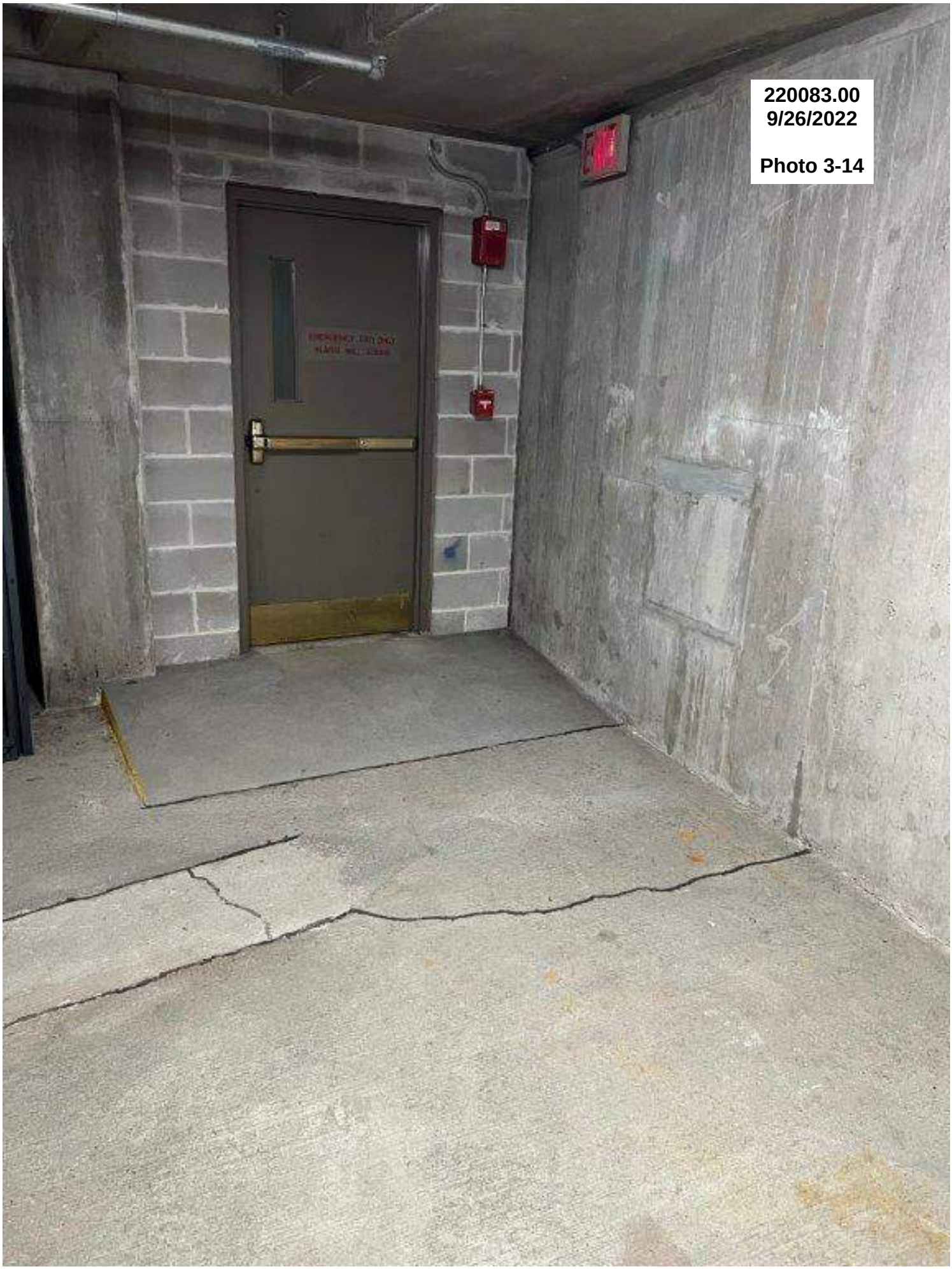
Photo 3-13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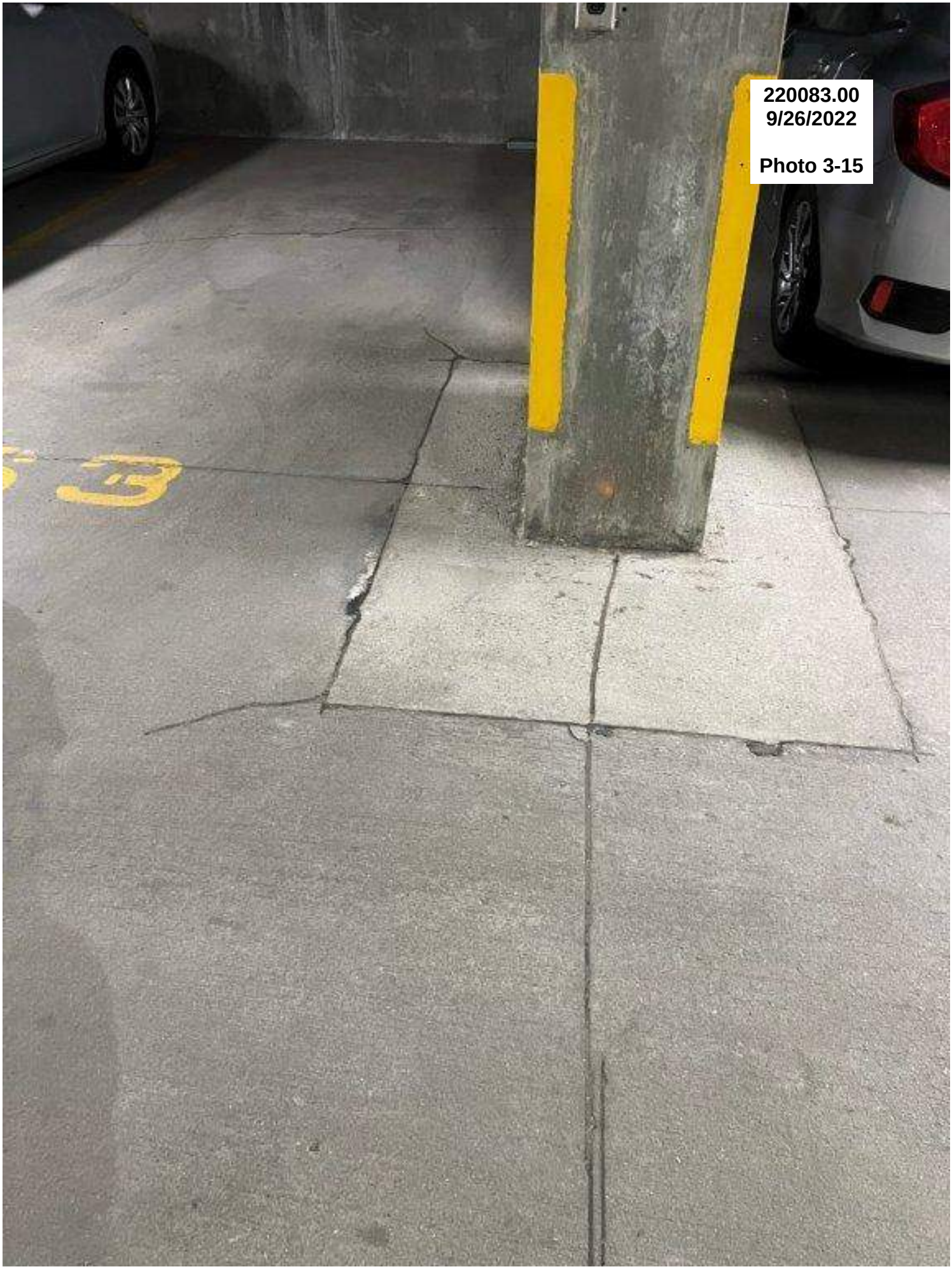
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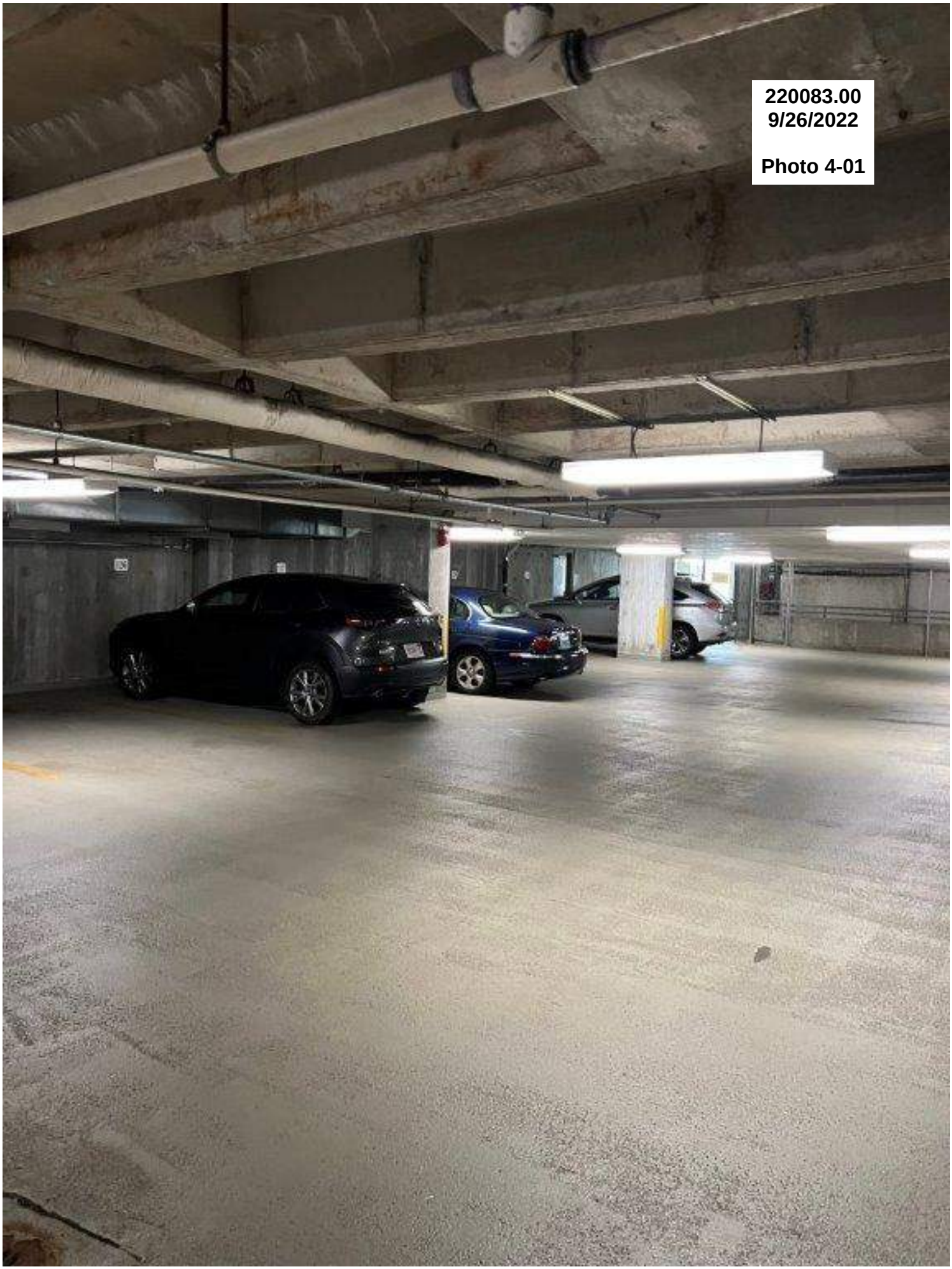
Photo 3-16
7CA 426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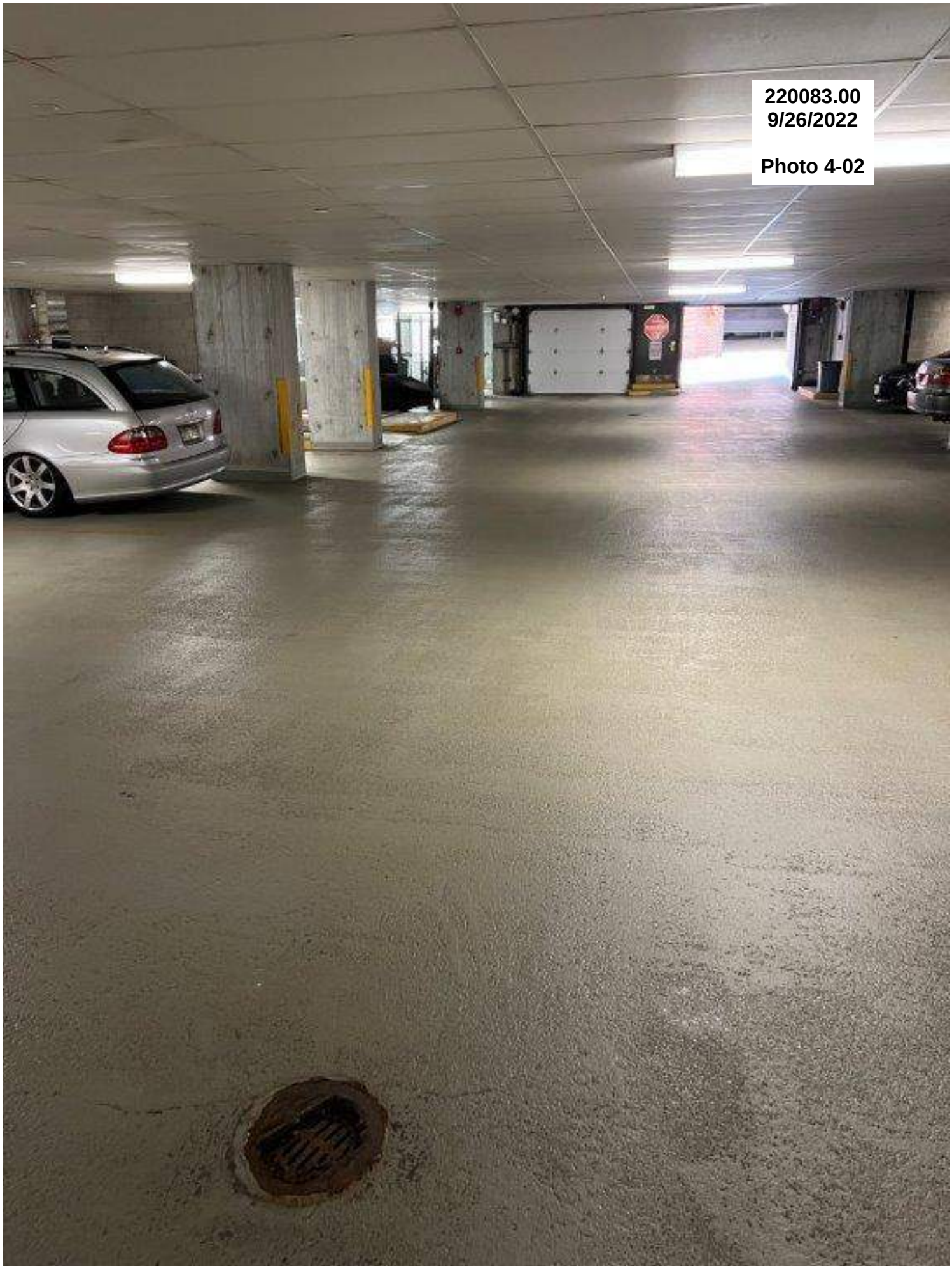
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Photo 4-02


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Photo 4-03


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Photo 4-04

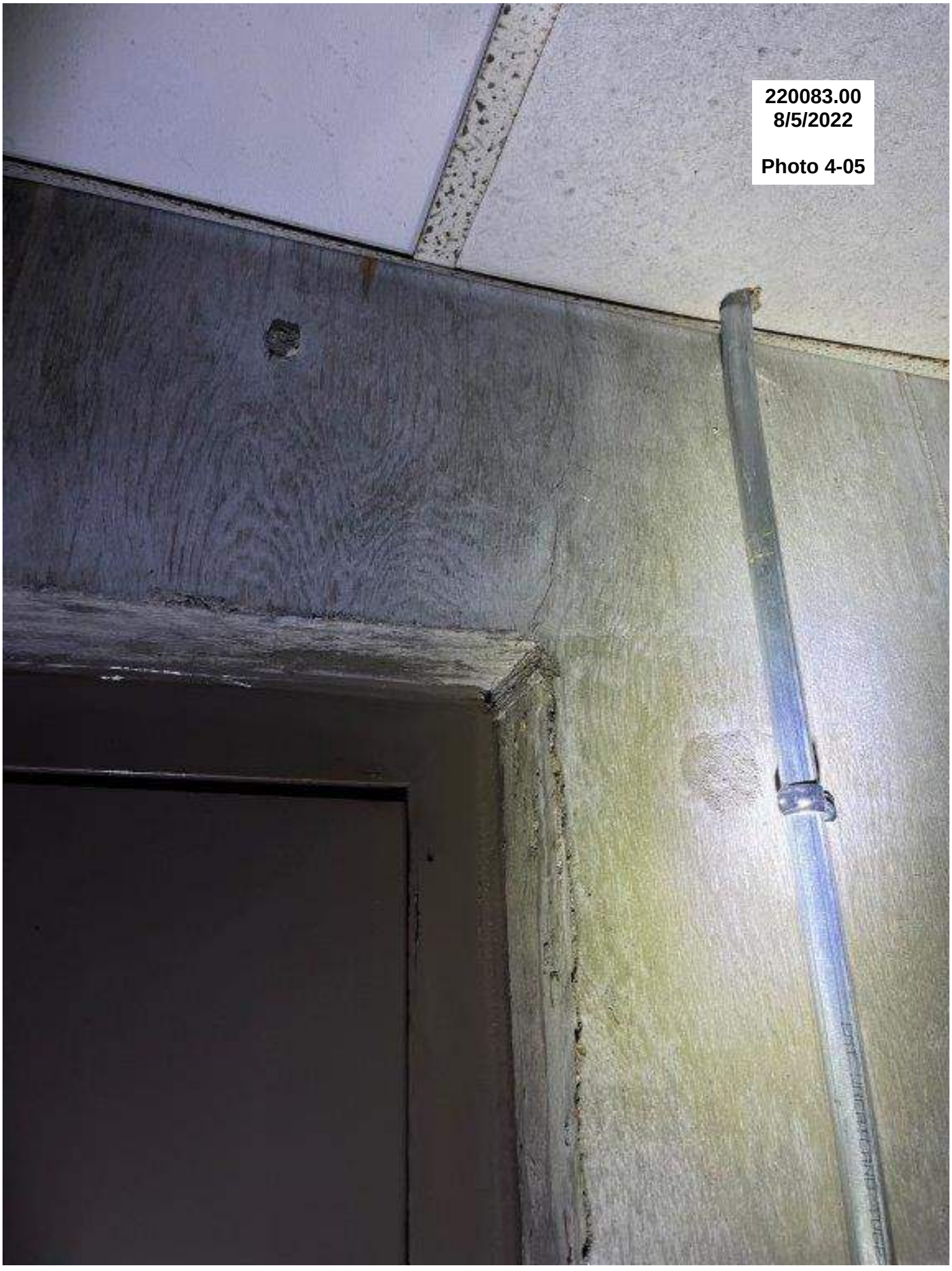
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Photo 4-06
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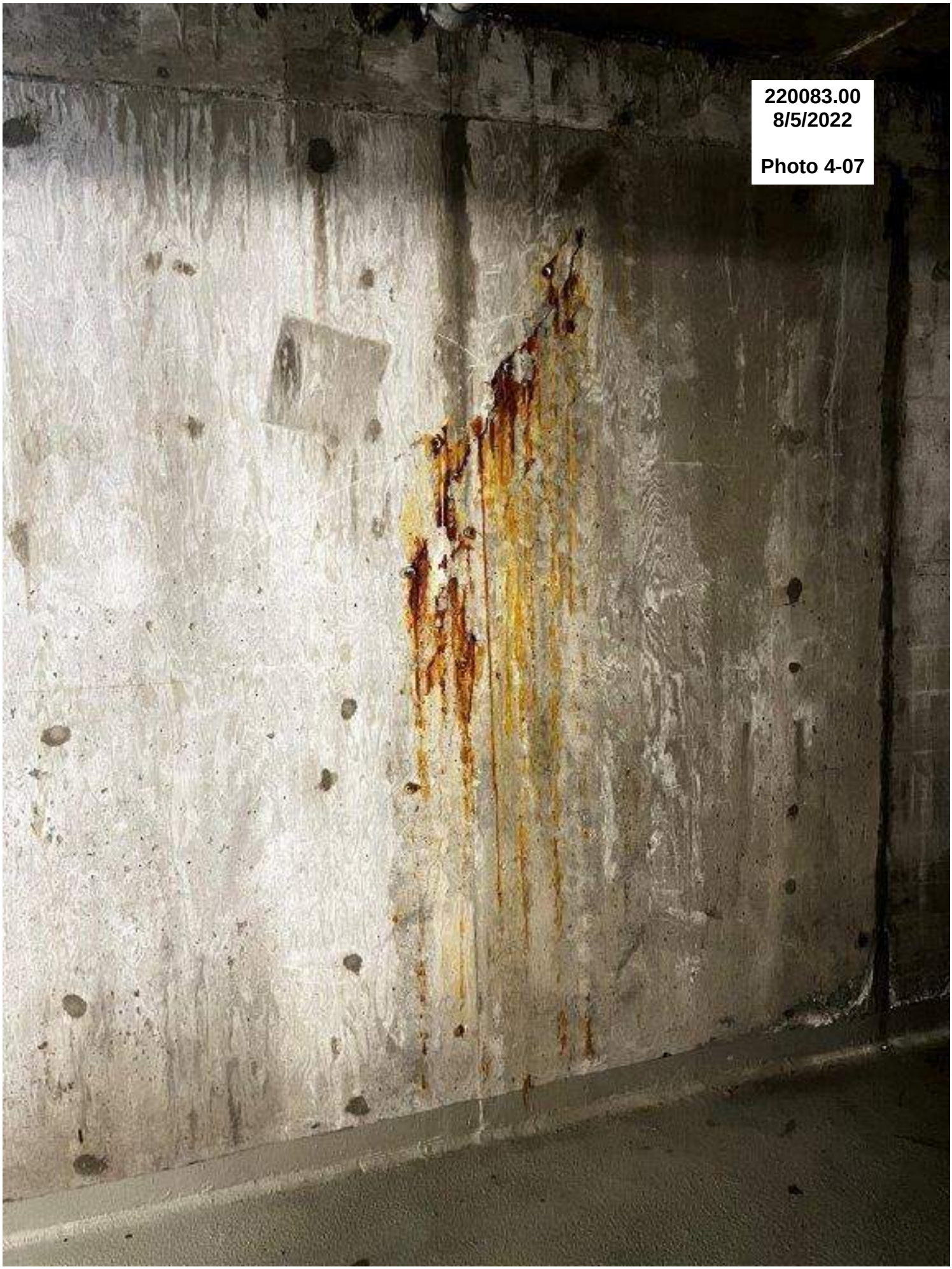
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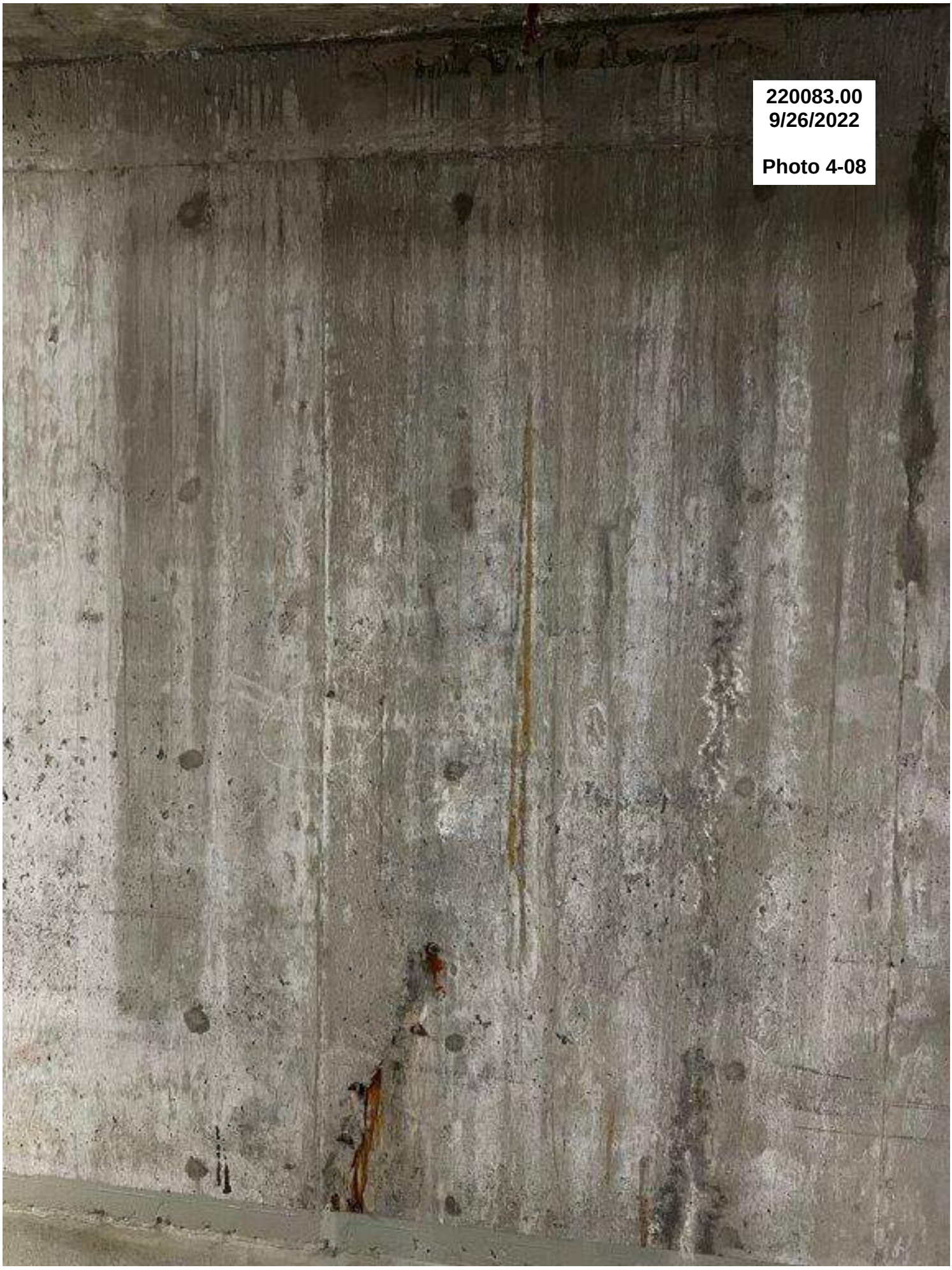
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8/5/2022
Photo 4-09
116
117


220083.00
8/5/2022
Photo 4-10
117


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Photo 4-11


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8/5/2022
Photo 4-12


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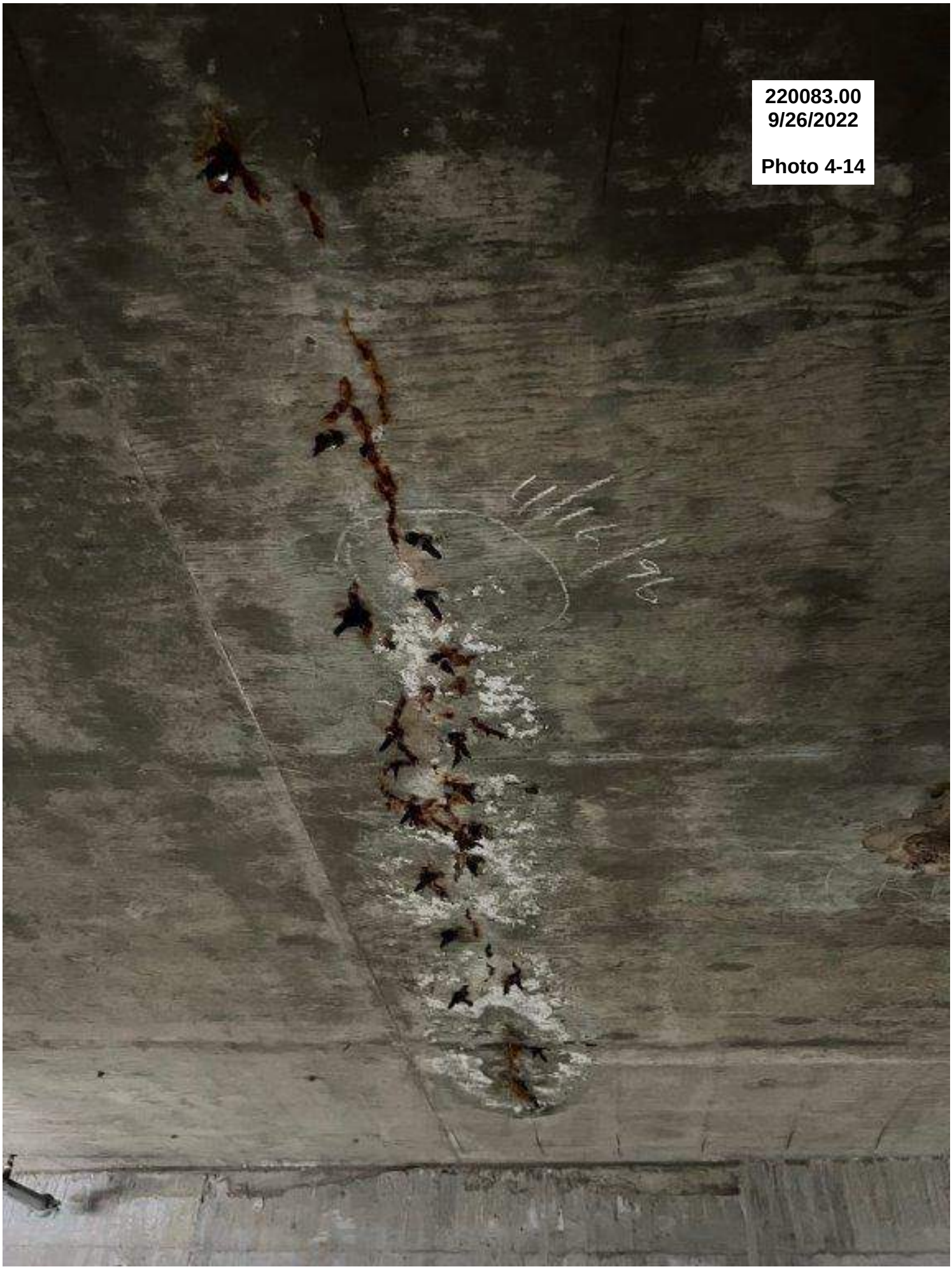
Photo 4-13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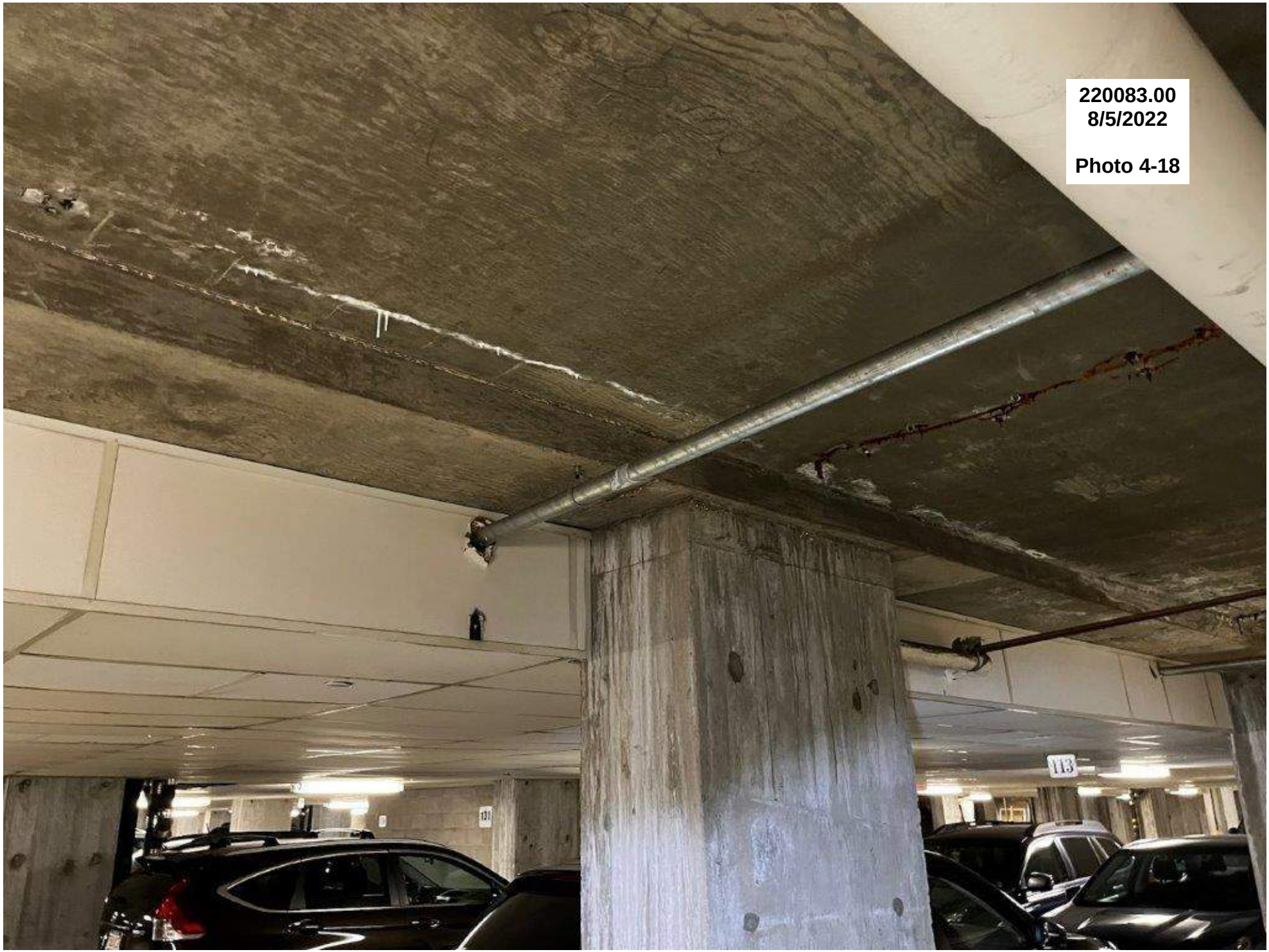
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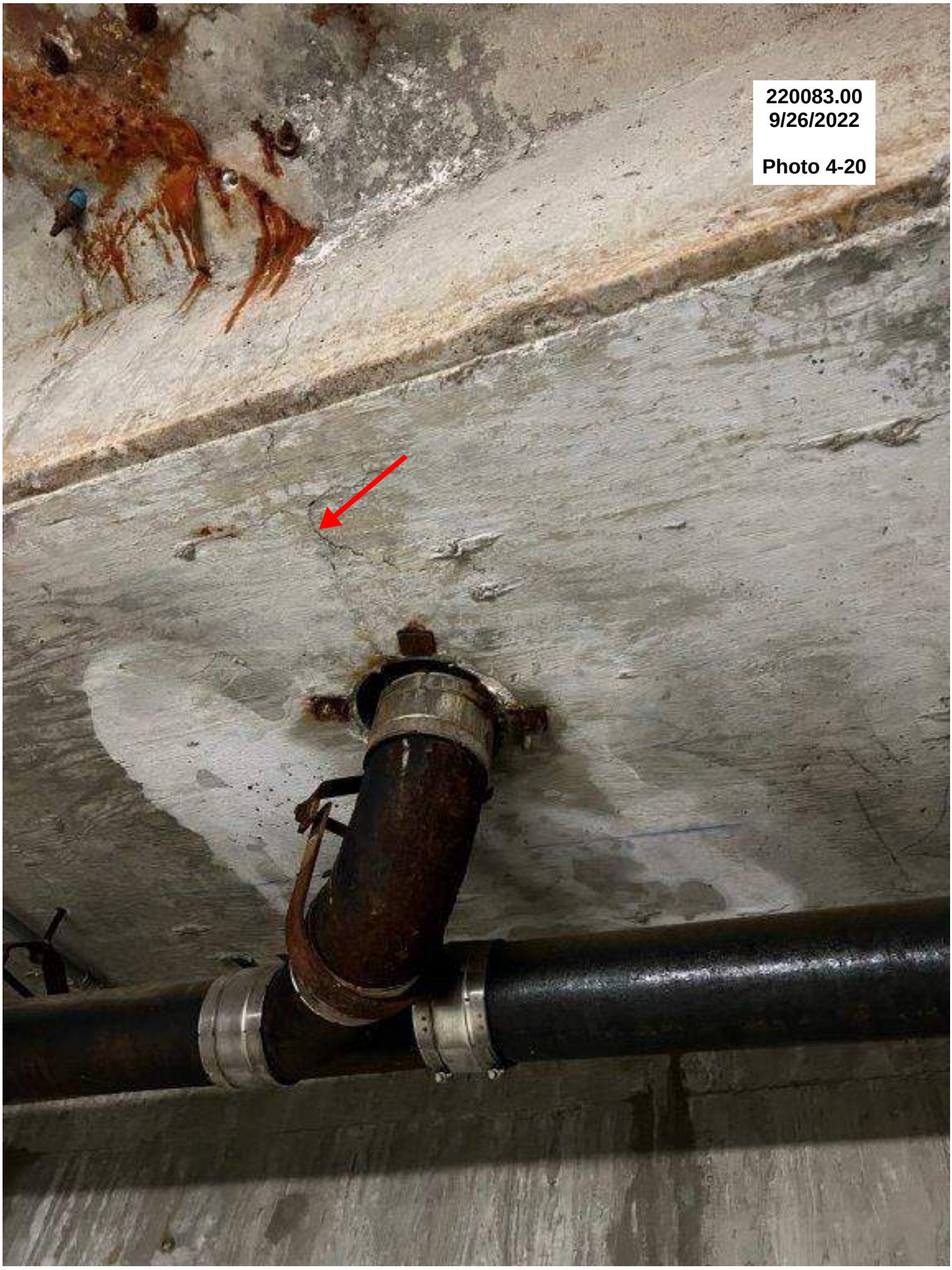
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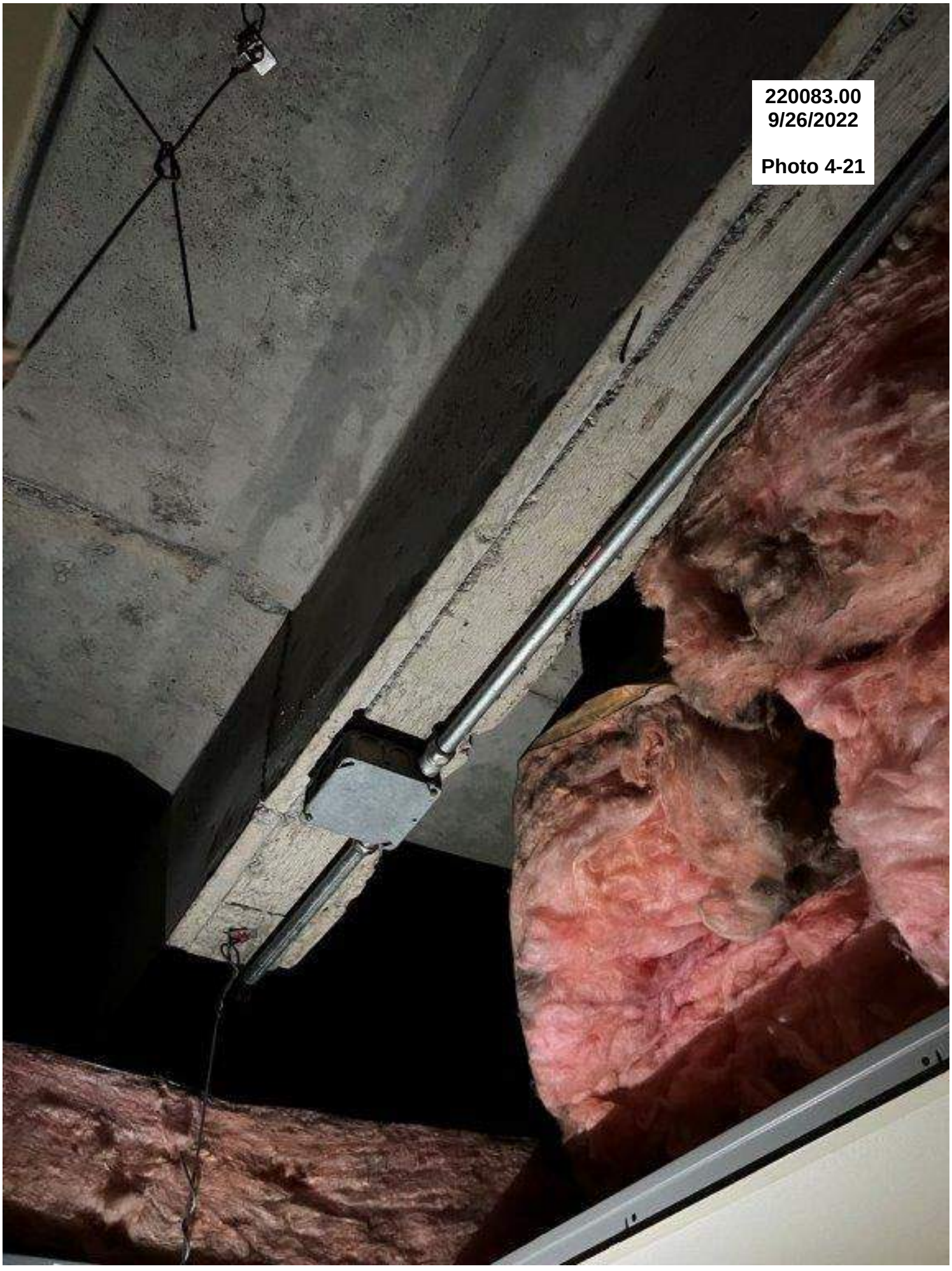
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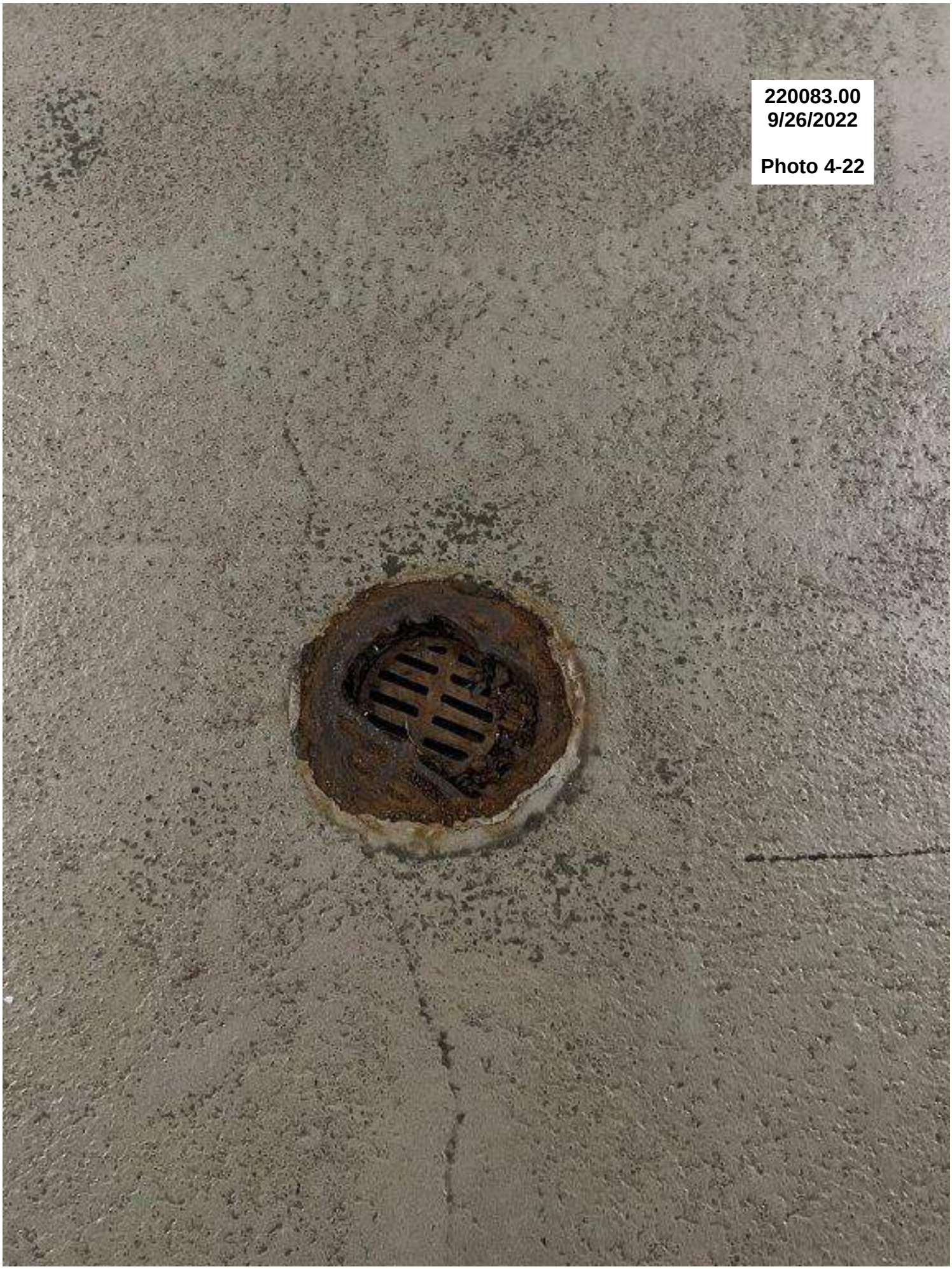
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Photo 5-01


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Photo 5-02


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8/29/2022
Photo 5-03


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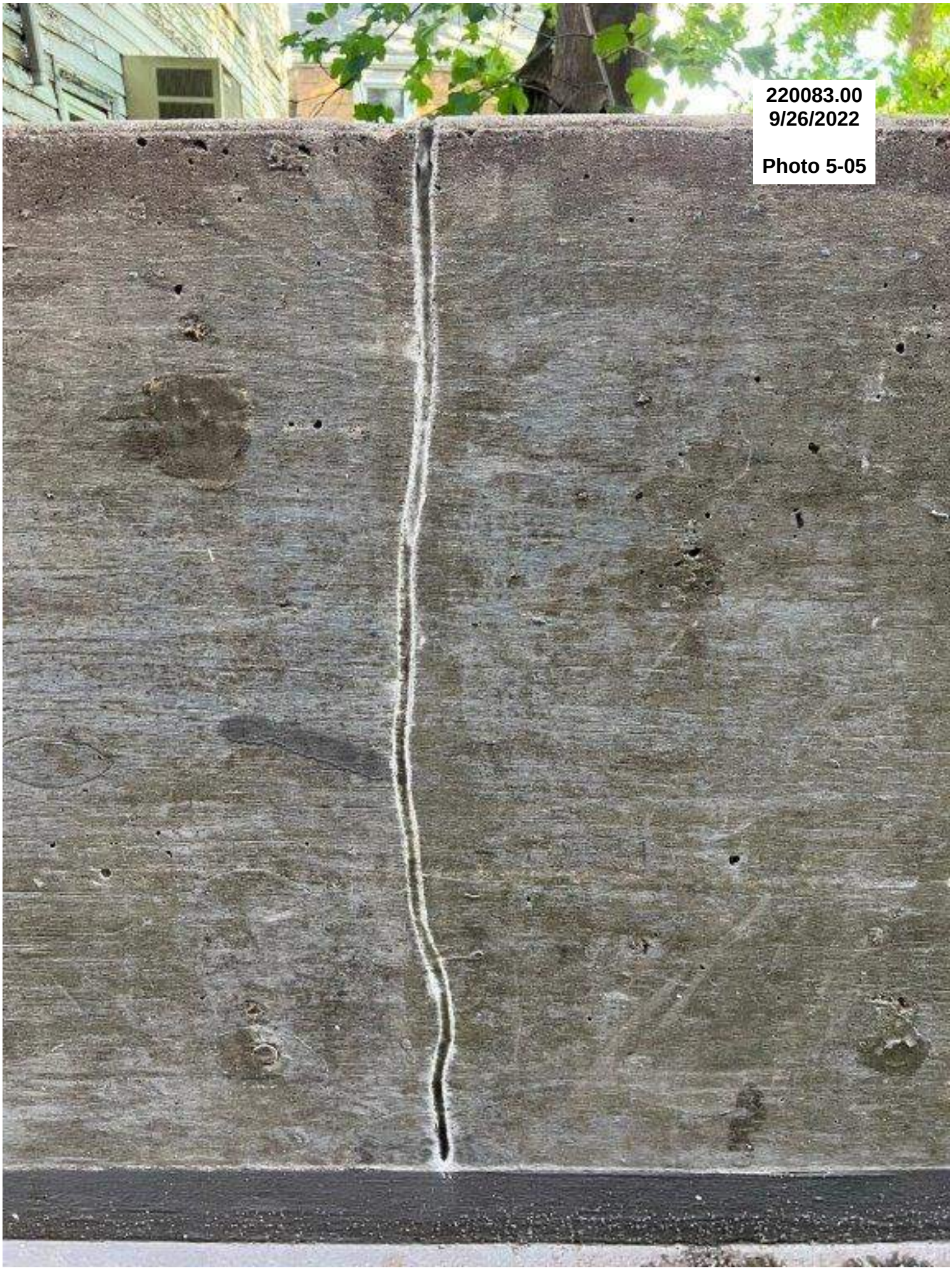
Photo 5-04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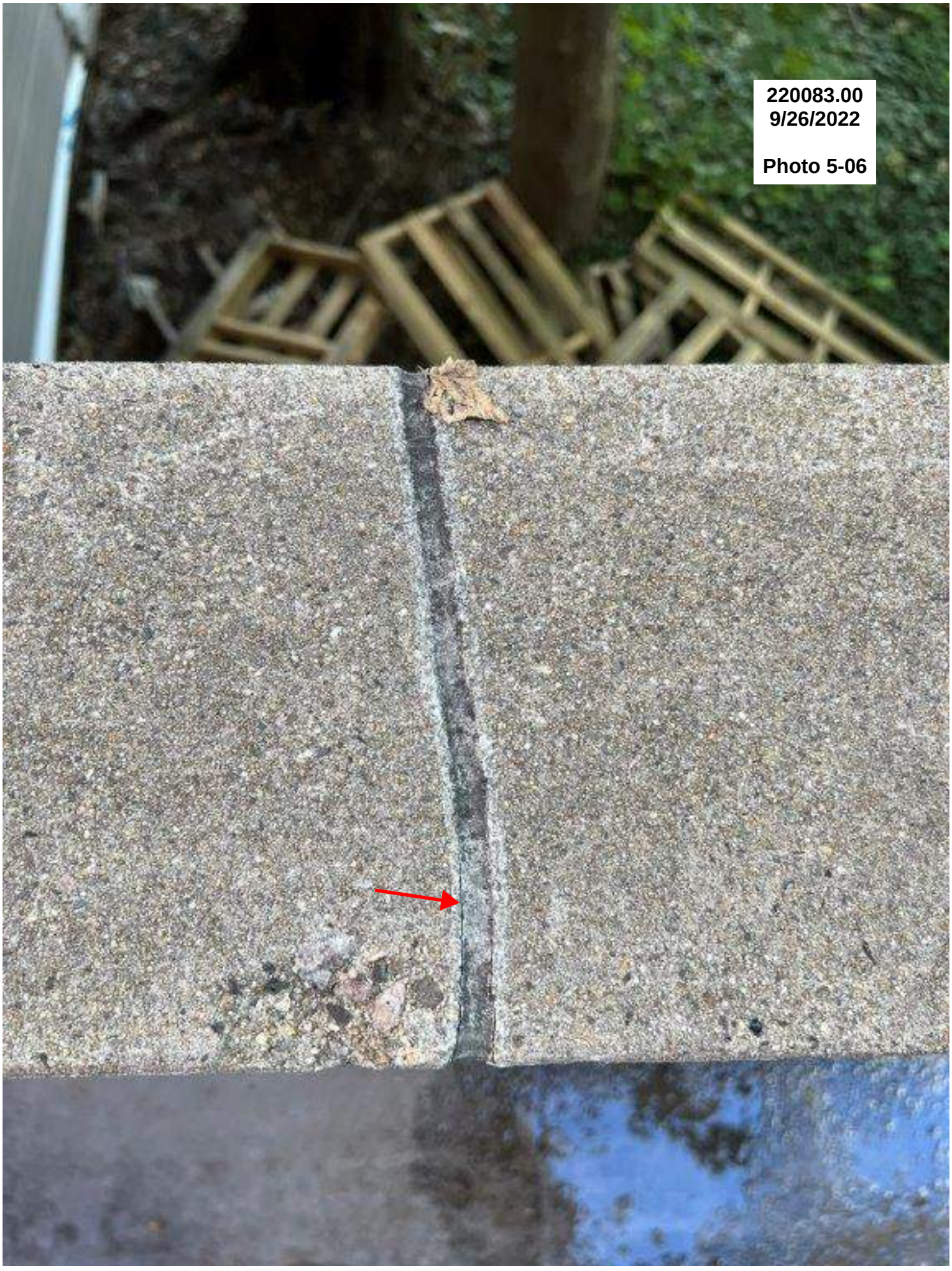
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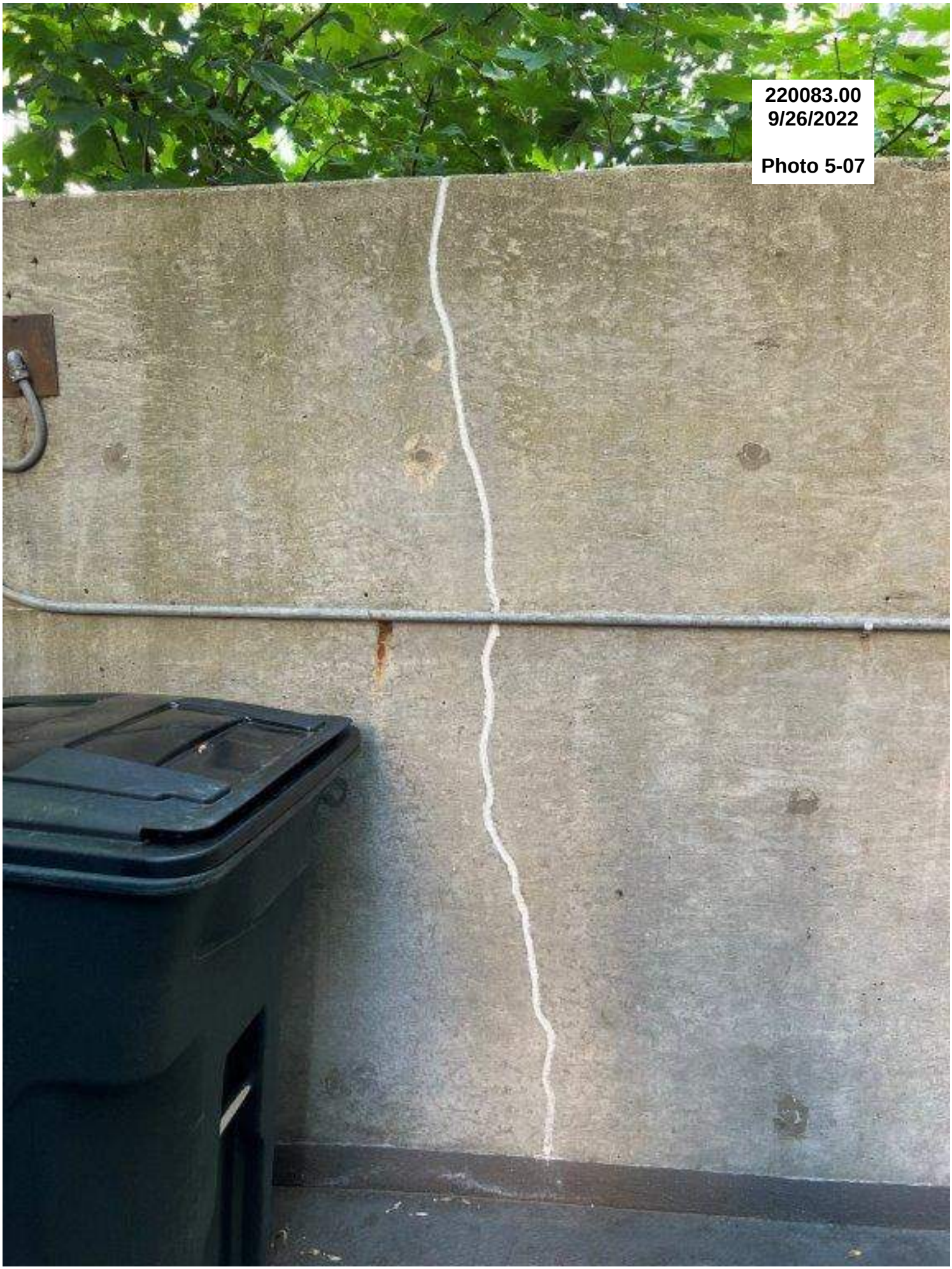
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Photo 5-08


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Photo 5-09


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Photo 5-10


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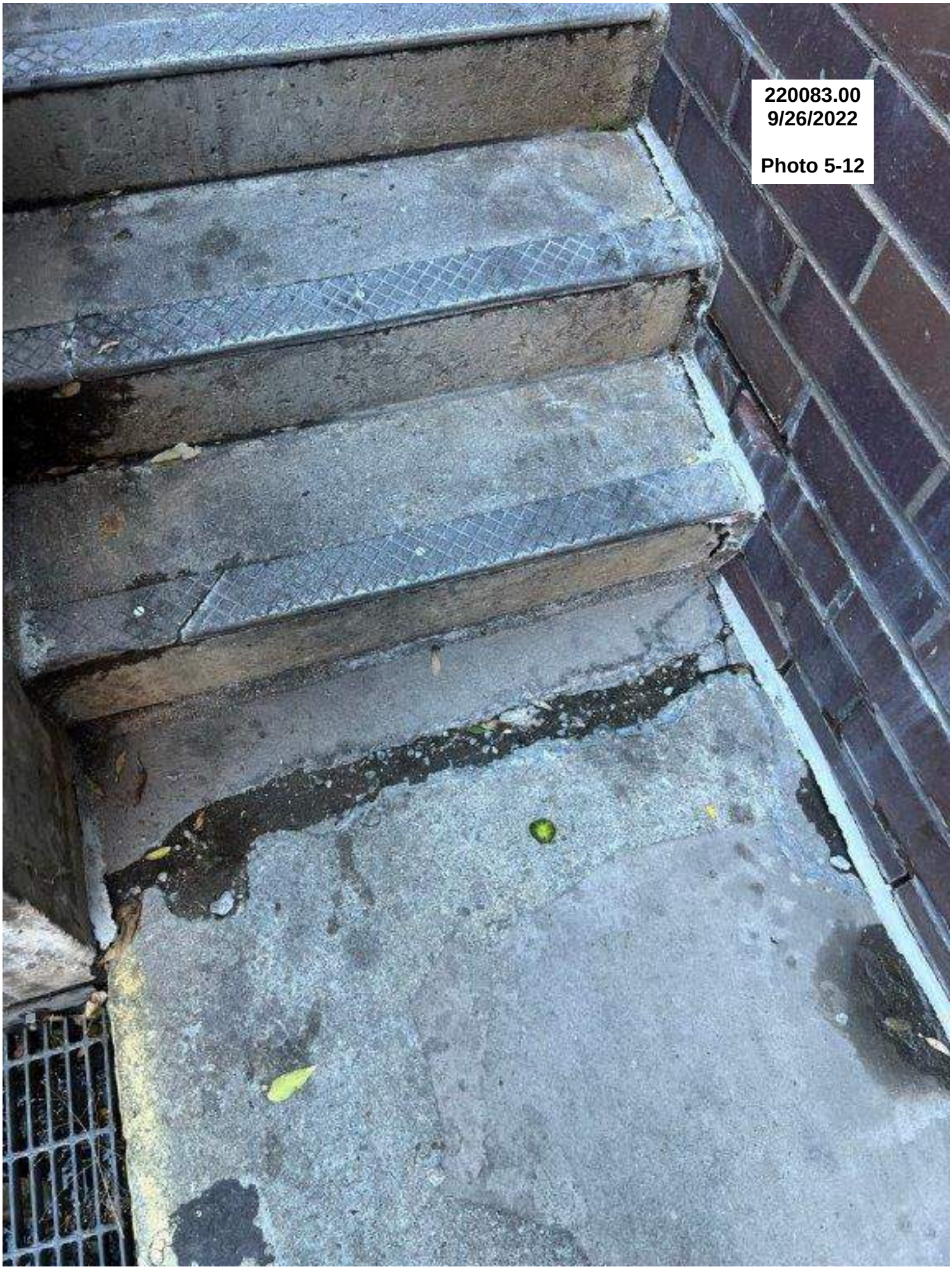
8/29/2022
Photo 5-11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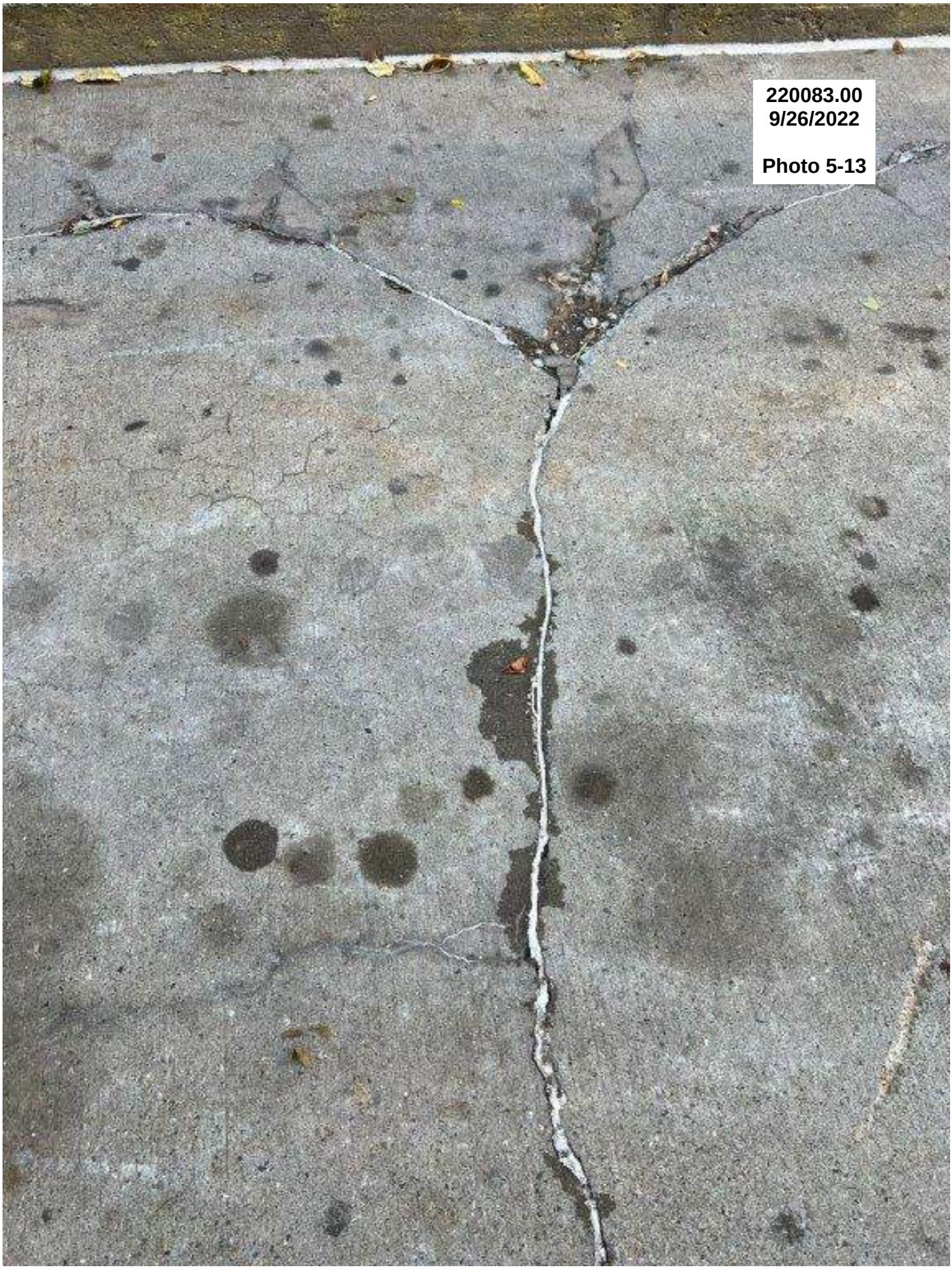
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Photo 5-13


220083.00
9/26/2022
Photo 5-14


220083.00
9/26/2022
Photo 5-15


220083.00
8/5/2022
Photo 6-01


220083.00
8/5/2022
Photo 6-02


220083.00
8/5/2022
Photo 6-03


220083.00
8/5/2022
Photo 6-04


220083.00
8/5/2022
Photo 6-05


220083.00
8/5/2022
Photo 6-06


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Photo 6-07
EXIT


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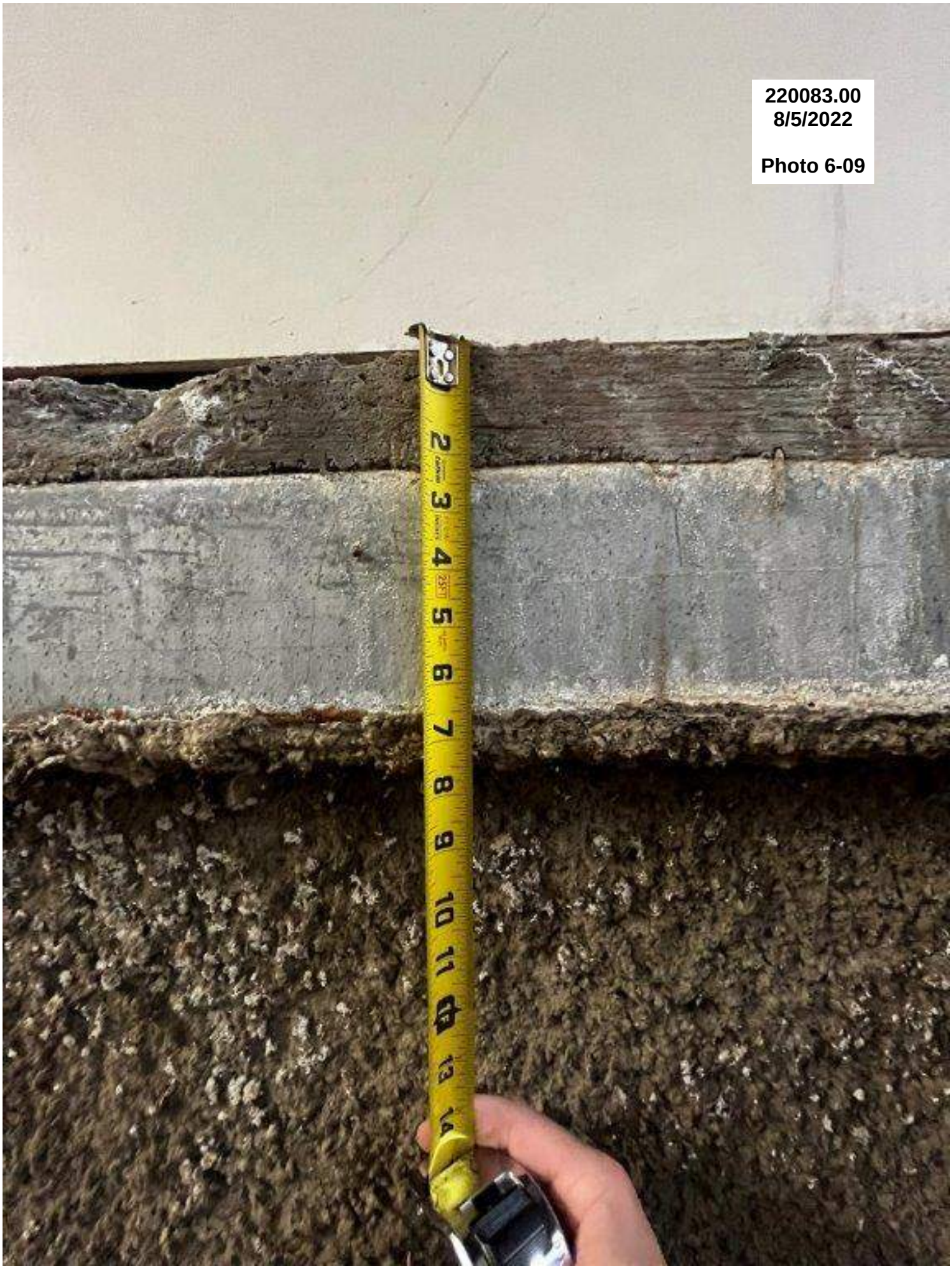
8/5/2022
Photo 6-08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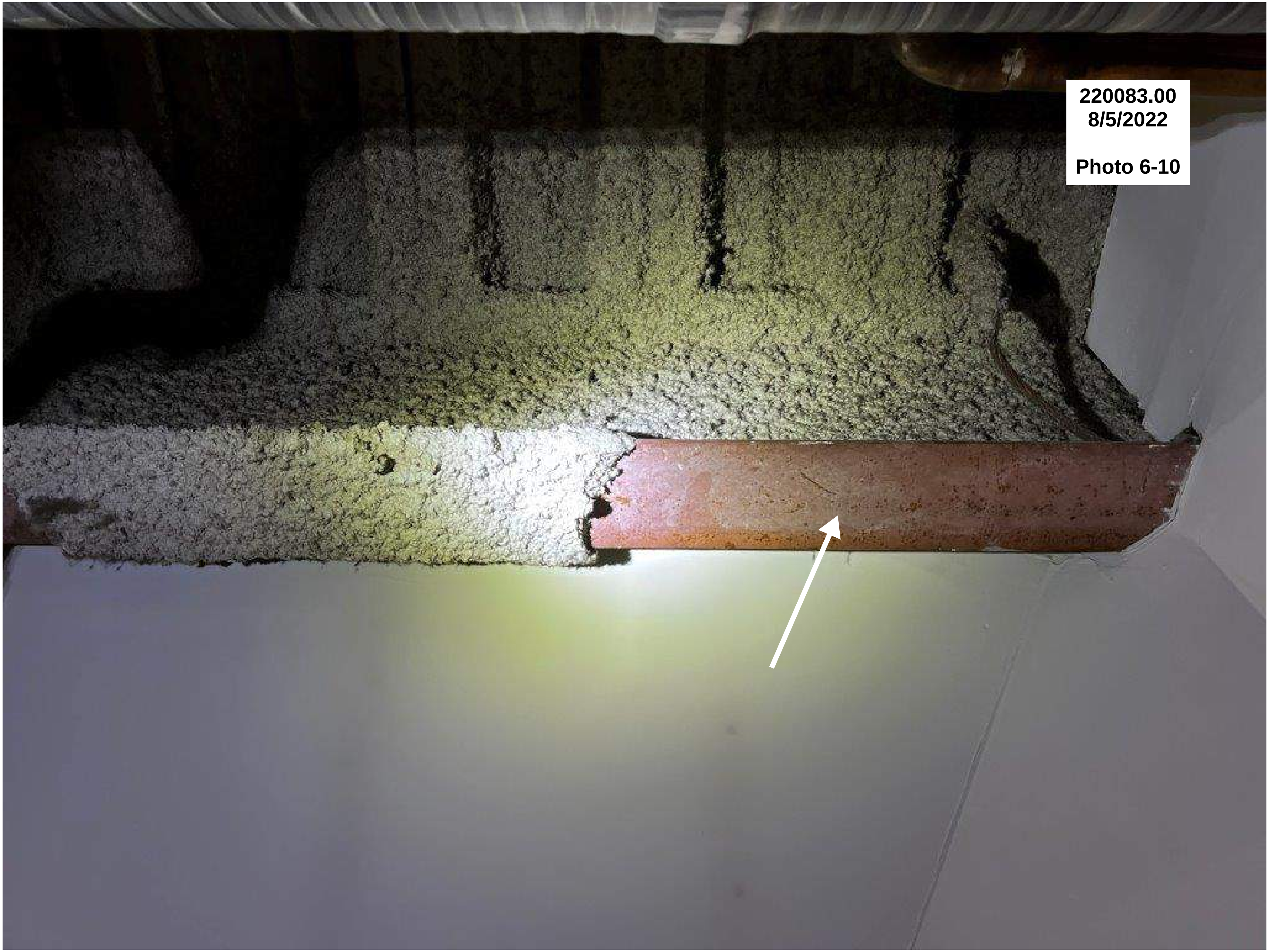
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Photo 6-10


220083.00
8/5/2022
Photo 6-11
NATURAL GAS