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BY HAND

April 28, 2025

Peter McLaughlin
Commissioner
Inspectional Services Department
831 Massachusetts Avenue
Cambridge, MA 02139

Re: 221 Mount Auburn Street
Riverview Condominium

Dear Commissioner McLaughlin,

Enclosed please find an Engineering report prepared by Simpson Gumpertz & Heger concerning the building at 221 Mount Auburn Street.

This report was authorized by the Trustees of the Condominium Trust and is being shared with ISD in order to keep you informed of the latest information in their possession regarding the building's structural status. The building is a nine story multi-family structure containing 77 dwelling units. All residents of the building were directed to vacate the premises on or about November 4, 2024. The building remains unoccupied and the site has been secured since that time.

Thank you for your attention to this matter.

Best regards,

James J. Rafferty

James J. Rafferty

Cc: Attorney Keith Barnett
M. Anne Sa'adah, Prsident, Board of Trustees
Jacob Lazarra, Assistant Commissioner

**not a partnership*

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M. Anne Sa'adah, President, Board of Trustees
Jacob Lazzara, Assistant Commissioner

not a partnership

SLAB EVALUATION

Riverview Condominiums
221 Mt. Auburn Street
Cambridge, MA
7 February 2025
(Revised 25 April 2025)

SGH Project 200609.04

PREPARED FOR

Thayer & Associates, Inc.
1812 Massachusetts Avenue
Cambridge, MA 02140

PREPARED BY

Simpson Gumpertz & Heger Inc.
480 Totten Pond Road
Waltham, MA 02451
O: 781.907.9000

SGH

7 February 2025
(Revised 25 April 2025)

Ms. Candice M. Morse
President
Thayer & Associates, Inc.
One Adams Place
859 Willard Street, Suite 440
Quincy, MA 02169

Project 200609.04 – Slab Evaluation, Riverview Condominiums, 221 Mt. Auburn Street, Cambridge, MA

Dear Ms. Morse:

Enclosed please find our report for the above-referenced project. The opinions presented in this report are based on our investigation and the currently available information. If new information becomes available that is relevant to our findings, we reserve the right to supplement or modify the material presented herein.

Sincerely yours,

John M. Porter, P.E.
Senior Principal
MA License No. 45684

Linda M. Seymour, Ph.D.
Project Consultant

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Encls.

COMMONWEALTH OF MASSACHUSETTS
JOHN M. PORTER
STRUCTURAL
No. 45684
REGISTERED
PROFESSIONAL ENGINEER

25 April 2025

SIMPSON GUMPERTZ & HEGER | 480 Totten Pond Road, Waltham, MA 02451 | 781.907.9000 | sgh.com

EXECUTIVE SUMMARY

Riverview Condominiums (Riverview) planned to replace the roofing at the Low Roof (Level 8) and install new drainage and downleaders to address leakage and ponding issues. As part of the work, the downleaders were to be installed through new core holes in the cantilevered balconies at the South (front) elevation. During coring operations, the coring contractor inadvertently cut through reinforcement in the cantilevered balconies. SGH observed cracks in the extracted cores as well as cracks in the slab and also observed that the slab reinforcement was substantially misplaced compared to the original design drawings.

As a result of these observations, Riverview asked SGH to evaluate the capacity of the slabs throughout the building. Our work included visual observations of the building, drone photography, slab deflection measurements, non-destructive testing, material testing, and observations of the slab at exploratory openings. We then performed a structural analysis of the two-way concrete slabs based on as-built conditions.

We documented the following conditions during our work:

- Low Reinforcement - Reinforcement placed lower than specified on the design drawings.
- Low Concrete Compressive Strength - Lower than specified concrete strength.
- Utility Penetrations - Penetrations and alterations of the concrete slabs.
- Deterioration from Leakage and Corrosion - Ongoing leakage through the exterior walls, concrete slabs, and leaking and condensing utilities causing reinforcing steel corrosion inside the building. There is also isolated corrosion damage to the exterior concrete components.
- Previous Concrete Repair Work – Slab repairs performed within the critical punching shear zone that may have further weakened the structure.

The compounding issues summarized above are in some cases widespread throughout the building, specifically the low reinforcement and low compressive strength. Our analysis results show that there is a very low (to potentially zero) safety factor when the slabs are subject to code-required loads. Widespread slab strengthening is required by applicable Building Codes and we prepared conceptual design documents to obtain an order-of-magnitude cost to strengthen the Riverview slabs.

The slab strengthening work has an order-of-magnitude cost equal to approximately $73.2M (prepared by Consigli). We understand that Riverview is utilizing the order-of-magnitude cost to help guide long-term decisions regarding the future of the property and is considering alternate options such as reconstruction of the building and redevelopment of the property. We recommend that the repair costs are reviewed in conjunction with other future capital planning needs over the next ten years and beyond. Riverview should continue to investigate Repair, Reconstruction, and Redevelopment Options and take into account future capital renewal costs until a preferred option to address the structural issues is selected.

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1. INTRODUCTION

1.1 Background

The Riverview Condominium Building (Riverview) in Cambridge, Massachusetts, is a nine-story reinforced concrete building constructed circa 1963. The building consists of a combination of 6-1/2 in. thick and 7-1/2 in. thick two-way flat slabs framing to reinforced concrete columns. In 2023, Riverview planned to replace the roofing at the Low Roof (Level 8) and install new drains and downleaders. The downleaders were planned to be installed through new core holes in the exterior cantilevered balcony slabs (Levels 1 - 8). During coring operations on 16 February 2023, Simpson Gumpertz & Heger Inc. (SGH) observed cracks in the slab and reinforcement that was low within the cross section of the slab (low reinforcement), where the coring contractor inadvertently cut through reinforcement. As a result of these observations, the Riverview Board of Trustees (Riverview Board) asked us to evaluate the two-way slabs.

We prepared this report to summarize the structural evaluation of the two-way slabs at Riverview. Information regarding live load restrictions, building evacuation (the building is currently unoccupied), City of Cambridge Inspectional Services, and Fire Department meetings and correspondence (among other documents) are addressed separately and are not explicitly summarized in this report.

1.2 Objective

The objective of our work is to document the as-built slab conditions and to analyze the two-way slabs to determine if they have sufficient capacity to support code-required loads.

1.3 Scope of Work

Our scope of work includes the following:

- Ground-penetrating radar (GPR) scans to document the location of the existing reinforcement at slab-column connections.
- Concrete compressive strength testing of cores extracted from the existing slabs and corresponding rebound hammer tests to verify the concrete quality and strength throughout the building.

- Reinforcement tension tests to determine the yield strength of the existing reinforcement.
- Visual observations of the exterior of the concrete structure and aerial drone photography to document the condition of the structure.
- Removal of finishes (referred to as exploratory openings throughout this report) within the building to expose and make observations of the slabs.
- Analysis of the slabs to assess their strength to support code-required loads.

1.4 Parties Involved

Throughout this report, we refer to the parties summarized in Table 1 below.

Table 1 – Parties

Party	Role
Riverview Condominium in Cambridge Board of Trustees (The Riverview Board)	Owner
Thayer and Associates (Thayer)	Property Manager
Maxwell Architects	Architect
Structures North	Structural Engineer (for prior building projects)
Rimkus Consulting Group (Rimkus)	Code Consultant
Cosentini Associates (Cosentini)	Mechanical, Electrical, and Plumbing Consultant
Consigli Construction Co. (Consigli)	Pre-Construction and Construction Manager
WS Aiken (Aiken)	Roofing Contractor
Bay Contracting (Bay)	Contractor (for prior construction projects)
Thornton Tomasetti (TT)	Structural Peer Reviewer

2. DOCUMENT REVIEW

We reviewed documents related to the existing conditions of Riverview, including the original design documents, condition assessment and repair reports by others, and prior investigation reports by SGH. We also reviewed code documents related to the evaluation and repair of the concrete building. The following subsections describe our review.

2.1 Original Drawings

Structural Drawings

We reviewed the structural drawings dated 14 December 1961 prepared by consulting engineers Nichols, Norton and Zaldastani and note the following:

- The General Notes on S-2 describe requirements for loads, concrete, and steel.
  - The building is designed for residential live loads of 60 psf, including partitions and roof live loads of 30 psf.
  - The required concrete strength (f'_c) at twenty-eight days for slabs is 3,000 psi.
  - The specified concrete cover over the reinforcement of formed slabs is 1 in. on the top and bottom.
  - The reinforcing bars are to conform to ASTM A15, which specifies a reinforcement yield strength (f_y) of 40 ksi for medium-grade billet steel.[1]
- S-3 to S-5 show the floor framing plans of the building. Figure 1 shows a partial view of a typical floor plan.
- S-6 (Figure 2) shows the typical floor cross-sections of the building. Levels 1 - 6 between Column Lines A-C and the High Roof slab have 6.5 in. thick slabs. Levels 1 – 6 between Column Lines D and E, and Levels 7 and 8 have 7.5 in. thick slabs. The reinforcement in the top mat that extends in the east-to-west (EW) direction sit on top of the bars that extend in the north-to-south (NS) direction. We note the following about the reinforcement patterns:
  - All levels have NS bent bars that alternate with the top and bottom reinforcement. The bent bars are typically placed in the top mat and extend at least 2.5 ft from Column Lines B, C, D, and E before bending down to the bottom mat in the middle strip of the slab.
  - EW bars are concentrated in the column strips; there is no EW reinforcement in the middle strips.

[1] The drawings specifically call out "medium-grade billet steel" which we interpret as intermediate-grade per ASTM A15 at the time of construction.

- At all levels, the slab cantilevers south of Column Line B (balconies). On Levels 1 - 6, the slab cantilevers north of Column Line C and south of Column Line D at half levels.

Architectural Drawings

We reviewed the architectural drawings dated 14 December 1961 prepared by Harris & Freeman Incorporated Architects and Milton Schwartz & Associates Architects. The building consists of split-level slabs, as shown in the Cross Section Detail on Sheet A3 (Figure 3). Figure 3 explains the nomenclature we use to identify the slab levels. Sheet A17 (Figure 4) provides a detail of louvers open to the exterior north elevation of the building.

Mechanical, Electrical, and Plumbing (MEP) Drawings

We reviewed the MEP drawings dated 14 December 1961 prepared by consulting engineers Dollar-Blitz and Associates. We note that riser pipe penetrations through the slab typically occur at the interior face of the columns at Column Lines 3, 6, 9, 12, 18, and 21 at Column Lines B and E on Levels 1 - 7. The drawings do not provide dimensions for the penetrations.

2.2 Previous Reports by Others

The Riverview Board engaged Structures North at various points in time to perform condition assessments and design repairs to the building. We reviewed the following documents dating back to 1999 to understand the extent of previous work done to the building:

- Structures North Appraisal Letter dated 11 August 1999.
- Structures North Project Specifications Project Specifications for Exterior Coatings Application, Sealants, and Balcony Repairs, dated 19 April 2001.
- Structures North Exterior Envelope Proposal, dated 28 October 2015.
- Structures North Additional Restoration Work Proposal, dated 18 January 2016.
- Structures North Exterior Condition Assessment, dated 17 November 2022.

The 1999 report describes that The Riverview Board engaged Structures North in 1991 to assess and recommend repairs to cracks in the concrete balconies. Structures North subsequently performed condition assessments and designed concrete repairs on the exterior of the building

(Column Lines B and E). Some of the concrete repairs are shown adjacent to columns, in particular, select spall and crack repairs at Column Line E.

2.3 Previous Reports by SGH

In 2019, Thayer & Associates, Inc. (Thayer) informed SGH of active leakage into Units 707 and 802 below the Low Roof along the south elevation of the building (Photos 1 and 2). The leakage indicates that water was able to travel through the depth of the slab through full-depth cracks. We issued a Water Leakage Investigation letter dated 7 January 2021 outlining multiple rounds of water testing and repairs that were performed with the assistance of Bay Contracting (Bay) and WS Aiken Roofing (Aiken) to diagnose and temporarily address the leakage. Additionally, we performed a roofing condition assessment to review the condition of the existing roofing assemblies and provide repair recommendations, as detailed in our report dated 11 August 2020.

We concluded that the existing ten-year-old roofing failed prematurely due to a lack of drainage, damage from wood roof decks bearing on the roof membrane, and low flashing heights at transitions. In our letter dated 13 December 2022, we recommended that the roofing be replaced in the next one or two years, addressing all three conditions, and we provided a roofing replacement plan for design, bidding, and construction administration. Thayer then retained SGH to provide construction administration services for the roofing replacement project.

2.4 Applicable Codes

The following codes are relevant to our structural evaluation. See Appendix A for specific code provisions that are discussed throughout this report.

- 1943[2] City of Cambridge – Building Code which was in effect at the time the building was designed.

[2] We note that the 1943 City of Cambridge building code was amended in September 1962 after the final revisions to the original 1961 Structural Drawings (the last noted revisions on the Structural Drawings is August 1962).

- Massachusetts State Building Code (MSBC) – tenth edition which is the current building code in effect for new and existing buildings.

- 2021 International Building Code – IBC, which includes the loads and load combinations that we use for our analysis.

- 2021 International Existing Building Code – IEBC, which we use to establish the criteria for repairs.

- American Concrete Institute (ACI 318 – 19) - Building Code Requirements for Structural Concrete, which we use to establish slab capacities.

- American Concrete Institute (ACI 562 - 21) - Code Requirements for Assessment, Repair, and Rehabilitation of Existing Concrete Structures, which we used as a guide for our investigation procedure, including the determination of in-situ material properties.

3. FIELD INVESTIGATION

SGH visited the site on numerous occasions between February 2023 and January 2025 to make visual observations, perform non-destructive testing, and collect material samples. Our investigation and observations described below are limited to the concrete slabs. The following subsections summarize our observations and testing.

3.1 Visual Observations

We made observations of the readily visible structural slabs throughout the course of our investigation. Visual observation of the concrete structure is typically limited due to the presence of exterior coatings, roofing, and interior architectural finishes (e.g., flooring, cabinetry, popcorn ceiling, etc.). We performed the following visual observations at slab-column connections in the building:

- We observed the slab where accessible and unobscured, such as in egress stairways, select storage rooms/mechanical spaces, and at select fan coil units at Column Line E.
- At select locations, we directed contractors to make exploratory openings by removing exterior coatings, roofing materials, or finishes at the slab-column connections.
- We performed two drone surveys (18 June 2024 and 28 October 2024) of the building's north elevation (Column Line E).

The following summarizes our observations. We provide detailed observations in Appendix B (Interior Exploratory Openings) and Appendix C (Drone Survey Results).

General Interior Observations

Our general observations represent readily accessible slab conditions that were visible without disturbing interior finishes and include the following:

- There is evidence of water leakage along the exterior walls, particularly at Column Lines B and E.
- There are cracks in some finishes, such as drywall (Photos 3 and 4) and ceramic tile (Photo 5).
- The structure visibly sags in many locations, with slopes measured on the surface of the finishes up to 5/16 in./ft and a total sag of up to 1-7/8 in. (at the slab mid-span).

- There are frequent cracks on the top pf the slab (in the EW direction) visible along Column Lines D and E. The cracks range in width from 0.008 in. to 0.04 in. (Photos 6 and 7).

- At shear walls on Column Lines 6, 12, and 18, there are cracks in the EW direction. The cracks range in width from hairline to 0.03 in. (Photos 8 and 9).

- At select locations along Column Line E, the concrete is delaminated at the fan coil units. In some locations, the delamination is easily removed by hand or with a mason's hammer, exposing corroded steel reinforcement.

- At approximately one-third of Column Line E and Column Line B columns (as shown on the mechanical drawings), there are riser pipe penetrations located approximately 1.5 to 3 in. from the interior face of the column.

- At Levels 1.5, 3.5, and 5.5, there are penetrations not shown on the mechanical drawings that are located approximately 2.5 in. to 4 in. from the face of the column at the following Column Lines (Photo 10):

    - Level 1.5: Columns E2, E5, E11, E13, E17, and E22.
    - Level 3.5: Columns E5 and E13.
    - Level 5.5: Columns E5 and E17.

Column Line B Exterior

We made visual observations at all unobstructed balconies on Column Line B. The top surface of the balcony slabs is coated with a pedestrian-traffic-bearing waterproofing at Levels 1 - 7 and roofing materials at Level 8. WS Aiken (Aiken) removed the pedestrian-traffic-bearing waterproofing and roofing materials from the slabs to expose the top surface of the concrete at the slab-column connections at the locations shown in Figures 5 and 6. At the exterior balconies at Column Line B, we observed the following:

- We observed cracks at all locations where Aiken removed the pedestrian-traffic-bearing waterproofing at Levels 1 - 7. Most of these cracks have been routed and sealed (Photo 11) and typically extend approximately parallel to EW or NS.

- There are typically cracks in the NS direction that extend the full balcony width. Many of these cracks are full depth (Photos 12 and 13) and can be seen from the topside and underside of the balconies.

- There are cracks at several Column Line B columns visible on the underside of the Level 8 balcony slab (Photo 14).

- At Level 8, at all locations where Aiken removed the roofing, we observed cracks that are parallel to Column Line B. The cracks range in width from hairline up to 1/16 in. (Photos 15 and 16).

- At Level 8, there are cracks extending NS at Columns B3 and B9 and at midspan between Columns B6 and B7 that extend south the full balcony width.

Interior Exploratory Openings

We made nine exploratory openings (with the assistance of Consigli) to make observations of the topside of the structural slab at the locations described in Table 2 below.

Table 2 – Exploratory Opening Locations

Slab Level	Column
2	C19
4	B15
4.5	E13
5	B5
7	B15
7	E15
7	B21
8	B16
8	B18

We provide a detailed summary of our interior exploratory work in Appendix B. In general, we observed the following during our interior exploratory work:

- We observed cracks at all opening locations. The cracks typically extend EW or NS (Photo 17). At the majority of these locations, there are also radial cracks at the columns (Photo 18). The cracks typically range in width from hairline up to 0.04 in.

- We sounded the concrete slab with hammers and identified delaminated concrete at the following columns: Level 8 B18, Level 7 E15, Level 7 B15, Level 5 B5. The delaminations were typically less than 1 sq ft. At Level 7 Column E15, we easily removed the concrete at the delamination, revealing a corroded EW reinforcing bar with approximately 50% or greater section loss.

- At Level 5 Column B5 (Photo 19), Level 4.5 Column E13 (Photo 20), and Level 8 Column B16 (Photos 21 and 22), we observed partial circumferential cracks (cracks that extend approximately perpendicular to the radial cracks) and noted the following:

    - At Level 5 Column B5, the first circumferential crack is approximately 2 in. from the face of the column and measures 0.016 in. in width. Additional partial circumferential cracks extend from radial cracks.

- At Level 4 Column E13, the circumferential crack is approximately 1.5 in. from the face of the column. Due to the proximity of the crack to the column, we were unable to get an accurate width measurement. The crack predominantly extends along the south face of the column and does not extend beyond the column width.
- At Level 8 Column B16, the circumferential crack is approximately 1 in. from the face of the column. Due to the proximity of the crack to the column, we were unable to get an accurate width measurement. The crack predominantly extends along the south face of the column and does not extend beyond the column width.

Drone Surveys

We conducted two exterior drone surveys on 18 June 2024 and 28 October 2024 to make visual observations of the condition of the slab edge, coating, and brick facade on the north, east, and west elevations. We supplemented our drone observations with binocular surveys. We provide the details of our drone surveys in Appendix C. In general, we observed the following:

- Along Column Line E (north elevation) there are cracks that are visible through the coating. Such cracks are typically one of the following:
    - Vertical cracks on the slab edge (Photos 23 - 25).
    - Cracks at a 45° angle to vertical on the slab edge near columns (Photos 26 - 28).
    - Topside cracks perpendicular to the wall (Photos 29 - 32).
    - Topside cracks near the column at an angle to the column face (Photos 33 and 34).
    - Underside cracks, either as a continuation of a slab edge crack (Photos 35 - 38) or isolated (Photos 37).
- There is spalled concrete (Photos 39 and 40) and incipient spalls (Photo 39) on the slab edge. Where the concrete is spalled, there is corroded reinforcement visible.
- At select locations, we observed cracks that may have widened, extended, or newly formed between our June and October surveys. We provide a side-by-side comparison of these locations in Appendix C.

3.2 Field Testing

As part of our investigation, we conducted non-destructive testing (NDT) and destructive testing of the concrete slabs. Our NDT included ground penetrating radar (GPR) scanning and rebound hammer testing; our destructive sampling included extraction of concrete cores and reinforcement samples for laboratory testing. The following subsections describe the test methods and summarize the NDT data. We provide laboratory data and data interpretation for NDT and laboratory testing in subsequent sections of this report.

Ground Penetrating Radar (GPR)

We performed GPR scanning at the majority (approximately 94%) of slab-column connections throughout the building, as shown in Figure 7. GPR systems send a pulse of energy into a material and record the amplitude and the time required for the return of any reflected signal. Reflections are produced whenever the energy pulse enters a material with a different density than the material it left. We use the two-way travel time of the signal to determine the concrete cover over the reinforcing bars. The amplitude of the reflection is determined by the contrast in the densities of the two materials. For this investigation, we used the following equipment:

- For all scanning on Levels 1 - 7 and scanning at Column Lines B, C, and D on Level 8, we used a Structure Scan Mini with a 2.6 GHz antenna from Geophysical Survey Systems Inc. (GSSI) (Photo 41).
- For all scanning on the high roof and scanning at Column Line E on Level 8, we used a SIR3000 control system coupled with a 1.5 GHz antenna (both from GSSI).

We calibrated the data using the observed depth of slab and reinforcement in core holes from the downleader installation (February 2023) and core holes from our destructive sampling (March 2024). We processed the data using GSSI's RADAN 7 software, which exports the calibrated concrete clear cover over the reinforcing bars captured in the scan. We used the exported concrete clear covers to calculate the effective depth of the reinforcement based on the as-designed reinforcing bar sizes. Figure 8 shows a representative GPR scan where the apex of the parabolic shapes are reinforcing bars. This scan shows the as-built bars approximately 2 in. lower than as-designed. Figure 9 presents our GPR results graphically, showing the GPR-measured clear cover over the reinforcement as a histogram. We used the measured clear cover to calculate the effective depth of the slab[3] at each column and summarize the results in Appendix D.

[3] ACI 318-19 defines the effective depth of a slab (d) as "distance from extreme compression fiber to centroid of longitudinal tension reinforcement." In the case of the two-way concrete slabs at Riverview, the effective depth of the slab at the columns is the distance from the bottom of the slab to the center of the top mat of reinforcing bars.

Rebound Hammer Testing

We performed rebound hammer testing in accordance with ASTM C805 – *Standard Test Method for Rebound Number of Hardened Concrete.* Rebound hammer testing works by impacting the concrete surface with a metal plunger using a known amount of energy. The distance the plunger rebounds after impact corresponds to a dimensionless number, the "rebound number." Higher rebound numbers typically represent harder (and, by correlation, stronger) concrete. The relative rebound numbers within a class of concrete in a structure represent the relative quality of the concrete.

We tested the underside of exposed concrete slabs on the interior and exterior of the building. Our 96 test locations represent concrete throughout the structure accessible by a ladder at the time of our investigation. Appendix E shows the rebound number recorded at each slab underside location. We note the average rebound number for all tests is 45.1 with a standard deviation of 3.4. Most tests (fifty-four) produced values within one standard deviation of the average. Figures 1 to 14 in Appendix E show the distribution of rebound number values on the architectural plans. Table 3 summarizes the values based on the following groupings:

- Values within one standard deviation of the average for all tests (between 41.7 and 48.5).
- Values greater than one standard deviation above the average for all tests (>48.5).
- Values between one and two standard deviations below the average for all tests (between 38.3 and 41.7).
- Values less than two standard deviations below the average for all tests (<38.3).
- Inconclusive tests (tests where readings did not meet the requirements of ASTM C805).

Table 3 – Rebound Hammer Results Summary

Rebound Number Value Range	Description	Number of Tests in Range
<38.3	Two standard deviations less than average or lower	1
38.3 to 41.7	Between one and two standard deviations of average	17
41.7 to 48.5	Within one standard deviation of average	54
>48.5	Greater than one standard deviation above average	18
-	Inconclusive Tests	6

Core Sampling

To understand the in-situ strength of the concrete, we directed the extraction of core samples from nine locations corresponding to rebound hammer test locations. We extracted, transported, and conditioned the cores in accordance with ASTM C42 – *Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.* Figure 10 shows the locations of the five interior and four exterior samples extracted from the Levels 7 and 8 slabs. We labeled each specimen using the corresponding floor level, relative sample location (east or west), and whether it was interior or exterior. After extraction, we returned the cores to our Waltham laboratory for compression testing (described below). Photos 42 - 50 show the as-extracted cores. During coring operations, we noted select locations where the concrete raveled during coring operations (Photos 51 - 53).

Reinforcement Sampling

To understand the in situ strength of the reinforcement, we directed the extraction of five reinforcement samples at Level 7. We extracted the samples in accordance with ASTM A370- *Standard Test Methods and Definitions for Mechanical Testing of Steel Products.* Figure 11 shows the locations of each reinforcement sample and its associated label. We labeled the samples based on the unit number and cardinal direction of the sample (east or west sample taken from the unit balcony). Photos 54 - 58 show the extracted reinforcement samples.

4. LABORATORY TESTING

We performed laboratory testing on steel reinforcement samples collected from the Level 7 slab and concrete core samples collected from Levels 7 and 8. We summarize the results in the subsections below and provide the laboratory reports for the testing in Appendices F – Reinforcing Steel Testing and Appendix G – Concrete Compression Testing.

4.1 Reinforcement Testing

We tested the tensile strength of three steel reinforcement samples from the Level 7 slab in accordance with ASTM A370 – *Standard Test Methods and Definitions for Mechanical Testing of Steel Products.* Table 4 summarizes the results. We note that the yield strength of all three samples complies with the yield strength specified in the Structural Drawings.

Table 4 – ASTM A370 Test Results

Specimen ID	Yield Strength (ksi)	Ultimate Tensile Strength (ksi)
703W	45.2	75.1
704E	47.3	81.6
704W	47.3	77.8

4.2 Compressive Strength Testing

We tested the compressive strength of nine core samples from Levels 7 and 8 in accordance with ASTM C42 – *Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete*. Table 5 summarizes the results. We note that the compressive strength tests vary from the as-designed concrete strength at twenty-eight days for slabs as required by the original Structural Drawings.

Table 5 – ASTM C42 Test Results

Sample ID	Compressive Strength (psi)
7E-EXT	3,200
7W-EXT	2,670
8E-EXT	2,700
8W-EXT	4,680
7E-IN	1,690
7W-IN	2,550
8E-IN 1	1,710
8E-IN 2	1,650
8W-IN	2,960

5. ANALYSIS

In accordance with ACI 562, we analyzed the structure's capacity to carry the code-required loads based on the as-built conditions that we documented during our field investigation. Our analysis consisted of the following:

- Calculation of the concrete's equivalent specified compressive strength (f_{ce}) based on the laboratory-measured properties.
- Development of a finite element model of the slab at each level to determine the flexure and shear demands due to code-required gravity loads
- Calculation of demand-to-capacity ratios (DCRs) in shear and flexure at each slab-column connection for which we have GPR data.

The following subsections summarize our analysis. Appendix D includes the DCRs at each GPR scan location.

5.1 Equivalent Concrete Properties for Design

In accordance with ACI 562, we calculated the concrete equivalent specified compressive strength (f_{ce}) based on the laboratory-measured properties of field-collected samples. ACI 562 considers the statistical variations in concrete and steel strength to calculate the property f_{ce} used in design equations. Table 6 summarizes the ACI 562 calculated f_{ce} at Riverview compared to the design values listed in the original structural drawings.

Table 6 – Concrete Equivalent Specified Compressive Strength

Property	Riverview Core Samples
Number of Core Samples	9
Average Core Compressive Strength (psi)	2,646
Std. Dev. of Measured Core Strengths (psi)	958
Variance of Measured Core Strengths	0.36
Equivalent Specified Compressive Strength (psi)[1]	1,960
As-Designed Compressive Strength (psi)	3,000

1. Calculated in accordance with ACI 562 Equation 6.4.3.1

5.2 Finite Element Model for Gravity Loads

We created a finite element model of each floor slab using CSI's Slab Analysis by the Finite Element Method (SAFE), Version 20. Figures 12 and 13 show typical models for the 6.5 in. and 7.5 in. slabs. SAFE calculates the punching shear and flexural demands in the slab based on

ACI 318-19. The SAFE models considered only the gravity load requirements. We did not consider lateral (wind or seismic) loads in the analysis. The following subsections describe our modeling parameters and assumptions.

Materials and Geometry

In accordance with ACI 562, our models account for the as-built material properties and geometry of the structure, including openings and as-built penetrations. For the SAFE models, we assumed the following:

- The floor slabs are either 6.5 or 7.5 in. thick based on the original structural drawings and confirmed by field measurements.
- The concrete strength is 1,960 psi, as calculated in accordance with ACI 562.
- The yield strength of the reinforcement is 40 ksi in accordance with the Structural Drawings and as confirmed by our laboratory testing.
- The strength reduction factors (Φ) for concrete are in accordance with ACI 318-19 Table 27.3.2.1 as follows:
    - Shear: $\Phi_V = 0.8$
    - Compression Controlled: $\Phi_C = 0.8$
    - Tension Controlled: $\Phi_T = 1.0$
- The effective depth of the reinforcement at each slab-column connection is based on the GPR data collected in the field. Where we were only able to collect the reinforcement depth in one direction, we assume that the reinforcement in the orthogonal direction sits directly above or below the measured bars in accordance with the original structural drawings.

Loads and Load Combinations

Our SAFE models consider the gravity loads shown in Table 7 below and the following load combinations in accordance with IBC 2021.

- 1.4D
- 1.2D+1.6L
- 1.2D+1.6S
- 1.2D+1.6L+0.5(S or L_r)
- 1.2D+1.6(S or L_r)+1.0L

Table 7 – Loads Used in SAFE Model

Load	Value	Code Reference
Dead Loads[1] (D)		
Self-Weight of Concrete Slabs	145 pcf	Assumed
Partitions (Wood or steel studs, 1/2 in. gypsum board each side)	8 psf	ASCE 7-16 Table C3.1-1
Other Superimposed Dead Loads (finishes, mechanical, etc.)	10 psf	Assumed
Live Loads[2] (L or L_r)		
Multifamily Dwelling (Private rooms and corridors serving them)	40 psf	IBC 2021 Table 1607.1
Balconies (1.5x the load of the occupancy served)	60 psf	IBC 2021 Table 1607.1
Roof	20 psf	IBC 2021 Table 1607.1
Other Loads		
Snow (S)	33.6 psf + Drift	MSBC Table 1604.11 and ASCE 7-16 Ch. 7

[1] Dead loads consist of the weight of materials that make up the building (e.g., the weight of the structure, walls, floors, roofing materials, etc.)
[2] Live loads are produced by the use and occupancy of the building (e.g., people and their possessions)

5.3 Analysis Results

Appendix D shows the demand-to-capacity ratios (DCRs) calculated at each slab-column connection for which we have GPR data. The DCRs represent the ratio of the code-required load (demand) to the code strength of the slab (capacity). DCRs greater than 1.0 indicate that the code-calculated demand on the slab exceeds the code-prescribed strength of the slab-column connection. We include the following DCRs in our analysis:

- Two-way (punching) shear, including the effect of unbalanced moment per ACI 318-19 Section 8.4.4.2.
- Punching shear due to direct gravity loads (v_{uv}).
- Flexure in two orthogonal directions: NS (typically the long-span or cantilever direction) and EW (typically the short span direction).

We provide a discussion of our results in the sections below.

6. DISCUSSION

6.1 General - Two-Way Slabs

The design and analysis of two-way concrete slabs, such as the slabs at Riverview, include several variables that all contribute to the strength of the slabs. Some of these variables include:

- Concrete Compressive Strength.
- Reinforcement Yield Strength.
- Slab Thickness.
- Placement and size of reinforcement.

Two of the primary strength conditions that the code requires to be evaluated are flexure and shear, as described below.

Flexure General Description - At a fundamental level, flexural strength is the slab's ability to resist bending or rotation along its length. Bending stress in two-way slabs is typically highest at slab mid-span and at supports such as beams, walls, or columns. In reinforced concrete construction, bending is resisted by a combination of forces (stress) in the slab; steel reinforcement typically resists tension stresses where the slab would otherwise want to crack due to bending or rotation, and the concrete that is inherently strong in compression is used to resist stresses on the face of the slab being "squeezed" or compressed by the same rotation. These two stresses act together to resist bending at any point within the slab, and they are critically dependent on the vertical distance between them (i.e., the distance between the concrete in compression and reinforcement in tension). The distance between the tension steel and compression face of the concrete slab (i.e., the offset between the two) is the effective depth of the slab. A smaller effective depth results in increased stresses, and therefore, the capacity of a given slab is reduced. Flexural failure is typically ductile and is preceded by significant deflections and cracking.

Shear General Description - Shear strength is the slab's ability to resist forces perpendicular to that slab span (i.e., slab strength to resist "dropping" or a crack developing with one side shifting vertically relative to the other). Specific to two-way slabs, punching shear at the slab-column connection is critical where shear stresses are highest. The effective depth and strength of the concrete contribute to the shear strength of the concrete slab. Punching shear failures are often brittle "sudden" failures.

We previously issued a handout titled "Engineering Principles of Reinforced Concrete Structures," summarizing concrete flexure and shear basics; see Appendix H for additional information.

6.2 Riverview - Two-Way Slabs

Our slab evaluation included ground-penetrating radar scans at approximately 94% of the slab-column connections to document the location and depth of the reinforcement. At the slab-column connections, reinforcing bars near the top surface (i.e., as designed with 1 in. concrete clear cover) correspond to larger effective depths, directly increasing the flexural and shear strengths of the slabs. We documented that the top mat of reinforcement near columns (at the critical punching shear and flexural locations) is often lower than required by the original construction documents (Figure 8). At many locations, the reinforcement is severely misplaced (low), which results in a very small offset distance between tension and compression forces within the slab and, therefore, a significant reduction in the slab flexural and punching shear capacity compared to the original design intent.

We performed concrete compressive strength testing on core samples extracted from several locations in the existing slabs in accordance with ASTM C39 (*Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens).* Based on the test results, the as-built effective design strength (f_{ce}) is 1,960 psi, as calculated in accordance with the American Concrete Institute's - Code Requirements for Assessment, Repair, and Rehabilitation of Existing Concrete Structures and Commentary (ACI 562). This is substantially lower than the as-specified compressive design strength of 3,000 psi. We performed rebound hammer testing throughout the building and confirmed that the concrete quality exhibits consistently low strength (represented by consistent rebound hammer numbers as shown in Appendix E, Figures 1 – 14). The low compressive strength further reduces the slab flexural and shear strengths in addition to the misplaced reinforcement discussed above. We extracted reinforcement samples from the existing slabs to perform testing and found that the reinforcement yield strength is consistently at least 40 ksi, which conforms to the requirements of the original drawings.

Based on our GPR scans, compressive strength testing, and reinforcement testing, we analyzed the slabs in their as-built condition to support code-required loads. We determined that there are widespread flexural and punching shear DCRs that exceed 1.0 (DCRs above 1.0 exceed the demand-to-capacity ratios prescribed by applicable Codes). At many locations, there are DCRs above 1.5, which are classified as "potentially dangerous" by ACI 562. While the building is currently vacant, which reduces the occupant live load on the slabs, select slab-column connections still have DCRs above 1.0 (under dead and snow loads only). This is of particularly high importance when evaluating punching shear, since punching shear failures are typically a brittle (sudden) failure.

As a result of our analysis and because almost all of the slabs are concealed, we recommended exploratory openings in the finishes to make direct observations of the slabs. The goal of the exploratory work was to assess the extent to which damage, if any, had occurred in the concrete slabs and the urgency to address such conditions. We made observations at nine exploratory opening locations and observed varying degrees of flexural and shear cracks, utility penetrations through the slabs in the critical punching shear zone, reinforcement corrosion damage, evidence of leakage through the exterior walls and slabs, and leaking and condensing utility pipes. These conditions all further reduce the capacity of the slabs. Specifically, the penetrations within the critical punching shear zone drastically reduce the punching shear capacity, and these penetrations occur at one-third of the columns along Columns Lines B and E. Corrosion damage and accompanying reinforcement section loss also reduces the slab strength. Corrosion damage within the building is concerning since the vast majority of the slabs are concealed, and the extent and severity of the corrosion damage is unpredictable until the slabs are physically exposed.

At three exploratory opening locations, we observed circumferential and radial cracks, consistent with elevated punching shear stresses. At two of these locations (Level 5 Column B5 and Level 4.5 Column E13), the crack patterns at Riverview are very similar to those that occur in laboratory punching shear tests at punching shear failure of the slabs. Figures 14 and 15 compare the crack patterns we observed at Riverview with crack patterns that occurred at failure. It is important to note that the punching shear tests slabs have similar geometry and low reinforcement as the Riverview slabs. The crack patterns consistent with punching shear failure support our calculated DCRs (above 1.0) and provide evidence of physical damage to the slabs.

During our work, we also made visual observations of exterior portions of the concrete structure and used an aerial drone to photograph the existing conditions. At Column Line E (rear of the building), we observed diagonal cracks through the thickness of the slab at many slab-column connections, evidence of previous concrete repairs, and corrosion damage. Our initial drone work occurred on 18 June 2024, and we performed another aerial drone survey on 28 October 2024. We compared the June and October drone images and documented that some existing cracks widened and lengthened, and we also observed new cracks (See Appendix C). Evidence of new cracks and lengthening and widening of existing cracks shows that deterioration, building movement (potentially thermal), and high flexural and shear stresses are continuing to damage the building.

The Riverview Board provided us with photographs of previous projects that show concrete slab repairs in the punching shear zone at Column Line E (rear of the building). Based on photographs, previous reports, and previous repair documents prepared by others (described above), it is not clear what, if anything, was done to intentionally restore punching shear capacity at these repair locations (such as doweling).

6.3 Riverview Slab - Summary

Multiple factors influence the performance of the concrete slabs at Riverview. Below, we summarize the issues that contribute to a reduction of the slab flexural and punching shear capacities. We list the issues below in the general order of most significance and most widespread (i.e., low reinforcement results in the largest strength reduction and occurs at the majority of the slab-column connections). The order of significance varies at each specific slab-column connection, but the list below provides the general hierarchy of the slab issues at Riverview.

- Low Reinforcement Placement - Reinforcement placed lower, and in many locations significantly lower, than specified on the design drawings.
- Low Compressive Strength – Lower than specified concrete strength.
- Utility Penetrations – Penetrations and alterations of the concrete slabs within the critical punching shear perimeter.
- Leakage and Corrosion – Ongoing leakage through the exterior walls, concrete slabs, and leaking and condensing utilities causing reinforcement corrosion inside the building. There is also isolated corrosion damage of the exterior concrete components.
- Previous Concrete Repair Work – Slab repairs performed within the critical punching shear zone that may have further weakened the structure.

6.4 Slab Strengthening

IEBC, MSBC, and ACI all have similar provisions that require structural components with DCRs greater than 1.05 to be strengthened. IEBC allows components with less than substantial structural damage to be strengthened or repaired to their intended (as-designed) strength. The strengthening work is classified as a "Repair" per IEBC and the applicable Codes do not require a lateral analysis (wind or seismic) of the building. The Riverview Board has the right to voluntarily upgrade the lateral force-resisting system of their building; however, we understand that this is not being contemplated at this time, and therefore, we did not perform a lateral analysis of the building.

More than half of the slab-column connections throughout the building have DCRs above 1.05 and require strengthening. We evaluated multiple options to strengthen the slabs for flexure and punching shear to support gravity loads, including:

- Steel Through Bolts.
- Concrete Capitals or Corbels.
- Concrete Drop Panels.

- Supplemental steel (e.g., stiffened seats, beams).
- Carbon Fiber Reinforced Polymer (CFRP) Sheets and Rods.

We evaluated the strengthening options above and include a checklist indicating the advantages and disadvantages of the various options in Appendix I. We identified that the most viable strengthening techniques are concrete corbels and concrete drop panels. The concrete corbels impact a smaller footprint at each repair location but are extremely deep and would drastically impact aesthetics and head height within the building and condominium units. The concrete drop panels occupy a larger footprint at each repair location but are a preferred strengthening option due to their shallower depth and less drastic aesthetic impact compared to concrete corbels.

Widespread structural strengthening is possible (see Section 6.4 below), but ongoing corrosion damage and leakage will continue unless waterproofing and corrosion mitigation measures are implemented. Ongoing leakage and corrosion will continue to reduce the capacity of the slabs if water continues to infiltrate the concrete. The propagation of cracks and the formation of new cracks provide additional pathways for water to enter the concrete and also provide evidence of ongoing building damage. To reduce future leakage and concrete corrosion damage, upgrades in addition to the structural strengthening can include upgrading waterproofing membranes and coatings, new cladding, roofing replacement, window replacement, and improved stormwater drainage on balconies and roofs. We developed a conceptual design package (see Section 6.5 below) that includes strengthening the slab-column connections to meet the current code requirements and included additional upgrades to reduce water ingress into the building and to reduce future concrete corrosion damage.

6.5 Conceptual Repair Documents

Various building components are impacted by the slab strengthening, such as mechanical, electrical, plumbing, and architectural elements. To assist with developing an order-of-magnitude cost for the strengthening work, SGH along with Thayer & Associates, TRC, Maxwell Architects, Rimkus, and Cosentiti prepared Conceptual Repair Documents (Appendix J). The

Riverview Board retained Consigli to develop order-of-magnitude pricing based on the Conceptual Repair Documents. We include a summary of the conceptual scope of work below.

Base Scope

The base scope includes the concrete strengthening, the work required to facilitate the strengthening, and basic measures to reduce water ingress into the building. Specifically, we include:

1. Abatement: Remove hazardous materials at effected areas that require abatement prior to the start of strengthening work.

2. Shoring: Shore all slab strengthening locations prior to the start of repairs. Shoring shall be constructed to support anticipated construction live loads and associated materials as well as the structural loads during the strengthening work.

3. Concrete Strengthening and Repairs

   - Strengthen slabs with DCR's greater than 1.05 with new concrete drop panels.
   - Repair areas of spalled and/or delaminated concrete with concrete repair materials as needed once areas are exposed during the strengthening work.

4. Ground Penetrating Radar (GPR): Use GPR to locate existing reinforcement prior to any drilling or cutting. Do not cut or damage any existing reinforcement.

5. Windows: Replace all windows and doors on all elevations.

6. Pedestrian-traffic-bearing waterproofing: Remove pedestrian-traffic-bearing waterproofing (PTBW) on balconies to perform repair and strengthening work and install new PTBW at these locations.

7. Epoxy Repairs: Gravity feed topside and full-depth slab cracks with epoxy prior to construction of strengthening repairs.

8. Coatings:

   - Provide new acrylic coating on the underside of balconies at all strengthening and repair locations.
   - Provide new elastomeric coating at all strengthening locations at Column Lines B and E.

9. Joint Sealant:

   - Provide all sealant joints associated with the PTBW and other coating systems.
   - Provide all sealant joints at all windows and doors.

10. Roofing: Provide new roofing at the Low and High Roofs.

11. Interior Finishes: Remove and reconstruct finishes at all strengthening and repair locations.

12. Mechanical, Electrical, Plumbing (MEP)

    - Remove and reconstruct the existing MEP components where impacted by strengthening, shoring, and repair work.
    - Replace all riser pipes.

Additional Scope

In addition to the base scope of work, The Riverview Board elected to include the following additional items for the purposes of order-of-magnitude pricing. These additional items include:

- Overclad the north, east, and west elevations to reduce water ingress in accordance with the add-alternate scope item in our conceptual design package.
- Provide a new fire-protection sprinkler system throughout the building.
- Upgrade existing HVAC systems in accordance with Cosentini's add-alternate scope items.
- Reinstate finishes to match existing, with limited evidence of patching.

6.6 Cost Estimate and Future Capital Renewal

Consigli provided their cost estimate based on the Conceptual Repair Documents (Appendix K) with a total repair cost of approximately $73.2 million. We understand that The Riverview Board is using this cost estimate to determine the viability of the repairs. As part of that review, a long-term capital plan and associated costs should be developed. While the Conceptual Repair work includes widespread replacement of multiple systems (i.e., windows, riser pipes, etc.), there will be other building components that will likely require repair or replacement within the next ten years and beyond.

Specific to the structural and enclosure components, we anticipate that even if the Overcladding Add Alternate is selected, future structural and enclosure repairs will be required. Future structural and enclosure work will likely include:

- Concrete Repairs – Concrete repairs at Penthouse columns, balconies, south elevation columns, and Ground Level columns (these components are not part of the current Overcladding Add Alternate).

- Balcony Coatings – Balcony coatings will need to be replaced and/or upgraded within a ten-year timeframe to help reduce future deterioration of the balcony slabs.
- Other Coatings – The coatings on the columns and slab undersides at the south elevation will require replacement within the next ten years to help reduce future concrete deterioration.
- Guardrail and Precast Components – The precast components at the south elevation (balconies) have been routinely repaired, we anticipate an additional round of repairs will be required in the near term and likely every five years after that.
- Foundations - We cannot opine on the condition of the foundations since that was outside of the scope of our evaluation, and we cannot predict if future repair work will be necessary.

Using the order-of-magnitude costs in conjunction with the capital renewal forecast will help The Riverview Board in their evaluation of the viability (from a financial perspective) of repairing and strengthening the structure. We understand that in addition to the repair option, The Riverview Board is also considering reconstruction and redevelopment options.

7. CONCLUSIONS

The slabs at Riverview have compounding issues that contribute to reduced strength and load-carrying capacity. The issues include the following:

- Low Reinforcement – Reinforcement placed significantly lower than specified on the design drawings.
- Low Compressive Strength – Lower than specified concrete strength.
- Utility Penetrations – Penetrations and alterations of the concrete slabs within the critical punching shear perimeter.
- Leakage and Corrosion – Ongoing leakage through the exterior walls, concrete slabs, and leaking and condensing utilities causing reinforcement corrosion inside the building. There is also isolated corrosion damage of the exterior concrete components.
- Previous Concrete Repair Work – Slab repairs performed within the critical punching shear zone that may have further weakened the structure.

Due to the compounding issues summarized above, at various locations throughout the building, there is a very low (to potentially zero) safety factor when the slabs are subject to code-required loads. Slab strengthening is required based on applicable Building Codes. We developed a slab-strengthening approach along with a Conceptual Design Package that has an order-of-magnitude cost equal to approximately $74M (prepared by Consigli). The Riverview Board should continue to investigate the Repair, Reconstruction, and Redevelopment Options and take into account future capital renewal costs until a preferred option to address the structural issues is selected.

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Photo 1

Stains due to water leakage on the interior side Column Line B on Level 7.

(Photo from 18 November 2020 during SGH Water Leak Investigation.)

Photo 2

Stains due to water leakage on the interior side of balconies at Column Line B on Level 7.

(Photo from 1 October 2020 during SGH Water Leak Investigation.)

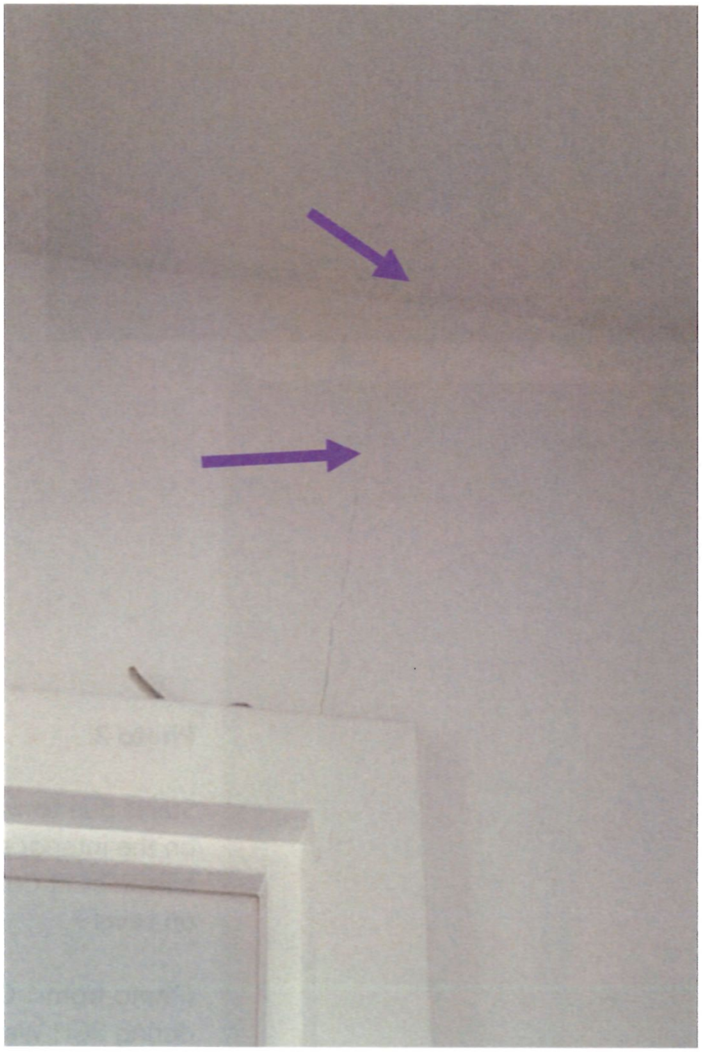


Photo 3

Crack in drywall above door propagates into ceiling in Unit 705.

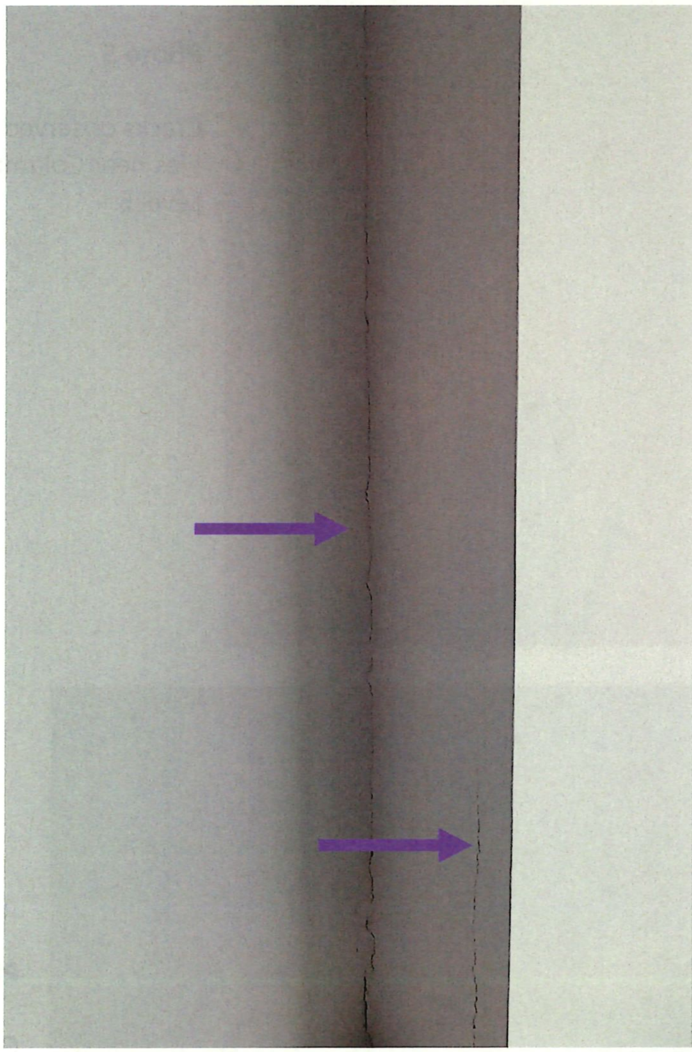


Photo 4

Typical cracks and separation in drywall near columns.

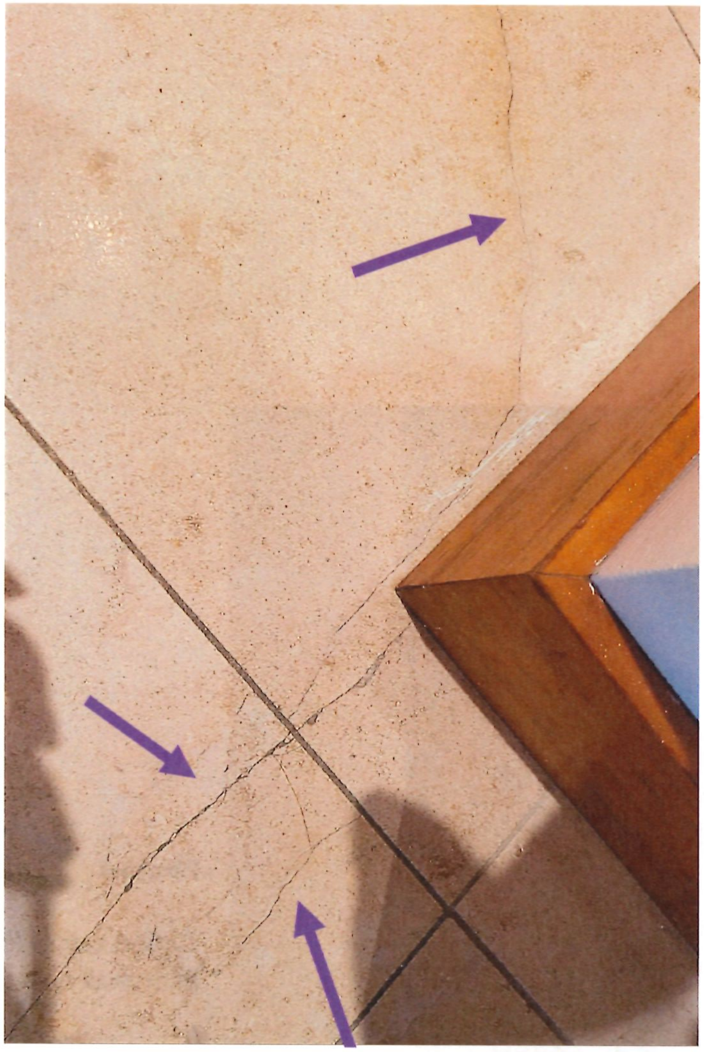


Photo 5

Cracks observed in bathroom tiles near Column D11 on Level 6.

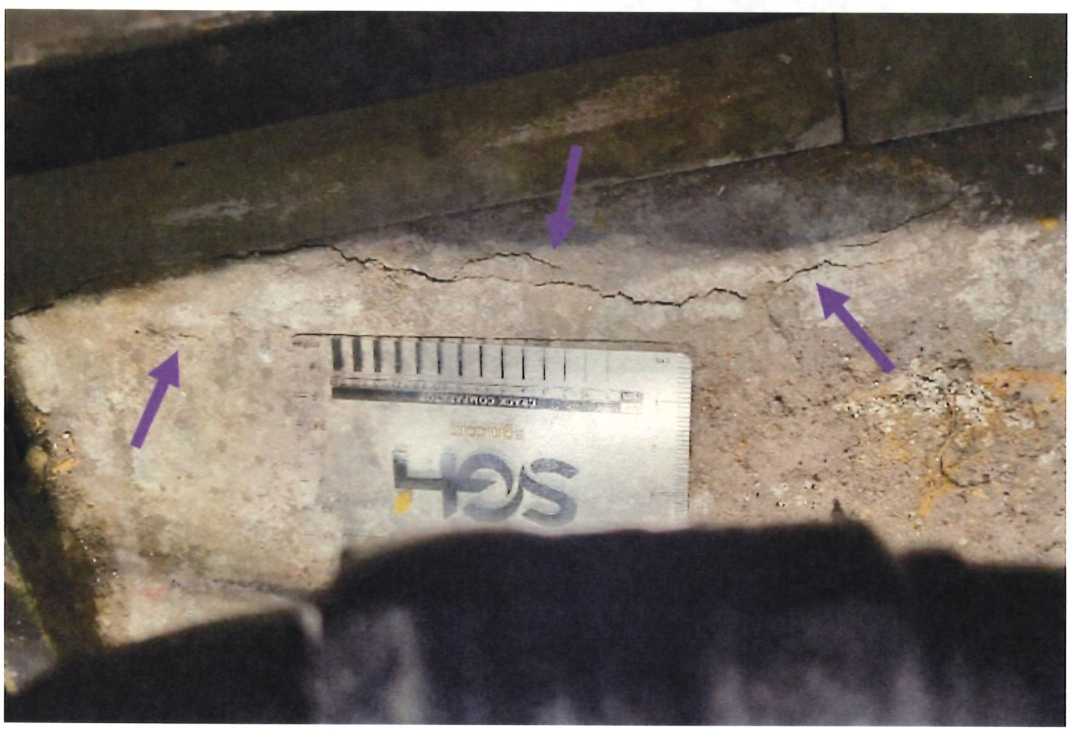


Photo 6

Cracks observed in a fan coil unit at Column Line E.

Photo 7

Cracks observed at Column D10 in the Level 8 storage room. Blue lines added by SGH for emphasis.

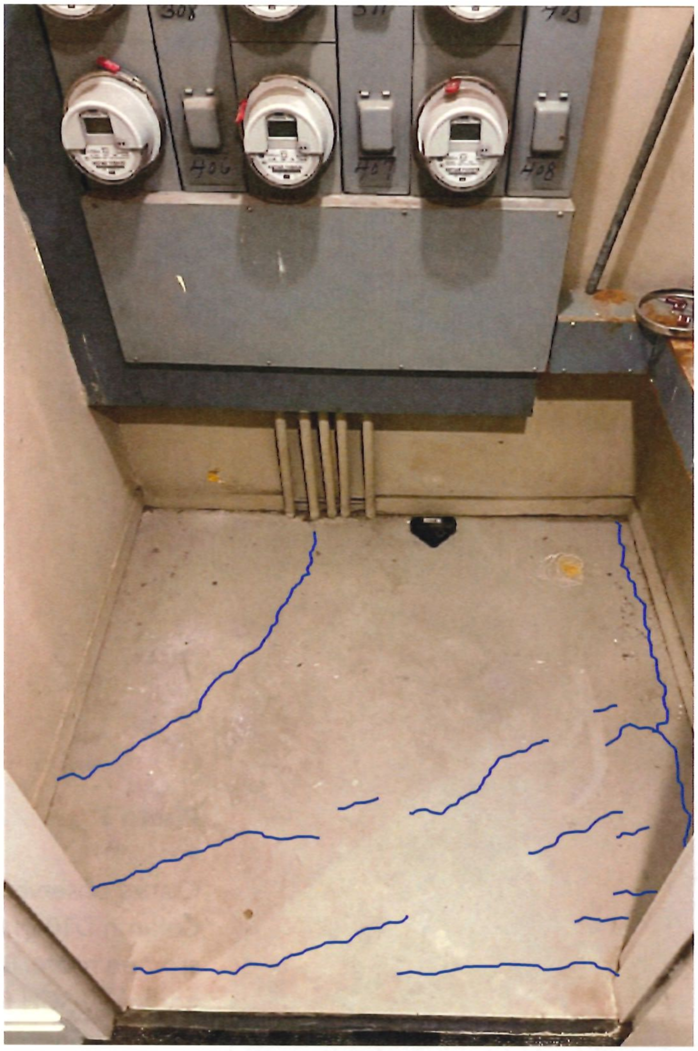


Photo 8

Cracks observed at shear wall inside Level 3.5 electrical room. Blue lines added by SGH for emphasis.

Photo 9

Cracks observed at shear walls inside electrical rooms.

Photo 10

Typical riser pipe penetration at fan coil units on Levels 1.5, 3.5, and 5.5.

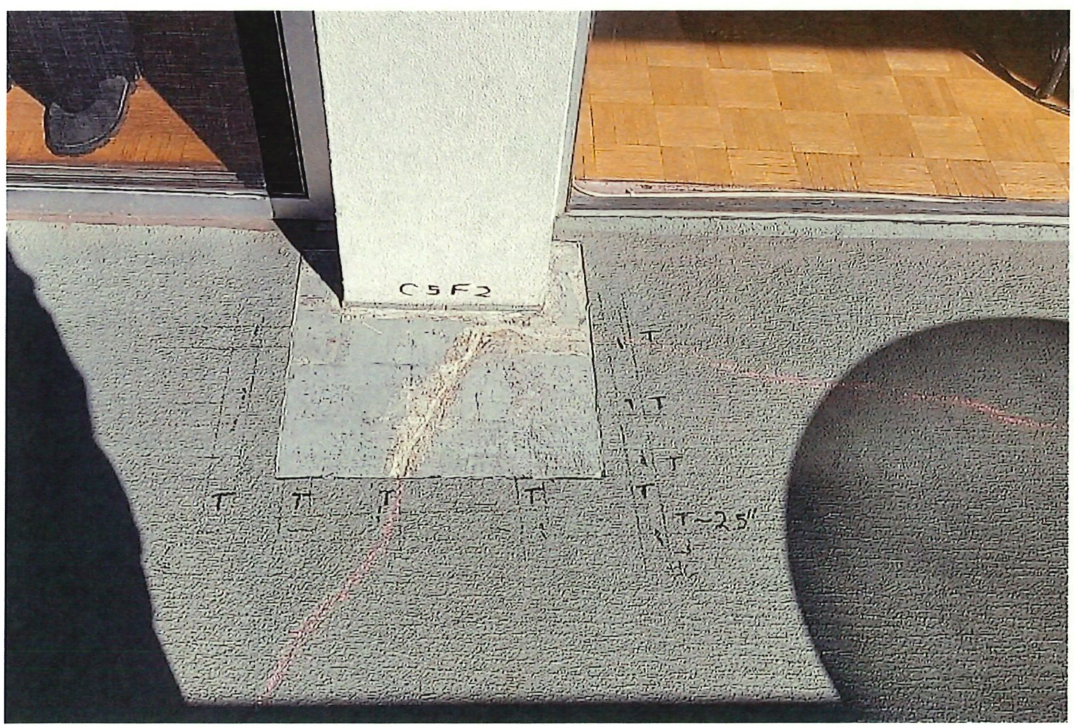


Photo 11

Balcony coating removal revealed preexisting cracks that were previously routed and sealed. SGH outlined the cracks through the coating in red chalk prior to taking the photograph.

Photo 12

Typical NS cracks extending the full balcony width (purple arrows). SGH outlined the crack in red chalk prior to taking the photograph.

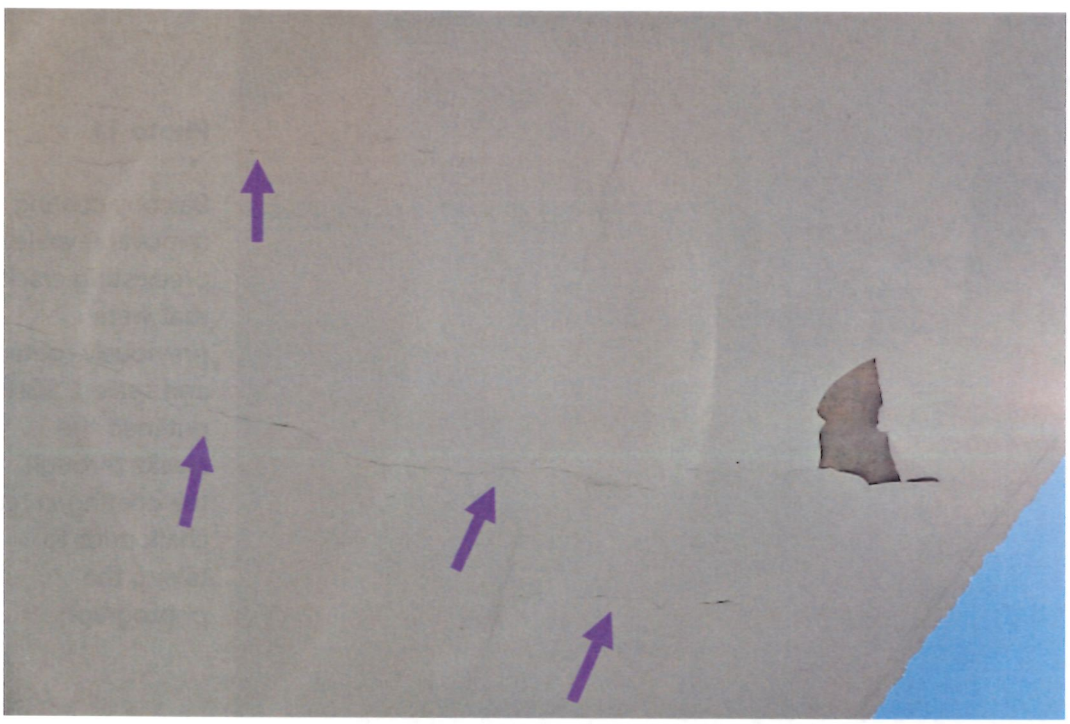


Photo 13

Typical NS cracks extending the full balcony width visible from the underside.

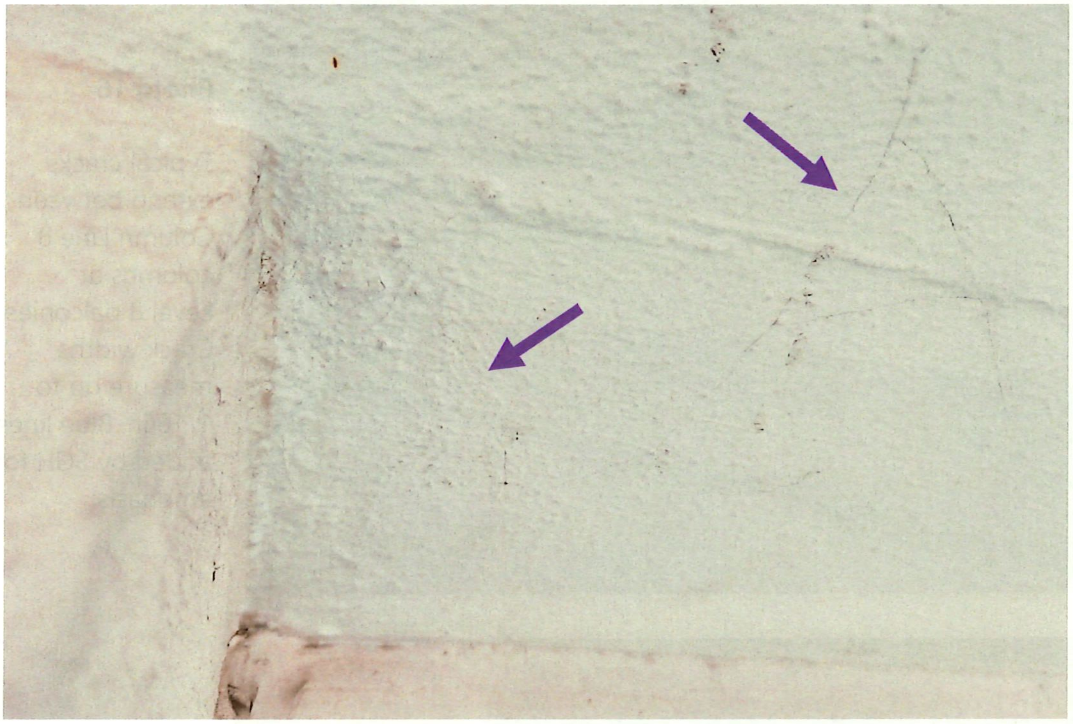


Photo 14

Cracks observed at underside of Level 8 slab at balcony columns.

Photo 15

Typical cracks extending between Column Line B columns at Level 8 balconies. Blue lines added by SGH for emphasis.

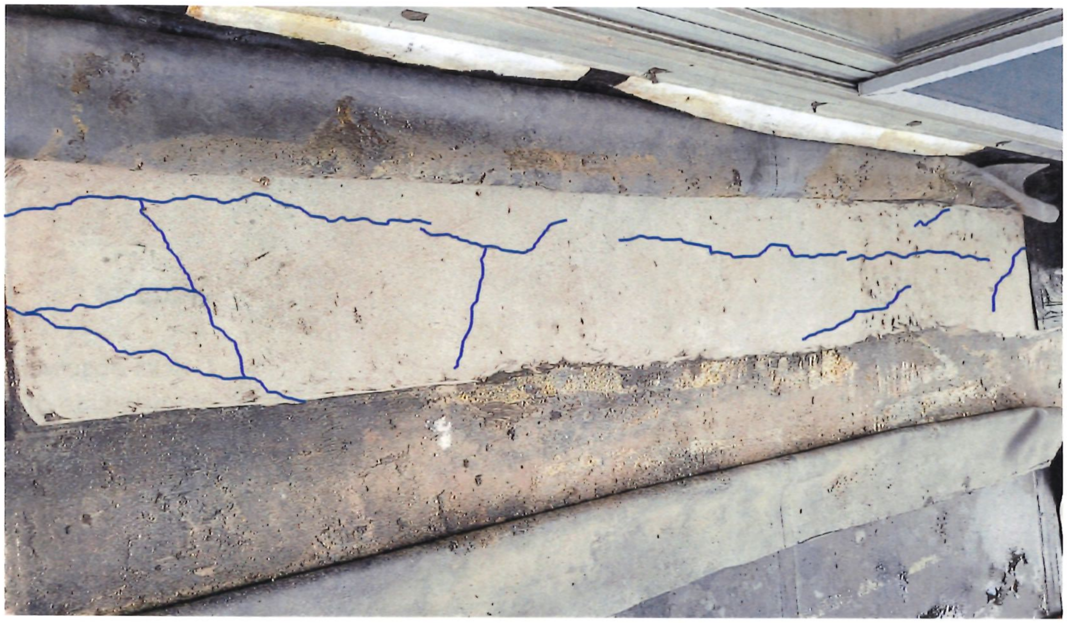


Photo 16

Typical cracks extend between Column Line B columns at Level 8 balconies. Crack widths measure up to 1/16 in. Blue lines added by SGH for emphasis.

Photo 17

Typical cracks observed at exploratory openings. Blue lines added by SGH for emphasis.

Photo 18

Typical radial cracks observed at exploratory openings. Blue lines added by SGH for emphasis.

Photo 19

Radial and circumferential cracks at Level 5 Column B5. Arrows point to circumferential cracks.

Photo 20

Radial and circumferential cracks at Level 4 Column E15. Blue lines added by SGH for emphasis. Arrow points to circumferential crack.

Photo 21

Radial and circumferential cracks at Level 8 Column B16. Blue lines added by SGH for emphasis.

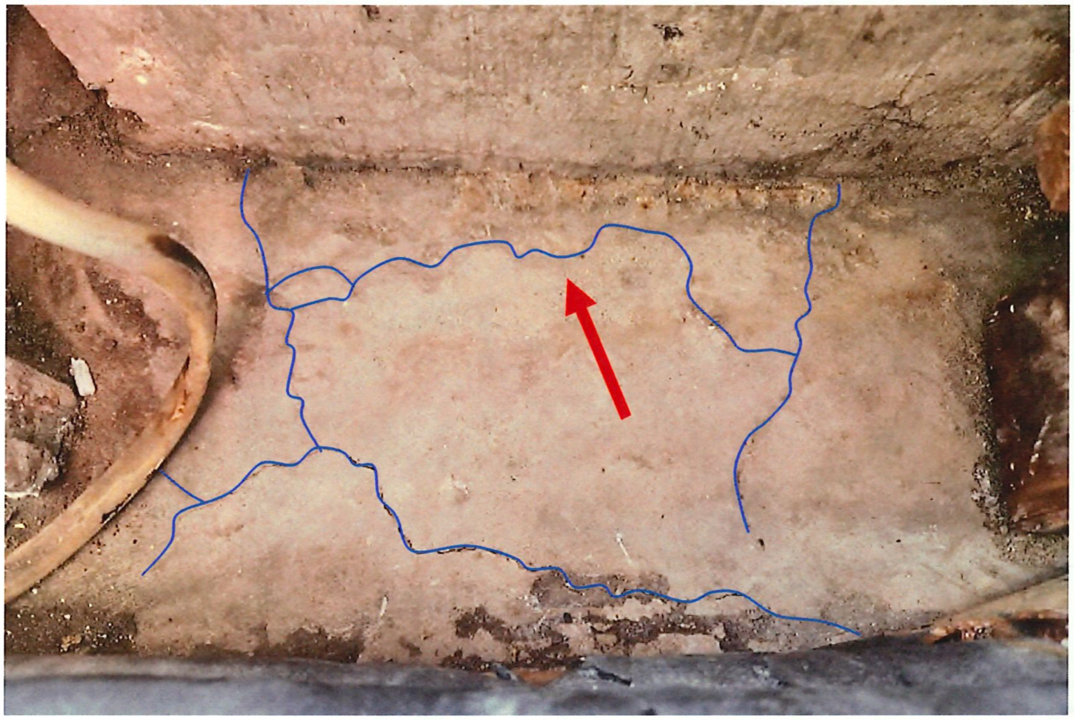


Photo 22

Radial and circumferential cracks (red arrow) at the face of Level 8 Column B16. Blue lines added by SGH for emphasis.

Photo 23

Vertical cracks at the Level 4.5 slab edge between Columns E15 and E16.

Photo 24

Vertical cracks at the Level 8 slab edge between Columns E20 and E21. Dashed lines representing the observed cracks added by SGH for emphasis.

Photo 25

Vertical cracks at Level 1.5 slab edge between Columns E6 and E7.

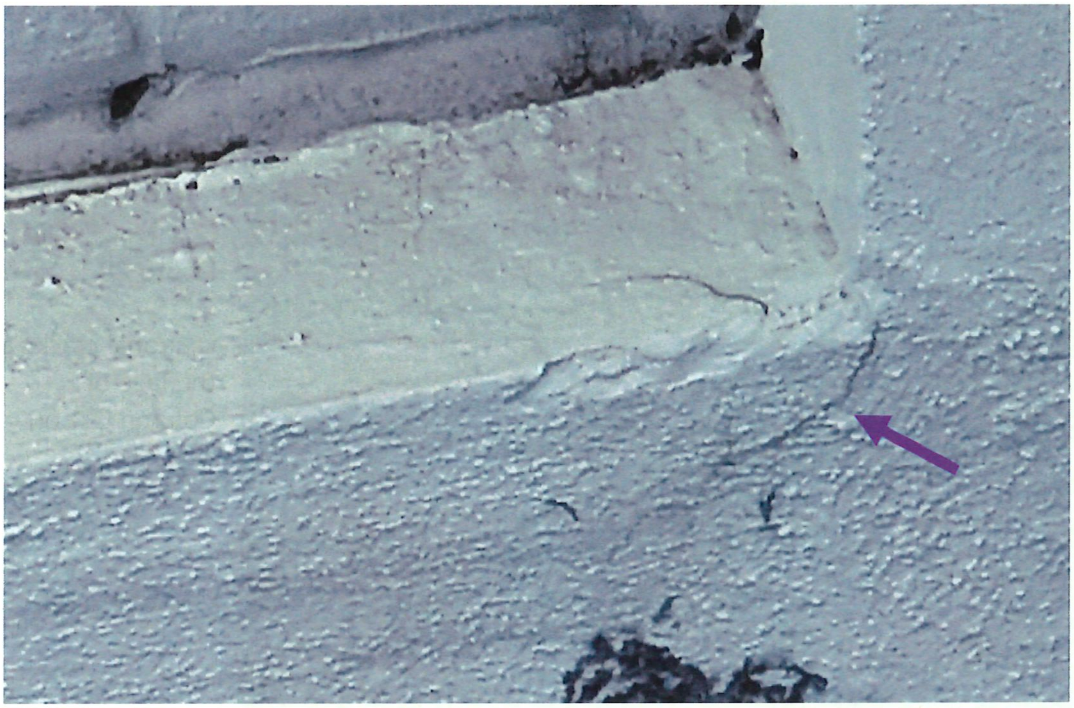


Photo 26

Diagonal crack at the face of Column E5 on Level 2.5.

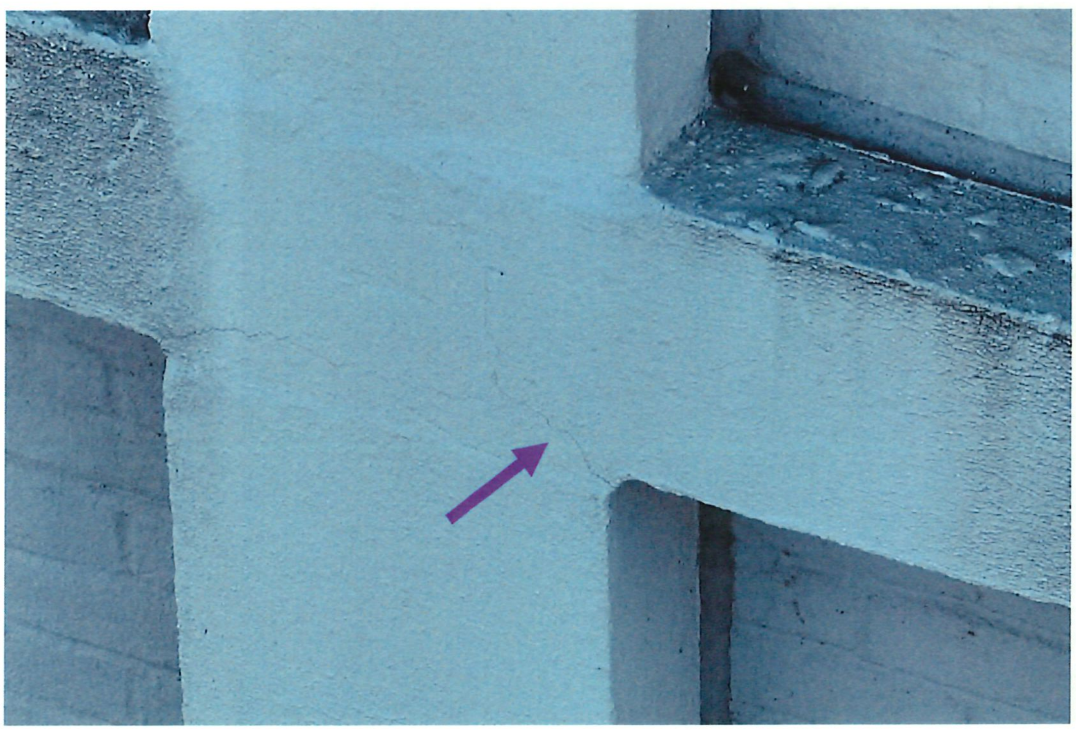


Photo 27

Diagonal cracks at the face of Column E19 on Level 7.

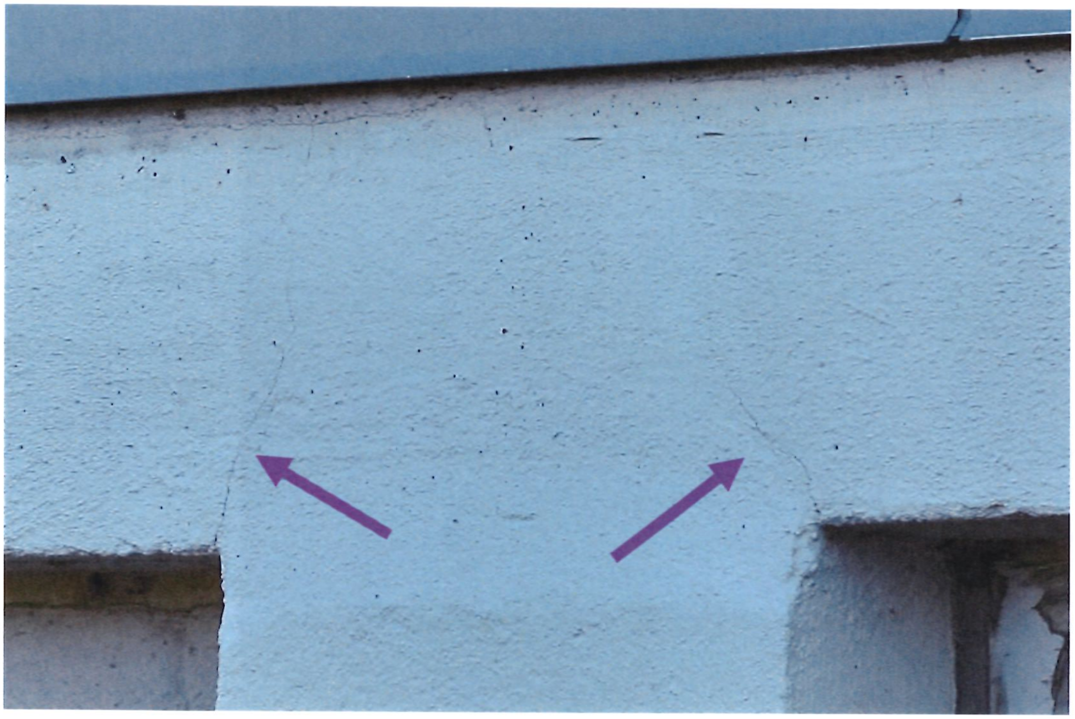


Photo 28

Diagonal cracks at the face of Column E21 on Level 8.

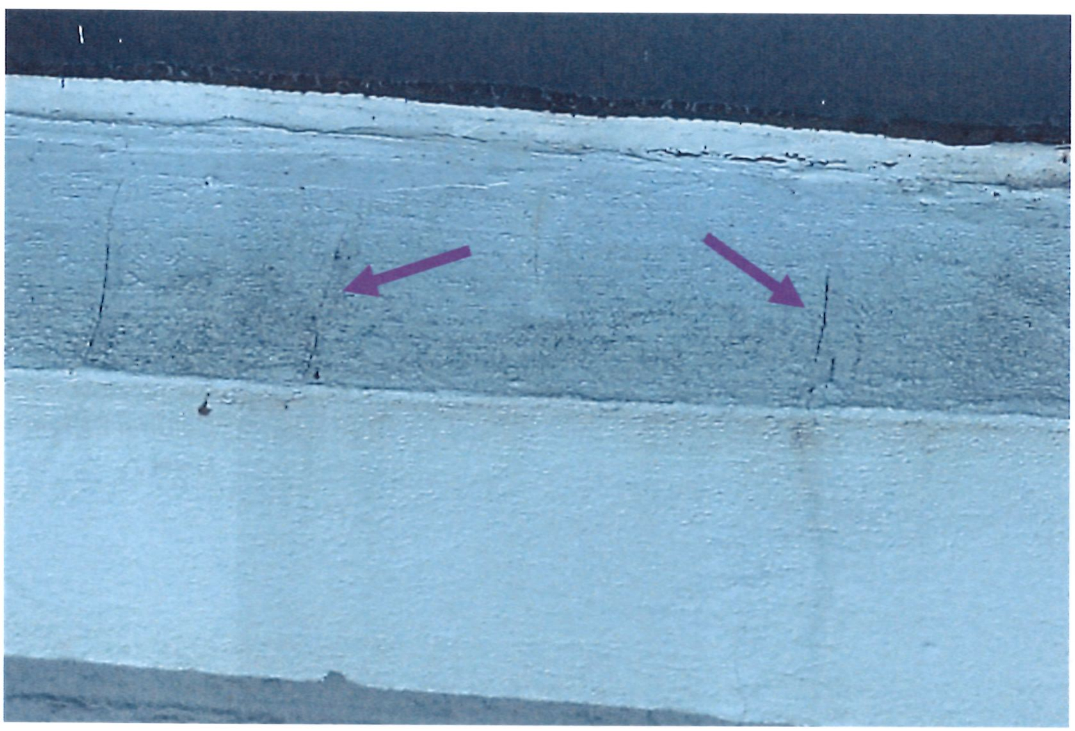


Photo 29

Topside cracks perpendicular to the wall at Level 2.5 slab edge between Columns E11 and E12.

Photo 30

Topside crack perpendicular to the wall (purple arrow) and topside crack at an angle to the wall (yellow arrow) at Level 4.5 slab edge between Columns E12 and E13.

Photo 31

Topside cracks perpendicular to the wall at the Level 7 slab edge between Columns E20 and E21.

Photo 32

Topside cracks perpendicular to the wall at the Level 5.5 slab edge between Columns E3 and E4.

Photo 33

Topside cracks at an angle to the column at the Level 7 slab edge between Columns E10 and E11.

Photo 34

Topside cracks at an angle to the column at the Level 7 slab edge between Columns E10 and E11.

Photo 35

Underside cracks connecting to vertical cracks at the slab edge at Level 8 between Columns E21 and E22.

Photo 36

Underside cracks connecting to vertical cracks at the slab edge at Level 5.5 slab edge between Columns E18 and E19.

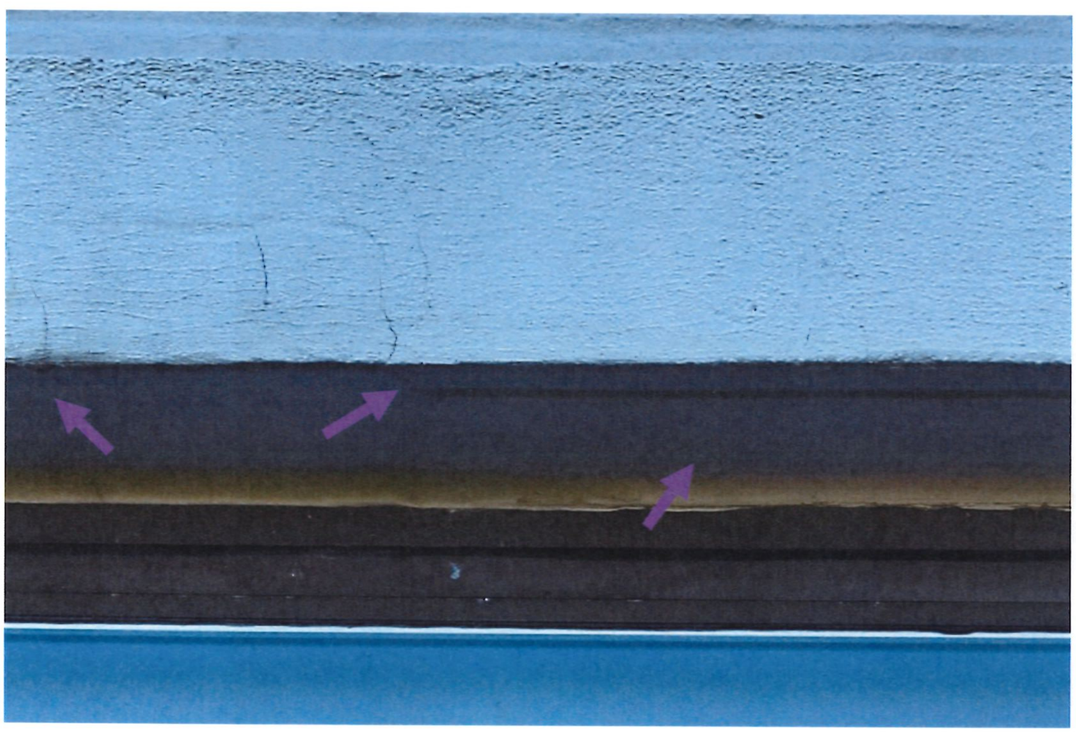


Photo 37

Underside cracks connecting to vertical cracks at the slab edge at Level 5.5 between Columns E18 and E19. The rightmost arrow identifies an isolated underside crack.

Photo 38

Underside crack connecting to vertical cracks at the slab edge at Level 6.5 between Columns E15 and E16.

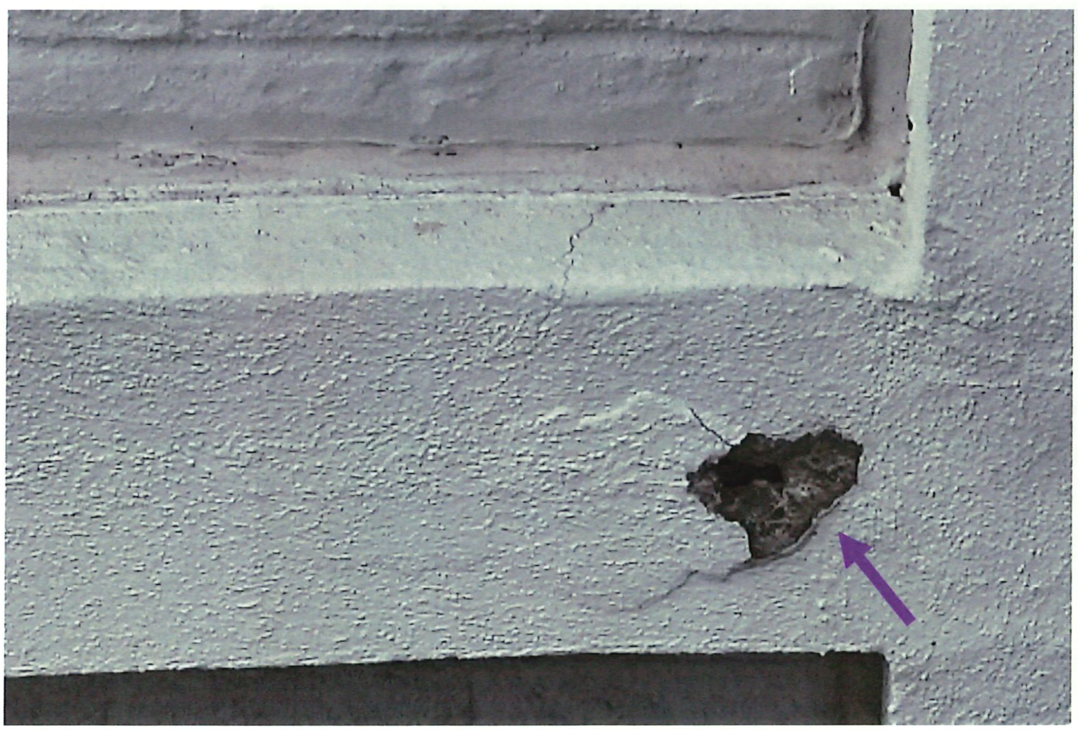


Photo 39

Spall at Level 2.5 slab edge between Columns E4 and E5. Corroded reinforcement is visible. An incipient spall is adjacent to the left of the exposed corroded reinforcement.

Photo 40

Spalled concrete at the Level 8 slab edge between Columns E13 and E14.

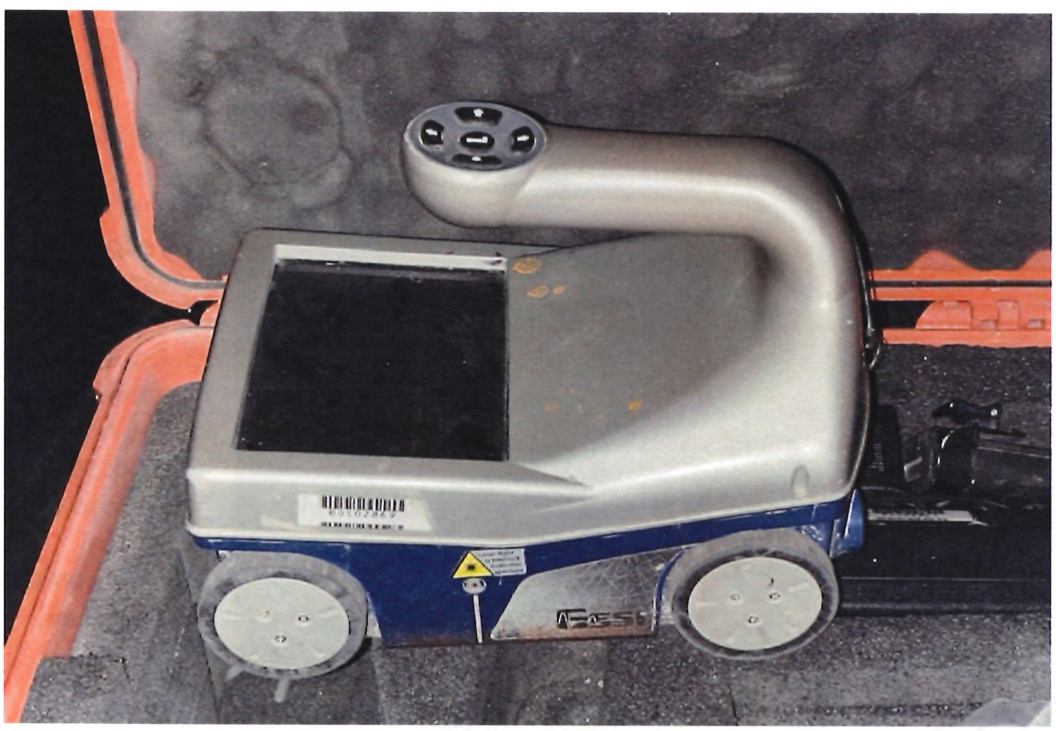


Photo 41

GSSI's Structure Scan Mini used to GPR scan the majority of slab-column connections on Levels 1 – 8.

Photo 42

Core 7W-IN from the Level 7 West stairwell.

Photo 43

Core 7E-IN from the Level 7 East stairwell.

Photo 44

First core 8E-IN-1 from the Level 8 East stairwell. The arrow points towards the wearing surface side.

Photo 45

Second core 8E-IN-2 from the Level 8 East stairwell.

Photo 46

Core 8W-IN from the Level 8 West stairwell. The arrow points towards the wearing surface side.

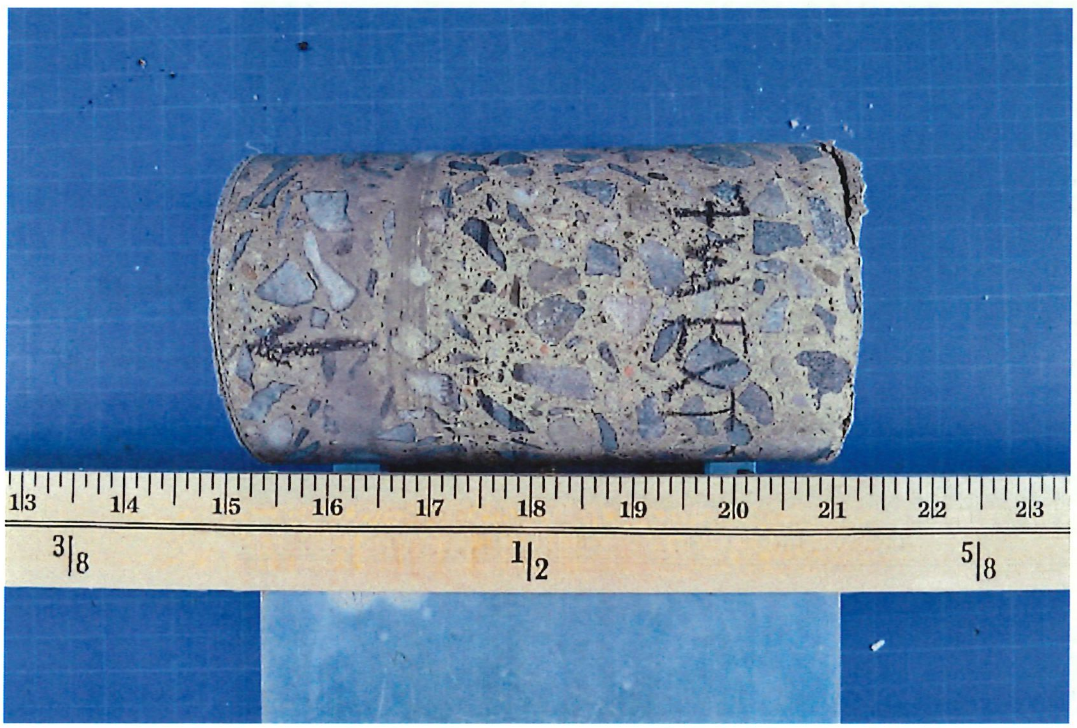


Photo 47

Core 7W-EXT from the Level 7 balcony.

Photo 48

Core 7E-EXT from the Level 7 balcony.

Photo 49

Core 8W-EXT from the Level 8 balcony.

Photo 50

Core 8E-EXT from the Level 8 balcony.

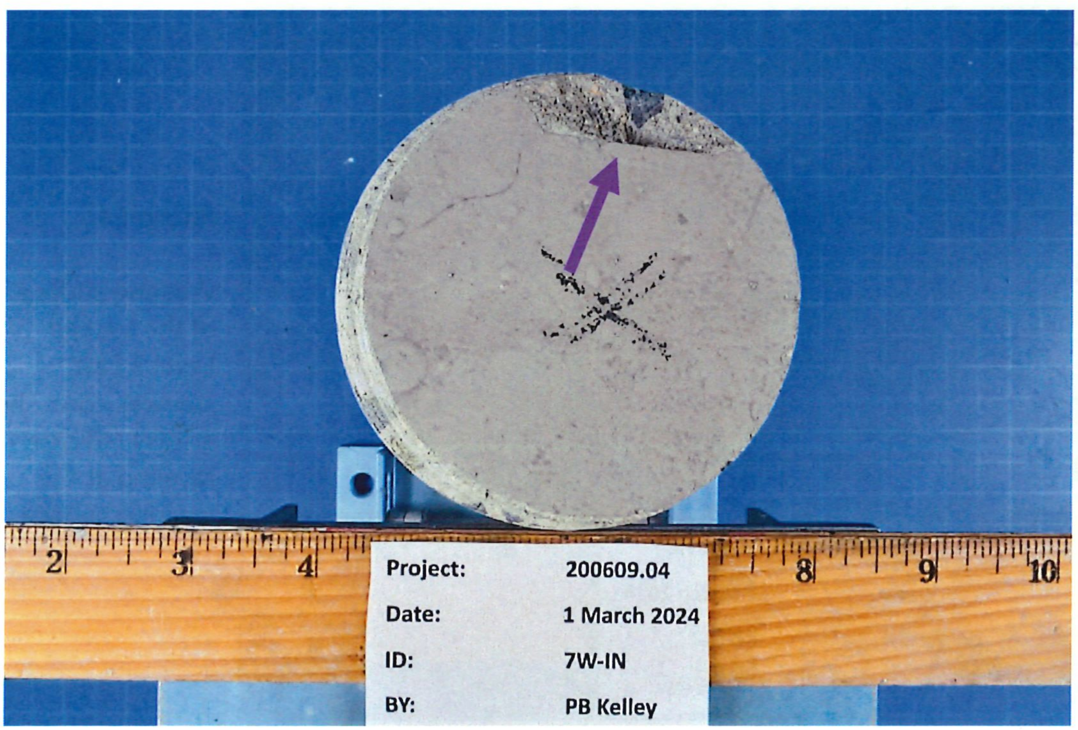


Photo 51

Wearing surface of the Level 7 West stairwell core. The arrow indicates raveling at the wearing surface.

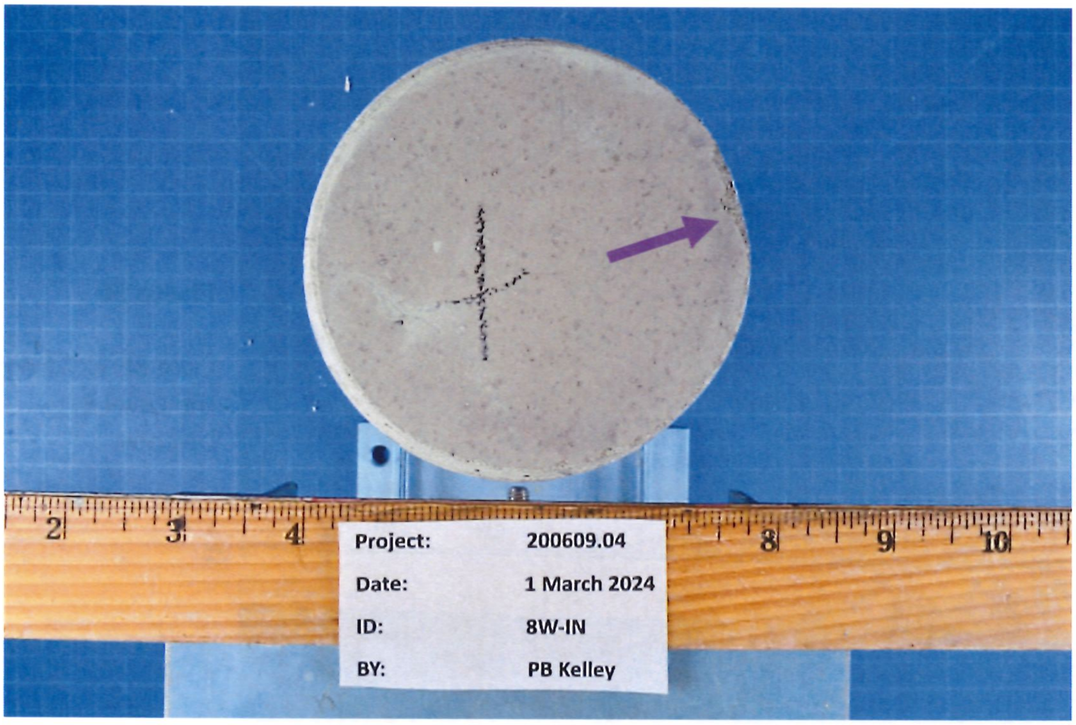


Photo 52

Wearing surface of the Level 8 West stairwell core. The arrow indicates raveling at the wearing surface.

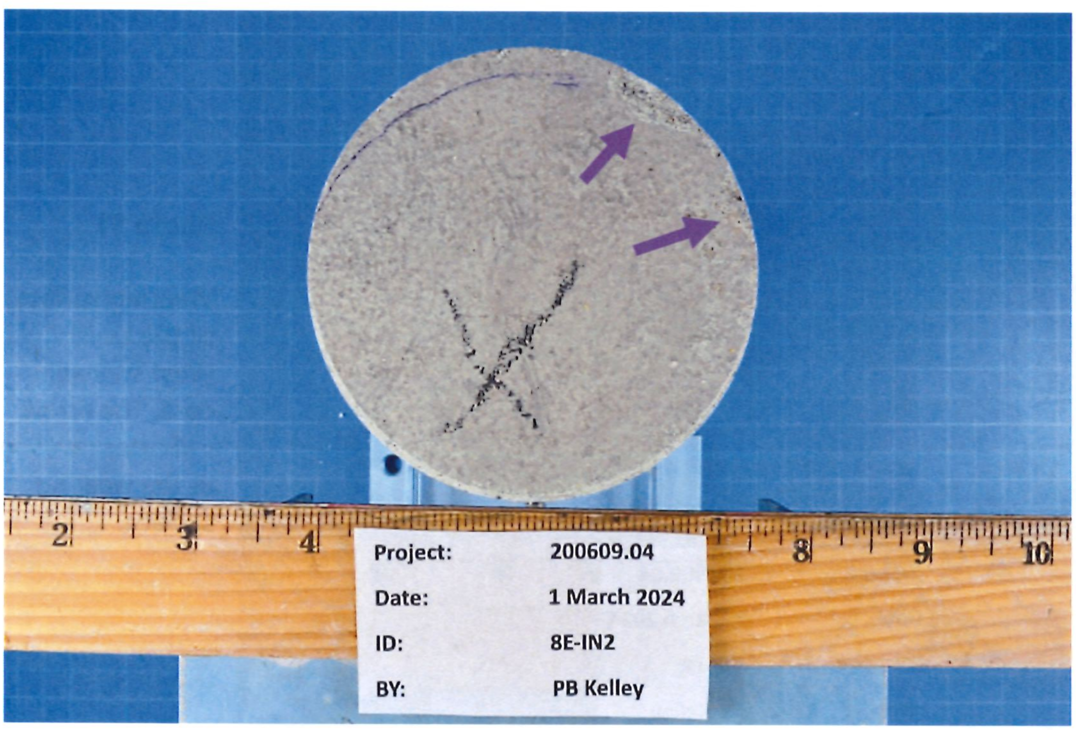


Photo 53

Wearing surface of the second Level 8 East stairwell core. The arrows indicate raveling at the wearing surface.

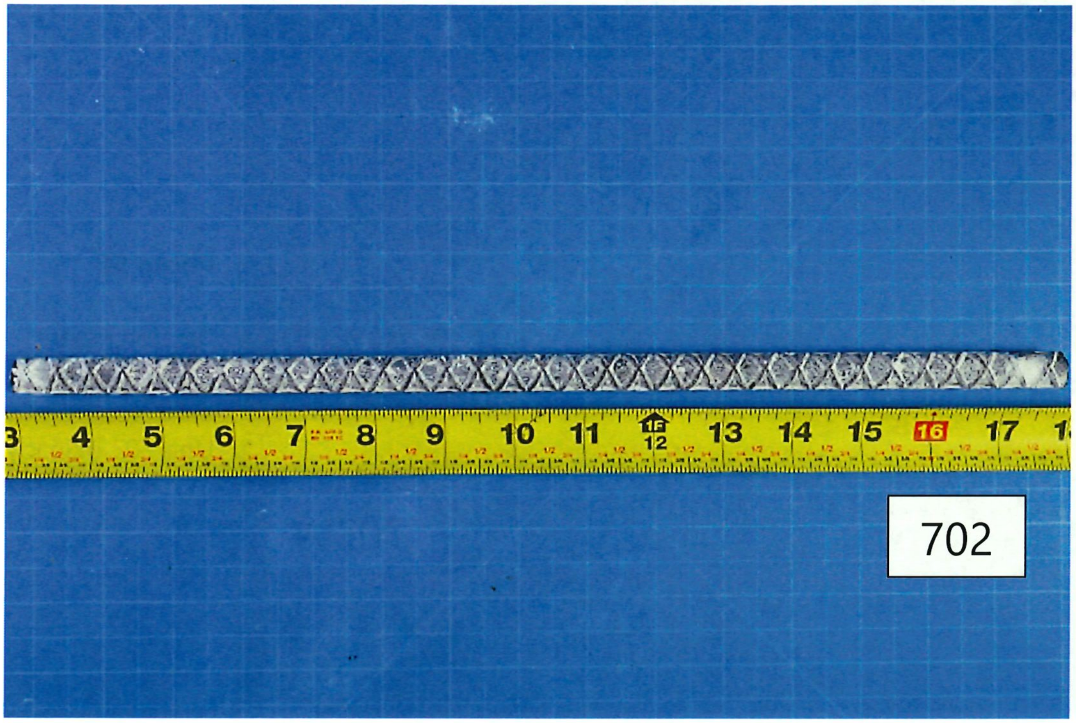


Photo 54

Reinforcement sample extracted from Unit 702 balcony.

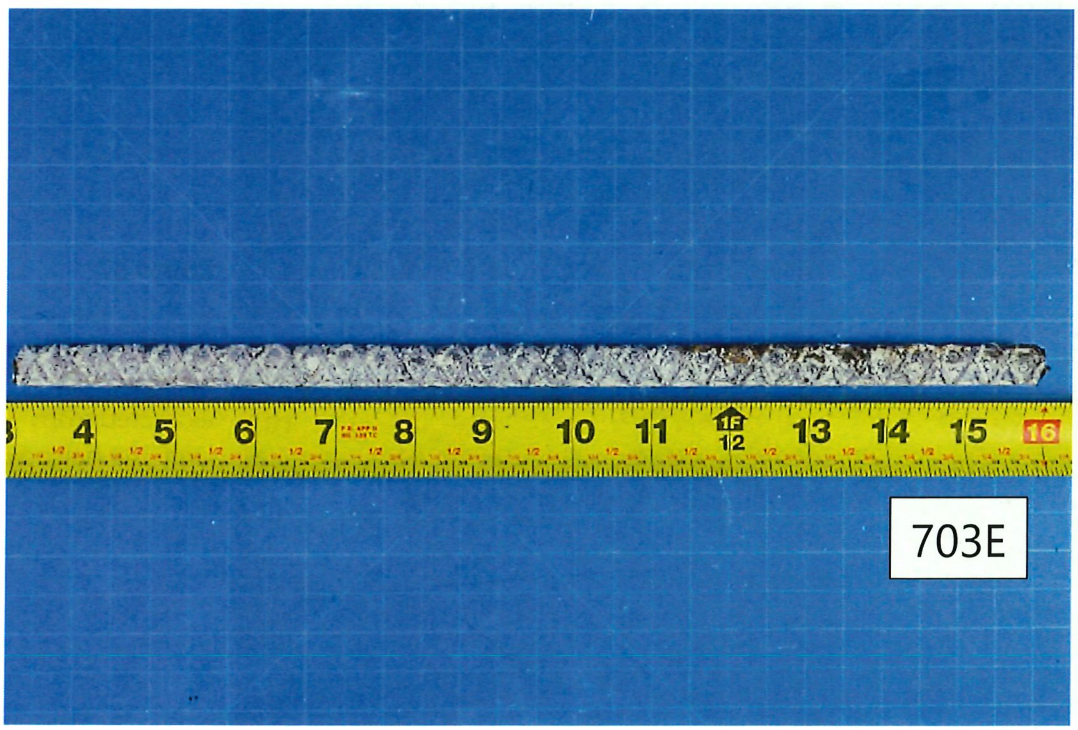


Photo 55

Reinforcement Sample 703E extracted from Unit 703 balcony.

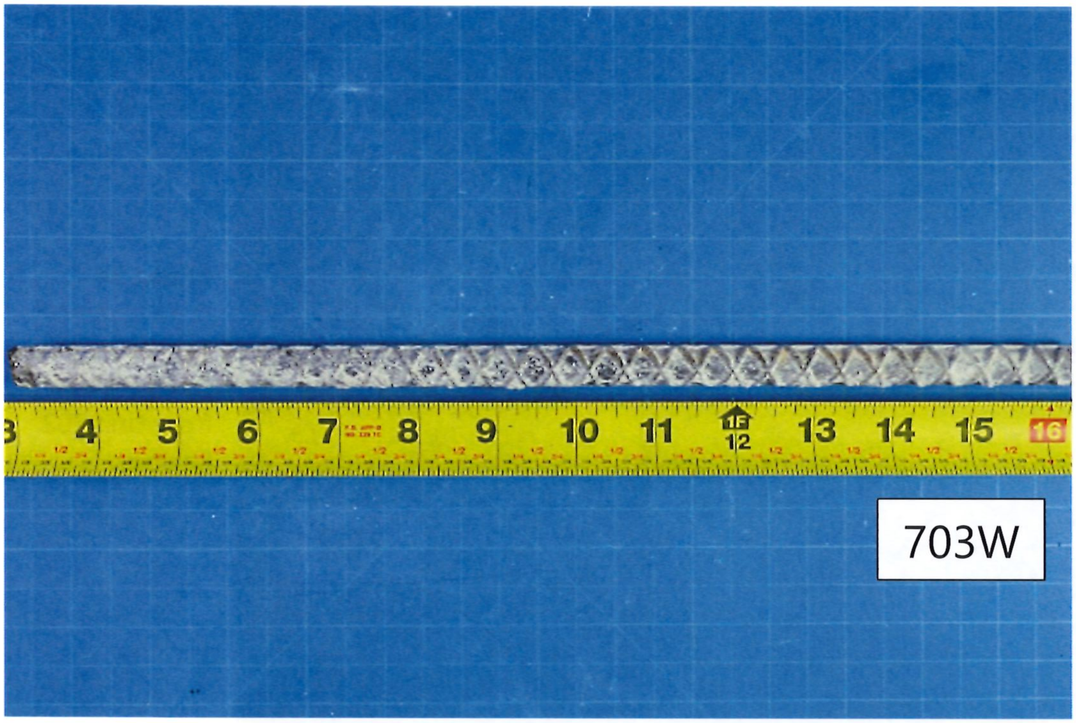


Photo 56

Reinforcement Sample 703W extracted from Unit 703 balcony.

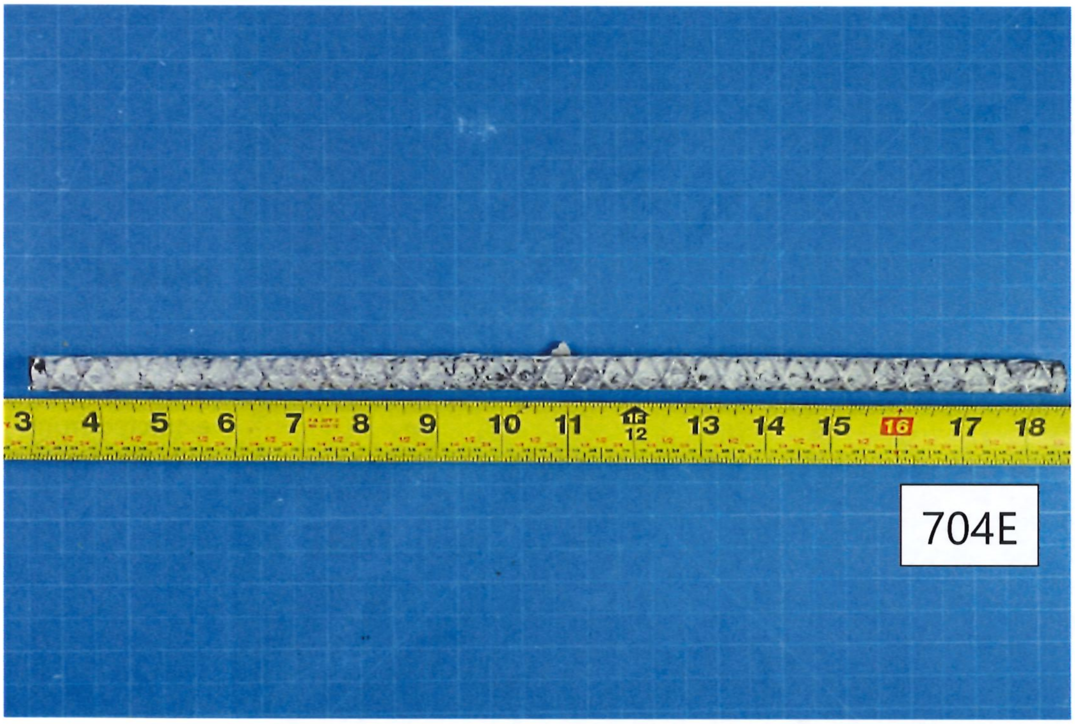


Photo 57

Reinforcement Sample 704E extracted from Unit 704 balcony.

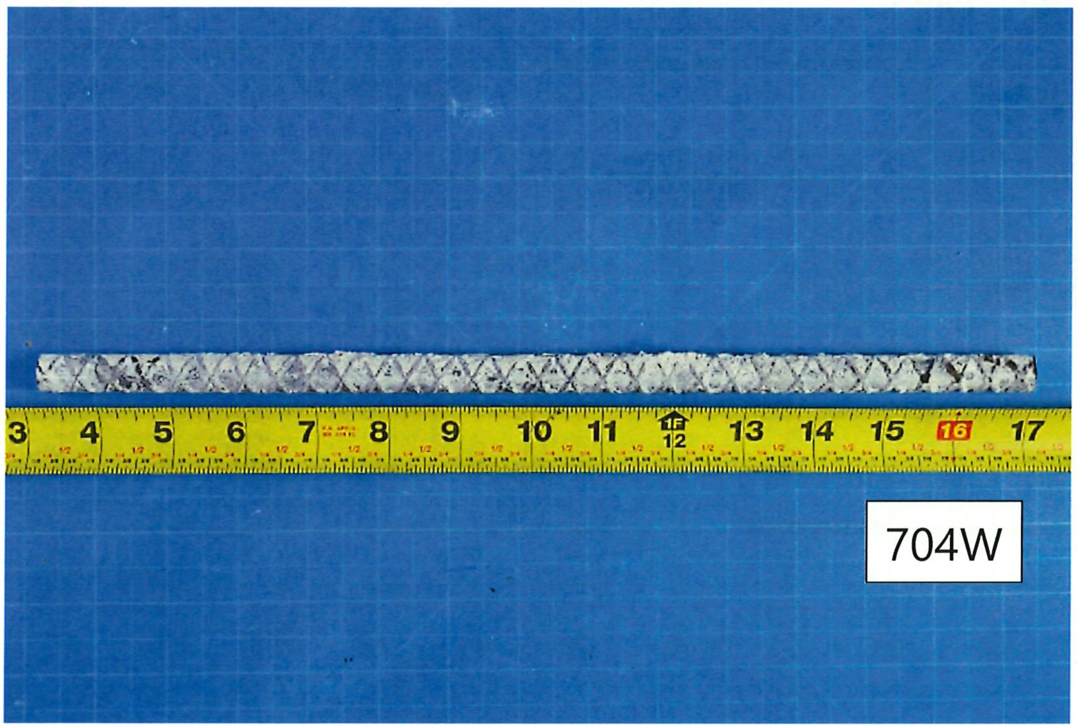


Photo 58

Reinforcement Sample 704W extracted from Unit 704 balcony.

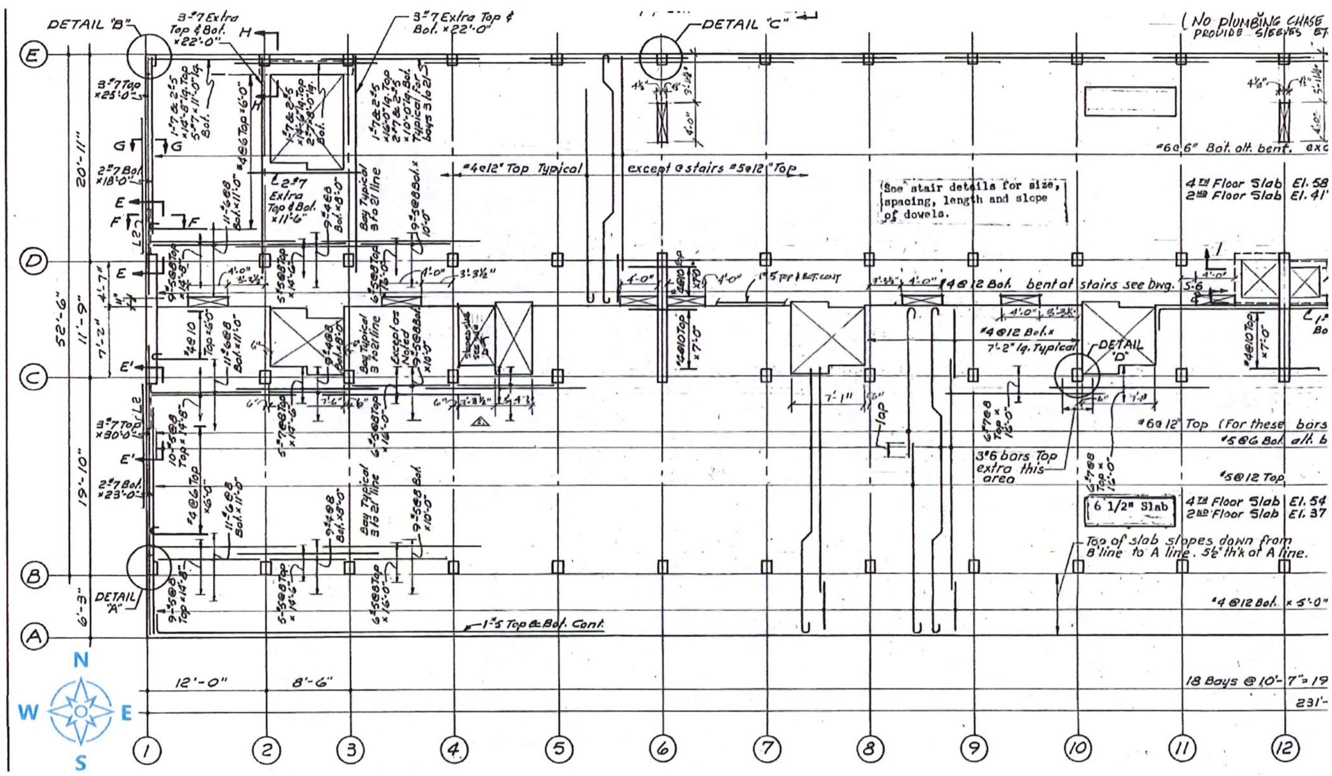


Figure 1

Partial view of a typical floor plan. Column Line A is at the South Elevation (river side) and Column Line E is at the North Elevation (garden side). Compass added by SGH.

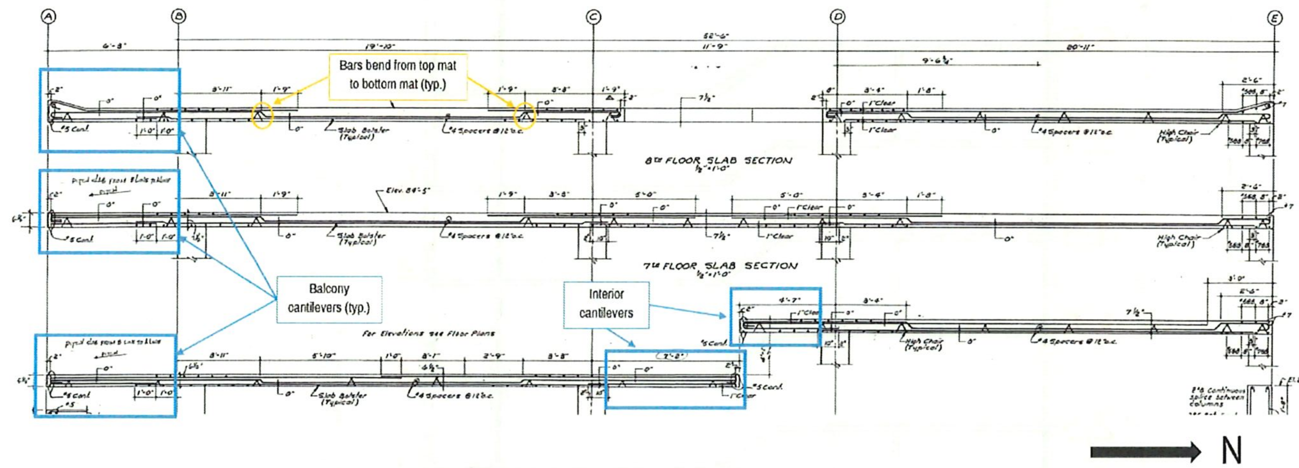


Figure 2

Typical floor cross-sections of the building. Bent bars (typical highlighted in yellow) transition from the top mat and bottom mat of reinforcement between Column Lines B and C and between D and E. Cantilevers are highlighted in blue.

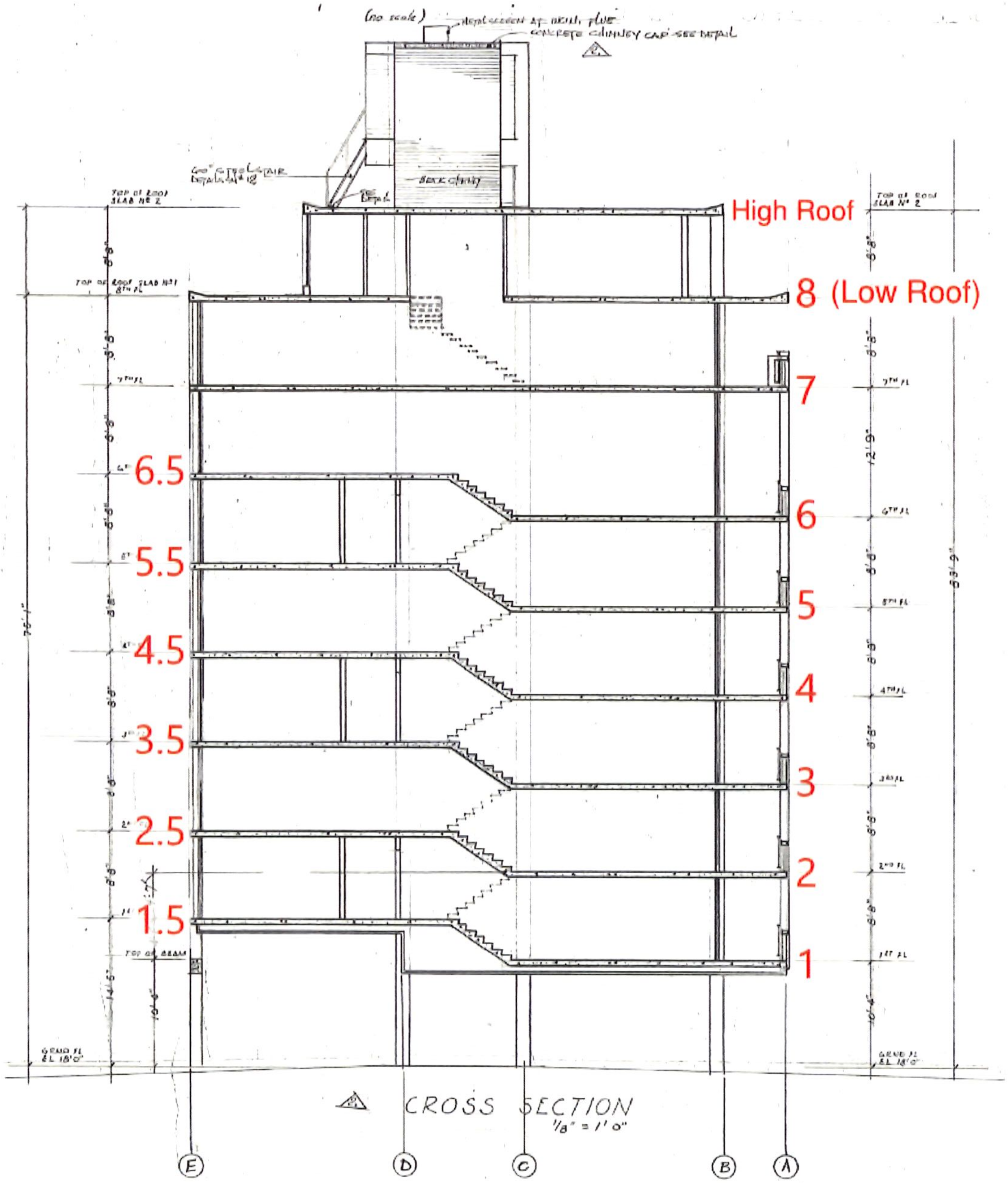


Figure 3

Cross Section Detail shown on Sheet A3. The building consists of split-level slabs. We labeled nomenclature of slab levels used in this report in red text. Slabs between Column Lines D and E at Levels 1 through 6 are classified as "half" levels.

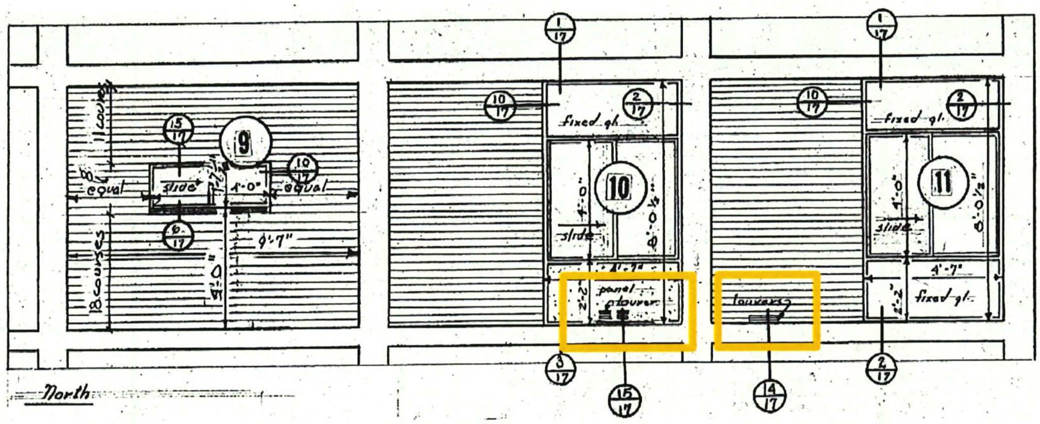


Figure 4

In the original design, louvers are open to the exterior North elevation of the building highlighted in yellow.

Figure 5

The red boxes show locations where WS Aiken removed the pedestrian-traffic-bearing waterproofing at slab-column connections on Levels 1 through 7.

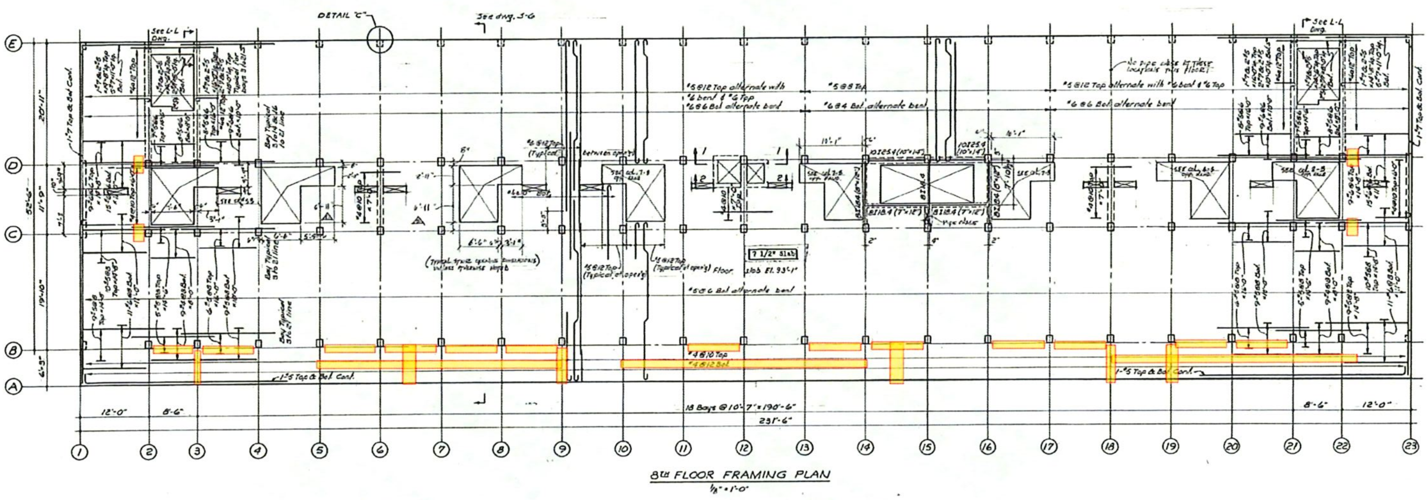


Figure 6

Approximate locations highlighted in yellow indicate where WS Aiken removed roofing materials from Level 8 balconies at slab-column connections.

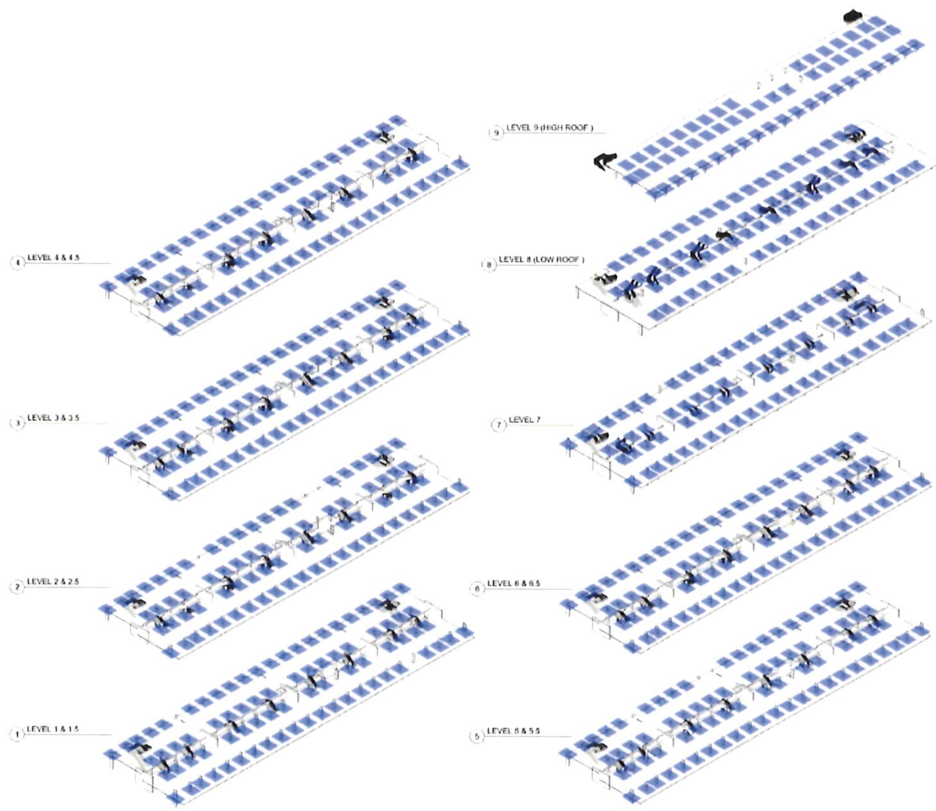


Figure 7

GPR-scan locations at slab-column connections (highlighted in blue).

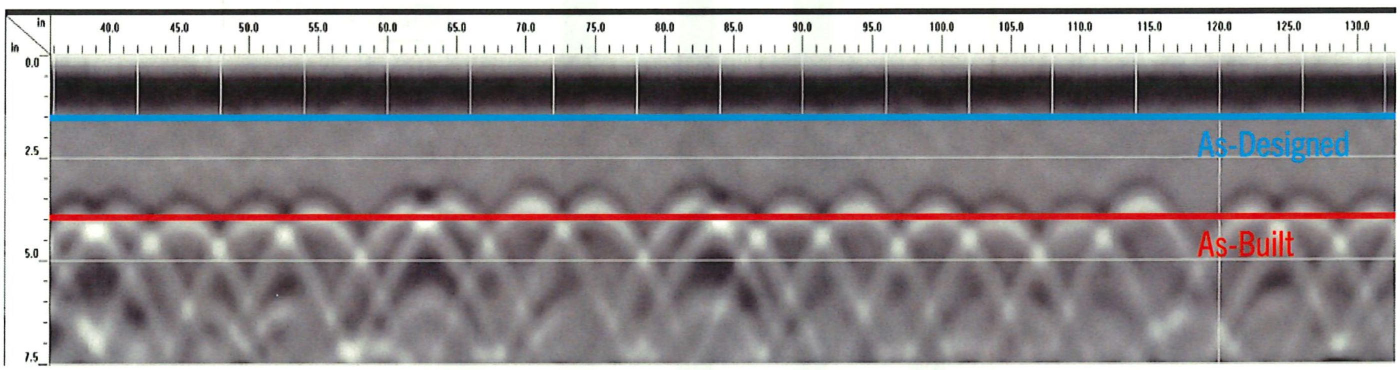


Figure 8

Example GPR scan showing the as-built reinforcement. The location of the apex of the parabolic shapes indicates the clear cover of the bars. The average as-built cover is shown by a red line, which is approximately two inches lower than the as-designed concrete cover shown by the blue line.

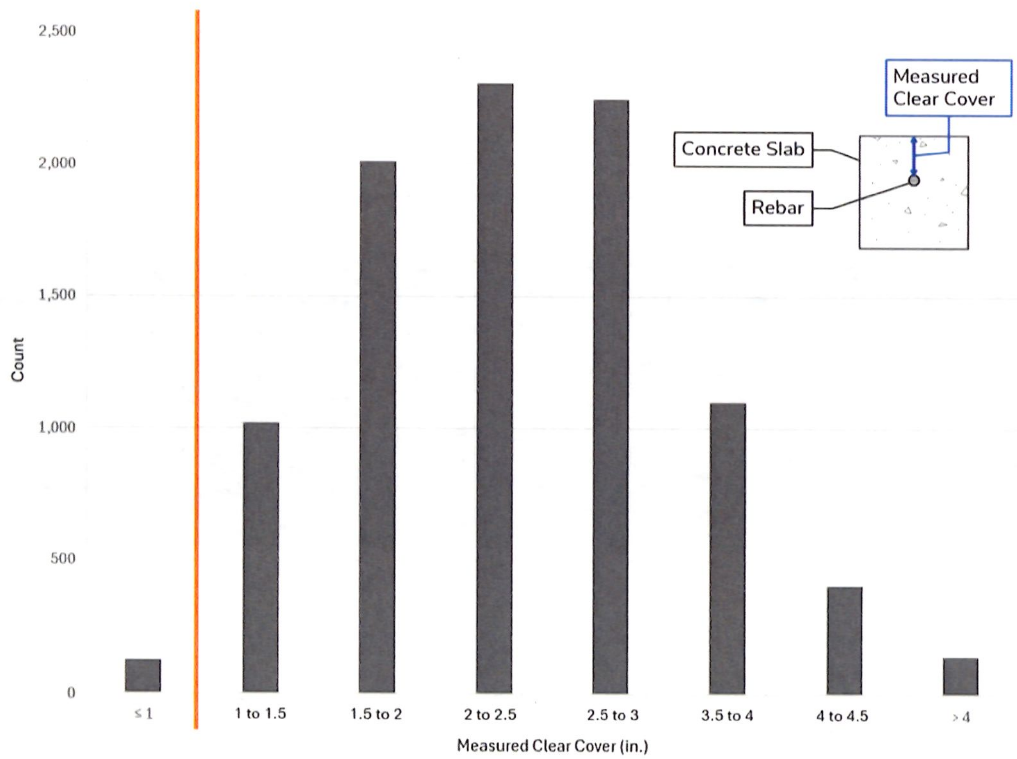


Figure 9

Histogram of the depth to reinforcing bars (clear cover) as measured by GPR. The depth indicates the distance from the top surface of the slab to the top of the reinforcing bar. The orange line represents the specified clear cover for top bars (1 in.) on the original Structural Drawings.

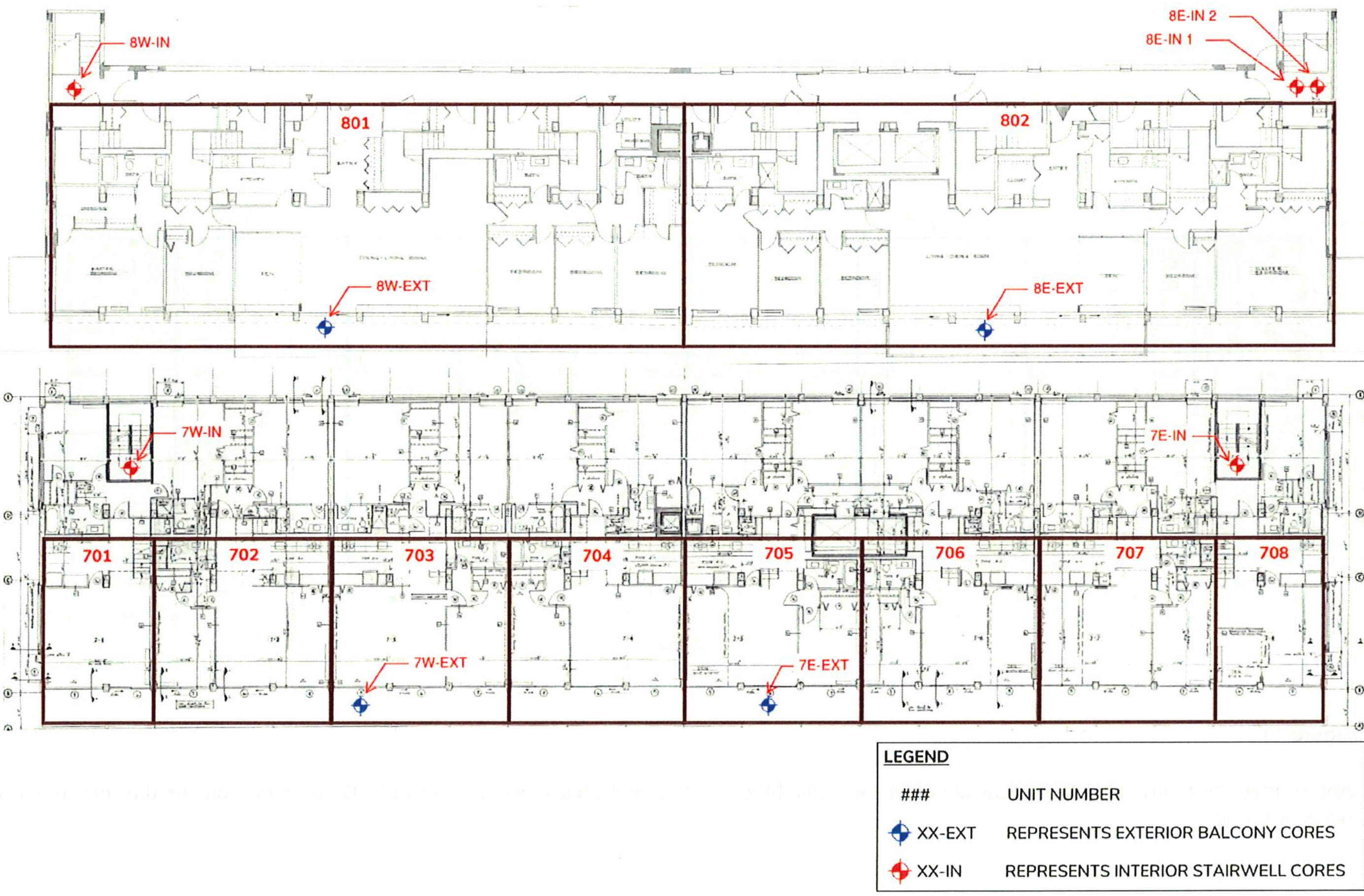


Figure 10

Targets (⌖) show the locations of the core samples. Red targets represent interior core samples and blue targets represent exterior core samples.

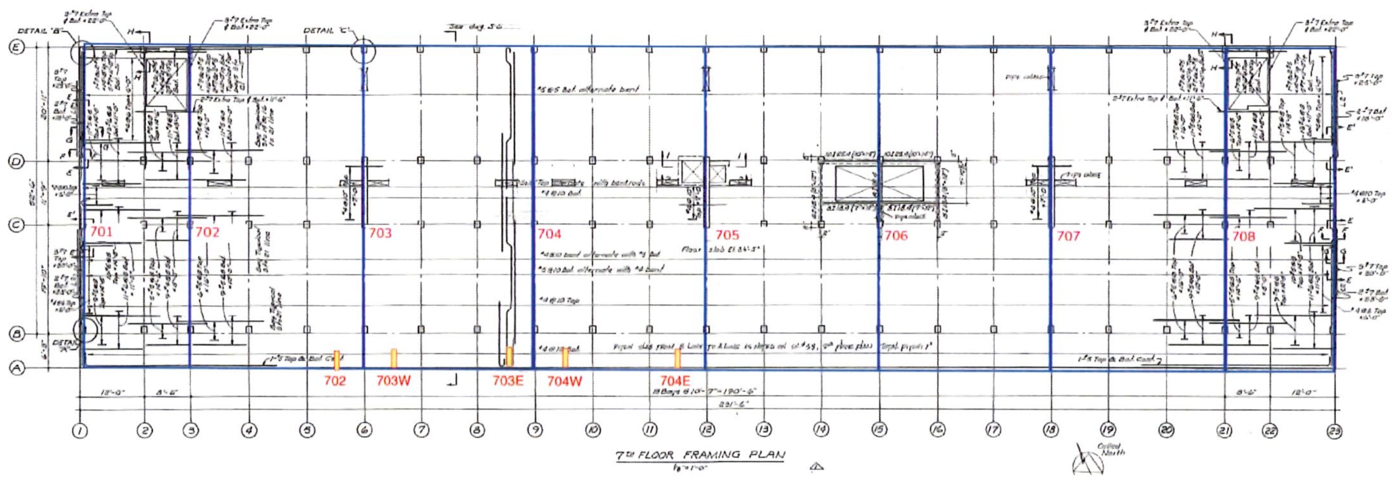


Figure 11

Approximate locations of reinforcement sampling are highlighted in yellow and labeled with their sample IDs. Blue lines outline the limits of each residential unit.

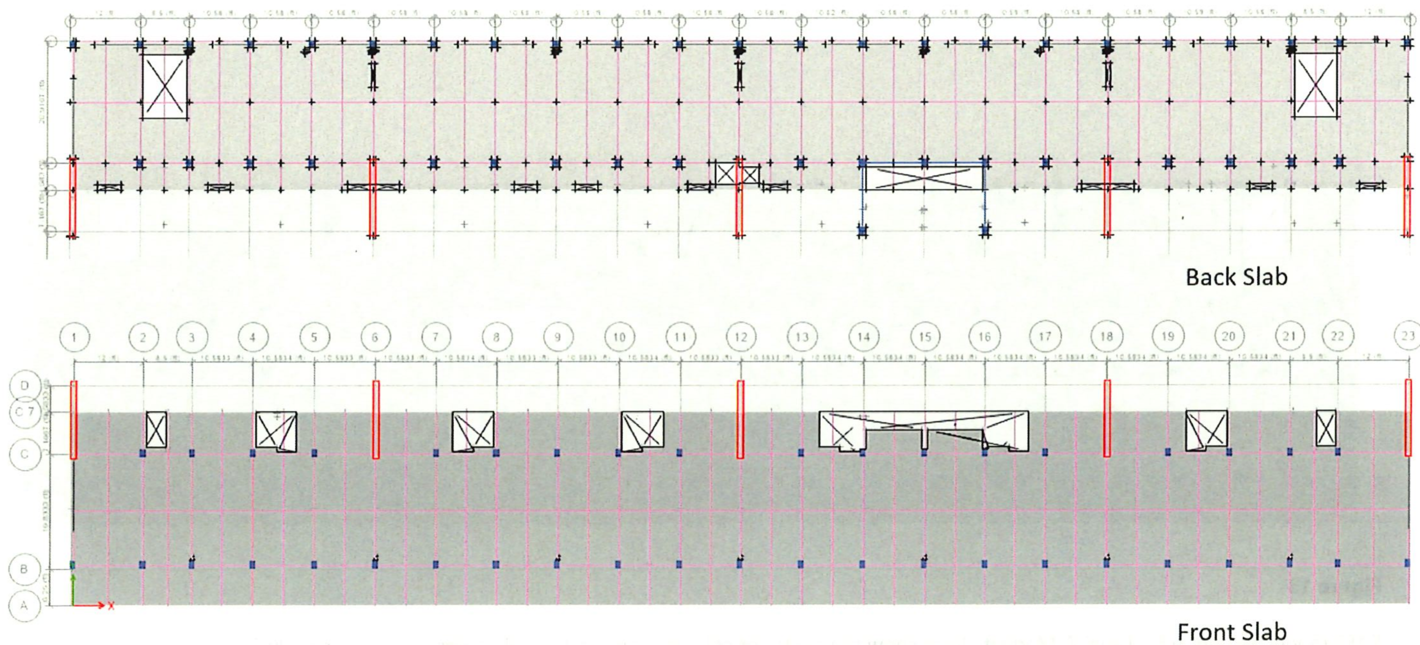


Figure 12

SAFE model geometry for Levels 5 (front slab) and 5.5 (back slab). Typical for Levels 1 – 6. Magenta lines show the center of column strips and middle strips used in our analysis.

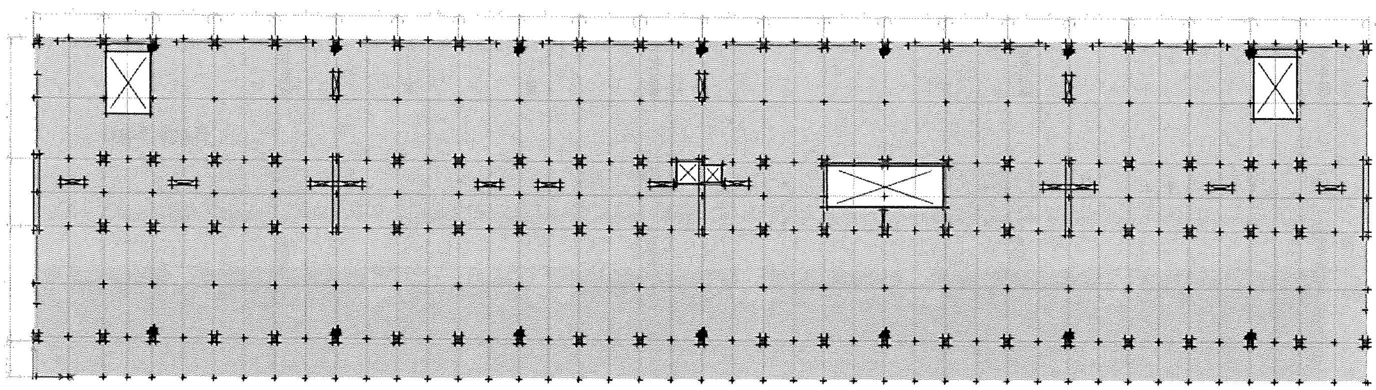


Figure 13

SAFE model geometry for Level 7. Magenta lines show the center of column strips and middle strips used in our analysis.

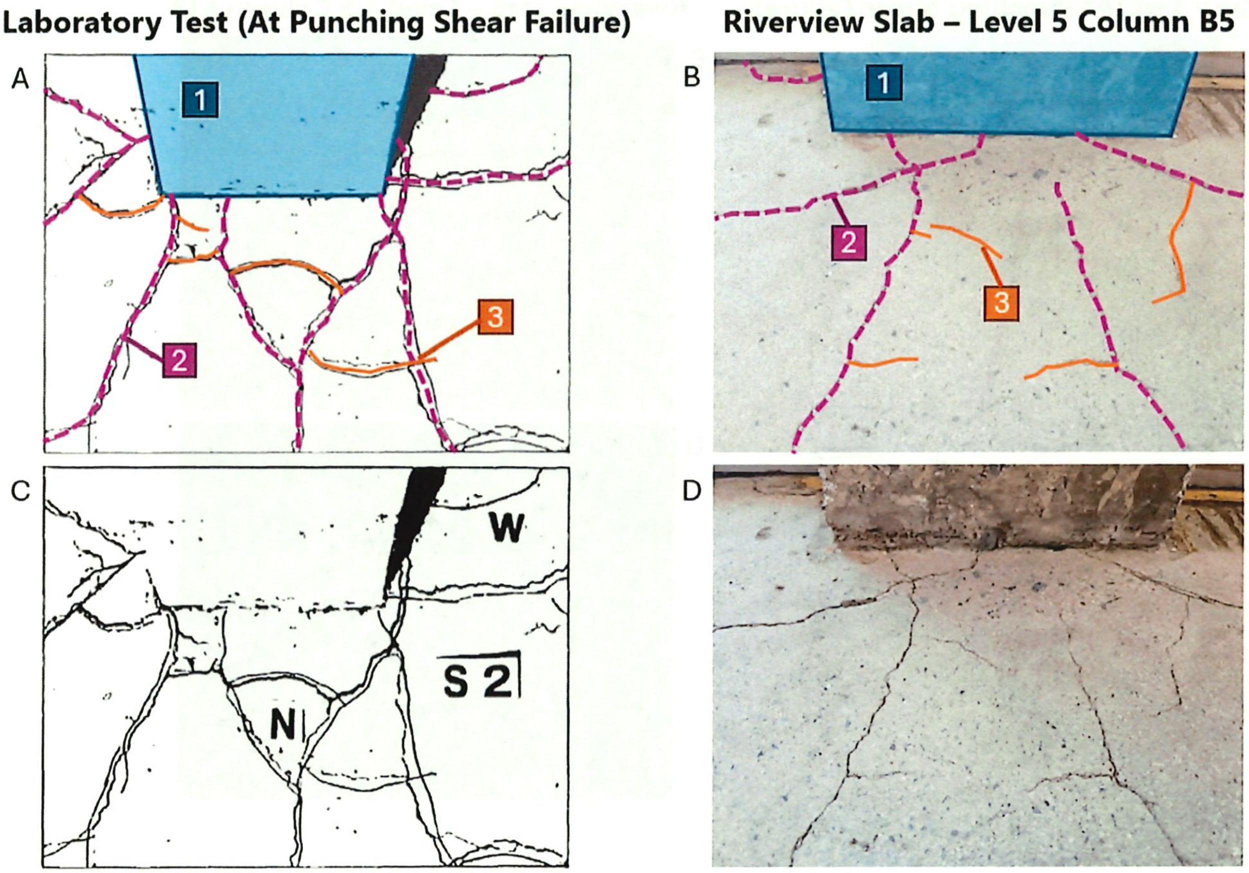


Figure 14
Comparison of crack patterns in laboratory experiments at punching shear failure (A, C) and at Riverview (B, D). We annotated panels A and B to show 1) the face of the column in blue; 2) radial cracks in dashed purple lines; and 3) circumferential cracks in orange lines. C and D show the original photos prior to annotation. The photo for A and C is reproduced from figure 4.6 of the following thesis:
Lai, Wai Kuen, "Slab-Column Connections with Misplaced Reinforcement," *Thesis*, McGill University, Montreal, Quebec, July 1983.

Laboratory Test (At Punching Shear Failure) **Riverview Slab – Level 4.5 Column E13**

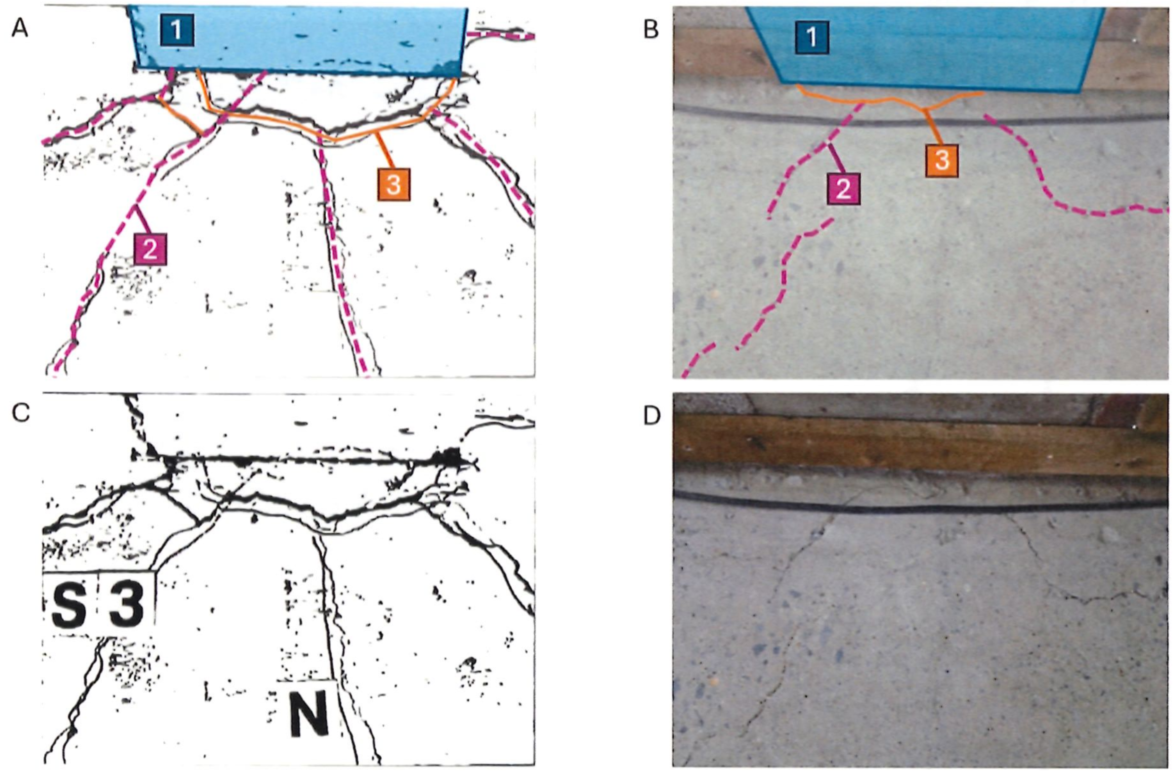


Figure 15

Comparison of crack patterns in laboratory experiments at punching shear failure (A, C) and at Riverview (B, D). We annotated Panels A and B to show 1) the face of the column in blue; 2) radial cracks in dashed purple lines; and 3) circumferential cracks in orange lines. C and D show the original photos prior to annotation. The photo for A and C is reproduced from Fig. 4.6 of the following thesis:
Lai, Wai Kuen, "Slab-Column Connections with Misplaced Reinforcement," *Thesis*, McGill University, Montreal, Quebec, July 1983.

APPENDIX A - CODE SUMMARY

We summarize relevant code criteria applicable to our structural evaluation in the following sections. The following summary does not include every applicable code provision, but is intended to identify provisions that have the most significance with respect to our evaluation and that are discussed in the Report.

1. 1943 CITY OF CAMBRIDGE – BUILDING CODE

The City of Cambridge Building Code was in effect at the time of original construction. Applicable loads are summarized below for reference:

• Residence Buildings	40psf
• Balconies	100 psf
• Partitions	Based on calculated load from plans
• Roof (with slope less than 4 in./ft)	30 psf

2. MASSACHUSETTS STATE BUILDING CODE (MSBC)

The tenth edition of the MSBC was adopted on 24 September 2024. The ninth and tenth editions will apply concurrently until the tenth edition takes full effect on 30 June 2025. Our evaluation is based on the MSBC tenth edition.

The MSBC adopts and amends the following codes:

- **International Building Code – 2021 (IBC)**
- **International Existing Building Code – 2021 (IEBC)**

The MSBC includes the following specific provisions:

- **MSBC Section 405.1.1** – permits structural repairs in accordance with American Concrete Institutes Code Requirements for Assessment, Repair, and Rehabilitation of Existing Concrete Structures (ACI 562)
- **Snow Load Provisions (Table 1604.11)** – The MSBC defines snow loads for Cambridge as follows
  - Ground Snow load 40 psf
  - Minimum flat roof snow Load 30 psf
- **MSBC Chapter 34 – Existing Building Code:** modifies the IEBC as follows:

Section 502.4 - Existing structural elements carrying gravity load. Delete the words *in design dead, live or snow load, including snow drift effects, of more than 5 percent* from first sentence and add the following sentence to end of section. "The increase in gravity loads or decrease in capacity shall account for the cumulative effects of additions and or alterations since original construction." Add the following exception: Structural elements whose demand capacity ratio is not increased by more than 5%.

SGH Commentary: The MSBC allows load increases or strength decreases up to a demand-to-capacity equal to 1.05 prior to evaluation and potential strengthening.

3. INTERNATIONAL BUILDING CODE – IBC

Applicable Loads provided for reference:

- Dead Loads – The weight of all permanent construction
- Live Loads
  - Multifamily dwellings (private room and corridors serving them) 40 psf
  - Balconies (1.5 x live load of occupancy served) 60 psf
  - Snow Loads See MSBC
  - Partition Loads - Based on calculated load from plans

4. INTERNATIONAL EXISTING BUILDING CODE – IEBC

- **Section 202 – Repair** - The reconstruction, replacement or renewal of any part of an existing building for the purposes of its maintenance or to correct damage.

SGH Commentary – The above definition is provided for reference.

- **Section 301.4.1 – New structural members and connections**. New structural members and connections shall comply with the detailing provisions of the International Building Code for new buildings of similar structure, purpose and location.

SGH Commentary – New components must meet the current IBC detailing provisions.

- **Section 405.2.1 – Repairs for less than substantial structural damage** – "...the damaged elements shall be permitted to be returned to their pre-damaged condition."

SGH Commentary – Components with less than substantial structural damage can be repaired to restore their intended strength.

- **Section 503.3 - Existing structural elements carrying gravity load**. "Any existing gravity load-carrying structural element for which an alteration causes an increase in design dead, live or snow load, including snow drift effects, of more than 5 percent shall be replaced or altered as needed to carry the gravity loads required by the International Building Code for new structures. Any existing gravity load-carrying structural element whose gravity load-carrying capacity is decreased as part of the alteration shall be shown to have the capacity to resist the applicable design dead, live and snow loads including snow drift effects required by the International Building Code..."

<u>SGH Commentary</u>: The IEBC allows load increases or strength decreases up to a demand-to-capacity equal to 1.05 prior to evaluation and potential strengthening. If strengthening is required, it must meet the provisions of the current IBC.

- **Multiple Sections – Voluntary lateral force-resisting system alterations.**

Structural alterations that are intended exclusively to improve the lateral force-resisting system and are not required by other sections of this code shall not be required to meet the requirements of Section 1609 or Section 1613 of the International Building Code, provided that the following conditions are met:

1. The capacity of existing structural systems to resist forces is not reduced.
2. New structural elements are detailed and connected to existing or new structural elements as required by the International Building Code for new construction.
3. New or relocated nonstructural elements are detailed and connected to existing or new structural elements as required by the International Building Code for new construction.
4. The alterations do not create a structural irregularity as defined in ASCE 7 or make an existing structural irregularity more severe.

<u>SGH Commentary</u> – The Owner has the right to voluntarily upgrade the lateral system of a structure. This section does not establish lateral load requirements, but allows the Owner and Registered Design Professional flexibility to determine performance goals to reduce lateral hazards.

5. AMERICAN CONCRETE INSTITUTE (ACI 318 – 19) - BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE

ACI 318 provides the minimum requirements necessary to provide for public health and safety. This includes design and analysis procedures along with required safety factors to be used in concrete construction. The design and analysis provisions used in our analysis are described in the Analysis Section of this report and/or included in our analysis results.

6. AMERICAN CONCRETE INSTITUTE (ACI 562) - CODE REQUIREMENTS FOR ASSESSMENT, REPAIR, AND REHABILITATION OF EXISTING CONCRETE STRUCTURES

Similar to ACI 318, the provisions of ACI 562 are incorporated into our analysis and evaluation results. We identify provisions that require explicit attention below.

Section 4.3 – Potentially dangerous structural conditions

- Section 4.3.1 - If there is a reason for the licensed design professional to question the capacity of the structure or if potentially dangerous structural conditions are observed as a part of the preliminary assessment, an assessment shall be performed in the work area.

- Section 4.3.2 - For gravity, fluid, soil, and wind loads, potentially dangerous structural conditions exist in members or structures if the demand-to-capacity ratio is greater than 1.5, as given in Eq. (4.3.2).

$$U_c/\phi R_{cn} > 1.5 \text{ (Equation 4.3.2)}$$

In Eq. (4.3.2), U_c is the strength-design demand determined by using the nominal gravity, fluid, soil, and wind loads identified in the current building code and the factored load combinations of ASCE/SEI 7, excluding seismic, flood, and tsunami forces; and ϕR_{cn} is the current in-place nominal capacity adjusted by the strength reduction factor (ϕ) in 5.3 or 5.4.

SGH Commentary – ACI defines conditions with demand-to-capacity ratios above 1.5 as "potentially dangerous".

Section 4.5 - Conditions of deterioration, faulty construction, or damage less than substantial structural damage with strengthening

- Section 4.5.1 - If a member, system, or structure in the work area has deterioration, contains faulty construction, or damage determined to be less than substantial structural damage, it shall be assessed by checking one of the criteria in 4.5.2, 4.5.3, or 4.5.4. Provisions 4.5.2 through 4.5.4 shall not be applied in combination with each other.

- Section 4.5.2 - The demand-to-capacity ratio of the member, system, or structure of the work area shall be evaluated using the nominal loads, load combinations, and capacities established by the original building code. Repairs are required if the demand-to-capacity ratio exceeds 1.0, as given by Eq. (4.5.2).

$$(U_o)/(\phi_o R_{cn}) > 1.0 \qquad \text{(Equation 4.5.2)}$$

In Eq. (4.5.2), U_o is the strength-design demand determined by using the nominal loads and factored load combinations of the original building code. $\phi_o R_{cn}$ is the current in-place nominal capacity adjusted by the strength reduction factor (ϕ_o) of the original building code.

- Section 4.5.2.1 - If $U_o/\phi_o R_{cn}$ is greater than 1.0, strengthening repairs are required to bring the structural capacity to the level required by the original building code.
- Section 4.5.2.2 - If $U_o/\phi_o R_{cn}$ is 1.0 or less, repairs to strengthen the structure are not required.

SGH Commentary – ACI requires strengthening if the demand-to-capacity of a member exceeds 1.0.

Section 4.5.3 Commentary: ...*If the current building code demand (Uc) does not exceed the original building code demand (U_o*) by 5 percent ($U_c \leq 1.05U_o$*), check the demand-to-capacity ratio using the original building code demand (U_o*) to determine if it exceeds 1.05, as given by Eq. (R4.5.3a). $U_o^*/\phi R_{cn} > 1.05$ (R4.5.3a). If the demand-to-capacity ratio exceeds 1.05, the system or I member should be strengthened using the original building code demand (U_o*). If the demand-to capacity ratio does not exceed 1.05, strengthening is not required.*

SGH Commentary – The Commentary to Section 4.5.3 provides additional guidance to the base code to account for changes in code loads from original construction to current codes. Where this occurs, ACI permits demand-to-capacity ratios up to 1.05 prior to strengthening (provided the provisions identified above are met).

APPENDIX B - INTERIOR EXPLORATORY OPENINGS

1. EXPLORATORY OPENINGS

We observed nine interior slab-column connections at Riverview where Consigli or others removed finishes (exploratory openings). The goal of the exploratory openings was to capture a wide range of conditions and assess the extent of damage, if any, at locations with demand-to-capacity ratios above 1.0. We considered the following in selecting a range of conditions for exploratory openings:

- The openings represent a range of flexure, total punching shear, and direct shear demand-to-capacity ratios (DCRs)
- The openings consist of different slab-column connection conditions, including different column lines, slab thicknesses, and penetration locations.
- We selected locations with limited fixtures, appliances, and built-in cabinetry to reduce disruption to residents.

Linda M. Seymour, Miranda K. Tan, and John M. Porter of SGH made several site visits to make observations at the exploratory openings after Consigli completed the finish removal and hazardous material abatement. At each exploratory opening, we performed the following:

- Visual observations of the slab to document distress
- Hammer sounding to identify delaminated concrete
- Ground penetrating radar (GPR) scanning to verify the concrete clear cover over the reinforcement

We summarize our observations at each location below.

2. OBSERVATIONS

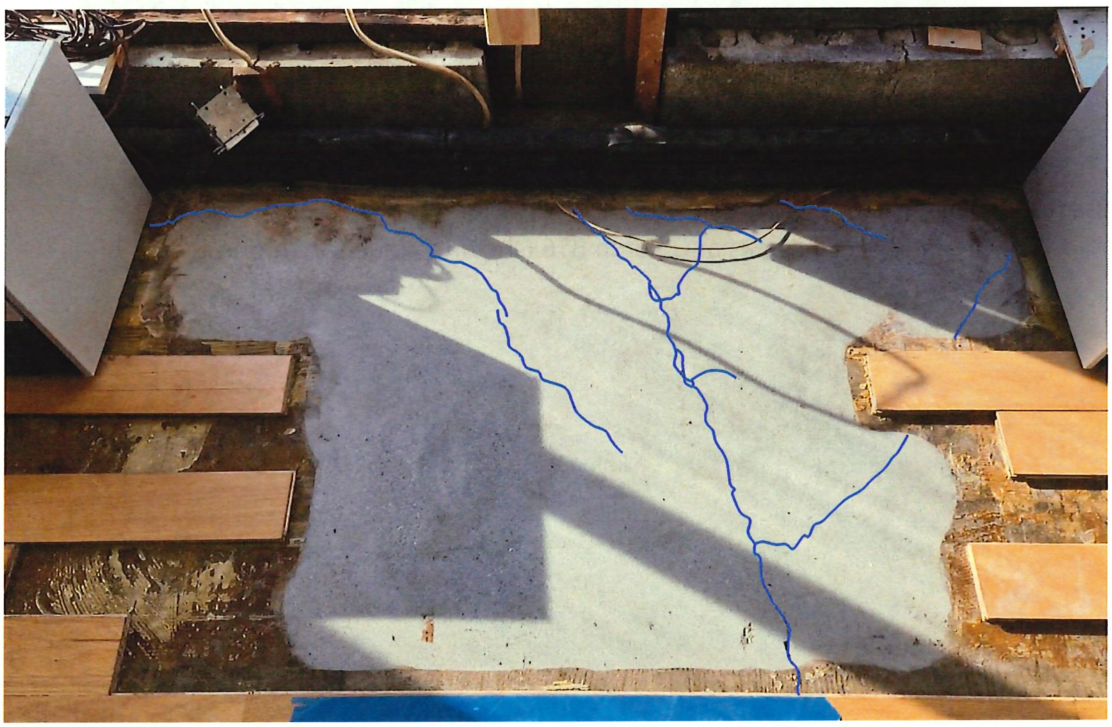
2.1 Ground Penetrating Radar

We scanned the surface of the slab at each exploratory opening location with ground penetrating radar (GPR) to verify our original scan data that we collected through the flooring materials (finishes). Our scans at the exploratory openings confirmed the accuracy of the scans through the finishes.

2.2 Observations

Opening 1 - Level 8 Column B16

We observed the slab-column connection at Column B16 on Level 8 inside Unit 802 on 4 October 2024.



Observation 1-1
Radial and circumferential cracks are present (shown in blue for emphasis). Crack widths ranged from 0.008 to 0.04 in.

Observation 1-2
Radial and circumferential cracks at Column B16 (shown in blue for emphasis).

Opening 2 - Level 8 Column B18

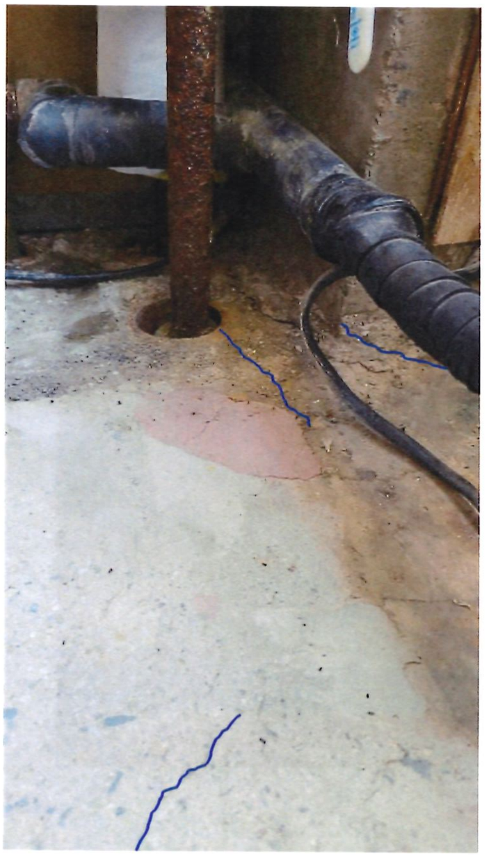
We observed the slab-column connection at Column B18 on level 8 inside Unit 802 on 4 October 2024.

Observation 2-1

Riser pipes and radial cracks are present (shown in blue for emphasis). We identified two small delaminations in the slab, highlighted in yellow. Crack widths ranged from 0.016 to 0.03 in.

Opening 3 - Level 7 Column E15

We observed the slab-column connection at the east side of Column E15 on Level 7 inside Unit 706 on 26 June 2024.



Observation 3-1
Riser pipes and radial cracks are present (shown in blue for emphasis).

Observation 3-2
We observed a vertical crack on the east face the column.

Observation 3-3
We measured a slope of 2-7/8 in/ft in the north-south direction and 3/4 in/ft in the east-west direction sloping away from the column.

Opening 4 - Level 7 Column B15

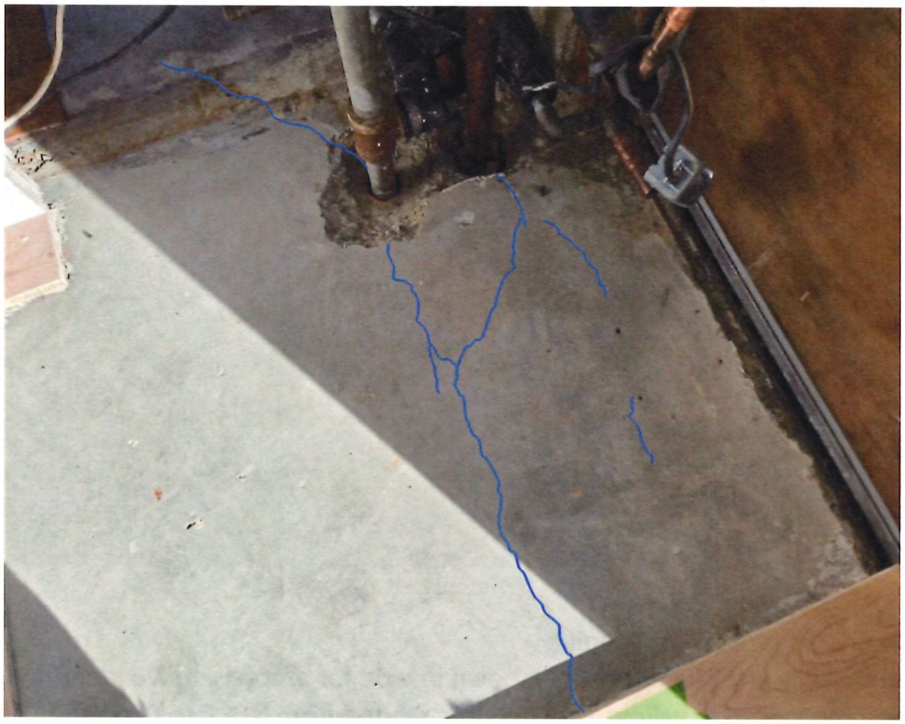
We observed the slab-column connection at the east side of Column B15 on Level 7 inside Unit 706 on 26 June 2024 and the west side inside Unit 705 on 4 October 2024.

Observation 4-1 (East Side of Opening)
Riser pipes and radial cracks are present (shown in blue for emphasis). Crack widths ranged from 0.02 to 0.03 in.

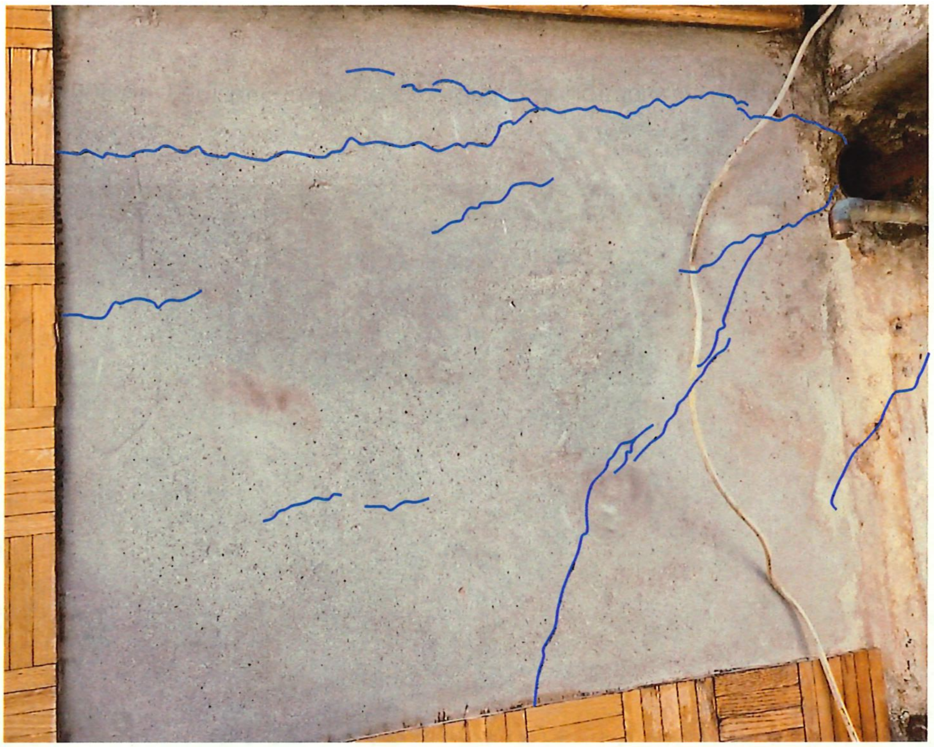
Observation 4-2 (West Side of Opening)
Riser pipes and radial cracks are present (shown in blue for emphasis). We identified a small delamination, highlighted in yellow. Crack widths ranged from 0.016 to 0.035 in.

Opening 5 - Level 7 Column B21

We observed the slab-column connection at the west side of Column B21 on Level 7 inside Unit 707 on 8 October 2024 and the east side of Column B21 on Level 7 inside Unit 708 on 8 October 2024.



Observation 5-1 (West Side of Opening)
Riser pipes and radial cracks are present (shown in blue for emphasis). Crack widths ranged from 0.012 to 0.016 in.

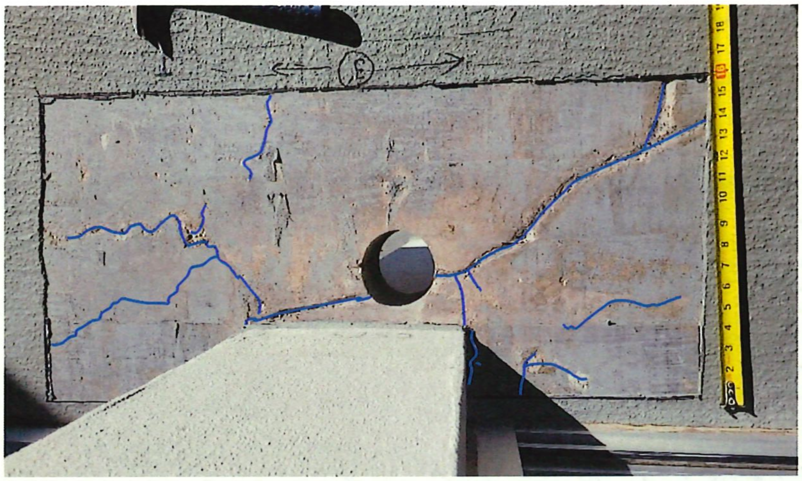


Observation 5-2 (East Side of Opening)
Riser pipes and radial cracks are present (shown in blue for emphasis). Crack widths ranged from 0.016 to 0.025 in.

Opening 6 - Level 5 Column B5

We observed the slab-column connection at Column B5 on Level 5 inside Unit 502 on 10 October 2024.

Observation 6-1
Radial and circumferential cracks are present. We identified two small delaminations highlighted in yellow. Crack widths ranged from 0.012 to 0.035 in.



Observation 6-2
One of the downleader cores from 16 February 2023 is at Column B5 at Level 5. Aiken removed the coating on 1 March 2023. Radial and circumferential cracks are present (shown in blue for emphasis).

Observation 6-3
We put a level on the slab and noted that it slopes down away from the column in both the north-south and east-west directions. Pictured here is north-south.

Observation 6-4
We put a level on the slab and noted that it slopes down away from the column in both the north-south and east-west directions. Pictured here is east-west.

Opening 7 - Level 4 Column E13

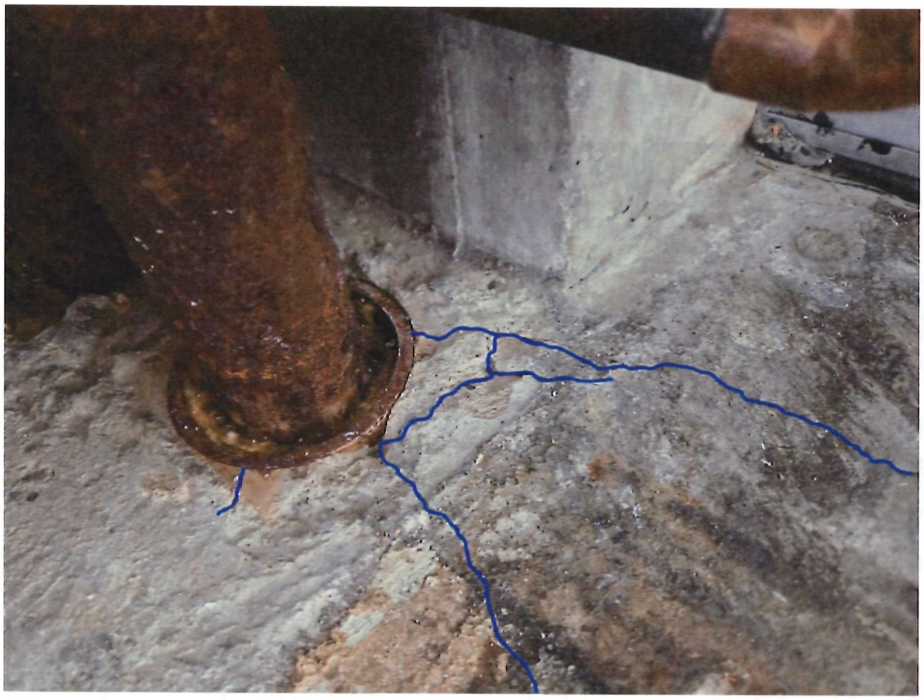
We observed the slab-column connection at Column E13 on Level 4 inside Unit 405 on 4 October 2024.

Observation 7-1
Radial cracks and a circumferential crack are present (shown in blue for emphasis). Crack widths ranged from 0.02 to 0.03 in.

Opening 8 - Level 4 Column B15

We observed the slab-column connection at the west side of Column B15 on Level 4 inside Unit 405 on 4 October 2024 and the east side inside Unit 406 on 8 October 2024.

Observation 8-1 (West Side of Opening)
Riser pipes and radial cracks are present (shown in blue for emphasis). Crack widths ranged from 0.012 to 0.04 in.



Observation 8-2 (West Side of Opening)
Radial cracks extending from riser pipe sleeve (shown in blue for emphasis).

Observation 8-3 (East Side of Opening)
Riser pipes and radial cracks are present (shown in blue for emphasis). Crack widths ranged from 0.008 to 0.04 in.

Opening 9 - Level 2 Column C19

We observed the slab-column connection at Column C19 on Level 2 inside Unit 207 on 9 August 2024. This location was exposed due to a pre-scheduled kitchen renovation.

Observation 9-1
Radial cracks are present (shown in blue for emphasis).

APPENDIX C - DRONE SURVEY RESULTS

1. DRONE SURVEY

We used a small unmanned aerial vehicle (SUAV) to document the condition of the exterior slab edge, coating, and brick facade on the north elevation of the building. The SUAV used is a DJI Mavic 3E with two 20-megapixel cameras with up to 56x zoom capability. It weighs two pounds, measures roughly 14 by 11 by 4 in. unfolded, and has four propellers. The SUAV provides additional viewpoints to supplement our visual observations with binoculars on the ground, such as top-of-slab and overall photos. The specifications of the drone cameras are described in Table 1 below.

Table 1 – Drone Camera Specifications

Specifications	Wide Camera	Tele Camera
Image Sensor, Effective Pixels	4/3 CMOS, 20 MP	1/2-inch CMOS, 12 MP
Lens FOV	84°	15°
Aperture	f/2.8-f/11	f/4.4
Focus	1 m to ∞	3 m to ∞
Digital Zoom	-	8x (56x hybrid zoom)
Still Photography Mode	Single and Timed Shot: 20 MP	Single and Timed Shot: 12 MP

We conducted two drone surveys. The first was conducted on 18 June 2024 from 8:00 a.m. to 6:00 p.m. in partly cloudy weather. The second was conducted on 28 October 2024 from 8:00 a.m. to 5:00 p.m. in cloudy conditions.

2. KEY OBSERVATIONS

We compared photos of the north elevation from both surveys. At select locations, we observed cracks that may have widened, extended, or newly formed between our June and October surveys. A side-by-side comparison of these locations (that we provided to the project team on 17 December 2024) is attached to this Appendix. In general, we noted the following conditions:

- Several locations throughout the building were previously repaired.
- Typical distress includes slab topside, edge, underside, and diagonal cracks visible through the coating.
- There are spalls and incipient spalls on the slab edge. Where the concrete is spalled, there is corroded reinforcement visible.
- Four locations appear to have new cracks in the 28 October 2024 survey that were not present in the 18 June 2024 survey photos.
- Cracks at nineteen locations appear to have lengthened or widened between the two surveys.

REPRESENTATIVE DRONE IMAGES

FROM SGH DRONE SURVEYS ON 16 JUNE AND 28 OCTOBER 2024

17 December 2024

COLUMN BAY 2-3, LEVEL 7

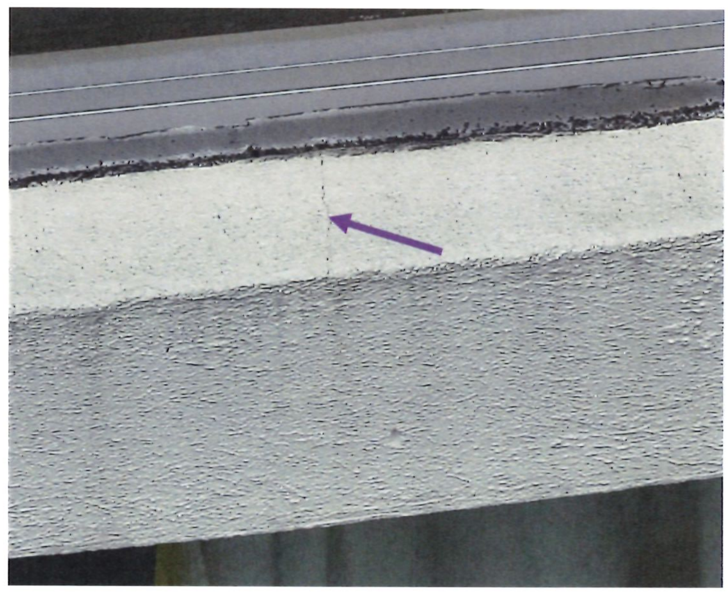
18 June 2024 Drone Survey, IMG#2-006

28 October Drone Survey, IMG#31

COLUMN BAY 3-4, LEVEL 2.5

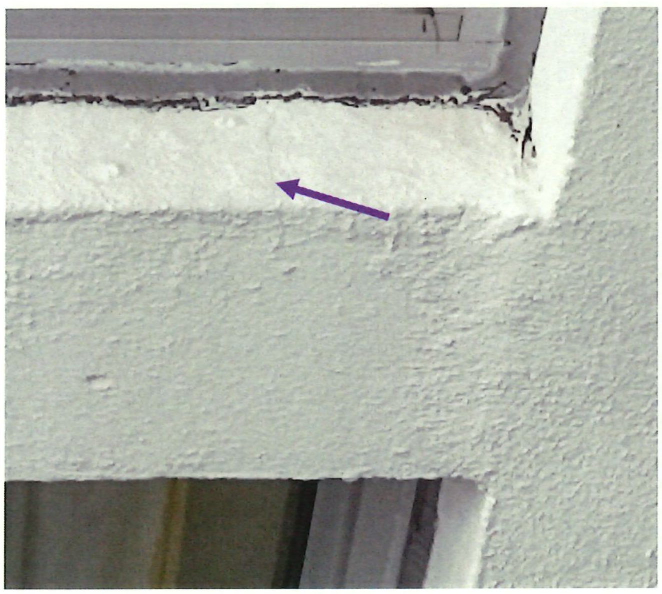
SGH

18 June 2024 Drone Survey, IMG#2-033

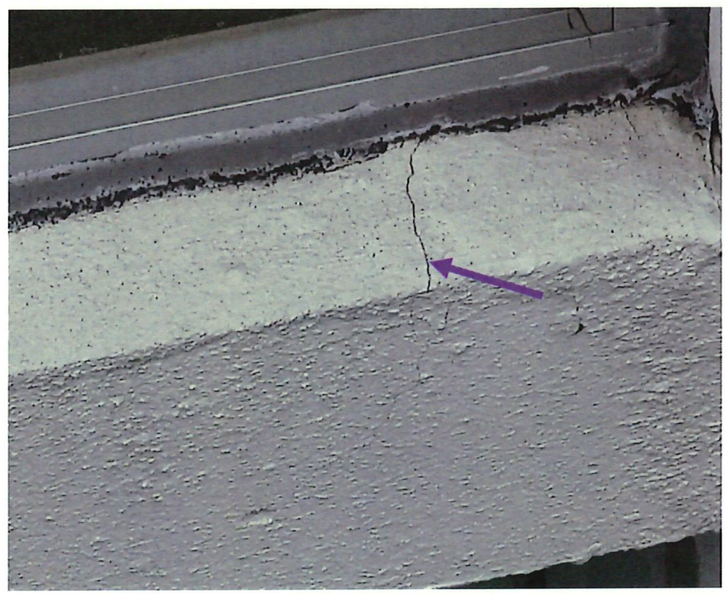


28 June 2024 Drone Survey, IMG#36

COLUMN BAY 3-4, LEVEL 2.5

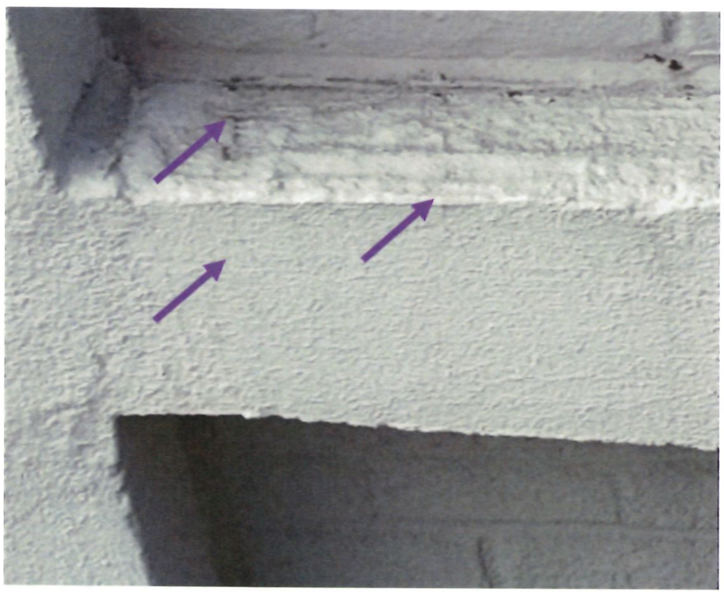


18 June 2024 Drone Survey, IMG#2-033



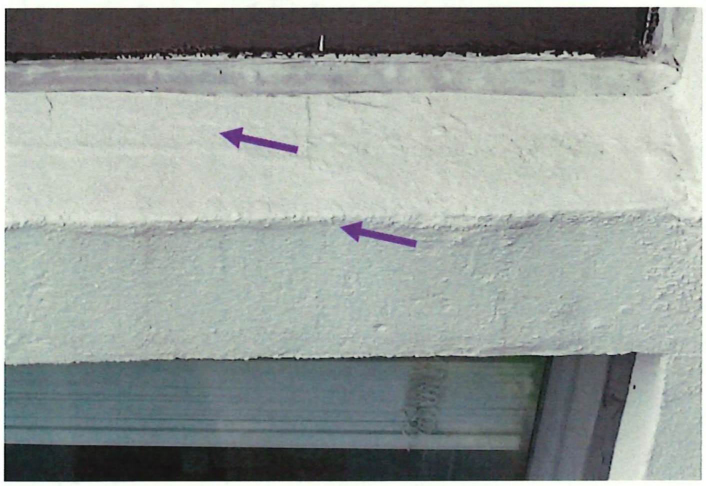
28 October Drone Survey, IMG#37

COLUMN BAY 3-4, LEVEL 3.5

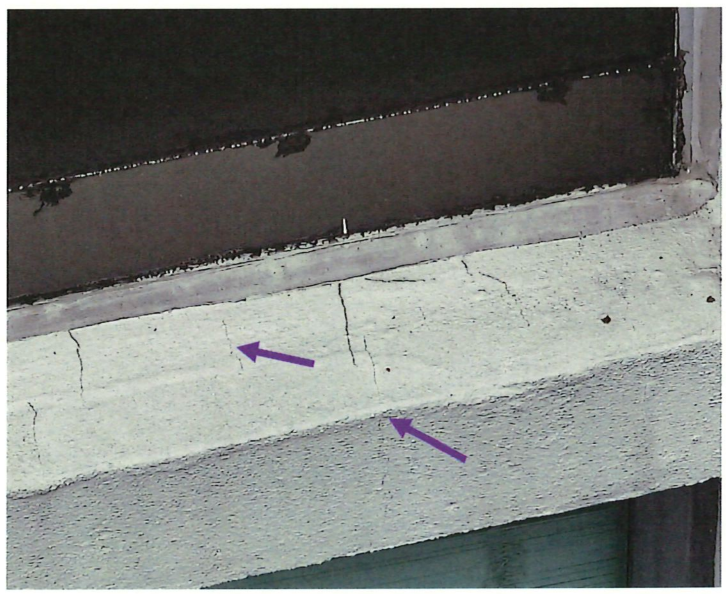

18 June 2024 Drone Survey, IMG#2-040


28 October 2024 Drone Survey, IMG#45

COLUMN BAY 3-4, LEVEL 5.5



18 June Drone Survey, IMG#2-029



28 October Drone Survey, IMG#48


18 June Drone Survey, IMG#2-029


28 October Drone Survey, IMG#51

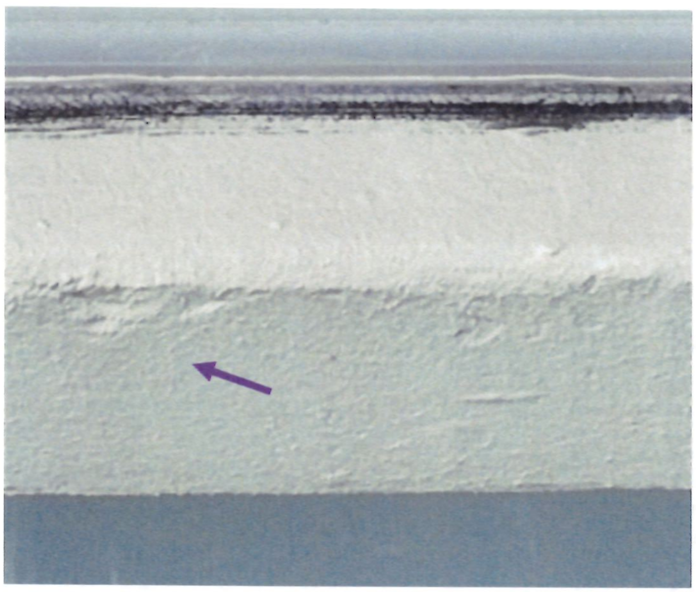
COLUMN BAY 3-4, LEVEL 6.5

18 June Drone Survey, IMG#2-043

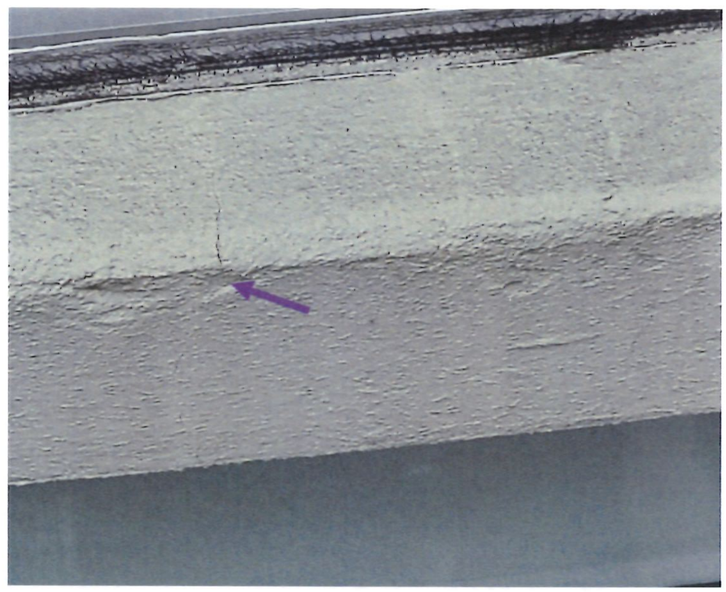
28 October Drone Survey, IMG#54

COLUMN BAY 3-4, LEVEL 6.5

SGH

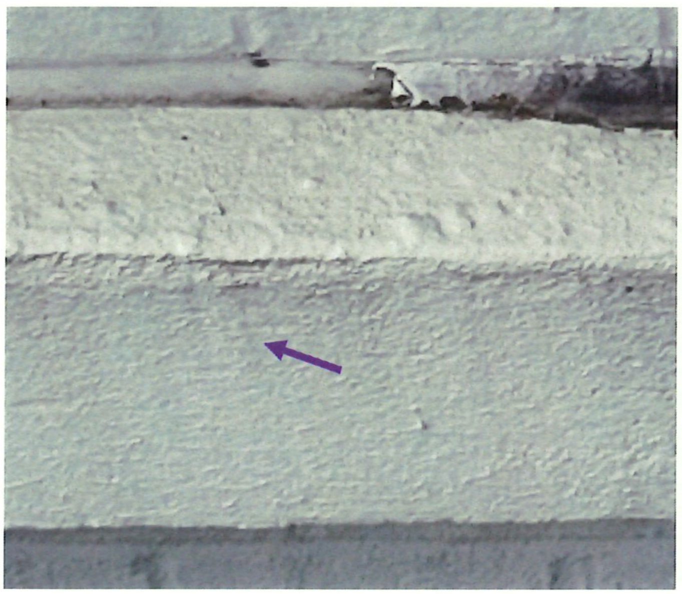


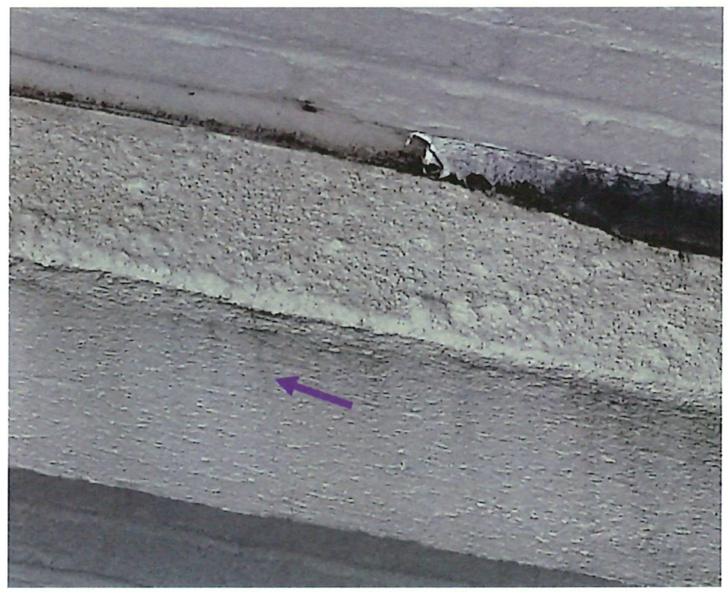
18 June Drone Survey, IMG#2-028



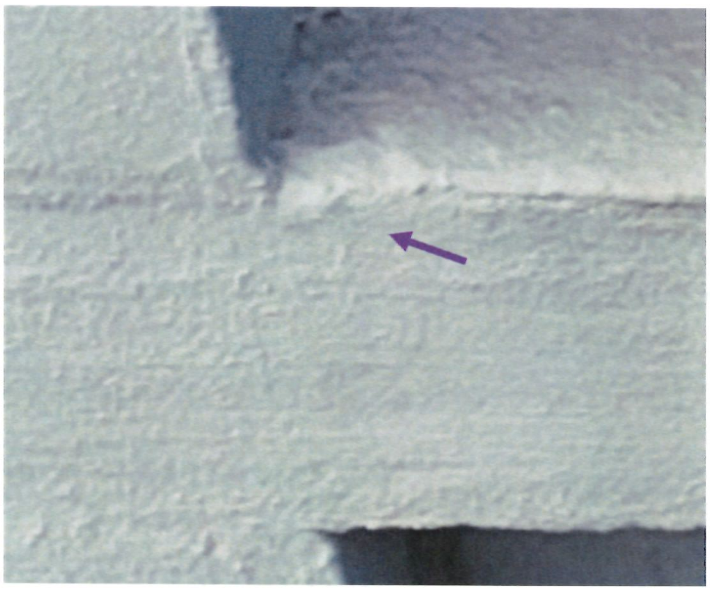
28 October Drone Survey, IMG#53

COLUMN BAY 3-4, LEVEL 7


18 June Drone Survey, IMG#2-027


28 October Drone Survey, IMG#58

COLUMN BAY 4-5, LEVEL 5.5


18 June Drone Survey, IMG#2-107


28 October Drone Survey, IMG#29

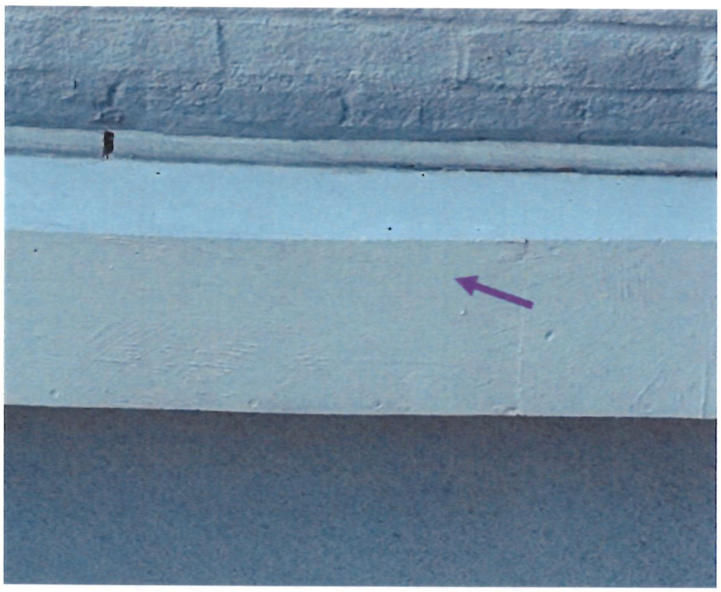
COLUMN BAY 5-6, LEVEL 1.5

SGH

18 June Drone Survey, IMG#3-011

28 October Drone Survey, IMG#3

COLUMN BAY 5-6, LEVEL 1.5 CONTINUED



18 June Drone Survey, IMG#3-011

28 October Drone Survey, IMG#4


18 June Drone Survey, IMG#3-011


28 October Drone Survey, IMG#6

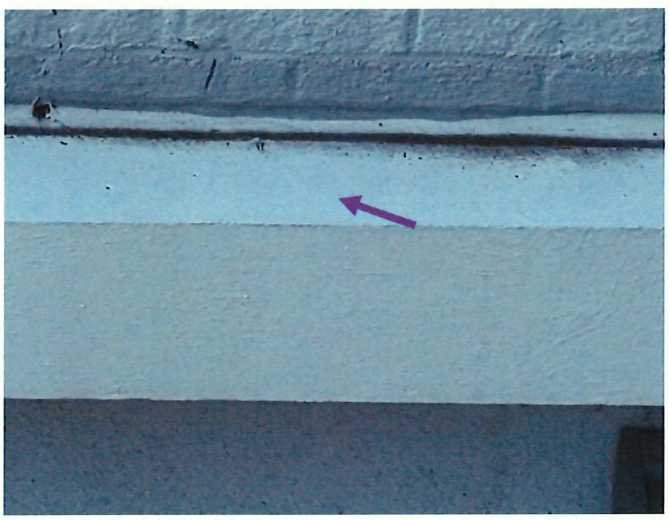
COLUMN BAY 5-6, LEVEL 1.5 CONTINUED

SGH

18 June Drone Survey, IMG#3-011

28 October Drone Survey, IMG#8

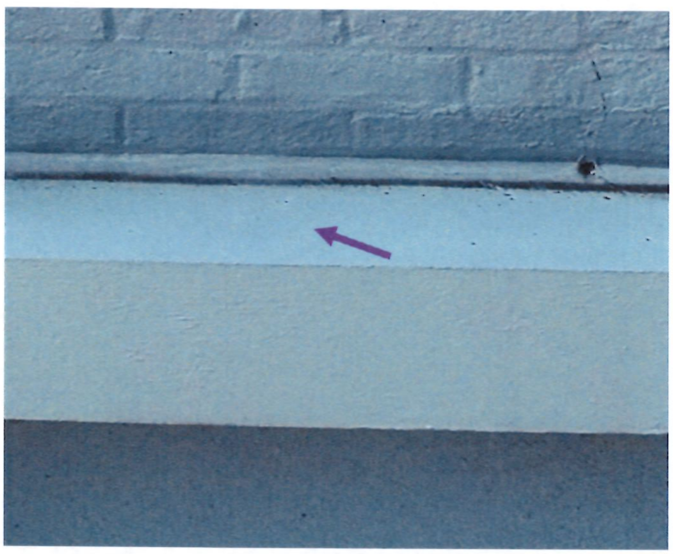
COLUMN BAY 5-6, LEVEL 1.5 CONTINUED



18 June Drone Survey, IMG#3-014

28 October Drone Survey, IMG#9

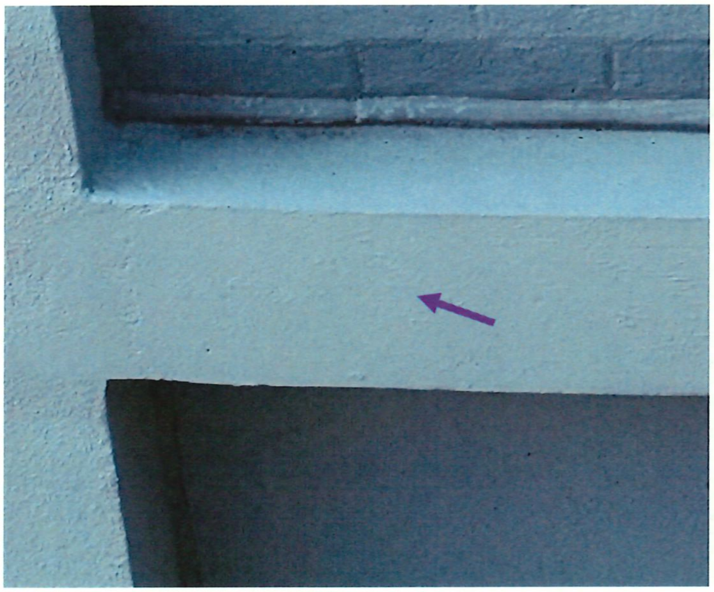
COLUMN BAY 5-6, LEVEL 1.5 CONTINUED



18 June Drone Survey, IMG#3-014

28 October Drone Survey, IMG#10

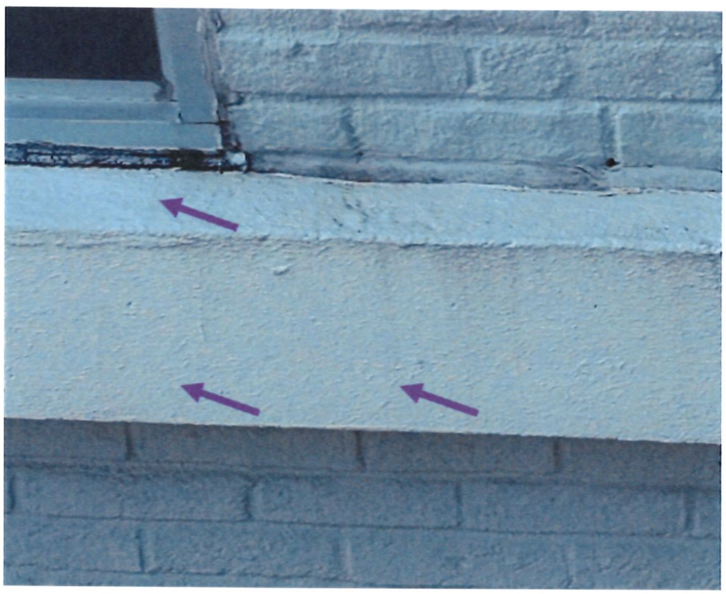
COLUMN BAY 5-6, LEVEL 1.5 CONTINUED



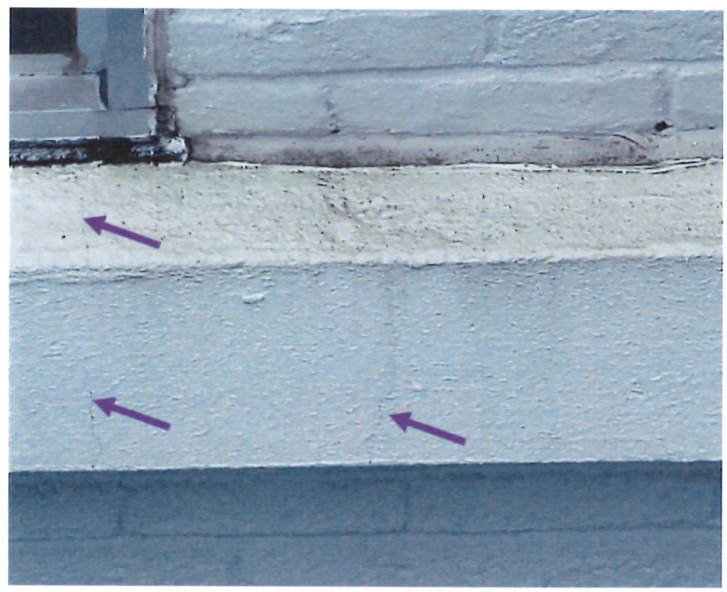
18 June Drone Survey, IMG#3-014

28 October Drone Survey, IMG#11

COLUMN BAY 5-6, LEVEL 2.5

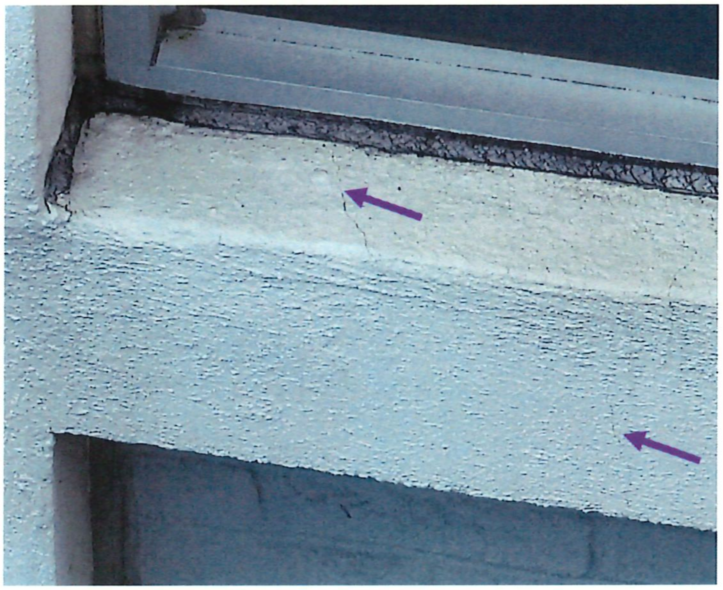


18 June Drone Survey, IMG#3-010

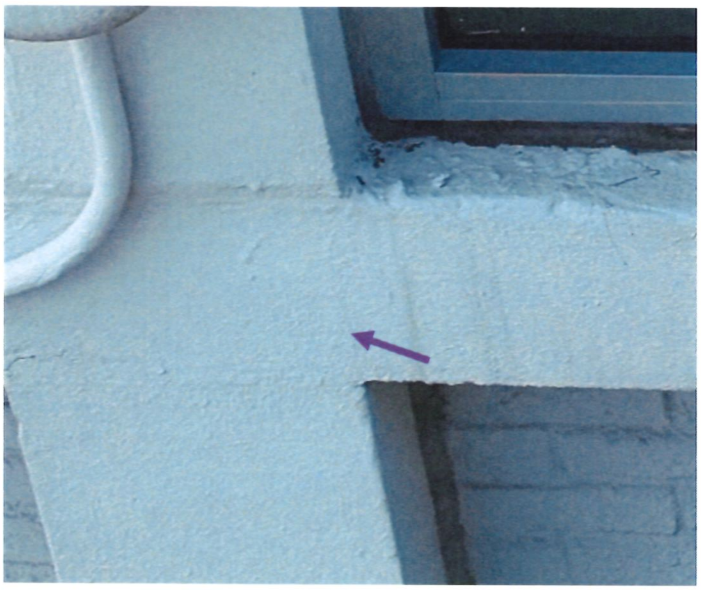


28 October Drone Survey, IMG#18


18 June Drone Survey, IMG#3-015


28 October Drone Survey, IMG#23

COLUMN BAY 5-6, LEVEL 4.5



18 June Drone Survey, IMG#3-020

28 October Drone Survey, IMG#37

COLUMN BAY 5-6, LEVEL 4.5

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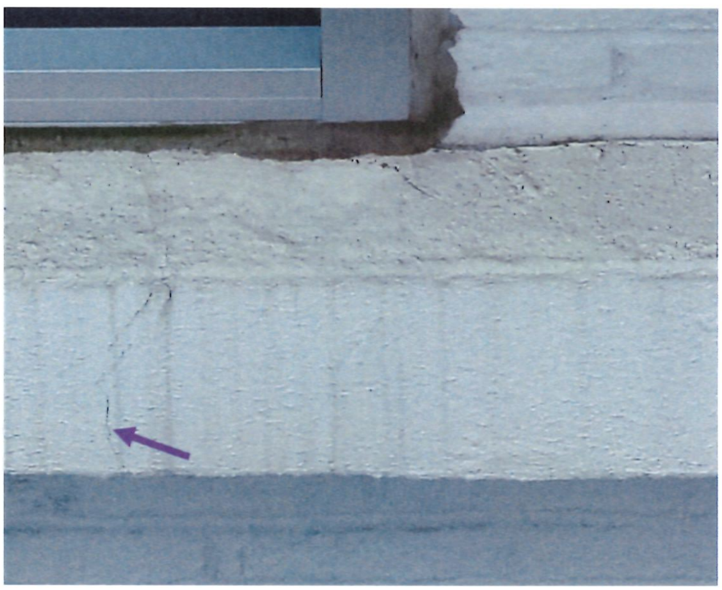
18 June Drone Survey, IMG#3-020

28 October Drone Survey, IMG#35

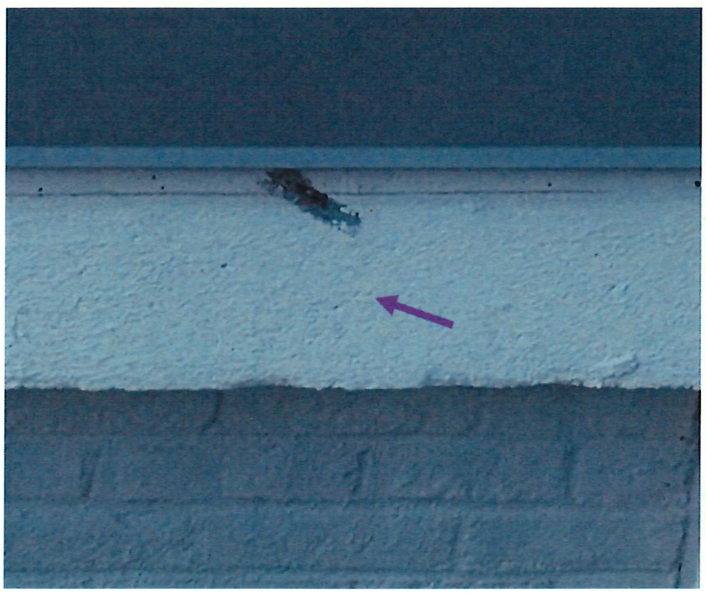
COLUMN BAY 5-6, LEVEL 4.5


18 June Drone Survey, IMG#3-020


28 October Drone Survey, IMG#34

COLUMN BAY 5-6, LEVEL 8

SGH



18 June Drone Survey, IMG#3-001

28 October Drone Survey, IMG#38

COLUMN BAY 6-7, LEVEL 1.5

18 June Drone Survey, IMG#3-082

28 October Drone Survey, IMG#50

COLUMN BAY 6-7, LEVEL 3.5

SGH

18 June Drone Survey, IMG#3-080

28 October Drone Survey, IMG#70

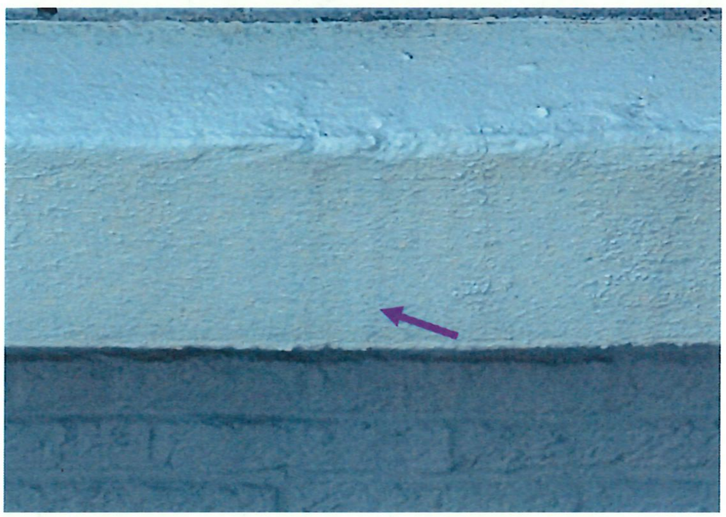
COLUMN BAY 6-7, LEVEL 5.5

18 June Drone Survey, IMG#3-077

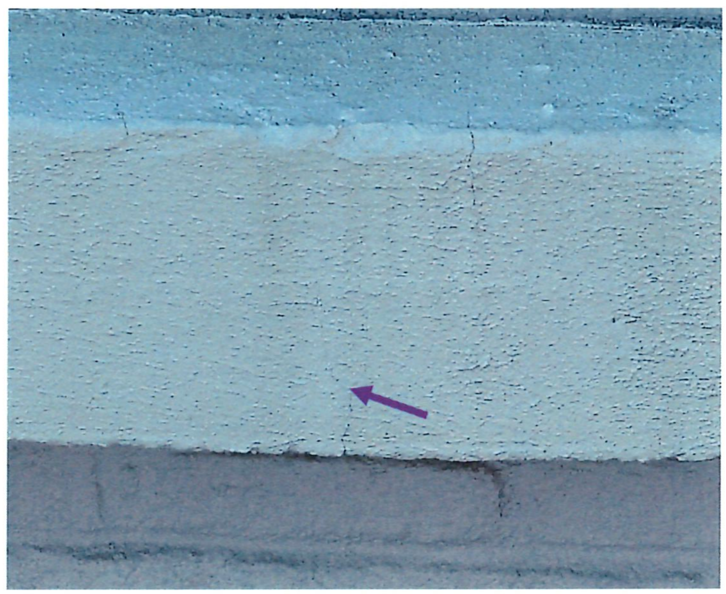
28 October Drone Survey, IMG#11

COLUMN BAY 7-8, LEVEL 3.5

SGH

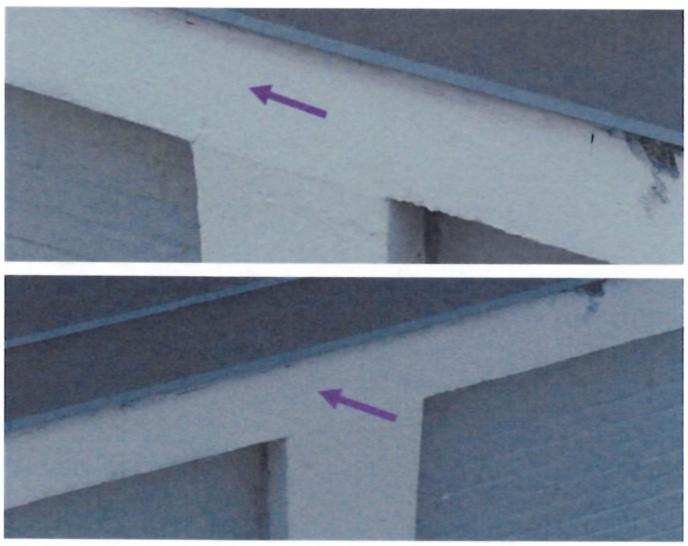


18 June Drone Survey, IMG#4-030

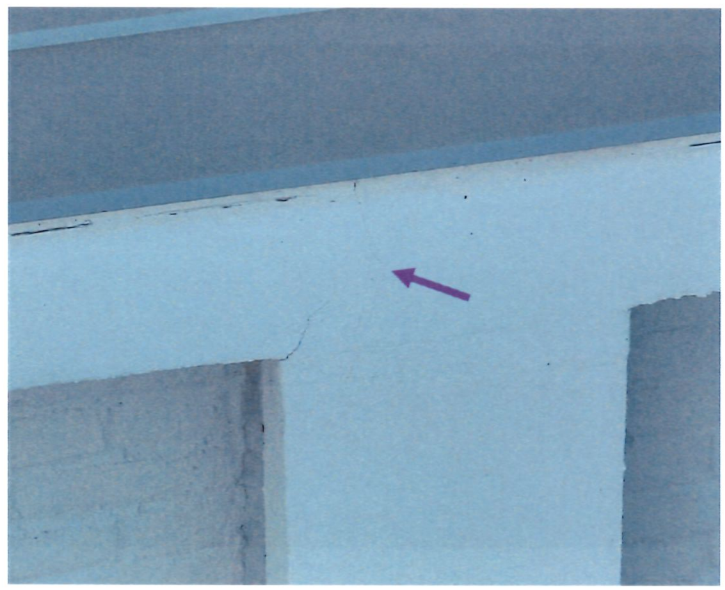


28 October Drone Survey, IMG#34

COLUMN BAY 14-15, LEVEL 8



18 June Drone Survey, IMG#8-132, 8-166



28 October Drone Survey, IMG#127

COLUMN BAY 15-16, LEVEL 5.5

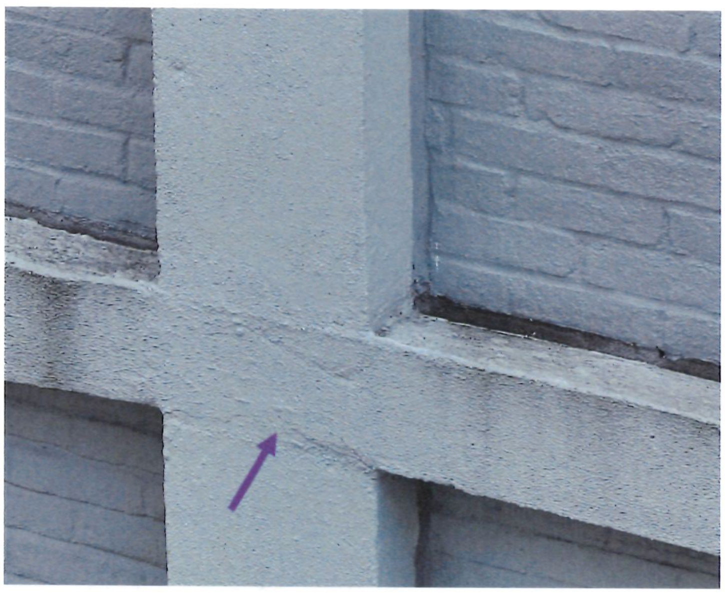
SGH

18 June 2024 Drone Survey, IMG#9-200

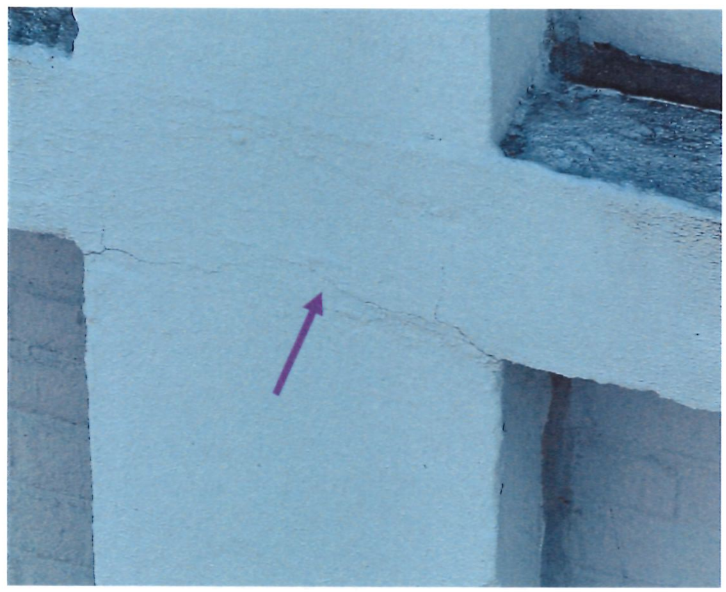
28 October 2024 Drone Survey, IMG#14

COLUMN BAY 15-16, LEVEL 7

SGH



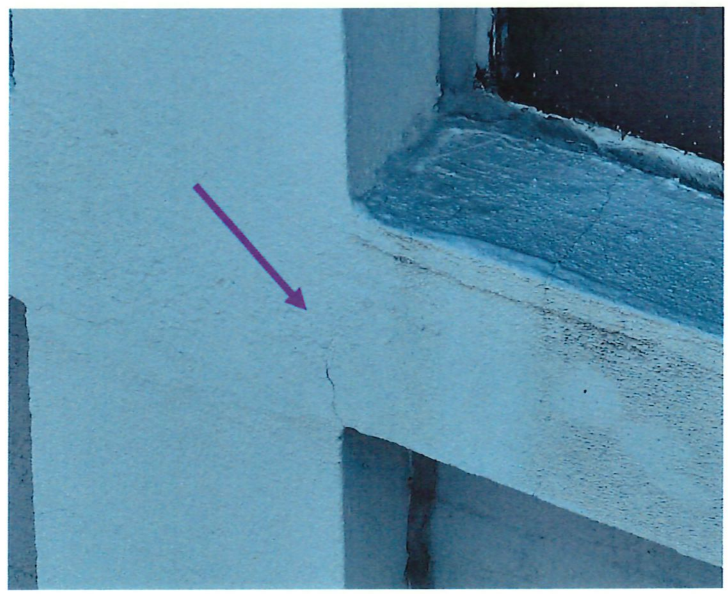
18 June 2024 Drone Survey, IMG#10-014



28 October 2024 Drone Survey, IMG#55

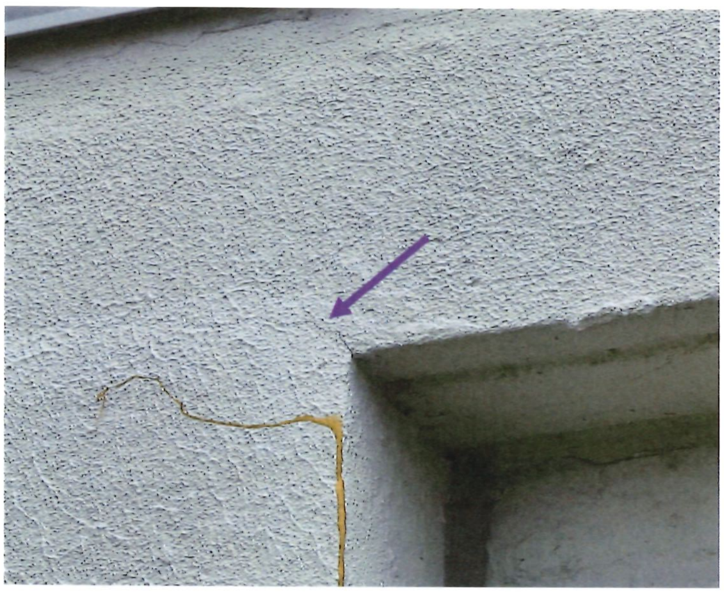
COLUMN BAY 16-17, LEVEL 5.5

18 June 2024 Drone Survey, IMG#10-098

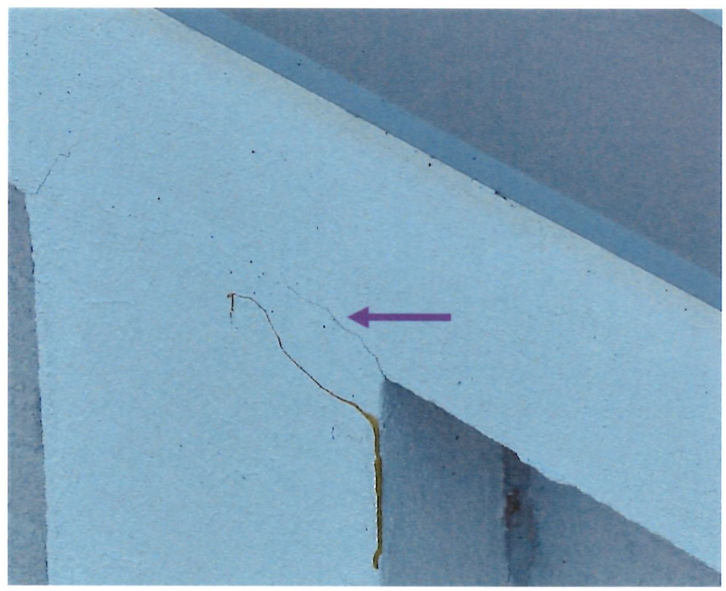


28 October 2024 Drone Survey, IMG#136

COLUMN BAY 16-17, LEVEL 8



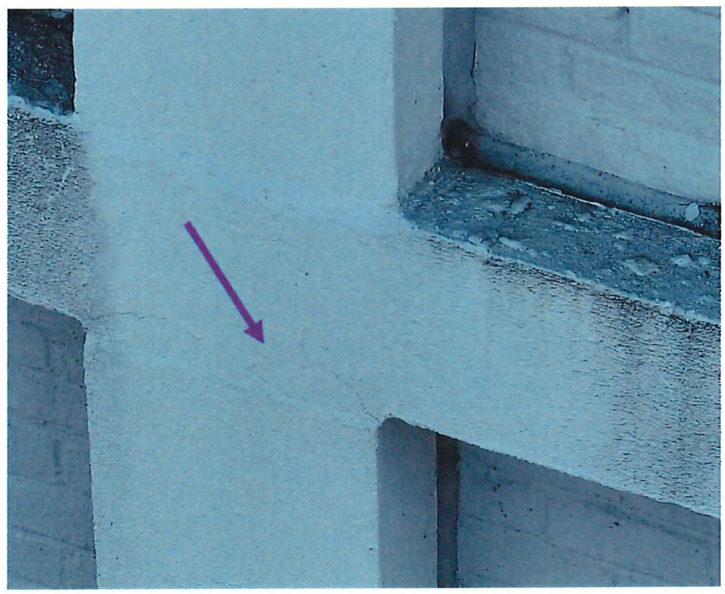
18 June 2024 Drone Survey, IMG#10-092



28 October 2024 Drone Survey, IMG#164

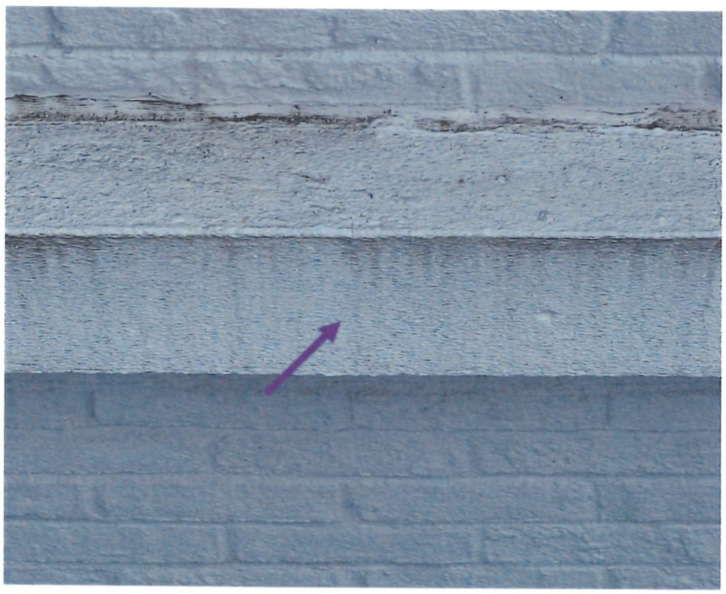
COLUMN BAY 18-19, LEVEL 7

18 June 2024 Drone Survey, IMG#11-095

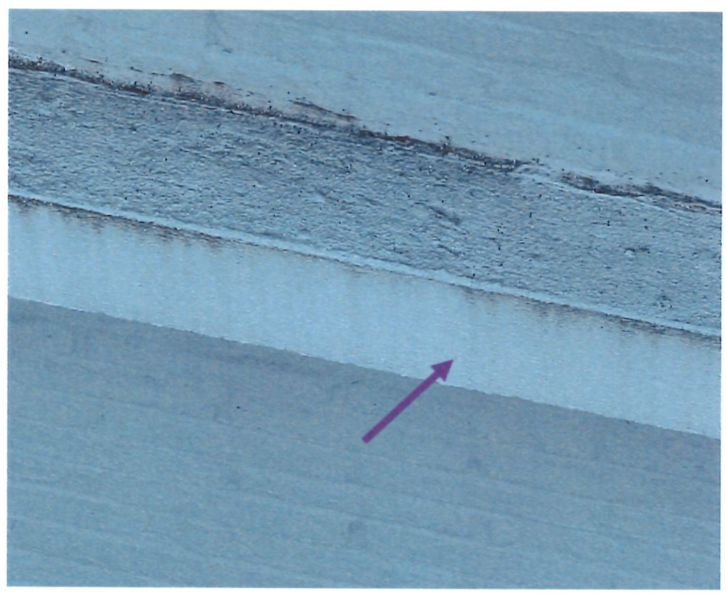


28 October 2024 Drone Survey, IMG#145

COLUMN BAY 21-22, LEVEL 3.5



18 June 2024 Drone Survey, IMG#12-165



28 October 2024 Drone Survey, IMG#144

APPENDIX D - ANALYSIS RESULTS

SGH

Project Riverview Slab Investigation

Subject Level 1 – GPR Results and DCRs

Sheet No 1 | 9
Project No. 200609.04
Date 14 January 2025
By/Chk By SGH

Slab Level	Column	Measured d at column (NS)	Measured d at column (EW)	Average d (for PS)	SAFE Punching Shear DCR	Direct Shear DCR	NS Moment DCR	EW Moment DCR	Notes
1	B1	3.68	4.33	4.01	1.92	0.82	1.30	0.67	
1	B2	3.53	4.38	3.95	1.30	0.85	1.21	0.59	
1	B3	3.92	4.70	4.31	1.03	0.73	0.93	0.47	
1	B4	3.80	4.36	4.08	0.96	0.81	1.03	0.55	
1	B5	4.30	4.90	4.60	0.82	0.70	0.89	0.48	
1	B6	4.23	4.92	4.57	0.95	0.77	0.87	0.45	
1	B7	4.21	4.93	4.57	0.83	0.70	0.91	0.48	
1	B8	4.22	4.87	4.55	0.83	0.71	0.91	0.48	
1	B9	3.96	4.89	4.42	0.99	0.81	0.94	0.45	
1	B10	3.64	4.39	4.02	0.97	0.82	1.08	0.54	
1	B11	3.95	4.70	4.32	0.89	0.75	0.98	0.50	
1	B12	4.14	4.90	4.52	0.96	0.78	0.89	0.45	
1	B13	3.94	4.46	4.20	0.92	0.78	0.99	0.53	
1	B14	3.90	4.69	4.30	0.91	0.76	1.01	0.50	
1	B15	3.89	4.54	4.21	1.09	0.86	0.97	0.49	
1	B16	3.74	4.82	4.28	0.91	0.76	1.06	0.49	
1	B17	3.32	4.64	3.98	0.99	0.83	1.21	0.51	
1	B18	3.85	4.83	4.34	1.01	0.82	0.98	0.46	
1	B19	3.44	4.16	3.80	1.04	0.88	1.16	0.57	
1	B20	3.55	4.20	3.87	1.02	0.87	1.11	0.57	
1	B21	3.59	4.19	3.89	1.16	0.82	1.04	0.58	
1	B22	3.76	4.50	4.13	1.22	0.81	1.12	0.57	
1	B23	3.45	4.60	4.03	1.85	0.80	1.40	0.60	
1	C2	3.47	4.29	3.88	2.09	0.86	1.09	0.33	
1	C3	3.78	4.60	4.19	1.15	0.75	0.88	0.32	
1	C4	3.43	4.04	3.73	1.35	0.81	1.06	0.57	
1	C5	3.92	4.72	4.32	1.16	0.67	0.84	0.39	
1	C7	3.69	4.12	3.90	1.33	0.76	0.93	0.46	
1	C8	4.06	4.71	4.39	1.12	0.67	0.81	0.40	
1	C9	3.71	4.86	4.28	1.13	0.68	0.92	0.33	
1	C10	3.14	4.17	3.65	1.45	0.97	1.19	0.30	
1	C11	3.04	3.97	3.51	1.65	0.99	1.33	0.33	
1	C13	3.75	4.56	4.16	1.30	0.82	0.90	0.29	
1	C14	4.05	4.61	4.33	N/A	N/A	0.76	0.21	Beam frames into column - punching shear not applicable.
1	C15	-	-	-	N/A	N/A	-	-	Beam frames into column - punching shear not applicable. No GPR data at this location.
1	C16	4.33	4.88	4.61	N/A	N/A	0.65	0.23	Beam frames into column - punching shear not applicable.
1	C17	4.31	5.13	4.72	0.95	0.62	0.76	0.40	
1	C19	3.78	4.60	4.19	1.10	0.72	0.89	0.45	
1	C20	3.48	4.36	3.92	1.61	0.88	1.01	0.45	
1	C21	3.77	4.68	4.23	1.07	0.76	0.89	0.35	
1	C22	3.79	4.51	4.15	1.91	0.78	0.92	0.31	
1.5	D2	3.46	4.46	3.96	1.82	0.70	1.17	0.44	
1.5	D3	4.57	5.42	4.99	1.17	0.47	0.69	0.34	
1.5	D4	4.74	5.46	5.10	1.27	0.57	0.85	0.31	
1.5	D5	4.50	5.28	4.89	1.33	0.60	0.91	0.32	
1.5	D7	4.41	5.54	4.97	1.30	0.59	0.93	0.30	
1.5	D8	4.29	4.89	4.59	1.47	0.65	0.97	0.34	
1.5	D9	4.63	5.54	5.08	1.28	0.57	0.89	0.30	
1.5	D10	4.58	5.53	5.05	1.29	0.57	0.90	0.35	
1.5	D11	4.91	5.60	5.26	1.22	0.55	0.83	0.36	
1.5	D13	4.46	5.40	4.93	1.33	0.60	1.06	0.38	
1.5	D14	4.86	5.23	5.04	N/A	N/A	0.69	0.36	Beam frames into column - punching shear not applicable.
1.5	D15	5.23	5.01	5.12	N/A	N/A	0.60	0.27	Beam frames into column - punching shear not applicable.
1.5	D16	4.72	5.39	5.05	N/A	N/A	0.73	0.35	Beam frames into column - punching shear not applicable.
1.5	D17	5.03	5.95	5.49	1.13	0.52	0.91	0.34	
1.5	D19	4.24	4.82	4.53	1.48	0.66	1.11	0.42	
1.5	D20	4.28	5.06	4.67	1.44	0.64	0.96	0.40	
1.5	D21	5.04	3.90	4.47	1.37	0.54	0.58	0.49	
1.5	D22	2.57	3.67	3.12	2.63	0.97	1.88	0.55	
1.5	E1	4.46	5.51	4.99	2.53	0.78	1.09	0.30	
1.5	E2	4.41	5.25	4.83	N/A	N/A	0.58	0.40	Beam frames into column - punching shear not applicable.
1.5	E3	3.80	4.43	4.11	N/A	N/A	0.70	0.34	Beam frames into column - punching shear not applicable.
1.5	E4	4.46	5.19	4.83	2.10	0.80	1.40	0.48	
1.5	E5	4.47	5.25	4.86	2.40	0.70	1.33	0.46	
1.5	E6	-	-	-	-	-	-	-	No GPR data at this location.
1.5	E7	4.20	5.15	4.67	2.19	0.78	1.50	0.47	
1.5	E8	4.97	5.54	5.25	1.83	0.71	1.25	0.43	
1.5	E9	5.01	6.02	5.52	2.03	0.65	1.16	0.35	
1.5	E10	4.35	4.90	4.62	2.23	0.82	1.45	0.49	
1.5	E11	4.38	5.03	4.70	2.19	0.77	1.44	0.48	
1.5	E12	4.29	5.42	4.85	2.54	0.87	1.39	0.45	
1.5	E13	4.59	5.07	4.83	2.32	0.64	1.32	0.48	
1.5	E14	4.24	4.72	4.48	2.33	0.86	1.51	0.51	
1.5	E15	4.65	5.95	5.30	2.20	0.69	1.29	0.36	
1.5	E16	5.51	5.95	5.73	1.64	0.65	1.14	0.40	
1.5	E17	5.48	5.95	5.71	1.91	0.51	1.05	0.33	
1.5	E18	5.42	4.66	5.04	2.32	0.74	1.05	0.49	
1.5	E19	5.16	5.69	5.42	1.77	0.66	1.19	0.43	
1.5	E20	4.98	5.66	5.32	1.81	0.71	1.24	0.43	
1.5	E21	4.59	4.14	4.37	N/A	N/A	0.52	0.38	Beam frames into column - punching shear not applicable.
1.5	E22	3.46	4.08	3.77	N/A	N/A	0.88	0.52	Beam frames into column - punching shear not applicable.
1.5	E23	4.63	4.57	4.60	2.76	0.83	1.01	0.35	

Legend

"d"	Effective depth, distance from extreme compression fiber to centroid of longitudinal tension reinforcement
NS	Bars extending in the north to south direction
EW	Bars extending in the east to west direction
PS	Punching shear
SAFE	CSI's Slab Analysis by the Finite Element Method
DCR	Demand-to-capacity ratio
(shaded)	Values calculated based on perpendicular bar direction

SGH

Project Riverview Slab Investigation

Subject Level 2 - GPR Results and DCRs

Sheet No. 2 | 9
Project No. 200609.04
Date 14 January 2025
By/Chk By SGH

Slab Level	Column	Measured d at column (NS)	Measured d at column (EW)	Average d (for PS)	SAFE Punching Shear DCR	Direct Shear DCR	NS Moment DCR	EW Moment DCR	Notes
2	B1	3.88	4.92	4.40	1.47	0.72	1.15	0.45	
2	B2	3.77	4.46	4.11	1.19	0.84	1.14	0.58	
2	B3	3.54	4.28	3.91	1.15	0.82	1.04	0.50	
2	B4	3.44	4.35	3.89	1.03	0.88	1.19	0.57	
2	B5	3.17	3.93	3.55	1.12	0.96	1.30	0.61	
2	B6	3.62	4.20	3.91	1.16	0.94	1.05	0.54	
2	B7	4.08	4.59	4.33	0.88	0.76	0.96	0.52	
2	B8	3.78	4.58	4.18	0.92	0.79	1.05	0.52	
2	B9	3.74	4.69	4.21	1.06	0.86	1.01	0.48	
2	B10	3.95	4.24	4.10	0.94	0.81	0.99	0.56	
2	B11	3.59	4.66	4.13	0.93	0.81	1.11	0.51	
2	B12	3.24	4.18	3.71	1.24	1.01	1.20	0.54	
2	B13	3.32	3.98	3.65	1.10	0.94	1.23	0.60	
2	B14	4.16	5.13	4.64	0.83	0.70	0.96	0.47	
2	B15	3.78	4.07	3.92	1.25	0.96	1.04	0.57	
2	B16	4.18	4.48	4.33	0.92	0.77	0.96	0.54	
2	B17	4.15	4.57	4.36	0.88	0.75	0.95	0.52	
2	B18	4.09	5.01	4.55	0.96	0.78	0.91	0.45	
2	B19	4.37	4.86	4.61	0.82	0.70	0.89	0.49	
2	B20	4.42	5.20	4.81	0.79	0.68	0.89	0.47	
2	B21	3.49	3.95	3.72	1.21	0.86	1.07	0.54	
2	B22	3.70	4.67	4.19	1.16	0.83	1.18	0.56	
2	B23	3.35	4.52	3.93	1.64	0.81	1.45	0.44	
2	C2	3.77	4.63	4.20	1.78	0.76	0.87	0.26	
2	C3	4.01	4.63	4.32	1.38	0.68	0.78	0.27	
2	C4	4.27	5.16	4.71	1.29	0.68	0.71	0.34	
2	C5	4.33	5.00	4.66	1.04	0.69	0.71	0.34	
2	C7	3.65	4.39	4.02	1.28	0.83	0.90	0.39	
2	C8	4.14	4.87	4.51	1.30	0.68	0.71	0.33	
2	C9	3.79	4.73	4.26	0.96	0.77	0.89	0.36	
2	C10	3.93	4.72	4.33	1.34	0.72	0.72	0.19	
2	C11	3.57	4.35	3.96	1.33	0.86	0.93	0.29	
2	C13	4.08	4.79	4.43	1.16	0.76	0.77	0.26	
2	C14	3.78	4.43	4.10	N/A	N/A	0.74	0.18	Beam frames into column - punching shear not applicable.
2	C15	-	-	-	N/A	N/A	-	-	Beam frames into column - punching shear not applicable. No GPR data at this location.
2	C16	4.03	4.85	4.44	N/A	N/A	0.65	0.20	Beam frames into column - punching shear not applicable.
2	C17	3.95	5.08	4.52	1.12	0.73	0.81	0.34	
2	C19	4.31	5.04	4.67	1.05	0.69	0.72	0.34	
2	C20	4.48	5.22	4.85	1.24	0.65	0.66	0.33	
2	C21	4.21	4.90	4.55	1.28	0.63	0.73	0.25	
2	C22	3.82	4.66	4.24	1.76	0.76	0.85	0.26	
2.5	D2	4.31	4.68	4.50	1.38	0.66	0.74	0.40	
2.5	D3	3.79	4.32	4.06	1.45	0.65	0.88	0.38	
2.5	D4	3.78	4.82	4.30	1.64	0.78	1.04	0.41	
2.5	D5	4.24	4.85	4.55	1.38	0.67	1.02	0.43	
2.5	D7	3.58	4.27	3.93	1.69	0.80	1.26	0.50	
2.5	D8	3.78	4.76	4.27	1.69	0.78	1.08	0.40	
2.5	D9	3.50	4.22	3.86	1.96	0.97	1.41	0.45	
2.5	D10	3.59	4.39	3.99	1.87	0.85	1.27	0.44	
2.5	D11	3.48	4.07	3.78	2.05	0.94	1.30	0.51	
2.5	D13	4.49	5.38	4.94	1.36	0.68	0.97	0.39	
2.5	D14	4.58	5.39	4.99	N/A	N/A	0.72	0.33	Beam frames into column - punching shear not applicable.
2.5	D15	-	-	-	N/A	N/A	-	-	Beam frames into column - punching shear not applicable. No GPR data at this location.
2.5	D16	4.38	5.12	4.75	N/A	N/A	0.78	0.34	Beam frames into column - punching shear not applicable.
2.5	D17	4.14	4.71	4.42	1.43	0.70	1.07	0.46	
2.5	D19	4.70	5.41	5.06	1.19	0.58	0.91	0.39	
2.5	D20	4.46	5.17	4.82	1.40	0.68	0.85	0.38	
2.5	D21	4.63	5.34	4.99	1.09	0.50	0.62	0.30	
2.5	D22	5.19	5.76	5.47	1.05	0.52	0.52	0.32	
2.5	E1	4.34	5.63	4.98	2.12	0.75	0.91	0.16	
2.5	E2	4.53	5.16	4.85	N/A	N/A	0.52	0.41	Beam frames into column - punching shear not applicable.
2.5	E3	3.99	4.62	4.31	N/A	N/A	0.58	0.29	Beam frames into column - punching shear not applicable.
2.5	E4	4.36	4.99	4.67	1.88	0.84	1.26	0.49	
2.5	E5	4.32	4.94	4.63	1.89	0.82	1.18	0.47	
2.5	E6	4.18	5.07	4.62	2.32	0.80	1.81	0.41	
2.5	E7	4.44	4.66	4.55	1.94	0.84	1.15	0.51	
2.5	E8	4.41	5.13	4.77	1.84	0.80	1.26	0.46	
2.5	E9	4.46	4.95	4.70	2.29	0.82	1.09	0.42	
2.5	E10	4.40	4.43	4.41	2.06	0.88	1.15	0.54	
2.5	E11	2.84	4.78	3.81	2.49	1.04	1.87	0.50	
2.5	E12	4.53	5.29	4.91	2.14	0.76	1.02	0.37	
2.5	E13	4.79	5.42	5.10	1.66	0.74	1.03	0.44	
2.5	E14	5.12	5.89	5.50	1.52	0.68	0.99	0.40	
2.5	E15	4.77	4.98	4.88	2.22	0.80	1.04	0.42	
2.5	E16	4.91	5.48	5.19	1.65	0.73	1.03	0.43	
2.5	E17	4.45	5.08	4.77	1.82	0.80	1.11	0.46	
2.5	E18	4.44	5.33	4.88	2.14	0.76	1.04	0.37	
2.5	E19	4.80	5.48	5.14	1.63	0.73	1.02	0.42	
2.5	E20	4.26	4.66	4.46	2.01	0.89	1.17	0.52	
2.5	E21	4.72	5.35	5.04	N/A	N/A	0.45	0.25	Beam frames into column - punching shear not applicable.
2.5	E22	4.64	5.26	4.95	N/A	N/A	0.51	0.40	Beam frames into column - punching shear not applicable.
2.5	E23	5.21	5.21	5.21	2.00	0.71	0.67	0.23	

Legend

"d"	Effective depth, distance from extreme compression fiber to centroid of longitudinal tension reinforcement
NS	Bars extending in the north to south direction
EW	Bars extending in the east to west direction
PS	Punching shear
SAFE	CSI's Slab Analysis by the Finite Element Method
DCR	Demand-to-capacity ratio
	Values calculated based on perpendicular bar direction

Project Riverview Slab Investigation

Subject Level 3 – GPR Results and DCRs

Sheet No. 3 | 9
Project No. 200609.04
Date 14 January 2025
By/Chk By SGH

Slab Level	Column	Measured d at column (NS)	Measured d at column (EW)	Average d (for PS)	SAFE Punching Shear DCR	Direct Shear DCR	NS Moment DCR	EW Moment DCR	Notes
3	B1	3.60	4.93	4.27	1.74	0.77	1.34	0.58	
3	B2	3.71	4.83	4.27	1.16	0.78	1.13	0.53	
3	B3	3.44	3.89	3.67	1.24	0.89	1.12	0.58	
3	B4	2.98	3.58	3.28	1.29	1.09	1.44	0.69	
3	B5	3.40	4.15	3.77	1.05	0.90	1.19	0.58	
3	B6	3.49	4.45	3.97	1.12	0.92	1.12	0.51	
3	B7	3.68	4.77	4.23	0.91	0.78	1.08	0.49	
3	B8	3.50	4.46	3.98	0.97	0.84	1.14	0.53	
3	B9	3.42	4.16	3.79	1.17	0.98	1.15	0.54	
3	B10	3.72	4.37	4.04	0.96	0.82	1.06	0.54	
3	B11	3.68	4.48	4.08	0.95	0.81	1.08	0.53	
3	B12	4.10	4.81	4.45	0.97	0.80	0.92	0.46	
3	B13	4.50	5.07	4.78	0.78	0.67	0.85	0.46	
3	B14	3.76	4.32	4.04	0.98	0.83	1.07	0.55	
3	B15	4.09	4.57	4.33	1.04	0.84	0.93	0.49	
3	B16	3.66	4.45	4.05	0.98	0.82	1.10	0.54	
3	B17	3.65	4.36	4.00	0.98	0.83	1.10	0.55	
3	B18	3.41	4.09	3.75	1.21	0.99	1.15	0.56	
3	B19	3.27	3.80	3.53	1.14	0.97	1.25	0.63	
3	B20	3.38	4.16	3.77	1.06	0.90	1.20	0.58	
3	B21	3.08	3.93	3.50	1.30	0.94	1.30	0.57	
3	B22	3.46	4.24	3.85	1.33	0.88	1.24	0.61	
3	B23	3.38	3.58	3.48	2.25	0.97	1.49	0.80	
3	C2	4.39	5.01	4.70	1.59	0.67	0.77	0.27	
3	C3	3.72	4.28	4.00	1.16	0.82	0.91	0.39	
3	C4	3.88	4.74	4.31	1.66	0.73	0.85	0.40	
3	C5	3.86	4.46	4.16	1.36	0.81	0.88	0.40	
3	C7	3.97	4.85	4.41	1.27	0.75	0.85	0.36	
3	C8	3.73	4.47	4.10	1.76	0.76	0.90	0.41	
3	C9	3.37	4.37	3.87	1.06	0.85	1.11	0.39	
3	C10	3.11	4.55	3.83	1.88	0.85	1.17	0.24	
3	C11	3.36	4.41	3.88	1.55	0.89	1.12	0.29	
3	C13	3.97	4.80	4.39	1.31	0.76	0.85	0.26	
3	C14	4.06	5.15	4.61	N/A	N/A	0.74	0.17	Beam frames into column - punching shear not applicable.
3	C15	4.22	4.55	4.38	N/A	N/A	0.71	0.26	Beam frames into column - punching shear not applicable.
3	C16	4.20	4.94	4.57	N/A	N/A	0.70	0.22	Beam frames into column - punching shear not applicable.
3	C17	3.79	4.92	4.36	1.31	0.77	0.91	0.36	
3	C19	3.63	4.57	4.10	1.41	0.82	0.98	0.39	
3	C20	3.76	4.46	4.11	1.78	0.77	0.89	0.42	
3	C21	3.46	4.57	4.02	1.16	0.81	1.04	0.36	
3	C22	3.46	4.56	4.01	2.01	0.81	1.10	0.31	
3.5	D2	4.76	5.19	4.97	1.33	0.57	0.66	0.36	
3.5	D3	4.30	5.14	4.72	1.27	0.55	0.77	0.35	
3.5	D4	4.29	4.82	4.56	1.61	0.72	0.96	0.41	
3.5	D5	4.02	5.09	4.56	1.47	0.65	1.18	0.39	
3.5	D7	5.04	5.15	5.10	1.26	0.57	0.90	0.39	
3.5	D8	4.54	5.35	4.94	1.46	0.64	0.93	0.36	
3.5	D9	4.99	5.69	5.34	1.31	0.64	1.01	0.33	
3.5	D10	4.97	5.63	5.30	1.32	0.59	0.93	0.34	
3.5	D11	4.70	5.54	5.12	1.47	0.64	0.99	0.35	
3.5	D13	5.09	5.39	5.24	1.36	0.61	0.90	0.37	
3.5	D14	4.90	5.57	5.23	N/A	N/A	0.68	0.34	Beam frames into column - punching shear not applicable.
3.5	D15	4.50	5.38	4.94	N/A	N/A	0.78	0.25	Beam frames into column - punching shear not applicable.
3.5	D16	4.22	5.64	4.93	N/A	N/A	0.89	0.33	Beam frames into column - punching shear not applicable.
3.5	D17	4.35	5.31	4.83	1.36	0.61	1.08	0.38	
3.5	D19	4.07	5.05	4.56	1.47	0.65	1.16	0.40	
3.5	D20	4.21	5.05	4.63	1.58	0.70	0.98	0.39	
3.5	D21	4.52	5.30	4.91	1.20	0.52	0.70	0.34	
3.5	D22	4.53	5.11	4.82	1.39	0.59	0.72	0.37	
3.5	E1	4.42	5.56	4.99	2.52	0.78	1.05	0.23	
3.5	E2	4.49	5.11	4.80	N/A	N/A	0.60	0.46	Beam frames into column - punching shear not applicable.
3.5	E3	4.46	5.09	4.78	N/A	N/A	0.52	0.30	Beam frames into column - punching shear not applicable.
3.5	E4	4.09	4.90	4.49	2.33	0.88	1.70	0.52	
3.5	E5	5.25	5.88	5.56	1.98	0.61	1.15	0.41	
3.5	E6	-	-	-	N/A	N/A	-	-	No GPR data at this location.
3.5	E7	5.65	6.19	5.92	1.56	0.59	1.12	0.39	
3.5	E8	5.15	5.77	5.46	1.74	0.68	1.32	0.41	
3.5	E9	5.20	5.64	5.42	2.09	0.67	1.12	0.38	
3.5	E10	4.63	5.13	4.88	2.06	0.78	1.35	0.47	
3.5	E11	5.30	5.80	5.55	1.72	0.64	1.17	0.42	
3.5	E12	-	-	-	N/A	N/A	-	-	No GPR data at this location.
3.5	E13	4.90	5.53	5.21	2.08	0.59	1.23	0.44	
3.5	E14	4.84	5.47	5.15	1.92	0.74	1.30	0.44	
3.5	E15	4.72	5.51	5.11	2.32	0.72	1.27	0.39	
3.5	E16	4.55	5.18	4.86	2.09	0.79	1.39	0.47	
3.5	E17	4.38	5.07	4.73	2.16	0.78	1.43	0.49	
3.5	E18	-	-	-	N/A	N/A	-	-	No GPR data at this location.
3.5	E19	4.92	5.55	5.23	1.87	0.69	1.26	0.44	
3.5	E20	5.13	5.76	5.44	1.76	0.70	1.20	0.43	
3.5	E21	3.40	4.03	3.71	N/A	N/A	0.85	0.40	Beam frames into column - punching shear not applicable.
3.5	E22	2.88	4.72	3.80	N/A	N/A	1.30	0.50	Beam frames into column - punching shear not applicable.
3.5	E23	2.64	3.27	2.96	5.01	1.42	2.51	0.56	

Legend

"d"	Effective depth, distance from extreme compression fiber to centroid of longitudinal tension reinforcement
NS	Bars extending in the north to south direction
EW	Bars extending in the east to west direction
PS	Punching shear
SAFE	CSI's Slab Analysis by the Finite Element Method
DCR	Demand-to-capacity ratio
(shaded)	Values calculated based on perpendicular bar direction

Project Riverview Slab Investigation

Subject Level 4 – GPR Results and DCRs

Sheet No. 4 | 9
Project No. 200609.04
Date 14 January 2025
By/Chk By SGH

Slab Level	Column	Measured d at column (NS)	Measured d at column (EW)	Average d (for PS)	SAFE Punching Shear DCR	Direct Shear DCR	NS Moment DCR	EW Moment DCR	Notes
4	B1	3.44	4.40	3.92	2.00	0.85	1.45	0.68	
4	B2	3.65	4.72	4.18	1.21	0.79	1.17	0.55	
4	B3	3.57	3.92	3.74	1.23	0.87	1.07	0.58	
4	B4	3.93	4.75	4.34	0.88	0.76	0.99	0.50	
4	B5	3.89	4.83	4.36	0.87	0.75	1.01	0.49	
4	B6	3.87	4.55	4.21	1.03	0.86	0.99	0.50	
4	B7	3.54	4.58	4.06	0.96	0.82	1.13	0.52	
4	B8	3.48	4.67	4.07	0.95	0.81	1.15	0.50	
4	B9	3.44	4.33	3.88	1.13	0.95	1.14	0.52	
4	B10	3.59	4.44	4.01	0.96	0.83	1.11	0.53	
4	B11	3.73	4.72	4.22	0.91	0.78	1.06	0.50	
4	B12	3.47	4.15	3.81	1.17	0.97	1.13	0.54	
4	B13	3.00	3.91	3.45	1.18	1.00	1.43	0.61	
4	B14	3.20	4.29	3.75	1.07	0.90	1.29	0.56	
4	B15	2.72	3.52	3.12	1.55	1.24	1.67	0.66	
4	B16	3.24	4.58	3.91	1.02	0.86	1.28	0.52	
4	B17	2.59	3.49	3.04	1.45	1.23	1.88	0.70	
4	B18	2.83	3.70	3.27	1.43	1.17	1.50	0.61	
4	B19	3.48	4.10	3.79	1.05	0.89	1.16	0.58	
4	B20	3.28	4.11	3.69	1.09	0.93	1.24	0.59	
4	B21	3.13	4.01	3.57	1.30	0.92	1.24	0.55	
4	B22	3.24	4.13	3.68	1.43	0.93	1.36	0.63	
4	B23	2.89	4.13	3.51	2.27	0.96	1.94	0.71	
4	C2	3.95	4.40	4.18	2.20	0.76	0.91	0.33	
4	C3	4.43	5.00	4.72	1.43	0.62	0.73	0.30	
4	C4	3.93	4.99	4.46	1.63	0.71	0.85	0.39	
4	C5	3.72	4.51	4.11	1.41	0.82	0.94	0.40	
4	C7	3.75	4.77	4.26	1.35	0.78	0.93	0.37	
4	C8	4.37	4.89	4.63	1.51	0.66	0.74	0.38	
4	C9	4.16	5.06	4.61	0.84	0.68	0.79	0.33	
4	C10	3.95	4.85	4.40	1.58	0.72	0.78	0.22	
4	C11	3.17	4.17	3.67	1.69	0.95	1.26	0.31	
4	C13	3.14	4.06	3.60	1.75	0.97	1.29	0.32	
4	C14	3.73	4.50	4.12	N/A	N/A	0.88	0.21	Beam frames into column - punching shear not applicable.
4	C15	-	-	-	N/A	N/A	-	-	Beam frames into column - punching shear not applicable. No GPR data at this location.
4	C16	3.61	4.03	3.82	N/A	N/A	0.95	0.29	Beam frames into column - punching shear not applicable.
4	C17	3.54	4.39	3.97	1.51	0.86	1.04	0.41	
4	C19	4.11	4.57	4.34	1.33	0.77	0.83	0.39	
4	C20	4.24	4.62	4.43	1.65	0.71	0.77	0.43	
4	C21	3.66	4.34	4.00	1.81	0.75	0.92	0.34	
4	C22	3.15	3.88	3.51	2.82	0.94	1.36	0.39	
4.5	D2	4.55	5.15	4.85	1.38	0.59	0.72	0.36	
4.5	D3	4.72	5.43	5.07	1.15	0.50	0.65	0.33	
4.5	D4	4.12	4.50	4.31	1.74	0.77	1.01	0.44	
4.5	D5	4.26	5.13	4.70	1.41	0.63	1.10	0.39	
4.5	D7	4.90	5.27	5.08	1.26	0.57	0.93	0.38	
4.5	D8	4.20	4.95	4.57	1.63	0.71	1.02	0.39	
4.5	D9	4.48	5.13	4.80	1.52	0.73	1.15	0.37	
4.5	D10	4.10	4.84	4.47	1.69	0.73	1.16	0.41	
4.5	D11	4.24	4.65	4.45	1.80	0.76	1.12	0.42	
4.5	D13	4.41	5.43	4.92	1.49	0.66	1.07	0.37	
4.5	D14	4.50	5.13	4.82	N/A	N/A	0.79	0.37	Beam frames into column - punching shear not applicable.
4.5	D15	-	-	-	N/A	N/A	-	-	Beam frames into column - punching shear not applicable. No GPR data at this location.
4.5	D16	4.67	5.54	5.10	N/A	N/A	0.74	0.34	Beam frames into column - punching shear not applicable.
4.5	D17	4.46	5.15	4.80	1.37	0.61	1.05	0.39	
4.5	D19	4.70	5.55	5.13	1.25	0.56	0.98	0.36	
4.5	D20	4.33	5.03	4.68	1.55	0.69	0.95	0.39	
4.5	D21	4.83	5.30	5.07	1.15	0.50	0.62	0.34	
4.5	D22	5.07	5.48	5.27	1.22	0.53	0.59	0.34	
4.5	E1	4.26	5.01	4.63	2.80	0.85	1.11	0.26	
4.5	E2	4.09	5.25	4.67	N/A	N/A	0.67	0.45	Beam frames into column - punching shear not applicable.
4.5	E3	3.88	5.07	4.47	N/A	N/A	0.67	0.30	Beam frames into column - punching shear not applicable.
4.5	E4	4.78	5.41	5.09	1.94	0.77	1.43	0.47	
4.5	E5	4.46	5.13	4.80	2.11	0.81	1.44	0.48	
4.5	E6	4.11	4.74	4.42	2.82	0.83	2.35	0.44	
4.5	E7	4.26	4.84	4.55	2.27	0.86	1.52	0.52	
4.5	E8	4.55	5.18	4.86	2.08	0.80	1.52	0.48	
4.5	E9	4.37	5.00	4.68	2.59	0.79	1.36	0.43	
4.5	E10	4.41	5.31	4.86	2.08	0.80	1.44	0.47	
4.5	E11	4.55	5.19	4.87	2.07	0.80	1.38	0.48	
4.5	E12	4.28	5.01	4.64	2.66	0.79	1.35	0.41	
4.5	E13	3.34	3.97	3.65	3.10	1.12	1.96	0.65	
4.5	E14	4.56	5.21	4.89	2.09	0.80	1.40	0.48	
4.5	E15	4.83	5.83	5.33	2.18	0.69	1.24	0.37	
4.5	E16	4.73	5.36	5.04	1.99	0.77	1.34	0.46	
4.5	E17	5.40	6.13	5.76	1.62	0.65	1.14	0.40	
4.5	E18	5.26	5.89	5.58	2.01	0.63	1.07	0.34	
4.5	E19	5.39	5.89	5.64	1.67	0.67	1.14	0.42	
4.5	E20	5.17	5.25	5.21	1.87	0.74	1.20	0.48	
4.5	E21	5.08	6.01	5.54	N/A	N/A	0.44	0.25	Beam frames into column - punching shear not applicable.
4.5	E22	4.51	4.72	4.62	N/A	N/A	0.59	0.50	Beam frames into column - punching shear not applicable.
4.5	E23	5.35	5.05	5.20	2.39	0.75	0.75	0.33	

Legend

"d"	Effective depth, distance from extreme compression fiber to centroid of longitudinal tension reinforcement
NS	Bars extending in the north to south direction
EW	Bars extending in the east to west direction
PS	Punching shear
SAFE	CSI's Slab Analysis by the Finite Element Method
DCR	Demand-to-capacity ratio
(shaded)	Values calculated based on perpendicular bar direction

SGH

Project Riverview Slab Investigation

Subject Level 5 – GPR Results and DCRs

Sheet No. 5 | 9
Project No. 200609.04
Date 14 January 2025
By/Chk By SGH

Slab Level	Column	Measured d at column (NS)	Measured d at column (EW)	Average d (for PS)	SAFE Punching Shear DCR	Direct Shear DCR	NS Moment DCR	EW Moment DCR	Notes
5	B1	2.61	4.07	3.34	2.46	1.03	2.32	0.74	
5	B2	2.47	3.19	2.83	2.14	1.37	2.18	0.84	
5	B3	2.87	3.44	3.15	1.52	1.07	1.49	0.65	
5	B4	2.85	3.61	3.23	1.31	1.12	1.56	0.68	
5	B5	2.61	3.46	3.03	1.44	1.23	1.84	0.70	
5	B6	2.80	4.00	3.40	1.38	1.12	1.58	0.58	
5	B7	3.13	4.05	3.59	1.11	0.95	1.32	0.59	
5	B8	2.96	3.70	3.33	1.23	1.06	1.46	0.65	
5	B9	2.92	3.84	3.38	1.38	1.13	1.47	0.60	
5	B10	2.67	3.09	2.88	1.56	1.33	1.77	0.79	
5	B11	2.97	3.40	3.18	1.33	1.14	1.45	0.71	
5	B12	2.78	3.60	3.19	1.49	1.21	1.61	0.64	
5	B13	3.13	4.05	3.59	1.11	0.95	1.32	0.59	
5	B14	2.98	3.90	3.44	1.20	1.01	1.46	0.62	
5	B15	3.09	3.73	3.41	1.42	1.12	1.31	0.62	
5	B16	3.13	3.69	3.41	1.22	1.02	1.33	0.65	
5	B17	2.62	3.63	3.13	1.39	1.17	1.85	0.67	
5	B18	3.27	4.54	3.91	1.15	0.94	1.21	0.50	
5	B19	3.71	4.79	4.25	0.91	0.77	1.07	0.49	
5	B20	2.98	4.02	3.50	1.15	0.98	1.44	0.60	
5	B21	3.12	4.11	3.62	1.28	0.91	1.27	0.56	
5	B22	3.08	3.67	3.38	1.60	1.04	1.44	0.72	
5	B23	2.74	4.01	3.38	2.38	1.00	2.05	0.74	
5	C2	3.49	4.63	4.06	2.00	0.80	1.08	0.31	
5	C3	3.69	4.50	4.09	1.13	0.80	0.93	0.37	
5	C4	3.65	4.74	4.20	1.76	0.75	0.95	0.40	
5	C5	3.49	4.48	3.98	1.47	0.85	1.06	0.40	
5	C7	3.74	4.00	3.87	1.54	0.88	0.93	0.45	
5	C8	3.92	4.72	4.32	1.67	0.72	0.84	0.39	
5	C9	2.95	3.95	3.45	1.21	0.97	1.42	0.44	
5	C10	3.67	5.08	4.37	1.59	0.72	0.90	0.21	
5	C11	3.14	4.08	3.61	1.73	0.97	1.28	0.32	
5	C13	2.72	3.94	3.33	1.93	1.07	1.70	0.33	
5	C14	3.39	4.48	3.93	N/A	N/A	1.06	0.21	Beam frames into column - punching shear not applicable.
5	C15	-	-	-	N/A	N/A	-	-	Beam frames into column - punching shear not applicable. No GPR data at this location.
5	C16	3.88	4.73	4.30	N/A	N/A	0.82	0.24	Beam frames into column - punching shear not applicable.
5	C17	3.56	4.24	3.90	1.55	0.88	1.03	0.43	
5	C19	4.05	4.99	4.52	1.26	0.73	0.84	0.36	
5	C20	3.83	4.58	4.20	1.76	0.75	0.87	0.42	
5	C21	3.68	4.44	4.06	1.15	0.80	0.93	0.38	
5	C22	3.66	4.40	4.03	2.04	0.81	1.00	0.33	
5.5	D2	5.29	5.82	5.56	1.13	0.50	0.55	0.32	
5.5	D3	4.30	4.95	4.62	1.31	0.56	0.78	0.37	
5.5	D4	4.29	5.34	4.82	1.49	0.67	0.96	0.37	
5.5	D5	4.88	5.56	5.22	1.22	0.55	0.94	0.36	
5.5	D7	4.27	4.95	4.61	1.45	0.64	1.10	0.40	
5.5	D8	4.73	5.52	5.13	1.39	0.61	0.88	0.35	
5.5	D9	4.73	5.32	5.02	1.43	0.69	1.08	0.35	
5.5	D10	4.89	5.63	5.26	1.34	0.59	0.95	0.34	
5.5	D11	4.60	5.33	4.97	1.56	0.66	1.02	0.36	
5.5	D13	3.71	4.57	4.14	1.94	0.83	1.31	0.45	
5.5	D14	3.96	3.86	3.91	N/A	N/A	1.01	0.51	Beam frames into column - punching shear not applicable.
5.5	D15	3.32	4.08	3.70	N/A	N/A	1.36	0.33	Beam frames into column - punching shear not applicable.
5.5	D16	4.16	5.70	4.93	N/A	N/A	0.92	0.33	Beam frames into column - punching shear not applicable.
5.5	D17	4.26	5.09	4.67	1.43	0.64	1.11	0.40	
5.5	D19	4.37	5.30	4.83	1.35	0.61	1.07	0.37	
5.5	D20	4.46	5.43	4.95	1.44	0.65	0.92	0.36	
5.5	D21	4.75	5.44	5.10	1.14	0.50	0.64	0.33	
5.5	D22	3.61	4.59	4.10	1.74	0.73	1.10	0.41	
5.5	E1	5.07	5.59	5.33	2.30	0.73	0.82	0.23	
5.5	E2	4.63	5.26	4.94	N/A	N/A	0.58	0.45	Beam frames into column - punching shear not applicable.
5.5	E3	4.49	5.48	4.99	N/A	N/A	0.52	0.27	Beam frames into column - punching shear not applicable.
5.5	E4	4.19	4.98	4.59	2.27	0.86	1.66	0.51	
5.5	E5	3.96	4.59	4.28	2.88	0.83	1.57	0.54	
5.5	E6	-	-	-	-	-	-	-	No GPR data at this location.
5.5	E7	4.64	5.26	4.95	2.03	0.74	1.38	0.47	
5.5	E8	4.58	5.21	4.89	2.04	0.78	1.50	0.46	
5.5	E9	5.29	5.92	5.61	1.99	0.64	1.10	0.36	
5.5	E10	4.82	5.45	5.13	1.91	0.74	1.30	0.44	
5.5	E11	5.13	5.72	5.42	1.78	0.66	1.21	0.43	
5.5	E12	-	-	-	-	-	-	-	No GPR data at this location.
5.5	E13	4.22	4.37	4.29	2.49	0.87	1.50	0.58	
5.5	E14	4.61	5.30	4.95	2.03	0.77	1.38	0.46	
5.5	E15	3.80	4.42	4.11	3.17	0.93	1.62	0.50	
5.5	E16	4.00	4.66	4.33	2.46	0.91	1.62	0.53	
5.5	E17	3.40	4.43	3.91	3.27	0.92	1.82	0.56	
5.5	E18	-	-	-	-	-	-	-	No GPR data at this location.
5.5	E19	3.70	4.47	4.09	2.80	0.97	1.73	0.56	
5.5	E20	4.14	4.84	4.49	2.32	0.88	1.52	0.52	
5.5	E21	3.15	3.78	3.47	N/A	N/A	0.98	0.43	Beam frames into column - punching shear not applicable.
5.5	E22	-	-	-	N/A	N/A	-	-	Beam frames into column - punching shear not applicable. No GPR data at this location.
5.5	E23	3.06	4.18	3.62	3.88	1.13	1.87	0.42	

Legend

"d"	Effective depth, distance from extreme compression fiber to centroid of longitudinal tension reinforcement
NS	Bars extending in the north to south direction
EW	Bars extending in the east to west direction
PS	Punching shear
SAFE	CSI's Slab Analysis by the Finite Element Method
DCR	Demand-to-capacity ratio
	Values calculated based on perpendicular bar direction

Project Riverview Slab Investigation

Subject Level 6 – GPR Results and DCRs

Sheet No. 6 | 9
Project No. 200609.04
Date 14 January 2025
By/Chk By SGH

Slab Level	Column	Measured d at column (NS)	Measured d at column (EW)	Average d (for PS)	SAFE Punching Shear DCR	Direct Shear DCR	NS Moment DCR	EW Moment DCR	Notes
6	B1	3.38	4.50	3.94	2.14	0.90	1.68	0.67	
6	B2	2.49	3.55	3.02	1.97	1.25	2.21	0.76	
6	B3	2.84	3.26	3.05	1.57	1.12	1.53	0.70	
6	B4	2.99	3.78	3.39	1.22	1.04	1.43	0.65	
6	B5	3.19	3.85	3.52	1.14	0.97	1.28	0.62	
6	B6	3.37	4.31	3.84	1.16	0.96	1.17	0.52	
6	B7	3.27	4.04	3.66	1.09	0.93	1.24	0.59	
6	B8	2.66	3.39	3.03	1.44	1.23	1.28	0.72	
6	B9	2.71	3.73	3.22	1.43	1.19	1.69	0.61	
6	B10	2.74	3.27	3.01	1.46	1.24	1.68	0.75	
6	B11	3.16	4.04	3.60	1.11	0.95	1.30	0.59	
6	B12	3.48	4.30	3.89	1.15	0.95	1.13	0.52	
6	B13	4.16	4.92	4.54	0.83	0.71	0.93	0.48	
6	B14	3.93	4.67	4.30	0.91	0.77	1.01	0.51	
6	B15	4.12	4.69	4.40	1.01	0.82	0.92	0.48	
6	B16	4.22	4.79	4.51	0.86	0.72	0.93	0.49	
6	B17	4.16	4.78	4.47	0.85	0.73	0.94	0.49	
6	B18	4.22	5.11	4.66	0.91	0.76	0.90	0.44	
6	B19	4.14	4.88	4.51	0.84	0.72	0.94	0.48	
6	B20	4.00	4.81	4.40	0.87	0.75	0.98	0.50	
6	B21	3.86	4.61	4.23	1.03	0.75	0.98	0.48	
6	B22	4.13	4.89	4.51	1.11	0.73	1.04	0.53	
6	B23	4.29	5.11	4.70	1.69	0.74	1.16	0.57	
6	C2	3.62	4.24	3.93	2.39	0.82	1.05	0.34	
6	C3	3.98	4.68	4.33	1.59	0.68	0.83	0.31	
6	C4	4.01	4.54	4.27	1.71	0.75	0.82	0.43	
6	C5	3.60	3.09	3.34	1.83	1.05	0.99	0.61	
6	C7	4.01	4.60	4.31	1.31	0.77	0.84	0.38	
6	C8	3.46	4.28	3.87	1.91	0.82	1.04	0.43	
6	C9	3.08	3.77	3.42	1.24	0.99	1.32	0.47	
6	C10	2.92	3.93	3.43	2.19	0.97	1.29	0.31	
6	C11	2.93	3.81	3.37	1.87	1.05	1.45	0.34	
6	C13	3.98	4.74	4.36	1.33	0.77	0.85	0.27	
6	C14	3.11	4.90	4.00	N/A	N/A	1.18	0.18	Beam frames into column - punching shear not applicable.
6	C15	-	-	-	N/A	N/A	-	-	Beam frames into column - punching shear not applicable. No GPR data at this location.
6	C16	4.42	5.07	4.75	N/A	N/A	0.63	0.22	Beam frames into column - punching shear not applicable.
6	C17	4.10	4.89	4.50	1.26	0.74	0.82	0.36	
6	C19	4.24	5.10	4.67	1.18	0.70	0.79	0.34	
6	C20	4.32	5.03	4.67	1.50	0.67	0.75	0.38	
6	C21	4.25	4.77	4.51	1.50	0.65	0.77	0.30	
6	C22	3.97	4.53	4.25	2.16	0.75	0.92	0.32	
6.5	D2	4.35	4.98	4.67	1.46	0.62	0.77	0.38	
6.5	D3	4.22	4.84	4.53	1.35	0.58	0.80	0.38	
6.5	D4	3.77	4.71	4.24	1.78	0.78	1.13	0.42	
6.5	D5	4.79	5.37	5.08	1.26	0.57	0.96	0.37	
6.5	D7	4.28	5.21	4.75	1.39	0.62	1.09	0.38	
6.5	D8	4.47	5.15	4.81	1.52	0.66	0.95	0.38	
6.5	D9	6.38	4.74	5.56	1.23	0.61	0.77	0.40	
6.5	D10	3.71	4.36	4.04	1.95	0.83	1.31	0.46	
6.5	D11	6.13	3.77	4.95	1.55	0.66	0.73	0.54	
6.5	D13	4.63	5.42	5.02	1.45	0.65	1.01	0.37	
6.5	D14	5.10	5.64	5.37	N/A	N/A	0.63	0.33	Beam frames into column - punching shear not applicable.
6.5	D15	3.34	3.40	3.37	N/A	N/A	1.36	0.41	Beam frames into column - punching shear not applicable.
6.5	D16	4.18	5.17	4.67	N/A	N/A	0.91	0.37	Beam frames into column - punching shear not applicable.
6.5	D17	4.78	5.44	5.11	1.26	0.57	0.97	0.37	
6.5	D19	4.82	6.14	5.48	1.13	0.52	0.95	0.32	
6.5	D20	5.07	6.00	5.53	1.22	0.56	0.79	0.32	
6.5	D21	5.30	5.89	5.60	1.00	0.44	0.52	0.30	
6.5	D22	5.05	5.84	5.45	1.17	0.51	0.58	0.32	
6.5	E1	4.43	4.63	4.53	2.90	0.88	1.05	0.29	
6.5	E2	-	-	-	N/A	N/A	-	-	Beam frames into column - punching shear not applicable. No GPR data at this location.
6.5	E3	3.23	4.17	3.70	N/A	N/A	0.95	0.37	Beam frames into column - punching shear not applicable.
6.5	E4	4.32	4.66	4.49	2.34	0.89	1.61	0.55	
6.5	E5	4.25	4.88	4.57	2.27	0.86	1.53	0.51	
6.5	E6	4.21	4.75	4.48	2.79	0.82	2.31	0.44	
6.5	E7	3.78	4.95	4.36	2.42	0.91	1.75	0.50	
6.5	E8	4.61	5.19	4.90	2.06	0.79	1.50	0.48	
6.5	E9	4.63	5.13	4.88	2.45	0.75	1.28	0.42	
6.5	E10	4.11	4.74	4.42	2.39	0.89	1.56	0.53	
6.5	E11	5.15	5.77	5.46	1.76	0.69	1.21	0.43	
6.5	E12	4.28	4.78	4.53	2.76	0.82	1.36	0.43	
6.5	E13	4.93	5.36	5.14	1.93	0.75	1.28	0.47	
6.5	E14	5.12	5.54	5.33	1.85	0.72	1.24	0.45	
6.5	E15	4.63	5.26	4.94	2.44	0.75	1.30	0.41	
6.5	E16	4.92	5.36	5.14	1.94	0.75	1.29	0.46	
6.5	E17	4.66	5.13	4.89	2.06	0.79	1.35	0.48	
6.5	E18	4.42	5.13	4.77	2.54	0.76	1.30	0.40	
6.5	E19	5.17	5.89	5.53	1.72	0.68	1.20	0.42	
6.5	E20	4.72	5.36	5.04	1.97	0.77	1.33	0.47	
6.5	E21	4.72	4.55	4.64	N/A	N/A	0.48	0.35	
6.5	E22	5.02	5.64	5.33	N/A	N/A	0.52	0.41	Beam frames into column - punching shear not applicable.
6.5	E23	4.49	5.23	4.86	2.64	0.81	1.02	0.32	

Legend

"d"	Effective depth, distance from extreme compression fiber to centroid of longitudinal tension reinforcement
NS	Bars extending in the north to south direction
EW	Bars extending in the east to west direction
PS	Punching shear
SAFE	CSI's Slab Analysis by the Finite Element Method
DCR	Demand-to-capacity ratio
(shaded)	Values calculated based on perpendicular bar direction

SGH

Project: Riverview Slab Investigation

Subject: Level 7 - GPR Results and DCRs

Sheet No. 7 / 9
Project No. 200609.04
Date 14 January 2025
By/Chk By SGH

Slab Level	Column	Measured d at column (NS)	Measured d at column (EW)	Average d (for PS)	SAFE Punching Shear DCR	Direct Shear DCR	NS Moment DCR	EW Moment DCR	Notes
7	B1	4.43	5.26	4.84	1.40	0.68	0.97	0.49	
7	B2	4.42	5.14	4.78	1.00	0.72	1.22	0.50	
7	B3	4.11	4.73	4.42	1.03	0.77	1.22	0.50	
7	B4	4.00	4.74	4.37	0.94	0.82	1.31	0.55	
7	B5	3.91	5.04	4.47	0.90	0.78	1.33	0.51	
7	B6	3.60	4.75	4.18	1.13	0.94	1.41	0.52	
7	B7	4.26	4.47	4.36	0.93	0.81	1.21	0.58	
7	B8	3.79	4.72	4.25	0.97	0.83	1.38	0.55	
7	B9	4.01	4.69	4.35	1.08	0.90	1.25	0.53	
7	B10	3.94	4.59	4.26	0.96	0.83	1.33	0.56	
7	B11	4.13	4.50	4.32	0.94	0.82	1.25	0.57	
7	B12	3.86	4.63	4.24	1.12	0.93	1.30	0.54	
7	B13	3.72	4.56	4.14	1.00	0.86	1.41	0.56	
7	B14	4.14	3.97	4.05	1.03	0.89	1.25	0.66	
7	B15	3.50	4.90	4.20	1.38	1.14	1.45	0.51	
7	B16	3.50	4.24	3.87	1.09	0.94	1.52	0.61	
7	B17	4.08	4.77	4.43	0.92	0.79	1.26	0.54	
7	B18	3.13	3.91	3.52	1.40	1.16	1.66	0.64	
7	B19	3.59	4.49	4.04	1.03	0.89	1.47	0.57	
7	B20	3.66	4.14	3.90	1.09	0.94	1.44	0.64	
7	B21	3.72	4.23	3.97	1.73	1.26	1.33	0.57	
7	B22	2.67	4.23	3.45	1.56	1.07	2.22	0.61	
7	B23	2.92	4.56	3.74	2.04	0.90	1.90	0.56	
7	C2	4.90	5.35	5.13	1.09	0.54	0.83	0.32	
7	C3	4.59	5.36	4.98	1.01	0.51	0.86	0.35	
7	C4	4.42	5.10	4.76	1.11	0.62	0.91	0.38	
7	C5	4.09	4.83	4.46	1.20	0.66	0.98	0.39	
7	C7	4.68	5.30	4.99	1.03	0.57	0.85	0.35	
7	C8	4.07	5.07	4.57	1.17	0.64	0.99	0.37	
7	C9	4.46	5.09	4.78	1.11	0.61	0.88	0.38	
7	C10	4.39	4.98	4.68	1.13	0.62	0.92	0.38	
7	C11	4.55	5.02	4.78	1.10	0.60	0.87	0.37	
7	C13	4.80	5.24	5.02	1.03	0.57	0.82	0.36	
7	C14	3.99	4.98	4.49	N/A	N/A	1.03	0.38	Beam frames into column - punching shear not applicable.
7	C15	-	-	-	N/A	N/A	-	-	Beam frames into column - punching shear not applicable. No GPR data at this location.
7	C16	4.17	5.43	4.80	N/A	N/A	0.99	0.33	Beam frames into column - punching shear not applicable.
7	C17	4.24	5.31	4.78	1.09	0.61	0.94	0.35	
7	C19	4.04	4.49	4.27	1.28	0.70	1.00	0.42	
7	C20	4.30	4.94	4.62	1.16	0.64	0.93	0.39	
7	C21	4.07	4.74	4.41	1.21	0.60	0.97	0.41	
7	C22	3.60	4.88	4.24	1.43	0.68	1.21	0.35	
7	D2	4.73	5.93	5.33	1.17	0.57	0.71	0.28	
7	D3	4.52	5.71	5.11	1.09	0.54	0.74	0.30	
7	D4	4.49	4.65	4.57	1.48	0.78	0.96	0.41	
7	D5	4.78	5.80	5.29	1.13	0.58	0.88	0.31	
7	D7	4.23	3.17	3.70	1.85	0.91	1.03	0.63	
7	D8	4.35	5.19	4.77	1.41	0.74	0.99	0.36	
7	D9	4.08	4.68	4.38	1.61	0.91	1.06	0.40	
7	D10	4.29	5.10	4.69	1.45	0.75	1.02	0.36	
7	D11	4.34	4.84	4.59	1.58	0.80	1.00	0.39	
7	D13	5.32	6.04	5.68	1.13	0.60	0.79	0.31	
7	D14	5.23	6.14	5.68	N/A	N/A	0.79	0.28	Beam frames into column - punching shear not applicable.
7	D15	5.48	5.89	5.69	N/A	N/A	0.69	0.23	Beam frames into column - punching shear not applicable.
7	D16	5.02	5.59	5.31	N/A	N/A	0.85	0.31	Beam frames into column - punching shear not applicable.
7	D17	5.37	5.74	5.56	1.06	0.55	0.77	0.32	
7	D19	4.19	4.24	4.22	1.55	0.78	1.04	0.45	
7	D20	3.90	4.61	4.26	1.64	0.86	1.13	0.41	
7	D21	4.37	4.99	4.68	1.24	0.61	0.76	0.35	
7	D22	4.68	5.13	4.91	1.31	0.63	0.72	0.32	
7	E1	5.11	4.57	4.84	2.58	0.80	0.86	0.37	
7	E2	4.23	4.85	4.54	N/A	N/A	0.68	0.53	Beam frames into column - punching shear not applicable.
7	E3	5.20	5.38	5.29	N/A	N/A	0.56	0.29	Beam frames into column - punching shear not applicable.
7	E4	5.51	4.95	5.23	1.82	0.72	1.26	0.54	
7	E5	5.43	5.45	5.44	1.71	0.68	1.27	0.47	
7	E6	4.94	4.55	4.75	2.60	0.61	1.50	0.47	
7	E7	4.77	5.39	5.08	1.89	0.74	1.47	0.48	
7	E8	-	-	-	-	-	-	-	No GPR data at this location.
7	E9	4.36	4.75	4.56	2.57	0.63	1.75	0.45	
7	E10	4.98	5.01	5.00	1.94	0.75	1.41	0.52	
7	E11	4.80	5.48	5.14	1.86	0.73	1.46	0.47	
7	E12	4.71	4.52	4.61	2.73	0.63	1.60	0.48	
7	E13	5.23	5.89	5.56	1.67	0.66	1.34	0.44	
7	E14	4.78	5.66	5.22	1.85	0.72	1.49	0.46	
7	E15	4.62	5.25	4.94	2.32	0.57	1.67	0.41	
7	E16	5.40	5.45	5.43	1.74	0.69	1.31	0.48	
7	E17	5.29	6.16	5.72	1.59	0.64	1.31	0.42	
7	E18	4.41	5.03	4.72	2.62	0.61	1.70	0.42	
7	E19	3.89	4.60	4.25	2.44	0.91	1.83	0.57	
7	E20	4.03	4.55	4.29	2.42	0.92	1.77	0.60	
7	E21	4.34	4.97	4.66	N/A	N/A	0.62	0.30	Beam frames into column - punching shear not applicable.
7	E22	4.41	5.04	4.73	N/A	N/A	0.65	0.50	Beam frames into column - punching shear not applicable.
7	E23	3.99	4.35	4.17	3.17	0.95	1.32	0.39	

Legend

"d"	Effective depth, distance from extreme compression fiber to centroid of longitudinal tension reinforcement
NS	Bars extending in the north to south direction
EW	Bars extending in the east to west direction
PS	Punching shear
SAFE	CSI's Slab Analysis by the Finite Element Method
DCR	Demand-to-capacity ratio
(shaded)	Values calculated based on perpendicular bar direction

Project Riverview Slab Investigation
Subject Level 8 – GPR Results and DCRs

Sheet No. 8 | 9
Project No. 200609.04
Date 14 January 2025
By/Chk By SGH

Slab Level	Column	Measured d at column (NS)	Measured d at column (EW)	Average d (for PS)	SAFE Punching Shear DCR	Direct Shear DCR	NS Moment DCR	EW Moment DCR	Notes
8	B1	-	-	-	-	-	-	-	No GPR data at this location.
8	B2	3.57	4.20	3.89	1.95	1.07	1.67	0.72	
8	B3	3.70	4.33	4.02	1.58	0.69	1.22	0.47	
8	B4	3.32	3.95	3.64	1.55	0.79	1.42	0.58	
8	B5	3.95	4.26	4.10	1.29	0.67	1.15	0.53	
8	B6	4.16	4.79	4.47	1.41	0.67	1.08	0.45	
8	B7	3.70	4.32	4.01	1.34	0.69	1.25	0.52	
8	B8	3.57	4.19	3.88	1.40	0.72	1.31	0.53	
8	B9	2.98	2.99	2.98	2.49	1.00	0.86	0.51	
8	B10	4.16	4.78	4.47	1.16	0.61	1.09	0.46	
8	B11	4.14	3.63	3.88	1.40	0.72	1.08	0.64	
8	B12	3.42	4.04	3.73	1.80	0.84	1.34	0.55	
8	B13	2.97	3.06	3.02	2.06	1.03	1.61	0.77	
8	B14	2.71	3.34	3.02	2.07	1.03	1.82	0.69	
8	B15	2.59	3.21	2.90	2.62	1.17	1.96	0.70	
8	B16	2.87	3.51	3.19	1.89	0.95	1.69	0.66	
8	B17	2.47	3.12	2.79	2.34	1.16	2.15	0.75	
8	B18	3.23	3.85	3.54	1.93	0.89	1.45	0.57	
8	B19	4.37	3.46	3.92	1.38	0.71	1.03	0.67	
8	B20	4.00	4.61	4.30	1.23	0.64	1.15	0.50	
8	B21	4.92	3.60	4.26	1.43	0.64	0.91	0.61	
8	B22	5.03	5.54	5.28	1.28	0.73	1.15	0.53	
8	B23	-	-	-	-	-	-	-	No GPR data at this location.
8	C2	3.66	5.07	4.37	2.77	1.13	1.50	0.45	
8	C3	3.67	4.48	4.08	2.24	0.86	1.17	0.43	
8	C4	4.20	5.11	4.66	1.74	0.71	0.97	0.37	
8	C5	4.66	5.55	5.10	1.31	0.75	0.88	0.34	
8	C7	4.23	4.73	4.48	1.56	0.76	0.84	0.39	
8	C8	4.30	4.87	4.59	1.88	0.79	0.95	0.37	
8	C9	3.96	4.31	4.13	1.40	0.73	0.91	0.46	
8	C10	3.70	4.33	4.02	2.29	0.95	1.13	0.42	
8	C11	4.17	4.74	4.45	1.58	0.77	0.84	0.39	
8	C13	3.65	3.89	3.77	2.06	1.03	1.17	0.50	
8	C14	4.07	3.23	3.65	N/A	N/A	1.01	0.57	Beam frames into column - punching shear not applicable.
8	C15	3.10	3.93	3.51	N/A	N/A	1.44	0.48	Beam frames into column - punching shear not applicable.
8	C16	3.07	3.61	3.34	N/A	N/A	1.45	0.49	Beam frames into column - punching shear not applicable.
8	C17	3.10	4.43	3.77	2.05	1.02	1.43	0.43	
8	C19	3.70	4.94	4.32	1.69	0.92	1.15	0.38	
8	C20	5.07	5.35	5.21	1.46	0.62	0.78	0.35	
8	C21	4.34	5.10	4.72	1.81	0.71	0.96	0.37	
8	C22	5.20	5.79	5.49	1.97	0.85	1.00	0.39	
8	D2	4.41	5.27	4.84	N/A	N/A	0.53	0.31	Beam frames into column - punching shear not applicable.
8	D3	4.29	5.21	4.75	N/A	N/A	0.48	0.25	Beam frames into column - punching shear not applicable.
8	D4	4.20	4.82	4.51	2.87	1.03	1.37	0.37	
8	D5	4.39	5.15	4.77	4.95	1.15	1.40	0.33	
8	D7	5.19	5.83	5.51	1.90	0.74	0.90	0.32	
8	D8	4.35	5.34	4.84	5.57	1.10	1.42	0.32	
8	D9	4.50	5.50	5.00	1.89	0.91	1.19	0.37	
8	D10	5.04	5.76	5.40	4.77	0.95	1.19	0.29	
8	D11	4.71	5.46	5.09	2.23	0.98	1.09	0.35	
8	D13	4.87	5.29	5.08	1.77	0.69	0.99	0.34	
8	D14	4.51	3.80	4.15	N/A	N/A	1.01	0.37	Beam frames into column - punching shear not applicable.
8	D15	4.68	3.77	4.23	N/A	N/A	0.80	0.35	Beam frames into column - punching shear not applicable.
8	D16	4.57	4.97	4.77	N/A	N/A	0.99	0.27	Beam frames into column - punching shear not applicable.
8	D17	4.28	4.79	4.54	2.11	0.70	1.26	0.38	
8	D19	5.27	6.02	5.65	3.62	0.93	1.13	0.29	
8	D20	5.07	5.87	5.47	2.16	0.81	1.10	0.30	
8	D21	4.79	5.54	5.17	N/A	N/A	0.42	0.23	Beam frames into column - punching shear not applicable.
8	D22	5.66	5.80	5.73	N/A	N/A	0.46	0.28	Beam frames into column - punching shear not applicable.
8	E1	5.56	6.19	5.88	1.76	0.60	0.68	0.56	No GPR data at this location, used as-designed bars.
8	E2	5.56	6.19	5.88	N/A	N/A	0.21	0.25	Beam frames into column - punching shear not applicable. No GPR data at this location, used as-designed bars.
8	E3	5.56	6.19	5.88	N/A	N/A	0.19	0.20	Beam frames into column - punching shear not applicable. No GPR data at this location, used as-designed bars.
8	E4	4.40	4.96	4.68	2.44	0.84	1.04	0.49	
8	E5	4.57	5.13	4.85	2.57	0.81	1.08	0.49	
8	E6	4.28	4.84	4.56	3.16	0.92	1.15	0.45	
8	E7	4.65	5.22	4.94	2.51	0.79	1.06	0.48	
8	E8	4.79	5.36	5.08	2.42	0.76	1.03	0.47	
8	E9	5.09	5.65	5.37	2.19	0.71	0.95	0.44	
8	E10	5.56	6.19	5.88	1.89	0.64	0.86	0.40	No GPR data at this location, used as-designed bars.
8	E11	4.79	5.35	5.07	2.42	0.76	1.03	0.48	
8	E12	5.56	6.19	5.88	2.18	0.68	0.85	0.36	No GPR data at this location, used as-designed bars.
8	E13	3.10	3.66	3.38	4.30	1.23	1.72	0.70	
8	E14	5.56	6.19	5.88	1.65	0.57	0.54	0.37	No GPR data at this location, used as-designed bars.
8	E15	4.47	5.04	4.75	1.98	0.65	0.71	0.40	
8	E16	4.27	4.84	4.55	2.44	0.78	0.89	0.48	
8	E17	4.30	4.86	4.58	2.74	0.86	1.00	0.51	
8	E18	5.16	5.72	5.44	2.44	0.74	0.92	0.38	
8	E19	4.88	5.44	5.16	2.33	0.76	1.00	0.46	
8	E20	5.09	5.65	5.37	1.99	0.71	0.87	0.43	
8	E21	5.56	6.19	5.88	N/A	N/A	0.19	0.20	Beam frames into column - punching shear not applicable. No GPR data at this location, used as-designed bars.
8	E22	4.12	4.68	4.40	N/A	N/A	0.30	0.33	Beam frames into column - punching shear not applicable.
8	E23	5.56	6.19	5.88	1.76	0.60	0.67	0.56	No GPR data at this location, used as-designed bars.

Legend

"d"	Effective depth, distance from extreme compression fiber to centroid of longitudinal tension reinforcement
NS	Bars extending in the north to south direction
EW	Bars extending in the east to west direction
PS	Punching shear
SAFE	CSI's Slab Analysis by the Finite Element Method
DCR	Demand-to-capacity ratio
(shaded)	Values calculated based on perpendicular bar direction

Project	Riverview Slab Investigation
Subject	High Roof – GPR Results and DCRs
Sheet No.	9 | 9
Project No.	200609.04
Date	14 January 2025
By/Chk By	SGH

Slab Level	Column	Measured d at column (NS)	Measured d at column (EW)	Average d (for PS)	SAFE Punching Shear DCR	Direct Shear DCR	NS Moment DCR	EW Moment DCR	Notes
High Roof	B2	3.75	4.25	4.00	0.50	0.16	0.32	0.12	No GPR data at this location, calculated based on 2" cover from exploratory openings
High Roof	B3	3.75	4.25	4.00	1.25	0.45	1.76	0.43	No GPR data at this location, calculated based on 2" cover from exploratory openings
High Roof	B4	4.79	5.29	5.04	1.16	0.42	1.75	0.42	
High Roof	B5	4.75	5.05	4.90	1.22	0.43	1.79	0.44	
High Roof	B6	4.78	4.78	4.78	1.26	0.44	1.77	0.46	
High Roof	B7	4.93	5.43	5.18	1.12	0.40	1.71	0.40	
High Roof	B8	5.02	5.52	5.27	1.09	0.39	1.68	0.39	
High Roof	B9	5.06	5.56	5.31	1.08	0.39	1.66	0.39	
High Roof	B10	4.91	5.41	5.16	1.12	0.40	1.71	0.40	
High Roof	B11	4.97	4.90	4.94	1.19	0.42	1.67	0.44	
High Roof	B12	4.97	5.47	5.22	1.09	0.39	1.66	0.39	
High Roof	B13	4.74	5.24	4.99	1.19	0.42	1.79	0.42	
High Roof	B14	4.67	5.17	4.92	1.23	0.43	1.86	0.43	
High Roof	B15	4.89	5.39	5.14	1.16	0.41	1.78	0.41	
High Roof	B16	4.89	5.39	5.14	1.15	0.41	1.75	0.41	
High Roof	B17	4.98	5.48	5.23	1.11	0.40	1.69	0.40	
High Roof	B18	4.86	5.36	5.11	1.15	0.41	1.74	0.41	
High Roof	B19	3.75	4.25	4.00	1.62	0.54	2.29	0.52	No GPR data at this location, calculated based on 2" cover from exploratory openings
High Roof	B20	3.75	4.25	4.00	1.62	0.55	2.26	0.53	No GPR data at this location, calculated based on 2" cover from exploratory openings
High Roof	B21	4.68	5.18	4.93	0.94	0.35	1.39	0.35	
High Roof	B22	3.75	4.25	4.00	0.50	0.16	0.32	0.12	No GPR data at this location, calculated based on 2" cover from exploratory openings
High Roof	C2	3.50	4.19	3.84	N/A	N/A	0.11	0.22	Bearing wall below - punching shear not applicable. No GPR data at this location, calculated based on 2" cover from exploratory openings
High Roof	C3	4.19	4.91	4.55	0.74	0.00	0.77	0.28	
High Roof	C4	4.19	4.65	4.42	0.98	0.58	1.04	0.29	
High Roof	C5	4.29	4.64	4.46	0.97	0.57	1.03	0.24	
High Roof	C6	4.57	5.28	4.92	1.12	0.65	0.96	0.21	
High Roof	C7	4.19	4.88	4.54	0.95	0.56	1.06	0.23	
High Roof	C8	4.02	5.26	4.64	0.97	0.57	1.10	0.21	
High Roof	C9	4.06	4.63	4.35	0.99	0.58	1.09	0.24	
High Roof	C10	4.13	4.47	4.30	1.03	0.60	1.08	0.25	
High Roof	C11	4.64	4.63	4.64	N/A	N/A	0.88	0.24	Beam frames into column - punching shear not applicable.
High Roof	C12	4.85	4.59	4.72	N/A	N/A	1.87	0.26	Beam frames into column - punching shear not applicable.
High Roof	C13	4.72	5.22	4.97	0.89	0.50	0.96	0.22	
High Roof	C14	4.45	5.18	4.81	N/A	N/A	1.04	0.20	Beam frames into column - punching shear not applicable.
High Roof	C15	3.50	4.19	3.84	N/A	N/A	1.28	0.23	Beam frames into column - punching shear not applicable. No GPR data at this location, calculated based on 2" cover from exploratory openings
High Roof	C16	4.26	4.76	4.51	N/A	N/A	1.11	0.23	Beam frames into column - punching shear not applicable.
High Roof	C17	4.18	5.36	4.77	0.90	0.53	1.07	0.21	
High Roof	C18	4.48	4.98	4.73	0.88	0.52	0.98	0.22	
High Roof	C19	4.78	4.42	4.60	0.93	0.55	0.91	0.26	
High Roof	C20	4.07	4.65	4.36	1.01	0.60	1.07	0.29	
High Roof	C21	4.76	4.89	4.82	0.69	0.42	0.67	0.28	
High Roof	C22	3.50	4.19	3.84	N/A	N/A	0.11	0.22	Bearing wall below - punching shear not applicable. No GPR data at this location, calculated based on 2" cover from exploratory openings
High Roof	D2	3.50	4.19	3.84	N/A	N/A	0.01	0.30	Bearing wall below - punching shear not applicable. No GPR data at this location, calculated based on 2" cover from exploratory openings
High Roof	D3	3.87	4.63	4.25	0.41	0.34	0.31	0.18	
High Roof	D4	4.27	4.85	4.56	0.44	0.36	0.29	0.15	
High Roof	D5	4.07	4.66	4.36	0.42	0.37	0.29	0.13	
High Roof	D6	4.15	4.61	4.38	0.52	0.40	0.28	0.13	
High Roof	D7	3.91	4.43	4.17	0.42	0.38	0.32	0.14	
High Roof	D8	4.24	4.84	4.54	0.42	0.35	0.29	0.13	
High Roof	D9	4.12	4.73	4.42	0.39	0.35	0.30	0.13	
High Roof	D10	4.12	4.88	4.50	0.38	0.34	0.30	0.13	
High Roof	D11	4.73	5.44	5.08	N/A	N/A	0.22	0.11	Beam frames into column - punching shear not applicable.
High Roof	D12	3.50	4.19	3.84	N/A	N/A	0.51	0.04	Beam frames into column - punching shear not applicable. No GPR data at this location, calculated based on 2" cover from exploratory openings
High Roof	D13	3.50	4.19	3.84	0.50	0.44	0.35	0.14	No GPR data at this location, calculated based on 2" cover from exploratory openings
High Roof	D14	3.50	4.19	3.84	N/A	N/A	0.35	0.13	Beam frames into column - punching shear not applicable. No GPR data at this location, calculated based on 2" cover from exploratory openings
High Roof	D15	3.50	4.19	3.84	N/A	N/A	0.32	0.06	Beam frames into column - punching shear not applicable. No GPR data at this location, calculated based on 2" cover from exploratory openings
High Roof	D16	4.12	4.81	4.47	N/A	N/A	0.31	0.12	Beam frames into column - punching shear not applicable. No GPR data at this location, calculated based on 2" cover from exploratory openings
High Roof	D17	4.58	5.20	4.89	0.45	0.35	0.28	0.13	
High Roof	D18	4.59	4.75	4.67	0.41	0.34	0.26	0.13	
High Roof	D19	5.42	4.87	5.15	0.36	0.31	0.22	0.12	
High Roof	D20	3.87	4.56	4.21	0.48	0.40	0.32	0.17	
High Roof	D21	4.15	4.84	4.49	0.41	0.27	0.28	0.16	
High Roof	D22	3.50	4.19	3.84	N/A	N/A	0.01	0.31	Bearing wall below - punching shear not applicable. No GPR data at this location, calculated based on 2" cover from exploratory openings

Legend

"d"	Effective depth, distance from extreme compression fiber to centroid of longitudinal tension reinforcement
NS	Bars extending in the north to south direction
EW	Bars extending in the east to west direction
PS	Punching shear
SAFE	CSI's Slab Analysis by the Finite Element Method
DCR	Demand-to-capacity ratio
(shaded)	Values calculated based on perpendicular bar direction

APPENDIX E - REBOUND HAMMER RESULTS

SGH

Project Riverview Slab Investigation

Subject Rebound Hammer Readings

Sheet No. 1 | 3
Project No. 200609.04
Date 18 Jan & 20 June 2024
By/Chk By MKT/LMS

NOTE:
TEST RESULTS HIGHLIGHTED IN GRAY ARE DISCARDED READINGS THAT DIFFERED FROM THE AVERAGE BY MORE THAN 6 UNITS.

Test No.	Test	Slab Level	Interior/ Exterior	Rebound Number	Reading 1	2	3	4	5	6	7	8	9	10	11	12
1	W1	6.5	Interior	51.7	53	52	48	57	54	56	46	47	53	51	57	46
2	W2	6.5	Interior	49.8	52	46	51	48	50	51	46	50	49	54	54	46
3	W3	6.5	Interior	50.1	48	50	47	53	51	52	54	49	49	47	54	47
4	W5	5.5	Interior	49.2	54	52	46	49	50	48	46	52	45	0	54	45
5	W6	5.5	Interior	47.3	47	48	45	49	49	50	48	48	44	46	50	44
6	W7	4.5	Interior	46.9	50	47	47	48	49	47	43	45	47	0	50	43
7	W8	4.5	Interior	47.5	46	46	47	50	49	50	44	46	48	50	50	44
8	W9	4.5	Interior	47.5	47	47	45	49	50	48	45	49	48	0	50	45
9	W10	3.5	Interior	45.9	45	46	47	44	50	50	45	44	42	0	50	42
10	W11	3.5	Interior	47.5	48	48	48	47	50	46	46	47	46	48	50	46
11	W12	3.5	Interior	46.8	48	45	45	45	48	43	46	48	51	48	51	43
12	W13	2.5	Interior	48.6	45	45	50	53	51	50	45	48	50	48	53	45
13	W14	2.5	Interior	50.4	52	51	53	54	51	46	47	52	47	52	54	46
14	W15	2.5	Interior	49.3	51	49	50	50	48	52	50	48	46	0	52	46
15	E1	6.5	Interior	46.1	46	44	46	46	46	50	45	44	46	46	50	44
16	E2	6.5	Interior	45.6	45	46	44	46	47	46	46	48	43	45	48	43
17	E3	6.5	Interior	45.3	46	47	45	46	46	44	46	46	45	43	47	43
18	E4	5.5	Interior	45.6	47	50	43	46	50	44	41	44	47	44	50	41
19	E5	5.5	Interior	45.3	48	43	50	44	44	46	44	45	44	43	50	43
20	E6	5.5	Interior	46.1	46	45	48	44	45	48	45	44	48	48	48	44
21	E7	4.5	Interior	48.7	46	44	51	54	46	49	52	47	52	45	54	44
22	E8	4.5	Interior	48.4	50	46	50	48	46	48	48	51	47	50	51	46
23	E9	4.5	Interior	44.0	44	44	46	45	42	42	48	43	41	44	48	41
24	E10	3.5	Interior	48.3	49	45	52	45	44	50	51	52	48	48	52	44
25	E11	3.5	Interior	50.1	46	50	54	53	49	46	50	54	49	0	54	46
26	E12	3.5	Interior	50.1	54	48	53	50	47	46	48	55	48	51	55	46
27	E13	2.5	Interior	42.5	43	42	42	42	40	44	40	40	47	0	47	40
28	E14	2.5	Interior	44.1	41	50	43	39	46	40	47	44	46	44	50	39
29	E15	2.5	Interior	46.0	44	44	44	45	45	51	46	44	46	48	51	44
30	508E	6	Exterior	42.5	46	41	43	42	41	42	41	41	41	45	46	41
31	508M	6	Exterior	40.8	42	42	41	42	44	42	36	38	43	40	44	36
32	508W	6	Exterior	41.8	42	41	43	44	42	39	42	42	42	0	44	39
33	504E	6	Exterior	44.5	43	47	40	46	44	45	42	48	44	47	48	40
34	504M	6	Exterior	45.5	48	46	42	43	45	47	49	43	46	0	49	42
35	504W	6	Exterior	44.6	44	45	42	46	46	45	45	43	46	45	46	42
36	107E	2	Exterior	48.3	52	50	46	48	48	47	46	46	46	52	52	46
37	107M	2	Exterior	40.3	38	42	40	42	44	38	38	40	41	38	44	38
38	107W	2	Exterior	44.8	40	45	46	46	46	44	47	46	44	46	47	40
39	104E	2	Exterior	43.3	44	45	40	44	46	43	41	42	44	44	46	40

Project Riverview Slab Investigation

Subject Rebound Hammer Readings

Sheet No. 2 | 3

Project No. 200609.04

Date 18 Jan & 20 June 2024

By/Chk By MKT/LMS

NOTE:
TEST RESULTS HIGHLIGHTED IN GRAY ARE DISCARDED READINGS THAT DIFFERED FROM THE AVERAGE BY MORE THAN 6 UNITS.

Test No.	Test	Slab Level	Interior/ Exterior	Rebound Number	Reading											
					1	2	3	4	5	6	7	8	9	10	11	12
40	104M	2	Exterior	35.3	34	39	34	37	36	38	30	33	35	38	39	30
41	104W	2	Exterior	42.1	44	46	40	38	44	42	42	46	39	40	46	38
42	402E	5	Exterior	41.6	43	43	40	40	43	42	40	40	43	42	43	40
43	402M	5	Exterior	49.0	48	46	50	50	48	50	48	50	52	48	52	46
44	402W	5	Exterior	40.4	44	41	38	38	39	42	39	37	44	42	44	37
45	305E	4	Exterior	38.5	38	40	37	39	40	36	39	38	40	0	40	36
46	305M	4	Exterior	40.3	39	40	39	39	42	42	40	40	40	42	42	39
47	305W	4	Exterior	41.4	44	41	40	42	44	42	38	42	42	40	44	38
48	502E	6	Exterior	44.0	47	43	45	46	46	44	44	40	42	0	47	40
49	502W	6	Exterior	45.0	47	45	46	46	48	40	44	48	46	42	48	40
50	201E	3	Exterior	47.8	48	48	44	48	46	52	49	48	50	45	52	44
51	201W	3	Exterior	49.0	50	52	48	48	48	52	48	46	48	50	52	46
52	W Stairs	8	Interior	51.2	49	52	56	50	51	53	50	51	50	50		
53	W Stairs	8	Interior	51.0	53	49	48	0	50	50	52	56	49	52		
54	W Stairs	8	Interior	50.6	52	48	46	53	54	49	56	50	50	48		
55	E Stairs	8	Interior	48.2	47	49	48	50	48	44	50	44	48	54		
56	E Stairs	8	Interior	50.0	48	54	52	50	47	46	50	52	0	51	50	
57	E Stairs	8	Interior	49.9	52	52	48	50	54	50	48	0	47	48		
58	E Stairs	7	Interior	45.7	40	40	50	48	48	44	48	48	47	44		
59	E Stairs	7	Interior	45.3	48	42	0	45	44	46	45	46	44	48		
60	W Stairs	7	Interior	49.4	50	47	50	46	52	49	52	54	46	48		
61	W Stairs	7	Interior	48.5	50	48	48	50	48	50	48	47	50	46		
62	703	8	Exterior	43.1	0	44	0	44	46	44	40	46	44	42	38	
63	703	8	Exterior	44.6	44	0	46	42	46	44	44	40	44	48	48	
64	704	8	Exterior	40.6	39	36	40	40	46	42	42	39	42	40		
65	704	8	Exterior	40.9	38	38	45	42	46	37	38	43	44	38		
66	701	8	Exterior	40.9	38	38	45	42	46	37	38	43	44	38		
67	701	8	Exterior	43.6	41	46	38	41	43	48	40	46	45	48		
68	702	8	Exterior	40.8	38	35	45	44	41	40	42	0	38	37	48	
69	702	8	Exterior	45.4	48	42	40	46	48	46	0	48	46	46	44	
70	702	8	Exterior	43.7	46	42	46	46	44	41	40	46	44	42		
71	706	8	Exterior	46.1	48	44	46	47	48	46	44	48	44	0		
72	706	8	Exterior	42.2	38	43	48	38	48	38	42	40	40	47		
73	706	8	Exterior	41.6	38	41	46	40	38	44	39	46	40	44		
74	707	8	Exterior	42.4	0	42	44	44	44	0	39	43	44	39		
75	707	8	Exterior	41.7	44	40	44	42	40	41	42	44	42	38		
76	707	8	Exterior	44.8	48	44	39	47	46	41	44	48	45	46		
77	708	8	Exterior	43.7	41	46	40	42	43	0	46	41	49	45		
78	708	8	Exterior	43.0	42	42	46	47	41	42	39	40	43	48		

Project Riverview Slab Investigation

Subject Rebound Hammer Readings

Sheet No. 3 | 3

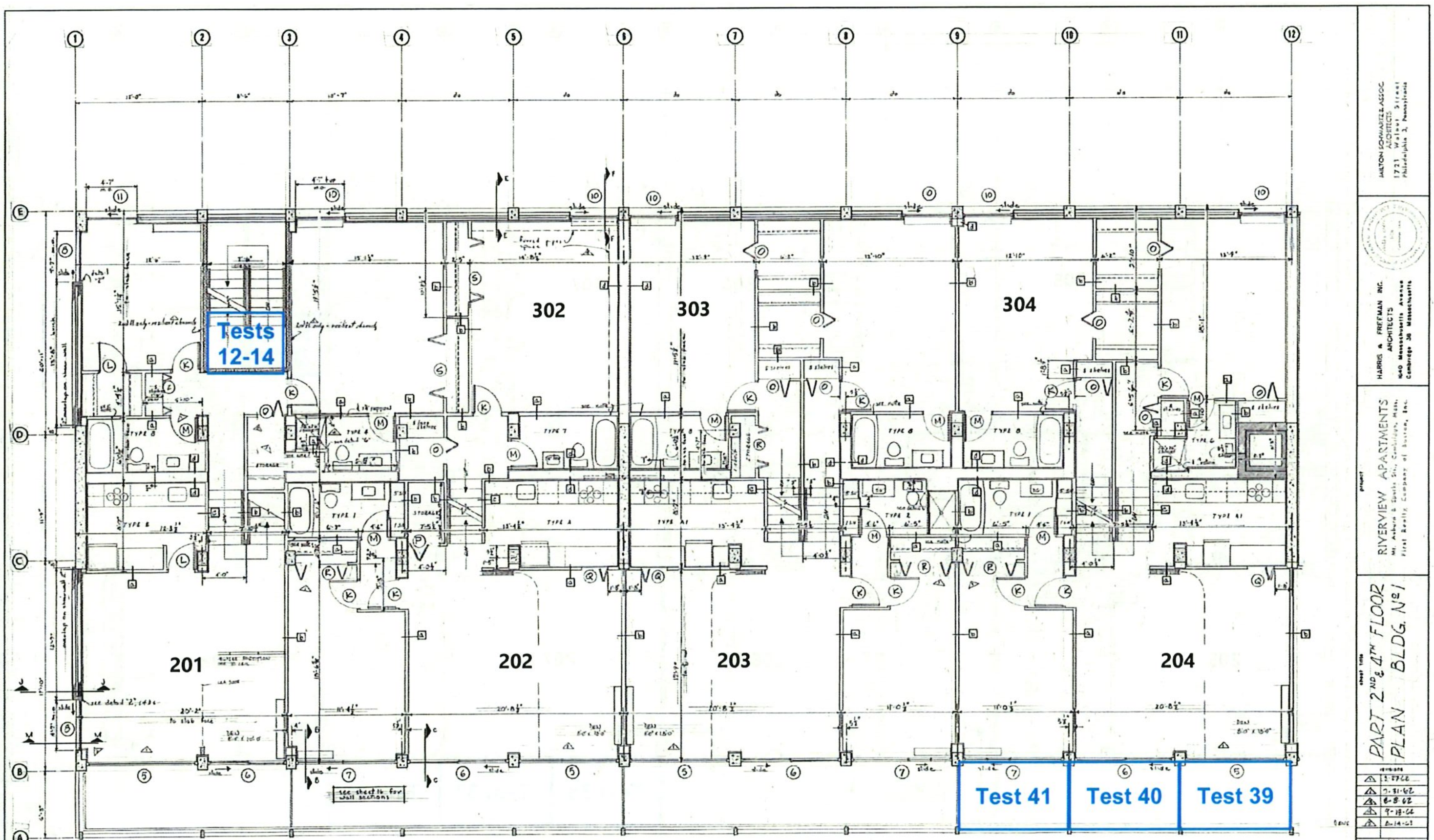
Project No. 200609.04

Date 18 Jan & 20 June 2024

By/Chk By MKT/LMS

NOTE:
TEST RESULTS HIGHLIGHTED IN GRAY ARE DISCARDED READINGS THAT DIFFERED FROM THE AVERAGE BY MORE THAN 6 UNITS.

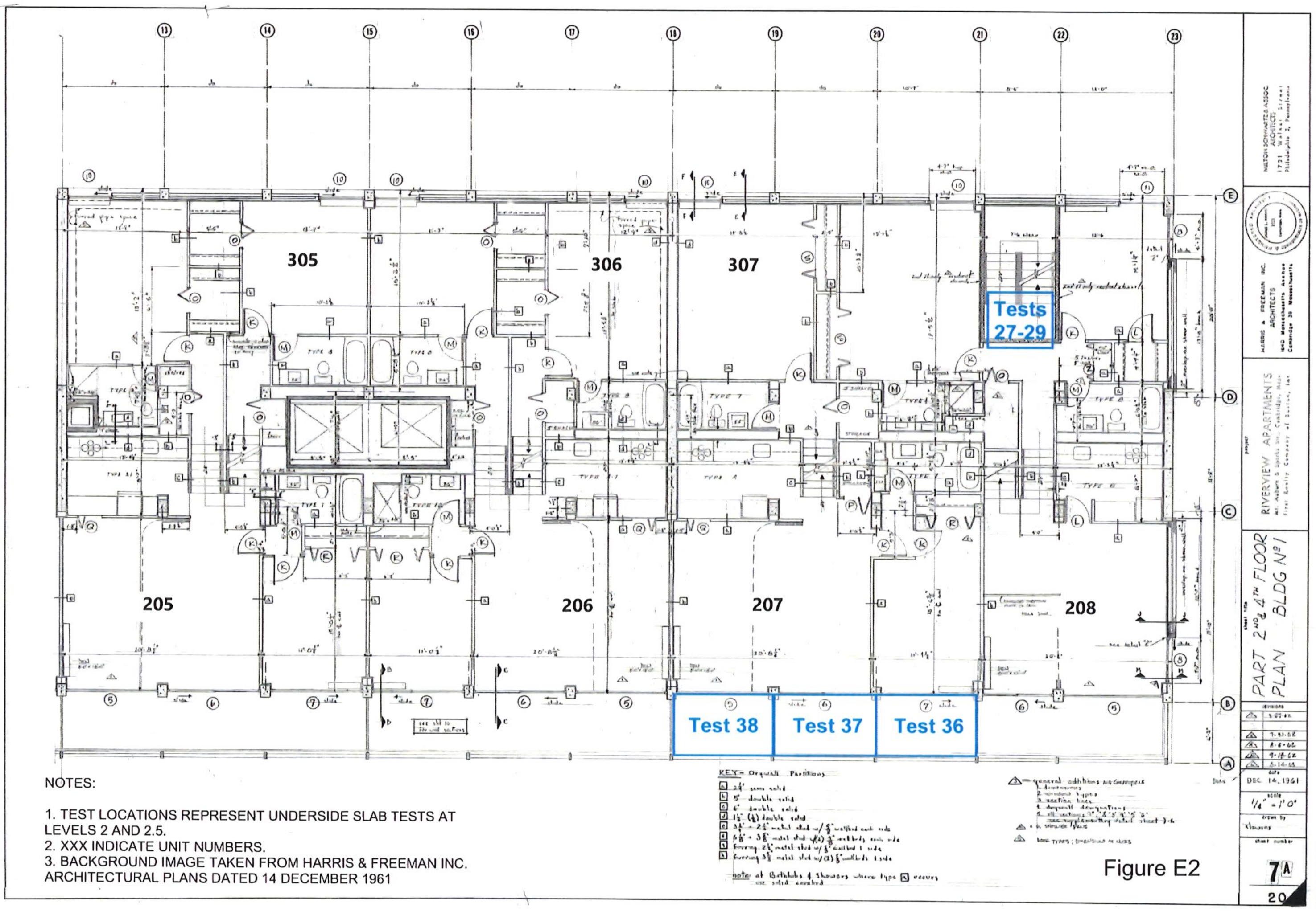
Test No.	Test	Slab Level	Interior/ Exterior	Rebound Number	Reading											
					1	2	3	4	5	6	7	8	9	10	11	12
79	603	7	Exterior	40.8	38	40	40	44	40	40	42	42	42	40		
80	603	7	Exterior	41.4	43	39	39	40	42	42	43	41	42	43		
81	603	7	Exterior	43.6	44	46	39	42	46	44	40	45	44	46		
82	705	8	Exterior	42.9	44	44	45	45	46	41	37	41	44	42		
83	705	8	Exterior	43.5	38	42	47	44	45	48	41	45	41	44		
84	705	8	Exterior	44.5	45	44	44	48	40	46	48	48	41	41		
85	604	7	Exterior	40.3	44	41	45	39	38	36	42	38	38	42		
86	604	7	Exterior	41.4	40	43	42	41	38	40	38	44	44	44		
87	604	7	Exterior	41.5	37	44	38	40	44	38	44	45	43	42		
88	605	7	Exterior	41.2	38	42	43	40	45	44	36	43	44	37		
89	608	7	Exterior	44.1	40	43	42	44	45	46	0	45	46	46		
90	608	7	Exterior	45.6	41	42	44	0	50	45	46	47	48	47		



NOTES:

1. TEST LOCATIONS REPRESENT UNDERSIDE SLAB TESTS AT LEVELS 2 AND 2.5.
2. XXX INDICATE UNIT NUMBERS.
3. BACKGROUND IMAGE TAKEN FROM HARRIS & FREEMAN INC. ARCHITECTURAL PLANS DATED 14 DECEMBER 1961

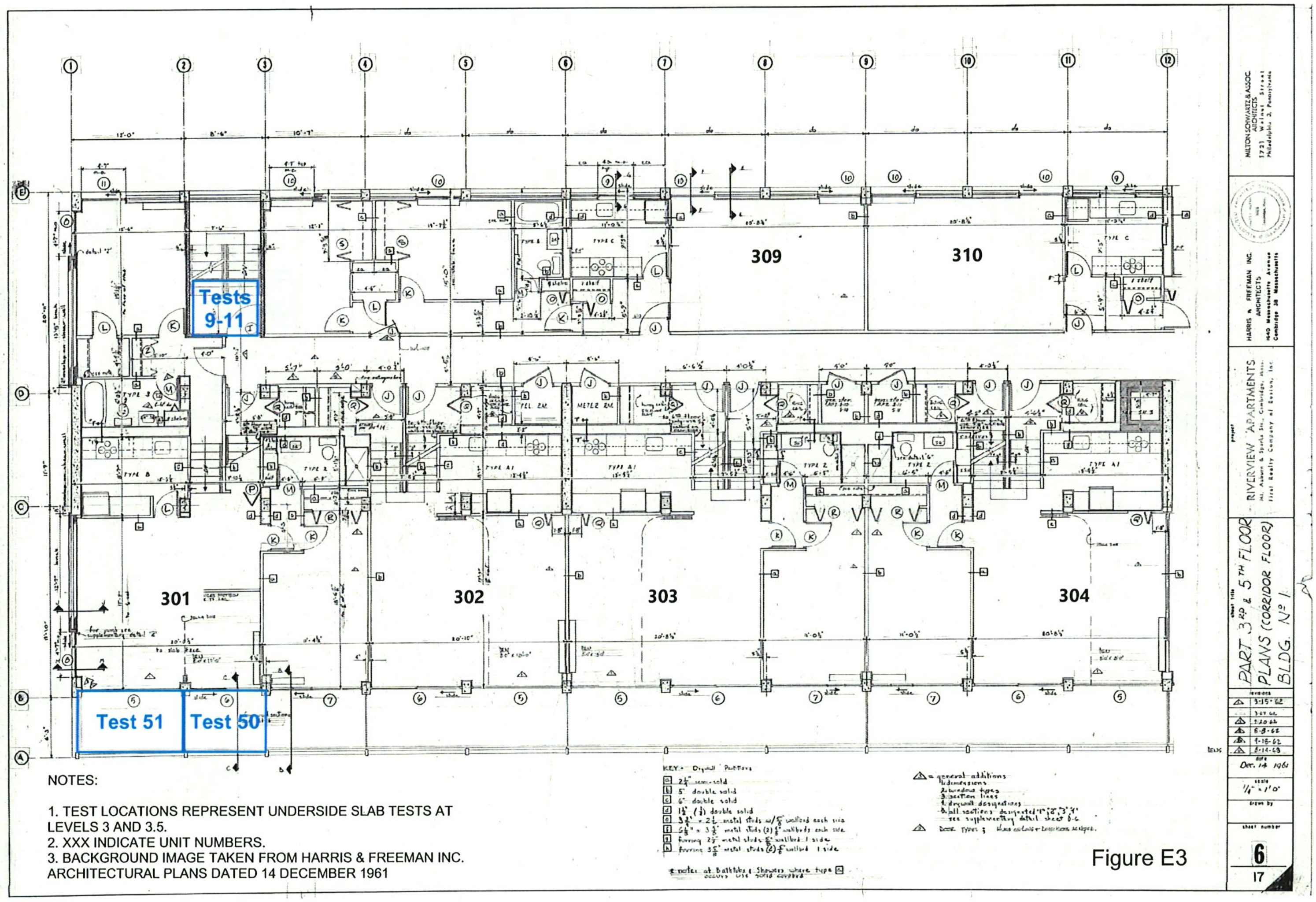
Figure E1



NOTES:

1. TEST LOCATIONS REPRESENT UNDERSIDE SLAB TESTS AT LEVELS 2 AND 2.5.
2. XXX INDICATE UNIT NUMBERS.
3. BACKGROUND IMAGE TAKEN FROM HARRIS & FREEMAN INC. ARCHITECTURAL PLANS DATED 14 DECEMBER 1961

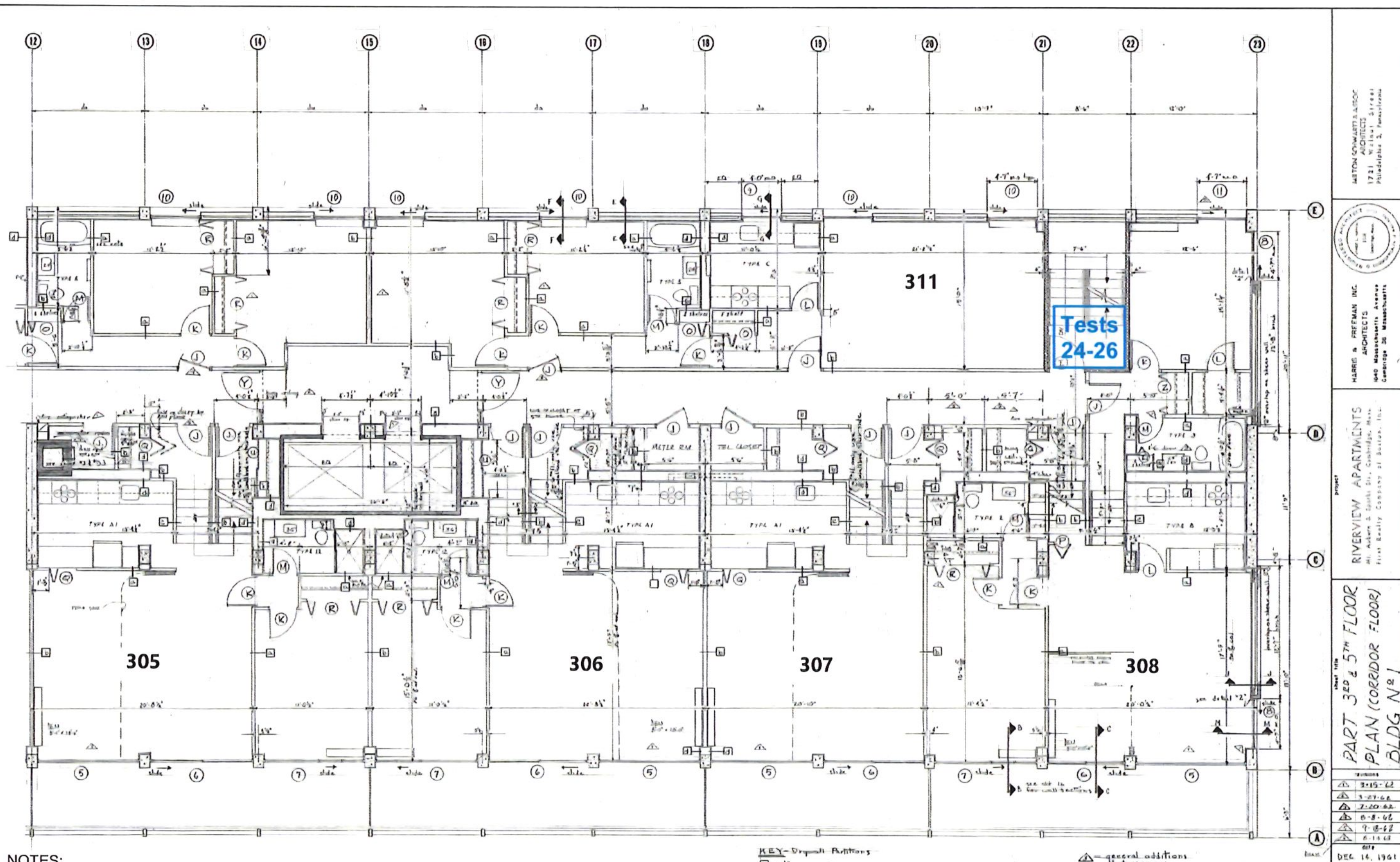
Figure E2



NOTES:

1. TEST LOCATIONS REPRESENT UNDERSIDE SLAB TESTS AT LEVELS 3 AND 3.5.
2. XXX INDICATE UNIT NUMBERS.
3. BACKGROUND IMAGE TAKEN FROM HARRIS & FREEMAN INC. ARCHITECTURAL PLANS DATED 14 DECEMBER 1961

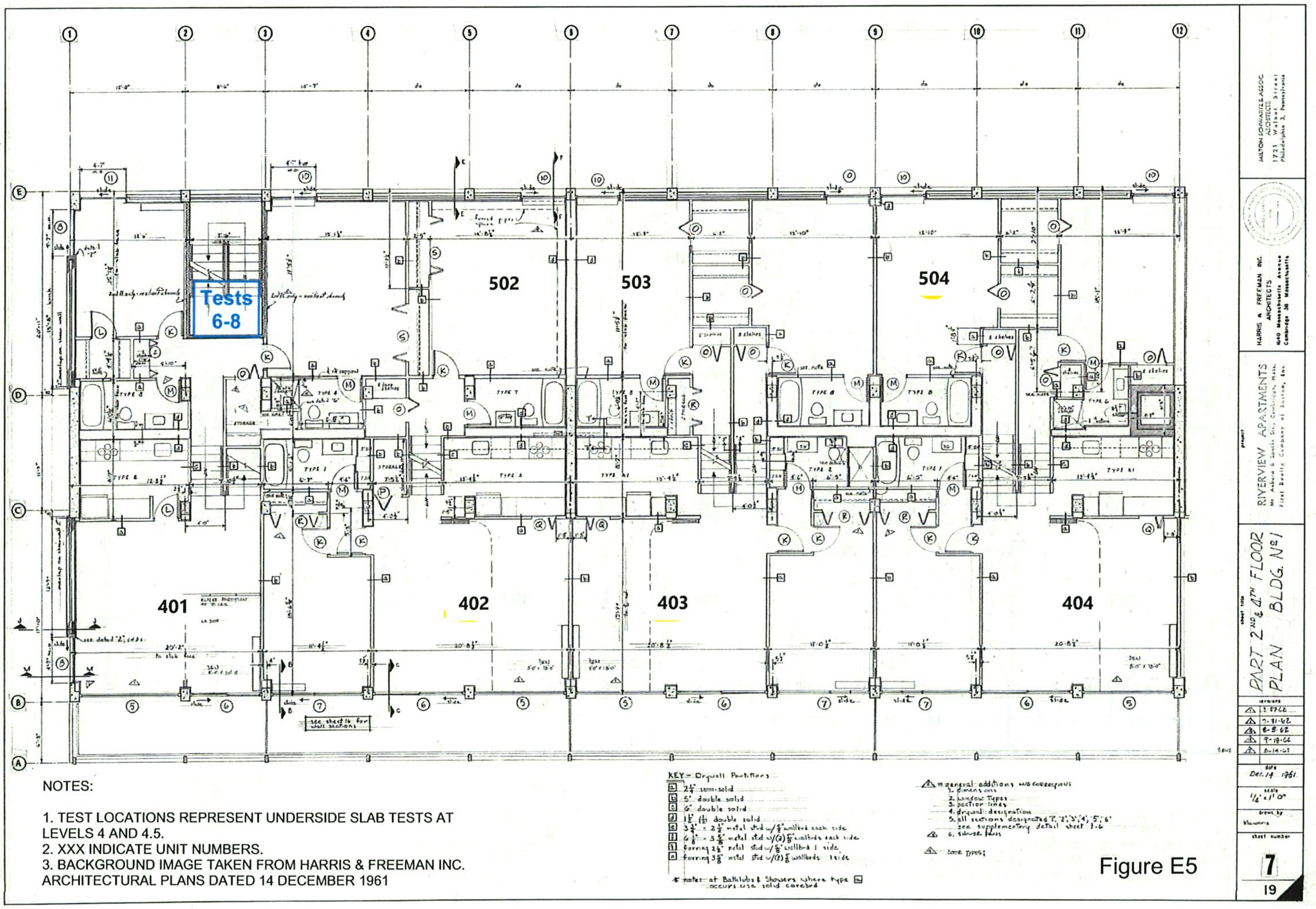
Figure E3



NOTES:

1. TEST LOCATIONS REPRESENT UNDERSIDE SLAB TESTS AT LEVELS 3 AND 3.5.
2. XXX INDICATE UNIT NUMBERS.
3. BACKGROUND IMAGE TAKEN FROM HARRIS & FREEMAN INC. ARCHITECTURAL PLANS DATED 14 DECEMBER 1961

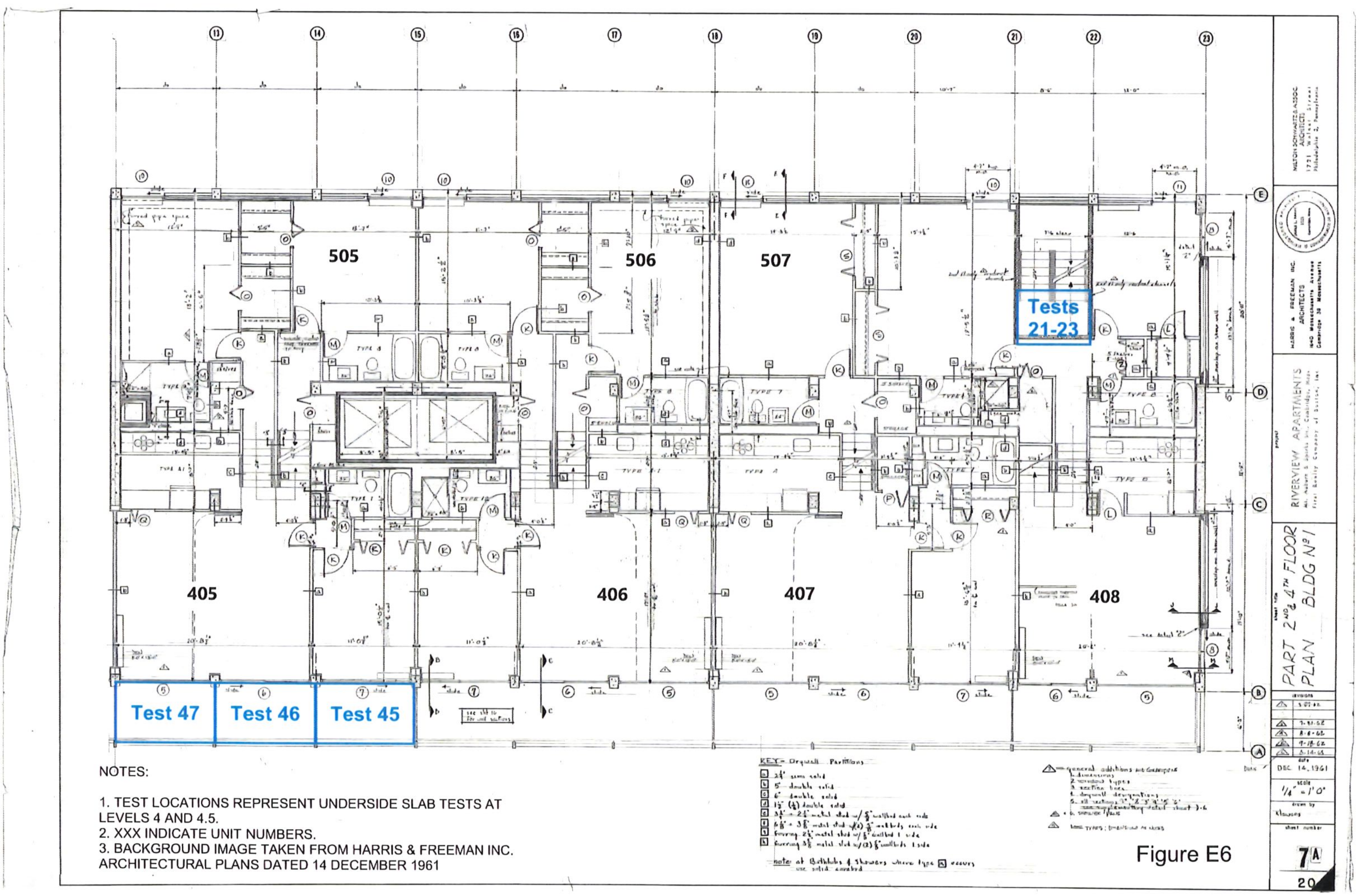
Figure E4



NOTES:

1. TEST LOCATIONS REPRESENT UNDERSIDE SLAB TESTS AT LEVELS 4 AND 4.5.
2. XXX INDICATE UNIT NUMBERS.
3. BACKGROUND IMAGE TAKEN FROM HARRIS & FREEMAN INC. ARCHITECTURAL PLANS DATED 14 DECEMBER 1961

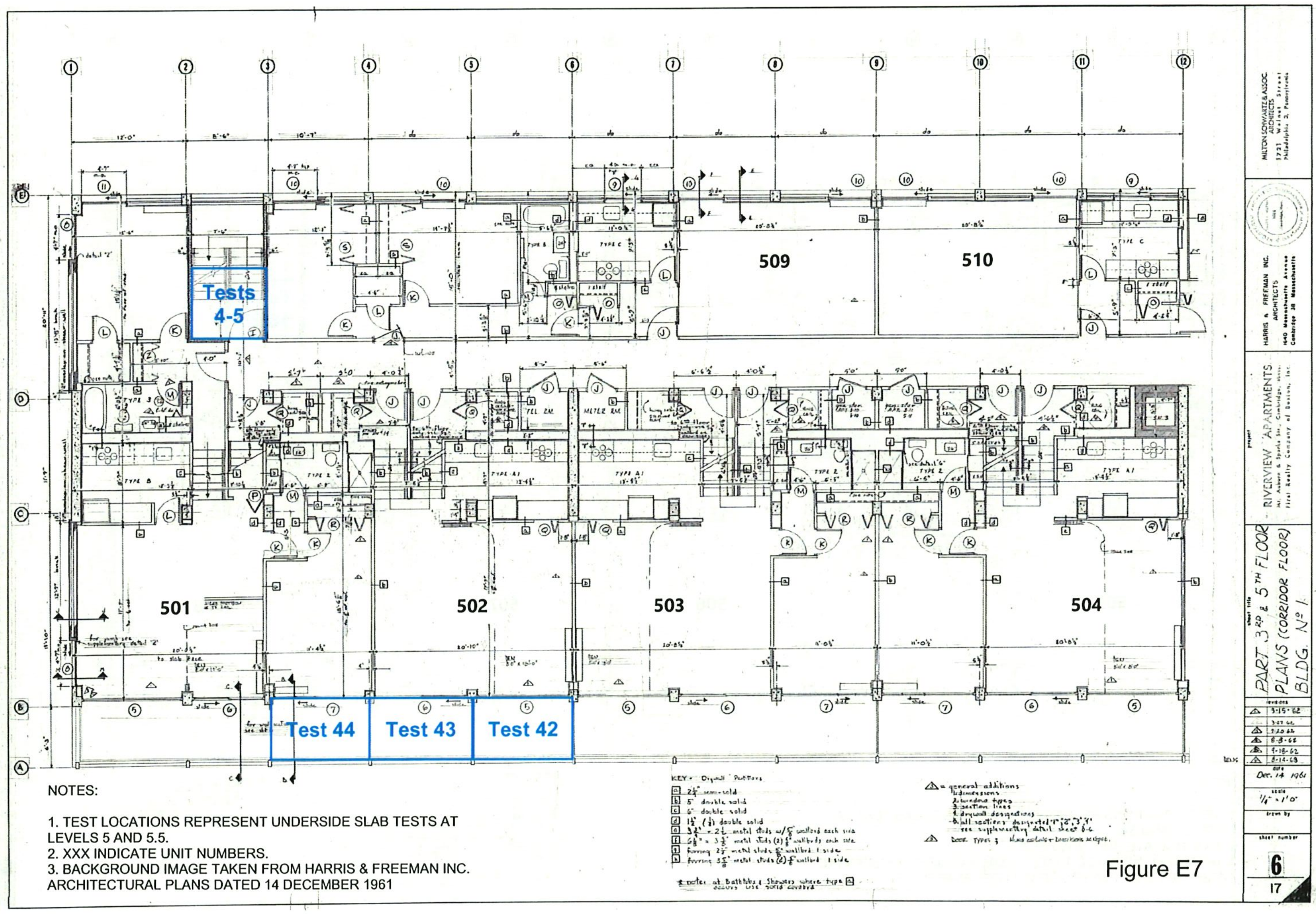
Figure E5



NOTES:

1. TEST LOCATIONS REPRESENT UNDERSIDE SLAB TESTS AT LEVELS 4 AND 4.5.
2. XXX INDICATE UNIT NUMBERS.
3. BACKGROUND IMAGE TAKEN FROM HARRIS & FREEMAN INC. ARCHITECTURAL PLANS DATED 14 DECEMBER 1961

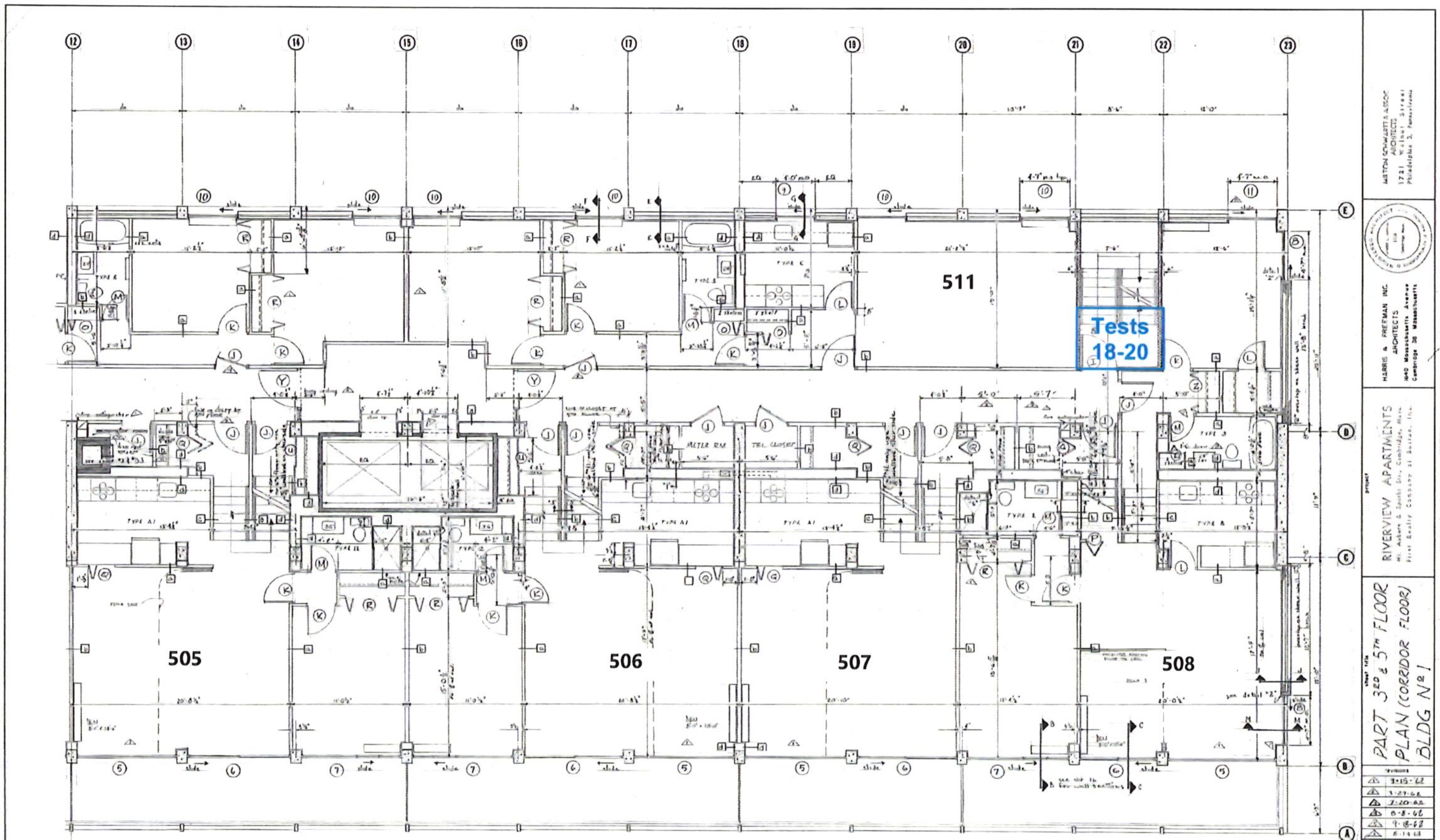
Figure E6



NOTES:

1. TEST LOCATIONS REPRESENT UNDERSIDE SLAB TESTS AT LEVELS 5 AND 5.5.
2. XXX INDICATE UNIT NUMBERS.
3. BACKGROUND IMAGE TAKEN FROM HARRIS & FREEMAN INC. ARCHITECTURAL PLANS DATED 14 DECEMBER 1961

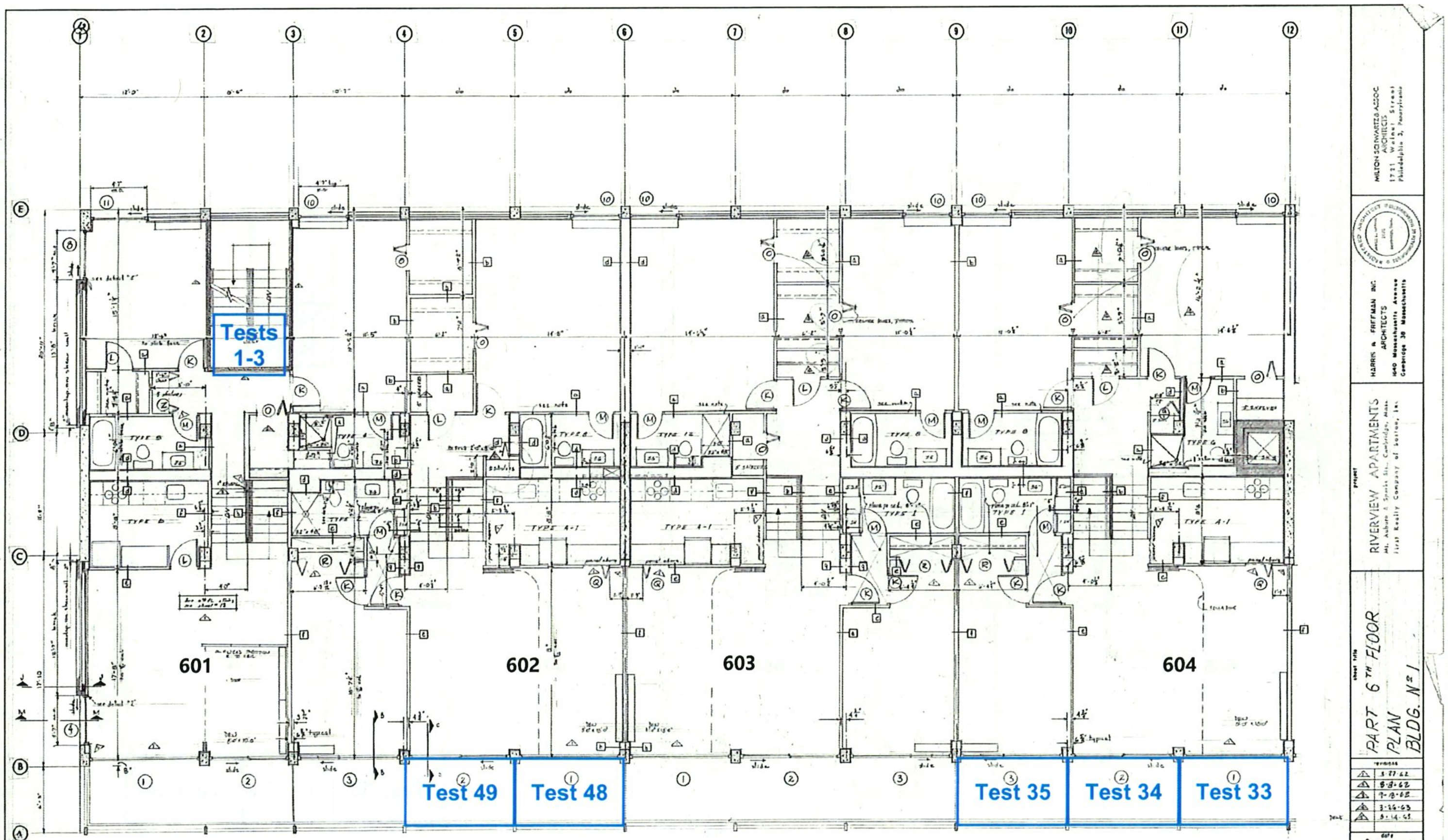
Figure E7



NOTES:

1. TEST LOCATIONS REPRESENT UNDERSIDE SLAB TESTS AT LEVELS 5 AND 5.5.
2. XXX INDICATE UNIT NUMBERS.
3. BACKGROUND IMAGE TAKEN FROM HARRIS & FREEMAN INC. ARCHITECTURAL PLANS DATED 14 DECEMBER 1961

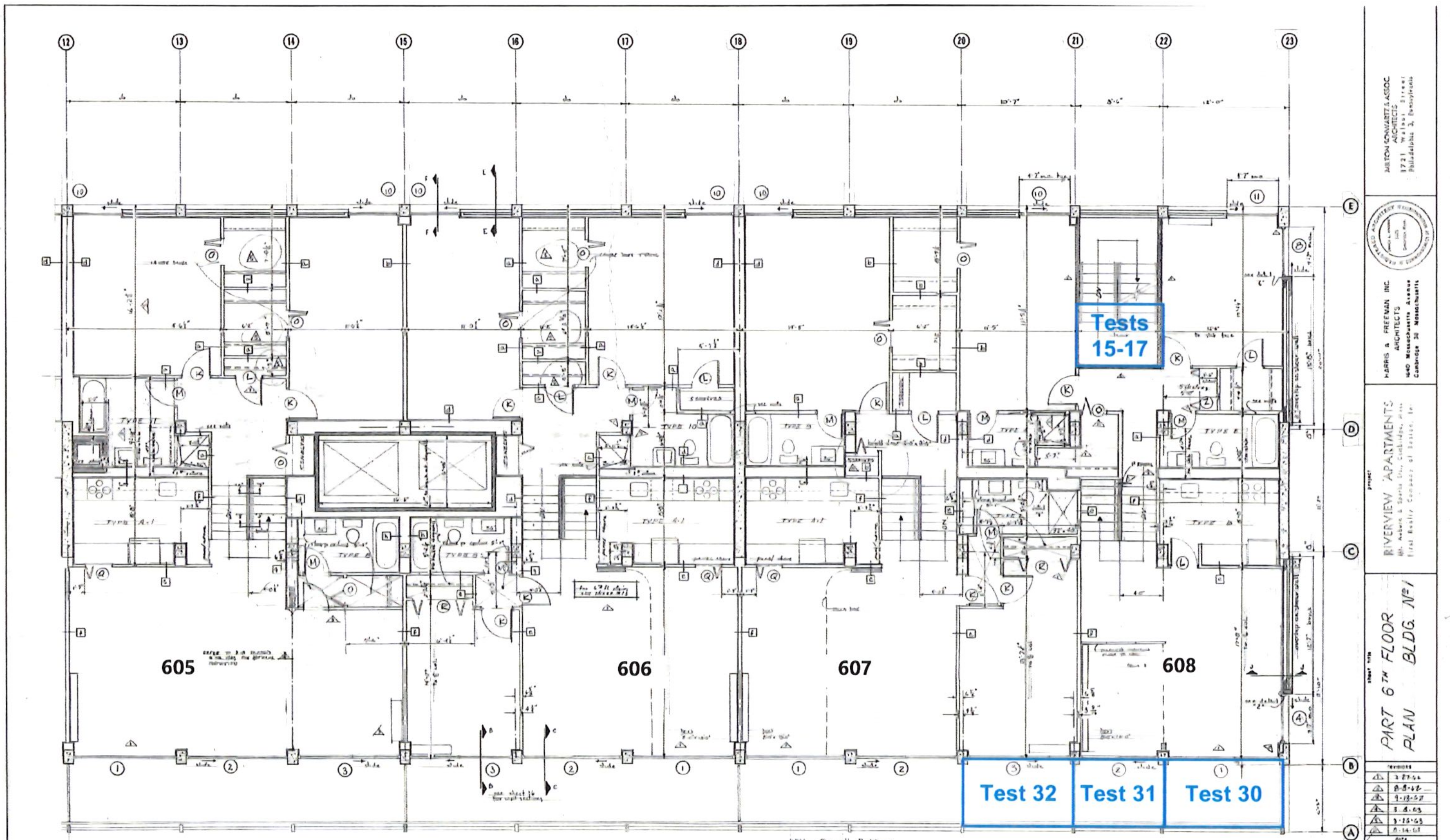
Figure E8



NOTES:

1. TEST LOCATIONS REPRESENT UNDERSIDE SLAB TESTS AT LEVELS 6 AND 6.5.
2. XXX INDICATE UNIT NUMBERS.
3. BACKGROUND IMAGE TAKEN FROM HARRIS & FREEMAN INC. ARCHITECTURAL PLANS DATED 14 DECEMBER 1961

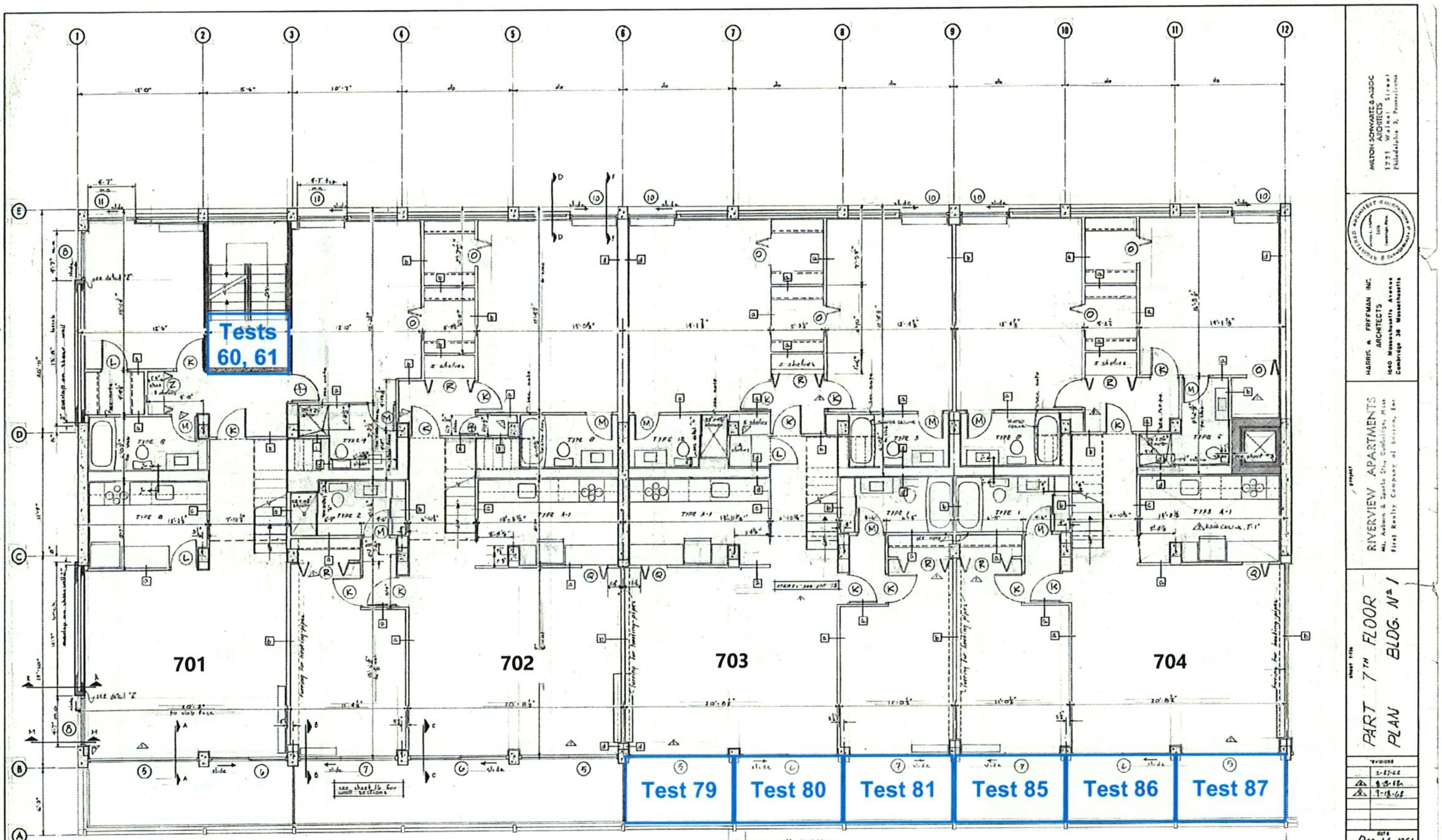
Figure E9



NOTES:

1. TEST LOCATIONS REPRESENT UNDERSIDE SLAB TESTS AT LEVELS 6 AND 6.5.
2. XXX INDICATE UNIT NUMBERS.
3. BACKGROUND IMAGE TAKEN FROM HARRIS & FREEMAN INC. ARCHITECTURAL PLANS DATED 14 DECEMBER 1961

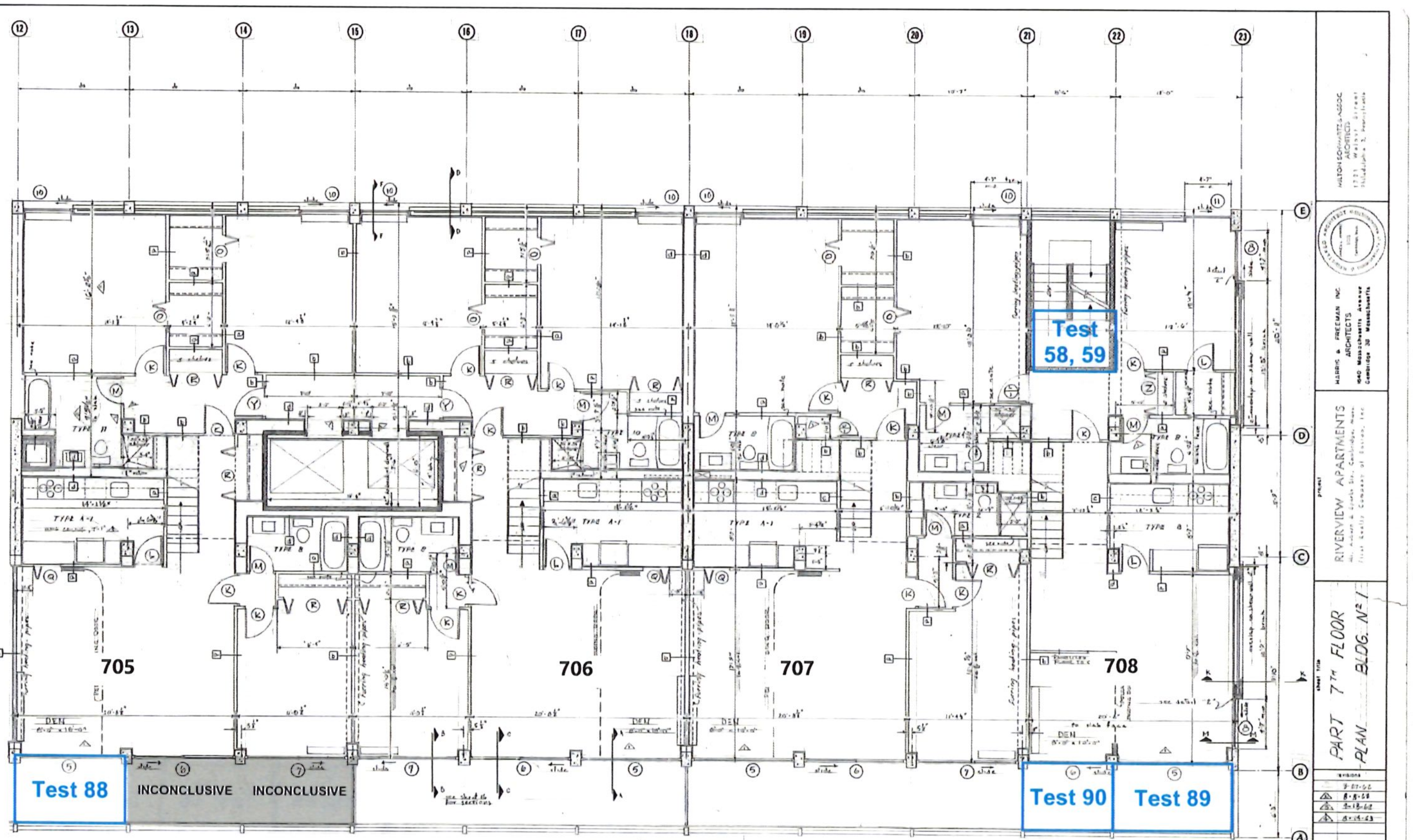
Figure E10



NOTES:

1. TEST LOCATIONS REPRESENT UNDERSIDE SLAB TESTS AT LEVEL 7.
2. XXX INDICATE UNIT NUMBERS.
3. BACKGROUND IMAGE TAKEN FROM HARRIS & FREEMAN INC. ARCHITECTURAL PLANS DATED 14 DECEMBER 1961

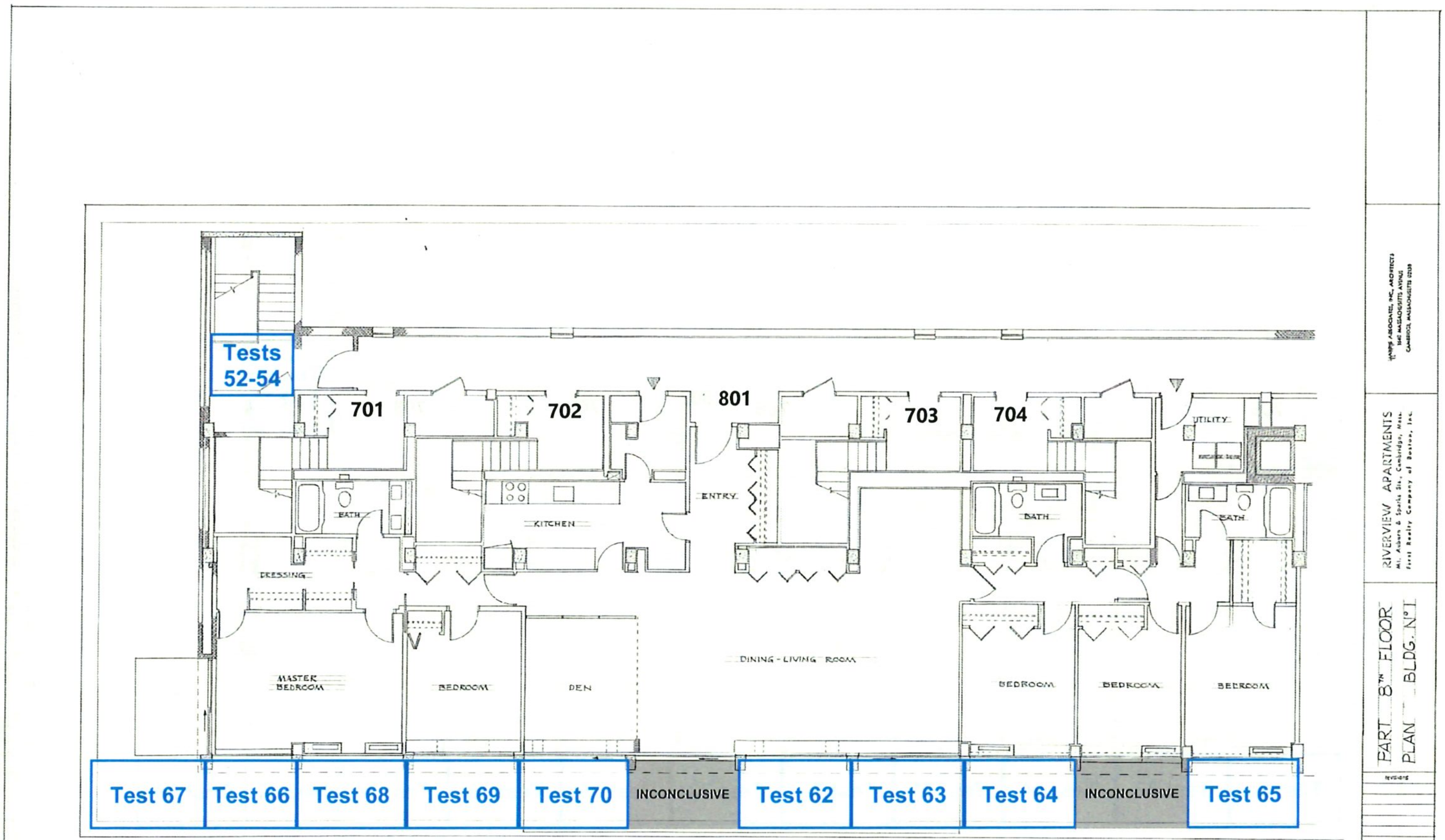
Figure E11



NOTES:

1. TEST LOCATIONS REPRESENT UNDERSIDE SLAB TESTS AT LEVEL 7.
2. XXX INDICATE UNIT NUMBERS.
3. BACKGROUND IMAGE TAKEN FROM HARRIS & FREEMAN INC. ARCHITECTURAL PLANS DATED 14 DECEMBER 1961

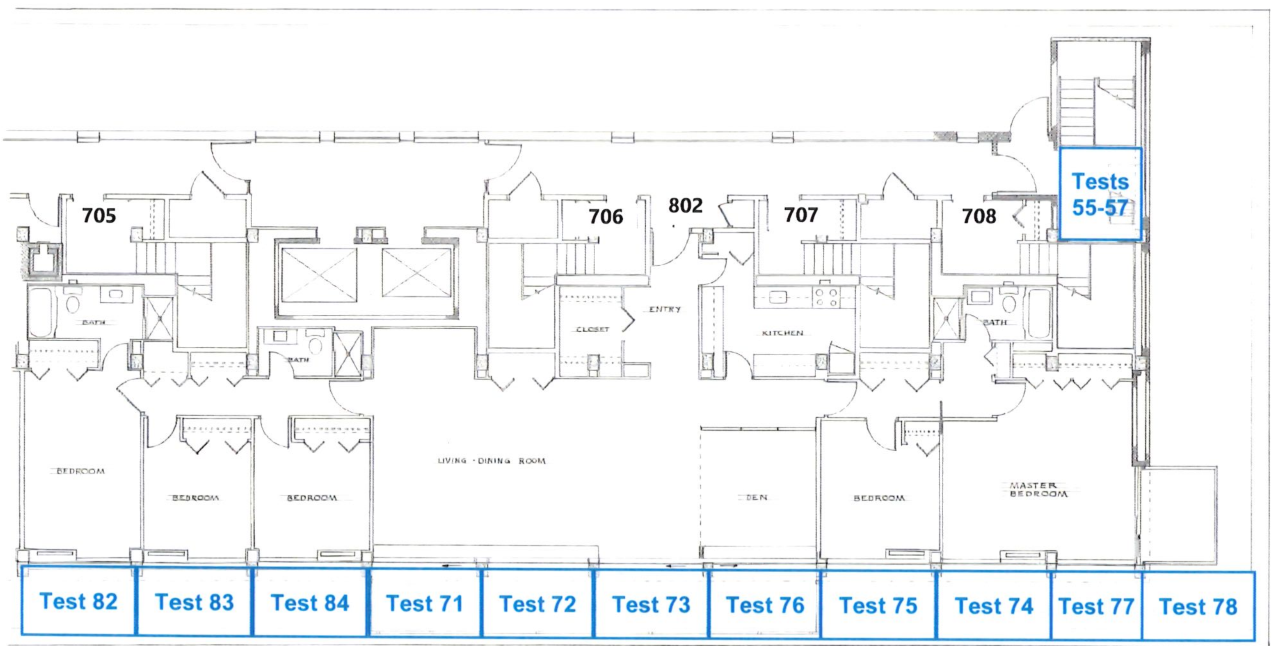
Figure E12



NOTES:

1. TEST LOCATIONS REPRESENT UNDERSIDE SLAB TESTS AT LEVEL 8.
2. XXX INDICATE UNIT NUMBERS.
3. BACKGROUND IMAGE TAKEN FROM HARRIS & FREEMAN INC. ARCHITECTURAL PLANS DATED 14 DECEMBER 1961

Figure E13



NOTES:

1. TEST LOCATIONS REPRESENT UNDERSIDE SLAB TESTS AT LEVEL 8.
2. XXX INDICATE UNIT NUMBERS.
3. BACKGROUND IMAGE TAKEN FROM HARRIS & FREEMAN INC. ARCHITECTURAL PLANS DATED 14 DECEMBER 1961

Figure E14

APPENDIX F - REINFORCEMENT TESTING

SGH

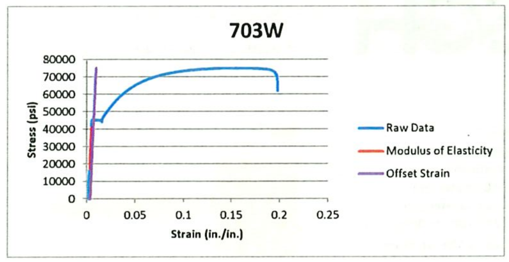
Project Riverview Slab Investigation

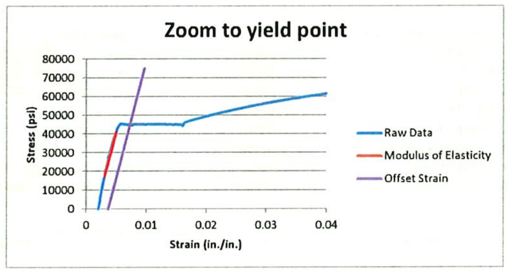
Subject ASTM A370 – Steel Tension

Sheet No. 1 | 4
Project No. 200609.04
Date 27 June 2023
By/Chk By RMS/MJR

Specimen ID	Cross-Sectional Area (in.^{2})	Yield Strength (ksi)	Strain at Yield (%)	Ultimate Tensile Strength (ksi)	Elongation After Break (%)
703W	0.196	45.2	0.74	75.1	19.4
704E	0.196	47.3	0.65	81.6	20.3
704W	0.196	47.3	0.66	77.8	19.1

Project	Riverview Slab Investigation	Sheet No.	2 | 4
		Project No.	200609.04
		Date	27 June 2023
Subject	ASTM A370 – Steel Tension	By/Chk By	RMS/MJR





Specimen ID: 703W

Dimensions:

Gage Length (in.)	9.5		
Nominal Diameter (in.)	0.500		
Measured Diameter (in.)	0.493	0.501	0.502
Punch Marks Before Break (in.)	7.456		
Punch Marks After Break (in.)	8.899		

Results

Average Measured Diameter (in.)	
Cross-Sectional Area (in.²)	0.196
Peak Load (lbf)	14749
Yield Load (lbf)	8866
Yield Strength (psi)	45155
Strain at Yield (in./in.)	0.0074
Ultimate Tensile Strength (psi)	75117
Modulus of Elasticity (psi)	12469785
Elongation After Break (%)	19.4

Modulus Line

		Stress	Strain
Max	0.55	41145	0.0050
Min	0.25	17675	0.0031
Y-Intercept	-20692		

Strain Offset Line

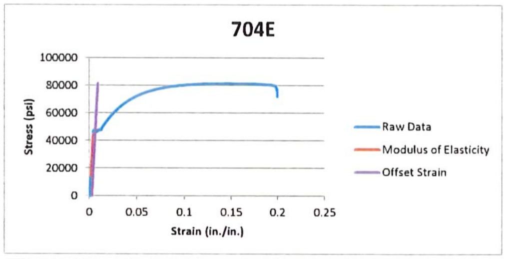
% Offset	0.2
Y-Intercept	-45632

Load Cell Output →

Time (s)	Load (lbf)	Crosshead (in.)	Extensometer (in.)	Stress (psi)	Strain (in./in.)	Offset Strain (in./in.)	Locate Yield Point
0	28.60157	-0.00005	0.0198	145.6666	0.002084	0.003671084	FALSE
0.0018	28.48097	0	0.01983	145.052389	0.002087	0.003671035	FALSE
0.1	393.3	0.00008	0.02079	2003.06045	0.002188	0.003820036	FALSE
0.2	812.18665	0.00024	0.0218	4136.43264	0.002295	0.003991119	FALSE
0.3	1217.17116	0.00039	0.02283	6199.00181	0.002403	0.004156524	FALSE
0.4	1614.93995	0.00054	0.02397	8224.82163	0.002523	0.004318983	FALSE
0.5	2008.10595	0.00069	0.025	10227.1996	0.002632	0.004479561	FALSE
0.6	2381.01838	0.00083	0.02604	12126.427	0.002741	0.004631867	FALSE
0.7	2746.24611	0.00096	0.0271	13986.5166	0.002853	0.004781035	FALSE
0.8	3117.51707	0.0011	0.02817	15877.3841	0.002965	0.004932671	FALSE
0.9	3470.51091	0.00124	0.02923	17675.1669	0.003077	0.005076842	FALSE
1	3817.8836	0.00137	0.03029	19444.3215	0.003188	0.005218717	FALSE
1.1	4156.6671	0.0015	0.03134	21169.7317	0.003299	0.005357085	FALSE
1.2	4481.84995	0.00162	0.03241	22825.8744	0.003412	0.005489897	FALSE
1.3	4810.48322	0.00175	0.03346	24499.5899	0.003522	0.005624119	FALSE
1.4	5114.8229	0.00186	0.03445	26049.5791	0.003626	0.005748418	FALSE
1.5	5415.61838	0.00198	0.03549	27581.5179	0.003736	0.00587127	FALSE
1.6	5708.34727	0.00209	0.03655	29072.3739	0.003847	0.005990828	FALSE
1.7	5985.55265	0.00219	0.03765	30484.1693	0.003963	0.006104045	FALSE
1.8	6256.90239	0.0023	0.03871	31866.1422	0.004075	0.006214871	FALSE
1.9	6515.82394	0.0024	0.03975	33184.8188	0.004184	0.006320621	FALSE
2	6759.88528	0.0025	0.04078	34427.813	0.004293	0.006420301	FALSE
2.1	7005.01858	0.00259	0.04181	35676.2667	0.004401	0.006520419	FALSE
2.2	7237.44902	0.00268	0.0429	36860.0252	0.004516	0.00661535	FALSE

4131.69

Project	Riverview Slab Investigation
Subject	ASTM A370 – Steel Tension
Sheet No.	3 | 4
Project No.	200609.04
Date	27 June 2023
By/Chk By	RMS/MJR

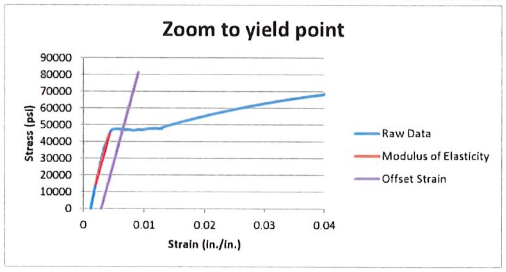


Specimen ID	704E		
Dimensions:			
Gage Length (in.)	10.75		
Nominal Diameter (in.)	0.500		
Measured Diameter (in.)	0.500	0.500	0.501
Punch Marks Before Break (in.)	8.657		
Punch Marks After Break (in.)	10.411		

Results	
Average Measured Diameter (in.)	
Cross-Sectional Area (in.²)	0.196
Peak Load (lbf)	16021
Yield Load (lbf)	9290
Yield Strength (psi)	47312
Strain at Yield (in./in.)	0.0065
Ultimate Tensile Strength (psi)	81592
Modulus of Elasticity (psi)	13320443
Elongation After Break (%)	20.3

Modulus Line		Stress	Strain
Max	0.55	44762	0.0043
Min	0.20	14825	0.0020
Y-Intercept	-12014		

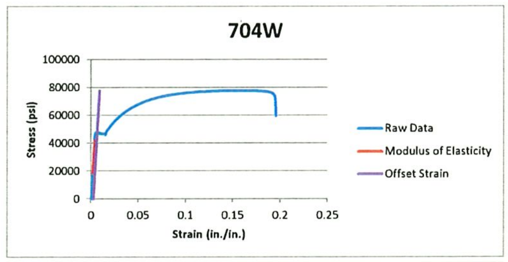
Strain Offset Line	
% Offset	0.2
Y-Intercept	-38655



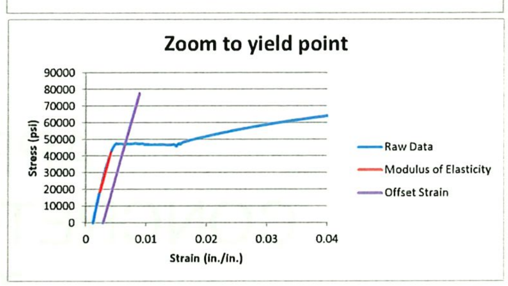
Load Cell Output →

Time (s)	Load (lbf)	Crosshead (in.)	Extensometer (in.)	Stress (psi)	Strain (in./in.)	Offset Strain (in./in.)	Locate Yield Point
0	2.89433	0	0.01327	14.7407016	0.001234	0.002903017	FALSE
0.0018	2.27794	0	0.01325	11.6014532	0.001233	0.002902781	FALSE
0.1	344.45826	0.00013	0.0142	1754.31151	0.001321	0.003033611	FALSE
0.2	731.06513	0.00029	0.01527	3723.28413	0.00142	0.003181427	FALSE
0.3	1117.66531	0.00044	0.01631	5692.22268	0.001517	0.00332924	FALSE
0.4	1484.2799	0.00059	0.0174	7559.37546	0.001619	0.003469412	FALSE
0.5	1850.75379	0.00073	0.01847	9425.81165	0.001718	0.00360953	FALSE
0.6	2212.8259	0.00088	0.01953	11269.8298	0.001817	0.003747965	FALSE
0.7	2560.64747	0.00102	0.02061	13041.2705	0.001917	0.003880952	FALSE
0.8	2910.94128	0.00115	0.02166	14825.3022	0.002015	0.004014884	FALSE
0.9	3246.84385	0.00129	0.02266	16536.0399	0.002108	0.004143313	FALSE
1	3568.92469	0.00141	0.0237	18176.3842	0.002205	0.004266458	FALSE
1.1	3897.48425	0.00154	0.02476	19849.7243	0.002303	0.00439208	FALSE
1.2	4220.54996	0.00168	0.02584	21495.0844	0.002404	0.004515601	FALSE
1.3	4523.87797	0.0018	0.0269	23039.9213	0.002502	0.004631576	FALSE
1.4	4841.59722	0.00193	0.02796	24658.0522	0.002601	0.004753054	FALSE
1.5	5134.5539	0.00204	0.02898	26150.0683	0.002696	0.004865063	FALSE
1.6	5433.15183	0.00216	0.03003	27670.8151	0.002793	0.004979229	FALSE
1.7	5716.52776	0.00228	0.03106	29114.0368	0.002889	0.005087576	FALSE
1.8	5992.54727	0.00239	0.0321	30519.7926	0.002986	0.00519311	FALSE
1.9	6263.85681	0.0025	0.03315	31901.5608	0.003084	0.005296842	FALSE
2	6531.09285	0.00261	0.03429	33262.5827	0.00319	0.005399018	FALSE
2.1	6772.86954	0.00271	0.03529	34493.9413	0.003283	0.005491459	FALSE
2.2	7033.40576	0.00282	0.03639	35820.8414	0.003385	0.005591073	FALSE

Project	Riverview Slab Investigation	Sheet No.	4 | 4
		Project No.	200609.04
		Date	27 June 2023
Subject	ASTM A370 – Steel Tension	By/Chk By	RMS/MJR



Specimen ID	704W		
Dimensions:			
Gage Length (in.)	9		
Nominal Diameter (in.)	0.500		
Measured Diameter (in.)	0.508	0.501	0.500
Punch Marks Before Break (in.)	6.930		
Punch Marks After Break (in.)	8.256		



Results				
Average Measured Diameter (in.)				
Cross-Sectional Area (in.^{2})	0.196			
Peak Load (lbf)	15277			
Yield Load (lbf)	9288			
Yield Strength (psi)	47306			
Strain at Yield (in./in.)	0.0066			
Ultimate Tensile Strength (psi)	77803			
Modulus of Elasticity (psi)	12731801			
Elongation After Break (%)	19.1			

Modulus Line		Stress	Strain
Max	0.55	42539	0.0042
Min	0.25	18815	0.0023
Y-Intercept	-10383		

Strain Offset Line	
% Offset	0.2
Y-Intercept	-35847

Load Cell Output →

Time (s)	Load (lbf)	Crosshead (in.)	Extensometer (in.)	Stress (psi)	Strain (in./in.)	Offset Strain (in./in.)	Locate Yield Point
0	15.6575	0	0.01118	79.7429927	0.001242	0.002821795	FALSE
0.0018	16.82997	-0.00002	0.0112	85.7143334	0.001244	0.002822264	FALSE
0.1	408.79671	0.00014	0.0121	2081.98455	0.001344	0.002979058	FALSE
0.2	858.90455	0.00031	0.01319	4374.36495	0.001466	0.003159109	FALSE
0.3	1295.84054	0.00047	0.01424	6599.66168	0.001582	0.003333892	FALSE
0.4	1707.50477	0.00062	0.01533	8696.25038	0.001703	0.003498565	FALSE
0.5	2110.66022	0.00077	0.01633	10749.5042	0.001814	0.003659835	FALSE
0.6	2512.32161	0.00092	0.01737	12795.1489	0.00193	0.003820507	FALSE
0.7	2903.55807	0.00106	0.01846	14787.6998	0.002051	0.003977009	FALSE
0.8	3321.15835	0.00121	0.01954	16914.5206	0.002171	0.004144057	FALSE
0.9	3694.33207	0.00134	0.02064	18815.0787	0.002293	0.004293333	FALSE
1	4061.02706	0.00147	0.02166	20682.641	0.002407	0.004440018	FALSE
1.1	4422.20138	0.00161	0.02272	22522.0867	0.002524	0.004584495	FALSE
1.2	4765.84896	0.00173	0.02382	24272.2694	0.002647	0.00472196	FALSE
1.3	5121.25474	0.00185	0.02481	26082.3362	0.002757	0.004864129	FALSE
1.4	5443.51647	0.00196	0.02584	27723.6017	0.002871	0.00499304	FALSE
1.5	5771.51995	0.00208	0.02695	29394.1097	0.002994	0.005124247	FALSE
1.6	6070.36578	0.00218	0.02797	30916.119	0.003108	0.005243791	FALSE
1.7	6378.81916	0.00228	0.02905	32487.0592	0.003228	0.005367178	FALSE
1.8	6655.62255	0.00238	0.03007	33896.8073	0.003341	0.005477905	FALSE
1.9	6940.61984	0.00247	0.03115	35348.2866	0.003461	0.005591909	FALSE
2	7190.38943	0.00256	0.03217	36620.3527	0.003574	0.005691822	FALSE
2.1	7462.20815	0.00266	0.03329	38004.714	0.003699	0.005800554	FALSE
2.2	7701.39201	0.00274	0.0343	39222.8674	0.003811	0.005896232	FALSE

APPENDIX G - CONCRETE COMPRESSION TESTING

APPENDIX G - CONCRETE COMPRESSION TESTING

SGH

Project Riverview Slab Investigation

Subject ASTM C42 - Compression Strength of Drilled Cores

Sheet No. 1 | 2
Project No. 200609.04
Date 6 March 2024
By/Chk By RMS/MJR

Laboratory Procedure/Method: SGH-C42 - Compressive Strength of Drilled Cores of Concrete
Exceptions to Procedure/Method: None
Project: Slab Evaluation, Riverview Condominiums, 221 Mt. Auburn Street, Cambridge, MA

Specimen ID	Length of core (as drilled) (in.)	Moist. Cond.	Diameter (in.)		Capped Length (in.)					Ends Perp. To Axis ± 0.5° (Yes/No)	Ends Plane ± 0.002 in. (Yes/No)
			1	2	1	2	3	4	5 (center)		
7E-IN	8.25	Dry	3.70	3.71	6.00	5.98	5.97	6.00	5.98	Yes	Yes
7W-IN	5.75		3.71	3.70	4.78	4.79	4.77	4.79	4.78	Yes	Yes
8E-IN 1	7.75		3.70	3.70	7.26	7.26	7.25	7.26	7.27	Yes	Yes
8E-IN 2	8.00		3.70	3.70	5.59	5.59	5.57	5.58	5.58	Yes	Yes
8W-IN	8.00		3.70	3.70	7.43	7.45	7.42	7.42	7.43	Yes	Yes

Specimen ID	Average Diameter (in.)	Cross-sectional Area (in^2)	Average Capped Length (in.)	L/D	L/D Factor	Maximum Load (lbf.)	Compressive Strength (psi)	Type of Fracture	Age (yrs)	Date Tested	Time of Test	Tested By	Unique Characteristics of Sample	Nom Agg size (in.)
7E-IN	3.705	10.78	5.99	1.62	0.97	18745	1690	IV	60+	3/6/2024	12:22pm	RMSovie	None	3/4
7W-IN	3.705	10.78	4.78	1.29	0.93	29605	2550	II			1:08pm			
8E-IN 1	3.700	10.75	7.26	1.96	1.00	18377	1710	IV			1:14pm			
8E-IN 2	3.700	10.75	5.58	1.51	0.96	18448	1650	II			1:17pm			
8W-IN	3.700	10.75	7.43	2.01	1.00	31821	2960	II			1:29pm			

Test and Measuement Equipment Used

Item	Equip ID	Last Cal	Next Cal
Caliper	BOS00303	12/7/2023	12/7/2024
Caliper	BOS03128	12/7/2023	12/7/2024
Comp. Tester	BOS03174	6/7/2023	6/7/2024

Sample Iinformation:
Submitted by: Linda Seymour **Date Submitted:** 2/29/2024
Date concrete placed (if known): Early 1960's
Date and time cored: 2/29/2024, Morning
Location and orientation where sample was made: Level 7 and 8 Slabs, Vertical orientation
Curing Conditions/History: Sealed plastic bags
End prep date and time (trim and/or grind ends): 2/29/24, trimmed. Ca

SGH	Project Riverview Slab Investigation Subject ASTM C42 - Compression Strength of Drilled Cores
	Sheet No. 2 / 2 Project No. 200609.04 Date 12 March 2024 By/Chk By RMS/MJR

Laboratory Procedure/Method: SGH-C42 - Compressive Strength of Drilled Cores of Concrete
Exceptions to Procedure/Method: None
Project: Slab Evaluation, Riverview Condominiums, 221 Mt. Auburn Street, Cambridge, MA

Specimen ID	Length of core (as drilled) (in.)	Moisture Condition	Diameter (in.)		Uncapped Length (in.)					Capped Length (in.)					Mass (g)	Ends Perp. To Axis ± 0.5° (Yes/No)	Ends Plane ± 0.002 in. (Yes/No)
			1	2	1	2	3	4	5 (center)	1	2	3	4	5 (center)			
7E-EXT	7.50	Dry	3.71	3.71	5.40	5.43	5.49	5.44	5.42	5.66	5.66	5.65	5.66	5.66	2230.10	Yes	Yes
7W-EXT	6.50		3.70	3.72	6.03	6.00	5.94	5.99	6.00	6.22	6.21	6.20	6.22	6.21	2507.40	Yes	Yes
8E-EXT	8.25		3.71	3.71	7.48	7.48	7.49	7.49	7.49	7.68	7.67	7.68	7.69	7.68	3085.60	Yes	Yes
8W-EXT	8.00		3.71	3.71	5.23	5.21	5.21	5.21	5.21	5.44	5.43	5.43	5.44	5.43	2172.60	Yes	Yes

Specimen ID	Average Diameter (in.)	Cross-sectional Area (in^2)	Uncapped Length (in.)	Capped Length (in.)	L/D	L/D Factor	Maximum Load (lbf.)	Compressive Strength[1] (psi)	Type of Fracture	Age (yrs.)	Density (pcf)	Date Tested	Time of Test	Tested By	Unique Characteristics of Sample	Nominal Aggregate Size (in.)
7E-EXT	3.710	10.810	5.436	5.658	1.53	0.96	35987	3200	IV	~60+	145	3/12/2024	8:03am	RMSovie	None	3/4
7W-EXT	3.710	10.810	5.992	6.212	1.67	0.97	29728	2670	IV		148		8:12am			
8E-EXT	3.710	10.810	7.486	7.680	2.07	1.00	29221	2700	IV		145		8:16am			
8W-EXT	3.710	10.810	5.214	5.434	1.46	0.96	52705	4680	I		147		9:05am			

Test and Measuement Equipment Used

Item	Equip ID	Last Cal	Next Cal
Caliper	BOS00303	12/7/2023	12/7/2024
Caliper	BOS03128	12/7/2023	12/7/2024
Scale	BOS00412	6/21/2023	6/21/2024
Square	BOS01605	1/31/2024	1/31/2025
Feeler Gauge	BOS03572	1/22/2024	1/22/2025
Comp. Tester	BOS03174	6/7/2023	6/7/2024

Sample Iinformation:
Submitted by: Linda Seymour **Date Submitted:** 3/7/2024
Date concrete placed (if known): Early 1960's
Date and time cored: 3/6/2024, Morning
Location and orientation where sample was made: Level 7 and 8 Slabs, Vertical orientation
Curing Conditions/History: Sealed plastic bags
End prep date and time (trim and/or grind ends): 3/7/24, trimmed. Capped on 9 March 2024

Made in USA

APPENDIX H - ENGINEERING PRINCIPLES OF REINFORCED CONCRETE STRUCTURES

ENGINEERING PRINCIPLES OF REINFORCED CONCRETE STRUCTURES

- A guide to structural engineering concepts in preparation for the 31 January 2024 informational meeting for unit owners.

Riverview Condominiums
Cambridge, MA
29 January 2024

SGH Project 200609.04

PREPARED BY
Simpson Gumpertz & Heger Inc.
480 Totten Pond Road
Waltham, MA 02451

Engineering Principles of Reinforced Concrete Structures

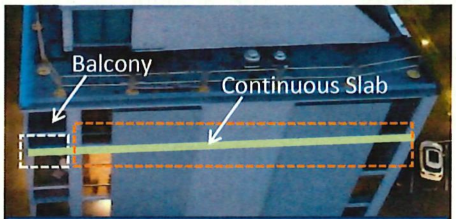
The basic principle of any structure is to carry **loads** from one part of the structure safely down to the foundation. The following infographic introduces the basic concepts of **structures**, the **loads** they support, and how engineers evaluate their **capacity**.

STRUCTURAL COMPONENTS

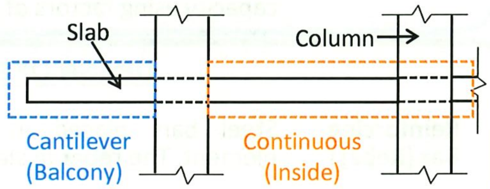
Structural System — The collection of elements that transfer loads. Riverview's primary structural system consists of reinforced concrete **slabs** and **columns**.

Structural Elements — The individual parts of the structural system. For Riverview, the floor is a reinforced concrete **slab** that supports its self-weight and the weight of people and items in the apartments and transfers the loads to the **columns**. The columns transfer the weight of the slab, people, and items to the foundation.

Support Conditions — The structural elements are supported when the forces can transfer to the foundation. At Riverview, the slab has two common support conditions: Cantilevered, where there is one supported end; and Continuous, where there are multiple supports. The columns support the slab.



At Riverview, the slab is continuous and cantilevered at the balconies.

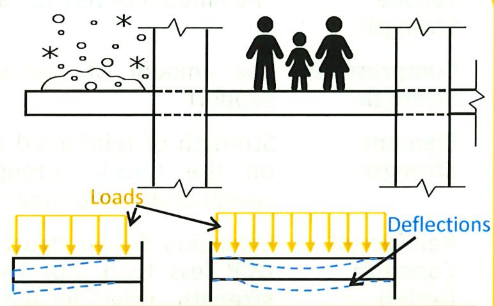


LOADS

Loads — The forces applied to the structural elements such as the weight of snow on the balcony or the people and furniture in a living space. The **building code** tells engineers what loads the structural elements must support.

Deflection — How the structural elements move when loads are applied. The **building code** tells engineers how much a structural element can deflect.

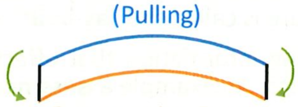
Load Transfer — How the structural elements distribute the load to the foundation. Concrete slabs, like at Riverview, transfer load through **flexure** and **shear.**



Engineers use idealized shapes (above) to represent the structural elements, loads, and deflections.

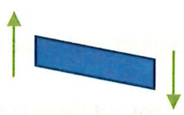
Flexure is the action of bending.

When the slab bends, one side is in **tension** and the other is in **compression**. The tension pulls the concrete slab and the compression pushes.

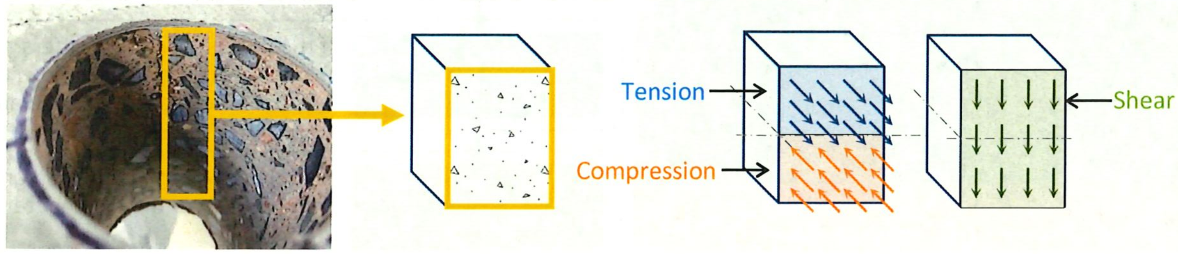


Shear is the shifting of the slab.

The slab must resist the tendency to shift or slide due to shear forces.



The concrete slab must resist tension, compression, and shear. These are the forces that occur inside the slab. We can visualize the forces by imagining we have cut out a chunk of the slab.



Engineering Principles of Reinforced Concrete Structures

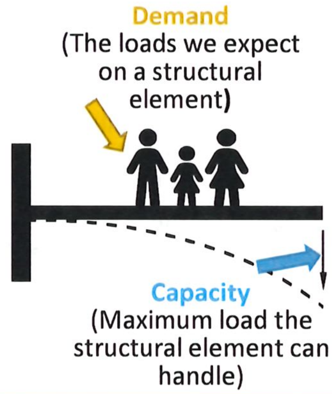
DEFINING A STRUCTURE'S CAPACITY

Demand The amount of **load** applied to a structural element.

Capacity The amount of **load** a structural element can support.

Demand to Capacity Ratio (DCR) The DCR quantifies the adequacy of a structural element. If the demand is greater than the capacity, the DCR is greater than 1.0 and represents an overstress of the element.

Factor of Safety In designing a structure, engineers overestimate **demand** and underestimate **capacity** when determining DCR. The **building code** tells engineers how to adjust the demand and capacity using factors of safety.



DESIGN OF REINFORCED CONCRETE STRUCTURES

Reinforcing Bar (Rebar) Steel bars placed in a concrete structural element. The rebar in slabs resists tension.

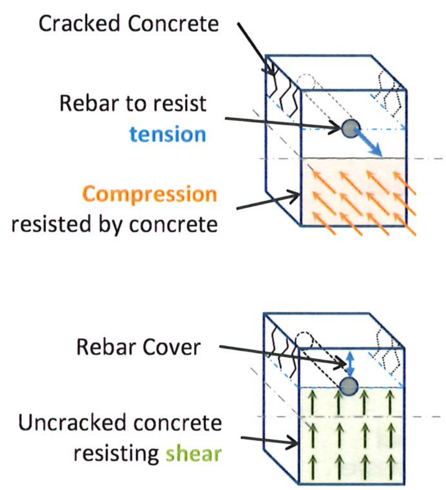
Rebar Cover The distance from the face of the slab to the **rebar**.

Tensile Strength The amount of tension a material can support.

Compressive Strength The amount of compression a material can support.

Element Strength Strength of reinforced concrete elements relies on the tensile strength of **rebar** and the compressive and shear strength of concrete.

Reinforced Concrete Design Engineers design structural elements to have a **DCR** less than 1.0. They may adjust material **strength**, rebar location, and other factors to achieve this. Engineers use **construction drawings** to tell the builders what to construct.



ASSESSMENT OF REINFORCED CONCRETE STRUCTURES

As-Built Frequently, a structure does not precisely match the construction drawings. The final, completed structure is called the "**as-built**" structure.

Structural Assessment Collecting and evaluating information that affects the performance of a structure and reporting the findings. An example **assessment** workflow is shown below.

Ground Penetrating Radar (GPR) A non-destructive scanning technique that engineers can use to determine where the **rebar** is in a concrete structural element.

During slab construction, builders use the construction drawings to layout the rebar before placing the concrete.

Is the rebar where we expect? — GPR is used to determine the precise location of the rebar.

↓

What is the capacity of the as-built slab? — If the as-built condition differs from design, engineers can calculate the capacity of the slab.

↓

Is the DCR less than or equal to 1.0? — Engineers determine the demand for each element and compute the DCR.

APPENDIX I - REPAIR OPTIONS

LEGEND:

✓ YES
X NO
/ PARTIALLY

REPAIR TYPE CONSIDERATIONS

SGH

Repair Options		Strengthens for Flexure	Strengthens for Shear	Feasible with Low-Strength Concrete	Reduces Plan Extent	Reduces Enclosure Impact
Through Bolts		X	✓	X	X	✓
Capital/ Corbel		/	✓	✓	✓	✓
Drop Panel		/	✓	✓	X	X
Supplemental Steel		✓	✓	✓	/	/
Carbon Fiber		✓	X	✓	✓	/

APPENDIX J - CONCEPTUAL REPAIR DOCUMENTS

Structural Strengthening and Repairs

Conceptual Design Documents

Riverview Condominium
221 Mt. Auburn St.
Cambridge, MA
13 December 2024

SGH Project 200609.04

PREPARED FOR
Riverview Condominium
c/o Thayer & Associates, Inc
1812 Massachusetts Avenue
Cambridge, MA 02140

PREPARED BY
Simpson Gumpertz & Heger Inc.
480 Totten Pond Road
Waltham, MA 02451
O: 781.907.9000

SECTION 011100

SUMMARY OF WORK

PART 1 – GENERAL

1.01 CONCEPTAUL DESIGN DOCUMENTS

A. The following documents are included:

1. Structural Strengthening and Repairs – Drawings (SGH).

2. Roof Replacement – Drawings (SGH).

3. Window and Door Replacement – Drawings (SGH).

4. Mechanical System Upgrade Study (Cosentini).

5. Code Report (Rimkus).

1.02 CONCEPTUAL DESIGN

A. The scope of work shown on the Drawings and described in this Section is intended to develop order-of-magnitude costs only. The Drawings are conceptual only and shall be used in conjunction with documents prepared by other Consultants, including code, mechanical, electrical, plumbing, and architectural disciplines.

1.03 DESCRIPTION OF WORK

A. Abatement – TRC Scope of Work:

1. There are potentially hazardous materials inside and outside of the building. TRC is currently testing suspect materials and will develop a scope of work to abate these prior to the start of repair and strengthening work. TRC's testing reports may be distributed by the Owner at a later date at their discretion.

B. Shoring:

1. Provide all labor, materials, equipment, and supervision necessary to determine the need for, to design, and to install shoring to safely support the existing structure during the work, including, but not limited to, shoring described in this Section.

a. All slab strengthening locations shall be shored prior to the start of repairs. Shoring shall also be constructed to support anticipated construction live loads and associated materials. We anticipate that shoring may need to extend to grade to support the elevated slabs prior to the work.

C. Concrete Strengthening and Repairs:

1. Slab Strengthening:

a. Strengthen slabs with new drop panels as shown on the Drawings.

b. Strengthening will require replacement of all doors and windows along Column Lines B and E (see window information below).

c. Strengthening will require removal of localized areas of concrete masonry unit (CMU) and brick masonry walls at Column Lines E, 1, and 23.

(1) Add Alternate – The drawings include an Add Alternate to remove all brick at Column Line E and overclad the North elevation.

2. Concrete Repairs:

a. Based on observations at exploratory openings performed to date, corrosion damage exists at Column Lines B and E (and possibly other locations). Repair areas of spalled and/or delaminated concrete (after shoring installation) with concrete repair materials after as areas are exposed during the strengthening work. Since the extent of damage is currently unknown, assumed repair types and quantities are shown on the Drawings to incorporate into the order-of-magnitude costs.

3. Ground Penetrating Radar (GPR):

a. Use GPR to locate existing reinforcement prior to any drilling or cutting. Do not cut or damage any existing reinforcement.

D. Windows:

1. The window and door replacement Drawings were prepared in 2021 and specify Arcadia thermal aluminum window systems. For pricing, include the following system in lieu of the Arcadia System:

a. Supera AW System by Intus Windows.

b. All sliding windows shown on the Drawings shall be awning style in lieu of sliding.

E. Pedestrian-traffic-bearing waterproofing:

1. Remove pedestrian-traffic-bearing waterproofing (PTBW) to perform repair and strengthening work and install new PTBW at these locations.

F. Epoxy Repairs:

1. Gravity feed topside and full depth slab cracks with epoxy prior to construction of strengthening repairs.

G. Coatings:

1. Provide new acrylic coating on the underside of balconies at all strengthening and repair locations.

2. Provide new elastomeric coating at all strengthening locations at Column Lines B and E.

H. Joint Sealant:

1. Provide all sealant joints associated with the PTBW and other coating systems.

2. Provide all sealant joints at all windows and doors.

I. Roofing:

1. Low Roof (Eighth Floor) – The Low Roof is currently under contract with WS Aiken. The Owner can provide the project costs to include in the overall order-of-magnitude costs, if desired.

2. High Roof – Remove the existing roofing and provide a new roofing assembly as shown on the Roof Replacement Drawings.

J. Interior Finishes – Maxwell Architects Scope of Work:

1. Finishes will be impacted within the shoring, repair, and strengthening areas. A table is included in this package that identifies the various room types impacted by the strengthening work. Based on prior meetings, Consigli will need to make assumptions regarding the extent of finish removal and reconstruction. We recommend that a walkthrough of representative strengthening locations is performed during the cost estimating phase to

understand the various conditions that will be encountered to perform the work.

K. Mechanical, Electrical, Plumbing (MEP) – Cosentini Scope of Work:

1. Remove and reconstruct the existing MEP components where impacted by strengthening, shoring, and repair work.

2. Replace all riser pipes as shown on the Drawings.

PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

Not used.

END OF SECTION

RIVERVIEW CONDOMINIUM

221 MT AUBURN ST
CAMBRIDGE, MA 02138

STRUCTURAL STRENGTHING AND REPAIRS

CONCEPT DESIGN DOCUMENTS - FOR PRICING ONLY
SGH PROJECT NUMBER: 200609.04

SIMPSON GUMPERTZ & HEGER
480 Totten Pond Road
Waltham, MA 02451
781.907.9000
sgh.com

Consultant

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No.	Date	Description	By

RIVERVIEW CONDOMINIUM STRUCTURAL STRENGTHENING AND REPAIRS

221 MT AUBURN ST
CAMBRIDGE, MA 02138

Project

COVER SHEET

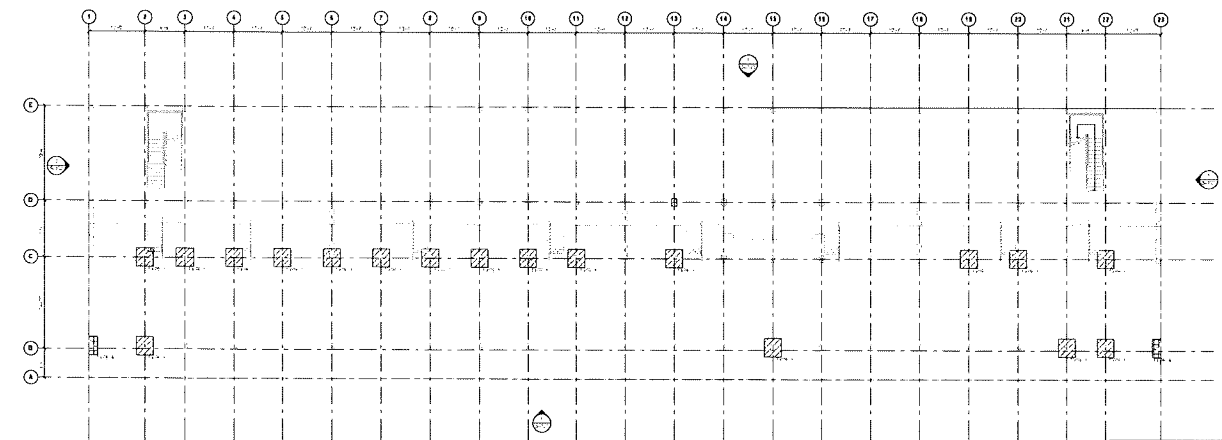
Drawing Title

Project No. 200609.04	Checked LMS	Date [illegible]
Drawn SKW	Approved JLP	Scale [illegible]

Seal

Drawing No.

G-000



1 CONCRETE REPAIRS - LEVEL 1

STRENGTHENING TYPE LEGEND	
TYPE	APPLICABLE DETAILS
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[illegible]	[illegible]
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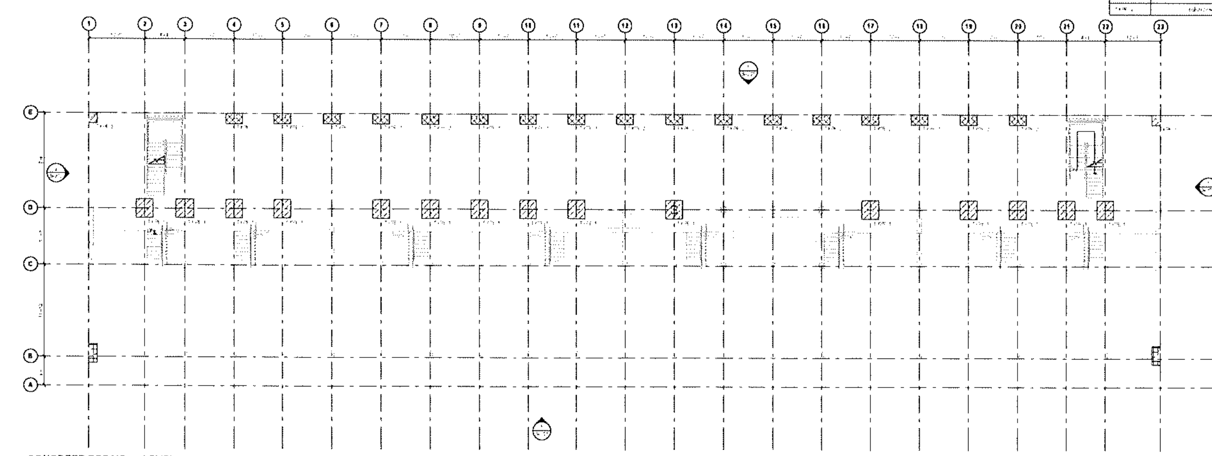

2 CONCRETE REPAIRS - LEVEL 1.5

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RIVERVIEW CONDOMINIUM STRUCTURAL STRENGTHENING AND REPAIRS

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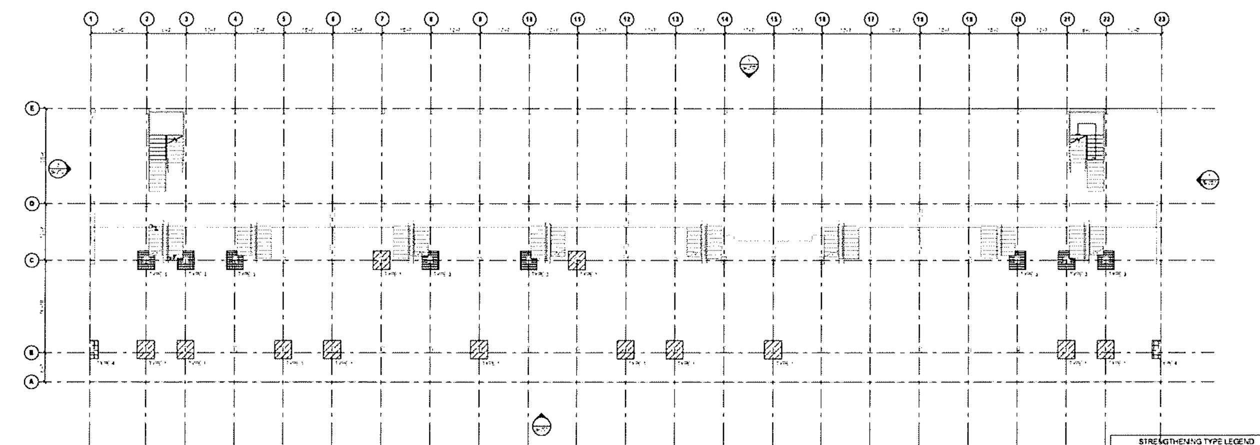
SLAB STRENGTHENING PLAN - LEVEL 1 & 1.5

S-101



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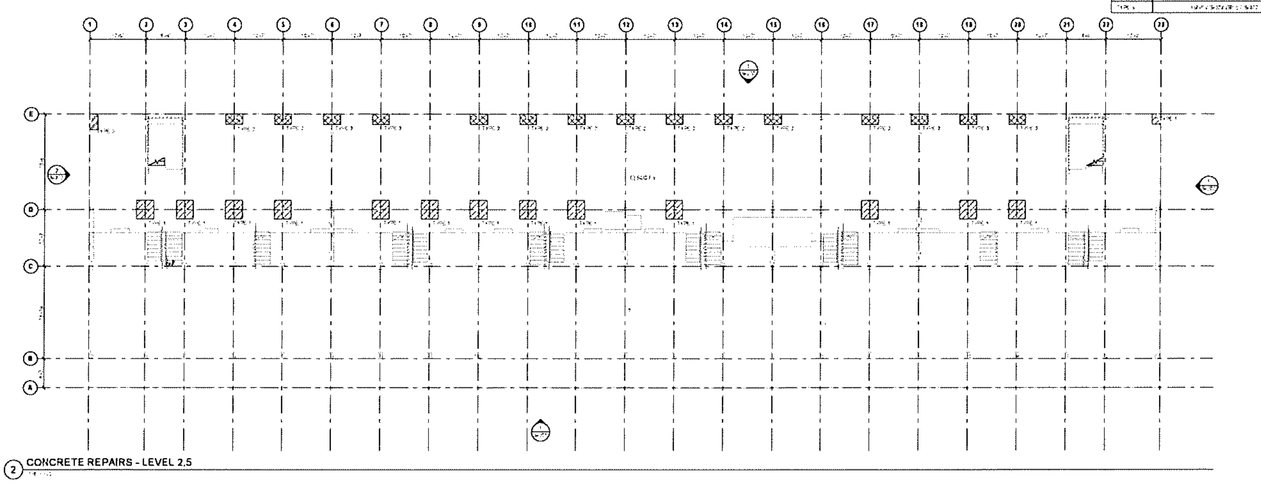

2 CONCRETE REPAIRS - LEVEL 2.5

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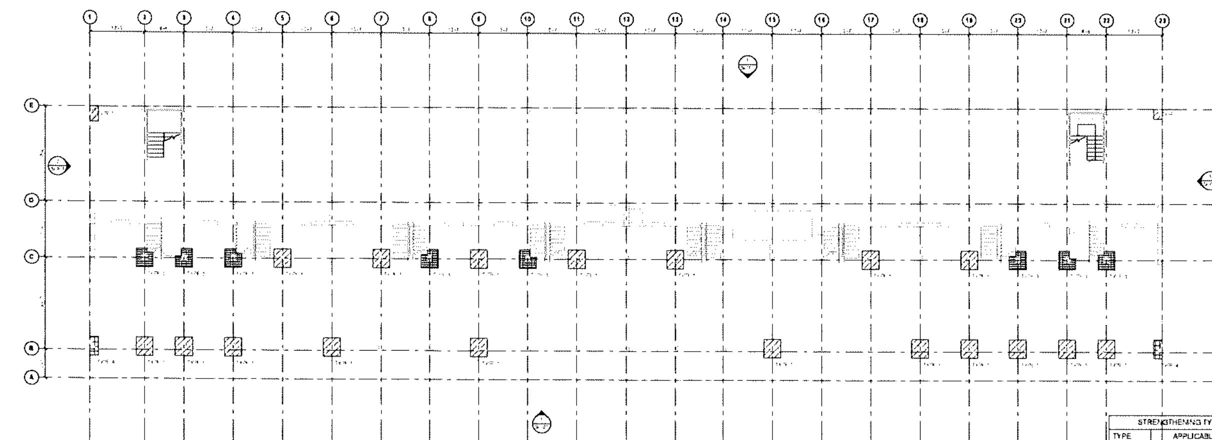
SLAB STRENGTHENING PLAN - LEVEL 2 & 2.5

S-102



1 CONCRETE REPAIRS - LEVEL 3

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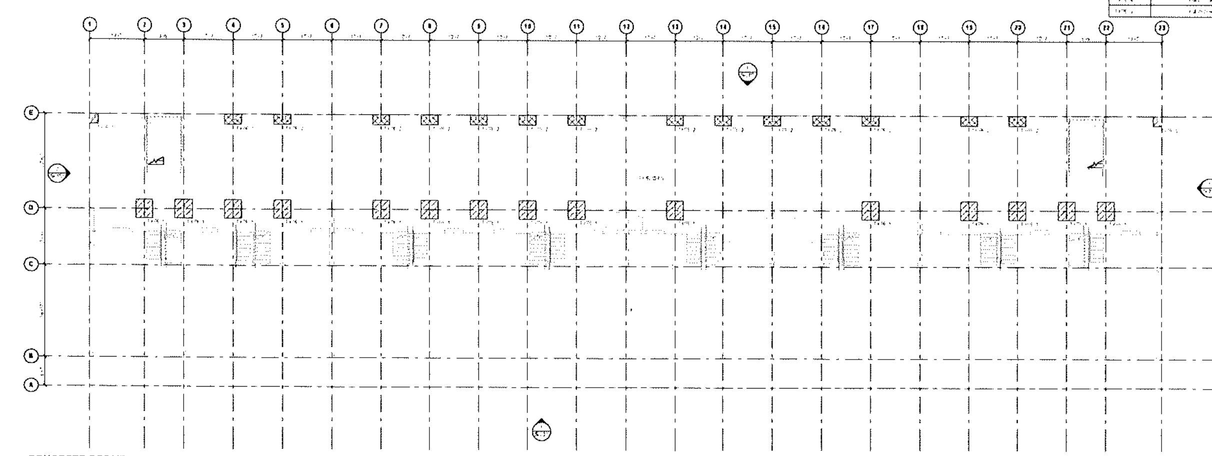

2 CONCRETE REPAIRS - LEVEL 3.5

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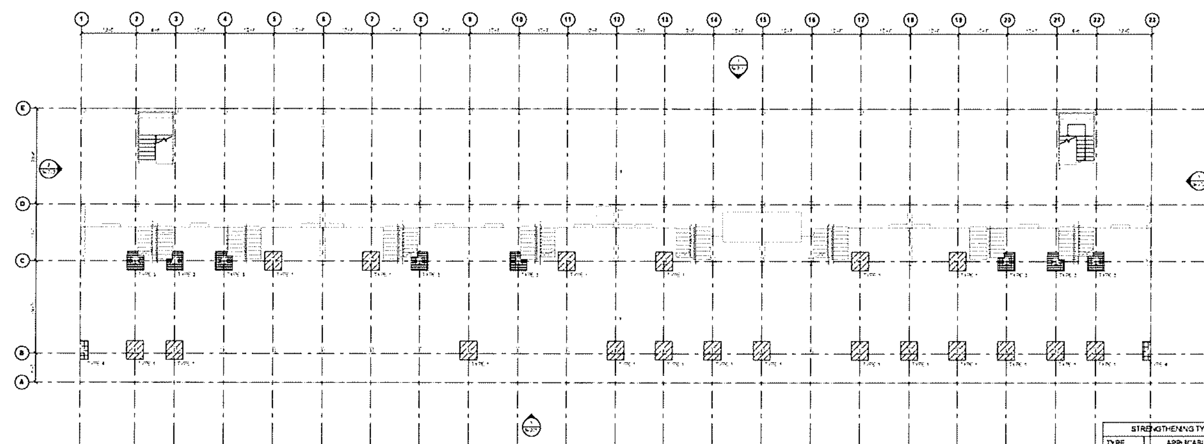
SLAB STRENGTHENING PLAN - LEVEL 3 & 3.5

S-103



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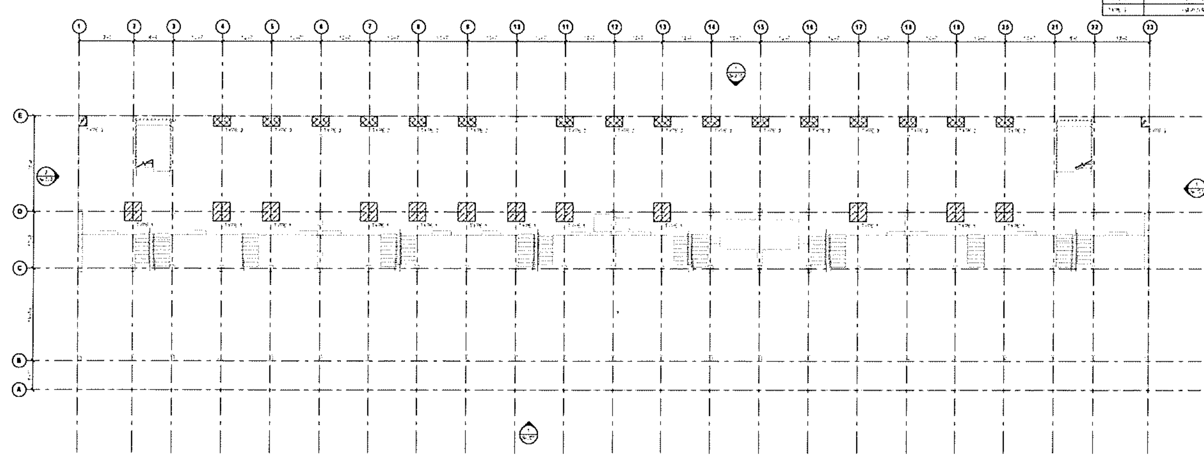

2 CONCRETE REPAIRS - LEVEL 4.5

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REPAIRS

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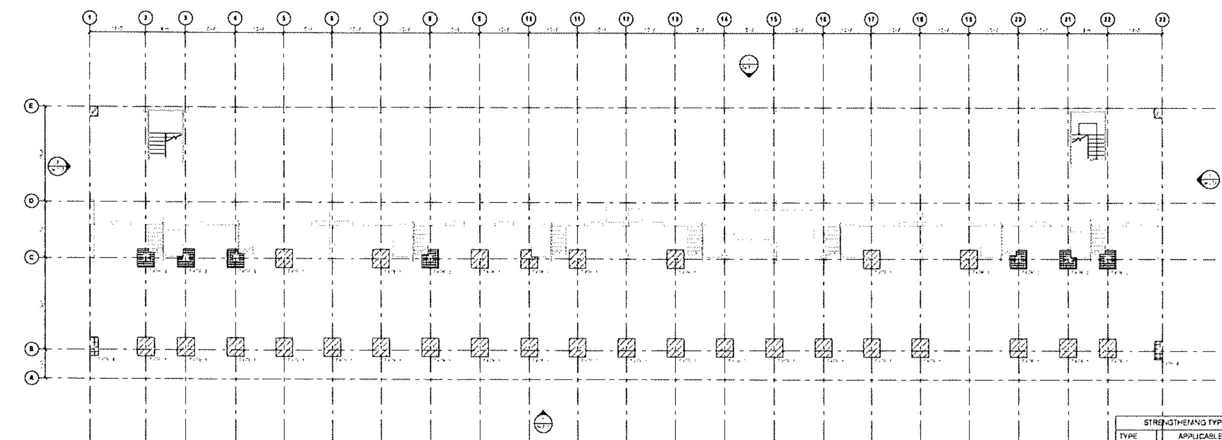
SLAB
STRENGTHENING
PLAN - LEVEL 4 & 4.5

S-104



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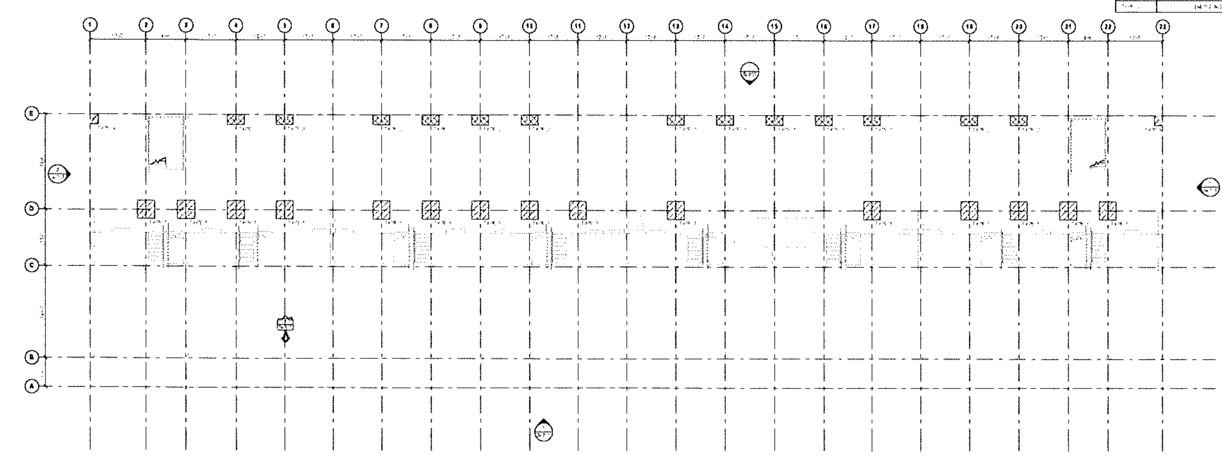

2 CONCRETE REPAIRS - LEVEL 5.5

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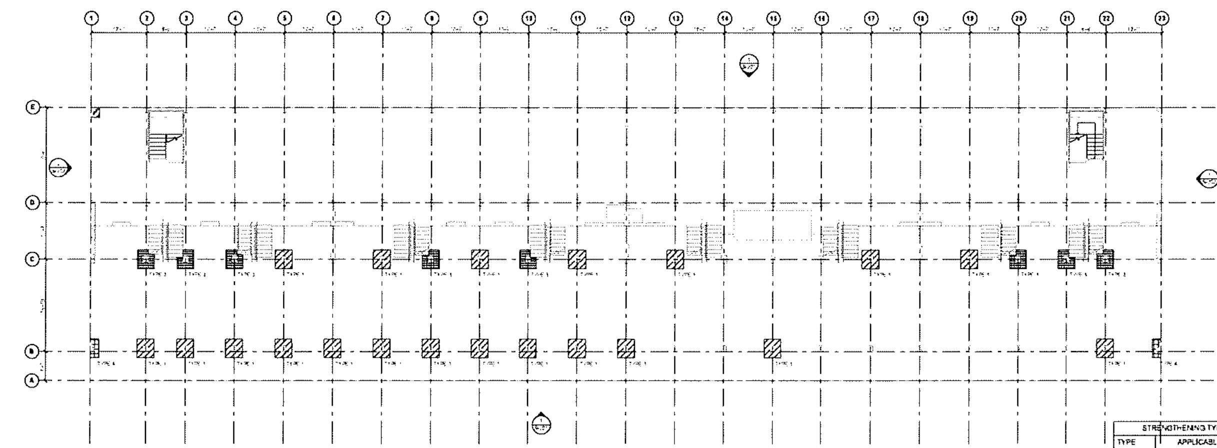
SLAB STRENGTHENING PLAN - LEVEL 5 & 5.5

S-105



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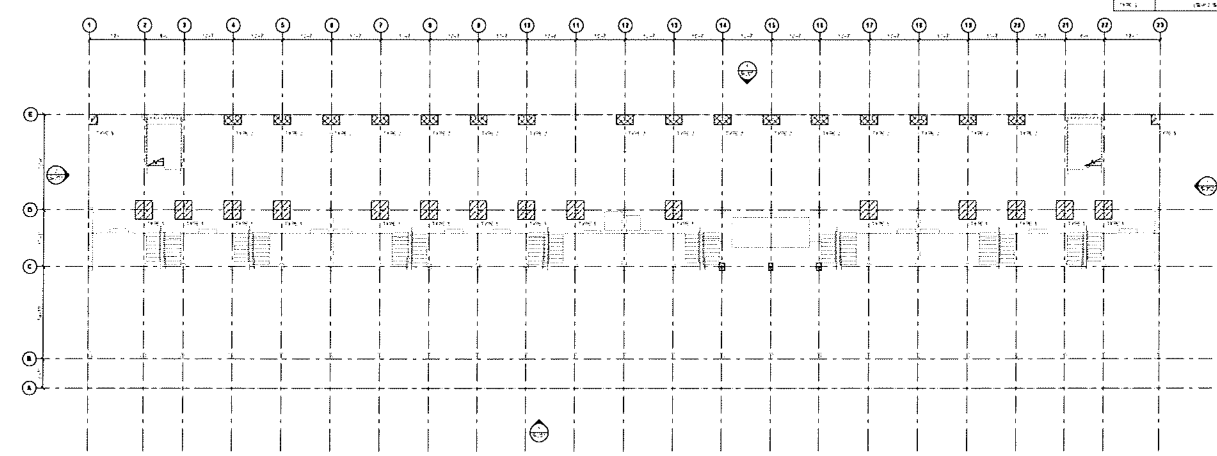

2 CONCRETE REPAIRS - LEVEL 6.5

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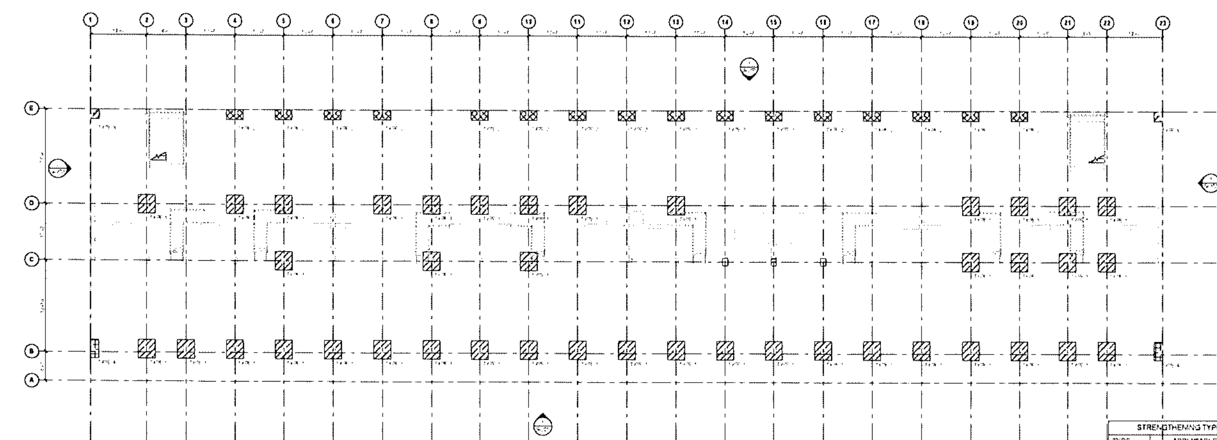
SLAB STRENGTHENING PLAN - LEVEL 6 & 6.5

S-106



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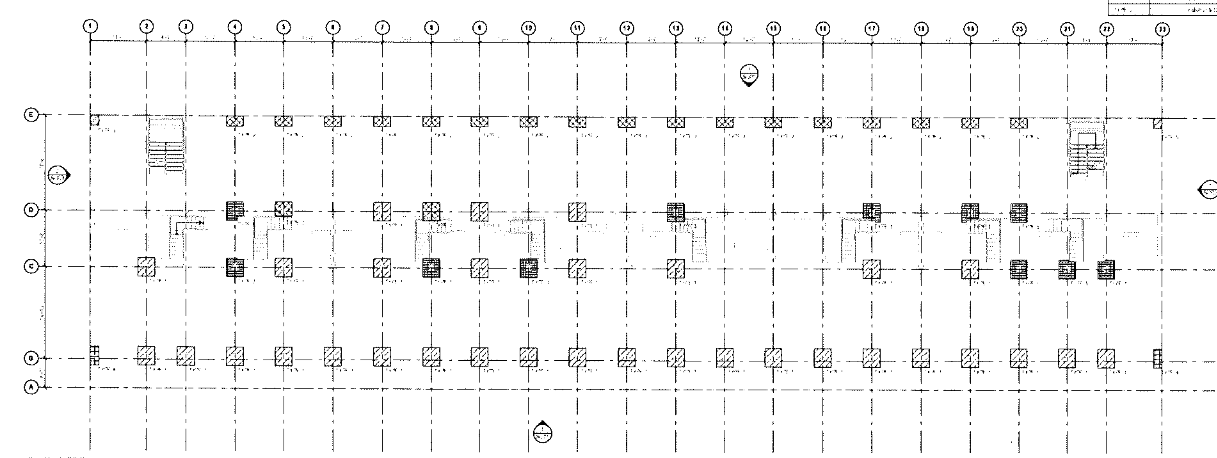

2 CONCRETE REPAIRS - LEVEL 8 (ROOF 1)

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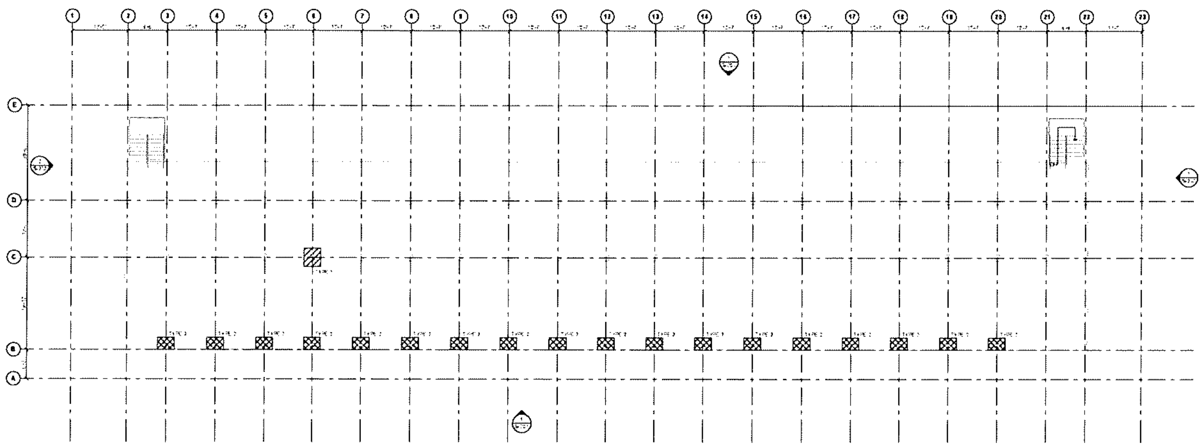
SLAB STRENGTHENING PLAN - LEVEL 7 & 8

S-107



1 CONCRETE REPAIRS - LEVEL 9 (ROOF 2)

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TYPE 3	[illegible]
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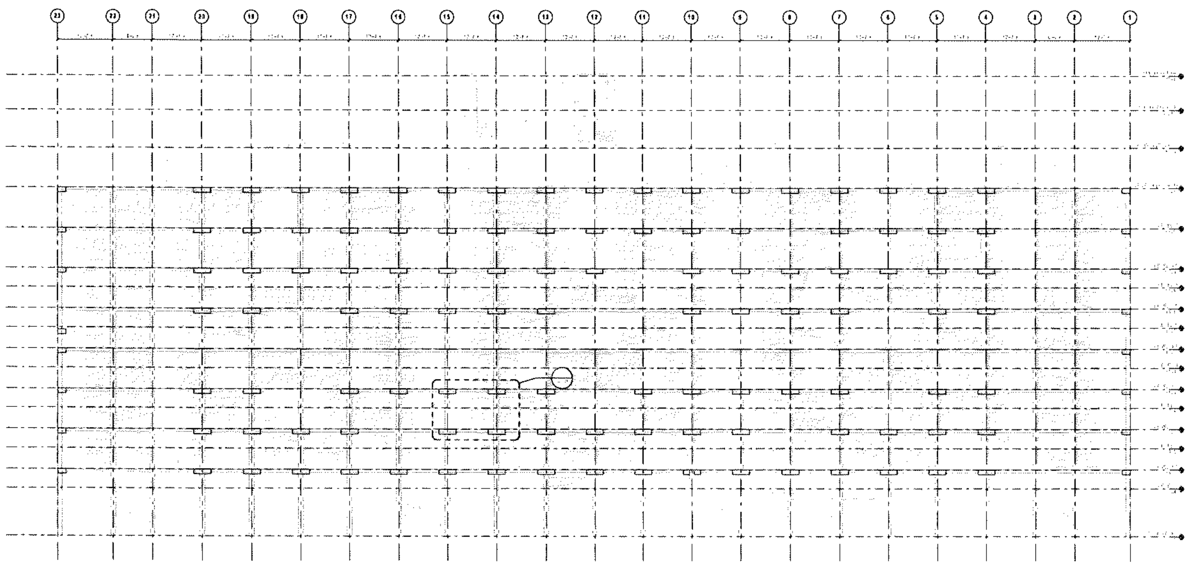
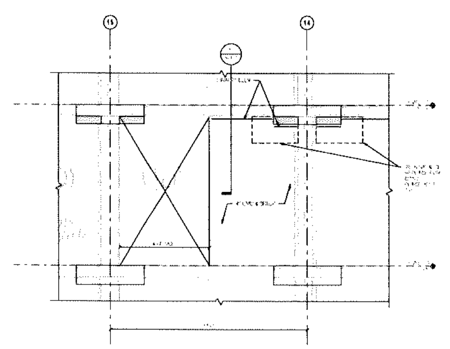
SLAB STRENGTHENING PLAN - LEVEL 9

S-108



1 NORTH ELEVATION



2 TYPICAL E LINE PARTIAL ELEVATION

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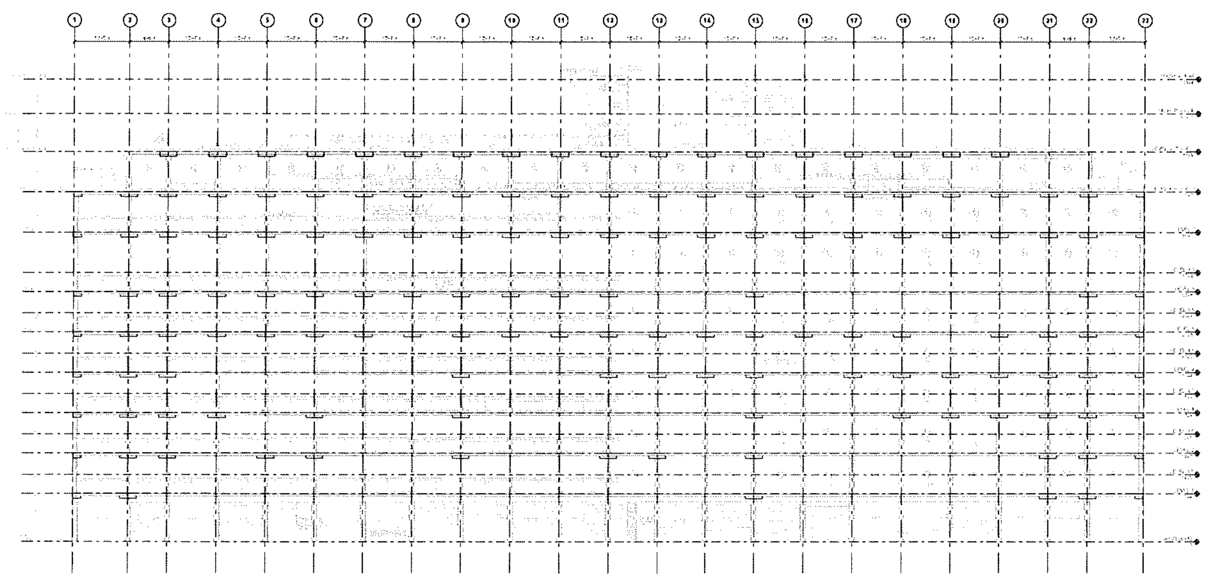
CAMBRIDGE, MA 02138

ELEVATIONS

S-200



1 SOUTH ELEVATION

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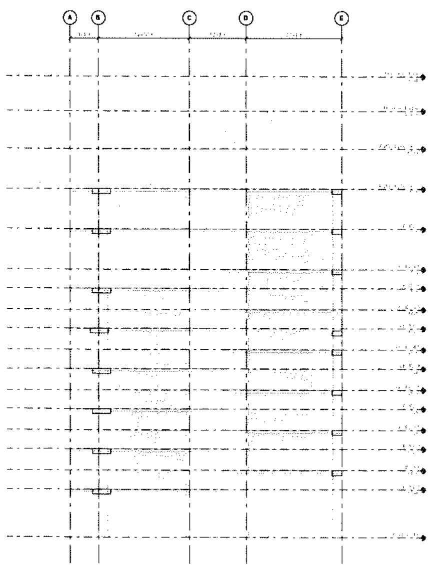
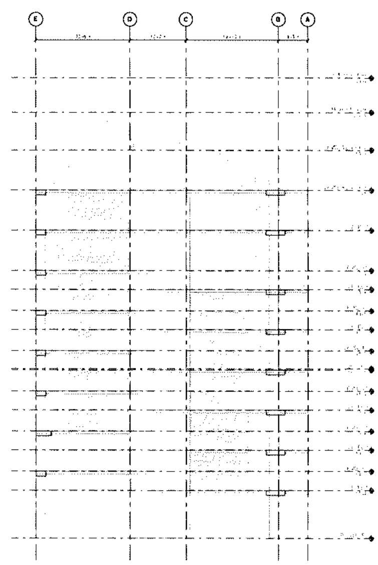
ELEVATIONS

S-201



1 EAST ELEVATION



2 WEST ELEVATION

SGH

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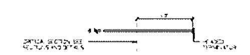
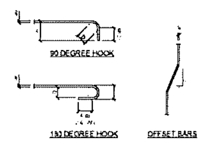
ELEVATIONS

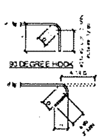
S-202





1 TENSION DEVELOPMENT LENGTH FOR HEADED BARS

2 REINFORCEMENT BENDS AND OFFSETS



3 STIRRUP AND TIE HOOK DIMENSIONS

4 REINFORCEMENT NOTATION

SIMPSON GUMPERTZ & HEGER

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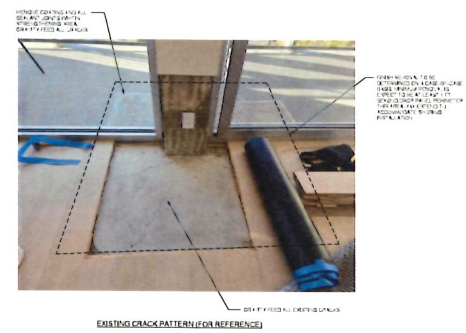
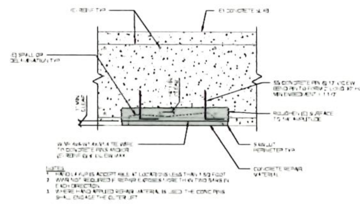
TYPICAL REINFORCEMENT DETAILS

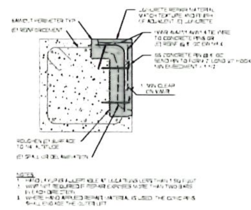
S-300



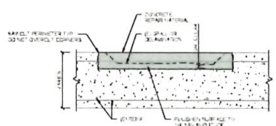
1 GRAVITY FEED EPOXY DETAIL



2 CONCRETE REPAIR - SLAB UNDERSIDE



3 CONCRETE COLUMN REPAIR



4 CONCRETE REPAIR - SLAB TOPSIDE

SIMPSON GUMPERTZ & HEGER
480 Totten Pond Road
Waltham, MA 02451
781.907.9000

Consultant

CONCEPT DESIGN - NOT FOR CONSTRUCTION

No.	Date	Description	By

RIVERVIEW CONDOMINIUM STRUCTURAL STRENGTHENING AND REPAIRS

221 MT AUBURN ST
CAMBRIDGE, MA 02138

Project

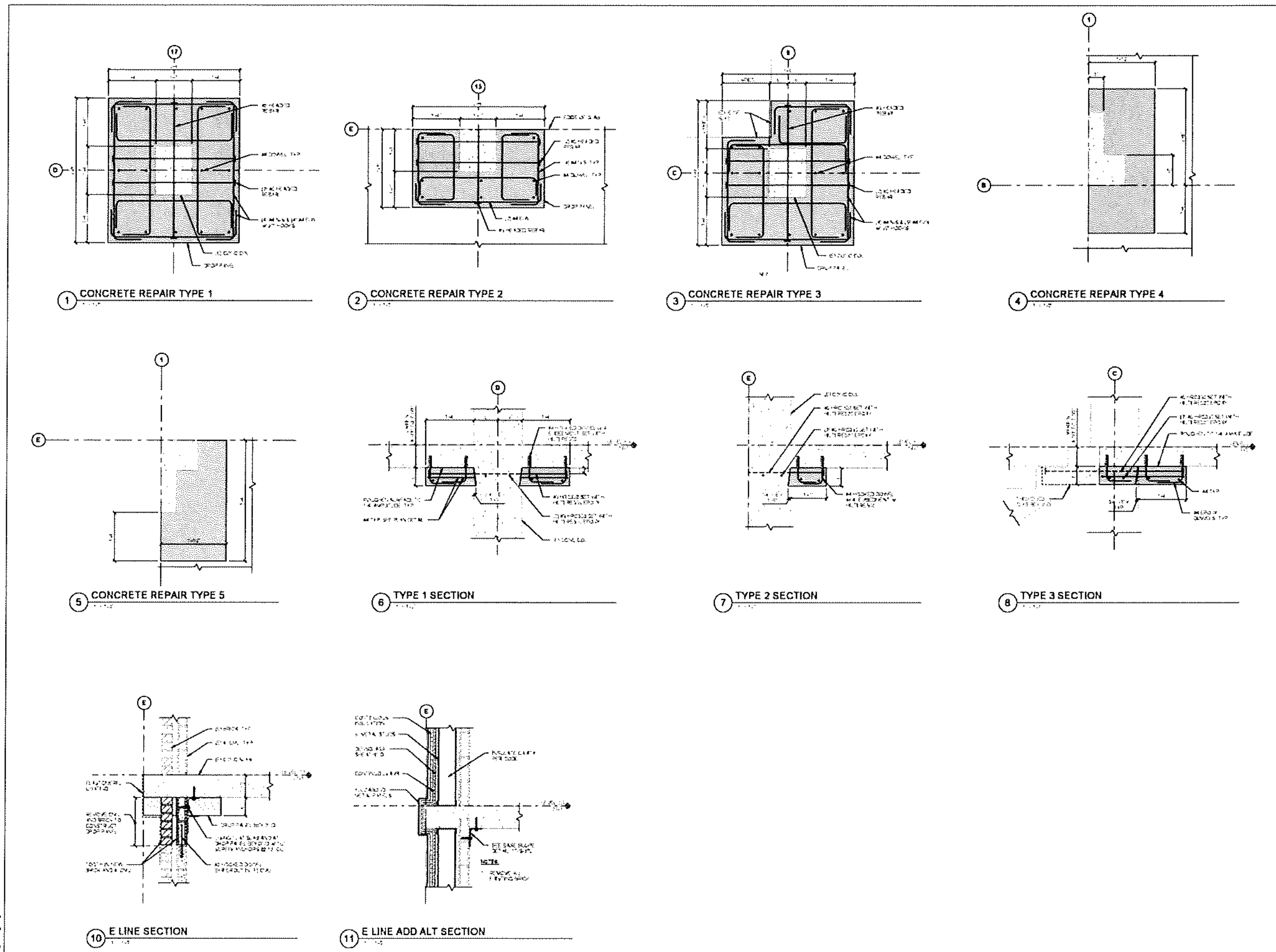
CONCRETE REPAIRS DETAILS

Drawing Title

Drawing No.

S-301

Seal



SGH
SIMPSON GUMPERTZ & HEGER

CONCEPT DESIGN - NOT FOR CONSTRUCTION

RIVERVIEW CONDOMINIUM STRUCTURAL STRENGTHENING AND REPAIRS

221 MT AUBURN ST
CAMBRIDGE, MA 02138

CONCRETE REPAIRS DETAILS

S-302

Riverview Condominiums

221 Mount Auburn Street
Cambridge, MA

ROOF REPLACEMENT
BID DOCUMENTS - 4 JUNE 2021
SGH PROJECT NUMBER: 200609.01-DSGN

GENERAL NOTES (APPLICABLE TO ALL SHEETS)

[illegible]

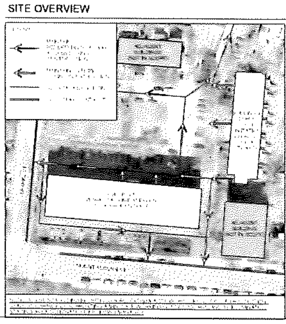
PROJECT OVERVIEW

[illegible]

PROJECT ALTERNATES

[illegible]

SITE OVERVIEW



ABBREVIATIONS

[illegible]

INDEX OF SHEETS	
Sheet Number	Sheet Name
C000	COVER SHEET
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	ROOF DETAILS
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

SIMPSON GUMPERTZ & HEGER

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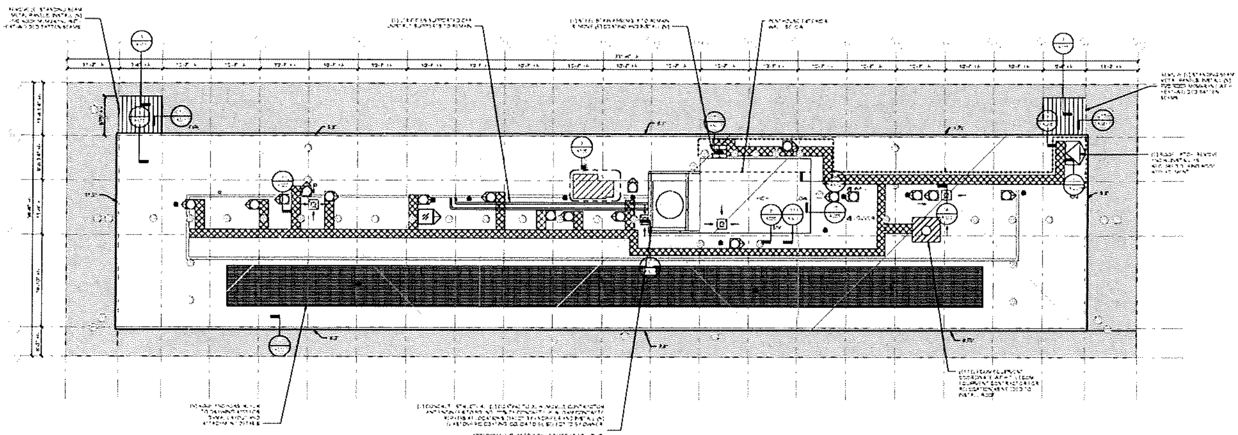
RIVERVIEW CONDOMINIUMS

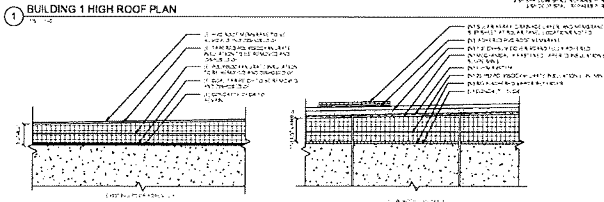
ROOF REPLACEMENT
221 MT. AUBURN ST.
CAMBRIDGE, MA

COVER SHEET

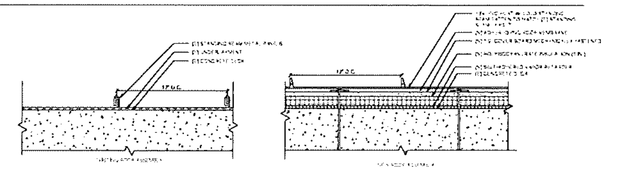
C000



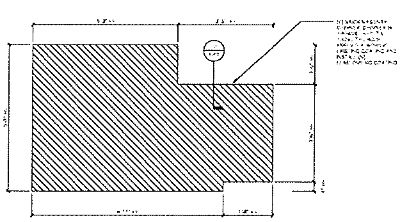
1 BUILDING 1 HIGH ROOF PLAN



2 HIGH ROOF ASSEMBLY (8,762 SF)



3 STEEP-SLOPED ROOF ASSEMBLY



4 CHIMNEY PLAN

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No.	Date	Description	By

RIVERVIEW CONDOMINIUMS

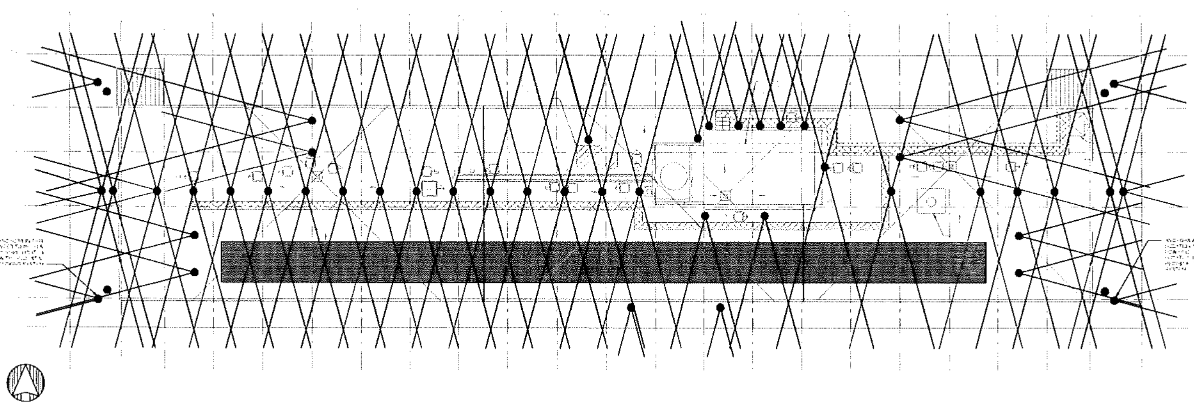
ROOF REPLACEMENT
221 MT. AUBURN ST.
CAMBRIDGE, MA

BUILDING 1 HIGH ROOF PLAN

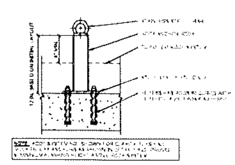
Drawing Title

Drawing No.

A100



(1) ROOF TIE-OFF ANCHOR CONCEPTUAL LAYOUT



(2) ROOF ANCHORS, CONCRETE DECK

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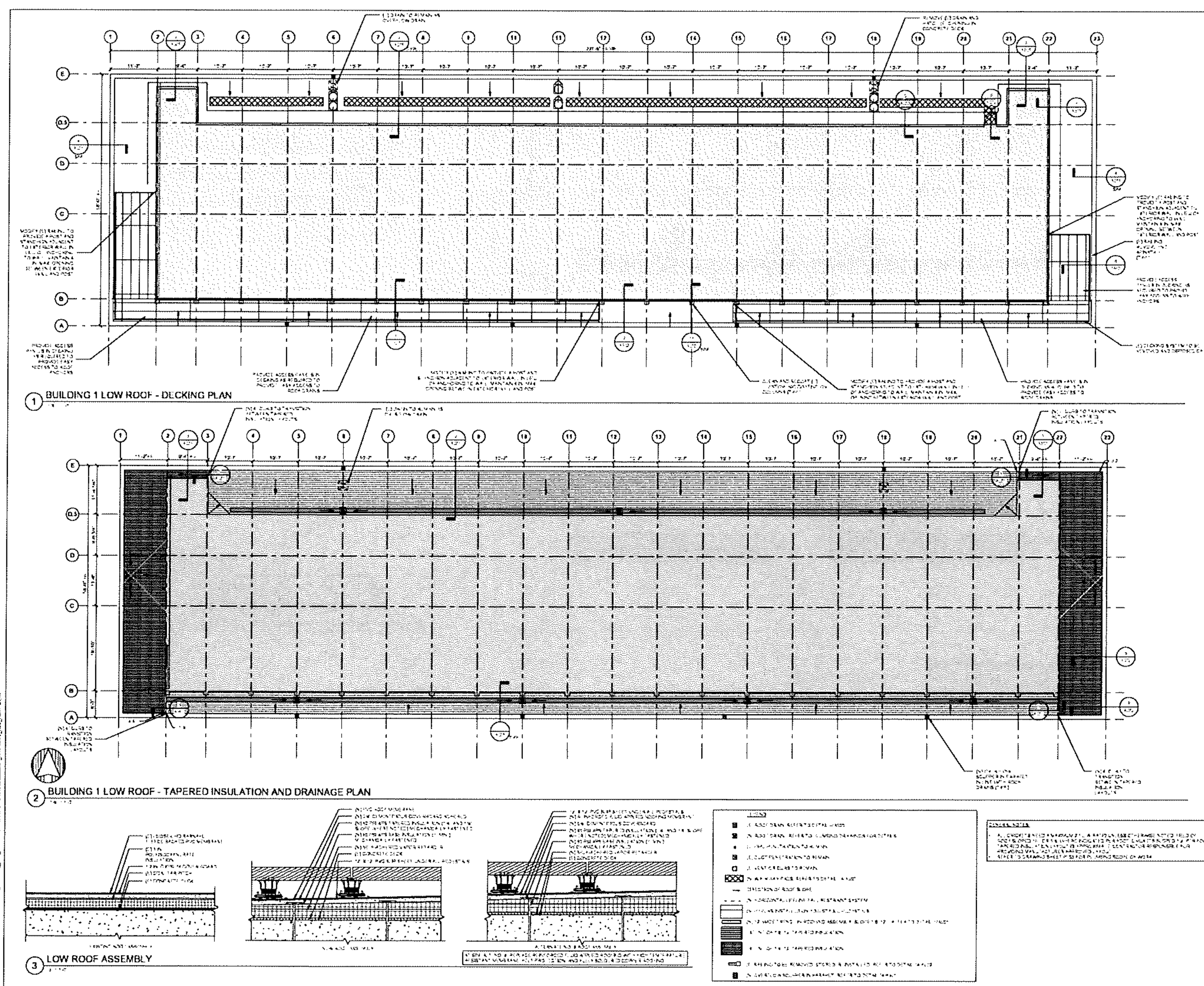
RIVERVIEW CONDOMINIUMS

ROOF REPLACEMENT
221 MT. AUBURN ST.
CAMBRIDGE, MA

BUILDING 1 ROOF TIE-OFF ANCHOR CONCEPTUAL LAYOUT

A101



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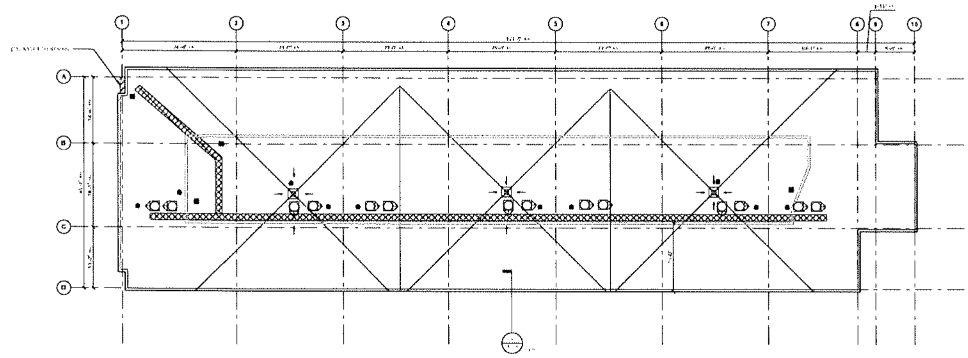
RIVERVIEW CONDOMINIUMS

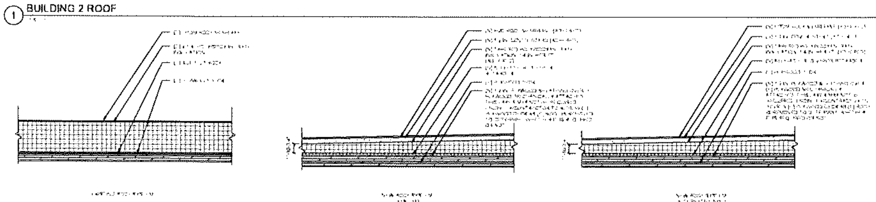
ROOF REPLACEMENT
221 MT. AUBURN ST.
CAMBRIDGE, MA

BUILDING 1 LOW ROOF PLAN

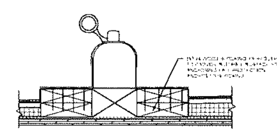
A102



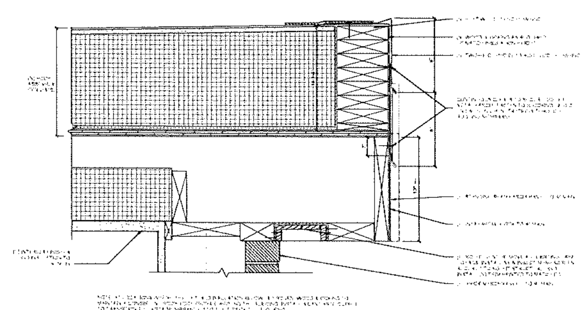
1 BUILDING 2 ROOF



2 BUILDING 2 ROOF SYSTEM



3 HORIZONTAL LIFE LINE ANCHORS, WOOD DECK



4 ROOF EDGE FLASHING

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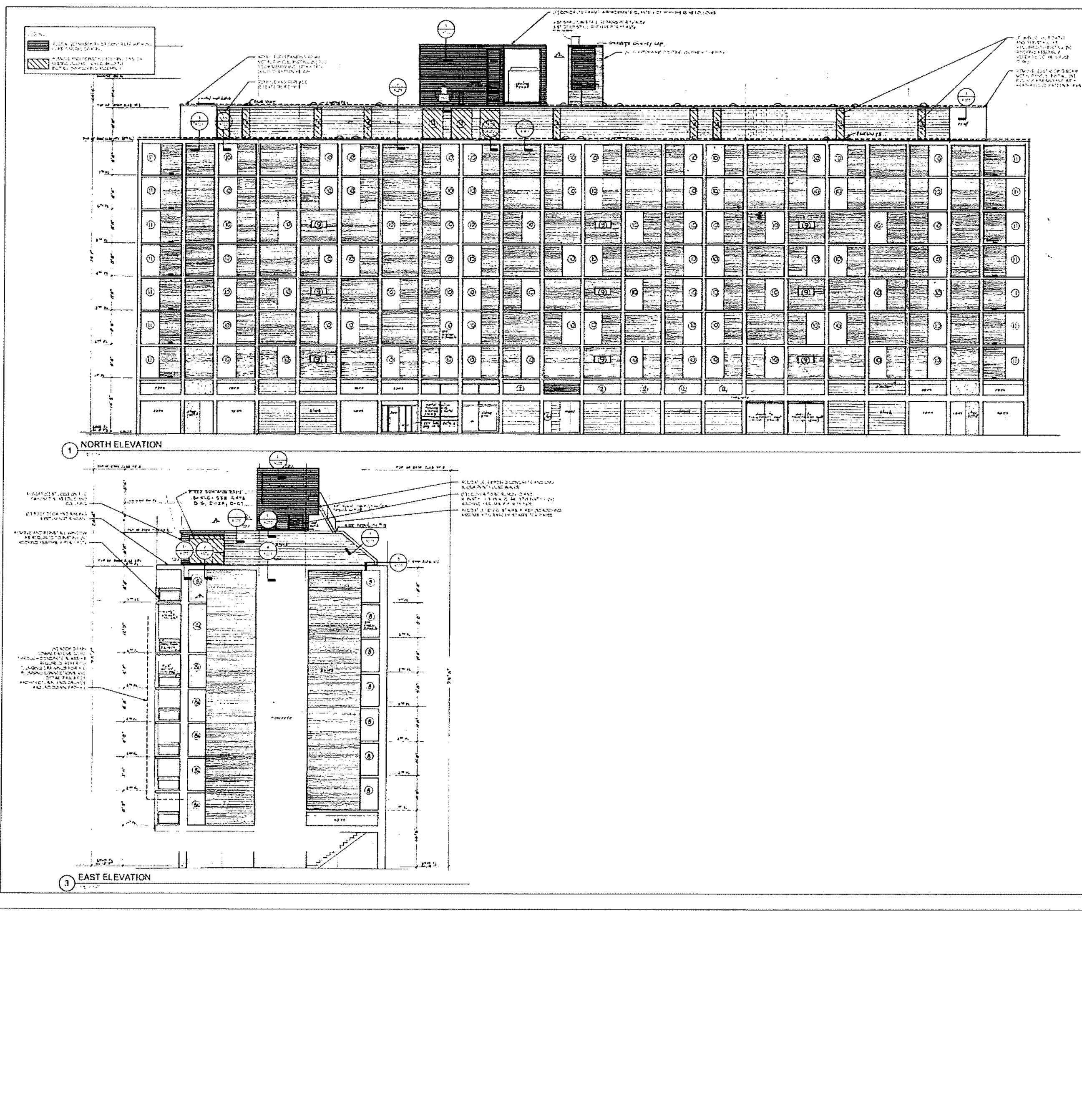
RIVERVIEW CONDOMINIUMS

ROOF REPLACEMENT
221 MT. AUBURN ST.
CAMBRIDGE, MA

BUILDING 2 ROOF PLAN

A103



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Engineering of Structures and Building Enclosures

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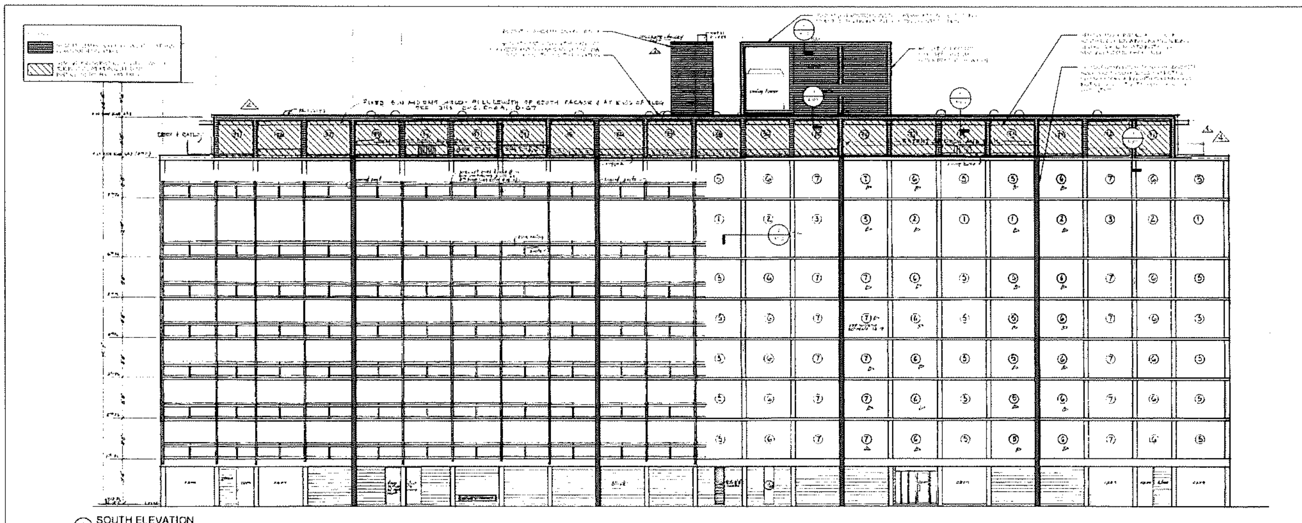
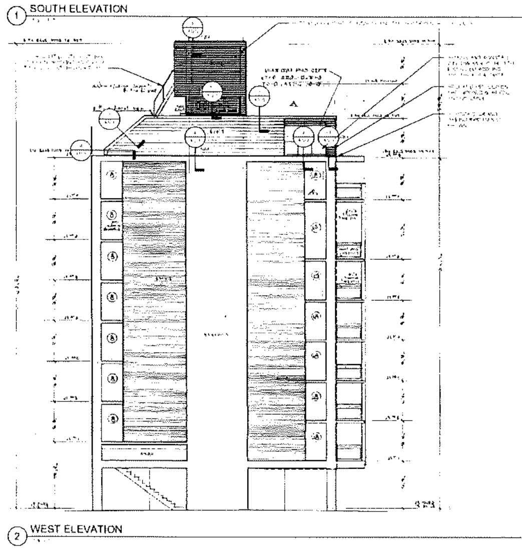
RIVERVIEW CONDOMINIUMS

ROOF REPLACEMENT
221 MT. AUBURN ST.
CAMBRIDGE, MA

BUILDING 1
ELEVATIONS -
NORTH, EAST

A200





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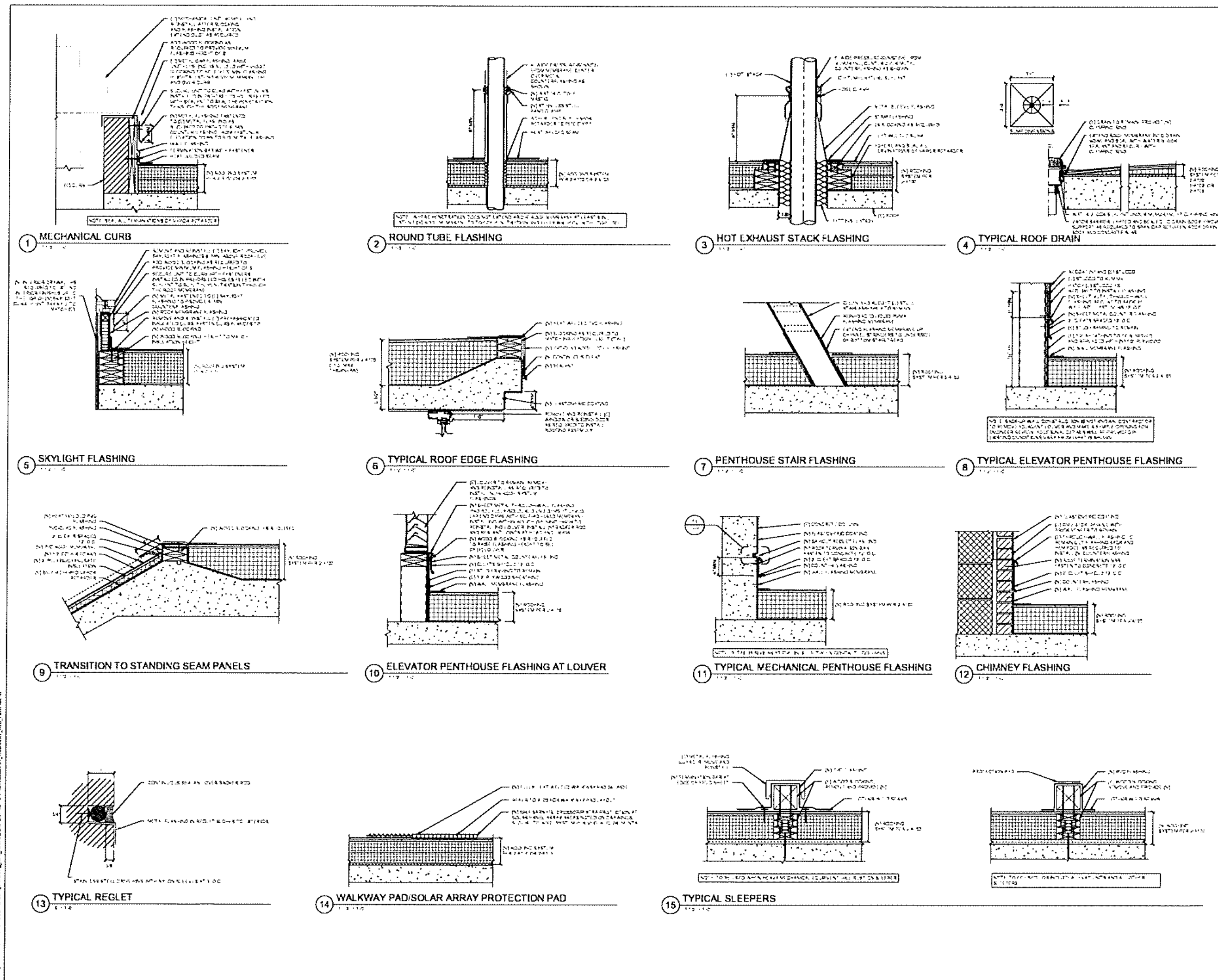
RIVERVIEW CONDOMINIUMS

ROOF REPLACEMENT
221 MT. AUBURN ST.
CAMBRIDGE, MA

BUILDING 1
ELEVATIONS - SOUTH, WEST

A201



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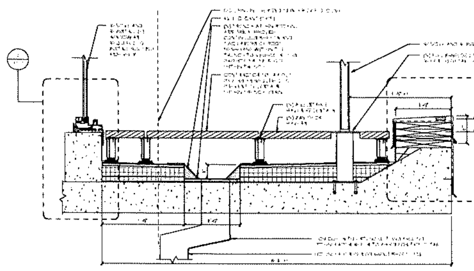
RIVERVIEW CONDOMINIUMS

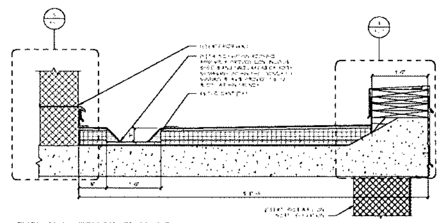
ROOF REPLACEMENT
221 MT. AUBURN ST.
CAMBRIDGE, MA

ROOF DETAILS

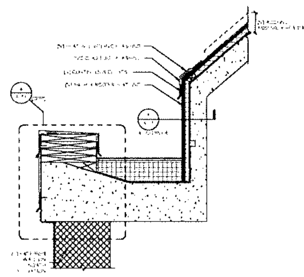
A500



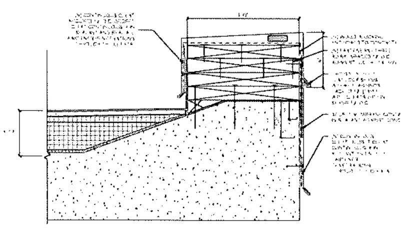
1 TYPICAL SOUTH SECTION CUT



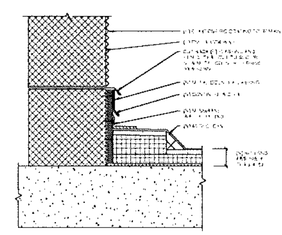
2 TYPICAL NORTH SECTION CUT



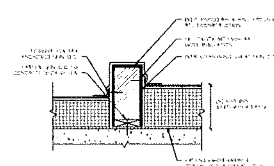
3 SECTION CUT AT STANDING SEAM PANELS



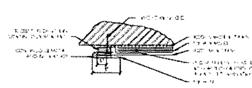
4 TYPICAL LOW ROOF PARAPET



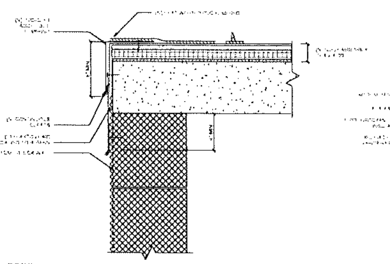
5 TYPICAL FLASHING AT CMU RISING WALL



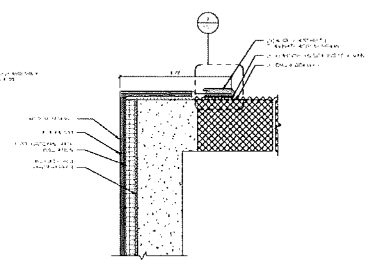
6 ROOF CURB AT TAPERED INSULATION TRANSITION



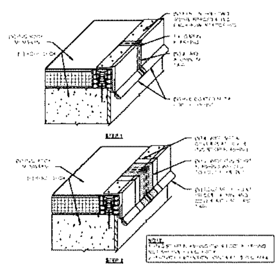
9 BLIND RECEIVERS



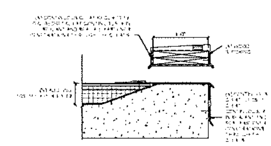
7 STEEP-SLOPED ROOF EDGE FLASHING



8 PLAN DETAIL - ROOF TERMINATION AT CMU RISING WALL



10 TYPICAL EDGE FLASHING EXPANSION JOINT



11 SCUPPER AT PARAPET

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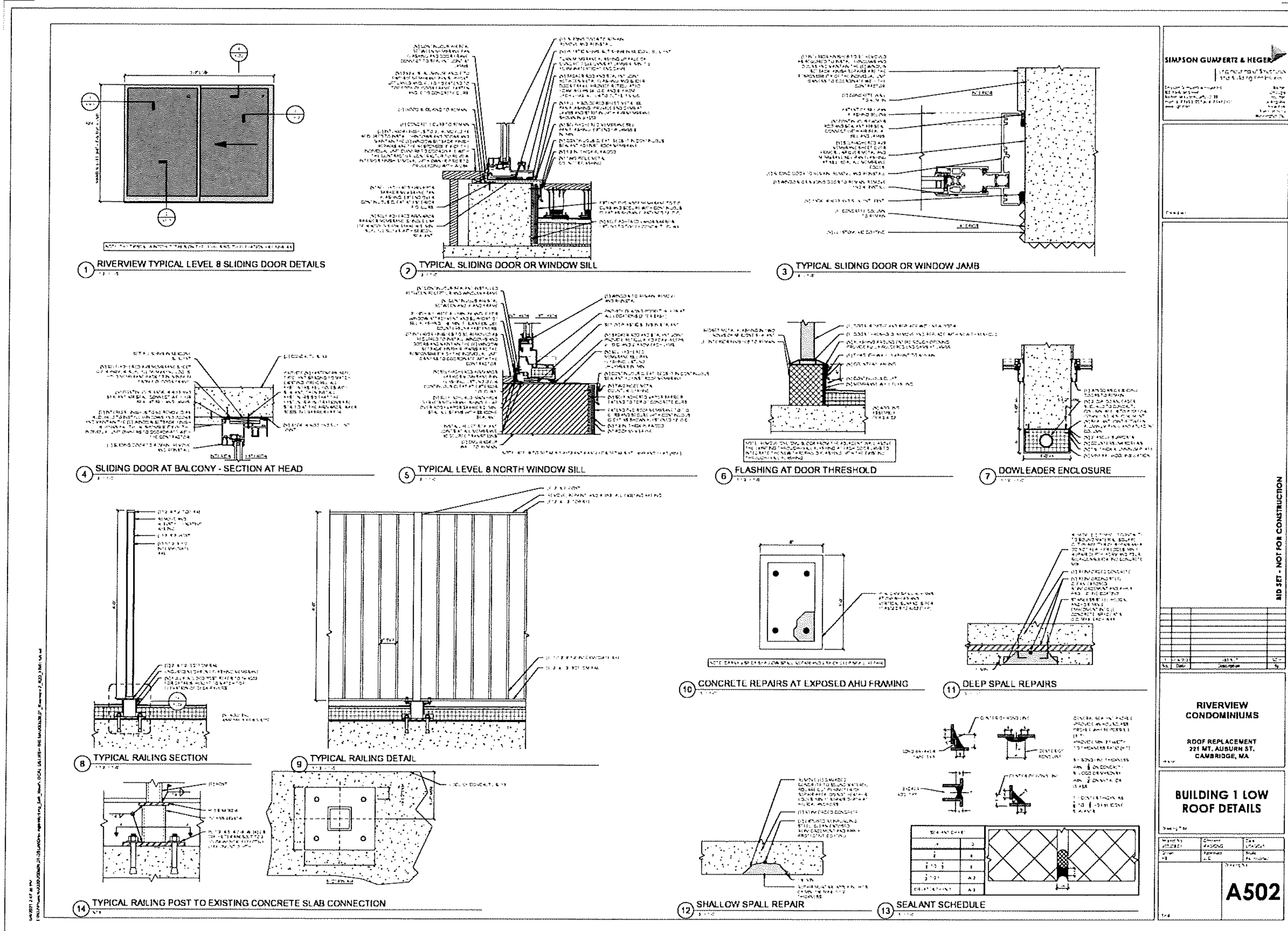
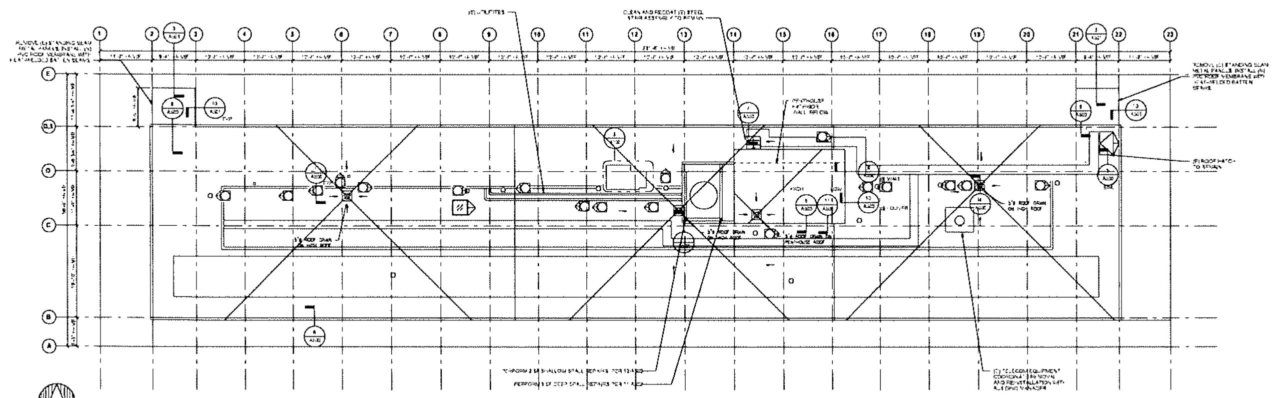
RIVERVIEW CONDOMINIUMS

ROOF REPLACEMENT
221 MT. AUBURN ST.
CAMBRIDGE, MA

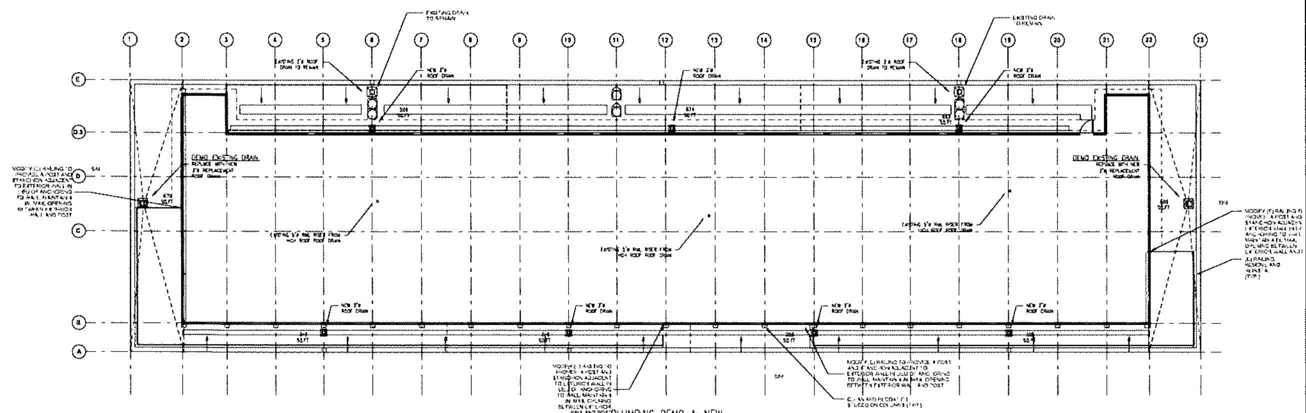
BUILDING 1 LOW ROOF DETAILS

A501


1 RIVERVIEW TYPICAL LEVEL 8 SLIDING DOOR DETAILS
2 TYPICAL SLIDING DOOR OR WINDOW SILL
3 TYPICAL SLIDING DOOR OR WINDOW JAMB
4 SLIDING DOOR AT BALCONY - SECTION AT HEAD
5 TYPICAL LEVEL 8 NORTH WINDOW SILL
6 FLASHING AT DOOR THRESHOLD
7 DOWLEADER ENCLOSURE
8 TYPICAL RAILING SECTION
9 TYPICAL RAILING DETAIL
10 CONCRETE REPAIRS AT EXPOSED AHU FRAMING
11 DEEP SPALL REPAIRS
12 SHALLOW SPALL REPAIR
13 SEALANT SCHEDULE
14 TYPICAL RAILING POST TO EXISTING CONCRETE SLAB CONNECTION
SIMPSON GUMPERTZ & HEGER
BID SET - NOT FOR CONSTRUCTION
RIVERVIEW CONDOMINIUMS
ROOF REPLACEMENT
221 MT. AUBURN ST.
CAMBRIDGE, MA
BUILDING 1 LOW ROOF DETAILS
A502



PLUMBING
HIGH ROOF PLAN



PLUMBING DEMO & NEW
LOW ROOF PLAN

SIMPSON GUMPERTZ & HEGER
Engineering of Structures and Building Enclosures

CROSSFIELD ENGINEERING, INC

06/03/21
PROGRESS

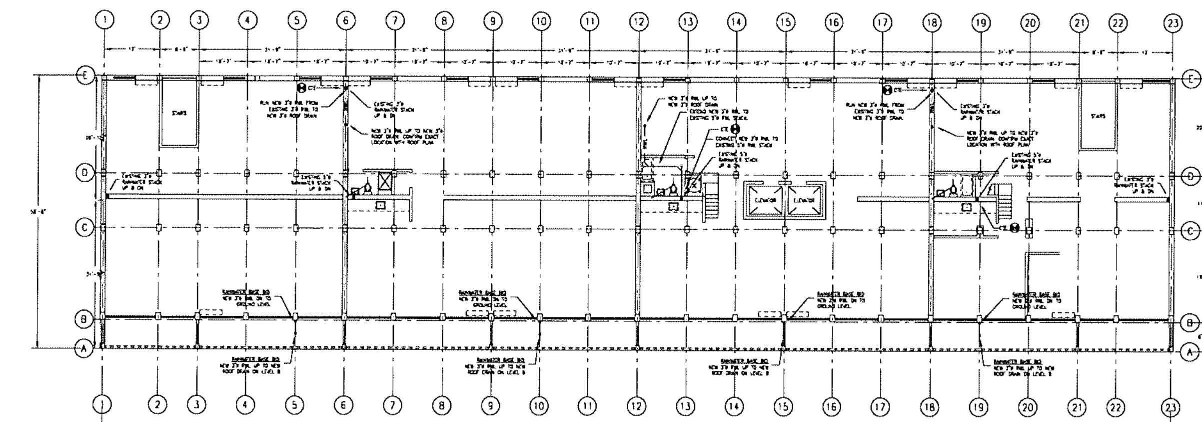
BID SET - NOT FOR CONSTRUCTION

RIVERVIEW CONDOMINIUMS

ROOF REPLACEMENT
221 MT AUBURN ST.
CAMBRIDGE, MA

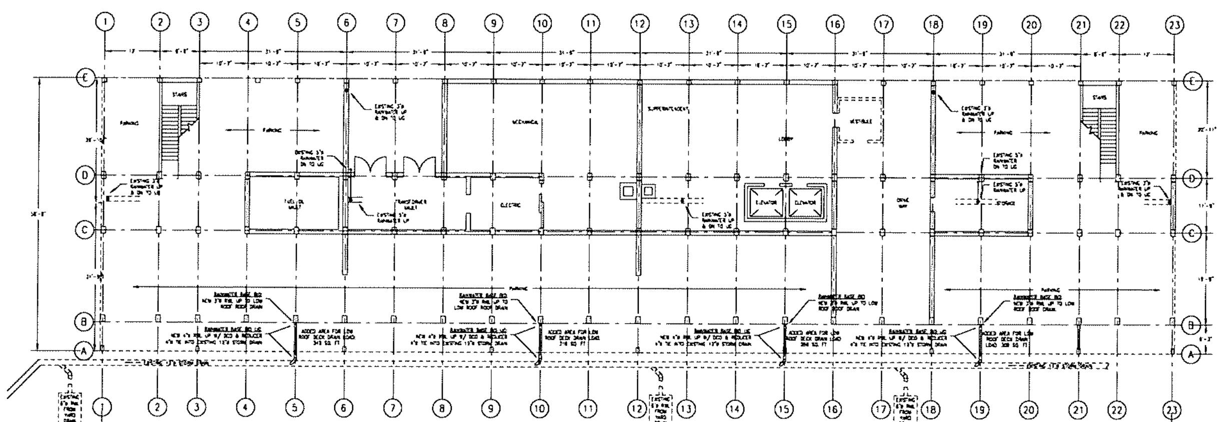
PLUMBING
LOW & HIGH ROOF PLANS
BASE BID AND
ALTERNATE #1
COMMON TO BOTH SCOPES

P101



PLUMBING
7TH FLOOR PLAN

EXISTING 7TH FLOOR PLUMBING WORK WAS OBTAINED FROM ORIGINAL MECHANICAL PDF DRAWINGS M-11 & M12 DATED DEC 14, 2061 REV 3/27/87



GROUND LEVEL & UNDERGROUND NEW PLUMBING
GROUND LEVEL PLAN

EXISTING GROUND LEVEL PLUMBING WORK WAS OBTAINED FROM ORIGINAL MECHANICAL PDF DRAWINGS M-1 DATED DEC 14, 2061

SIMPSON GUMPERTZ & HEGER
Engineering of Structures and Building Enclosures

CROSSFIELD ENGINEERING, INC.

06/03/21
PROGRESS

BID SET - NOT FOR CONSTRUCTION

No.	Date	Description	By

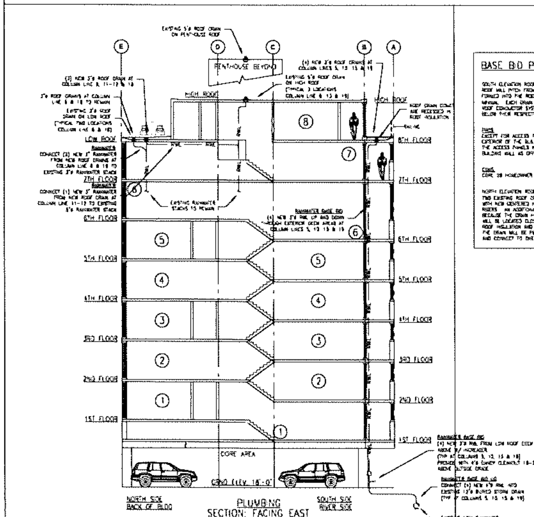
RIVERVIEW CONDOMINIUMS

ROOF REPLACEMENT
221 MT AUBURN ST.
CAMBRIDGE, MA

PLUMBING
GROUND, UNDERGROUND
& 7TH FLOOR PLAN
BASE BID

Project No.	Checked MAT	Date
Drawn DCN	Approved SRH	Scale

Drawing No.
P102



PLUMBING
SECTION: FACING EAST

BASE BID PLUMBING SCOPE:

SOUTH ELEVATION ROOF: INSTALL FOUR NEW ROOF DRAINS ADJACENT TO THE PENTHOUSE EXTERIOR WALLS. THE ROOF WILL PITCH FROM THE OUTER EDGE INWARD TOWARD THE BUILDING. TAPERED DRAINAGE CHANNELS WILL BE FORMED INTO THE ROOF INSULATION AND MEMBRANE TO ASSIST FLOW TO THE DRAINS WHERE ROOF SLOPE ITSELF IS MINIMAL. EACH DRAIN WILL SIT ON TOP OF A NEW 3" CAST IRON RISER (WITH NO OFFSETS) AND CONNECT TO THE ROOF CONDUCTOR SYSTEM ABOVE THE GARAGE CEILING. THE RISERS WILL PENETRATE EACH BALCONY DIRECTLY BELOW THEIR RESPECTIVE DRAIN AND BOXED IN AT THE BUILDING COLUMNS TO BE AS INCONSPICUOUS AS POSSIBLE.

PROS:
EXCEPT FOR ACCESS TO THE BALCONIES THROUGH THE DWELLING UNITS, THE WORK WILL TAKE PLACE ON THE EXTERIOR OF THE BUILDING AND IN THE OPEN PARKING GARAGE.
THE ACCESS PANELS IN THE DECK SURFACE FOR CLEANING AND MAINTAINING THE DRAINS WILL BE CLOSE TO THE BUILDING WALL AS OPPOSED TO THE CENTER OF THE DECKS.

CONS:
CORE 28 HOMEOWNER BALCONIES AND BOX IN PIPE RISERS AT EACH LOCATION

NORTH ELEVATION ROOF: THIS IS THE ONLY VIABLE OPTION WE CAME UP WITH FOR THE NORTH SIDE. REMOVE THE TWO EXISTING ROOF DRAINS AT COLUMNS [illegible] (AND ADD NEW DRAIN ON COLUMN LINE [illegible]) AND REPLACE WITH NEW CENTERED IN THE SHORT DIMENSION OF THE ROOF. EACH DRAIN WILL BE CONNECTED TO THE EXISTING RISERS. AN ADDITIONAL DRAIN WILL BE REQUIRED BUT IT CANNOT BE IN LINE WITH THE OTHER THREE DRAINS BECAUSE THE DRAIN HUB WOULD BE EXPOSED AT THE CEILING OF ONE OF THE DWELLING UNITS. THE NEW DRAIN WILL BE LOCATED CLOSE TO THE 8TH FLOOR WALL. A TAPERED DRAINAGE CHANNEL WILL BE FORMED INTO THE ROOF INSULATION AND MEMBRANE TO ASSIST FLOW TO THE DRAIN, FROM THE CENTER OF THE ROOF AREA IT SERVES. THE DRAIN WILL BE PIPED ABOVE THE CEILING IN THE 7TH FLOOR HALL TO THE UTILITY ROOM NEAR THE ELEVATORS AND CONNECT TO ONE OF THE EXISTING 5 RAIN LEADERS SERVING THE HIGH ROOF.

RAINWATER PIPING SPECIFICATIONS

HUBLESS CAST IRON SOIL PIPE AND FITTINGS:
HUBLESS CAST IRON PIPE AND FITTINGS SHALL BE MANUFACTURED FROM GRAY CAST IRON AND SHALL CONFORM TO ASTM A 888 AND CISPI STANDARD 301. ALL PIPE AND FITTINGS SHALL BE MARKED WITH THE COLLECTIVE TRADEMARK OF THE CAST IRON SOIL PIPE INSTITUTE & AND LISTED BY NSF INTERNATIONAL. HUBLESS COUPLINGS SHALL CONFORM TO CISPI STANDARD 310, SHALL BE MANUFACTURED IN THE UNITED STATES, AND BE CERTIFIED BY NSF INTERNATIONAL. HEAVY DUTY COUPLINGS SHALL CONFORM TO ASTM C 1540, SHALL BE MANUFACTURED IN THE UNITED STATES, AND SHALL BE USED IF INDICATED. GASKETS SHALL CONFORM TO ASTM C 564. ALL PIPE AND FITTINGS TO BE PRODUCED BY A SINGLE MANUFACTURER AND ARE TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND APPLICABLE CODE REQUIREMENTS. COUPLINGS SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S BAND TIGHTENING SEQUENCE AND TORQUE RECOMMENDATIONS. TIGHTEN BANDS WITH A PROPERLY CALIBRATED TORQUE LIMITING DEVICE. THE SYSTEM SHALL BE HYDROSTATICALLY TESTED AFTER INSTALLATION TO 10 FT OF HEAD (4.3 PSI MAXIMUM). WARNING! NEVER TEST WITH OR TRANSPORT/STORE COMPRESSED AIR OR GAS IN CAST IRON PIPE OR FITTINGS. DOING SO CAN RESULT IN EXPLOSIVE FAILURES AND CAUSE SEVERE INJURY OR DEATH.
HUB AND SPIGOT CAST IRON SOIL PIPE AND FITTINGS:
HUB AND SPIGOT CAST IRON PIPE AND FITTINGS SHALL BE MANUFACTURED FROM GRAY CAST IRON AND SHALL CONFORM TO ASTM A 74. ALL PIPE AND FITTINGS SHALL BE MARKED WITH THE COLLECTIVE TRADEMARK OF THE CAST IRON SOIL PIPE INSTITUTE & AND LISTED BY NSF INTERNATIONAL.
PIPE AND FITTING JOINTS (ABOVE GRADE):
JOINTS TO BE MADE USING LEAD AND OAKUM. ALL PIPE AND FITTINGS TO BE PRODUCED BY A SINGLE MANUFACTURER AND ARE TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND APPLICABLE CODE REQUIREMENTS. THE SYSTEM SHALL BE HYDROSTATICALLY TESTED AFTER INSTALLATION TO 10 FT OF HEAD (4.3 PSI MAXIMUM). WARNING! NEVER TEST WITH OR TRANSPORT/STORE COMPRESSED AIR OR GAS IN CAST IRON PIPE OR FITTINGS. DOING SO CAN RESULT IN EXPLOSIVE FAILURES AND CAUSE SEVERE INJURY OR DEATH.

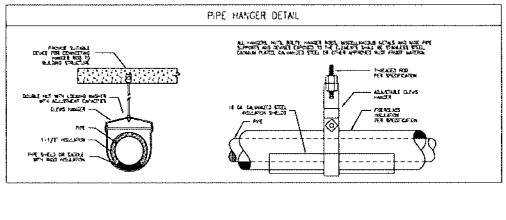
ROOF DRAIN SPECIFICATIONS

ZURN ZC-100 SERIES, 15" DIAMETER ROOF DRAIN, DURA COATED CAST IRON BODY WITH MEMBRANE FLASHING, FLASHING CLAMP / GRAVEL GUARD AND CAST IRON DOME. PROVIDE WITH ALL ACCESSORIES, ADAPTORS AND/OR DEVICES REQUIRED TO COORDINATE, INSTALL AND MATCH ROOF AND DECK CONSTRUCTION.

REPLACEMENT ROOF DRAIN SPECIFICATIONS

RD2150 REPLACEMENT ROOF DRAIN DESIGNED FOR RENOVATION ROOF APPLICATIONS WHERE EXISTING ROOF DRAIN BODIES CANNOT BE UTILIZED. THE RD2150 IS DESIGNED TO PENETRATE THE OLD ROOF DRAIN BODY BONDING SECURELY TO THE INSIDE OF THE DRAIN PIPE. THE RD2150 IS FURNISHED WITH #14 GAGE TYPE 304 STAINLESS STEEL BODY AND NEOPRENE GASKET, COMPLETE WITH DURA-COATED CAST IRON CLAMP COLLAR AND DOME WITH STAINLESS STEEL HARDWARE.

PIPE HANGER DETAIL



SIMPSON GUMPERTZ & HEGER
Engineering of Structures and Building Enclosures

CROSSFIELD ENGINEERING, INC.

06/03/21
PROGRESS

BID SET - NOT FOR CONSTRUCTION

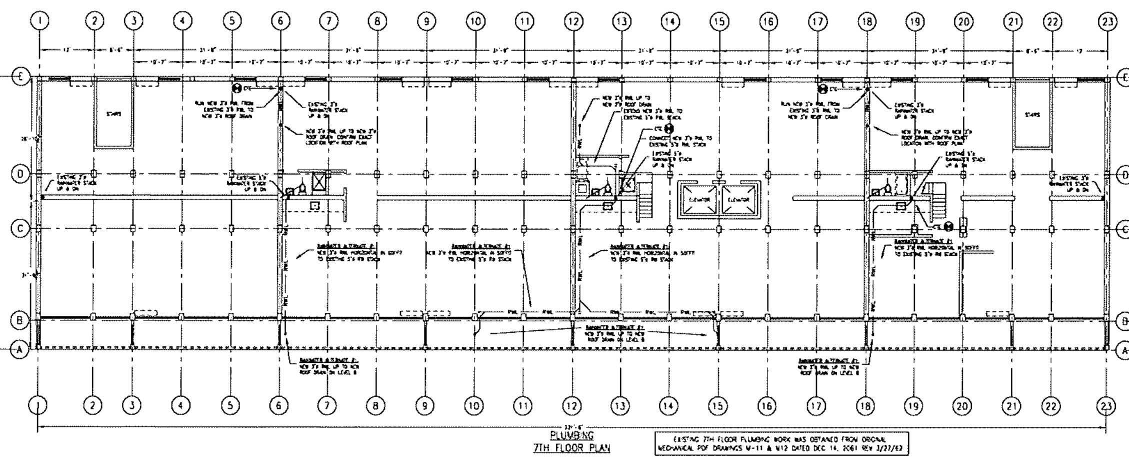
RIVERVIEW CONDOMINIUMS

ROOF REPLACEMENT
221 MT AUBURN ST.
CAMBRIDGE, MA

PLUMBING
BASE BID
SCOPE, RISER DIAGRAM
SCHEDULES & DETAILS

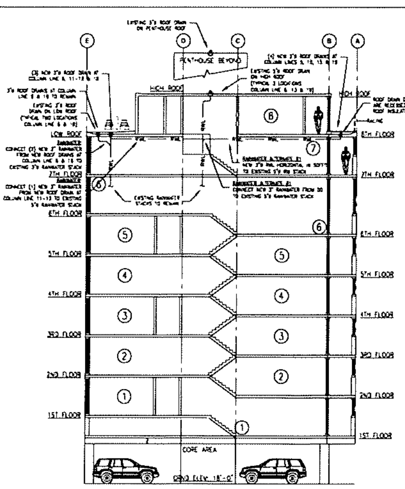
	Checked: MAT	
Drawn: DCN	Approved: SPH	Scale: AS NOTED

P103



PLUMBING
7TH FLOOR PLAN

EXISTING 7TH FLOOR PLUMBING WORK WAS OBTAINED FROM ORIGINAL MECHANICAL PDF DRAWINGS M-11 & M12 DATED DEC 14, 2061 REV 3/27/62



NORTH SIDE
BACK OF BLDG

PLUMBING
SECTION: FACING EAST

SOUTH SIDE
RIVER SIDE

ALTERNATE #1 PLUMBING SCOPE:

SOUTH ELEVATION ROOF, SIMILAR TO OPTION 1 EXCEPT THE DRAINS WILL BE PIPED IN SOFFITS THROUGH THE 7TH FLOOR DWELLING UNITS TO THE UTILITY ROOM NEAR THE ELEVATORS AND CONNECT TO THE EXISTING 5 RAIN LEADERS SERVING THE HIGH ROOF

NORTH ELEVATION ROOF SAME AS OPTION 1
NORTH ELEVATION ROOF THIS IS THE ONLY VIABLE OPTION WE CAME UP WITH FOR THE NORTH SIDE. REMOVE THE THREE EXISTING ROOF DRAINS AND REPLACE WITH NEW CENTERED IN THE SHORT DIMENSION OF THE ROOF. EACH DRAIN WILL BE CONNECTED TO THE EXISTING RISERS. AN ADDITIONAL DRAIN WILL BE REQUIRED BUT IT CANNOT BE IN LINE WITH THE OTHER THREE DRAINS BECAUSE THE DRAIN HUB WOULD BE EXPOSED AT THE CEILING OF ONE OF THE DWELLING UNITS. THE NEW DRAIN WILL BE LOCATED CLOSE TO THE 8TH FLOOR WALL. A TAPERED DRAINAGE CHANNEL WILL BE FORMED INTO THE ROOF INSULATION AND MEMBRANE TO ASSIST FLOW TO THE DRAIN, FROM THE CENTER OF THE ROOF AREA IT SERVES. THE DRAIN WILL BE PIPED ABOVE THE CEILING IN THE 7TH FLOOR HALL TO THE UTILITY ROOM NEAR THE ELEVATORS AND CONNECT TO ONE OF THE EXISTING 5 RAIN LEADERS SERVING THE HIGH ROOF.

PROS. ELIMINATES COMING BALCONIES AND BOXING IN RISERS.
CONS. REQUIRES A [illegible] (EXACT TBD DURING CD PHASE) SOFFIT IN THREE RESIDENCES.

RAINWATER PIPING SPECIFICATIONS

HUBLESS CAST IRON SOIL PIPE AND FITTINGS.
HUBLESS CAST IRON PIPE AND FITTINGS SHALL BE MANUFACTURED FROM GRAY CAST IRON AND SHALL CONFORM TO ASTM A 888 AND CISPI STANDARD 301. ALL PIPE AND FITTINGS SHALL BE MARKED WITH THE COLLECTIVE TRADEMARK OF THE CAST IRON SOIL PIPE INSTITUTE ® AND LISTED BY NSF INTERNATIONAL. HUBLESS COUPLINGS SHALL CONFORM TO CISPI STANDARD 310, SHALL BE MANUFACTURED IN THE UNITED STATES, AND BE CERTIFIED BY NSF INTERNATIONAL. HEAVY DUTY COUPLINGS SHALL CONFORM TO ASTM C 1540, SHALL BE MANUFACTURED IN THE UNITED STATES, AND SHALL BE USED IF INDICATED. GASKETS SHALL CONFORM TO ASTM C 564. ALL PIPE AND FITTINGS TO BE PRODUCED BY A SINGLE MANUFACTURER AND ARE TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND APPLICABLE CODE REQUIREMENTS. COUPLINGS SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S BAND TIGHTENING SEQUENCE AND TORQUE RECOMMENDATIONS. TIGHTEN BANDS WITH A PROPERLY CALIBRATED TORQUE LIMITING DEVICE. THE SYSTEM SHALL BE HYDROSTATICALLY TESTED AFTER INSTALLATION TO 10 FT. OF HEAD (4.3 PSI MINIMUM). WARNING: NEVER TEST WITH OR TRANSPORT/STORE COMPRESSED AIR OR GAS IN CAST IRON PIPE OR FITTINGS. DOING SO CAN RESULT IN EXPLOSIVE FAILURES AND CAUSE SEVERE INJURY OR DEATH.
HUB AND SPIGOT CAST IRON SOIL PIPE AND FITTINGS.
HUB AND SPIGOT CAST IRON PIPE AND FITTINGS SHALL BE MANUFACTURED FROM GRAY CAST IRON AND SHALL CONFORM TO ASTM A 74. ALL PIPE AND FITTINGS SHALL BE MARKED WITH THE COLLECTIVE TRADEMARK OF THE CAST IRON SOIL PIPE INSTITUTE ® AND LISTED BY NSF INTERNATIONAL.
PIPE AND FITTING JOINTS (LEAD & OAKUM).
JOINTS TO BE MADE USING LEAD AND OAKUM. ALL PIPE AND FITTINGS TO BE PRODUCED BY A SINGLE MANUFACTURER AND ARE TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND APPLICABLE CODE REQUIREMENTS. THE SYSTEM SHALL BE HYDROSTATICALLY TESTED AFTER INSTALLATION TO 10 FT. OF HEAD (4.3 PSI MINIMUM). WARNING: NEVER TEST WITH OR TRANSPORT/STORE COMPRESSED AIR OR GAS IN CAST IRON PIPE OR FITTINGS. DOING SO CAN RESULT IN EXPLOSIVE FAILURES AND CAUSE SEVERE INJURY OR DEATH.

ROOF DRAIN SPECIFICATIONS

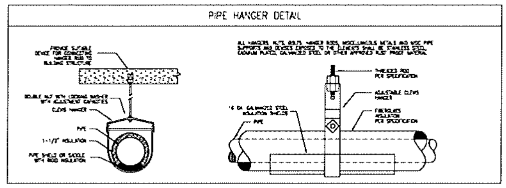
ZURN ZC-100 SERIES, 15" DIAMETER ROOF DRAIN, DURA COATED CAST IRON BODY WITH MEMBRANE FLASHING FLASHING CLAMP/ GRAVEL GUARD AND CAST IRON DOME. PROVIDE WITH ALL ACCESSORIES, ADAPTERS AND/OR DEVICES REQUIRED TO COORDINATE, INSTALL AND MATCH ROOF AND DECK CONSTRUCTION.

REPLACEMENT ROOF DRAIN SPECIFICATIONS

RD2130 REPLACEMENT ROOF DRAIN DESIGNED FOR RENOVATION ROOF APPLICATIONS WHERE EXISTING ROOF DRAIN BODIES CANNOT BE UTILIZED. THE RD2130 IS DESIGNED TO PENETRATE THE OLD ROOF DRAIN BODY, BONDING SECURELY TO THE INSIDE OF THE DRAIN PIPE. THE RD2130 IS FURNISHED WITH #14 GAGE TYPE 304 STAINLESS STEEL BODY AND NEOPRENE GASKET, COMPLETE WITH DURA-COATED CAST IRON CLAMP COLLAR AND DOME WITH STAINLESS STEEL HARDWARE.

PIPE HANGER DETAIL

ALL HANGERS, NUTS, BOLTS, HANGER RODS, MISCELLANEOUS METALS AND MISC PIPE SUPPORTS AND DEVICES EXPOSED TO THE ELEMENTS SHALL BE STAINLESS STEEL, CADMIUM PLATED, GALVANIZED STEEL OR OTHER APPROVED RUST PROOF MATERIAL.



SIMPSON GUMPERTZ & HEGER
Engineering of Structures and Building Enclosures

CROSSFIELD ENGINEERING, INC.

06/03/21
PROGRESS

BID SET - NOT FOR CONSTRUCTION

No.	Date	Description	By

RIVERVIEW CONDOMINIUMS

ROOF REPLACEMENT
221 MT AUBURN ST.
CAMBRIDGE, MA

PLUMBING
7TH FLOOR PLAN
ALTERNATE #1
SCOPE, RISER DIAGRAM
SCHEDULES & DETAILS

Project No.	Checked MAT	Date
Drawn JCN	Approved SAH	Scale

Drawing No.
P104

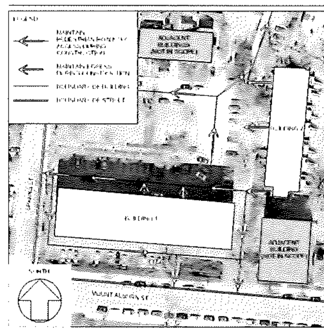
Riverview Condominiums
221 Mount Auburn Street
Cambridge, MA

WINDOW AND DOOR REPLACEMENT
PHASE 1 - 2022 REPLACEMENTS - 1 OCTOBER 2021
SGH PROJECT NUMBER: 190352.02-DSGN

GENERAL NOTES (APPLICABLE TO ALL SHEETS)

PROJECT OVERVIEW

SITE OVERVIEW



ABBREVIATIONS:

INDEX OF SHEETS		
Sheet Number	Sheet Name	BID SET
C100	COVER SHEET	•
A200	BUILDING 1 - NORTH ELEVATION	•
A201	BUILDING 1 - SOUTH ELEVATION	•
A202	BUILDING 1 - EAST & WEST ELEVATIONS	•
A203	BUILDING 2 - NORTH & SOUTH ELEVATIONS	•
A204	BUILDING 2 - EAST & WEST ELEVATIONS	•
[illegible]	OVERALL FENESTRATION SCHEDULE	•
A400	WINDOW AND DOOR TYPES (1 OF 3)	•
A401	WINDOW AND DOOR TYPES (2 OF 3)	•
A402	WINDOW AND DOOR TYPES (3 OF 3)	•
A500	BUILDING 1 SECTIONS	•
A501	BUILDING 1 CONCRETE FRAME TYPICAL DETAILS	•
A502	BUILDING 1 BRICK AND BLOCK FRAME TYPICAL DETAILS	•
A503	BUILDING 2 SECTIONS	•
A504	BUILDING 2 WINDOW PERIMETER DETAILS	•

SIMPSON GUMPERTZ & HEGER
Engineering of Structures and Building Enclosures

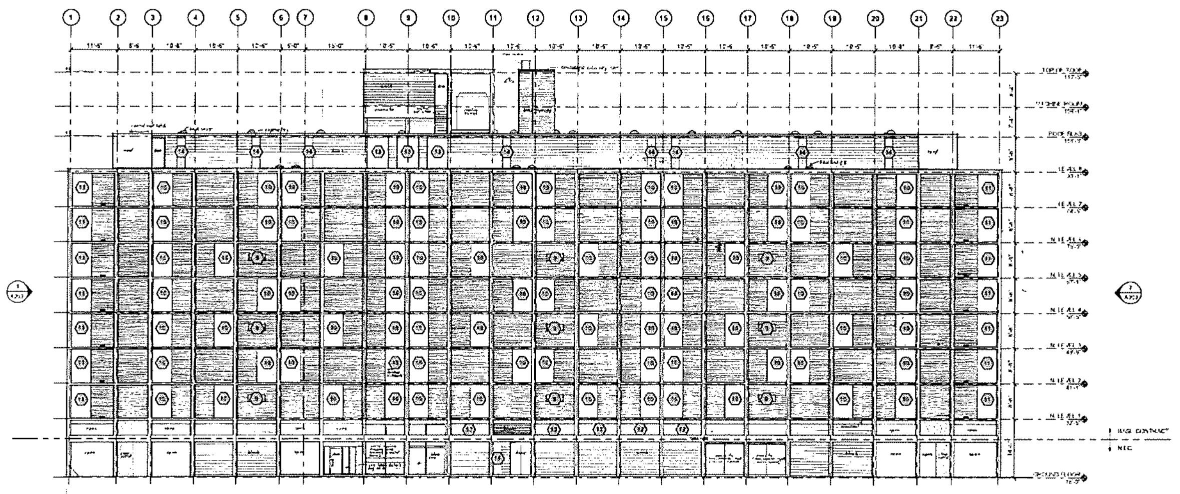
KEY PLAN

DRAFT FOR OWNER REVIEW

RIVERVIEW CONDOMINIUMS
WINDOW AND DOOR REPLACEMENT
221 MOUNT AUBURN STREET, CAMBRIDGE, MA

COVER SHEET

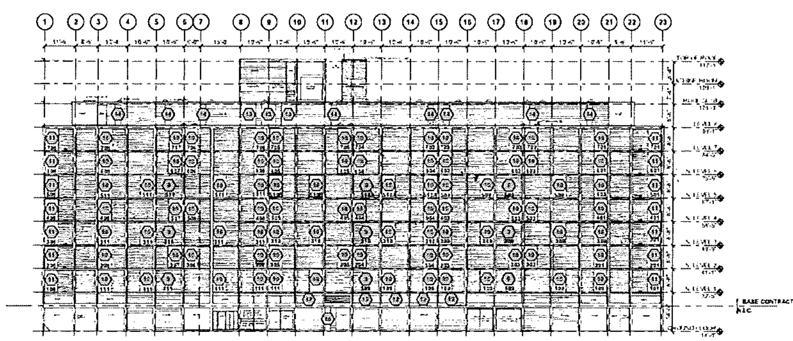
C100



BUILDING 1 - NORTH ELEVATION

BUILDING 1 NORTH ELEVATION SCHEDULE					
TYPE NO.	FENESTRATION	TYPE	APPROXIMATE OPENING HEIGHT (IN.)	APPROXIMATE OPENING WIDTH (IN.)	SUBTOTAL
TYPE 8	WINDOW	SLIDING WINDOW	13.5	48	28
TYPE 10	WINDOW GROUP	SLIDING WINDOW, FIXED & PANEL WITH LOUVER	94.5	53	158
TYPE 11	WINDOW GROUP	SLIDING WINDOW & FIXED	95.5	56	28
TYPE 12	WINDOW	FIXED	21.5	17.5	12
TYPE 13	WINDOW	FIXED	69.5	72	5
TYPE 14	WINDOW	FIXED	69.5	24	15
TYPE 15	ASSEMBLY GROUP	FIXED & PANEL WITH LOUVER	124	24	2

BUILDING 1 NORTH ELEVATION TOTAL: 248



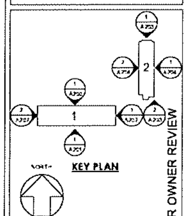
NOTE: WINDOWS WITH NO UNIT NUMBERS ARE CONSIDERED COMMON AREAS

PHASED UNIT KEY PLAN

SIMPSON GUMPERTZ & HEGER

Engineering of Structures and Building Enclosures

Consultant



KEY PLAN

DRAFT FOR OWNER REVIEW

No.	Date	Description	By

RIVERVIEW CONDOMINIUMS

WINDOW AND DOOR REPLACEMENT
221 MOUNT AUBURN STREET,
CAMBRIDGE, MA

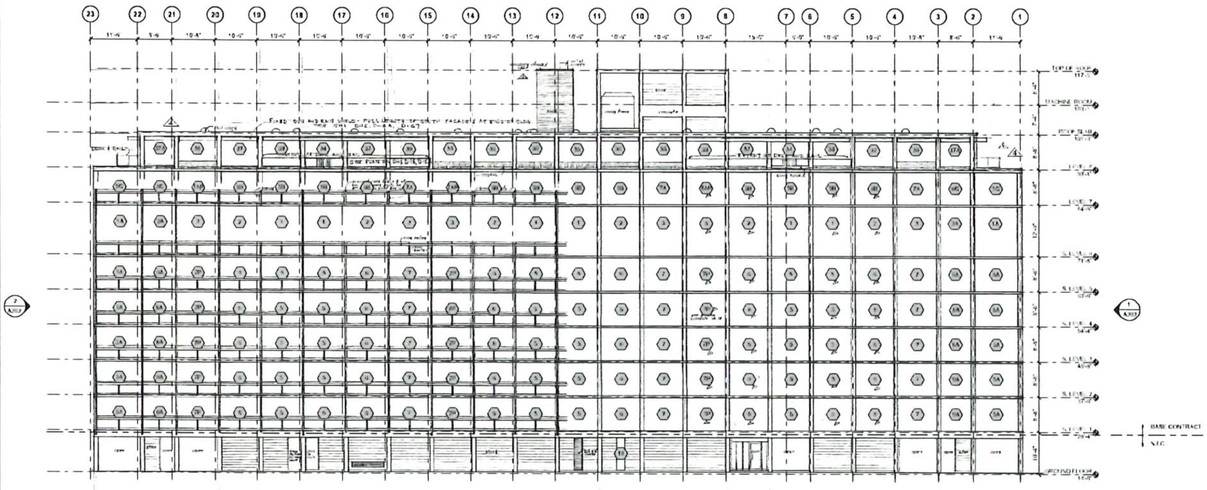
Project

BUILDING 1 - NORTH ELEVATION

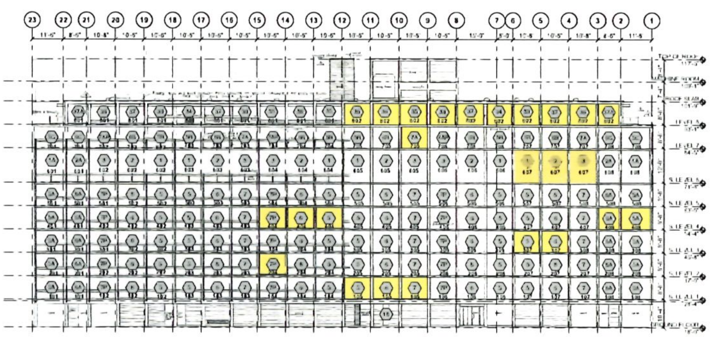
Drawing Title

Drawing No.

A200



1 BUILDING 1 - SOUTH ELEVATION



NOTE: WINDOWS WITH NO UNIT NUMBERS ARE CONSIDERED COMMON AREAS

1A PHASED UNIT KEY PLAN

BUILDING 1 SOUTH ELEVATION SCHEDULE

TYPE NO.	FENESTRATION	TYPE	APPROXIMATE OPENING HEIGHT (IN.)	APPROXIMATE OPENING WIDTH (IN.)	SUBTOTAL
TYPE 1	WINDOW GROUP	FIXED	145.5	115	12
TYPE 1A	WINDOW GROUP	FIXED	145.5	128	4
TYPE 2	WINDOW GROUP	SLIDING DOOR & FIXED	145.5	115	12
TYPE 2A	WINDOW GROUP	SLIDING DOOR & FIXED	145.5	90	4
TYPE 3	WINDOW GROUP	SLIDING WINDOW, FIXED, & PANEL WITH LOUVER	145.5	115	12
TYPE 5	WINDOW GROUP	FIXED	97.5	115	50
TYPE 5A	WINDOW GROUP	FIXED	97.5	128	20
TYPE 5B	WINDOW GROUP	FIXED	96.5	115	12
TYPE 5C	WINDOW GROUP	FIXED	98.5	128	4
TYPE 6	DOOR	SLIDING DOOR	97.5	115	50
TYPE 6A	DOOR	SLIDING DOOR	97.5	90	20
TYPE 6B	DOOR	SLIDING DOOR	96.5	115	12
TYPE 6C	DOOR	SLIDING DOOR	96.5	90	4
TYPE 7	WINDOW GROUP	SLIDING WINDOW, FIXED, & PANEL WITH LOUVER	97.5	115	30
TYPE 7 (OPP)	WINDOW GROUP	SLIDING WINDOW, FIXED, & PANEL WITH LOUVER	97.5	115	30
TYPE 7A	WINDOW GROUP	SLIDING WINDOW, FIXED, & PANEL WITH LOUVER	96.5	115	6
TYPE 7A (OPP)	WINDOW GROUP	SLIDING WINDOW, FIXED, & PANEL WITH LOUVER	98.5	115	6
TYPE 16	ASSEMBLY GROUP	FIXED & PANEL WITH LOUVER	154	24	2
TYPE 34	DOOR	SLIDING DOOR	83.5	115	4
TYPE 35	WINDOW GROUP	FIXED	71.75	115	8
TYPE 36	WINDOW GROUP	HOPPER & FIXED	71.75	115	8
TYPE 37	WINDOW GROUP	HOPPER & FIXED	83.5	115	8
TYPE 37A	WINDOW GROUP	HOPPER & FIXED	83.5	90	4
TYPE 39	DOOR	SLIDING DOOR	83.5	115	8

BUILDING 1 SOUTH ELEVATION TOTAL: 330

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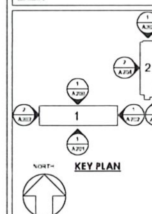


KEY PLAN

DRAFT FOR OWNER REVIEW

No.	Date	Description	By

RIVERVIEW CONDOMINIUMS

WINDOW AND DOOR REPLACEMENT
221 MOUNT AUBURN STREET, CAMBRIDGE, MA

Project

BUILDING 1 - SOUTH ELEVATION

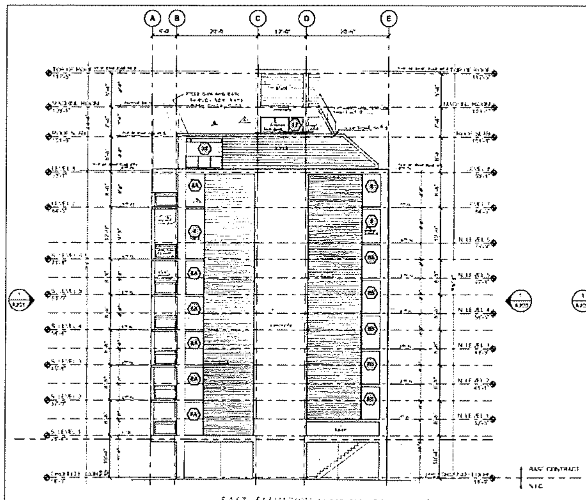
Drawing Title

Commission	Checked	Date
Drawn	Approved	Scale: As indicated

Drawing No.

A201

Seal

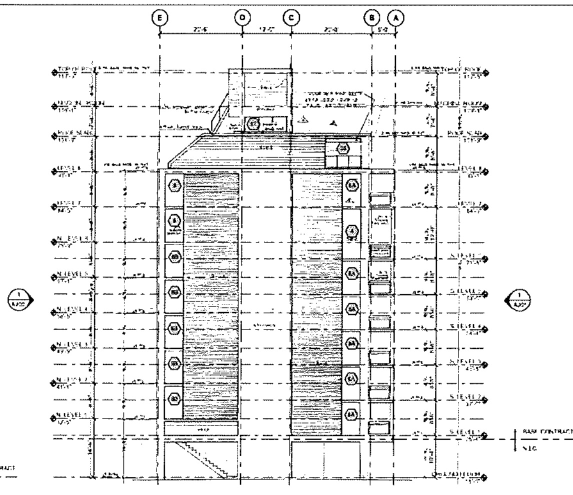


EAST ELEVATION

1 BUILDING 1 - EAST ELEVATION

BUILDING 1 EAST ELEVATION SCHEDULE					
TYPE NO.	FENESTRATION	TYPE	APPROXIMATE OPENING HEIGHT (IN.)	APPROXIMATE OPENING WIDTH (IN.)	SUBTOTAL
TYPE 4	WINDOW GROUP	FIXED	145.5	55	2
TYPE 8	WINDOW GROUP	SLIDING WINDOW & FIXED	56.5	55	4
TYPE 8A	WINDOW GROUP	FIXED	56.5	55	12
TYPE 8B	WINDOW GROUP	SLIDING WINDOW & FIXED	37.5	55	12
TYPE 17	WINDOW GROUP	FIXED	45	125	2
TYPE 38	DOOR	SLIDING DOOR	83.5	115	2

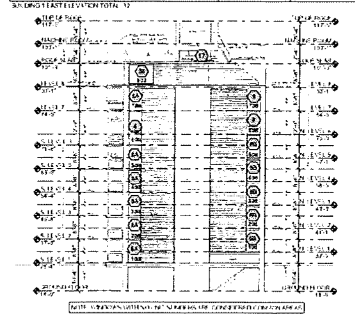
BUILDING 1 EAST ELEVATION TOTAL: 32



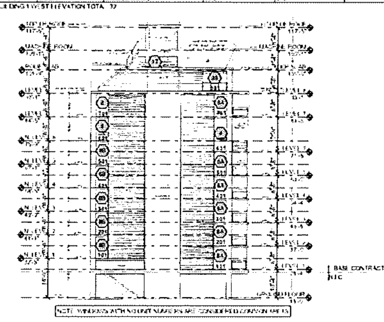
2 BUILDING 1 - WEST ELEVATION

BUILDING 1 WEST ELEVATION SCHEDULE					
TYPE NO.	FENESTRATION	TYPE	APPROXIMATE OPENING HEIGHT (IN.)	APPROXIMATE OPENING WIDTH (IN.)	SUBTOTAL
TYPE 4	WINDOW GROUP	FIXED	145.5	56	2
TYPE 8	WINDOW GROUP	SLIDING WINDOW & FIXED	56.5	56	4
TYPE 8A	WINDOW GROUP	FIXED	56.5	55	12
TYPE 8B	WINDOW GROUP	SLIDING WINDOW & FIXED	37.5	55	10
TYPE 17	WINDOW GROUP	FIXED	45	125	2
TYPE 38	DOOR	SLIDING DOOR	83.5	115	2

BUILDING 1 WEST ELEVATION TOTAL: 32



1A PHASED UNIT KEY PLAN-EAST



2A PHASED UNIT KEY PLAN-WEST

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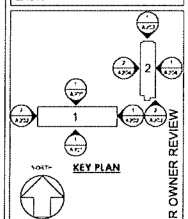
Engineering of Structures and Building Enclosures

Consultant



DRAFT FOR OWNER REVIEW

No.	Date	Description	By

RIVERVIEW CONDOMINIUMS

WINDOW AND DOOR REPLACEMENT
221 MOUNT AUBURN STREET, CAMBRIDGE, MA

Project

BUILDING 1 - EAST & WEST ELEVATIONS

Drawing Title

Commission	Checked	Date
[illegible]	CWJ	[illegible]
Drawn	Approved	Scale
[illegible]	JJC	As indicated

Seal

Drawing No.

A202

BUILDING 1 OVERALL SCHEDULE

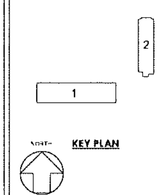
TYPE NO.	FENESTRATION	TYPE	APPROXIMATE OPENING HEIGHT (IN.)	APPROXIMATE OPENING WIDTH (IN.)	TOTAL
TYPE 1	WINDOW GROUP	FIXED	145.5	115	12
TYPE 1A	WINDOW GROUP	FIXED	145.5	125	4
TYPE 2	WINDOW GROUP	SLIDING DOOR & FIXED	145.5	115	12
TYPE 2A	WINDOW GROUP	SLIDING DOOR & FIXED	145.5	90	4
TYPE 3	WINDOW GROUP	SLIDING WINDOW, FIXED & PANEL WITH LOUVER	145.5	115	12
TYPE 4	WINDOW GROUP	FIXED	145.5	55	4
TYPE 5	WINDOW GROUP	FIXED	97.5	115	50
TYPE 5A	WINDOW GROUP	FIXED	97.5	128	20
TYPE 5B	WINDOW GROUP	FIXED	96.5	115	12
TYPE 5C	WINDOW GROUP	FIXED	94.5	124	4
TYPE 6	DOOR	SLIDING DOOR	97.5	115	50
TYPE 6A	DOOR	SLIDING DOOR	97.5	90	20
TYPE 6B	DOOR	SLIDING DOOR	96.5	115	12
TYPE 6C	DOOR	SLIDING DOOR	94.5	90	4
TYPE 7	WINDOW GROUP	SLIDING WINDOW, FIXED, & PANEL WITH LOUVER	97.5	115	30
TYPE 7 (OPP)	WINDOW GROUP	SLIDING WINDOW, FIXED, & PANEL WITH LOUVER	97.5	115	30
TYPE 7A	WINDOW GROUP	SLIDING WINDOW, FIXED, & PANEL WITH LOUVER	95.5	115	5
TYPE 7A (OPP)	WINDOW GROUP	SLIDING WINDOW, FIXED, & PANEL WITH LOUVER	96.5	115	6
TYPE 8	WINDOW GROUP	SLIDING WINDOW & FIXED	95.5	55	8
TYPE 8A	WINDOW GROUP	FIXED	95.5	55	24
TYPE 8B	WINDOW GROUP	SLIDING WINDOW & FIXED	97.5	55	20
TYPE 9	WINDOW	SLIDING WINDOW	17.5	41	18
TYPE 10	WINDOW GROUP	SLIDING WINDOW, FIXED, & PANEL WITH LOUVER	93.5	55	168
TYPE 11	WINDOW GROUP	SLIDING WINDOW & FIXED	93.5	55	20
TYPE 12	WINDOW	FIXED	71.5	115	10
TYPE 13	WINDOW	FIXED	83.5	72	6
TYPE 14	WINDOW	FIXED	83.5	24	18
TYPE 16	ASSEMBLY GROUP	FIXED & PANEL WITH LOUVER	150	24	4
TYPE 17	WINDOW GROUP	FIXED	49	125	4
TYPE 34	DOOR	SLIDING DOOR	83.5	115	4
TYPE 35	WINDOW GROUP	FIXED	71.75	115	8
TYPE 36	WINDOW GROUP	HOPPER & FIXED	71.75	115	8
TYPE 37	WINDOW GROUP	HOPPER & FIXED	83.5	115	6
TYPE 37A	WINDOW GROUP	HOPPER & FIXED	83.5	90	4
TYPE 38	DOOR	SLIDING DOOR	83.5	115	4
TYPE 39	DOOR	SLIDING DOOR	83.5	115	4

BUILDING 1 TOTAL 667

SIMPSON GUMPERTZ & HEGER

Engineering of Structures and Building Enclosures

Consultant



KEY PLAN

DRAFT FOR OWNER REVIEW

No.	Date	Description	By

RIVERVIEW CONDOMINIUMS

WINDOW AND DOOR REPLACEMENT
221 MOUNT AUBURN STREET, CAMBRIDGE, MA

Project

OVERALL FENESTRATION SCHEDULE

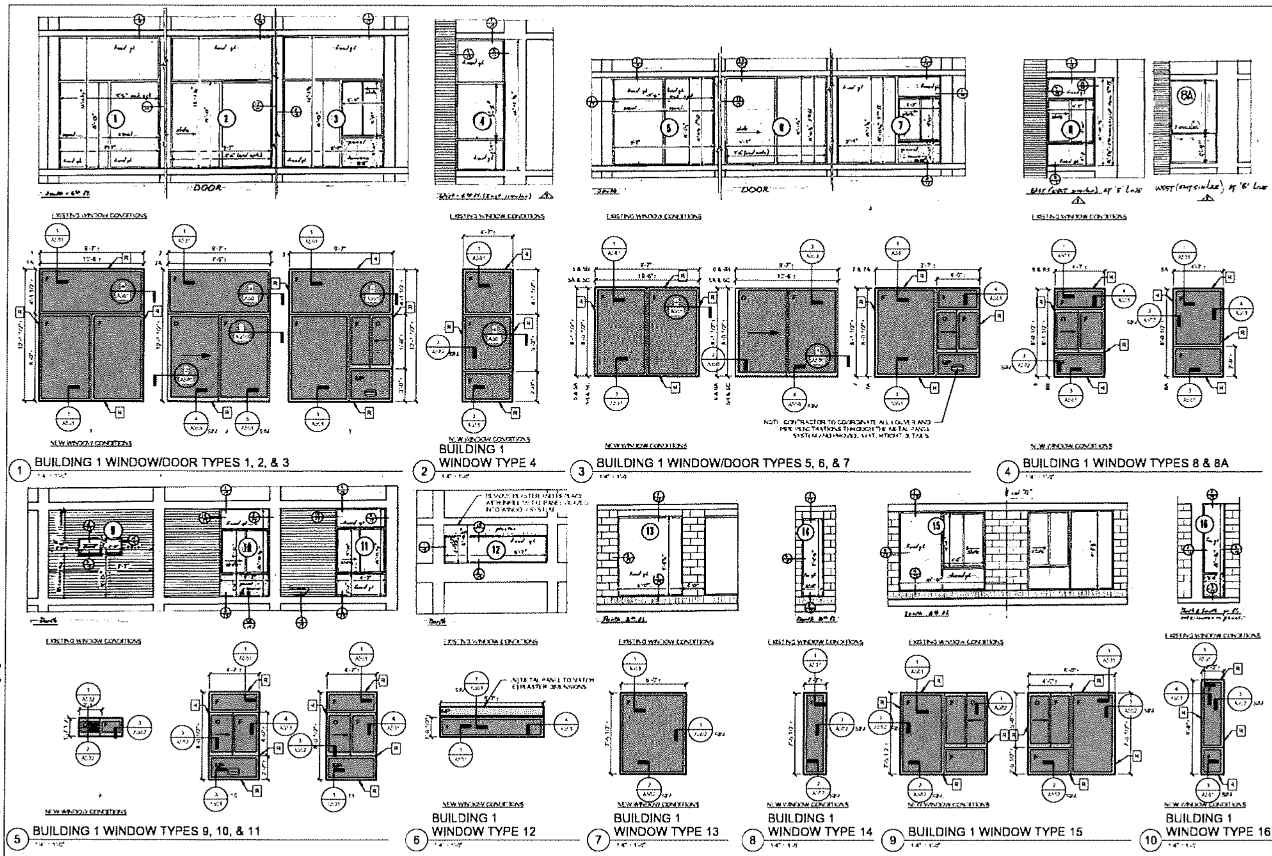
Drawing Title

Commission | Checked | Date
Drawn | Approved | Scale

Drawing No.

A205

Seal



1 BUILDING 1 WINDOW/DOOR TYPES 1, 2, & 3

2 BUILDING 1 WINDOW TYPE 4

3 BUILDING 1 WINDOW/DOOR TYPES 5, 6, & 7

4 BUILDING 1 WINDOW TYPES 8 & 8A

5 BUILDING 1 WINDOW TYPES 9, 10, & 11

6 BUILDING 1 WINDOW TYPE 12

7 BUILDING 1 WINDOW TYPE 13

8 BUILDING 1 WINDOW TYPE 14

9 BUILDING 1 WINDOW TYPE 15

10 BUILDING 1 WINDOW TYPE 16

GENERAL NOTES

1. ALL WINDOW NUMBER TAGS CORRELATE TO EXISTING DRAWINGS

2. ALL DIMENSIONS NOTED ARE APPROXIMATE AND BASED ON EXISTING DRAWING DIMENSIONS. ALL DIMENSIONS SHALL BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO ORDERING WINDOWS AND DOORS.

3. WINDOWS SHOWN WITHOUT RECEPTORS ARE INTENDED TO BE COMPOSITE UNITS. UNITS WITH RECEPTORS ARE INTENDED/ASSUMED TO BE COMBINATION UNITS. CONTRACTORS ARE TO MAXIMIZE COMPOSITE UNIT USAGE WHERE POSSIBLE. IF COMPOSITE UNITS CAN BE INSTALLED WHERE WE ARE CURRENTLY SHOWING RECEPTORS/COMBINATION UNITS, THE RECEPTORS MAY BE ELIMINATED. ENGINEER TO REVIEW RECEPTOR REMOVAL ON A CASE BY CASE BASIS.

LEGEND

- F - FIXED
- O - OPERABLE
- MP - METAL PANEL
- → - OPERABLE DIRECTION
- R - RECEPTOR

SIMPSON GUMPERTZ & HEGER
Engineering of Structures and Building Enclosures

DRAFT FOR OWNER REVIEW

KEY PLAN

1

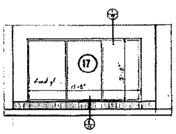
2

RIVERVIEW CONDOMINIUMS

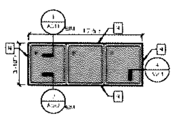
WINDOW AND DOOR REPLACEMENT
221 MOUNT AUBURN STREET, CAMBRIDGE, MA

WINDOW AND DOOR TYPES (1 OF 3)

A400



EXISTING WINDOW CONDITIONS



NEW WINDOW CONDITIONS

1 BUILDING 1 WINDOW TYPE 17

GENERAL NOTES

1. ALL WINDOW NUMBER TAGS CORRELATE TO EXISTING DRAWINGS.

2. ALL DIMENSIONS NOTED ARE APPROXIMATE AND BASED ON EXISTING DRAWING DIMENSIONS. ALL DIMENSIONS SHALL BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO ORDERING WINDOWS AND DOORS.

3. WINDOWS SHOWN WITHOUT RECEPTORS ARE INTENDED TO BE COMPOSITE UNITS. UNITS WITH RECEPTORS ARE INTENDED ASSUMED TO BE COMBINATION UNITS. CONTRACTORS ARE TO MAXIMIZE COMPOSITE UNIT USAGE WHERE POSSIBLE. IF COMPOSITE UNITS CAN BE INSTALLED WHERE WE ARE CURRENTLY SHOWING RECEPTORS COMBINATION UNITS, THE RECEPTORS MAY BE ELIMINATED. ENGINEER TO REVIEW RECEPTOR REMOVAL ON A CASE BY CASE BASIS.

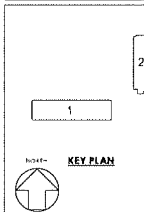
LEGEND

- F - FIXED
- O - OPERABLE
- MP - METAL PANEL
- OPERABLE DIRECTION
- RECEPTOR

SIMPSON GUMPERTZ & HEGER

Engineering of Structures and Building Enclosures

Consultant



NORTH KEY PLAN

DRAFT FOR OWNER REVIEW

No.	Date	Description	By

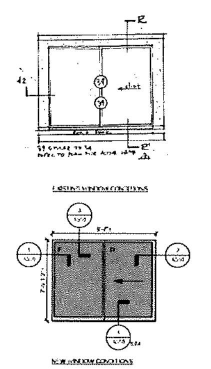
RIVERVIEW CONDOMINIUMS

WINDOW AND DOOR REPLACEMENT
221 MOUNT AUBURN STREET, CAMBRIDGE, MA

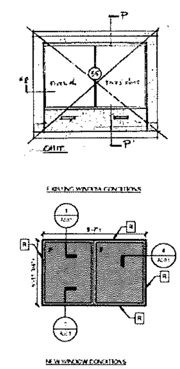
WINDOW AND DOOR TYPES (2 OF 3)

Drawing No.

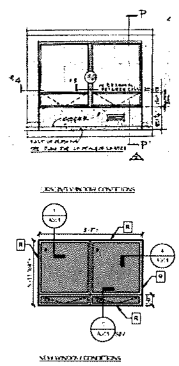
A401



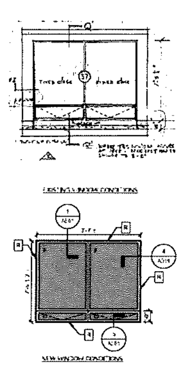
1 BUILDING 1 WINDOW/DOOR TYPES 34 & 39



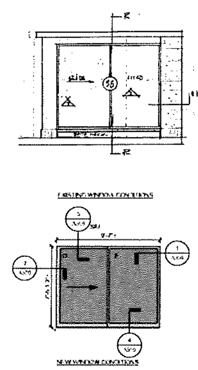
2 BUILDING 1 WINDOW TYPE 35



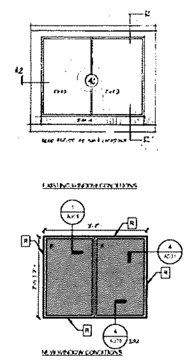
3 BUILDING 1 WINDOW TYPE 36



4 BUILDING 1 WINDOW TYPE 37



5 BUILDING 1 WINDOW/DOOR TYPE 38



6 BUILDING 1 WINDOW TYPE 40

GENERAL NOTES

1. ALL WINDOW NUMBER TAGS CORRELATE TO EXISTING DRAWINGS.

2. ALL DIMENSIONS NOTED ARE APPROXIMATE AND BASED ON EXISTING DRAWING DIMENSIONS. ALL DIMENSIONS SHALL BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO ORDERING WINDOWS AND DOORS.

3. WINDOWS SHOWN WITHOUT RECEPTORS ARE INTENDED TO BE COMPOSITE UNITS. UNITS WITH RECEPTORS ARE INTENDED/ASSUMED TO BE COMBINATION UNITS. CONTRACTORS ARE TO MAXIMIZE COMPOSITE UNIT USAGE WHERE POSSIBLE. IF COMPOSITE UNITS CAN BE INSTALLED WHERE WE ARE CURRENTLY SHOWING RECEPTORS/COMBINATION UNITS, THE RECEPTORS MAY BE ELIMINATED. ENGINEER TO REVIEW RECEPTOR REMOVAL ON A CASE BY CASE BASIS.

LEGEND

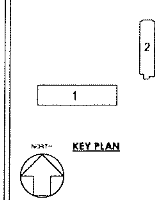
F	- FIXED
O	- OPERABLE
MP	- METAL PANEL
——	- OPERABLE DIRECTION
R	- RECEPTOR

SIMPSON GUMPERTZ & HEGER

Engineering of Structures and Building Enclosures

Simpson Gumpertz & Heger Inc.
Boston
Chicago
Houston
Los Angeles
New York
San Francisco
Washington, DC

Consultant



DRAFT FOR OWNER REVIEW

No.	Date	Description	By

RIVERVIEW CONDOMINIUMS

WINDOW AND DOOR REPLACEMENT
221 MOUNT AUBURN STREET, CAMBRIDGE, MA

Project

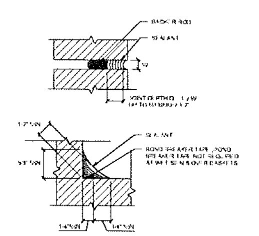
WINDOW AND DOOR TYPES (3 OF 3)

Drawing Title

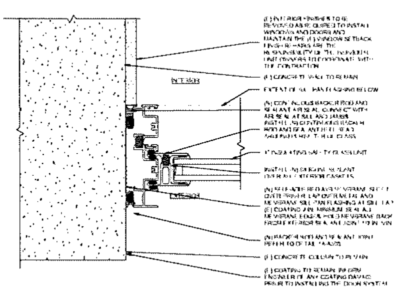
Drawing No.

A402

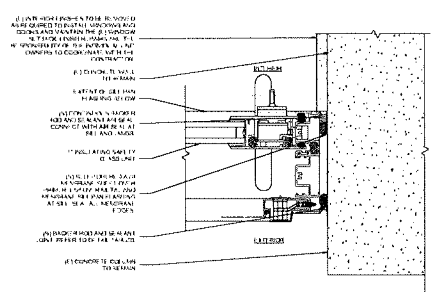
Seal



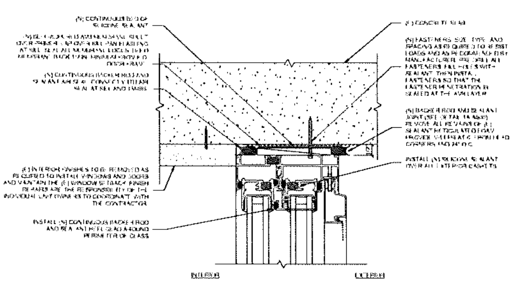
(1A) CONVENTIONAL SEALANT JOINTS



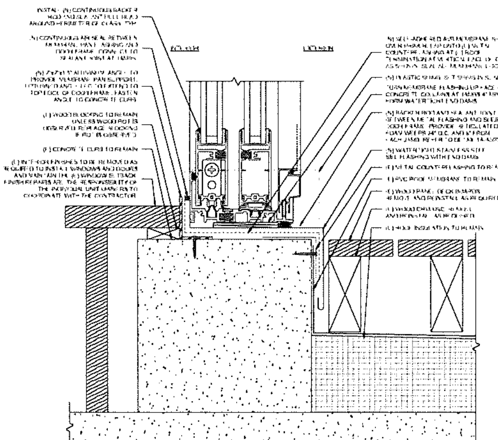
(1) SLIDING DOOR - SECTION AT FIXED JAMB



(2) SLIDING DOOR - SECTION AT SLIDING JAMB



(3) SLIDING DOOR AT BALCONY - SECTION AT HEAD



(4) SLIDING DOOR AT BALCONY - SECTION AT SILL

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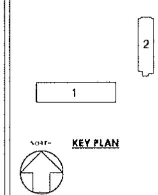


DRAFT FOR OWNER REVIEW

No.	Date	Description	By

RIVERVIEW CONDOMINIUMS

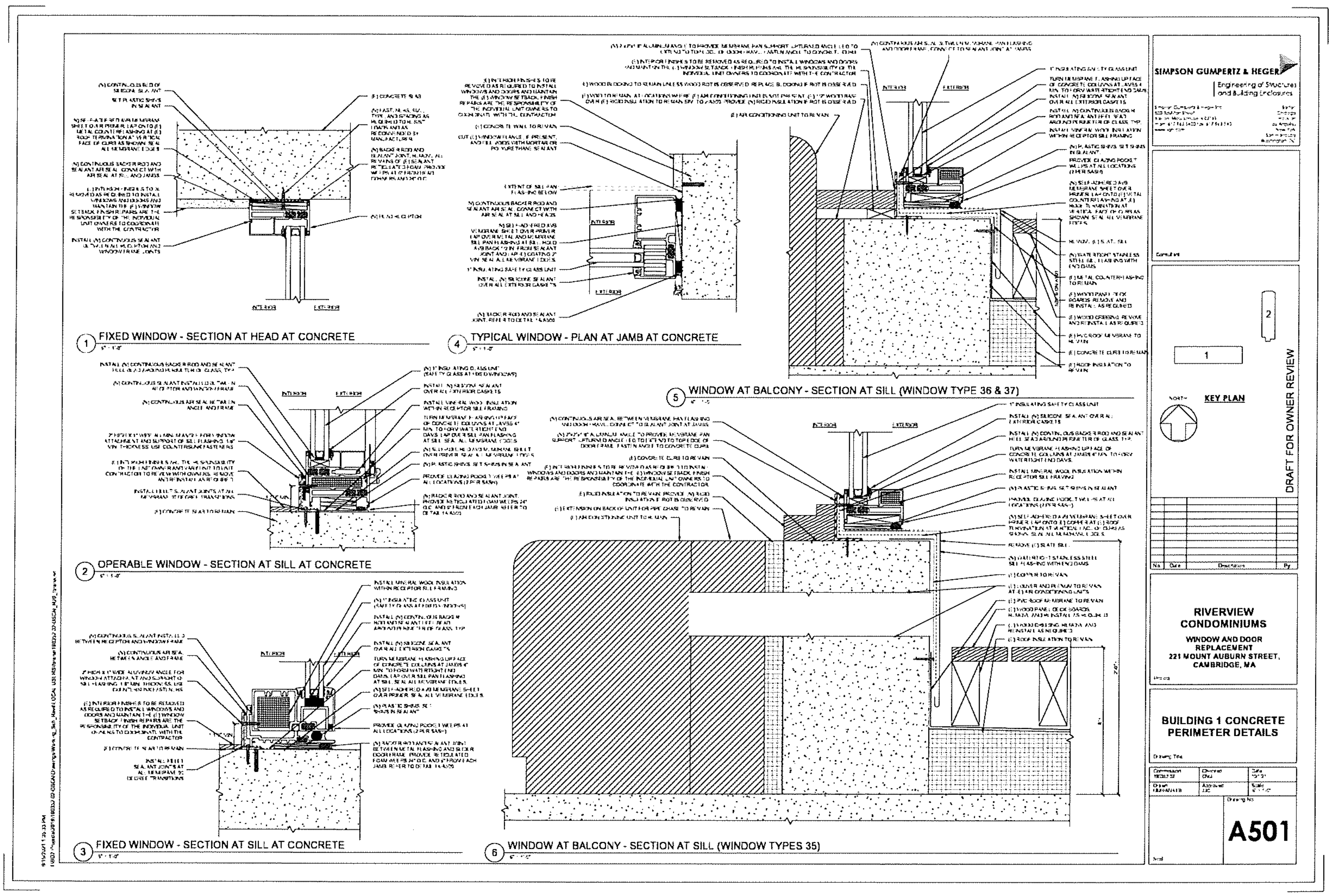
WINDOW AND DOOR REPLACEMENT
221 MOUNT AUBURN STREET,
CAMBRIDGE, MA

BUILDING 1 SLIDERS

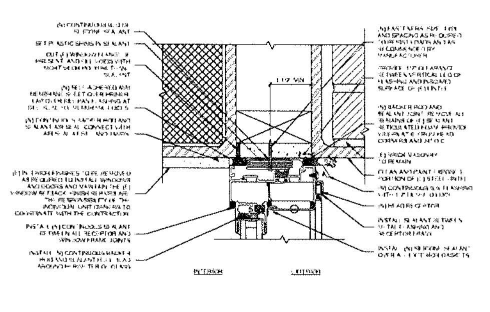
Drawing Title

Seal

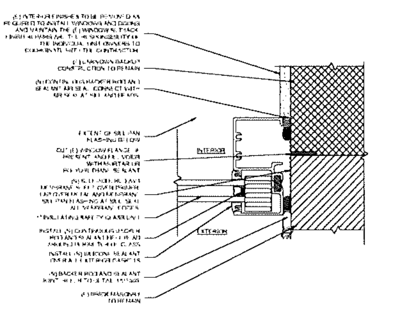
A500



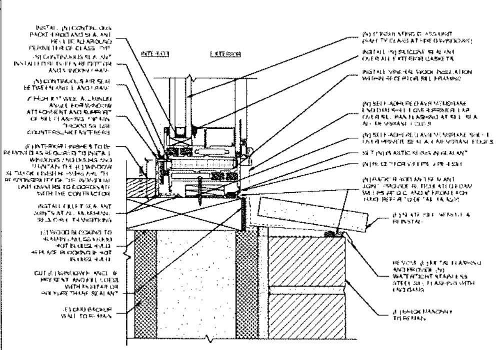
1 FIXED WINDOW - SECTION AT HEAD AT CONCRETE
2 OPERABLE WINDOW - SECTION AT SILL AT CONCRETE
3 FIXED WINDOW - SECTION AT SILL AT CONCRETE
4 TYPICAL WINDOW - PLAN AT JAMB AT CONCRETE
5 WINDOW AT BALCONY - SECTION AT SILL (WINDOW TYPE 36 & 37)
6 WINDOW AT BALCONY - SECTION AT SILL (WINDOW TYPES 35)
INTERIOR
EXTERIOR
SIMPSON GUMPERTZ & HEGER
Engineering of Structures and Building Enclosures
Consultant
KEY PLAN
1
2
DRAFT FOR OWNER REVIEW
No. Date Description By
RIVERVIEW CONDOMINIUMS
WINDOW AND DOOR REPLACEMENT
221 MOUNT AUBURN STREET, CAMBRIDGE, MA
BUILDING 1 CONCRETE PERIMETER DETAILS
A501



(1) SLIDING WINDOW - SECTION AT HEAD AT BRICK MASONRY



(3) WINDOW - SECTION AT OPERABLE JAMB AT BRICK MASONRY



(2) SLIDING WINDOW - SECTION AT SILL AT BRICK MASONRY

SIMPSON GUMPERTZ & HEGER

Engineering of Structures and Building Enclosures

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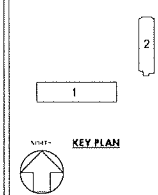

DRAFT FOR OWNER REVIEW

No	Date	Description	By

RIVERVIEW CONDOMINIUMS

WINDOW AND DOOR REPLACEMENT
221 MOUNT AUBURN STREET, CAMBRIDGE, MA

Project

BUILDING 1 BRICK AND BLOCK PERIMETER DETAILS

Drawing Title

Drawing No.

A502

A TETRA TECH COMPANY

101 Federal Street

T: 617.748.7800
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www.cosentini.com

RIVERVIEW CONDOMINIUMS
221 MOUNT AUBURN
STREETCAMBRIDGE MA

STRUCTURAL REMEDIATION

MECHANICAL SYSTEMS UPGRADES STUDY

Prepared by: Cosentini a Tetratech Company

Prepared for: Thyer & Assoc., Inc, Agents for Riverview-in-Cambridge Condo Trust

December 13, 2024

Cosentini
A TETRA TECH COMPANY

GENERAL

Cosentini Associates was engaged by Thyer & Assoc., Inc. (Client), to participate in the structural remediation study for Riverview Condominiums at 221 Mount Auburn Street in Cambridge MA in a role of MEP consulting engineer. The study consists of two phases. Phase 1 is limited to developing conceptual solution for relocation of the mechanical piping risers from the zones affected by structural remediation work to other locations within the building. Phase 2 conceptualizes a number of potential options for complete replacement of the building mechanical systems with state-of-the-art energy efficient systems including options for full building electrification.

The following study is based on the meetings and discussions with the Client, Architect, and Structural Engineer, as well as information obtained from the 1960's original MEP design drawings and 2013 mechanical infrastructure project construction submittals.

EXISTING MECHANICAL SYSTEMS

The building is heated and cooled by a 2-pipe dual temperature change-over hydronic system. The central heating/cooling plant consists of the following components all of which were replaced during the 1013 mechanical system upgrades:

- (3) gas fire condensing type hot water boilers – 2000 MBH each
- 150 tons water cooled chillers and cooling tower.
- (1) condenser water pump, (1) main hot water/ chilled water pump, (1) common standby pump, (1) Bradbury pump
- (1) Ground floor soffit heating indexed temperature hot water pump.
- (1) Kitchen / bathroom heating indexed temperature hot water pump.
- (2) Indirect domestic hot water heaters source hot water pumps

Mechanical ventilation is provided by a 100% OA air handling unit (with heating/cooling coil) supplying air to the residential corridors. Bathroom and kitchen exhaust is provided by vertical shafts with floor-by-floor sub-ducted take-offs and fans on the roof. No mechanical ventilation air supply to the apartments.

Domestic hot water is generated by (2) water heaters using boiler water as a heating source. System is provided with recirculating pump.

Hot / chilled water is distributed from the central plant to the fan coil units via a 2-pipe distribution system including horizontal mains on the Ground floor and vertical risers located around the perimeter of the building adjacent to the associated fan coil units. Condensate from FCU coils is drained by vertical condensate riser located adjacent to CHW/HW risers, collected horizontally, and disposed on the ground level.

Separate indexed hot water system serves unit heaters on the ground floor.

Separate indexed hot water system serves convectors in the perimeter bathrooms and kitchens within the apartments.

The central mechanical plant serves the Riverview building as well as Bradbury building. HW/CHW piping and DHW supply and recirculation piping are extended underground from Riverview to Bradbury building.

PHASE 1 STUDY

Riverview (Main) Building

The apartments are heated and cooled by 2-pipe dual temperature chilled /hot water (DTW) system serving fan coils units (FCU) located at the exterior walls in each room. DTW and condensate drain (CD) pipe risers are located within vertical chases at the perimeter adjacent to the FCUs they serve. The structure at the perimeter of the building will be undergoing some remediation work which will necessitate relocating the risers from their current locations. According to the Structural Engineer the closest the new riser can be located to the exterior walls will be 4'.

The scope of this Phase of the Study includes development of options for locating new DTW and CD risers and routing of the branch piping from the risers to the FCUs.

The Study identifies several mostly typical room /FCU configuration conditions that are present throughout the building (Conditions "A", "B", "C", and "D"). For each condition the Study develops a few options as appropriate for that condition. These options are typically as follows.

- Option 1A
  - risers are located at the demising walls at least 4' from the perimeter.
  - FCUs stay at their original locations – mostly oriented along exterior walls, though some units are originally located along demising wall.
  - DTW and CD horizontal branches from the risers to FCUs run along demising walls at floor level.
  - This option will likely require risers to be enclosed in vertical chases and horizontal runs to be enclosed in baseboard soffits.
- Option 1B
  - same as Option 1A except the FCU are turned 90deg and oriented along the demising walls.
  - This option will minimize / eliminate horizontal piping runs at the floor level from risers to FCUs but it's feasibility needs to be evaluated from architectural / furniture layout standpoint.
- Option 2A

        - risers are located at the existing plumbing / ventilation shafts.
        - FCUs stay at their original locations – mostly oriented along exterior walls, though some units are originally located along demising wall.
        - DTW and CD horizontal branches from the risers to FCUs run in the ceiling of the floor below to within approximately 4' of the exterior wall, at which point they turn up, penetrate slab, and continue horizontally at floor level to the FCUs.
        - This option will likely require horizontal runs to be enclosed in ceiling soffits and limited baseboard soffits.
    - Option 2B
        - same as Option 2A except the FCU are turned 90deg and oriented along the demising walls.
        - This option will minimize / eliminate horizontal piping runs at the floor level from pipe slab penetrations to FCUs but it's feasibility needs to be evaluated from architectural / furniture layout standpoint.
    - Option 3A
        - risers are located at the existing plumbing / ventilation shafts.
        - FCUs stay at their original locations – mostly oriented along exterior walls, though some units are originally located along demising wall.
        - DTW and CD horizontal branches from the risers to FCUs run in the ceiling of the floor they serve and drop down to FCUs (at the locations of current risers).
        - Since condensate needs to be lifted from the FCUs up to horizontal piping at the ceiling, this option will require providing small condensate pumps at FCUs.
        - This option will likely require horizontal runs to be enclosed in ceiling soffits.
    - Option 3B
        - same as Option 3A except the FCU are turned 90deg and oriented along the demising walls.
        - This option will apply only to the conditions where FCUs are originally oriented along demising walls.

Several kitchens and bathrooms (at least 3 locations) are located at the building perimeter and fall within the structural remediation zone. Plumbing fixture and associated CW/HW/S/V pipes would need to be removed to allow for structural work. After its's completion the fixtures will be reinstalled (or replaced) and new associated branch CW/HW/S/V pipes will need to be installed. It appears from the drawings than none of the plumbing risers (except storm drain) running in plumbing chases are located within the affected zone and will not need to be relocated. This would need to be field verified at each location and coordinated with structural work. 3" storm drain risers appear to be located within affected zone and may need to be moved.

New DTW and CD risers will need to be connected to the horizontal mains at the Ground Level. There are two Options for performing this scope.

- Base scope (minimum scope)
  - Existing horizontal distribution piping will remain.
  - Existing risers will be disconnected from the distribution downstream of the riser isolation valves and removed.
  - Existing riser take-offs and associated isolation valves will remain.
  - New risers will be connected to existing take-offs.
  - Existing riser isolation valves will need to be checked and replace if necessary.
- Add Alternate 1 (maximum scope) – include separate line in pricing.
  - Majority of the existing piping in building is original except for the central plant piping which was mostly replaced during the 2013 infrastructure project. The system components are generally beyond their life expectancy.
  - Provide new piping distribution from the central plant to the new riser locations.

Base scope does not include replacement of HW risers serving perimeter kitchens and bathrooms convectors as they are not in the structural remediation zone. However, they are reportedly numerous leaks associated with these risers.

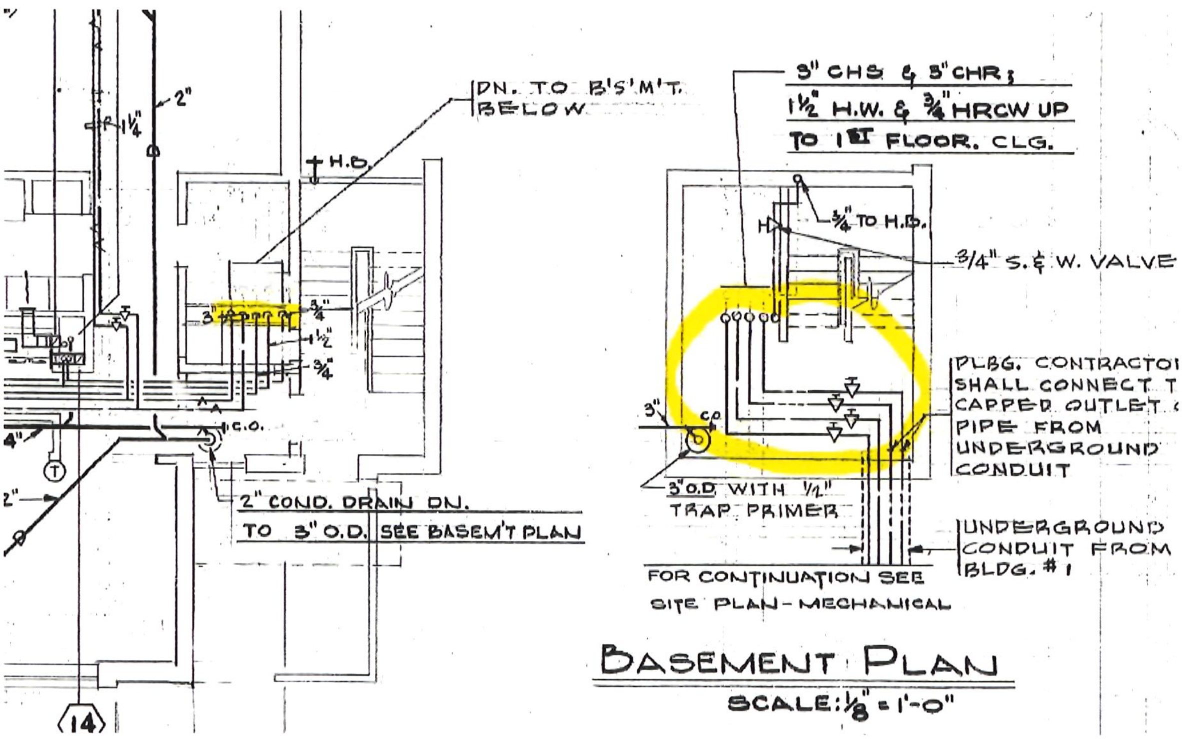
- Add Alternate 2 - include separate line in pricing.
  - Replace (5) sets of HW risers serving perimeter kitchens and bathroom convectors.

Bradbury Building

Bradbury building is served by DTW for fan coils as well as domestic HW from the Main Building plant via an underground piping. The building needs to remain occupiable during the Main building upgrades described above. Here are two options for achieving this goal.

- Option 1 – Main building heating/cooling plant can remain operational during upgrades.
  - Isolate systems serving Main Building from the central plant by closing respective isolation valves.
  - Central heating, cooling and DHW plant continues to operate and serves just the Bradbury building only.
- Option 2 – Main building heating/cooling plant needs to be shut down during upgrades due to safety or other issues associated with structural upgrades.

- Temporary air-cooled chiller (+/-50 tons) can be rented for the cooling season.
- Temporary boiler (+/-2000 BMH) with DHW heating option can be rented for the entire duration of the project to provide heating during heating season and continuous domestic hot water.
- Equipment will be parked outside the building and connected with hoses to the building piping systems at the location highlighted in image below.



All the above scope including various options, conditions and Alternates is illustrated in Appendix A at the end of this Study.

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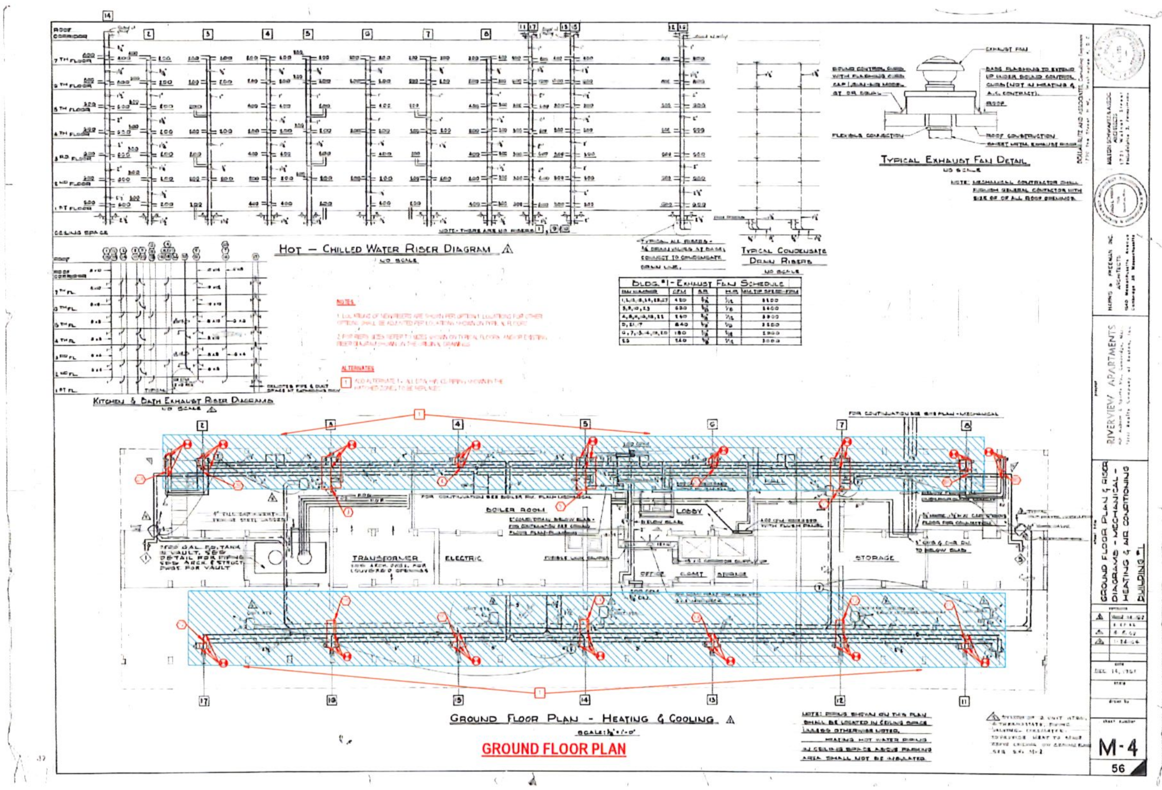
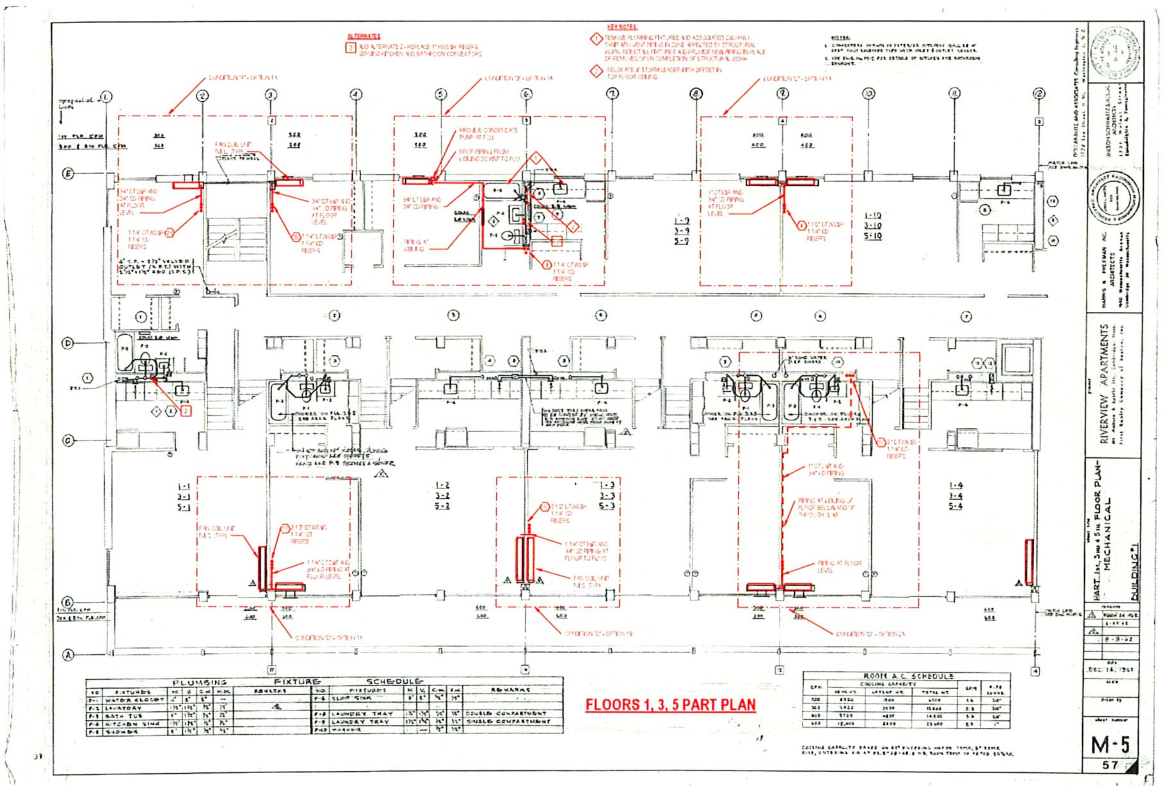
Appendix A

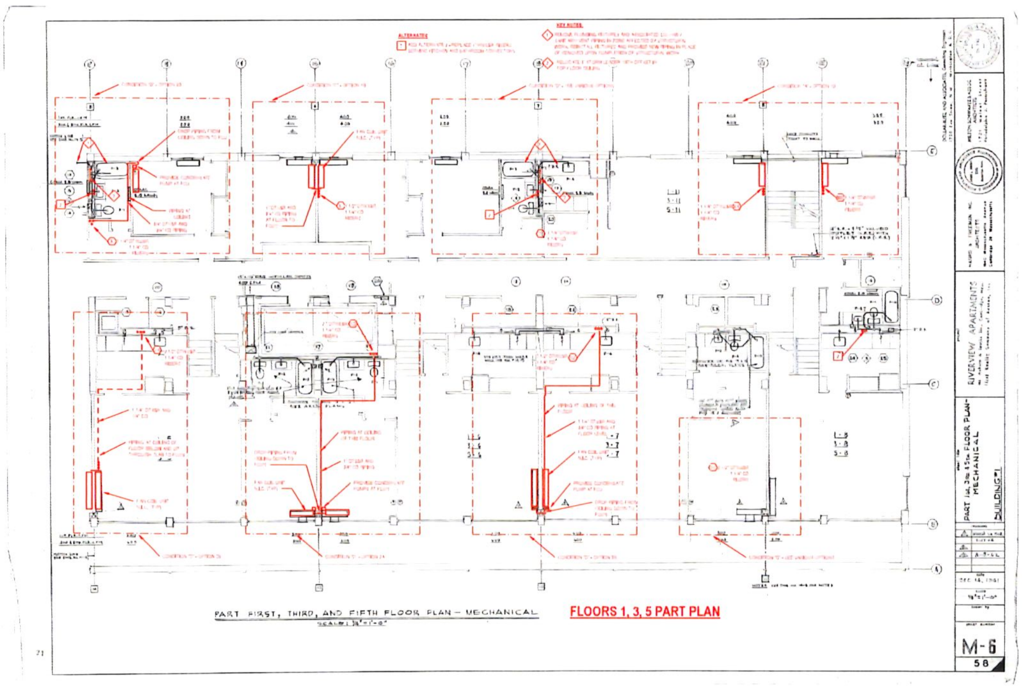
Mechanical Diagrams

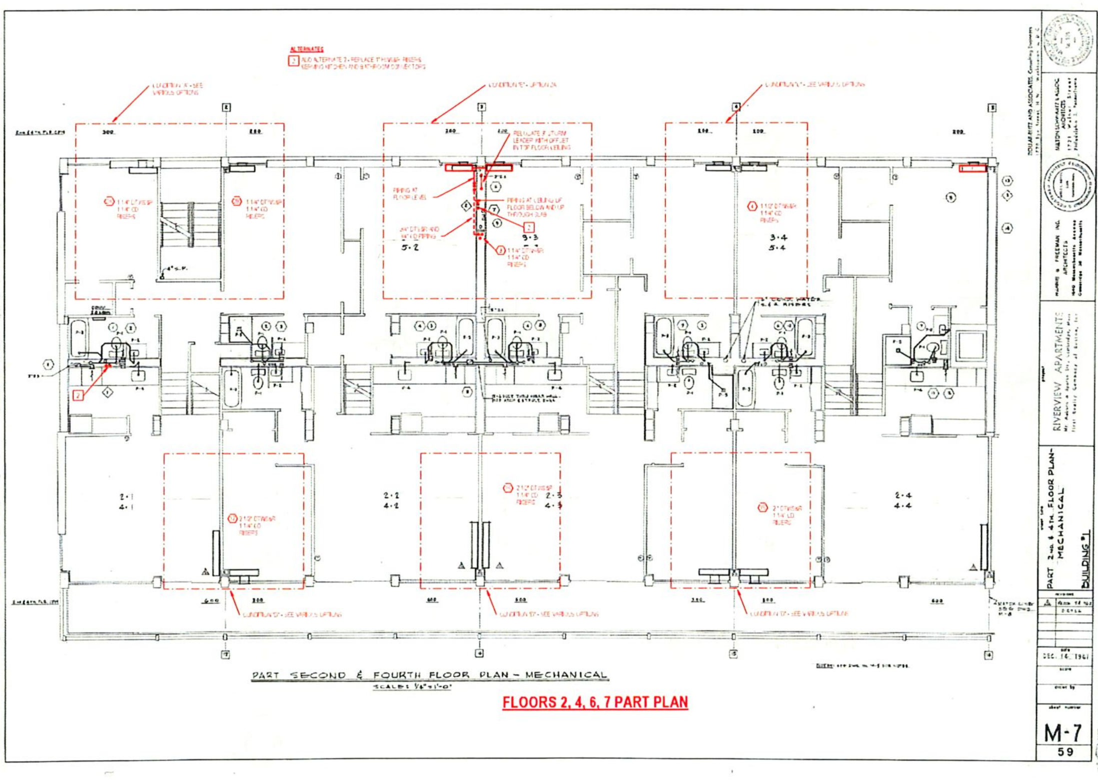


Hot – Chilled Water Riser Diagram
Typical Exhaust Fan Detail
Typical Condensate Drain Risers
Kitchen & Bath Exhaust Riser Diagram
Bldg #1 – Exhaust Fan Schedule
Boiler Room
Transformer
Electric
Lobby
Storage
Ground Floor Plan – Heating & Cooling
GROUND FLOOR PLAN
Riverview Apartments
M-4
56

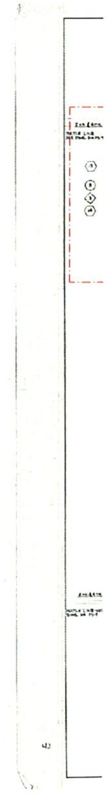


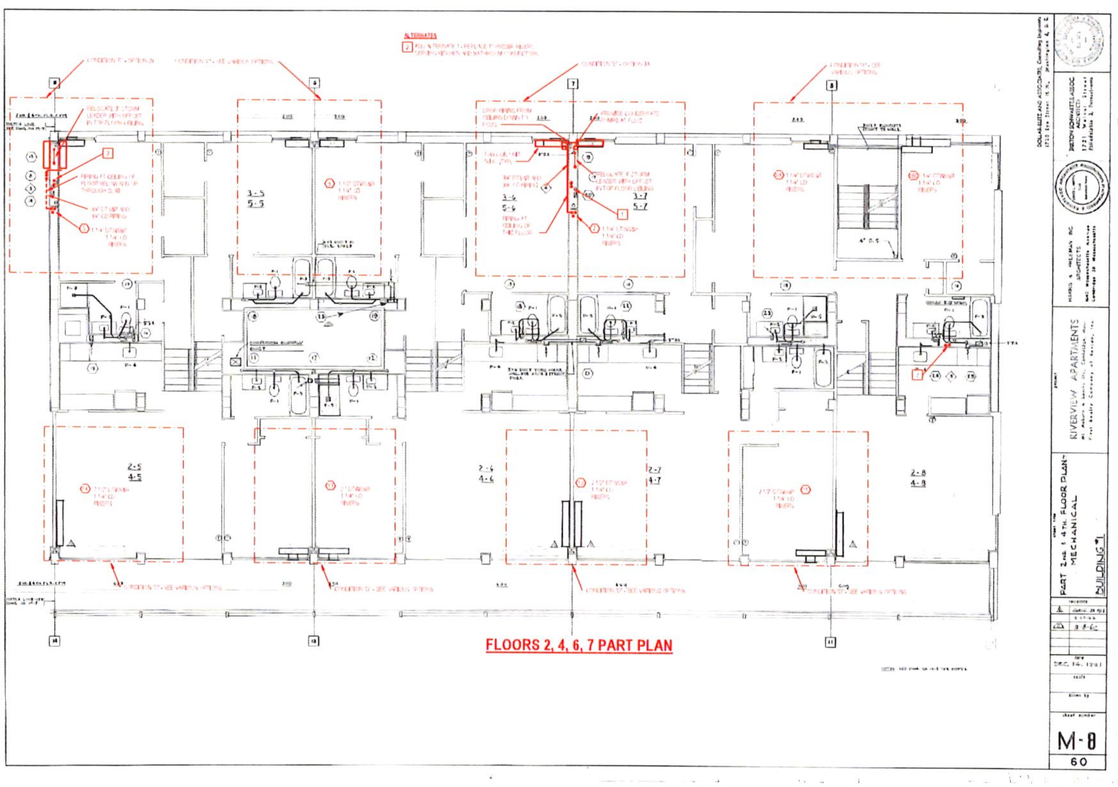
FLOORS 1, 3, 5 PART PLAN
PLUMBING FIXTURE SCHEDULE
WATER CLOSET
LAVATORY
BATH TUB
KITCHEN SINK
SHOWER
SLOP SINK
LAUNDRY TRAY
DOUBLE COMPARTMENT
SINGLE COMPARTMENT
WASHER
ROOM A.C. SCHEDULE
RIVERVIEW APARTMENTS
HARRIS & FREEMAN INC.
ARCHITECTS
MILTON SCHWARTZ & ASSOC.
ARCHITECTS
PART 1st, 3rd & 5th FLOOR PLAN-
MECHANICAL
BUILDING #1
DEC. 14, 1961
M-5
57


PART FIRST, THIRD, AND FIFTH FLOOR PLAN - MECHANICAL
FLOORS 1, 3, 5 PART PLAN
RIVERVIEW APARTMENTS
PART 1st, 3rd & 5th FLOOR PLAN - MECHANICAL
BUILDING #1
DEC. 14, 1961
M-6
58



ALTERNATES
PART SECOND & FOURTH FLOOR PLAN - MECHANICAL
FLOORS 2, 4, 6, 7 PART PLAN
RIVERVIEW APARTMENTS
HARRIS & FREEMAN INC. ARCHITECTS
PART 2nd & 4th FLOOR PLAN - MECHANICAL
BUILDING #1
DEC. 14, 1961
M-7
59





FLOORS 2, 4, 6, 7 PART PLAN
RIVERVIEW APARTMENTS
PART 2nd & 4th FLOOR PLAN - MECHANICAL
BUILDING #1
M-8
60

313 Congress Street
Boston, MA 02210
(617) 330-9390

December 12, 2024

Riverview-In-Cambridge Condo Trust c/o
Dwight Johnson
Senior Vice President
Thayer & Associates, Inc.
1812 Massachusetts Avenue
Cambridge, MA 02140

Re:	**Project Title:**	**Riverview-in-Cambridge**
	Project Address:	221 Mount Auburn Street, Cambridge
	Rimkus Matter No.:	100232113
	Subject:	**Investigation and Evaluation Report, 780 CMR 9th Edition**

Prepared By: Doug Anderson, Code Advisory Practice Leader
Rimkus Consulting Group, Inc
danderson@c3boston.com

The following code summary is based on the proposed repairs and/or replacement of structural elements due to inadequate construction techniques when the building was originally built in the 1960s.

Building Overview: 8 stories, 66 unit condominium building.

Applicable Codes

Code Type	Applicable Code (Model Code Basis)
Building	780 CMR: Massachusetts Building Code (9th Edition) (*2015 International Building Code*, amended) (*2015 International Existing Building Code*, amended)
Energy	225 CMR 23: Massachusetts Commercial Stretch Energy Code (2021 *International Energy Conservation Code*, with MA amendments)
Fire	527 CMR: Massachusetts Comprehensive Fire Safety Code (*2021 NFPA 1*, amended)
Accessibility	521 CMR: Massachusetts Architectural Access Board Regulations (2006)
Electrical	527 CMR 12.00: Massachusetts Electrical Code (*2023 National Electrical Code [NFPA 70]*, amended)
Elevator	524 CMR: Massachusetts Elevator Code (2013 ASME A17.1, amended)
Mechanical	*2015 International Mechanical Code*
Plumbing	248 CMR: Massachusetts Plumbing Code (2023)

RIMKUS

Building Summary

Existing Occupancy: Group R-2 (Multi-family residential)

Proposed Occupancy: same

Min. Construction Type: Type IB (presumed to start)

Work Area Compliance Method

The premise behind the three levels of work is, besides requiring that all new equipment and systems meet the code for new construction, that additional building improvements are required above and beyond the scope of work otherwise proposed.

> ***IEBC 502.1 Repairs.*** *Repairs, as defined in Chapter 2, include the patching or restoration or replacement of damaged materials, elements, equipment or fixtures for the purpose of maintaining such components in good or sound condition with respect to existing loads or performance requirements.*
>
> ***IEBC 503.1 Alterations – Level 1:*** *Level 1 alterations include the removal and replacement or the covering of existing materials, elements, equipment or fixtures using new materials, elements, equipment or fixtures that serve the same purpose.*
>
> ***IEBC 504.1 Alterations – Level 2:*** *Level 2 alterations include the addition or elimination of any door or window, the reconfiguration or extension of any system, or the installation of any additional equipment, and shall apply where the work area is equal to or less than 50 percent of the building area.*
>
> ***IEBC 505.1 Alterations – Level 3:*** *Level 3 alterations apply where the work area exceeds 50 percent of the building area.*

Analysis: This project can be considered as Repairs, Level 1 and Level 2, depending on the final scope of work. A project can consist of multiple Levels of work.

> ***IEBC 202, WORK AREA.*** *That portion or portions of a building consisting of all reconfigured spaces as indicated on the construction documents. Work area excludes other portions of the building where incidental work entailed by the intended work must be performed and portions of the building where work not initially intended by the owner is specifically required by this code.*

Analysis: Any reconfigured space as a result of the project can be considered "incidental" and therefore not considered a "work area." Therefore, any upgrades required due to alterations within a "work area" would not apply to this project.

New Construction

> ***Level 1, IEBC 702.7:*** *New work shall comply with materials and methods requirements in the IBC, IECC, IMC, and IPC, as applicable…*

Analysis: Any replacement structure or equipment must meet the applicable current code for new construction.

> ***Level 2, IEBC 801.3:*** *New construction elements, components, systems and spaces shall comply with the requirements of the IBC.*

Analysis: Fixtures, finishes, and replacement equipment and materials must meet the provisions of the code for new construction.

Primary Structural Frame Fire Resistance Ratings

The table shown below summarizes the requirements for Type IIB construction. This table is based upon 780 CMR Table 601.

Building Element	Type IB Rating (Hours)
Structural frame Including girders, trusses, columns	2
Bearing walls Exterior	2
Bearing walls Interior	2
Non-Bearing Walls and Partitions Exterior	Based on fire separation distance
Non-Bearing Walls and Partitions Interior	0
Floor Construction Including supporting beams and joists	2
Roof Construction Including supporting beams and joists	1

A. Not less than rating based on fire separation distance. Analysis detailed below.

Analysis: Type IB construction is presumed based on the construction and materials used. Additional testing should be done to determine the construction type so that any replacement components match the fire resistance rating of the existing building.

Fire Protection Systems

Automatic Sprinkler System

> ***IEBC Section 804.2.2*** *In buildings with occupancies in Groups A, B, E, F-1, H, I, M, R-1, R-2, R-3, R-4, S-1 and S-2, work areas that have exits or corridors shared by more than one tenant or that have exits or corridors serving an occupant load greater than 30 shall be provided with automatic sprinkler protection where all of the following conditions occur:*
>
> *1. The work area is required to be provided with automatic sprinkler protection in accordance with the Inter-national Building Code as applicable to new construction; and*
>
> *2. The work area exceeds 50 percent of the floor area.*

Analysis: Any reconfigured space as a result of the project can be considered "incidental" and therefore not considered a "work area." The project will not trigger installation of a sprinkler system.

Means of Egress

The means of egress is not impacted by the project.

Interior Finish

Wall and Ceiling Classifications
Class A: flame spread 0-25
Class B: flame spread 26-75
Class C: flame spread 76-200
All: (new) smoke developed 0-450

Floor Classifications
Class I: critical radiant flux not less than $0.45 W/cm^2$
Class II: critical radiant flux not less than $0.22 W/cm^2$ but less than $0.45 W/cm^2$
No listing: critical radiant flux rating not required.

Non-Sprinklered

	Group R-2 Walls/Ceilings	Floors (all)
Exit Enclosures	B	Class II
Exit Access Corridors	B	Class II
Rooms & Enclosed Spaces	C	Class II

Analysis: Replacement interior finish in common areas only must comply with the requirements noted above. Finishes within the dwelling units are not regulated by the code.

Energy Code

Any altered elements of the building resulting from the structural remediation must comply with all applicable provisions of the 2021 International Energy Conservation Code (IECC) as amended by Massachusetts, and with 225 CMR 23 for Stretch Code requirements.

Analysis: There are no requirements to upgrade any existing systems that do not need to be altered, removed or relocated as part of the project.

Accessibility

521 CMR, MAAB Compliance Triggers
In accordance with 521 CMR, only buildings undergoing renovation which meet the following dollar thresholds based on the assessed value of the building must provide access.

1. Work amounting to greater than 30% of the full and fair cash value (100% equalized assessed value) of the building. The building is required to comply with the requirements of 521 CMR in full (521 CMR 3.3.2).

2. Work amounting to less than 30% of the full and fair cash value but greater than $100,000. All new work must comply and, in addition, an accessible public entrance and accessible toilet room, telephone and drinking fountain (if public toilets, telephones and drinking fountains are provided) are required (521 CMR 3.3.1(b)).

3. Work amounting to less than $100,000. Only the work being performed is required to comply (521 CMR 3.3.1(a)).

Analysis: As of January 1, 2023, the aggregate assessed value of all condominiums is $90,745,100.00. If the expected cost of construction exceeds 30% of the pro-rated assessed value over any 36 consecutive months ($27,223,530.00), all public portions of the building are required to be fully compliant with 521 CMR.

All new construction is required to comply with 521 CMR. If it is infeasible to make portions of the tenant space compliant with 521 CMR, a variance may be sought.

105 CMR 410, MA State Sanitary Code

In addition to the requirements of 780 CMR, the following provisions of **105 CMR 410.000: MINIMUM STANDARDS OF FITNESS FOR HUMAN HABITATION (STATE SANITARY CODE, CHAPTER II),** apply to all dwelling units.

A "Habitable Room" means every room or enclosed floor space used or intended to be used for living, sleeping, cooking, or eating purposes, excluding rooms containing toilets, bathtubs or showers and excluding laundries, pantries, foyers, communicating corridors, closets and storage spaces.

105 CMR 410.430 Natural Light and Obstruction. *The owner shall provide transparent or translucent glass which admits unobstructed light from the outdoors equal in area to a minimum of 8% of the entire floor area in:*

1. *Habitable rooms other than a kitchen.*
2. *Kitchens which have a floor area greater than 70 square feet.*

105 CMR 410.220 Natural and Mechanical Ventilation. *The owner shall provide for each habitable room, and room containing a toilet, bathtub or shower, ventilation to the outdoors consisting of:*

(A) Habitable rooms and rooms with a toilet, bathtub, or shower shall have:

1. *Windows, skylights, doors through the exterior walls or roofs that can be easily opened with a combined opening of at least 4% of the floor area of that habitable room or room containing a toilet, bathtub or shower; or*
2. *Mechanical ventilation capable of exhausting air to the outdoors.*

(C) Mechanical ventilation shall be installed and maintained in accordance with 780 CMR: Massachusetts State Building Code.

APPENDIX K - CONSIGLI PRICING PACKAGE

APPENDIX K - CONSIGLI PRICING PACKAGE

Riverview Condominium

Cambridge, MA

Concept Estimate

1/29/2025

CONSIGLI
Est. 1905

BP	DESCRIPTION		TOTAL COST	
			104,280 SF	
02-20	Selective Demolition		24.01	2,504,283
02-82	Hazardous Material Abatement		17.72	1,848,000
03-30	Concrete Repairs		28.40	2,961,804
03-31	Shoring		16.95	1,767,500
04-20	Masonry		3.40	355,000
05-50	Misc Metals		1.37	143,250
06-10	Rough Carpentry		4.35	453,172
06-25	Finish Carpentry		43.54	4,539,860
07-10	Waterproofing & Caulking		3.19	333,088
07-42	Metal Panels / Siding		11.52	1,201,555
07-50	Roofing		11.33	1,181,370
08-10	Doors, Frames & Hardware		3.07	320,420
08-41	Aluminum Entrances & Storefront		1.39	144,847
08-51	uPVC Windows		31.65	3,300,091
08-62	Skylights		0.02	2,250
09-21	Drywall		34.57	3,605,100
09-23	Stucco		0.83	87,000
09-30	Tile		4.65	484,800
09-65	Flooring		14.63	1,525,633
09-90	Painting		10.74	1,119,565
10-01	Typical Specialties		5.35	557,486
11-24	Fall Protection		1.20	125,000
11-31	Residential Appliances		9.49	990,000
22-01	Fire Protection		10.51	1,096,020
22-01	Plumbing		33.40	3,482,643
23-01	HVAC		19.32	2,014,259
26-01	Electrical		11.86	1,236,434
32-10	Landscaping & Site Improvements		1.11	115,400
SUBTOTAL			**360**	**37,495,830**
	Design/Estimate Contingency	15.00%	53.94	5,624,375
	Escalation	2.00%	8.27	862,400
	SDI / Subcontractor Bonds	1.40%	5.90	615,760
SUBTOTAL (TRADE COSTS)			**428**	**44,598,365**
	Construction Contingency	5.00%	21.38	2,229,918
	General Conditions	5.00%	21.38	2,229,918
	General Requirements	6.00%	25.66	2,675,902
SUBTOTAL			**496**	**51,734,103**
	GL Insurance	1.40%	7.56	788,650
	Builder's Risk - By Owner	0.00%		-
	Building Permit	2.00%	10.80	1,126,640
	P&P Bond - By Owner	0.00%	-	-
SUBTOTAL			**514**	**53,649,393**
	CM Fee	5.00%	25.72	2,682,470
DIRECT CONSTRUCTION COST			**540**	**56,331,863**
	Permitting/Legal/Bonding/Design/Management/Owner Contingencies		162.06	16,899,559
GRAND TOTAL COST			**702**	**73,231,422**

Riverview Condominiums

Cambridge, MA

Conceptual Estimate dated January 29, 2025

CONSIGLI
Est. 1905

Spreadsheet Level	Takeoff Quantity	Total Cost/Unit	Total Amount
01 DEMOLITION & ABATEMENT			
02-20 DEMOLITION			
02.41.01 Demolition - General			
Dumpsters - for demolition	48.00 ea	950.00 /ea	45,600
Debris chute	80.00 vlf	125.00 /vlf	10,000
Demolition - General	**104,280.00 sf**	**0.53 /sf**	**55,600**
02-20 DEMOLITION	**104,280.00 sf**	**0.53 /sf**	**55,600**
02-82 HAZARDOUS MATERIAL ABATEMENT			
02.82.00 Asbestos Remediation			
Asbestos abatement, interior	92,000.00 sf	19.00 /sf	1,748,000
Asbestos abatement - exterior caulking	4,000.00 lf	25.00 /lf	100,000
Asbestos Remediation	**104,280.00 sf**	**17.72 /sf**	**1,848,000**
02-82 HAZARDOUS MATERIAL ABATEMENT	**104,280.00 sf**	**17.72 /sf**	**1,848,000**
04-20 MASONRY			
04.20.00 Unit Masonry			
Replace brick at column repairs	625.00 sf	125.00 /sf	78,125
Replace CMU at column repairs	625.00 sf	100.00 /sf	62,500
Unit Masonry	**104,280.00 sf**	**1.35 /sf**	**140,625**
04-20 MASONRY	**104,280.00 sf**	**1.35 /sf**	**140,625**
01 DEMOLITION & ABATEMENT	**104,280.00 sf**	**19.60 /sf**	**2,044,225**
02 SHORING			
03-30 CONCRETE			
03.33.25 Concrete Flatwork - Structural Slabs			
Shoring, erect, relocate, rental, and dismantle	1.00 ls	1,767,500.00 /ls	1,767,500
Concrete Flatwork - Structural Slabs	**104,280.00 sf**	**16.95 /sf**	**1,767,500**
03-30 CONCRETE	**104,280.00 sf**	**16.95 /sf**	**1,767,500**
02 SHORING	**104,280.00 sf**	**16.95 /sf**	**1,767,500**
03 CONCRETE REPAIRS			
01-20 OWNER'S ALLOWANCES			

CONSIGLI
Est. 1905

Riverview Condominiums

Cambridge, MA

Conceptual Estimate dated January 29, 2025

Spreadsheet Level	Takeoff Quantity	Total Cost/Unit	Total Amount
01.21.00 Allowances			
Record Drawings outlining actual repairs if different than plan	1.00 ls	5,000.00 /ls	5,000
Miscellaneous Slab apalling repairs	1.00 ls	100,000.00 /ls	100,000
Allowances	**104,280.00 sf**	**1.01 /sf**	**105,000**
01-20 OWNER'S ALLOWANCES	**104,280.00 sf**	**1.01 /sf**	**105,000**
01-30 GENERAL CONDITIONS			
01.31.00 Project Management & Coordination			
Project manager (40 hrs per wk)	2.00 wk	6,800.00 /wk	13,600
Project manager (8 hrs per wk)	26.00 wk	1,360.00 /wk	35,360
General superintendent (8 hrs per wk)	26.00 wk	1,880.00 /wk	48,880
Superintendent - Duration (40 hrs per wk)	26.00 wk	5,600.00 /wk	145,600
Project Management & Coordination	**104,280.00 sf**	**2.33 /sf**	**243,440**
01.31.75 Field & Trades Foreman			
Labor for clean-up - full time - 26 weeks	1,040.00 hr	112.00 /hr	116,480
Labor for unload and distribute	1,040.00 hr	217.00 /hr	225,680
Field & Trades Foreman	**104,280.00 sf**	**3.28 /sf**	**342,160**
01.43.00 Quality Assurance			
Concrete mockup - assume in situ	***0.00 ea***	***/ea***	
Quality Assurance	**104,280.00 sf**	**/sf**	
01-30 GENERAL CONDITIONS	**104,280.00 sf**	**5.62 /sf**	**585,600**
01-50 GENERAL REQUIREMENTS			
01.51.00 Temporary Utilities			
Temporary power - Generator(s) with fuel	1.00 ea	5,000.00 /ea	5,000
Temporary Utilities	**104,280.00 sf**	**0.05 /sf**	**5,000**
01.52.00 Construction Facilities			
Temporary toilets	3.00 mo	750.00 /mo	2,250
Construction Facilities	**104,280.00 sf**	**0.02 /sf**	**2,250**
01.54.00 Construction Aids			
Equipment/Staging for underside form work	1.00 ls	5,000.00 /ls	5,000
Small tools - chipping hammers/blades	1.00 ls	2,500.00 /ls	2,500
Small tools - grout pump(s) & Accessories	2.00 ea	5,000.00 /ea	10,000
Small tools and consumables	1.00 ea	50,000.00 /ea	50,000
Construction Aids	**104,280.00 sf**	**0.65 /sf**	**67,500**
01-50 GENERAL REQUIREMENTS	**104,280.00 sf**	**0.72 /sf**	**74,750**

Spreadsheet Level	Takeoff Quantity	Total Cost/Unit	Total Amount
02-20 DEMOLITION			
02.41.01 Demolition - General			
Dumpsters	4.00 ea	1,000.00 /ea	4,000
Demolition - General	**104,280.00 sf**	**0.04 /sf**	**4,000**
02-20 DEMOLITION	**104,280.00 sf**	**0.04 /sf**	**4,000**
03-30 CONCRETE			
03.36.00 Miscellaneous Concrete Items			
Scan Column and underside of slab for Type 1 Repair - 4 each per day	18.00 ea	100.00 /ea	1,800
Scan Column and underside of slab for Type 2 Repair - 6 each per day	***0.00 ea***	***/ea***	
Scan Column and underside of slab for Type 3 Repair - 4 each per day	***0.00 ea***	***/ea***	
Scan Column and underside of slab for Type 4 Repair - 6 each per day	2.00 ea	100.00 /ea	200
Scan Column and underside of slab for Type 5 Repair - 6 each per day	***0.00 ea***	***/ea***	
Scan Column and underside of slab for Type 1 Repair - 4 each per day	16.00 ea	100.00 /ea	1,600
Scan Column and underside of slab for Type 2 Repair - 6 each per day	17.00 ea	100.00 /ea	1,700
Scan Column and underside of slab for Type 3 Repair - 4 each per day	***0.00 ea***	***/ea***	
Scan Column and underside of slab for Type 4 Repair - 6 each per day	2.00 ea	100.00 /ea	200
Scan Column and underside of slab for Type 5 Repair - 6 each per day	1.00 ea	100.00 /ea	100
Scan Column and underside of slab for Type 1 Repair - 4 each per day	12.00 ea	100.00 /ea	1,200
Scan Column and underside of slab for Type 2 Repair - 6 each per day	***0.00 ea***	***/ea***	
Scan Column and underside of slab for Type 3 Repair - 4 each per day	8.00 ea	100.00 /ea	800
Scan Column and underside of slab for Type 4 Repair - 6 each per day	2.00 ea	100.00 /ea	200
Scan Column and underside of slab for Type 5 Repair - 6 each per day	***0.00 ea***	***/ea***	
Scan Column and underside of slab for Type 1 Repair - 4 each per day	14.00 ea	100.00 /ea	1,400
Scan Column and underside of slab for Type 2 Repair - 6 each per day	15.00 ea	100.00 /ea	1,500
Scan Column and underside of slab for Type 3 Repair - 4 each per day	***0.00 ea***	***/ea***	
Scan Column and underside of slab for Type 4 Repair - 6 each per day	***0.00 ea***	***/ea***	
Scan Column and underside of slab for Type 5 Repair - 6 each per day	1.00 ea	100.00 /ea	100
Scan Column and underside of slab for Type 1 Repair - 4 each per day	19.00 ea	100.00 /ea	1,900
Scan Column and underside of slab for Type 2 Repair - 6 each per day	***0.00 ea***	***/ea***	
Scan Column and underside of slab for Type 3 Repair - 4 each per day	8.00 ea	100.00 /ea	800
Scan Column and underside of slab for Type 4 Repair - 6 each per day	2.00 ea	100.00 /ea	200
Scan Column and underside of slab for Type 5 Repair - 6 each per day	***0.00 ea***	***/ea***	
Scan Column and underside of slab for Type 1 Repair - 4 each per day	15.00 ea	100.00 /ea	1,500
Scan Column and underside of slab for Type 2 Repair - 6 each per day	14.00 ea	100.00 /ea	1,400

Spreadsheet Level	Takeoff Quantity	Total Cost/Unit	Total Amount
03.36.00 Miscellaneous Concrete Items			
Scan Column and underside of slab for Type 3 Repair - 4 each per day	***0.00 ea***	***/ea***	
Scan Column and underside of slab for Type 4 Repair - 6 each per day	***0.00 ea***	***/ea***	
Scan Column and underside of slab for Type 5 Repair - 6 each per day	3.00 ea	100.00 /ea	300
Scan Column and underside of slab for Type 1 Repair - 4 each per day	19.00 ea	100.00 /ea	1,900
Scan Column and underside of slab for Type 2 Repair - 6 each per day	***0.00 ea***	***/ea***	
Scan Column and underside of slab for Type 3 Repair - 4 each per day	8.00 ea	100.00 /ea	800
Scan Column and underside of slab for Type 4 Repair - 6 each per day	2.00 ea	100.00 /ea	200
Scan Column and underside of slab for Type 5 Repair - 6 each per day	***0.00 ea***	***/ea***	
Scan Column and underside of slab for Type 1 Repair - 4 each per day	12.00 ea	100.00 /ea	1,200
Scan Column and underside of slab for Type 2 Repair - 6 each per day	16.00 ea	100.00 /ea	1,600
Scan Column and underside of slab for Type 3 Repair - 4 each per day	***0.00 ea***	***/ea***	
Scan Column and underside of slab for Type 4 Repair - 6 each per day	***0.00 ea***	***/ea***	
Scan Column and underside of slab for Type 5 Repair - 6 each per day	2.00 ea	100.00 /ea	200
Scan Column and underside of slab for Type 1 Repair - 4 each per day	28.00 ea	100.00 /ea	2,800
Scan Column and underside of slab for Type 2 Repair - 6 each per day	***0.00 ea***	***/ea***	
Scan Column and underside of slab for Type 3 Repair - 4 each per day	7.00 ea	100.00 /ea	700
Scan Column and underside of slab for Type 4 Repair - 6 each per day	2.00 ea	100.00 /ea	200
Scan Column and underside of slab for Type 5 Repair - 6 each per day	***0.00 ea***	***/ea***	
Scan Column and underside of slab for Type 1 Repair - 4 each per day	15.00 ea	100.00 /ea	1,500
Scan Column and underside of slab for Type 2 Repair - 6 each per day	13.00 ea	100.00 /ea	1,300
Scan Column and underside of slab for Type 3 Repair - 4 each per day	***0.00 ea***	***/ea***	
Scan Column and underside of slab for Type 4 Repair - 6 each per day	***0.00 ea***	***/ea***	
Scan Column and underside of slab for Type 5 Repair - 6 each per day	2.00 ea	100.00 /ea	200
Scan Column and underside of slab for Type 1 Repair - 4 each per day	20.00 ea	100.00 /ea	2,000
Scan Column and underside of slab for Type 2 Repair - 6 each per day	***0.00 ea***	***/ea***	
Scan Column and underside of slab for Type 3 Repair - 4 each per day	8.00 ea	100.00 /ea	800
Scan Column and underside of slab for Type 4 Repair - 6 each per day	2.00 ea	100.00 /ea	200
Scan Column and underside of slab for Type 5 Repair - 6 each per day	***0.00 ea***	***/ea***	
Scan Column and underside of slab for Type 1 Repair - 4 each per day	15.00 ea	100.00 /ea	1,500
Scan Column and underside of slab for Type 2 Repair - 6 each per day	16.00 ea	100.00 /ea	1,600
Scan Column and underside of slab for Type 3 Repair - 4 each per day	***0.00 ea***	***/ea***	
Scan Column and underside of slab for Type 4 Repair - 6 each per day	***0.00 ea***	***/ea***	
Scan Column and underside of slab for Type 5 Repair - 6 each per day	2.00 ea	100.00 /ea	200
Scan Column and underside of slab for Type 1 Repair - 4 each per day	41.00 ea	100.00 /ea	4,100

Spreadsheet Level	Takeoff Quantity	Total Cost/Unit	Total Amount
03.36.00 Miscellaneous Concrete Items			
Scan Column and underside of slab for Type 2 Repair - 6 each per day	16.00 ea	100.00 /ea	1,600
Scan Column and underside of slab for Type 3 Repair - 4 each per day	***0.00 ea***	***/ea***	
Scan Column and underside of slab for Type 4 Repair - 6 each per day	2.00 ea	100.00 /ea	200
Scan Column and underside of slab for Type 5 Repair - 6 each per day	2.00 ea	100.00 /ea	200
Scan Column and underside of slab for Type 1 Repair - 4 each per day	32.00 ea	100.00 /ea	3,200
Scan Column and underside of slab for Type 2 Repair - 6 each per day	19.00 ea	100.00 /ea	1,900
Scan Column and underside of slab for Type 3 Repair - 4 each per day	11.00 ea	100.00 /ea	1,100
Scan Column and underside of slab for Type 4 Repair - 6 each per day	2.00 ea	100.00 /ea	200
Scan Column and underside of slab for Type 5 Repair - 6 each per day	2.00 ea	100.00 /ea	200
Scan Column and underside of slab for Type 1 Repair - 4 each per day	1.00 ea	100.00 /ea	100
Scan Column and underside of slab for Type 2 Repair - 6 each per day	18.00 ea	100.00 /ea	1,800
Scan Column and underside of slab for Type 3 Repair - 4 each per day	***0.00 ea***	***/ea***	
Scan Column and underside of slab for Type 4 Repair - 6 each per day	***0.00 ea***	***/ea***	
Scan Column and underside of slab for Type 5 Repair - 6 each per day	***0.00 ea***	***/ea***	
Roughen surface with scabbler Type 1 Repair - 18 columns @ 14 each	18.00 ea	420.00 /ea	7,560
Roughen surface with scabbler Type 2 Repair - 8 each	***0.00 ea***	***/ea***	
Roughen surface with scabbler Type 3 Repair - 14 each	***0.00 ea***	***/ea***	
Roughen surface with scabbler Type 4 Repair - 2 columns @ 10 each	2.00 ea	315.00 /ea	630
Roughen surface with scabbler Type 5 Repair - 10 each	***0.00 ea***	***/ea***	
Roughen surface with scabbler Type 1 Repair - 16 columns @ 14 each	16.00 ea	420.00 /ea	6,720
Roughen surface with scabbler Type 2 Repair- 17 columns @ 8 each	17.00 ea	315.00 /ea	5,355
Roughen surface with scabbler Type 3 Repair	***0.00 ea***	***/ea***	
Roughen surface with scabbler Type 4 Repair - 2 columns @ 10 each	2.00 ea	315.00 /ea	630
Drill & Epoxy Dowel Type 5 Repair - 1 columns @ 10 each	1.00 ea	315.00 /ea	315
Drill & Epoxy Dowel Type 1 Repair - 18 columns @ 14 each	12.00 ea	420.00 /ea	5,040
Drill & Epoxy Dowel Type 2 Repair	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 3 Repair - 8 columns @ 14 each	8.00 ea	420.00 /ea	3,360
Drill & Epoxy Dowel Type 4 Repair - 2 columns @ 10 each	2.00 ea	315.00 /ea	630
Drill & Epoxy Dowel Type 5 Repair	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 1 Repair - 14 columns @ 14 each	14.00 ea	420.00 /ea	5,880
Drill & Epoxy Dowel Type 2 Repair - 15 columns @ 8 each	15.00 ea	315.00 /ea	4,725
Drill & Epoxy Dowel Type 3 Repair	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 4 Repair	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 5 Repair - 1 columns @ 10 each	1.00 ea	315.00 /ea	315
Drill & Epoxy Dowel Type 1 Repair - 19 columns @ 14 each	19.00 ea	420.00 /ea	7,980
Drill & Epoxy Dowel Type 2 Repair	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 3 Repair - 8 columns @ 14 each	8.00 ea	420.00 /ea	3,360
Drill & Epoxy Dowel Type 4 Repair - 2 columns @ 10 each	2.00 ea	315.00 /ea	630
Drill & Epoxy Dowel Type 5 Repair	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 1 Repair - 15 columns @ 14 each	15.00 ea	420.00 /ea	6,300
Drill & Epoxy Dowel Type 2 Repair - 14 columns @ 14 each	14.00 ea	315.00 /ea	4,410
Drill & Epoxy Dowel Type 3 Repair	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 4 Repair	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 5 Repair - 3 columns @ 10 each	3.00 ea	315.00 /ea	945
Drill & Epoxy Dowel Type 1 Repair - 19 columns @ 14 each	19.00 ea	420.00 /ea	7,980

Riverview Condominiums

Cambridge, MA

Conceptual Estimate dated January 29, 2025

Spreadsheet Level	Takeoff Quantity	Total Cost/Unit	Total Amount
03.36.00 Miscellaneous Concrete Items			
Drill & Epoxy Dowel Type 2 Repair	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 3 Repair - 8 columns @ 14 each	8.00 ea	420.00 /ea	3,360
Drill & Epoxy Dowel Type 4 Repair - 2 columns @ 10 each	2.00 ea	315.00 /ea	630
Drill & Epoxy Dowel Type 5 Repair	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 1 Repair - 12 columns @ 14 each	12.00 ea	420.00 /ea	5,040
Drill & Epoxy Dowel Type 2 Repair - 16 columns @ 14 each	16.00 ea	315.00 /ea	5,040
Drill & Epoxy Dowel Type 3 Repair	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 4 Repair	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 5 Repair - 2 columns @ 10 each	2.00 ea	315.00 /ea	630
Drill & Epoxy Dowel Type 1 Repair - 28 columns @ 14 each	28.00 ea	420.00 /ea	11,760
Drill & Epoxy Dowel Type 2 Repair	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 3 Repair - 7 columns @ 14 each	7.00 ea	420.00 /ea	2,940
Drill & Epoxy Dowel Type 4 Repair - 2 columns @ 10 each	2.00 ea	315.00 /ea	630
Drill & Epoxy Dowel Type 5 Repair	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 1 Repair - 15 columns @ 14 each	15.00 ea	420.00 /ea	6,300
Drill & Epoxy Dowel Type 2 Repair - 13 columns @ 8 each	13.00 ea	315.00 /ea	4,095
Drill & Epoxy Dowel Type 3 Repair	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 4 Repair	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 5 Repair - 2 columns @ 10 each	2.00 ea	315.00 /ea	630
Drill & Epoxy Dowel Type 1 Repair - 20 columns @ 14 each	20.00 ea	420.00 /ea	8,400
Drill & Epoxy Dowel Type 2 Repair	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 3 Repair - 8 columns @ 14 each	8.00 ea	420.00 /ea	3,360
Drill & Epoxy Dowel Type 4 Repair - 2 columns @ 10 each	2.00 ea	315.00 /ea	630
Drill & Epoxy Dowel Type 5 Repair	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 1 Repair - 15 columns @ 14 each	15.00 ea	420.00 /ea	6,300
Drill & Epoxy Dowel Type 2 Repair - 16 columns @ 8 each	16.00 ea	315.00 /ea	5,040
Drill & Epoxy Dowel Type 3 Repair	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 4 Repair	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 5 Repair - 2 columns @ 10 each	2.00 ea	315.00 /ea	630
Drill & Epoxy Dowel Type 1 Repair - 41 columns @ 14 each	41.00 ea	420.00 /ea	17,220
Drill & Epoxy Dowel Type 2 Repair - 16 columns @ 8 each	16.00 ea	315.00 /ea	5,040
Drill & Epoxy Dowel Type 3 Repair	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 4 Repair - 2 columns @ 10 each	2.00 ea	315.00 /ea	630
Roughen surface with scabbler Type 5 Repair - 2 columns @ 10 each	2.00 ea	315.00 /ea	630
Roughen surface with scabbler Type 1 Repair - 32 columns @ 14 each	32.00 ea	420.00 /ea	13,440
Roughen surface with scabbler Type 2 Repair - 19 columns @ 8 each	19.00 ea	315.00 /ea	5,985
Roughen surface with scabbler Type 3 Repair - 11 columns @ 14 each	11.00 ea	420.00 /ea	4,620
Roughen surface with scabbler Type 4 Repair - 2 columns @ 10 each	2.00 ea	315.00 /ea	630
Roughen surface with scabbler Type 5 Repair - 2 columns @ 10 each	2.00 ea	315.00 /ea	630
Roughen surface with scabbler Type 1 Repair - 1 columns @ 14 each	1.00 ea	420.00 /ea	420
Roughen surface with scabbler Type 2 Repair - 18 columns @ 8 each	18.00 ea	315.00 /ea	5,670
Roughen surface with scabbler Type 3 Repair	***0.00 ea***	***/ea***	
Roughen surface with scabbler Type 4 Repair	***0.00 ea***	***/ea***	
Roughen surface with scabbler Type 5 Repair	***0.00 ea***	***/ea***	
Drill & Thru Dowel Type 1-3 Level 1 - 3 hours per column (1 hour each dowel)	20.00 ea	315.00 /ea	6,300
Drill & Thru Dowel Type 1-3 Level 1.5 - 3 hours per column (1 hour each dowel)	36.00 ea	315.00 /ea	11,340
Drill & Thru Dowel Type 1-3 Level 2 - 3 hours per column (1 hour each dowel)	22.00 ea	315.00 /ea	6,930
Drill & Thru Dowel Type 1-3 Level 2.5 - 3 hours per column (1 hour each dowel)	30.00 ea	315.00 /ea	9,450
Drill & Thru Dowel Type 1-3 Level 3 - 3 hours per column (1 hour each dowel)	29.00 ea	315.00 /ea	9,135
Drill & Thru Dowel Type 1-3 Level 3.5 - 3 hours per column (1 hour each dowel)	32.00 ea	315.00 /ea	10,080

Spreadsheet Level	Takeoff Quantity	Total Cost/Unit	Total Amount
03.36.00 Miscellaneous Concrete Items			
Drill & Thru Dowel Type 1-3 Level 4 - 3 hours per column (1 hour each dowel)	29.00 ea	315.00 /ea	9,135
Drill & Thru Dowel Type 1-3 Level 4.5 - 3 hours per column (1 hour each dowel)	30.00 ea	315.00 /ea	9,450
Drill & Thru Dowel Type 1-3 Level 5 - 3 hours per column (1 hour each dowel)	37.00 ea	315.00 /ea	11,655
Drill & Thru Dowel Type 1-3 Level 5.5 - 3 hours per column (1 hour each dowel)	30.00 ea	315.00 /ea	9,450
Drill & Thru Dowel Type 1-3 Level 6 - 3 hours per column (1 hour each dowel)	30.00 ea	315.00 /ea	9,450
Drill & Thru Dowel Type 1-3 Level 6.5 - 3 hours per column (1 hour each dowel)	33.00 ea	315.00 /ea	10,395
Drill & Thru Dowel Type 1-3 Level 7 - 3 hours per column (1 hour each dowel)	61.00 ea	315.00 /ea	19,215
Drill & Thru Dowel Type 1-3 Level 8 (Roof 1) - 3 hours per column (1 hour each dowel)	66.00 ea	315.00 /ea	20,790
Drill & Thru Dowel Type 1-3 Level 9 (Roof 2) - 3 hours per column (1 hour each dowel)	19.00 ea	315.00 /ea	5,985
Drill & Epoxy Dowel Type 1 Repair - 18 columns @ 14 each	252.00 ea	33.25 /ea	8,379
Drill & Epoxy Dowel Type 2 Repair - 8 each	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 3 Repair - 14 each	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 4 Repair - 2 columns @ 10 each	20.00 ea	33.25 /ea	665
Drill & Epoxy Dowel Type 5 Repair - 10 each	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 1 Repair - 16 columns @ 14 each	224.00 ea	33.25 /ea	7,448
Drill & Epoxy Dowel Type 2 Repair- 17 columns @ 8 each	136.00 ea	33.25 /ea	4,522
Drill & Epoxy Dowel Type 3 Repair	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 4 Repair - 2 columns @ 10 each	20.00 ea	33.25 /ea	665
Drill & Epoxy Dowel Type 5 Repair - 1 columns @ 10 each	10.00 ea	33.25 /ea	333
Drill & Epoxy Dowel Type 1 Repair - 18 columns @ 14 each	252.00 ea	33.25 /ea	8,379
Drill & Epoxy Dowel Type 2 Repair	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 3 Repair - 8 columns @ 14 each	112.00 ea	33.25 /ea	3,724
Drill & Epoxy Dowel Type 4 Repair - 2 columns @ 10 each	20.00 ea	33.25 /ea	665
Drill & Epoxy Dowel Type 5 Repair	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 1 Repair - 14 columns @ 14 each	196.00 ea	33.25 /ea	6,517
Drill & Epoxy Dowel Type 2 Repair - 15 columns @ 8 each	120.00 ea	33.25 /ea	3,990
Drill & Epoxy Dowel Type 3 Repair	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 4 Repair	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 5 Repair - 1 columns @ 10 each	10.00 ea	33.25 /ea	333
Drill & Epoxy Dowel Type 1 Repair - 19 columns @ 14 each	266.00 ea	33.25 /ea	8,845
Drill & Epoxy Dowel Type 2 Repair	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 3 Repair - 8 columns @ 14 each	112.00 ea	33.25 /ea	3,724
Drill & Epoxy Dowel Type 4 Repair - 2 columns @ 10 each	20.00 ea	33.25 /ea	665
Drill & Epoxy Dowel Type 5 Repair	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 1 Repair - 15 columns @ 14 each	210.00 ea	33.25 /ea	6,983
Drill & Epoxy Dowel Type 2 Repair - 14 columns @ 14 each	196.00 ea	33.25 /ea	6,517
Drill & Epoxy Dowel Type 3 Repair	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 4 Repair	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 5 Repair - 3 columns @ 10 each	30.00 ea	33.25 /ea	998
Drill & Epoxy Dowel Type 1 Repair - 19 columns @ 14 each	266.00 ea	33.25 /ea	8,845
Drill & Epoxy Dowel Type 2 Repair	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 3 Repair - 8 columns @ 14 each	112.00 ea	33.25 /ea	3,724
Drill & Epoxy Dowel Type 4 Repair - 2 columns @ 10 each	20.00 ea	33.25 /ea	665
Drill & Epoxy Dowel Type 5 Repair	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 1 Repair - 12 columns @ 14 each	168.00 ea	33.25 /ea	5,586
Drill & Epoxy Dowel Type 2 Repair - 16 columns @ 14 each	224.00 ea	33.25 /ea	7,448
Drill & Epoxy Dowel Type 3 Repair	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 4 Repair	***0.00 ea***	***/ea***	

Spreadsheet Level	Takeoff Quantity	Total Cost/Unit	Total Amount
03.36.00 Miscellaneous Concrete Items			
Drill & Epoxy Dowel Type 5 Repair - 2 columns @ 10 each	20.00 ea	33.25 /ea	665
Drill & Epoxy Dowel Type 1 Repair - 28 columns @ 14 each	392.00 ea	33.25 /ea	13,034
Drill & Epoxy Dowel Type 2 Repair	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 3 Repair - 7 columns @ 14 each	98.00 ea	33.25 /ea	3,259
Drill & Epoxy Dowel Type 4 Repair - 2 columns @ 10 each	20.00 ea	33.25 /ea	665
Drill & Epoxy Dowel Type 5 Repair	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 1 Repair - 15 columns @ 14 each	210.00 ea	33.25 /ea	6,983
Drill & Epoxy Dowel Type 2 Repair - 13 columns @ 8 each	104.00 ea	33.25 /ea	3,458
Drill & Epoxy Dowel Type 3 Repair	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 4 Repair	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 5 Repair - 2 columns @ 10 each	20.00 ea	33.25 /ea	665
Drill & Epoxy Dowel Type 1 Repair - 20 columns @ 14 each	280.00 ea	33.25 /ea	9,310
Drill & Epoxy Dowel Type 2 Repair	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 3 Repair - 8 columns @ 14 each	112.00 ea	33.25 /ea	3,724
Drill & Epoxy Dowel Type 4 Repair - 2 columns @ 10 each	20.00 ea	33.25 /ea	665
Drill & Epoxy Dowel Type 5 Repair	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 1 Repair - 15 columns @ 14 each	210.00 ea	33.25 /ea	6,983
Drill & Epoxy Dowel Type 2 Repair - 16 columns @ 8 each	128.00 ea	33.25 /ea	4,256
Drill & Epoxy Dowel Type 3 Repair	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 4 Repair	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 5 Repair - 2 columns @ 10 each	20.00 ea	33.25 /ea	665
Drill & Epoxy Dowel Type 1 Repair - 41 columns @ 14 each	574.00 ea	33.25 /ea	19,086
Drill & Epoxy Dowel Type 2 Repair - 16 columns @ 8 each	128.00 ea	33.25 /ea	4,256
Drill & Epoxy Dowel Type 3 Repair	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 4 Repair - 2 columns @ 10 each	20.00 ea	33.25 /ea	665
Drill & Epoxy Dowel Type 5 Repair - 2 columns @ 10 each	20.00 ea	33.25 /ea	665
Drill & Epoxy Dowel Type 1 Repair - 32 columns @ 14 each	448.00 ea	33.25 /ea	14,896
Drill & Epoxy Dowel Type 2 Repair - 19 columns @ 8 each	152.00 ea	33.25 /ea	5,054
Drill & Epoxy Dowel Type 3 Repair - 11 columns @ 14 each	154.00 ea	33.25 /ea	5,121
Drill & Epoxy Dowel Type 4 Repair - 2 columns @ 10 each	20.00 ea	33.25 /ea	665
Drill & Epoxy Dowel Type 5 Repair - 2 columns @ 10 each	20.00 ea	33.25 /ea	665
Drill & Epoxy Dowel Type 1 Repair - 1 columns @ 14 each	14.00 ea	33.25 /ea	466
Drill & Epoxy Dowel Type 2 Repair - 18 columns @ 8 each	144.00 ea	33.25 /ea	4,788
Drill & Epoxy Dowel Type 3 Repair	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 4 Repair	***0.00 ea***	***/ea***	
Drill & Epoxy Dowel Type 5 Repair	***0.00 ea***	***/ea***	
Reinforce new column capital for Type 1 Repair	18.00 ea	562.25 /ea	10,121
Reinforce new column capital for Type 2 Repair	***ea***	***/ea***	
Reinforce new column capital for Type 3 Repair	***ea***	***/ea***	
Reinforce new column capital for Type 4 Repair	2.00 ea	415.50 /ea	831
Reinforce new column capital for Type 5 Repair	***ea***	***/ea***	
Reinforce new column capital for Type 1 Repair	16.00 ea	562.25 /ea	8,996
Reinforce new column capital for Type 2 Repair	17.00 ea	406.50 /ea	6,911
Reinforce new column capital for Type 3 Repair	***ea***	***/ea***	
Reinforce new column capital for Type 4 Repair	2.00 ea	415.50 /ea	831
Reinforce new column capital for Type 5 Repair	1.00 ea	415.50 /ea	416
Reinforce new column capital for Type 1 Repair	12.00 ea	562.25 /ea	6,747
Reinforce new column capital for Type 2 Repair	***ea***	***/ea***	
Reinforce new column capital for Type 3 Repair	8.00 ea	566.75 /ea	4,534

Spreadsheet Level	Takeoff Quantity	Total Cost/Unit	Total Amount
03.36.00 Miscellaneous Concrete Items			
Reinforce new column capital for Type 4 Repair	2.00 ea	325.50 /ea	651
Reinforce new column capital for Type 5 Repair	***ea***	***/ea***	
Reinforce new column capital for Type 1 Repair	14.00 ea	562.25 /ea	7,872
Reinforce new column capital for Type 2 Repair	15.00 ea	406.50 /ea	6,098
Reinforce new column capital for Type 3 Repair	***ea***	***/ea***	
Reinforce new column capital for Type 4 Repair	***ea***	***/ea***	
Reinforce new column capital for Type 5 Repair	1.00 ea	415.50 /ea	416
Reinforce new column capital for Type 1 Repair	19.00 ea	562.25 /ea	10,683
Reinforce new column capital for Type 2 Repair	***ea***	***/ea***	
Reinforce new column capital for Type 3 Repair	8.00 ea	566.75 /ea	4,534
Reinforce new column capital for Type 4 Repair	2.00 ea	415.50 /ea	831
Reinforce new column capital for Type 5 Repair	***ea***	***/ea***	
Reinforce new column capital for Type 1 Repair	15.00 ea	562.25 /ea	8,434
Reinforce new column capital for Type 2 Repair	14.00 ea	406.50 /ea	5,691
Reinforce new column capital for Type 3 Repair	***ea***	***/ea***	
Reinforce new column capital for Type 4 Repair	***ea***	***/ea***	
Reinforce new column capital for Type 5 Repair	3.00 ea	415.50 /ea	1,247
Reinforce new column capital for Type 1 Repair	19.00 ea	562.25 /ea	10,683
Reinforce new column capital for Type 2 Repair	***ea***	***/ea***	
Reinforce new column capital for Type 3 Repair	8.00 ea	566.75 /ea	4,534
Reinforce new column capital for Type 4 Repair	2.00 ea	415.50 /ea	831
Reinforce new column capital for Type 5 Repair	***ea***	***/ea***	
Reinforce new column capital for Type 1 Repair	12.00 ea	562.25 /ea	6,747
Reinforce new column capital for Type 2 Repair	16.00 ea	406.50 /ea	6,504
Reinforce new column capital for Type 3 Repair	***ea***	***/ea***	
Reinforce new column capital for Type 4 Repair	***ea***	***/ea***	
Reinforce new column capital for Type 5 Repair	2.00 ea	415.50 /ea	831
Reinforce new column capital for Type 1 Repair	28.00 ea	562.25 /ea	15,743
Reinforce new column capital for Type 2 Repair	***ea***	***/ea***	
Reinforce new column capital for Type 3 Repair	7.00 ea	566.75 /ea	3,967
Reinforce new column capital for Type 4 Repair	2.00 ea	415.50 /ea	831
Reinforce new column capital for Type 5 Repair	***ea***	***/ea***	
Reinforce new column capital for Type 1 Repair	15.00 ea	562.25 /ea	8,434
Reinforce new column capital for Type 2 Repair	13.00 ea	406.50 /ea	5,285
Reinforce new column capital for Type 3 Repair	***ea***	***/ea***	
Reinforce new column capital for Type 4 Repair	***ea***	***/ea***	
Reinforce new column capital for Type 5 Repair	2.00 ea	415.50 /ea	831
Reinforce new column capital for Type 1 Repair	20.00 ea	562.25 /ea	11,245
Reinforce new column capital for Type 2 Repair	***ea***	***/ea***	
Reinforce new column capital for Type 3 Repair	8.00 ea	566.75 /ea	4,534
Reinforce new column capital for Type 4 Repair	2.00 ea	415.50 /ea	831
Reinforce new column capital for Type 5 Repair	***ea***	***/ea***	
Reinforce new column capital for Type 1 Repair	15.00 ea	562.25 /ea	8,434
Reinforce new column capital for Type 2 Repair	16.00 ea	406.50 /ea	6,504
Reinforce new column capital for Type 3 Repair	***ea***	***/ea***	
Reinforce new column capital for Type 4 Repair	***ea***	***/ea***	
Reinforce new column capital for Type 5 Repair	2.00 ea	415.50 /ea	831
Reinforce new column capital for Type 1 Repair	41.00 ea	562.25 /ea	23,052
Reinforce new column capital for Type 2 Repair	16.00 ea	406.50 /ea	6,504

Spreadsheet Level	Takeoff Quantity	Total Cost/Unit	Total Amount
03.36.00 Miscellaneous Concrete Items			
Reinforce new column capital for Type 3 Repair	***ea***	***/ea***	
Reinforce new column capital for Type 4 Repair	2.00 ea	415.50 /ea	831
Reinforce new column capital for Type 5 Repair	2.00 ea	415.50 /ea	831
Reinforce new column capital for Type 1 Repair	32.00 ea	562.25 /ea	17,992
Reinforce new column capital for Type 2 Repair	19.00 ea	406.50 /ea	7,724
Reinforce new column capital for Type 3 Repair	11.00 ea	566.75 /ea	6,234
Reinforce new column capital for Type 4 Repair	2.00 ea	415.50 /ea	831
Reinforce new column capital for Type 5 Repair	2.00 ea	415.50 /ea	831
Reinforce new column capital for Type 1 Repair	1.00 ea	562.25 /ea	562
Reinforce new column capital for Type 2 Repair	18.00 ea	406.50 /ea	7,317
Reinforce new column capital for Type 3 Repair	***ea***	***/ea***	
Reinforce new column capital for Type 4 Repair	***ea***	***/ea***	
Reinforce new column capital for Type 5 Repair	***ea***	***/ea***	
Form Column Capital - Type 1 Repair	18.00 ea	1,210.00 /ea	21,780
Form Column Capital - Type 2 Repair	***ea***	***/ea***	
Form Column Capital - Type 3 Repair	***ea***	***/ea***	
Form Column Capital - Type 4 Repair	2.00 ea	1,210.00 /ea	2,420
Form Column Capital - Type 5 Repair	***ea***	***/ea***	
Form Column Capital - Type 1 Repair	16.00 ea	1,210.00 /ea	19,360
Form Column Capital - Type 2 Repair	17.00 ea	1,210.00 /ea	20,570
Form Column Capital - Type 3 Repair	***ea***	***/ea***	
Form Column Capital - Type 4 Repair	2.00 ea	1,210.00 /ea	2,420
Form Column Capital - Type 5 Repair	1.00 ea	1,210.00 /ea	1,210
Form Column Capital - Type 1 Repair	12.00 ea	1,210.00 /ea	14,520
Form Column Capital - Type 2 Repair	***ea***	***/ea***	
Form Column Capital - Type 3 Repair	8.00 ea	1,210.00 /ea	9,680
Form Column Capital - Type 4 Repair	2.00 ea	1,210.00 /ea	2,420
Form Column Capital - Type 5 Repair	***ea***	***/ea***	
Form Column Capital - Type 1 Repair	14.00 ea	1,210.00 /ea	16,940
Form Column Capital - Type 2 Repair	15.00 ea	1,210.00 /ea	18,150
Form Column Capital - Type 3 Repair	***ea***	***/ea***	
Form Column Capital - Type 4 Repair	***ea***	***/ea***	
Form Column Capital - Type 5 Repair	1.00 ea	1,210.00 /ea	1,210
Form Column Capital - Type 1 Repair	19.00 ea	1,210.00 /ea	22,990
Form Column Capital - Type 2 Repair	***ea***	***/ea***	
Form Column Capital - Type 3 Repair	8.00 ea	1,210.00 /ea	9,680
Form Column Capital - Type 4 Repair	2.00 ea	1,210.00 /ea	2,420
Form Column Capital - Type 5 Repair	***ea***	***/ea***	
Form Column Capital - Type 1 Repair	15.00 ea	1,210.00 /ea	18,150
Form Column Capital - Type 2 Repair	14.00 ea	1,210.00 /ea	16,940
Form Column Capital - Type 3 Repair	***ea***	***/ea***	
Form Column Capital - Type 4 Repair	***ea***	***/ea***	
Form Column Capital - Type 5 Repair	3.00 ea	1,210.00 /ea	3,630
Form Column Capital - Type 1 Repair	19.00 ea	1,210.00 /ea	22,990
Form Column Capital - Type 2 Repair	***ea***	***/ea***	
Form Column Capital - Type 3 Repair	8.00 ea	1,210.00 /ea	9,680
Form Column Capital - Type 4 Repair	2.00 ea	1,210.00 /ea	2,420
Form Column Capital - Type 5 Repair	***ea***	***/ea***	
Form Column Capital - Type 1 Repair	12.00 ea	1,210.00 /ea	14,520

Spreadsheet Level	Takeoff Quantity	Total Cost/Unit	Total Amount
03.36.00 Miscellaneous Concrete Items			
Form Column Capital - Type 2 Repair	16.00 ea	1,210.00 /ea	19,360
Form Column Capital - Type 3 Repair	***ea***	***/ea***	
Form Column Capital - Type 4 Repair	***ea***	***/ea***	
Form Column Capital - Type 5 Repair	2.00 ea	1,210.00 /ea	2,420
Form Column Capital - Type 1 Repair	28.00 ea	1,210.00 /ea	33,880
Form Column Capital - Type 2 Repair	***ea***	***/ea***	
Form Column Capital - Type 3 Repair	7.00 ea	1,210.00 /ea	8,470
Form Column Capital - Type 4 Repair	2.00 ea	1,210.00 /ea	2,420
Form Column Capital - Type 5 Repair	***ea***	***/ea***	
Form Column Capital - Type 1 Repair	15.00 ea	1,210.00 /ea	18,150
Form Column Capital - Type 2 Repair	13.00 ea	1,210.00 /ea	15,730
Form Column Capital - Type 3 Repair	***ea***	***/ea***	
Form Column Capital - Type 4 Repair	***ea***	***/ea***	
Form Column Capital - Type 5 Repair	2.00 ea	1,210.00 /ea	2,420
Form Column Capital - Type 1 Repair	20.00 ea	1,210.00 /ea	24,200
Form Column Capital - Type 2 Repair	***ea***	***/ea***	
Form Column Capital - Type 3 Repair	8.00 ea	1,210.00 /ea	9,680
Form Column Capital - Type 4 Repair	2.00 ea	1,210.00 /ea	2,420
Form Column Capital - Type 5 Repair	***ea***	***/ea***	
Form Column Capital - Type 1 Repair	15.00 ea	1,210.00 /ea	18,150
Form Column Capital - Type 2 Repair	16.00 ea	1,210.00 /ea	19,360
Form Column Capital - Type 3 Repair	***ea***	***/ea***	
Form Column Capital - Type 4 Repair	***ea***	***/ea***	
Form Column Capital - Type 5 Repair	2.00 ea	1,210.00 /ea	2,420
Form Column Capital - Type 1 Repair	41.00 ea	1,210.00 /ea	49,610
Form Column Capital - Type 2 Repair	16.00 ea	1,210.00 /ea	19,360
Form Column Capital - Type 3 Repair	***ea***	***/ea***	
Form Column Capital - Type 4 Repair	2.00 ea	1,210.00 /ea	2,420
Form Column Capital - Type 5 Repair	2.00 ea	1,210.00 /ea	2,420
Form Column Capital - Type 1 Repair	32.00 ea	1,210.00 /ea	38,720
Form Column Capital - Type 2 Repair	19.00 ea	1,210.00 /ea	22,990
Form Column Capital - Type 3 Repair	11.00 ea	1,210.00 /ea	13,310
Form Column Capital - Type 4 Repair	2.00 ea	1,210.00 /ea	2,420
Form Column Capital - Type 5 Repair	2.00 ea	1,210.00 /ea	2,420
Form Column Capital - Type 1 Repair	1.00 ea	1,210.00 /ea	1,210
Form Column Capital - Type 2 Repair	18.00 ea	1,210.00 /ea	21,780
Form Column Capital - Type 3 Repair	***ea***	***/ea***	
Form Column Capital - Type 4 Repair	***ea***	***/ea***	
Form Column Capital - Type 5 Repair	***ea***	***/ea***	
Pressure Inject column capitals Type 1 Repair - Labor - 6.68 cf ea = 15.5 bags ea	18.00 ea	108.50 /ea	1,953
Pressure Inject column capitals Type 2 Repair - Labor - 3.39 cf ea = 8 bags ea	***ea***	***/ea***	
Pressure Inject column capitals Type 3 Repair - Labor 5.79 cf ea = 13.5 bags ea	***ea***	***/ea***	
Pressure Inject column capitals Type 4 Repair - Labor - 10 bags ea	2.00 ea	108.50 /ea	217
Pressure Inject column capitals Type 5 Repair - Labor - 10 bags ea	***ea***	***/ea***	
Pressure Inject column capitals - Materials - all repairs Level 1 SikaQuick VOH	328.90 bag	30.00 /bag	9,867

Spreadsheet Level	Takeoff Quantity	Total Cost/Unit	Total Amount
03.36.00 Miscellaneous Concrete Items			
Pressure Inject column capitals Type 1 Repair - Labor	16.00 ea	108.50 /ea	1,736
Pressure Inject column capitals Type 2 Repair - Labor	17.00 ea	108.50 /ea	1,845
Pressure Inject column capitals Type 3 Repair - Labor	***ea***	***/ea***	
Pressure Inject column capitals Type 4 Repair - Labor	2.00 ea	108.50 /ea	217
Pressure Inject column capitals Type 5 Repair - Labor	1.00 ea	108.50 /ea	109
Pressure Inject column capitals - Materials - all repairs Level 1.5 SikaQuick VOH	455.40 bag	30.00 /bag	13,662
Pressure Inject column capitals Type 1 Repair - Labor	12.00 ea	108.50 /ea	1,302
Pressure Inject column capitals Type 2 Repair - Labor	***ea***	***/ea***	
Pressure Inject column capitals Type 3 Repair - Labor	8.00 ea	108.50 /ea	868
Pressure Inject column capitals Type 4 Repair - Labor	2.00 ea	108.50 /ea	217
Pressure Inject column capitals Type 5 Repair - Labor	***ea***	***/ea***	
Pressure Inject column capitals - Materials - all repairs Level 2 SikaQuick VOH	345.40 bag	30.00 /bag	10,362
Pressure Inject column capitals Type 1 Repair - Labor	14.00 ea	108.50 /ea	1,519
Pressure Inject column capitals Type 2 Repair - Labor	15.00 ea	108.50 /ea	1,628
Pressure Inject column capitals Type 3 Repair - Labor	***ea***	***/ea***	
Pressure Inject column capitals Type 4 Repair - Labor	***ea***	***/ea***	
Pressure Inject column capitals Type 5 Repair - Labor	1.00 ea	108.50 /ea	109
Pressure Inject column capitals - Materials - all repairs Level 2.5 SikaQuick VOH	381.70 bag	30.00 /bag	11,451
Pressure Inject column capitals Type 1 Repair - Labor	19.00 ea	108.50 /ea	2,062
Pressure Inject column capitals Type 2 Repair - Labor	***ea***	***/ea***	
Pressure Inject column capitals Type 3 Repair - Labor	8.00 ea	108.50 /ea	868
Pressure Inject column capitals Type 4 Repair - Labor	2.00 ea	108.50 /ea	217
Pressure Inject column capitals Type 5 Repair - Labor	***ea***	***/ea***	
Pressure Inject column capitals - Materials - all repairs Level 3 SikaQuick VOH	464.75 bag	30.00 /bag	13,943
Pressure Inject column capitals Type 1 Repair - Labor	15.00 ea	108.50 /ea	1,628
Pressure Inject column capitals Type 2 Repair - Labor	14.00 ea	108.50 /ea	1,519
Pressure Inject column capitals Type 3 Repair - Labor	***ea***	***/ea***	
Pressure Inject column capitals Type 4 Repair - Labor	***ea***	***/ea***	
Pressure Inject column capitals Type 5 Repair - Labor	3.00 ea	108.50 /ea	326
Pressure Inject column capitals - Materials - all repairs Level 3.5 SikaQuick VOH	412.50 bag	30.00 /bag	12,375
Pressure Inject column capitals Type 1 Repair - Labor	19.00 ea	108.50 /ea	2,062
Pressure Inject column capitals Type 2 Repair - Labor	***ea***	***/ea***	
Pressure Inject column capitals Type 3 Repair - Labor	8.00 ea	108.50 /ea	868
Pressure Inject column capitals Type 4 Repair - Labor	2.00 ea	108.50 /ea	217
Pressure Inject column capitals Type 5 Repair - Labor	***ea***	***/ea***	
Pressure Inject column capitals - Materials - all repairs Level 4 SikaQuick VOH	465.30 bag	30.00 /bag	13,959
Pressure Inject column capitals Type 1 Repair - Labor	12.00 ea	108.50 /ea	1,302
Pressure Inject column capitals Type 2 Repair - Labor	16.00 ea	108.50 /ea	1,736
Pressure Inject column capitals Type 3 Repair - Labor	***ea***	***/ea***	
Pressure Inject column capitals Type 4 Repair - Labor	***ea***	***/ea***	
Pressure Inject column capitals Type 5 Repair - Labor	2.00 ea	108.50 /ea	217
Pressure Inject column capitals - Materials - all repairs Level 4.5 SikaQuick VOH	367.40 bag	30.00 /bag	11,022
Pressure Inject column capitals Type 1 Repair - Labor	28.00 ea	108.50 /ea	3,038
Pressure Inject column capitals Type 2 Repair - Labor	7.00 ea	108.50 /ea	760
Pressure Inject column capitals Type 3 Repair - Labor	***ea***	***/ea***	
Pressure Inject column capitals Type 4 Repair - Labor	***ea***	***/ea***	

Spreadsheet Level	Takeoff Quantity	Total Cost/Unit	Total Amount
03.36.00 Miscellaneous Concrete Items			
Pressure Inject column capitals Type 5 Repair - Labor	2.00 ea	108.50 /ea	217
Pressure Inject column capitals - Materials - all repairs Level 5 SikaQuick VOH	561.00 bag	30.00 /bag	16,830
Pressure Inject column capitals Type 1 Repair - Labor	15.00 sf	1.09 /sf	16
Pressure Inject column capitals Type 2 Repair - Labor	13.00 sf	1.09 /sf	14
Pressure Inject column capitals Type 3 Repair - Labor	***sf***	***/sf***	
Pressure Inject column capitals Type 4 Repair - Labor	***sf***	***/sf***	
Pressure Inject column capitals Type 5 Repair - Labor	2.00 sf	1.09 /sf	2
Pressure Inject column capitals - Materials - all repairs Level 5.5 SikaQuick VOH	392.70 bag	30.00 /bag	11,781
Pressure Inject column capitals Type 1 Repair - Labor	20.00 ea	108.50 /ea	2,170
Pressure Inject column capitals Type 2 Repair - Labor	***ea***	***/ea***	
Pressure Inject column capitals Type 3 Repair - Labor	8.00 ea	108.50 /ea	868
Pressure Inject column capitals Type 4 Repair - Labor	2.00 ea	108.50 /ea	217
Pressure Inject column capitals Type 5Repair - Labor	***ea***	***/ea***	
Pressure Inject column capitals - Materials - all repairs Level 6 SikaQuick VOH	481.80 bag	30.00 /bag	14,454
Pressure Inject column capitals Type 1 Repair - Labor	15.00 ea	108.50 /ea	1,628
Pressure Inject column capitals Type 2 Repair - Labor	16.00 ea	108.50 /ea	1,736
Pressure Inject column capitals Type 3 Repair - Labor	***ea***	***/ea***	
Pressure Inject column capitals Type 4 Repair - Labor	***ea***	***/ea***	
Pressure Inject column capitals Type 5 Repair - Labor	2.00 ea	108.50 /ea	217
Pressure Inject column capitals - Materials - all repairs Level 6.5 SikaQuick VOH	419.10 bag	30.00 /bag	12,573
Pressure Inject column capitals Type 1 Repair - Labor	41.00 ea	108.50 /ea	4,449
Pressure Inject column capitals Type 2 Repair - Labor	16.00 ea	108.50 /ea	1,736
Pressure Inject column capitals Type 3 Repair - Labor	***ea***	***/ea***	
Pressure Inject column capitals Type 4 Repair - Labor	2.00 ea	108.50 /ea	217
Pressure Inject column capitals Type 5 Repair - Labor	2.00 ea	108.50 /ea	217
Pressure Inject column capitals - Materials - all repairs Level 7 SikaQuick VOH	884.40 bag	30.00 /bag	26,532
Pressure Inject column capitals Type 1 Repair - Labor	32.00 sf	1.09 /sf	35
Pressure Inject column capitals Type 2 Repair - Labor	19.00 sf	1.09 /sf	21
Pressure Inject column capitals Type 3 Repair - Labor	11.00 sf	1.09 /sf	12
Pressure Inject column capitals Type 4 Repair - Labor	2.00 sf	1.09 /sf	2
Pressure Inject column capitals Type 5 Repair - Labor	2.00 sf	1.09 /sf	2
Pressure Inject column capitals - Materials - all repairs Level 8 (roof 1) SikaQuick VOH	920.70 bag	30.00 /bag	27,621
Pressure Inject column capitals Type 1 Repair - Labor	1.00 ea	108.50 /ea	109
Pressure Inject column capitals Type 2 Repair - Labor	18.00 ea	108.50 /ea	1,953
Pressure Inject column capitals Type 3 Repair - Labor	***ea***	***/ea***	
Pressure Inject column capitals Type 4vRepair - Labor	***ea***	***/ea***	
Pressure Inject column capitals Type 5 Repair - Labor	***ea***	***/ea***	
Pressure Inject column capitals - Materials - all repairs Level 9 (roof 2) SikaQuick VOH	176.00 bag	109.60 /bag	19,290
Strip & Patch Type 1 repair - Labor	18.00 ea	53.60 /ea	965
Strip & Patch Type 2 repair - Labor	***ea***	***/ea***	
Strip & Patch Type 3 repair - Labor	***ea***	***/ea***	
Strip & Patch Type 4 repair - Labor	2.00 ea	53.60 /ea	107
Strip & Patch Type 5 repair - Labor	***ea***	***/ea***	
Patch Materials - all repairs Level 1	20.00 ea	1.10 /ea	22
Strip & Patch Type 1 repair - Labor	16.00 ea	53.60 /ea	858
Strip & Patch Type 2 repair - Labor	17.00 ea	53.60 /ea	911

Spreadsheet Level	Takeoff Quantity	Total Cost/Unit	Total Amount
03.36.00 Miscellaneous Concrete Items			
Strip & Patch Type 3 repair - Labor	***ea***	***/ea***	
Strip & Patch Type 4 repair - Labor	2.00 ea	53.60 /ea	107
Strip & Patch Type 5 repair - Labor	1.00 ea	53.60 /ea	54
Patch Materials - all repairs Level 1.5	***ea***	***/ea***	
Strip & Patch Type 1 repair - Labor	12.00 ea	53.60 /ea	643
Strip & Patch Type 2 repair - Labor	***ea***	***/ea***	
Strip & Patch Type 3 repair - Labor	8.00 ea	53.60 /ea	429
Strip & Patch Type 4 repair - Labor	2.00 ea	53.60 /ea	107
Strip & Patch Type 5 repair - Labor	***ea***	***/ea***	
Patch Materials - all repairs Level 2	***ea***	***/ea***	
Strip & Patch Type 1 repair - Labor	14.00 ea	53.60 /ea	750
Strip & Patch Type 2 repair - Labor	15.00 ea	53.60 /ea	804
Strip & Patch Type 3 repair - Labor	***ea***	***/ea***	
Strip & Patch Type 4 repair - Labor	***ea***	***/ea***	
Strip & Patch Type 5 repair - Labor	1.00 ea	53.60 /ea	54
Patch Materials - all repairs Level 2.5	***ea***	***/ea***	
Strip & Patch Type 1 repair - Labor	19.00 ea	53.60 /ea	1,018
Strip & Patch Type 2 repair - Labor	***ea***	***/ea***	
Strip & Patch Type 3 repair - Labor	8.00 ea	53.60 /ea	429
Strip & Patch Type 4 repair - Labor	2.00 ea	53.60 /ea	107
Strip & Patch Type 5 repair - Labor	***ea***	***/ea***	
Patch Materials - all repairs Level 3	***ea***	***/ea***	
Strip & Patch Type 1 repair - Labor	15.00 ea	53.60 /ea	804
Strip & Patch Type 2 repair - Labor	14.00 ea	53.60 /ea	750
Strip & Patch Type 3 repair - Labor	***ea***	***/ea***	
Strip & Patch Type 4 repair - Labor	***ea***	***/ea***	
Strip & Patch Type 5 repair - Labor	3.00 ea	53.60 /ea	161
Patch Materials - all repairs Level 3.5	***ea***	***/ea***	
Strip & Patch Type 1 repair - Labor	19.00 ea	53.60 /ea	1,018
Strip & Patch Type 2 repair - Labor	***ea***	***/ea***	
Strip & Patch Type 3 repair - Labor	8.00 ea	53.60 /ea	429
Strip & Patch Type 4 repair - Labor	2.00 ea	53.60 /ea	107
Strip & Patch Type 5 repair - Labor	***ea***	***/ea***	
Patch Materials - all repairs Level 4	***ea***	***/ea***	
Strip & Patch Type 1 repair - Labor	12.00 ea	53.60 /ea	643
Strip & Patch Type 2 repair - Labor	16.00 ea	53.60 /ea	858
Strip & Patch Type 3 repair - Labor	***ea***	***/ea***	
Strip & Patch Type 4 repair - Labor	***ea***	***/ea***	
Strip & Patch Type 5 repair - Labor	2.00 ea	53.60 /ea	107
Patch Materials - all repairs Level 4.5	***ea***	***/ea***	
Strip & Patch Type 1 repair - Labor	28.00 ea	53.60 /ea	1,501
Strip & Patch Type 2 repair - Labor	7.00 ea	53.60 /ea	375
Strip & Patch Type 3 repair - Labor	***ea***	***/ea***	
Strip & Patch Type 4 repair - Labor	***ea***	***/ea***	
Strip & Patch Type 5 repair - Labor	2.00 ea	53.60 /ea	107
Patch Materials - all repairs Level 5	***ea***	***/ea***	
Strip & Patch Type 1 repair - Labor	15.00 sf	1.63 /sf	24
Strip & Patch Type 2 repair - Labor	13.00 sf	1.63 /sf	21

Spreadsheet Level	Takeoff Quantity	Total Cost/Unit	Total Amount
03.36.00 Miscellaneous Concrete Items			
Strip & Patch Type 3 repair - Labor	***sf***	***/sf***	
Strip & Patch Type 4 repair - Labor	***sf***	***/sf***	
Strip & Patch Type 5 repair - Labor	2.00 sf	1.63 /sf	3
Patch Materials - all repairs Level 5.5	***sf***	***/sf***	
Strip & Patch Type 1 repair - Labor	20.00 ea	53.60 /ea	1,072
Strip & Patch Type 2 repair - Labor	***ea***	***/ea***	
Strip & Patch Type 3 repair - Labor	8.00 ea	53.60 /ea	429
Strip & Patch Type 4 repair - Labor	2.00 ea	53.60 /ea	107
Strip & Patch Type 5 repair - Labor	***ea***	***/ea***	
Patch Materials - all repairs Level 6	***ea***	***/ea***	
Strip & Patch Type 1 repair - Labor	15.00 ea	53.60 /ea	804
Strip & Patch Type 2 repair - Labor	16.00 ea	53.60 /ea	858
Strip & Patch Type 3 repair - Labor	***ea***	***/ea***	
Strip & Patch Type 4 repair - Labor	***ea***	***/ea***	
Strip & Patch Type 5 repair - Labor	2.00 ea	53.60 /ea	107
Patch Materials - all repairs Level 6.5	***ea***	***/ea***	
Strip & Patch Type 1 repair - Labor	41.00 ea	53.60 /ea	2,198
Strip & Patch Type 2 repair - Labor	16.00 ea	53.60 /ea	858
Strip & Patch Type 3 repair - Labor	***ea***	***/ea***	
Strip & Patch Type 4 repair - Labor	2.00 ea	53.60 /ea	107
Strip & Patch Type 5 repair - Labor	2.00 ea	53.60 /ea	107
Patch Materials - all repairs Level 7	***ea***	***/ea***	
Strip & Patch Type 1 repair - Labor	32.00 ea	1.63 /ea	52
Strip & Patch Type 2 repair - Labor	19.00 ea	1.63 /ea	31
Strip & Patch Type 3 repair - Labor	11.00 ea	1.63 /ea	18
Strip & Patch Type 4 repair - Labor	2.00 ea	1.63 /ea	3
Strip & Patch Type 5 repair - Labor	2.00 ea	1.63 /ea	3
Patch Materials - all repairs Level 8 (roof 1)	***ea***	***/ea***	
Strip & Patch Type 1 repair - Labor	1.00 ea	53.60 /ea	54
Strip & Patch Type 2 repair - Labor	18.00 ea	53.60 /ea	965
Strip & Patch Type 3 repair - Labor	***ea***	***/ea***	
Strip & Patch Type 4 repair - Labor	***ea***	***/ea***	
Strip & Patch Type 5 repair - Labor	***ea***	***/ea***	
Patch Materials - all repairs Level 9 (roof 2)	***ea***	***/ea***	
GCs, GRs, and markups for concrete repair work	1.00 ls	421,798.00 /ls	421,798
Miscellaneous Concrete Items	**104,280.00 sf**	**21.03 /sf**	**2,192,454**
03-30 CONCRETE	**104,280.00 sf**	**21.03 /sf**	**2,192,454**
03 CONCRETE REPAIRS	**104,280.00 sf**	**28.40 /sf**	**2,961,804**

04 ROOF REPLACEMENT

02-20 DEMOLITION

02.41.01 Demolition - General

Dumpsters - for demolition	24.00 ea	950.00 /ea	22,800

Spreadsheet Level	Takeoff Quantity	Total Cost/Unit	Total Amount
Demolition - General	**104,280.00 sf**	**0.22 /sf**	**22,800**
02.41.34 Demolition - Roofing / Siding			
Demo membrane roofing, high roof	8,878.00 sf	12.00 /sf	106,536
Demo membrane roofing, low roof	4,144.00 sf	12.00 /sf	49,728
Demo standing seam metal roofing panels	215.00 sf	10.00 /sf	2,150
Demo copings, high roof	500.00 lf	15.00 /lf	7,500
Demo copings, low roof	800.00 lf	15.00 /lf	12,000
Demo roof accessories, allowance	1.00 allw	25,000.00 /allw	25,000
Demolition - Roofing / Siding	**104,280.00 sf**	**1.95 /sf**	**202,914**
02.41.37 Demolition - Doors / Windows			
Demo glazed skylights	1.00 ea	1,500.00 /ea	1,500
Demolition - Doors / Windows	**104,280.00 sf**	**0.01 /sf**	**1,500**
02-20 DEMOLITION	**104,280.00 sf**	**2.18 /sf**	**227,214**
05-50 MISCELLANEOUS METALS			
05.52.00 Metal Railings			
Railing - ptd. galv. steel pipe - 3 rail - exterior, safety rail, high roof	114.00 lf	250.00 /lf	28,500
New railing, low roof	160.00 lf	450.00 /lf	72,000
Lifeline fall restraint system, low roof	285.00 lf	150.00 /lf	42,750
Metal Railings	**104,280.00 sf**	**1.37 /sf**	**143,250**
05-50 MISCELLANEOUS METALS	**104,280.00 sf**	**1.37 /sf**	**143,250**
06-10 ROUGH CARPENTRY			
06.10.00 Rough Carpentry			
Roof blocking (4x 2x12), parapet coping, high roof	500.00 lf	60.00 /lf	30,000
Roof blocking (4x 2x12), parapet coping, low roof	1,108.00 lf	60.00 /lf	66,480
Roof blocking - cant, high roof	97.00 lf	14.00 /lf	1,358
Roof blocking - cant, low roof	534.00 lf	14.00 /lf	7,476
Rough Carpentry	**104,280.00 sf**	**1.01 /sf**	**105,314**
06-10 ROUGH CARPENTRY	**104,280.00 sf**	**1.01 /sf**	**105,314**
07-41 METAL ROOFING			
07.41.00 Roof Panels			
Standing seam batten roofing - copper	215.00 sf	85.00 /sf	18,275
Roof Panels	**104,280.00 sf**	**0.18 /sf**	**18,275**
07-41 METAL ROOFING	**104,280.00 sf**	**0.18 /sf**	**18,275**

Spreadsheet Level	Takeoff Quantity	Total Cost/Unit	Total Amount
07-50 MEMBRANE ROOFING			
07.50.00 Membrane Roofing			
Membrane roofing - PVC, includes tapered insulation, high roof	8,878.00 sf	45.00 /sf	399,510
Membrane roofing - cold-applied fluid, includes tapered insulation, low roof	4,144.00 sf	75.00 /sf	310,800
Membrane roofing - vertical (parapet/elevator/penthouse)	3,216.00 sf	40.00 /sf	128,640
Tapered insulation (above average) - premium, high roof	8,878.00 sf	10.00 /sf	88,780
Tapered insulation (above average) - premium, low roof	4,144.00 sf	10.00 /sf	41,440
Membrane Roofing	**104,280.00 sf**	**9.29 /sf**	**969,170**
07.60.00 Flashing & Sheet Metal			
Roof drain flashing - aluminum	7.00 ea	250.00 /ea	1,750
Parapet coping - aluminum, high roof	500.00 lf	45.00 /lf	22,500
Parapet coping - aluminum, low roof	1,108.00 lf	45.00 /lf	49,860
Roof to wall flashing, high roof	97.00 lf	20.00 /lf	1,940
Roof to wall flashing, low roof	534.00 lf	20.00 /lf	10,680
Roof penetration flashing	25.00 ea	150.00 /ea	3,750
Roof curb flashing, allowance	1.00 allw	5,000.00 /allw	5,000
4" curb transition between tapered insulation layouts	12.00 lf	40.00 /lf	480
Flashing & Sheet Metal	**104,280.00 sf**	**0.92 /sf**	**95,960**
07.71.00 Roof Specialties			
Scuppers, new overflow	6.00 ea	650.00 /ea	3,900
EFVM leak detection system	13,022.00 sf	5.00 /sf	65,110
Roof Specialties	**104,280.00 sf**	**0.66 /sf**	**69,010**
07.72.00 Roof Accessories			
PV membrane slip sheet, high roof	1,444.00 sf	20.00 /sf	28,880
Remove & reinstall roof hatch (5' x 3')	1.00 ea	3,500.00 /ea	3,500
Roof walkway pads, high roof, 322 lf	644.00 sf	15.00 /sf	9,660
Roof walkway pads, low roof, 173 lf	346.00 sf	15.00 /sf	5,190
Roof Accessories	**104,280.00 sf**	**0.45 /sf**	**47,230**
07-50 MEMBRANE ROOFING	**104,280.00 sf**	**11.33 /sf**	**1,181,370**
08-62 SKYLIGHTS			
08.63.00 Metal-Framed Skylights			
Replace 3'x3' skylight	9.00 sf	250.00 /sf	2,250
Metal-Framed Skylights	**104,280.00 sf**	**0.02 /sf**	**2,250**
08-62 SKYLIGHTS	**104,280.00 sf**	**0.02 /sf**	**2,250**
09-21 DRYWALL			
09.21.16 Gypsum Board Assemblies - Ceilings & Soffits			
Framing of exterior soffits/risers for roof drains	2,000.00 sf	20.00 /sf	40,000

Spreadsheet Level	Takeoff Quantity	Total Cost/Unit	Total Amount
Gypsum Board Assemblies - Ceilings & Soffits	**104,280.00 sf**	**0.38 /sf**	**40,000**
09-21 DRYWALL	**104,280.00 sf**	**0.38 /sf**	**40,000**
11-24 WINDOW WASHING EQUIPMENT			
11.24.00 Maintenance Equipment			
Tie-off anchors, low roof	14.00 ea	2,500.00 /ea	35,000
Tie-off anchors, high roof	36.00 ea	2,500.00 /ea	90,000
Maintenance Equipment	**104,280.00 sf**	**1.20 /sf**	**125,000**
11-24 WINDOW WASHING EQUIPMENT	**104,280.00 sf**	**1.20 /sf**	**125,000**
23-01 HVAC			
23.00.01 HVAC			
Relocate hvac equipment for roof install	240.00 mh	125.00 /mh	30,000
HVAC	**104,280.00 sf**	**0.29 /sf**	**30,000**
23-01 HVAC	**104,280.00 sf**	**0.29 /sf**	**30,000**
26-01 ELECTRICAL			
26.00.01 Electrical			
Relocate electrical for roof install	120.00 mh	125.00 /mh	15,000
Relocation coordination for telecom for roof install	60.00 mh	125.00 /mh	7,500
Electrical	**104,280.00 sf**	**0.22 /sf**	**22,500**
26-01 ELECTRICAL	**104,280.00 sf**	**0.22 /sf**	**22,500**
32-10 LANDSCAPING & SITE IMPROVEMENTS			
32.14.00 Unit Paving			
Porcelain roof deck pavers	612.00 sf	65.00 /sf	39,780
Unit Paving	**104,280.00 sf**	**0.38 /sf**	**39,780**
32.93.00 Plants			
Sedum trays	732.00 sf	35.00 /sf	25,620
Restoration of plantings/shrubs, allowance	1.00 allw	50,000.00 /allw	50,000
Plants	**104,280.00 sf**	**0.73 /sf**	**75,620**
32-10 LANDSCAPING & SITE IMPROVEMENTS	**104,280.00 sf**	**1.11 /sf**	**115,400**
04 ROOF REPLACEMENT	**104,280.00 sf**	**19.28 /sf**	**2,010,573**

Spreadsheet Level	Takeoff Quantity	Total Cost/Unit	Total Amount
05 WINDOW & DOOR REPLACEMENT			
02-20 DEMOLITION			
02.41.37 Demolition - Doors / Windows			
Demo windows - aluminum (ea), abatement of entire window	331.00 ea	900.00 /ea	297,900
Window protection	19,297.00 sf	7.50 /sf	144,728
Demolition - Doors / Windows	**104,280.00 sf**	**4.25 /sf**	**442,628**
02-20 DEMOLITION	**104,280.00 sf**	**4.25 /sf**	**442,628**
04-01 MASONRY REPAIR/RESTORATION			
04.01.25 Masonry Restoration - Repairs - Brick			
Replace brick at column repairs	600.00 sf	175.00 /sf	105,000
Replace CMU at column repairs	600.00 sf	75.00 /sf	45,000
Masonry Restoration - Repairs - Brick	**104,280.00 sf**	**1.44 /sf**	**150,000**
04-01 MASONRY REPAIR/RESTORATION	**104,280.00 sf**	**1.44 /sf**	**150,000**
06-10 ROUGH CARPENTRY			
06.10.00 Rough Carpentry			
Window blocking	10,057.00 lf	12.00 /lf	120,684
Rough Carpentry	**104,280.00 sf**	**1.16 /sf**	**120,684**
06-10 ROUGH CARPENTRY	**104,280.00 sf**	**1.16 /sf**	**120,684**
07-10 WATERPROOFING & JOINT SEALANTS			
07.92.00 Joint Sealants			
Caulking - window / glazing, exterior	10,057.00 lf	8.00 /lf	80,456
Caulking - window / glazing, interior	10,057.00 lf	6.00 /lf	60,342
Joint Sealants	**104,280.00 sf**	**1.35 /sf**	**140,798**
07-10 WATERPROOFING & JOINT SEALANTS	**104,280.00 sf**	**1.35 /sf**	**140,798**
08-41 ALUMINUM ENTRANCES& STOREFRONT			
08.00.05 Glass/Glazing General Requirements			
Air/water test	1.00 ea	10,000.00 /ea	10,000
Glass system mockup - in-place	1.00 ea	7,500.00 /ea	7,500
Scaffolding	19,297.00 sf	6.00 /sf	115,782
Glass/Glazing General Requirements	**104,280.00 sf**	**1.28 /sf**	**133,282**
08.44.13 Glazed Aluminum Curtain Walls			
Refurbish fixed sun and rain shield at penthouse , 257 lf, allowance	771.00 sf	15.00 /sf	11,565

Spreadsheet Level	Takeoff Quantity	Total Cost/Unit	Total Amount
Glazed Aluminum Curtain Walls	**104,280.00 sf**	**0.11 /sf**	**11,565**
08-41 ALUMINUM ENTRANCES& STOREFRONT	**104,280.00 sf**	**1.39 /sf**	**144,847**
08-53 UPVC WINDOWS			
08.53.00 uPVC Windows - Triple Glazed			
F&I type 1, fixed window, 1'x3', 2 ea	697.00 sf	150.00 /sf	104,550
F&I type 1A, fixed window	255.00 sf	150.00 /sf	38,250
F&I type 2, sliding door & fixed window	697.00 sf	200.00 /sf	139,400
F&I type 2A, sliding door & fixed window	182.00 sf	200.00 /sf	36,400
F&I type 3, awning, fixed, & panel w/louver	697.00 sf	170.00 /sf	118,490
F&I type 4, fixed window	111.00 sf	150.00 /sf	16,650
F&I type 5, fixed window	2,335.00 sf	150.00 /sf	350,250
F&I type 5A, fixed window	853.00 sf	150.00 /sf	127,950
F&I type 5B, fixed window	462.00 sf	150.00 /sf	69,300
F&I type 5C, fixed window	169.00 sf	150.00 /sf	25,350
F&I type 6, sliding door	2,335.00 sf	200.00 /sf	467,000
F&I type 6A, sliding door	609.00 sf	200.00 /sf	121,800
F&I type 6B, sliding door	462.00 sf	200.00 /sf	92,400
F&I type 6C, sliding door	121.00 sf	200.00 /sf	24,200
F&I type 7, awning, fixed, & panel w/louver	1,168.00 sf	170.00 /sf	198,560
F&I type 7P, awning, fixed, & panel w/louver	1,168.00 sf	170.00 /sf	198,560
F&I type 7A, awning, fixed, & panel w/louver	231.00 sf	170.00 /sf	39,270
F&I type 7AP, awning, fixed, & panel w/louver	231.00 sf	170.00 /sf	39,270
F&I type 8, awning & fixed	147.00 sf	150.00 /sf	22,050
F&I type 8A, fixed	442.00 sf	150.00 /sf	66,300
F&I type 8B, awning & fixed	372.00 sf	150.00 /sf	55,800
F&I type 9, awning window	59.00 sf	150.00 /sf	8,850
F&I type 10, awning, fixed & panel w/louver	3,096.00 sf	170.00 /sf	526,320
F&I type 11, awning & fixed	516.00 sf	150.00 /sf	77,400
F&I type 12, fixed	86.00 sf	150.00 /sf	12,900
F&I type 13, fixed	134.00 sf	150.00 /sf	20,100
F&I type 14, fixed	119.00 sf	150.00 /sf	17,850
F&I type 16, fixed & panel w/louver	35.00 sf	170.00 /sf	5,950
F&I type 17, fixed	80.00 sf	150.00 /sf	12,000
F&I type 34, sliding door	143.00 sf	200.00 /sf	28,600
F&I type 35, fixed	229.00 sf	150.00 /sf	34,350
F&I type 36, hopper & fixed	229.00 sf	150.00 /sf	34,350
F&I type 37, hopper & fixed	286.00 sf	150.00 /sf	42,900
F&I type 37A, hopper & fixed	112.00 sf	150.00 /sf	16,800
F&I type 38, sliding door	143.00 sf	200.00 /sf	28,600
F&I type 39, sliding door	286.00 sf	200.00 /sf	57,200
Clean windows, exterior	19,297.00 sf	1.25 /sf	24,121
uPVC Windows - Triple Glazed	**104,280.00 sf**	**31.65 /sf**	**3,300,091**
08-53 UPVC WINDOWS	**104,280.00 sf**	**31.65 /sf**	**3,300,091**
09-23 PLASTER			
09.24.00 Cement Plastering			

Spreadsheet Level	Takeoff Quantity	Total Cost/Unit	Total Amount
09.24.00 Cement Plastering			
Recoat stucco, penthouse concrete frame	900.00 sf	30.00 /sf	27,000
Recoat stucco, north elevation	1,000.00 sf	30.00 /sf	30,000
Recoat stucco, east elevation	500.00 sf	30.00 /sf	15,000
Recoat stucco, west elevation	500.00 sf	30.00 /sf	15,000
Cement Plastering	**104,280.00 sf**	**0.83 /sf**	**87,000**
09-23 PLASTER	**104,280.00 sf**	**0.83 /sf**	**87,000**
09-90 PAINTING			
09.01.90 Paint Restoration			
Remove existing coating, brick chimney	420.00 sf	10.00 /sf	4,200
Remove existing coating, cooling tower concrete frame	1,611.00 sf	10.00 /sf	16,110
Remove existing coating, penthouse concrete frame	450.00 sf	10.00 /sf	4,500
Remove existing coating, cooling tower stairs	1.00 ea	2,500.00 /ea	2,500
Paint Restoration	**104,280.00 sf**	**0.26 /sf**	**27,310**
09.90.00 Painting & Coating			
Elastomeric coating, brick chimney	420.00 sf	25.00 /sf	10,500
Elastomeric coating, cooling tower concrete frame	1,611.00 sf	25.00 /sf	40,275
Elastomeric coating, cooling tower stairs	1.00 ea	5,000.00 /ea	5,000
Painting & Coating	**104,280.00 sf**	**0.54 /sf**	**55,775**
09-90 PAINTING	**104,280.00 sf**	**0.80 /sf**	**83,085**
05 WINDOW & DOOR REPLACEMENT	**104,280.00 sf**	**42.86 /sf**	**4,469,133**
06 INTERIOR FINISHES			
02-20 DEMOLITION			
02.41.40 Demolition - Walls / Partitions / Ceilings			
Demolition - Walls / Partitions / Ceilings	66,233.60 sf	20.00 /sf	1,324,672
Demolition - Walls / Partitions / Ceilings	**104,280.00 sf**	**12.70 /sf**	**1,324,672**
02-20 DEMOLITION	**104,280.00 sf**	**12.70 /sf**	**1,324,672**
06-10 ROUGH CARPENTRY			
06.10.00 Rough Carpentry			
Rough Carpentry	66,233.60 sf	2.50 /sf	165,584
Rough Carpentry	**104,280.00 sf**	**1.59 /sf**	**165,584**
06-10 ROUGH CARPENTRY	**104,280.00 sf**	**1.59 /sf**	**165,584**

Spreadsheet Level	Takeoff Quantity	Total Cost/Unit	Total Amount
06-25 FINISH CARPENTRY			
06.41.00 Architectural Millwork			
Misc Millwork Allowance	30,100.00 sf	10.00 /sf	301,000
Misc Millwork Allowancace	896.00 sf	10.00 /sf	8,960
Architectural Millwork	**104,280.00 sf**	**2.97 /sf**	**309,960**
12.30.00 Residential Casework			
Vanity	115.00 ea	6,500.00 /ea	747,500
Kitchen Cabinets	66.00 ea	45,000.00 /ea	2,970,000
Residential Casework	**104,280.00 sf**	**35.65 /sf**	**3,717,500**
12.36.00 Solid Surface			
Solid surface countertops - corian	1,464.00 sf	350.00 /sf	512,400
Solid Surface	**104,280.00 sf**	**4.91 /sf**	**512,400**
06-25 FINISH CARPENTRY	**104,280.00 sf**	**43.54 /sf**	**4,539,860**
08-10 DOORS, FRAMES & HARDWARE			
08.14.00 Doors, Frames & Hardware			
Doors, Frames & Hardware	64,084.00 sf	5.00 /sf	320,420
Doors, Frames & Hardware	**104,280.00 sf**	**3.07 /sf**	**320,420**
08-10 DOORS, FRAMES & HARDWARE	**104,280.00 sf**	**3.07 /sf**	**320,420**
09-21 DRYWALL			
09.21.13 Gypsum Board Assemblies - Walls			
GWB partition - standard	62,188.80 sf	20.00 /sf	1,243,776
Gypsum Board Assemblies - Walls	**104,280.00 sf**	**11.93 /sf**	**1,243,776**
09.21.16 Gypsum Board Assemblies - Ceilings & Soffits			
Gypsum board ceilings	62,188.80 sf	20.00 /sf	1,243,776
Gypsum Board Assemblies - Ceilings & Soffits	**104,280.00 sf**	**11.93 /sf**	**1,243,776**
09.21.25 Gypsum Board Assemblies - Patching/Infills			
Patch drywall	62,188.80 sf	9.00 /sf	559,699
Gypsum Board Assemblies - Patching/Infills	**104,280.00 sf**	**5.37 /sf**	**559,699**
09.21.28 Gypsum Board Assemblies - Miscellaneous			
Drywall clean-up	62,188.80 sf	1.00 /sf	62,189
Gypsum Board Assemblies - Miscellaneous	**104,280.00 sf**	**0.60 /sf**	**62,189**

Spreadsheet Level	Takeoff Quantity	Total Cost/Unit	Total Amount
09-21 DRYWALL	**104,280.00 sf**	**29.82 /sf**	**3,109,440**
09-30 TILE			
09.30.00 Tiling			
Ceramic floor tile	16,160.00 sf	30.00 /sf	484,800
Tiling	**104,280.00 sf**	**4.65 /sf**	**484,800**
09-30 TILE	**104,280.00 sf**	**4.65 /sf**	**484,800**
09-65 FLOOR COVERING			
09.61.00 Flooring Treatment			
Floor prep - 1/4" (plus anti-fracture)	94,671.00 sf	7.50 /sf	710,033
Flooring Treatment	**104,280.00 sf**	**6.81 /sf**	**710,033**
09.63.00 Floor Covering			
Floor Covering & Base SF	65,248.00 sf	12.50 /sf	815,600
Floor Covering	**104,280.00 sf**	**7.82 /sf**	**815,600**
09-65 FLOOR COVERING	**104,280.00 sf**	**14.63 /sf**	**1,525,633**
09-90 PAINTING			
09.90.00 Painting & Coating			
Paint drywall partitions	103,648.00 sf	10.00 /sf	1,036,480
Painting & Coating	**104,280.00 sf**	**9.94 /sf**	**1,036,480**
09-90 PAINTING	**104,280.00 sf**	**9.94 /sf**	**1,036,480**
10-01 TYPICAL SPECIALTIES			
10.28.00 Toilet, Bath, & Laundry Accessories			
Toilet & bath accessories	115.00 ea	580.00 /ea	66,700
Toilet & bath accessories	66.00 ea	400.00 /ea	26,400
Toilet, Bath, & Laundry Accessories	**104,280.00 sf**	**0.89 /sf**	**93,100**
10.40.00 Typical Specialties			
Typical Specialties	92,879.00 sf	5.00 /sf	464,386
Typical Specialties	**104,280.00 sf**	**4.45 /sf**	**464,386**
10-01 TYPICAL SPECIALTIES	**104,280.00 sf**	**5.35 /sf**	**557,486**
11-31 RESIDENTIAL APPLIANCES			

Spreadsheet Level	Takeoff Quantity	Total Cost/Unit	Total Amount
11.31.00 Residential Appliances			
Residential appliances	66.00 ea	15,000.00 /ea	990,000
Residential Appliances	**104,280.00 sf**	**9.49 /sf**	**990,000**
11-31 RESIDENTIAL APPLIANCES	**104,280.00 sf**	**9.49 /sf**	**990,000**
22-01 PLUMBING			
22.00.01 Plumbing			
Fixtures & Trim	542.00 ea	5,400.00 /ea	2,926,800
Water Conncetions	234.00 ea	1,540.00 /ea	360,360
Plumbing	**104,280.00 sf**	**31.52 /sf**	**3,287,160**
22-01 PLUMBING	**104,280.00 sf**	**31.52 /sf**	**3,287,160**
23-01 HVAC			
23.00.01 HVAC			
HVAC Modifications	55,727.40 sf	20.00 /sf	1,114,548
HVAC	**104,280.00 sf**	**10.69 /sf**	**1,114,548**
23-01 HVAC	**104,280.00 sf**	**10.69 /sf**	**1,114,548**
26-01 ELECTRICAL			
26.00.01 Electrical			
Electrical Modifications	55,727.40 sf	20.00 /sf	1,114,548
Electrical	**104,280.00 sf**	**10.69 /sf**	**1,114,548**
26-01 ELECTRICAL	**104,280.00 sf**	**10.69 /sf**	**1,114,548**
06 INTERIOR FINISHES	**104,280.00 sf**	**187.67 /sf**	**19,570,630**
07 MEP REPAIRS			
22-01 PLUMBING			
22.00.05 Plumbing General Requirements			
Plumbing General Requirements	1.00 ls	18,000.00 /ls	18,000
Demolition/cut, drop & make safe (lump sum)	1.00 ls	17,500.00 /ls	17,500
Plumbing General Requirements	**104,280.00 sf**	**0.34 /sf**	**35,500**
22.14.00 Facility Storm Drainage			
Roof drain/#ZC100 - 3"	7.00 ea	1,040.12 /ea	7,281
Rainleader AG/cast iron no hub pipe & ftgs. - 3"	907.00 lf	68.00 /lf	61,675
Rainleader AG/cast iron no hub pipe & ftgs. - 4"	40.00 lf	78.83 /lf	3,153

Spreadsheet Level	Takeoff Quantity	Total Cost/Unit	Total Amount
Facility Storm Drainage	**104,280.00 sf**	**0.69 /sf**	**72,109**
22.40.00 Plumbing Fixtures			
Sink/lay-in/2-bowl 37"x22"/std faucet	9.00 ea	3,829.72 /ea	34,467
Bathtub - 42"x5'	9.00 ea	5,934.13 /ea	53,407
Plumbing Fixtures	**104,280.00 sf**	**0.84 /sf**	**87,875**
22-01 PLUMBING	**104,280.00 sf**	**1.88 /sf**	**195,483**
23-01 HVAC			
23.00.05 HVAC General Requirements			
General requirements (management, permits, as-builts, coring, fire stopping)	95,766.00 sf	0.75 /sf	71,825
Misc. relocations in mechanical room for shoring	1.00 ls	35,000.00 /ls	35,000
Coordination drawings	1.00 ls	22,500.00 /ls	22,500
Demolition/cut, drop & make safe	95,766.00 sf	0.50 /sf	47,883
Demolition disconnect and reconnect roof equipment	95,766.00 sf	0.25 /sf	23,942
Core drilling	117.00 ea	817.32 /ea	95,626
Temporary HVAC New Isolation Valves	1.00 ls	20,000.00 /ls	20,000
HVAC General Requirements	**104,280.00 sf**	**3.04 /sf**	**316,775**
23.21.13 Hydronic Piping			
Dual Temp water s&r/type "L" copper solder - 3/4"	440.00 lf	35.12 /lf	15,451
Dual Temp water s&r/type "L" copper solder - 1"	291.00 lf	44.31 /lf	12,895
Dual Temp water s&r/type "L" copper solder - 1-1/4"	339.00 lf	53.58 /lf	18,163
Dual Temp water s&r/type "L" copper solder - 1-1/4" Risers	870.00 lf	74.27 /lf	64,619
Dual Temp water s&r/type "L" copper solder - 1-1/2"	36.00 lf	63.61 /lf	2,290
Dual Temp water s&r/type "L" copper solder - 1-1/2" Risers	390.00 lf	83.04 /lf	32,384
Dual Temp water s&r/sch 40 blk stl ERW weld - 2-1/2"	43.00 lf	112.05 /lf	4,818
Dual Temp water s&r/sch 40 blk stl ERW weld - 2-1/2" Risers	480.00 lf	113.17 /lf	54,319
Hydronic Piping	**104,280.00 sf**	**1.97 /sf**	**204,938**
23.23.50 AC Condensate Drains			
A/C cond./type "L" copper pipe & ftgs. - 3/4"	68.00 lf	30.17 /lf	2,051
A/C cond./type "L" copper pipe & ftgs. - 1-1/4"	810.00 lf	47.21 /lf	38,243
A/C cond./type "L" copper pipe & ftgs. - 1-1/2"	260.00 lf	56.53 /lf	14,698
AC Condensate Drains	**104,280.00 sf**	**0.53 /sf**	**54,992**
23.82.00 Heating & Cooling Terminal Equipment			
Fan coil unit/hydronic 2-pipe/horiz. or vert. - medium	40.00 ea	1,339.76 /ea	53,590
Heating & Cooling Terminal Equipment	**104,280.00 sf**	**0.51 /sf**	**53,590**
23.90.00 HVAC Equipment Rigging/Setting/Start Up			
Crane support for high roof replacement	95,766.00 sf	0.65 /sf	62,248
HVAC Equipment Rigging/Setting/Start Up	**104,280.00 sf**	**0.60 /sf**	**62,248**
23-01 HVAC	**104,280.00 sf**	**6.64 /sf**	**692,544**

Spreadsheet Level	Takeoff Quantity	Total Cost/Unit	Total Amount
26-01 ELECTRICAL			
26.00.05 Electrical General Requirements			
General requirements (management, permits, as-builts, tools, man lifts)	1.00 ls	15,000.00 /ls	15,000
Electrical General Requirements	**104,280.00 sf**	**0.14 /sf**	**15,000**
26.05.05 Demolition for Electrical			
Demolish FCU connection	40.00 ea	332.20 /ea	13,288
Demolish disconnect and reconnect roof equipment	95,766.00 sf	0.10 /sf	9,577
Demolition for Electrical	**104,280.00 sf**	**0.22 /sf**	**22,865**
26.05.83 Equipment Wiring			
FCU - circuit / disconnect / connection	40.00 ea	1,538.04 /ea	61,522
Equipment Wiring	**104,280.00 sf**	**0.59 /sf**	**61,522**
26.27.00 Distribution Equipment			
Rework distribution for Bradbury building - NIC	***NIC***	***/NIC***	
Distribution Equipment	**104,280.00 sf**	**/sf**	
26-01 ELECTRICAL	**104,280.00 sf**	**0.95 /sf**	**99,386**
07 MEP REPAIRS	**104,280.00 sf**	**9.47 /sf**	**987,413**
08 HVAC ALT. #1			
23-01 HVAC			
23.00.05 HVAC General Requirements			
Demolition/cut, drop & make safe	95,766.00 sf	0.15 /sf	14,365
HVAC General Requirements	**104,280.00 sf**	**0.14 /sf**	**14,365**
23.07.00 HVAC Insulation			
Insulation/pipe/copper (1/2"-1")	291.00 lf	11.35 /lf	3,304
Insulation/pipe/copper (1-1/4"-2")	459.00 lf	14.61 /lf	6,708
Insulation/pipe/weld (2-1/2"-4")	225.00 lf	21.46 /lf	4,828
HVAC Insulation	**104,280.00**	**0.14**	**14,839**
23.21.13 Hydronic Piping			
Dual Temp water s&r/type "L" copper solder - 1"	291.00 lf	44.31 /lf	12,895
Dual Temp water s&r/type "L" copper solder - 1-1/2"	52.00 lf	63.61 /lf	3,307
Dual Temp water s&r/type "L" copper solder - 2"	135.00 lf	65.07 /lf	8,785
Dual Temp water s&r/sch 40 blk stl ERW weld - 2-1/2"	225.00 lf	112.05 /lf	25,211
Hydronic Piping	**104,280.00 sf**	**0.48 /sf**	**50,197**
23.23.50 AC Condensate Drains			

Spreadsheet Level	Takeoff Quantity	Total Cost/Unit	Total Amount
23.23.50 AC Condensate Drains			
A/C cond./type "L" copper pipe & ftgs. - 1-1/2"	272.00 lf	56.53 /lf	15,377
AC Condensate Drains	**104,280.00 sf**	**0.15 /sf**	**15,377**
23-01 HVAC	**104,280.00 sf**	**0.91 /sf**	**94,779**
08 HVAC ALT. #1	**104,280.00 sf**	**0.91 /sf**	**94,779**
09 HVAC ALT. #2			
23-01 HVAC			
23.00.05 HVAC General Requirements			
Demolition/cut, drop & make safe (sq. ft.)	95,766.00 sf	0.25 /sf	23,942
HVAC General Requirements	**104,280.00 sf**	**0.23 /sf**	**23,942**
23.07.00 HVAC Insulation			
Insulation/pipe/copper (1/2"-1")	1,050.00 lf	11.35 /lf	11,920
HVAC Insulation	**104,280.00**	**0.11**	**11,920**
23.21.13 Hydronic Piping			
Hot water s&r/type "L" copper solder - 1"	1,050.00 lf	44.31 /lf	46,527
Hydronic Piping	**104,280.00 sf**	**0.45 /sf**	**46,527**
23-01 HVAC	**104,280.00 sf**	**0.79 /sf**	**82,388**
09 HVAC ALT. #2	**104,280.00 sf**	**0.79 /sf**	**82,388**
10 REPLACE BRICK INFILL W/MTL PNL - N ELEV			
02-20 DEMOLITION			
02.41.22 Demolition - Masonry			
Demo brick wall infill, north	7,861.00 sf	28.00 /sf	220,108
Demolition - Masonry	**104,280.00 sf**	**2.11 /sf**	**220,108**
02-20 DEMOLITION	**104,280.00 sf**	**2.11 /sf**	**220,108**
04-20 MASONRY			
04.00.05 Masonry General Conditions			
Scaffolding, north	17,444.00 sf	8.00 /sf	139,552
Masonry General Conditions	**104,280.00 sf**	**1.34 /sf**	**139,552**
04-20 MASONRY	**104,280.00 sf**	**1.34 /sf**	**139,552**

Spreadsheet Level	Takeoff Quantity	Total Cost/Unit	Total Amount
06-10 ROUGH CARPENTRY			
06.16.00 Sheathing			
Wall sheathing - dens glass, north	7,861.00 sf	5.50 /sf	43,236
Sheathing	**104,280.00 sf**	**0.42 /sf**	**43,236**
06-10 ROUGH CARPENTRY	**104,280.00 sf**	**0.42 /sf**	**43,236**
07-10 WATERPROOFING & JOINT SEALANTS			
07.26.00 Air/Vapor Retarders			
Air/vapor barrier - sheet-applied at infill, north	7,861.00 sf	9.50 /sf	74,680
Air/vapor barrier - sheet-applied at column covers, north	1,713.00 sf	9.50 /sf	16,274
Air/vapor barrier - sheet-applied at floor slab edges, north	1,024.00 sf	9.50 /sf	9,728
Air/vapor barrier - sheet-applied at roof slab edges, north	228.00 sf	9.50 /sf	2,166
Air/Vapor Retarders	**104,280.00 sf**	**0.99 /sf**	**102,847**
07-10 WATERPROOFING & JOINT SEALANTS	**104,280.00 sf**	**0.99 /sf**	**102,847**
07-42 METAL/COMPOSITE PANELS & SIDING			
07.42.00 Wall Panels			
Composite wall panels - aluminum, infill, north	7,861.00 sf	70.00 /sf	550,270
Composite wall panels - aluminum, column covers, north	1,713.00 sf	70.00 /sf	119,910
Composite wall panels - aluminum, floor slab edges, north	1,024.00 sf	70.00 /sf	71,680
Composite wall panels - aluminum, roof slab edge, north	228.00 sf	70.00 /sf	15,960
Wall Panels	**104,280.00 sf**	**7.27 /sf**	**757,820**
07-42 METAL/COMPOSITE PANELS & SIDING	**104,280.00 sf**	**7.27 /sf**	**757,820**
09-21 DRYWALL			
07.21.00 Thermal Insulation			
Mineral wool insulation - exterior wall assembly (4"), north	10,826.00 sf	8.00 /sf	86,608
Batt insulation - in-wall - exterior (6"), north	7,861.00 sf	7.50 /sf	58,958
Thermal Insulation	**104,280.00 sf**	**1.40 /sf**	**145,566**
09.21.13 Gypsum Board Assemblies - Walls			
6" LGMF at infill - exterior, north	7,861.00 sf	15.00 /sf	117,915
6" LGMF at cladding - exterior, north	2,965.00 sf	12.00 /sf	35,580
Gypsum Board Assemblies - Walls	**104,280.00 sf**	**1.47 /sf**	**153,495**
09-21 DRYWALL	**104,280.00 sf**	**2.87 /sf**	**299,061**
10 REPLACE BRICK INFILL W/MTL PNL - N ELEV	**104,280.00 sf**	**14.99 /sf**	**1,562,623**

Spreadsheet Level	Takeoff Quantity	Total Cost/Unit	Total Amount
11 REPLACE BRICK INFILL W/MTL PNL - E&W ELEV			
02-20 DEMOLITION			
02.41.22 Demolition - Masonry			
Demo brick wall infill, east	1,703.00 sf	28.00 /sf	47,684
Demo brick wall infill, west	1,634.00 sf	28.00 /sf	45,752
Demolition - Masonry	**104,280.00 sf**	**0.90 /sf**	**93,436**
02-20 DEMOLITION	**104,280.00 sf**	**0.90 /sf**	**93,436**
04-20 MASONRY			
04.00.05 Masonry General Conditions			
Scaffolding, east	4,171.00 sf	8.00 /sf	33,368
Scaffolding, west	4,010.00 sf	8.00 /sf	32,080
Masonry General Conditions	**104,280.00 sf**	**0.63 /sf**	**65,448**
04-20 MASONRY	**104,280.00 sf**	**0.63 /sf**	**65,448**
06-10 ROUGH CARPENTRY			
06.16.00 Sheathing			
Wall sheathing - dens glass, east	1,703.00 sf	5.50 /sf	9,367
Wall sheathing - dens glass, west	1,634.00 sf	5.50 /sf	8,987
Sheathing	**104,280.00 sf**	**0.18 /sf**	**18,354**
06-10 ROUGH CARPENTRY	**104,280.00 sf**	**0.18 /sf**	**18,354**
07-10 WATERPROOFING & JOINT SEALANTS			
07.26.00 Air/Vapor Retarders			
Air/vapor barrier - sheet-applied at infill, east	1,703.00 sf	9.50 /sf	16,179
Air/vapor barrier - sheet-applied at infill, west	1,634.00 sf	9.50 /sf	15,523
Air/vapor barrier - sheet-applied at infill, east	1,703.00 sf	9.50 /sf	16,179
Air/vapor barrier - sheet-applied at conc clad, east	1,401.00 sf	9.50 /sf	13,310
Air/vapor barrier - sheet-applied at infill, west	1,634.00 sf	9.50 /sf	15,523
Air/vapor barrier - sheet-applied at conc clad, west	1,340.00 sf	9.50 /sf	12,730
Air/Vapor Retarders	**104,280.00 sf**	**0.86 /sf**	**89,443**
07-10 WATERPROOFING & JOINT SEALANTS	**104,280.00 sf**	**0.86 /sf**	**89,443**
07-42 METAL/COMPOSITE PANELS & SIDING			
07.42.00 Wall Panels			
Composite wall panels - aluminum, infill, east	1,703.00 sf	70.00 /sf	119,210
Composite wall panels - aluminum, conc clad, east	1,401.00 sf	70.00 /sf	98,070
Composite wall panels - aluminum, infill, west	1,634.00 sf	70.00 /sf	114,380
Composite wall panels - aluminum, conc clad, west	1,340.00 sf	70.00 /sf	93,800

Spreadsheet Level	Takeoff Quantity	Total Cost/Unit	Total Amount
Wall Panels	**104,280.00 sf**	**4.08 /sf**	**425,460**
07-42 METAL/COMPOSITE PANELS & SIDING	**104,280.00 sf**	**4.08 /sf**	**425,460**
09-21 DRYWALL			
07.21.00 Thermal Insulation			
Mineral wool insulation - exterior wall assembly (4"), east	3,104.00 sf	8.00 /sf	24,832
Mineral wool insulation - exterior wall assembly (4"), west	2,974.00 sf	8.00 /sf	23,792
Batt insulation - in-wall - exterior (6"), east	1,703.00 sf	7.50 /sf	12,773
Batt insulation - in-wall - exterior (6"), west	1,634.00 sf	7.50 /sf	12,255
Thermal Insulation	**104,280.00 sf**	**0.71 /sf**	**73,652**
09.21.13 Gypsum Board Assemblies - Walls			
6" LGMF at infill - exterior, east	1,703.00 sf	15.00 /sf	25,545
6" LGMF at infill - exterior, west	1,634.00 sf	15.00 /sf	24,510
6" LGMF at cladding - exterior, east	1,401.00 sf	12.00 /sf	16,812
6" LGMF at cladding - exterior, west	1,340.00 sf	12.00 /sf	16,080
Gypsum Board Assemblies - Walls	**104,280.00 sf**	**0.80 /sf**	**82,947**
09-21 DRYWALL	**104,280.00 sf**	**1.50 /sf**	**156,599**
11 REPLACE BRICK INFILL W/MTL PNL - E&W ELEV	**104,280.00 sf**	**8.14 /sf**	**848,739**
12 NEW FIRE PROTECTION SPRINKLER SYSTEM			
21-01 FIRE PROTECTION			
21.00.01 Fire Suppression			
Fire protection main	50.00 lf	500.00 /lf	25,000
Double check valve assembly	1.00 ea	7,500.00 /ea	7,500
Fire pump/ jockey pump	1.00 ea	100,000.00 /ea	100,000
Sprinkler room	1.00 ea	25,000.00 /ea	25,000
Fire protection, wet system	104,280.00 sf	9.00 /sf	938,520
Fire Suppression	**104,280.00 sf**	**10.51 /sf**	**1,096,020**
21-01 FIRE PROTECTION	**104,280.00 sf**	**10.51 /sf**	**1,096,020**
12 NEW FIRE PROTECTION SPRINKLER SYSTEM	**104,280.00 sf**	**10.51 /sf**	**1,096,020**

Estimate Totals

Description	Amount	Totals	Rate	Cost per Unit
Subtotal	**37,495,826**	**37,495,826**		**359.569 /gsf**
Design Contingency	5,624,374		15.000 %	53.935 /gsf
Escalation	862,404		2.000 %	8.270 /gsf
SDI (Subcontractor Bonds)	615,756		1.400 %	5.905 /gsf
Subtotal	**7,102,534**	**44,598,360**		**427.679 /gsf**
Contractor's Contingency	2,229,918		5.000 %	21.384 /gsf
General Conditions	2,229,918		5.000 %	21.384 /gsf
General Requirements	2,675,902		6.000 %	25.661 /gsf
Subtotal	**7,135,738**	**51,734,098**		**496.108 /gsf**
Builder's Risk Insurance - NIC				
General Liability Insurance	788,646		1.400 %	7.563 /gsf
Building Permit	1,126,637		2.000 %	10.804 /gsf
Performance & Payment Bond - NIC				
Subtotal	**1,915,283**	**53,649,381**		**514.474 /gsf**
Fee	2,682,469		5.000 %	25.724 /gsf
Direct Construction Cost		**56,331,850**		**540.198 /gsf**
Permitting/Legal/Bonding/Design/Management/Owner Contingencies	16,899,559			
Grand Total		**73,231,409**		