

27 June 2025

Ms. Anne Sa'adah President, Board of Trustees Riverview-in-Cambridge Condominium Trust 221 Mt. Auburn Street Cambridge, MA 02138

Project 200609 -Supplemental Information Requested by City of Cambridge, Slab

Evaluation, Riverview Condominiums, 221 Mt. Auburn Street,

Cambridge, MA

Dear Ms. Sa'adah:

We prepared this letter to supplement our Slab Evaluation report dated 7 February 2025.

## 1. **BACKGROUND**

The objective of our 7 February 2025 Slab Evaluation Report (referred to as the "Report" in this letter) was 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. As stated in our Report, information regarding live load restrictions, building evacuation (the building is currently unoccupied), City of Cambridge Inspectional Services meetings, and Fire Department meetings and correspondence (among other documents) were addressed separately and were not explicitly summarized in our Report. Similarly, our Report did not include discussion regarding shoring, abatement, or demolition of the structure since that work occurred concurrently with development of our Report.

The project team, including representatives from Riverview (and legal counsel), Consigli, and Simpson Gumpertz & Heger Inc. (SGH) met with City of Cambridge (City) representatives on 2 June 2025, 16 June 2025, and 23 June 2025. STV Inc. (consulting engineers retained by the City) also attended the 16 and 23 June 2025 meetings. As a result of these meetings, the City requested that we provide the three pieces of specific supplemental information listed below. This letter was prepared only to address the supplemental information requested. Refer to our Report for more comprehensive information regarding the condition of the Riverview slabs. The City requested the following:

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- <u>Load Combinations</u> Provide the punching shear demand-to-capacity ratios (DCRs) for dead load and snow load combinations.
- <u>Shoring and Abatement Challenges</u> Provide information regarding the challenges to abate hazardous materials and shore the structure.
- <u>Thornton Tomasetti (TT) Peer Review</u> Provide a response to TT's peer review recommendations to perform in-situ compressive strength testing and non-linear punching shear evaluation of the slabs.

## 2. LOAD COMBINATIONS

The results included in our Report include gravity loads and applicable load combinations in accordance with the Massachusetts State Building Code (MSBC), which adopts and amends the International Building Code (IBC 2021). Our analysis included an envelope of load combinations, including those below, and the final values presented in our Report represent the controlling load combination. At the City's request, we prepared results specific to the following load combinations (these load combinations were included in our previous analysis and Report, but are separated from other load combination results in this letter):

- 1.4D (Dead Load)
- 1.2D (Dead Load) + 1.6S (Snow Load)

We categorized the DCR results into the following two categories:

Punching Shear DCRs 1.05 to 1.5

• Punching Shear DCRs >1.5

We graphically show the DCRs in Figure 1 (1.4D load combination) and Figure 2 (1.2D  $\pm$  1.6S load combination).

American Concrete Institute (ACI) Code 562 - Assessment, Repair, and Rehabilitation of Existing Concrete Structures states that 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 the following equation:

$$U_c/\Phi R_{cn} > 1.5$$

In the above equation,  $U_c$  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

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combinations of ASCE/SEI 7.  $\phi R_{cn}$  is the current in-place nominal capacity adjusted by the strength reduction factor ( $\phi$ ).

Figure 1 (1.4D load combination) shows that many column-slab connections have punching shear DCRs greater than 1.5 under dead-load only (i.e., the self-weight of the structure). Similarly, Figure 2 (1.2D + 1.6S load combination) also shows many locations with DCRs greater than 1.5, in particular at the High Roof and Low Roof slabs, due to snow loads. ACI 562 Commentary states that "the demand-to-capacity ratio for unsafe conditions was developed consistent with the performance-based procedures" contained in American Society of Civil Engineers and Structural Engineering Institutes – Minimum Design Loads and Associated Criteria for Buildings and Other Structures (ASCE/SEI 7-16)<sup>1</sup> and that "a demand-to-capacity ratio greater than 1.5...represents a condition with limited to no margin of safety against failure for ASCE/SEI loads."

We previously recommended shoring the structure due to the "potentially dangerous" categorization, consistent with ACI 562 recommendations; however, shoring has significant challenges as summarized in Section 3 of this letter.

We also considered potential structural redundancies and alternate load paths as described in ACI 562 commentary. Many of the locations with DCRs above 1.5 are located at Column Line E (rear elevation). The exterior wall along this column line consists of concrete masonry unit (CMU) backup walls and brick masonry veneer, which are constructed "tight" between the slabs. This wall was not designed to support the slabs, but it could provide an alternate load path along this column line. However, this wall terminates at the first floor (the first elevated slab) and is discontinuous at various locations along Column Line E (i.e., window openings). If the wall is going to be relied on as an alternate load path, shoring would need to be installed to transfer loads to grade, specifically at the first floor and at window openings. However, shoring Column Line E has the same challenges as shoring other locations throughout the building, as described below. While other alternate load paths may exist in the structure, they are not intentionally designed and are not reliable to support the required loads.

## 3. ABATEMENT AND SHORING CHALLENGES

Our analysis results show many locations throughout the building with DCRs categorized as "potentially dangerous" when subjected to code-required loads. We also observed cracks consistent with both flexural and punching shear stresses. We made these observations and findings in the fall of 2024, and, at the time, potential snow loads and drifting snow on the Low Roof would increase the slab stresses where there are high DCRs, corrosion damage, and a history of leakage through the slabs. Even without snow loads, the structure has DCRs that

<sup>1</sup> The ASCE/SEI loads and load combinations are consistent with IBC 2021 as amended by MSBC.

exceed 1.5 when exposed to dead load alone (Figure 1). This prompted our recommendation in fall 2024 to shore the structure, we notified the City of the structural issues, and, concurrently, the Riverview Board of Trustees began planning to move residents out of the building.

Riverview, Consigli, and SGH made significant efforts to design and install shoring starting in the fall of 2024. Due to the extent of "potentially dangerous" conditions, shoring is recommended throughout the majority of the structure. This is complicated by hazardous materials that exist throughout the building (based on hazardous material testing performed by various testing agents). The testing shows that the textured "popcorn" ceilings, floor mastics, and drywall compounds contain asbestos. These components are located at essentially all required shoring locations and would require abatement to implement this work.

Riverview asked SGH and Consigli to develop a plan to abate hazardous materials and shore the building until demolition of the structure could occur. Throughout the winter of 2024/2025, Consigli worked to obtain construction-market feedback to abate hazardous materials, shore the structure, and plan for demolition of the structure. As a result of these efforts, Consigli determined that it would be unsafe for the work crews to perform abatement and shoring work in the building due to the "potentially dangerous" conditions (see Consigli letter attached). As a result, Riverview determined that the appropriate path forward was to demolish the structure. Riverview then contacted the City to begin discussions regarding demolition of the building.

## 4. TT PEER REVIEW

The City asked us to respond to TT's recommendation to perform in-situ compressive strength testing of the concrete slabs and to perform a non-linear punching shear evaluation of the slabs.

Regarding the in-situ compressive strength testing recommendation, we performed compressive strength testing of cores extracted from the existing floor slabs and correlated the results to rebound hammer testing throughout the building. The testing results are included in our Report.

Regarding the non-linear punching shear evaluation, we do not expect a non-linear analysis to significantly impact our findings. We understand that TT's recommendation included in their original report dated 27 December 2023 was focused on a typical slab bay, and was a potential alternative to the previously completed elastic analysis methods to study the capacity limits of the slab. Since that time, both SGH and TT documented the widespread punching shear and flexural issues (beyond the limited scope included in the 2023 report). We recently discussed TT's initial recommendation in the context of our collective additional work to date, and TT agrees that a non-linear analysis would not have a significant impact on the findings, primarily due to the magnitude of the punching shear DCRs.

We shall be pleased to meet with you and the City to discuss this supplemental letter at your request.

Sincerely yours,

John M. Porter, P.E. Senior Principal

MA License No. 45684

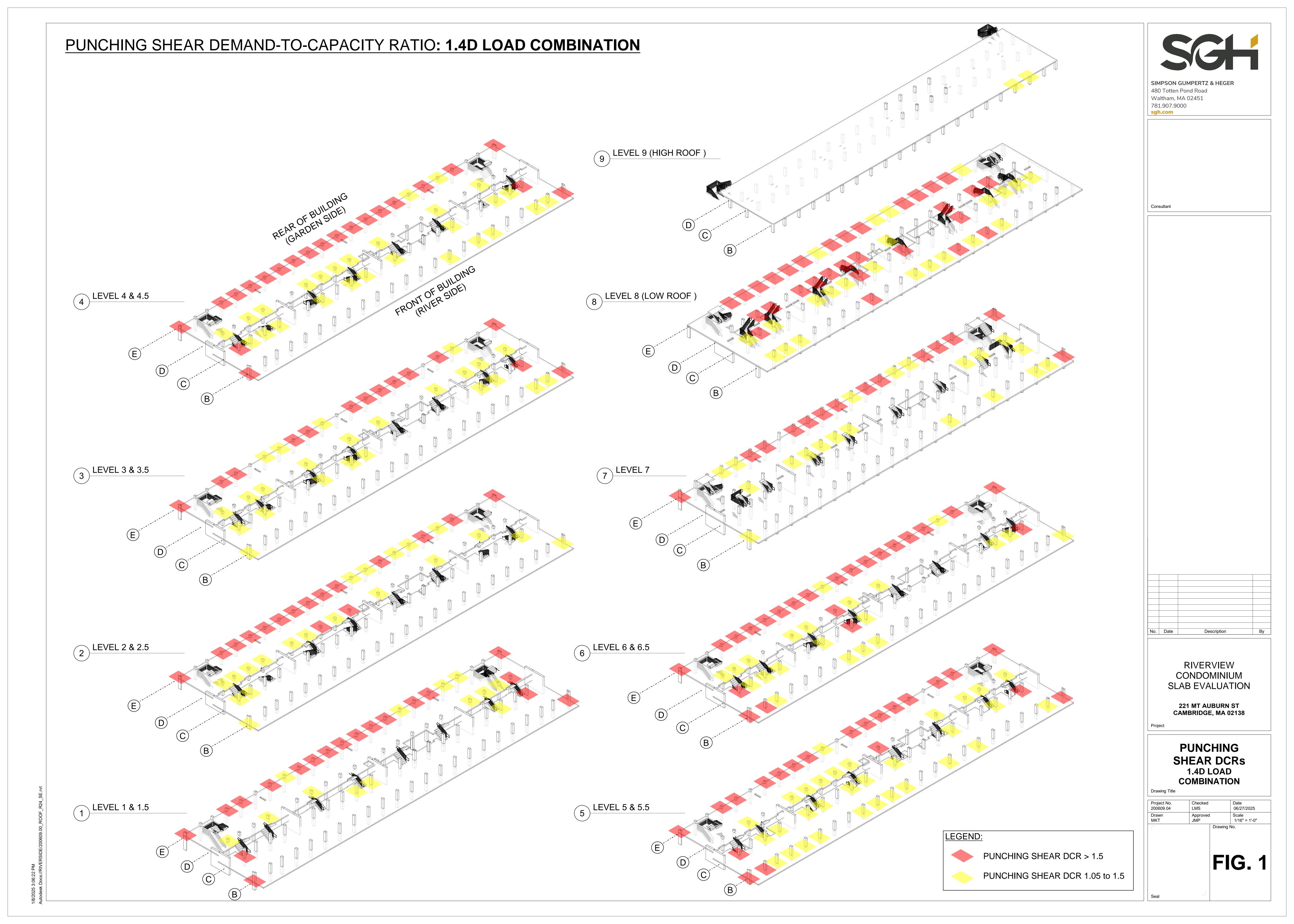
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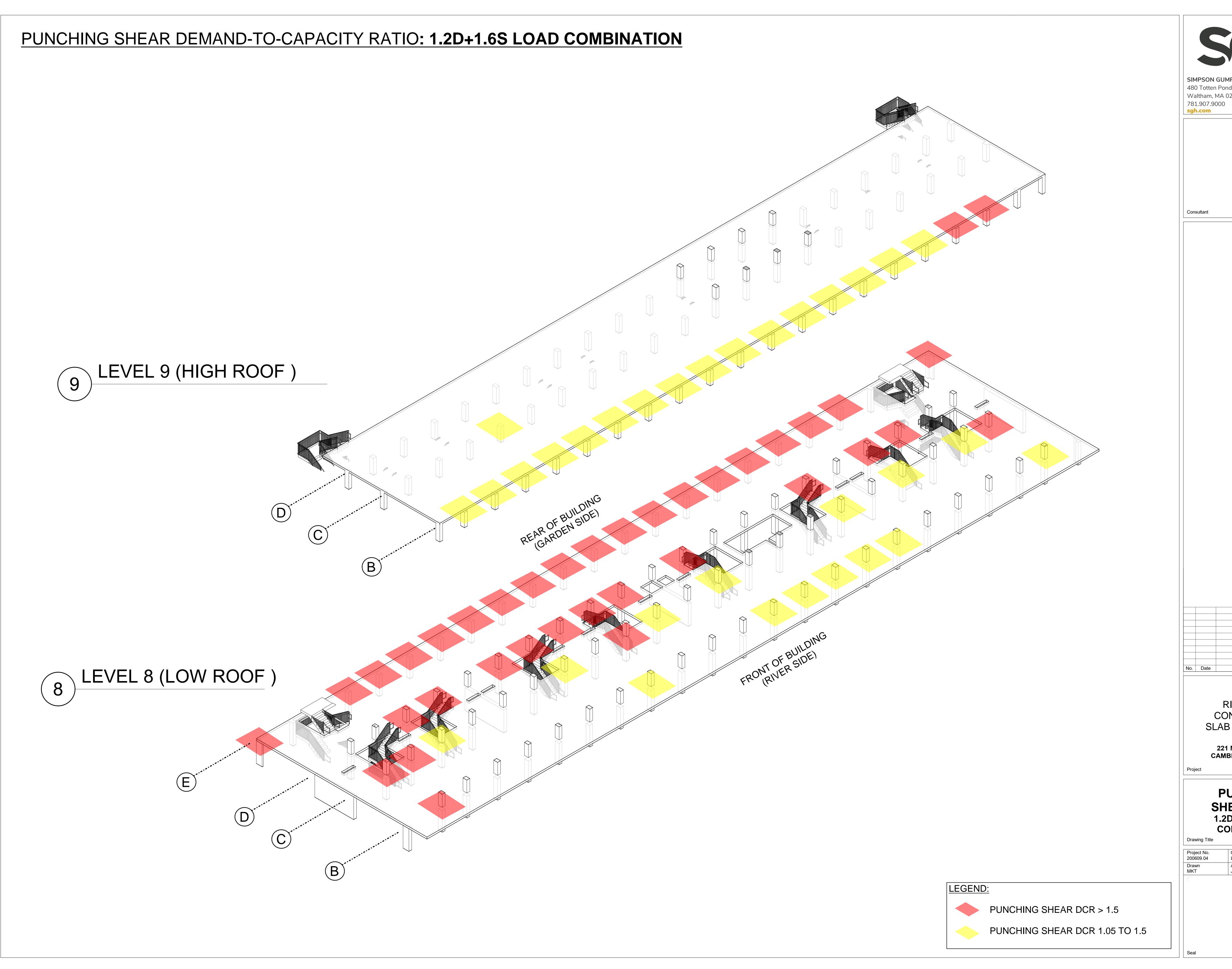
Linda M. Seymour, Ph.D. Project Consultant

Encls.

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27 June 2025





480 Totten Pond Road Waltham, MA 02451

Description

RIVERVIEW CONDOMINIUM SLAB EVALUATION

221 MT AUBURN ST CAMBRIDGE, MA 02138

**PUNCHING** SHEAR DCRs
1.2D+1.6S LOAD
COMBINATION

Date 06/27/2025

FIG. 2

**Attachment 1** 

**Consigli Letter** 



June 25, 2025

M. Anne Sa'adah President, Board of Trustees Riverview-in-Cambridge Condominium Trust 221 Mt. Auburn Street Cambridge MA 02138

Dear Ms. Sa'adah,

Consigli Construction Co., Inc., has developed a proposal and approach for the demolition of the Riverview Condominium tower, based on feedback from several demolition subcontractors and our understanding of the project.

As part of the process to develop our approach, Consigli was informed by Simpson, Gumpertz & Heger (SGH) that the building had very low, to potentially zero factor of safety, which Consigli interpreted to mean that it would be unsafe for any contractor to perform abatement and/or shoring installation inside the building. This led to the conclusion that a Massachusetts Department of Environmental Protection AQ 36 Non-Traditional Asbestos Abatement Work Practice (NTWP) Approval, in which the building is demolished and disposed of entirely as hazardous waste, is the only viable option.

Consigli has prepared a budget for the NTWP demolition, valued at approximately \$8.8 million, a preliminary schedule, and qualifications. The NTWP demolition will require extensive engineering and coordination by Consigli, the selected demolition contractor and its structural engineer, as well as SGH. That submittal process is anticipated to take 6-8 weeks, during which time enabling work such as utility disconnections could be happening. Consigli also suggests planning for an additional 20-25% to cover soft costs, including permitting, legal, bonding, design, management, and owner contingencies.

Additionally, an environmental consultant will need to be engaged and will work in collaboration with Consigli and our selected demolition subcontractor to prepare the NTWP application. We recommend that this process begin as soon as possible as the permitting process will likely involve several stakeholders, including the City of Cambridge. The timeframe to complete this permitting process is estimated at 60 days, but this could take longer based on stakeholder input. The demolition of the building is anticipated to take 12-16 weeks once permitting and utility disconnects are complete.

If you have any questions regarding the above, please contact me at (626) 823-4285.

Sincerely,

Consigli Construction Co., Inc.

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Jason Flood, P.E.

Senior Preconstruction Manager

CC: Rich Scopelliti, Vice President of Preconstruction
Bob Lizza, Chief Legal Officer
Gabe Mater, Director/General Superintendent
Ryan Jennette, Vice President/Regional Director-Boston
Bryan Kingsbury, Corporate Safety Director
Dan Geary, General Superintendent
Patrick McGary, Senior Estimator