

April 18, 2024

Aaron Young
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1205 E Pike Street, #2F
Seattle, WA 98122

**Subject: City of Mercer Island Public Works Department Maintenance Building
Seismic Upgrade design
Quantum Project #23452.01**

Dear Aaron Young:

Quantum recently issued a draft of our seismic upgrade drawings for the Mercer Island Shop Facility, dated April 5, 2024. This draft set of drawings is close to 90% complete, barring any changes requested by the City, and is based on the seismic analysis work performed by our firm.

The analysis was completed for 100% of the current IBC 2021 seismic loads for "Risk Category 2". However, since this is an existing building, we also used provisions from the Existing Building Code (IEBC 2021) which allow for the analysis to be completed using "Intermediate Masonry Shear Wall" and "Ordinary Concrete Shear Wall" seismic systems that are otherwise not permitted by the IBC 2021 in our seismic zone. If we were to construct this building today under the 2021 IBC, we would use "Special" seismic systems which need slightly more rebar in the shear walls and a thicker concrete topping slab.

Using "Intermediate" and "Ordinary" seismic systems results in the Code requiring that these shear walls be designed for higher seismic forces than what a currently required "Special" system with more rebar would be designed for (because they are less ductile). So, while these systems are not permitted for new construction today, the IEBC recognizes that they do still have capacity. This approach is similar to the approach used by ASCE 41 "Seismic Evaluation and Retrofit of Existing Buildings."

Our conclusion is that the existing shear walls are adequate if the soil on the roof is completely removed. The impact of removing the vegetative roof cannot be understated in allowing this building to comply with the Code, in conjunction with the select retrofit work as detailed in the drawings. A general order of retrofit priority is outlined below (all predicated on the removal of the vegetive roof):

As noted in the previously issued Stemper/MLA report, the first retrofit priority is anchoring the masonry walls to the wood diaphragms at the two higher roofs: the office and the high-bay garage. In past major earthquakes the lack of a robust, positive attachment from the masonry walls to the roof diaphragms has led to partial and full wall collapses. Therefore, we strongly recommend that the retrofit shown on sheet S2.2 of the drawings be made in the near term. This retrofit could be accomplished from the exterior as part of a re-roof to minimize the impact to the building use.

The second priority is to reinforce the foundations along the high bay doors on both the east and west sides, as shown on sheet S2.0 of the drawings. This retrofit may have more impact on the use of the building but should be able to be completed relatively quickly.

The third priority is to brace the internal non-bearing CMU walls against toppling over in an earthquake, as it is unclear if they are currently attached to the roof. This work is shown on sheet S2.1 of the drawings and should have minimal impact on the use of the facility.

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Please feel free to call me or Travis at 206-957-3900 if you have any questions regarding this memo.

Sincerely,
Quantum Consulting Engineers, LLC



Scott Tinker, P.E., S.E., Principal

