



28 June 2022

Mr. Raul Velez
Vice President & Chief Operating Officer
Sutro Tower, Inc.
1 La Avanzada Street
San Francisco, CA 94131

Project 067199.24 – Sutro Tower, Inc. Cladding Options Assessment

Dear Raul:

This letter addresses our evaluation of alternative cladding options for Sutro Tower.

BACKGROUND

The Planning Commission's 2019 approval of the Federal Communication Commission (FCC) repacking project was conditioned on the requirement that Sutro Tower, Inc. (STI) complete an ongoing reevaluation of the structural integrity of the tower and at a minimum perform certain structural upgrades within a set timeframe to enable the tower to meet more stringent wind and seismic standards under newer versions of the building codes. The assessment which I completed recommended implementation of a limited range of structural enhancements, some of which were completed in conjunction with work on the FCC repacking project. Most of the recommended enhancements that remain to be implemented are covered under Building Permit Application No. 2019.01.08.9773, which proposes to remove existing architectural steel panels (commonly referred to as cladding) from the vertical legs of the tower (Cladding Elimination). Cladding Elimination removes approximately 1,500 steel architectural panels from the tower's legs to create "open truss" legs, as are commonly found on most communications towers in the United States. Such action eliminates approximately 140,000 lbs of excess steel from the tower and substantially lessens wind and seismic forces.

As required as a condition of approval of the FCC repacking project, STI commissioned an independent peer review panel to assess the structural improvements which I recommended, specifically including the Cladding Elimination proposal. The independent peer review panel completed its analysis and such report was submitted to Planning in April 2021, finding the design of all proposed structural improvements to meet or exceed the professional engineering standard of care for the design of tower upgrades. Panel members also acknowledged that the information they had reviewed supported the conclusion that Cladding Elimination from the tower's legs was necessary to comply with the current wind standards.

CLADDING REPLACEMENT OPTION

Prior to recommending Cladding Elimination, I also concluded that the existing panels could be replaced with a stronger, more deeply corrugated (but not heavier) material (Cladding Replacement), but that the new, similarly-sized panels when added to the tower's legs would need to be attached with a greater number of stronger and heavier fasteners and supports, which in total would add approximately 30,000 lbs of additional weight to the tower (as opposed to the roughly 140,000 lb weight reduction associated with Cladding Elimination). Implementation of this latter option was not recommended due to 1) the added weight on the tower, 2) the fact that cladding on the tower's vertical legs serves no functional purpose (other than aesthetics), 3) ease of tower maintenance without cladding, 4) the impact on the neighbors of prolonged construction, and 5) the tower could not practically be strengthened to meet these newer code requirements. For clarification, Cladding Replacement would allow the tower to meet current code wind requirements for Risk Category II and Risk Category III which are the categories assigned to non-essential structures and sets the minimum level of safety, but not Risk Category IV which sets the code requirements for an "essential structure" which Sutro Tower has been declared by the City.

CIRCULAR CLADDING REPLACEMENT

Notwithstanding the peer review panel's conclusions, the Planning Department advised STI last month that it continues to favor some type of cladding replacement option. Planning representatives asked me to develop further alternatives. After analyzing many options which were unworkable either for structural reasons or because they would create wind-induced noise (as summarized in Exhibit A, attached), I believe cladding replacement using steel panels, similar to the original cladding, but arranged in a circular form over each of the tower's vertical legs, as illustrated in Figure 1 below, is a viable alternative. The circular shape is aerodynamically efficient and results in reduced wind loading, as compared with a square or triangular shape. I believe this can be accomplished with practical levels of strengthening, to make upgrade to code compliance feasible.

(Added graphics)

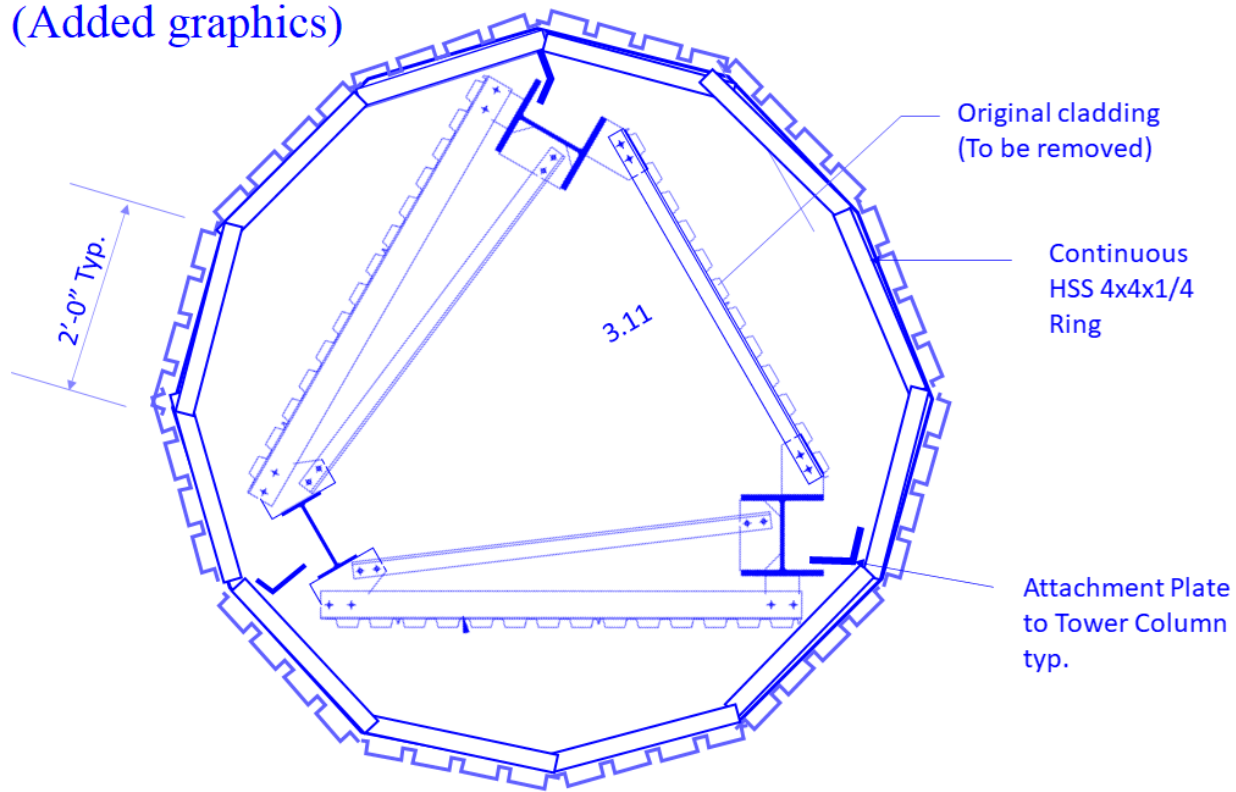


Figure 1 – Plan View of Circular Cladding Arrangement

Preliminarily, while adding approximately 300,000 lbs of weight to the tower, I believe the tower will be able to support Circular Cladding Replacement with installation of additional structural improvements such as strengthening of columns with the addition of cover plates; strengthening of selected braces with the insertion of new WT strongback elements between existing double angle members; and strengthening of connections by welding and supplemental gusset plate extensions.¹ Of course, the downside with any cladding replacement (Circular Cladding Replacement or otherwise) remains 1) there will be hundreds of thousands of pounds of added weight and new attachments on the tower, 2) the fact that cladding on the tower's vertical legs serves no functional purpose, 3) tower maintenance is easier and more productive without cladding, 4) the impact on neighbors of prolonged construction, and 5) concerns about the ability to cost-effectively meet the updated code requirements. As such, while Circular Cladding Replacement meets the requirements to which we are striving, I continue to recommend Cladding Elimination.

¹ A WT strongback element is the “T” shaped member inserted between the double angles. The “T” is formed by splitting a wide flange (“W”) in half. Strongback is an industry standard term for a “strong” member that is used to support a weaker member.

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Please let us know if you require any additional information on this matter.

Sincerely yours,



Ronald O. Hamburger, S.E.

Senior Principal

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Encl.

Cc:, Ms. Kristen Thall Peters (Cooper White & Cooper LLP)

Exhibit A
Cladding Options Evaluation

Option Description	Structure Meets Updated Codes for Essential Facility	Cladding Meets Updated Codes for Essential Facility	Years of Construction Required	Ease of Tower Maintenance	Notes
Re-install existing cladding	NO	NO	3 – 4	Difficult	
Cladding Replacement	NO	YES	3 – 4	Difficult	
Cladding replacement on only outward faces of legs	NO	NO	1 – 2	Moderate	
Cladding replacement with perforated panels	NO	YES	3 – 4	Difficult	Wind-induced whistling likely to result
Replacement with lighter materials	NO	NO	2 – 3	Difficult	Lighter materials will detach on windy days
Circular Cladding Replacement	YES	YES	3 – 4	Difficult	
Cladding Elimination	YES	YES	0	Moderate	