November 11, 2020

Ramon Lugo
Director, Florida Space Institute

SUBJECT: Recommendation for Future Efforts at Arecibo Observatory

Dear Mr. Lugo:

There are currently two main cables that have failed at the Arecibo Observatory, both located from Tower 4 to the platform. It is known that the M4N Aux main cable failed from the socket on August 10, which is undergoing forensic analysis to confirm the hypothesis that fabrication or installation was at fault. When the M4-4 cable failed on November 6, the cable was at approximately 60% of its minimum breaking strength per available documentation. M4-4 failed in tension, the cause of which is believed to be degradation of the cable itself, potentially due to corrosion.

From Thornton Tomasetti's (TT) model, we can conclude with a high level of confidence, that if an additional main cable fails, a catastrophic collapse of the entire structure will soon follow.

All options initially considered to reduce the weight on the platform or to install cables to stabilize the structure would require having personnel on the platform and the towers. After the recent failure, WSP does not recommend allowing personnel on the platform or the towers, or anywhere in their immediate physical vicinity in case of potential sudden structural failure.

The current stability of the structure is unknown, and we cannot quantify the structure's factor of safety. Wiss, Janney, Elstner (WJE) has proposed using a proof load test to quantify the current factor of safety. WSP does not recommend performing a proof load test on the system for the following reasons:

1. Due to the compromised state and additional damage being observed in the remining cables from Tower 4, the maximum capacity of the remaining cables is unknown, and the additional load could cause additional cable failures.
2. It is not recommended to put the structure through additional load cycles due to the additional degradation that can occur by adding load to the system through proof loading.
3. The proof load proves capacity at that moment in time and it is unknown if the cables can support that load again in the future.

Conclusions and Recommendations

Since we are observing additional wire breaks, this leads us to believe that there is additional degradation of the cables and therefore less capacity than expected. At this time, WSP believes that there is no course of action that can be taken to confidently verify the structural integrity of the existing cables/structure. WSP strongly advises against allowing personnel on the platform or towers, or anywhere in their immediate physical vicinity in case of potential sudden structural failure.

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Therefore, based on an engineering alternatives assessment, WSP recommends the following course of action as the recommended alternative: controlled de-commissioning of the structure, with appropriate site access restriction and other safety precautions as determined by safety lead WJE in-place until decommissioning is complete.

Regards,

Vincent M. Antes, SE, PE
Program Manager