Thornton Tomasetti

Via email: domalley@nsf.gov

Donna M. O'Malley
Portfolio Manager
Mathematical & Physical Sciences (MPS)
U.S. NATIONAL SCIENCE FOUNDATION

August 26, 2026

RE: The Richard B. Dunn Solar Telescope (DST) Demolition

Dear Ms. O'Malley,

The Richard B. Dunn Solar Telescope (DST) is a vertical solar telescope constructed in 1969 at the Sunspot Solar Observatory. Its central steel telescope structure is surrounded by a 3-foot-thick reinforced concrete shell. The telescope extends approximately 136 feet above grade and 193 feet below grade into the concrete-lined pit, with a total length of 329 feet.

The telescope core is composed of three sections: the Upper Turret Azimuth, the Lower Turret Azimuth, and the Main Telescope body consisting of an assembly of vacuum tubes. The 265 tons (530,000 lbs) telescope is supported by a concrete shell through two mercury float bearings, including the Azimuth tube float bearing at Elevation 1,106 feet and the Main vacuum tube float bearing at Elevation 1,082 feet. Mercury also forms top seals where the Lower Turret Azimuth, Iris, and the Main Telescope tube are connected, and a lower seal where the bottom of the tube is terminated within the pit. This integrated mercury bearing configuration allows the telescope to float and rotate smoothly with virtually no frictional resistance but makes complete access and disassembly difficult.

At approximately 7 am on January 5, 2026, a mercury leak was discovered by DST personnel on the main observatory table, and a total of 186 lbs (1.65 gallons) of elemental mercury was removed from the site. The source of the leak was not determined. Additional mercury was later observed on floors and in collection containers in early April and again in July, 2026 beneath the Main float bearing, indicating continued mercury leakage and migration from the telescope assembly.

By early August, Thornton Tomasetti has successfully drained the elemental mercury at the four designated locations and cleaned up the accessible contaminated surfaces. We recovered approximately 2% less in total volume of mercury than anticipated from the engineering estimate. The unaccounted amount may reflect residual mercury in inaccessible spaces, uncertainty of initial quantities, migration, or other losses. Its final location cannot be established without opening the telescope system and removing the central vacuum tube.

It is our opinion that complete remediation of the DST for mercury should be performed through controlled deconstruction and demolition of the telescope and surrounding concrete structure. Draining accessible mercury reservoirs and cleaning accessible surfaces are important interim measures to lower the risk of mercury exposure, but they cannot demonstrate that all mercury has been removed from the telescope system or exposed materials.

The DST's metal structure has been exposed to elemental mercury for over 50 years. When mercury travels in a liquid or vapor form, it can be retained on or within steel surfaces, seams, roughness, corrosion products, connections, and inaccessible crevices. In addition, mercury can penetrate the steel, causing localized corrosion or embrittlement. The extent of any such conditions cannot be reliably determined from visual observation or air monitoring alone.

Testing, remediation, or partial demolition of the existing telescope structure are not feasible methods to remediate the telescope of all the mercury. The most efficient approach to minimize the risk is to remove the telescope components following a planned demolition of the entire telescope and concrete structure. This work should incorporate mercury containment, air monitoring, structural stabilization, hazardous material controls, waste documentation under a detailed engineered plan, and all applicable regulatory approvals.

Very truly yours,

Liling Cao, Ph.D.
Senior Principal

John Abruzzo
Managing Principal

THORNTON TOMASETTI, INC.

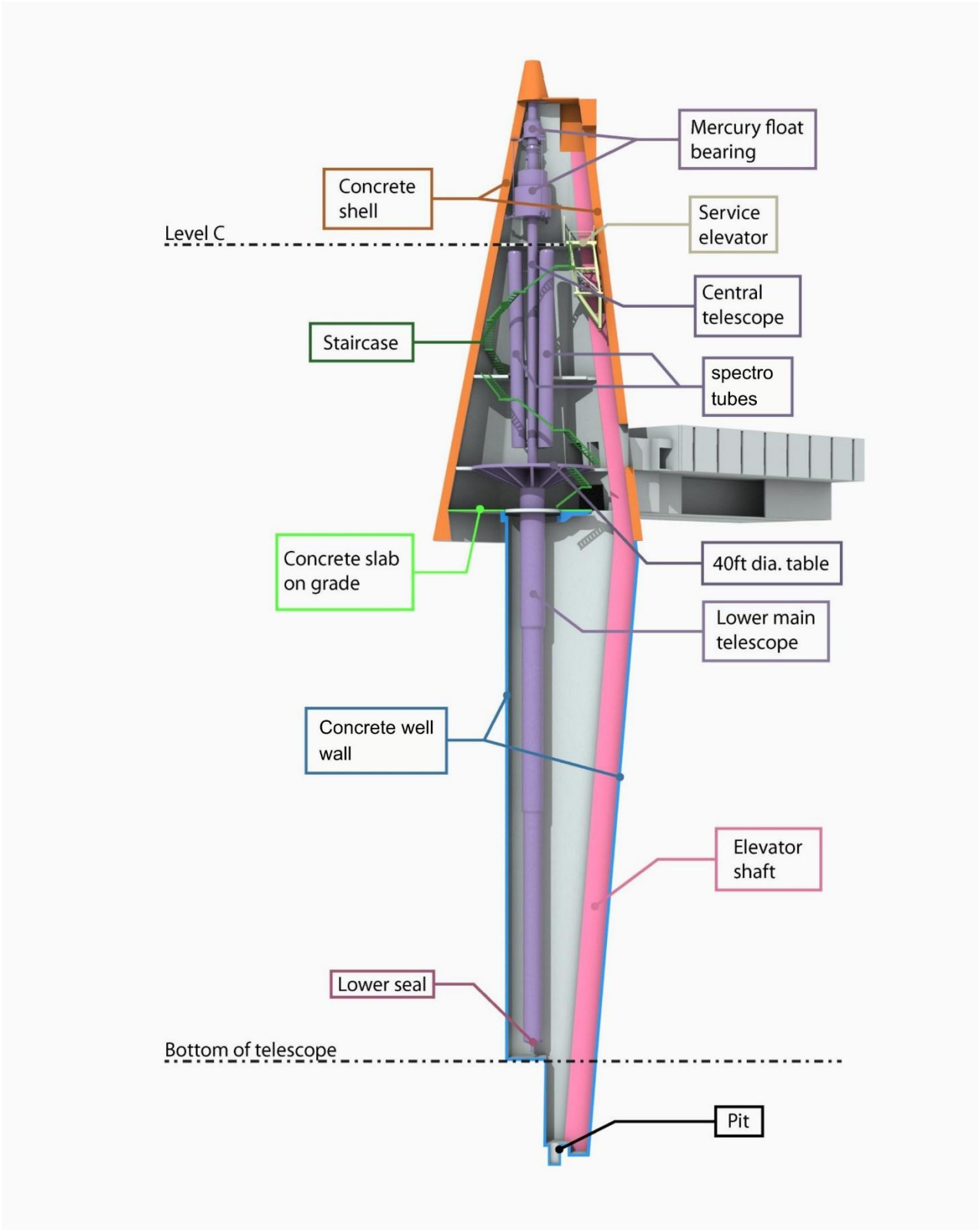

Figure 1. DST Configuration

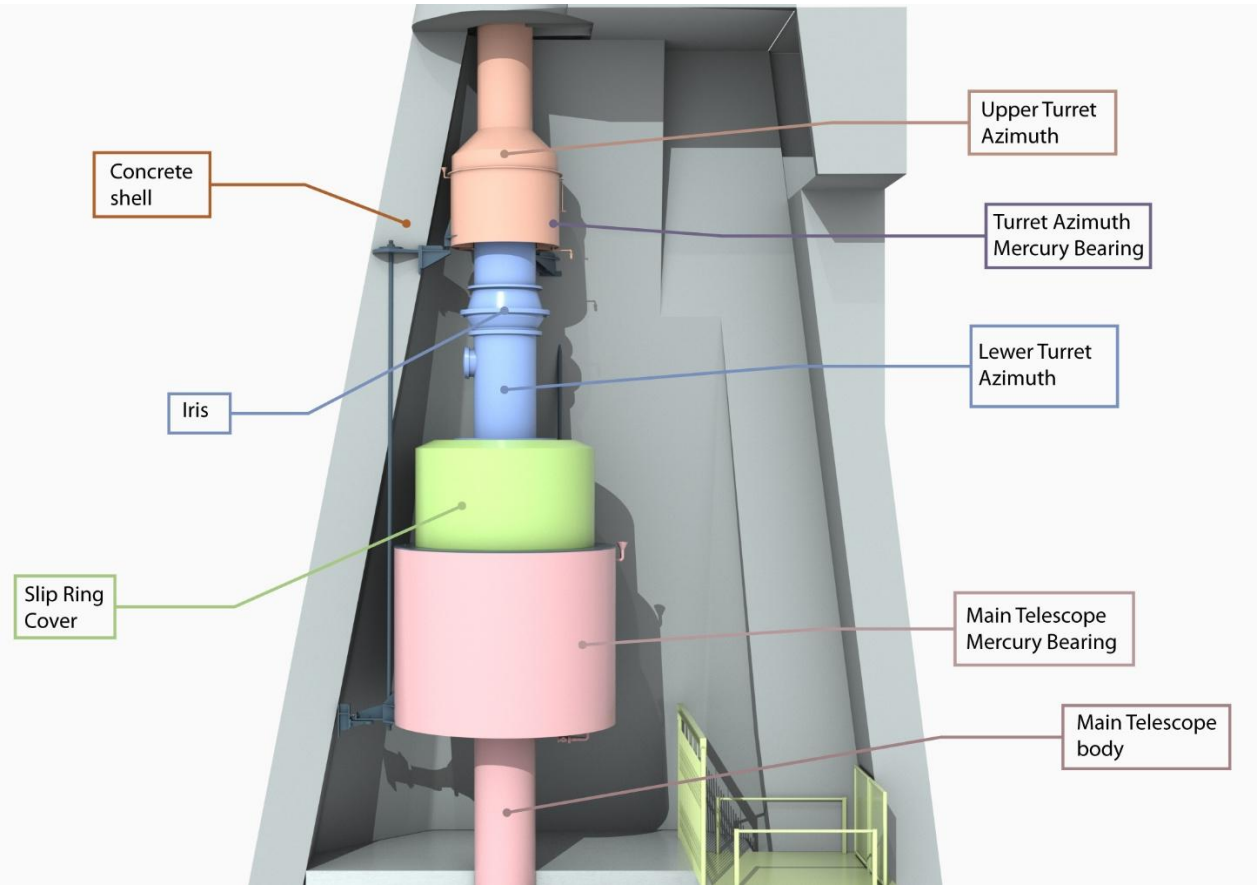

Figure 2. DST float bearings