Staff Report for Heritage Richmond Hill Meeting

Date of Meeting: September 5, 2024
Report Number: SRPBS.24.087

Department: Planning and Building Services
Division: Policy Planning

Subject: SRPBS.24.087 - Heritage Permit for David Dunlap Observatory Building Repairs - City File D12-07228

Purpose:

To seek Heritage Richmond Hill's recommendation that Council approve the repairs to the interior of the David Dunlap Observatory building.

Recommendation(s):

a) That staff report SRPBS.24.087 titled "Heritage Permit for David Dunlap Observatory Building Repairs" be received; and,

b) That the heritage permit application to repair the interior of the David Dunlap Observatory building, as described in staff report SRPBS.24.087, be approved.

Contact Person(s):

- Pamela Vega, Urban Design/Heritage Planner, extension 5529
- Kunal Chaudhry, Manager of Heritage and Urban Design, extension 5562
- Gus Galanis, Commissioner of Planning and Building Services, extension 2465

Report Approval:

All reports are electronically reviewed and/or approved by the Division Director, Treasurer (as required), City Solicitor (as required), Commissioner, and City Manager. Details of the reports approval are attached.

Key Messages:

- The proposed repairs of the David Dunlap Observatory building, as outlined in this report, will improve the appearance and will help ensure its long-term conservation; and,
- The costs for the proposed repairs have already been approved by Council and 50% of the costs will be covered by a Parks Canada grant.

Background:

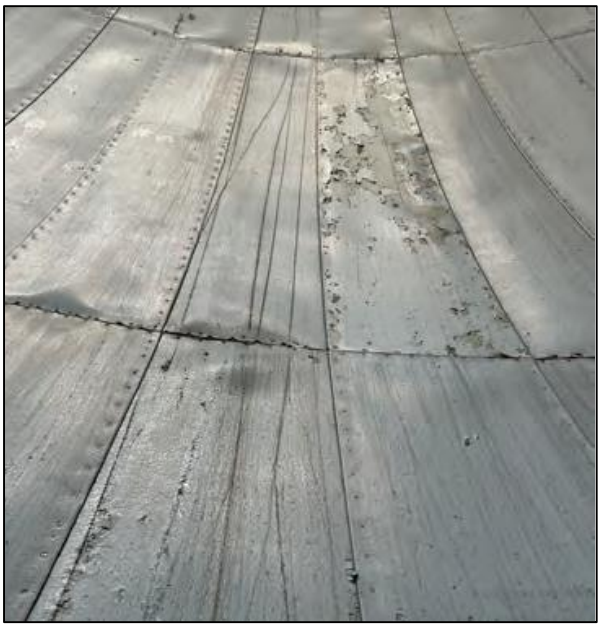
The Richmond Hill David Dunlap Observatory (DDO) Park is a 42-hectare (110-acre) City-owned property located centrally within Richmond Hill. The park is generally bounded by Bayview Avenue to the east, the CN rail line to the west, 16th Avenue to the south, and Hillsview Drive to the north, and contains several buildings, including the David Dunlap Observatory building that houses the largest telescope in Canada.

On September 29, 2009, Council passed By-law 100-09 to designate the Richmond Hill David Dunlap Observatory (DDO) Cultural Heritage Landscape (CHL) as a "property of cultural heritage value or interest" under Part IV, Section 29 of the *Ontario Heritage Act*. Additionally, the property was also designated a National Historic Site in 2019 by the federal Minister of Environment and Climate Change.

In 2023, a condition assessment was undertaken of the interior of the Observatory building. It was found that the Agasote panels that line the interior of the dome are warped, damaged and have become detached from the underlying frame (see Figures 1 to 5) and that the paint on the dome's metal frame is peeling (see Figures 4 and 5). These conditions are believed to have been caused by natural condensation cycles and past water infiltrations. The lobby's terrazzo flooring has also cracked along the exterior wall due to seasonal floor movements (see Figure 6). The City is proposing to replace the damaged Agasote panels, repaint the dome's interior visible metal components, and repair the crack in the lobby's terrazzo flooring.

The interior of the Observatory building, including the Agasote panels, the dome's metal frame, and the terrazzo flooring, are identified as heritage attributes in the property's heritage designation by-law (By-law 100-09, as amended by By-law 28-17). As per section 33(1) of the *Ontario Heritage Act*, Council approval is required prior to undertaking work that may affect the property's heritage attributes.

Funding for the proposed repairs was approved by Council in 2018 and 2023 respectively through the approvals of both the "DDO – Building Restoration and Revitalization" and the "DDO – Interior Dome Panel Replacement" projects. Additionally, the City successfully received Parks Canada's 2024 National Cost-Sharing Program for Heritage Places grant, which will cover 50% of the repair costs.



Figures 1-3 Agasote panels showing degradation, including warping, peeling, and failed joints (Source: +VG Architects)

Figure 4 The upper portion of the dome showing degraded Agasote panels and peeling paint (Source: +VG Architects)

Figure 5 The upper portion of the dome showing degraded Agasote panels and peeling paint (Source: +VG Architects).

Figure 6 A portion of the crack in the terrazzo flooring that runs parallel to the exterior Observatory wall (Source: City of Richmond Hill).

Discussion:

There are three components of the building being proposed for repairs which include the Agasote panels, the visible metal components of the dome, and the terrazzo flooring.

Existing Liner Panels

The interior face of the Observatory dome is lined with Agasote panels, which is an early type of fiberboard, used to help regulate the temperature within the dome and to provide acoustic dampening of exterior and interior noise. These panels are now in a poor and progressively deteriorating state.

Approximately 10% of the Agasote panels require replacement, most of which are located at the apex of the dome (see Figures 8, 9). These panels exhibit advanced deterioration, warping, and are no longer positively fastened to the underlying metal frame. As a result, the panels cannot be repaired and must be replaced.

Since Agasote panels are no longer manufactured, alternative materials and approaches were considered for the panels that require replacement. To better evaluate

these options, mockups of the three intervention options were completed during the summer of 2024. These options were:

- removing the existing Agasote panel and replacing with a new 0.5 inch-thick Homasote panel;
- removing the existing Agasote panel and replacing with a new 0.25-inch high density fibreboard panel; or,
- removing the existing Agasote panel and painting the underlying exposed metal supporting structure and the backside of the outer dome copper panels with acoustic paint.

Homasote Panels

Homasote is manufactured by the same company that produced Agasote fibreboard and is the option most similar to Agasote both in composition and in performance. It is composed primarily of recycled paper fibers bound together with an adhesive. This material is weather-resistant, durable, and has good structural and insulating characteristics. However, it is only available in a 0.5-inch thickness, which doesn't match the 0.25-inch thickness of the existing panels.

High Density Fibreboard Panels

High density fibreboard (HDF) is a building board composed of wood fibers combined with adhesive resins and is of a comparable thickness to the original Agasote panels. It has a moderate moisture resistance, is generally higher density and stronger than Homasote and can be treated with fire-resistant additives to decrease its combustibility. While it expands if it is wet, which may cause potential stress at joints and fastener locations, sealing the panels on all sides can provide long-lasting protection from the ongoing, naturally occurring, environmental condensation within the dome.

Acoustic Paint Finish

Consideration was also given to removing the Agasote panels and applying an acoustic paint finish to the underlying exposed dome surface. This was considered for two reasons. First, the un-vented and un-conditioned cavity that is located between the Agasote panels and the outer metal dome panels causes condensation to accumulate in this interstitial space, which damages the moisture-sensitive Agasote panels. Secondly, interior liner panels were not always used in facilities like the Observatory; in these instances, an applied finish was used on the exposed dome surface.

Results of Mockups

The mockups were installed above the top deck between the existing 48-inch girder trusses (see Figure 8). Four panels were removed and replaced with two HDF and two Homasote panels, respectively, and two panels were removed and the underlying metal structure was painted with acoustic paint (see Figure 7). The Homasote and the HDF were sized and templated to match the existing layout, curvature, placement, and shape

of the original panels and were attached with large head, flush wood screws with a maximum spacing of 150 mm on centre.

The Homasote panels were noticeably thicker than the existing panels and created significant shadow lines along the joints where they overlapped the adjacent panels; this was not an issue with the HDF panels which were the same thickness as the existing panels. Further, the Homasote panels were also difficult to shape and curve as needed. The HDF panels' texture better matched the texture of the existing panels whereas the Homasote panels were noticeably different, having a dimpled rather than smooth texture.

There were also concerns about the Homasote's longevity. These concerns were due to the fact that the Homasote fibres are less compressed than the HDF and are thus more likely to be damaged by impact. Also, the Homasote appeared to be more porous and thus more prone to absorb moisture than the HDF, which would be detrimental to both the panel itself and to the underlying metal structures.

While using the acoustic paint treatment on the steel structure and exterior metal liner panels is a possibility, it is not a suitable option at this time because the City is only considering doing a partial replacement of the Agasote panels. Removing the existing panels and applying the acoustic paint in a piecemeal fashion would negatively impact the appearance of the dome.

Accordingly, it was determined that the HDF panels are the most appropriate replacement material.

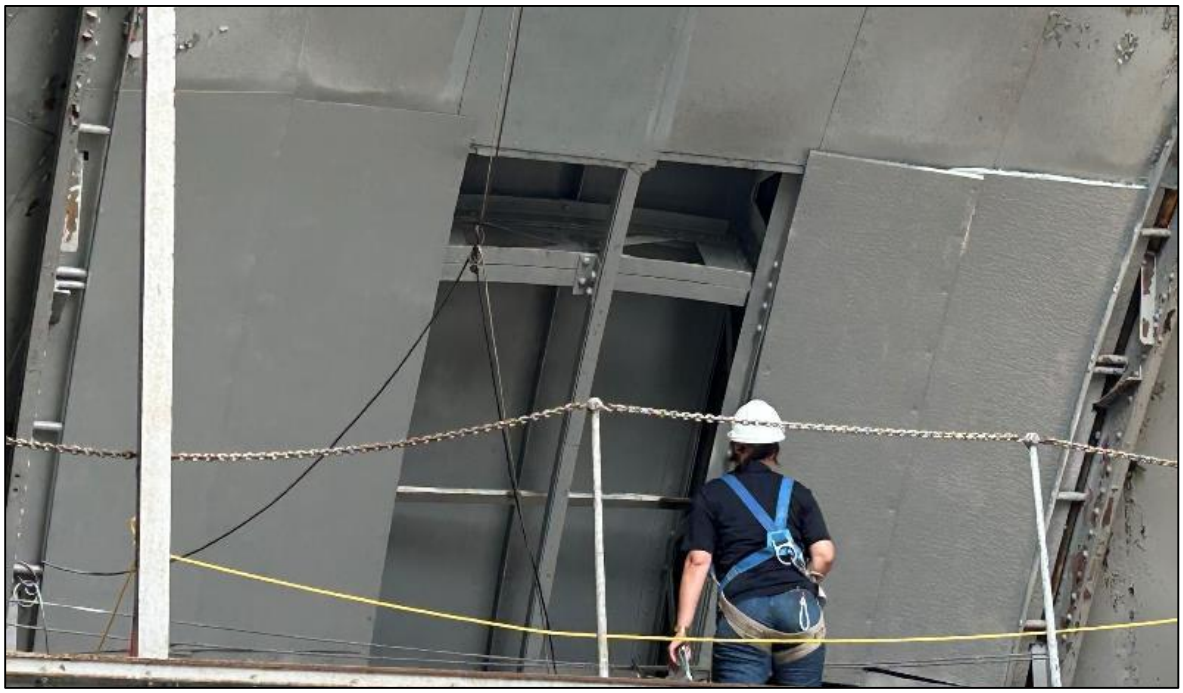


Figure 7 The three mockups (built in pairs), from left to right: HDF panels; acoustic paint in cavity; Homasote panels (Source: +VG Architects)

Proposed Repairs

29 panels are proposed to be replaced (see Figures 8 and 9). Once the panels are removed, the wood substrates, blocking and strapping will be inspected and any unsound wood will be repaired or replaced with new wood to match the existing (see Figures 9 and 10). The replacement panels will be cut, sized, and shaped to match the original panel and fastened back into place. New stainless-steel screws that match the size and head type of the existing screws will be used to fasten the panels to the substrates. The new liner panels will then be painted with an exterior-grade latex paint. The existing panels within the first and second tiers and those on the third and fourth tiers between the 48-inch-deep girder trusses will also be painted (see Figures 8, 9).

Metal Surfaces

As the dome is not heated or air conditioned, its internal temperature and moisture levels fluctuate throughout the year. This has caused the paint on the exposed metal elements in the dome to peel.

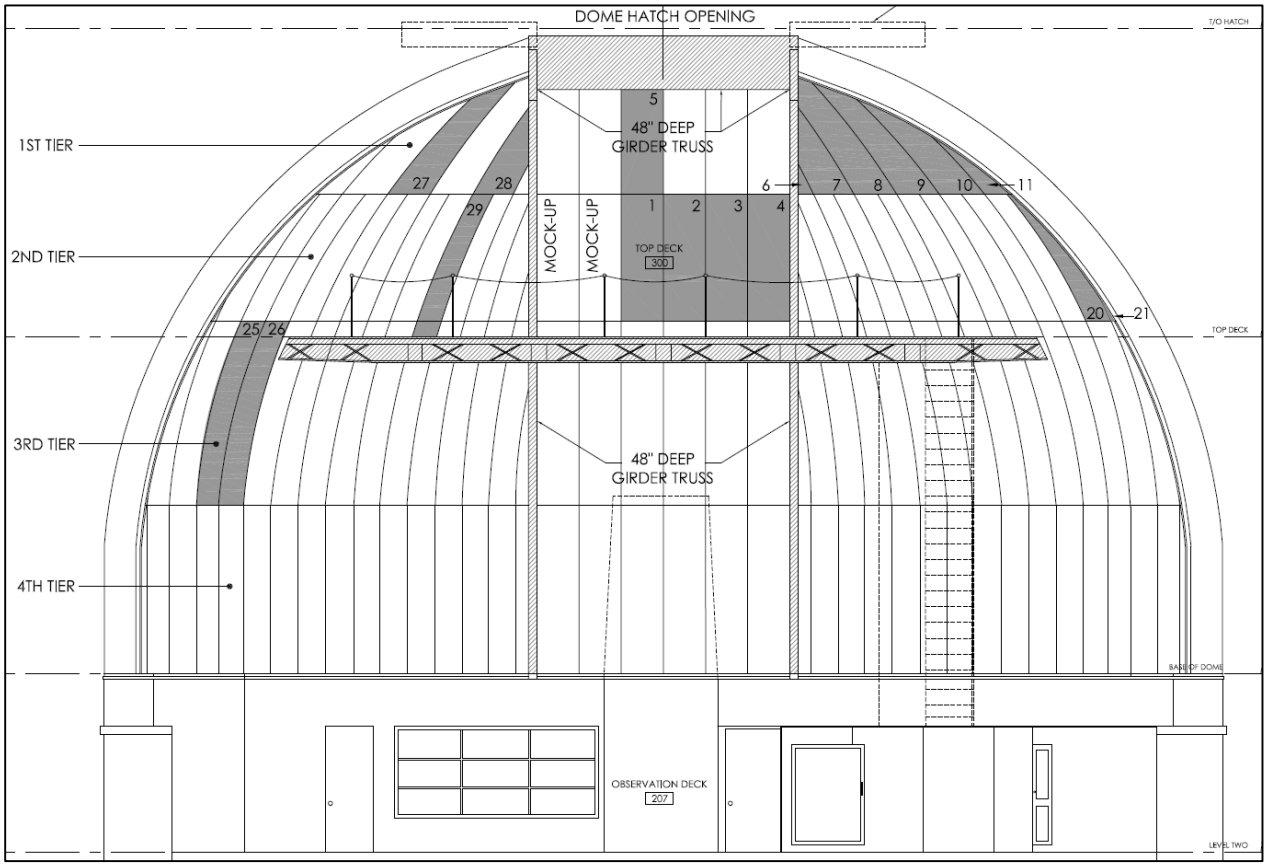


Figure 8 Location of panels to be replaced and metal components to be repainted, north portion of dome. Dark grey indicates panels to be replaced, and the hatched areas indicate metal surfaces that are to be refinished and repainted (Source: +VG Architects).

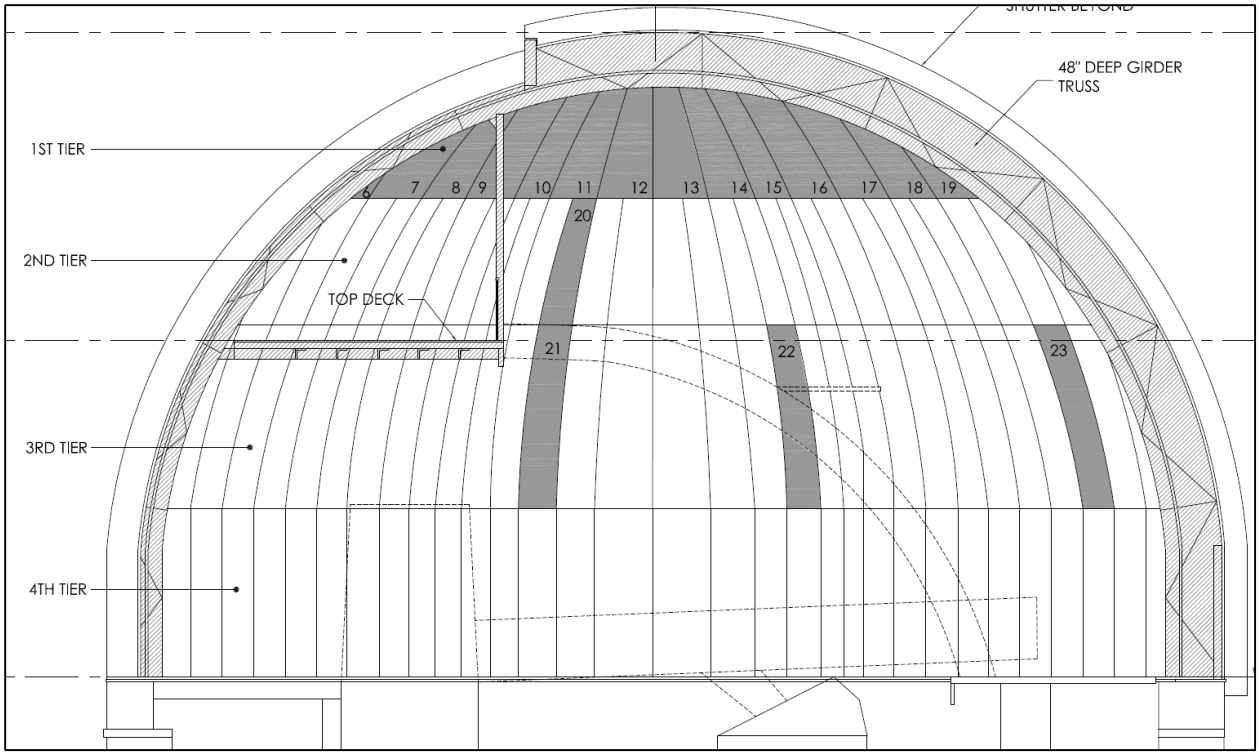
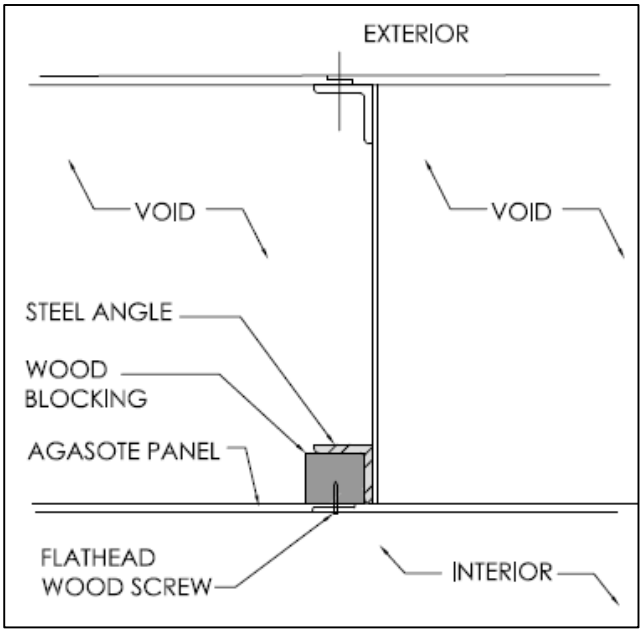


Figure 9 Location of panels to be replaced and metal components to be repainted, south portion of dome. Dark grey indicates panels to be replaced, and the hatched areas indicate metal surfaces that are to be refinished and repainted (Source: +VG Architects).



Figures 10, 11 Panel removed to show underlying wood strapping and supporting metal structure (left); illustration of how existing panels overlap and are attached to the steel girder (Source: +VG Architects).

Proposed Repairs

The areas that are being proposed to be repainted relate to the top deck and its supporting structure, as well as the components that are related to the dome's hatch opening (see Figures 8, 9, 12, and 13).

Paint, rust, and loose particles will be removed prior to the area being cleaned. The surfaces will then be patched where needed before being repainted in a colour that matches the existing paint. While all the repairs are proposed to be done onsite, the exception will be related to the top deck's guards and balustrades, which will be completely disassembled, removed, and refinished offsite before being reinstalled.

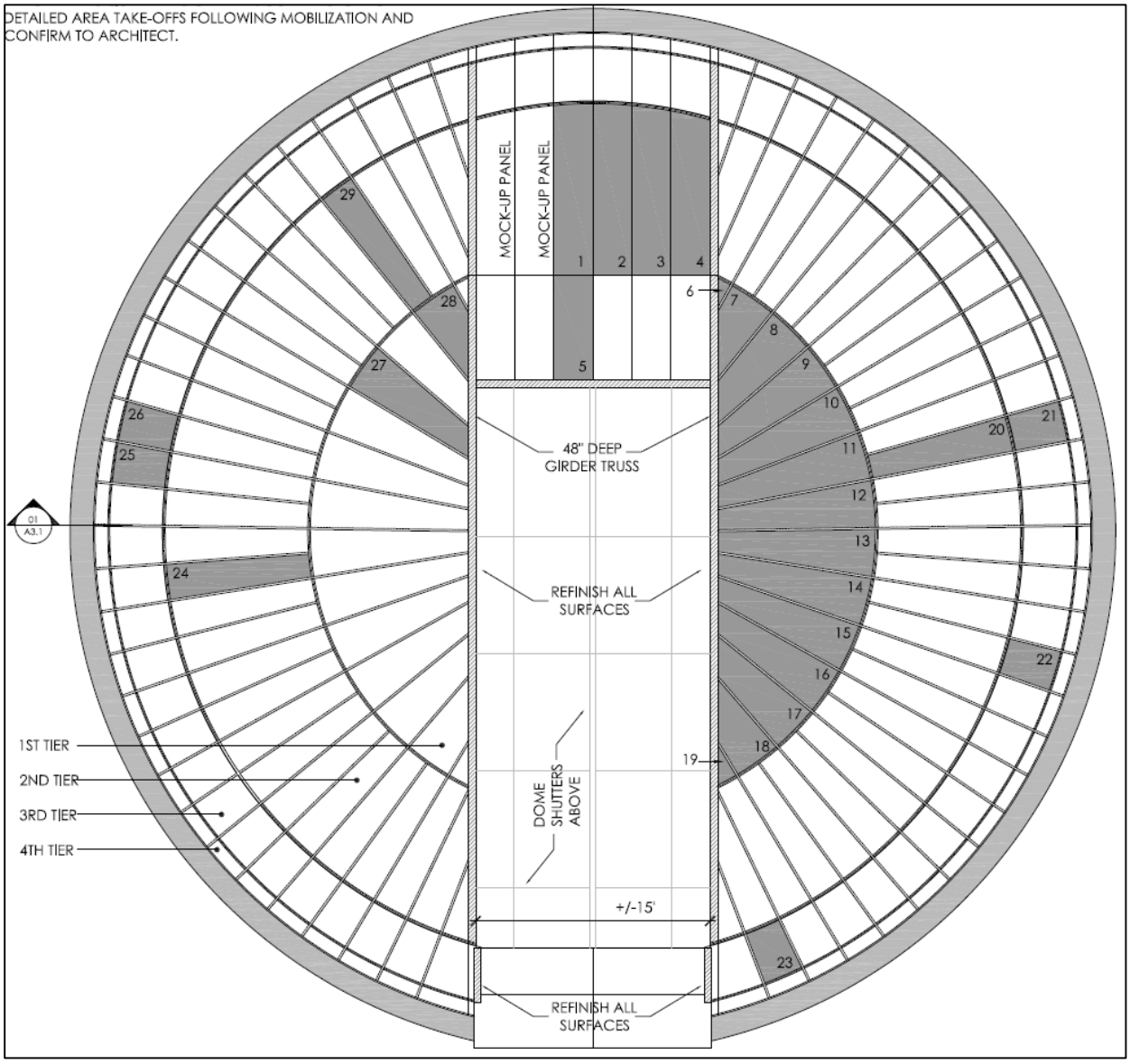


Figure 12 Location of panels to be replaced and metal components to be repainted. Dark grey indicates panels to be replaced (Source: +VG Architects).

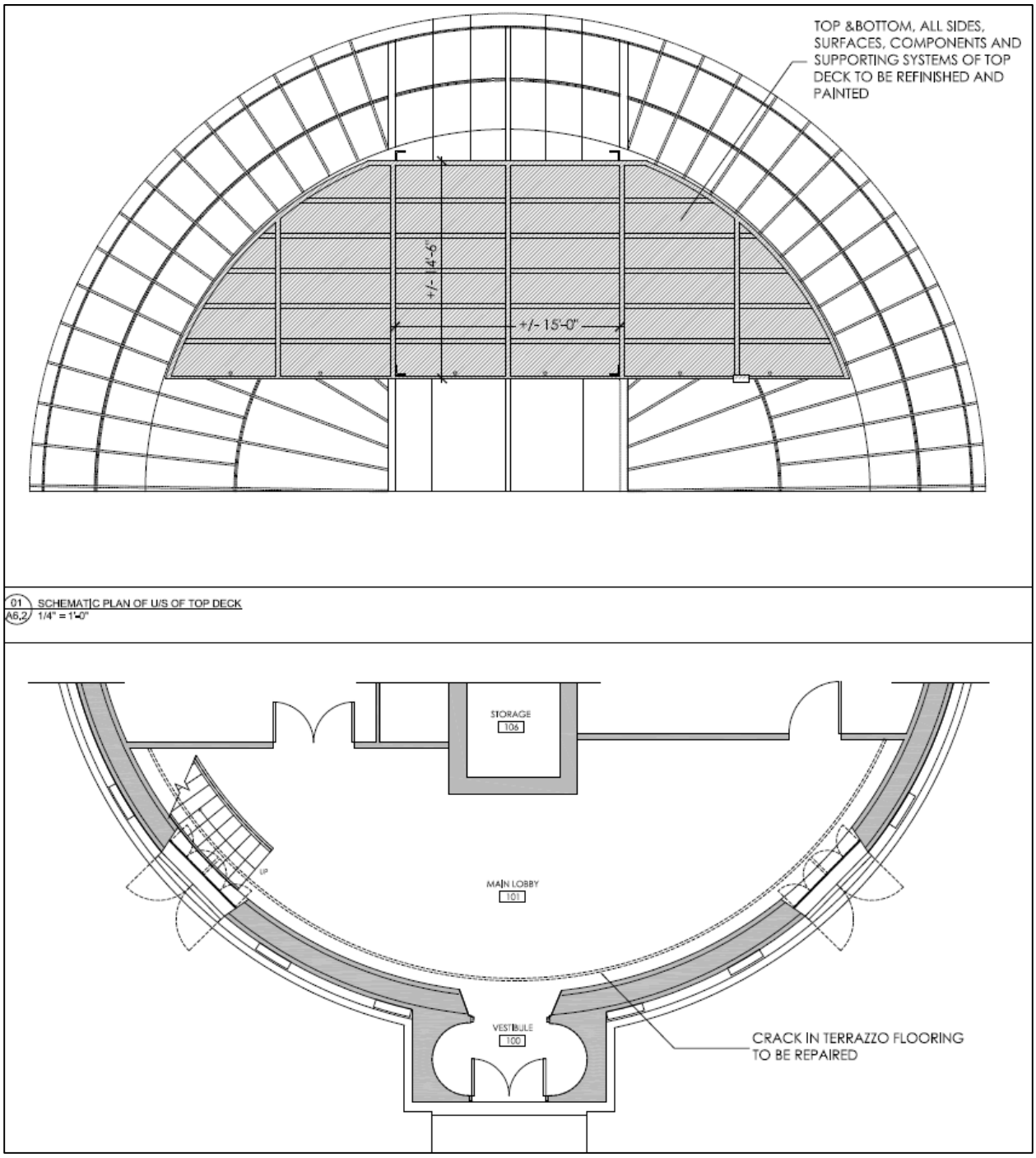


Figure 13 Areas to be repainted (top), and location of crack in terrazzo flooring (bottom). The hatched areas indicate metal surfaces that are to be refinished and repainted (Source: +VG Architects).

Terrazzo Flooring

The main floor slab of the Observatory building is reported to be slab-on grade and is disconnected from the foundation on which the building's outer structure is supported,

leaving it “floating” between the perimeter foundation and the circular central foundation on which the telescope itself rests upon.

A long crack has appeared on the terrazzo flooring that runs parallel to the exterior wall of the Observatory (see Figure 12). This crack has formed because the outer foundation and the inner “floating” slab move at different rates. As the “floating” slab moves with changing temperatures while the exterior foundation wall does not. This causes stress on the terrazzo flooring and, due to its low elasticity, has broken where the foundation and “floating” slab meet.

Proposed Repair

Damaged, spalling, and loose material within the crack and over the adjacent floor surfaces will be grinded back to a sound substrate to achieve a clean, continuous joint width and stable surface on which to adhere the repair materials. The joint will then be plugged with a temporary separation strip to maintain a consistent opening while the patching material is applied to the adjacent floor surfaces.

A terrazzo flooring cementitious mix that matches the existing flooring will then be applied to both sides of the joint and to the adjacent floor areas that require repair. The existing construction joints and patterns will be maintained where they cross the new joint and the areas that are to be repaired.

Once the flooring material has finished curing, the separation strip will be removed and the repaired areas will be grinded down to achieve a level surface, then polished. A floor sealant will then be applied.

To allow for the “floating” slab to move independently from the exterior foundation wall, a backer rod will be placed in the joint and covered with a sealant. This sealant will be of industrial strength, resistant to mildew and will be elastic enough to bend with floor movements without breaking. This sealant will be level with the adjacent floor surfaces.

Protection of Telescope While Repairs Are Being Undertaken

The utmost care will be taken to ensure that the telescope and associated elements will not be damaged during the course of the proposed repairs.

Prior to the repairs being undertaken, all surfaces that are not being repaired—including the telescope, gears, pulleys, and associated equipment—will be covered with protective, sealed enclosures. The telescope itself will be placed in a vertical position to provide maximum clearance and floor work area and a 16 foot-tall framed enclosure shall be constructed around its base, covered with canvas and sealed. The hole in the existing mirror cover will be plugged and sealed to prevent any debris from going on to the mirror. The secondary mirror, located at the top end of the telescope, will be individually covered with canvas and sealed. The remaining telescope sections and its framing will be covered by a canvas tarp, sealed and secured with ties.

Should the telescope be required to be moved, it will only be done so by qualified City staff.

Financial Implications:

There are no financial implications at this time.

Relationship to Strategic Plan 2024-2027:

The long-term conservation of significant cultural heritage resources by undertaking repairs as needed supports Pillar 1 of the 2024-2027 Strategic Plan, “Growing a Livable, Sustainable Community”; specifically, it supports Priority 3, “to build and implement a land-use planning vision and regulatory framework while conserving the city’s unique cultural heritage.”

Report Approval Details

Document Title:	SRPBS.24.087 Heritage Permit - DDO Observatory Panel Repairs.docx
Attachments:	
Final Approval Date:	Aug 15, 2024

This report and all of its attachments were approved and signed as outlined below:

Maria Flores - Aug 15, 2024 - 2:58 PM

Task assigned to Gus Galanis was completed by delegate Deborah Giannetta

Deborah Giannetta on behalf of Gus Galanis - Aug 15, 2024 - 3:40 PM

Darlene Joslin - Aug 15, 2024 - 4:32 PM