Design Development – Retaining Wall Stabilization Scope Narrative

Saint Louis Zoo – Elephant Management Facility

June 17, 2025

Overview:

This report is issued to convey the appropriate scope to stabilize the existing concrete retaining wall at the rear (south) of the Saint Louis Zoo's Elephant Management Facility.

Existing Conditions:

At the eastern end of the existing retaining wall, there are several large diagonal cracks in the concrete. The wall near the existing steel swing door is visibly out of plane, likely due to the added weight of the steel and hydrostatic pressure build-up on the retained earth side of the wall.

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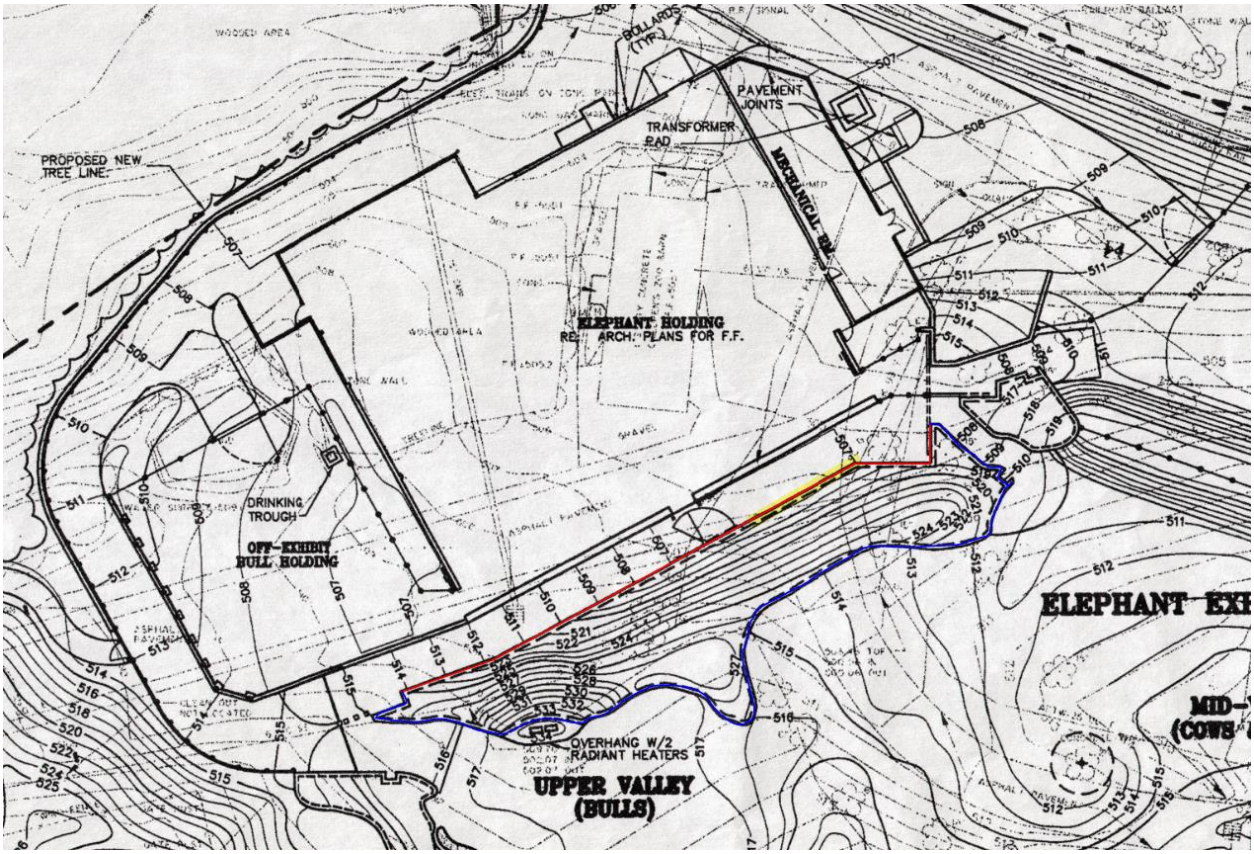
Behind / on top of this retaining wall is the public-facing Elephant exhibit. There are many plants and trees in this area, and there is another gunnite retaining wall in the elephant exhibit to the south.

Below is the existing civil drawings of this facility. The red wall below is the concrete retaining wall in need of stabilization. The highlighted yellow portion is the part that is cracking and experiencing out-of-plane movement. The blue wall is the gunnite retaining wall in the public-facing Elephant exhibit.



The distance between these two retaining walls are +/- 20’-0” at the area in need of stabilization.

Proposed Stabilization Scope:

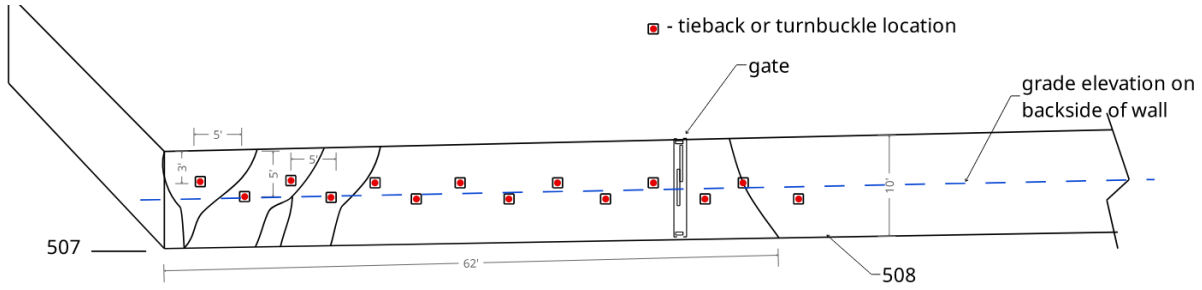
The architect and structural engineer consulted with a contractor specializing in retaining walls and the stabilization of existing retaining walls to help establish the general scope of stabilization required. Based on this input, the retaining wall is anticipated to require a minimum of fifteen (15) turnbuckle anchors of varying depths, depending on the actual configuration of the gunnite retaining wall beyond.

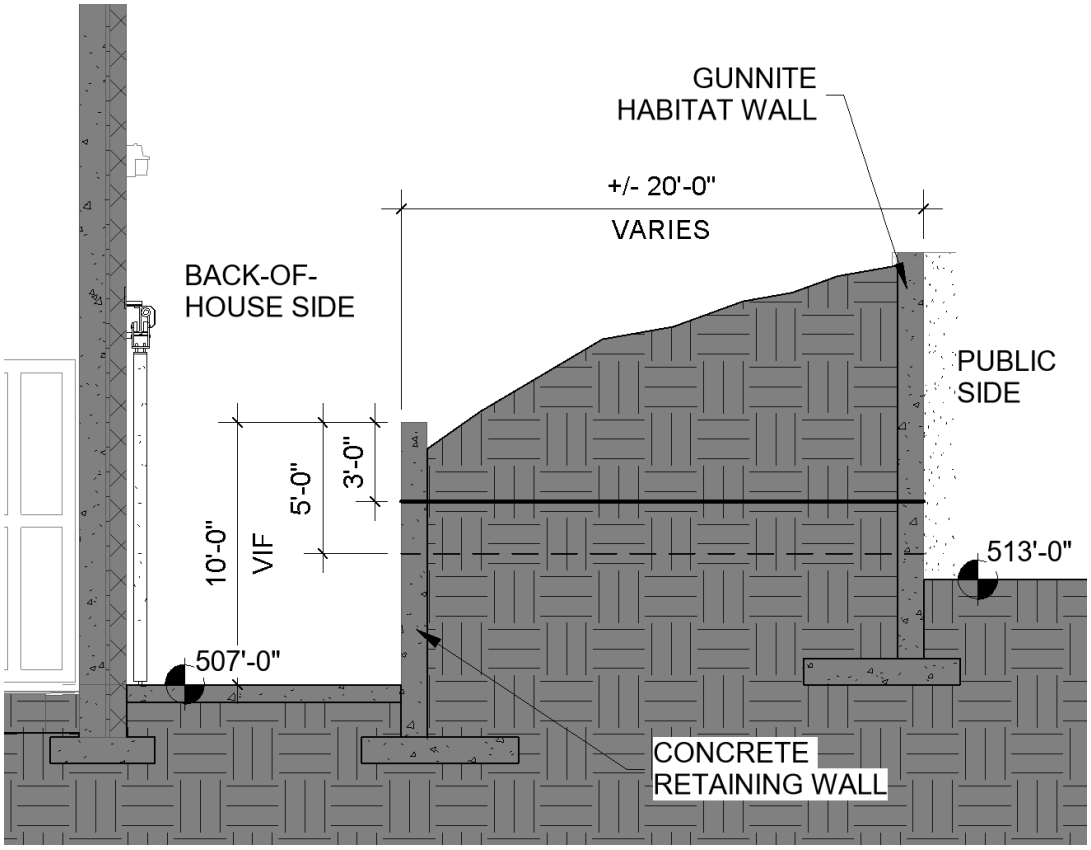
The contractor shall be responsible for providing the final engineered design and layout of the turnbuckle anchor system, including anchor spacing, embedment depths, and configuration, to meet the required stabilization performance. The conceptual configuration is illustrated in the exhibits below and consists of a staggered anchor layout, alternating between 3 feet and 5 feet from the top of the wall, spaced at 5 feet on center, and installed perpendicular to the face of the existing retaining wall. The final configuration may vary based on site conditions and contractor's design and must be submitted for review and approval by the structural engineer prior to installation. The contractor has the option to engage a geotechnical engineer to perform a soil investigation report to determine the soil conditions of the retained earth including but not limited to at-rest, active, and passive earth pressures; (saturated and dry) soil density; water table location; allowable bearing capacity; global slope stability analysis, etc. for use in the soil anchor design.

All turnbuckle anchors shall be installed from the back-of-house side of the two retaining walls. When the anchor is drilled through the earth and exits on the public-facing side of the gunnite wall, the contractor shall chip off approximately 3 inches of gunnite to allow for the installation of a minimum 12-inch by 12-inch, 1-inch-thick baseplate to tie off the turnbuckle.

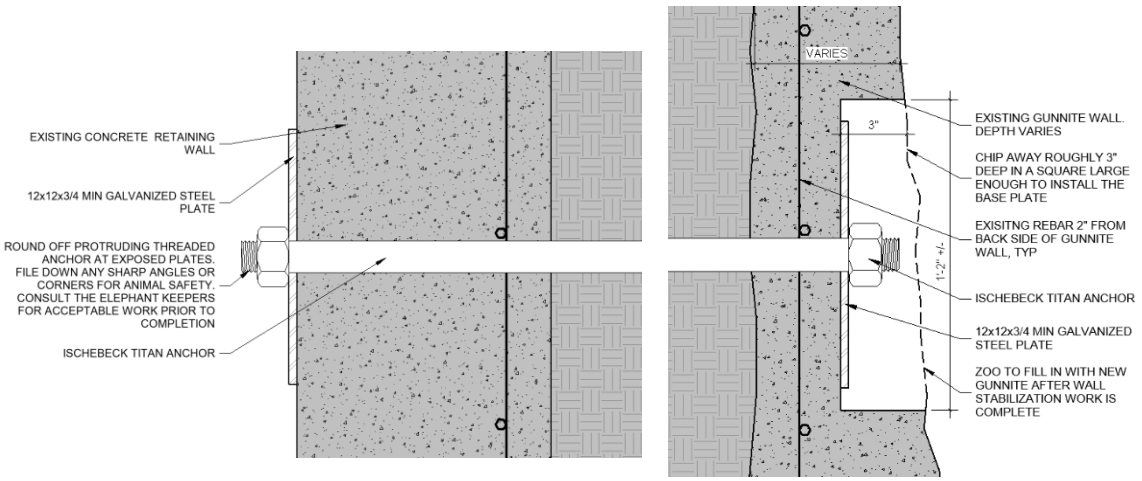
The basis of design for the stabilization anchors is Ischebeck Titan or an approved equivalent hollow-bar soil anchor system. Each anchor shall be capable of achieving an allowable load resistance of Pa = 75 kips (ultimate load resistance of Pu = 150 kips); the contractor's engineer shall verify the required anchor loading and provide design calculations accordingly. All anchors shall be designed and installed for a minimum 50-year service life and shall include corrosion protection suitable for permanent application, such as galvanization. The contractor shall furnish a product and configuration meeting or exceeding the performance requirement provided above. Any proposed substitutions or deviations from the conceptual configuration must also be submitted for review and approval by the structural engineer.

The contractor shall submit the final anchor design (including calculations), testing procedures, product data, and installation plan to the structural engineer for review and approval prior to any field work. All records of drilling depth, torque, embedment, and load testing shall be documented and submitted upon completion of anchor installation.





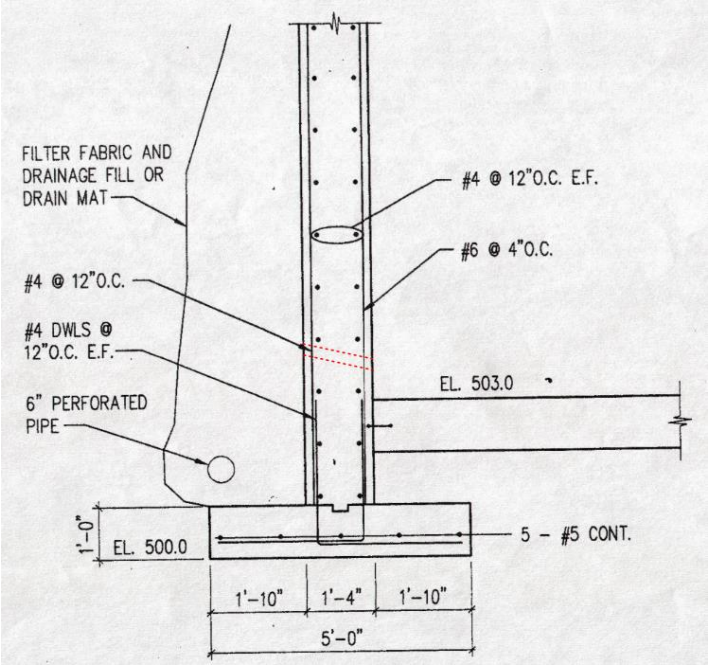
The detail below shows the desired base plate condition at the public-facing gunnite wall in the habitat. The Zoo's maintenance staff will then patch the hole over the baseplate with new gunnite and paint for a seamless finish.



Both sides of this installation will be in animal-accessible areas. Any sharp edges caused by the new work at the back-of-house side of the work, in the elephant gangway, shall be filed down for animal safety.

Proposed Scope to Relieve Hydrostatic Pressure:

The design team also noted that there are no weep holes in this existing concrete retaining wall. In order to relieve any hydrostatic pressure that may be gathering behind the wall, the contractor shall drill weep holes (min 1" in diameter) at 6'-0" oc, angling down toward the ground. These holes shall be installed 9" above the concrete floor. Weep hole shown in the photo below with red dashed lines.



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