

SPECIFICATIONS

Impact Rammed Aggregate Piers

1. Rammed Aggregate Pier Foundation support has been designed by Design/Build Geotechnical, LLC and the Geopier Foundation Company, Inc. (the Designer) who is responsible for delivering a foundation system capable of supporting the proposed loads while limiting long term building settlement to the criteria summarized in the design submittal booklet.

2. Rammed Aggregate Pier layout is the responsibility of the General Contractor. Piers shall be installed in the field within 6" of locations shown on these plans.

3. Rammed Aggregate Pier design shall be confirmed by a full-scale modulus load test performed at the site.

4. A qualified, full-time Quality Control (QC) representative provided by the Rammed Aggregate Pier installer (the Installer) shall be responsible for installation of the piers in accordance with the design, and shall report all Aggregate Pier foundation construction activities to the Designer. If authorized by the Owner, the QC representative shall coordinate QC activities with the Testing Agency hired by the Owner. Under no circumstance shall the Testing Agency direct Rammed Aggregate Pier installation procedures.

5. Rammed Aggregate Piers shall be accepted based on the following criteria unless otherwise approved in writing by the Designer:

a. Rammed Aggregate Piers shall be within 3-inches or deeper than the depths shown on the plans unless approved in writing by the Designer.

b. Average compacted lift thickness of the shaft shall be approximately 12 inches. During the mandrel removal phase of pier construction, the rate of withdrawal shall be less than the rate determined from flow testing to ensure sufficient aggregate flow to fill the resulting mandrel cavity and shall be no greater than six seconds per foot.

c. A Bottom Stabilization Performance Test (BST-P) shall be performed on the first 5 installed piers (including pre-production piers) to establish acceptance criteria for the maximum allowable deflection of the mandrel under the full-static crowd pressure. The proof test should be performed in accordance with the following guidelines:

i. A BST-P should be performed by shutting the hammer energy off at the top of the compacted base of the pier.

ii. Once the hammer energy is off and the mandrel is resting on top of the last compacted lift, static crowd pressure should be applied to the pier for a period of three minutes. The corresponding deflection of the mandrel is then noted and recorded on the Quality Control forms.

iii. Results of the Initial BST-Ps should be provided to the Designer for review and establishment of acceptance criteria and frequency of BST Proof Testing. BSTs, BST Proof testing shall be completed in accordance with the same procedures noted above for performance testing except that the full mandrel crowd pressure should be maintained for only 10 seconds. The frequency of BSTs may vary depending on the soil conditions; however, BSTs shall be performed on no less than 10% of the production piers.

d. Aggregate used by the Rammed Aggregate Pier installer for pier construction shall be pre-approved by the Designer and shall demonstrate suitable performance during modulus testing. Typical aggregate consists of Type 1 Grade B in accordance with ASTM D-1241-68, No. 57 stone washed/processed recycled concrete or other graded aggregate approved by the Designer.

6. When obstructions are encountered that cannot be removed with conventional Rammed Aggregate Pier installation equipment, the General Contractor shall be responsible for removing the obstructions. If the General Contractor does not do so in a timely manner that does not interrupt Rammed Aggregate Pier production, the installer may remove the obstruction(s) and shall be reimbursed for costs incurred, including labor, equipment and materials.

7. Rammed Aggregate Piers not meeting the requirements defined in the design and modulus test shall be reinstalled to meet project requirements unless otherwise approved in writing by the Designer.

8. Footing and ground surface elevations at footing support pier locations are the responsibility of the Contractor and shall be reported in writing to the installer's QC representative prior to installing piers.

9. Utility locations are the responsibility of the Contractor. The Designer should be notified of any conflicts with pier element locations shown on the plans.

10. Rammed Aggregate Piers are located at the intersections of grid lines or at the centerline of strip footings unless dimensioned otherwise.

11. All Rammed Aggregate Piers have a minimum nominal compacted shaft diameter of 20 inches. All piers shall be constructed to the depths and termination criteria provided in the Design Submittal unless noted otherwise on these plans or otherwise agreed upon by the Designer and the Owner's representative. Estimated shaft lengths for each pier, based on evaluation of the available subsurface information, are included in the Geopier Schedule included in the Design Submittal Booklet.

SPECIFICATIONS (Continued)

12. These drawings are based on structural drawings S.101, Foundation Plan, and G.S1.01, Parking Garage Fdn. Plan, dated February 26, 2016, prepared by Becker Structural Engineers. Foundation loads provided by Becker Structural Engineers and received via email on February 10 and 29, 2016. In the event the structural loads vary, the Designer shall be notified immediately. The Rammed Aggregate Pier Layout Plan and Details are for pier numbering, location, and layout purposes only. Footing locations, sizes, and orientations shown on these plans are for information only. Please refer to the structural plans for specific foundation dimensions and location. The Designer accepts no responsibility for location of footings shown on these plans. The Designer shall be notified immediately if information on these plans conflicts with structural or architectural drawings.

13. The Rammed Aggregate Pier Foundation design is based on the geotechnical information contained in the Geotechnical Report prepared by S.N. Cole Engineering, Inc., dated August 31, 2015. Design/Build Geotechnical, LLC and Geopier Foundation Company Inc. have relied on this information and have no reason to suspect any of the information in the report is in error. Design/Build Geotechnical, LLC and Geopier Foundation Company Inc. are not responsible for errors or omissions in the report that may affect the parameter values in our design. If the subsurface or site conditions differ from those utilized in the design, The Designer shall be notified immediately.

14. The Structural Engineer must review the foundation geometry shown on the Geopier Location Plan(s) for consistency with the structural foundation plan(s). Written confirmation that this review has been completed shall be provided to the Designer prior to the start of Geopier construction.

CONSTRUCTION NOTES

Site Preparation

1. Prior to placing structural fill on the Geopier reinforced sub-grade, the tops of Geopier elements and sub-grade soils shall be exposed and thoroughly compacted with a standard, hand-operated impact compactor or twin drum vibratory roller. Compaction shall be performed on the same day that structural fill is to be placed and shall extend over the entire sub-grade to compact any loose surface soil and loose surface pier aggregate.

2. Excavation adjacent to a completed Geopier element shall not extend below a 1H to 1V line extending downward from the nearest edge of the top of the pier without written authorization from the Designer. In the event that excavation is carried beyond these limits, as shown in the Excavation Limits Adjacent to Geopier Elements Detail, the Contractor is responsible for the remedial measures shown in the detail that may include the reconstruction of the impacted portion of the pier or placement of structural fill to the limits shown in the detail.

Fill Placement Following Geopier Construction

1. Compacted Structural Fill to be placed above Rammed Aggregate Pier support elements as noted herein shall consist of granular material placed and compacted in controlled lifts with a maximum particle size no larger than 4 to 6 inches and no greater than 50% of the loose lift thickness, compacted to 95% maximum dry density in accordance with the requirements of ASTM-D1951, and approved for support of spread footings at an allowable bearing pressure of at least the allowable foundation bearing pressure upon which the Geopier Design Submittal has been based.

CONSTRUCTION NOTES (Continued)

Concrete Footing Construction Supported by Rammed Aggregate Piers:

1. All excavations for footings supported by Geopier elements shall be prepared in the following manner by the General Contractor: Use of a smooth edge excavator bucket is required for excavation to the final footing bearing level and over excavation below the bottom of footing shall be limited to three inches unless approved in writing by the Designer. This includes limiting the teeth of excavators from over excavation beyond three inches below the footing elevation or bottom of a sub-grade protection layer as described below.

2. Whenever possible, footing concrete shall be placed the same day as footing excavations are completed. If immediate placement is not possible, then suitable protection of the prepared sub-grade soils shall be provided to prevent disturbance of the sub-grade or softening of the soils in response to ponded water. Sub-grade protection measures may consist of a three-inch thick lean mix concrete "mud mat", a 6 inch thick layer of thoroughly compacted, 3/4 in., clean crushed stone possibly placed on heavy polyethylene plastic or geotextile material, or other protection measures that may be determined by the Contractor to be appropriate. Proposed sub-grade protection alternatives, if required, shall be submitted to the Designer for approval.

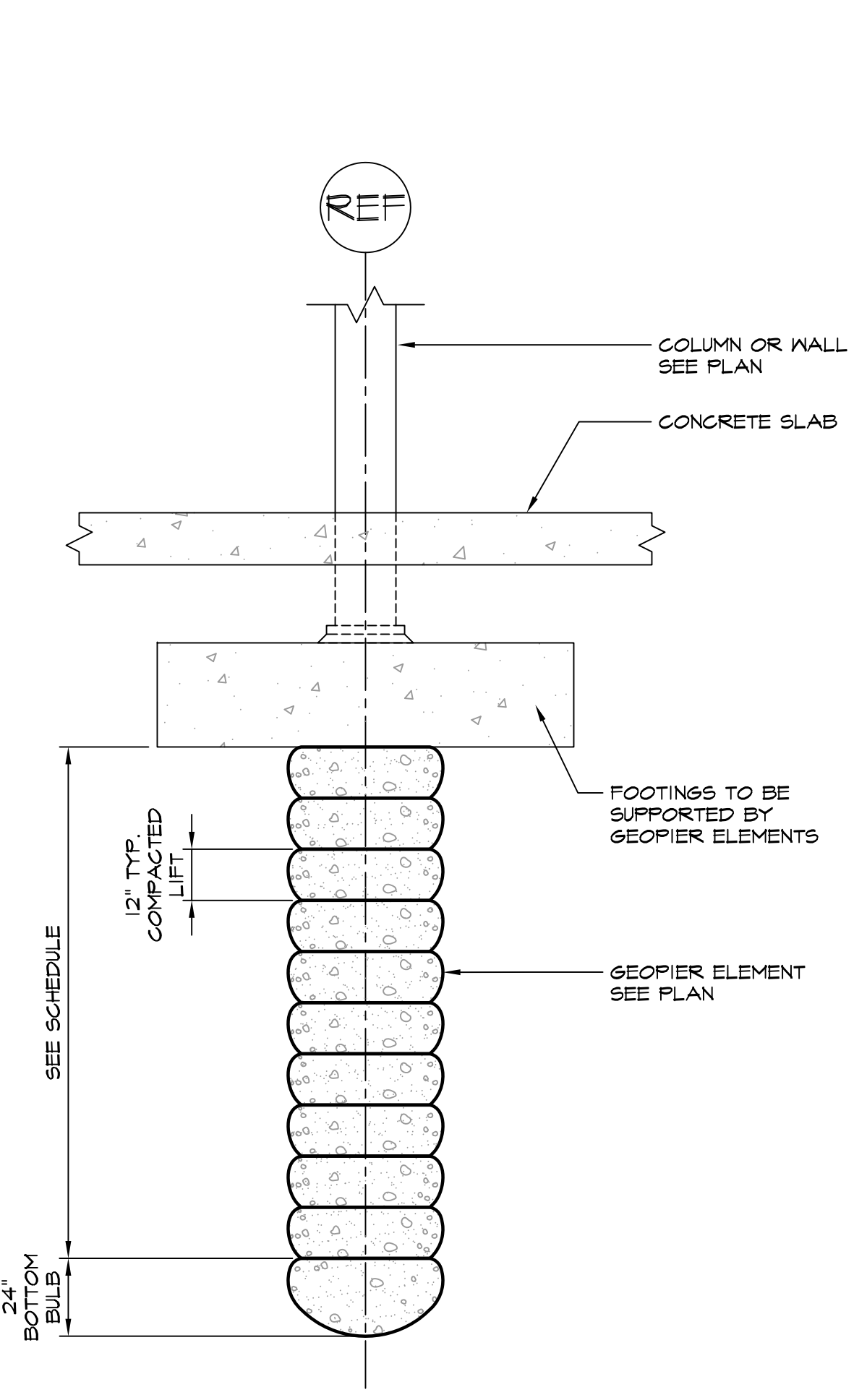
3. Prior to placing footing concrete, sub-grade protection layer, or structural fill to support footings, the exposed sub-grade soils and tops of Geopier elements shall be thoroughly compacted with a standard, hand-operated impact compactor or twin drum vibratory roller. Compaction shall be performed on the same day that footing concrete, sub-grade protection, or structural fill is to be placed and shall extend over the entire sub-grade to compact any loose surface soil and loose surface pier aggregate.

4. Water shall not be allowed to accumulate in the footing excavations prior to concrete placement.

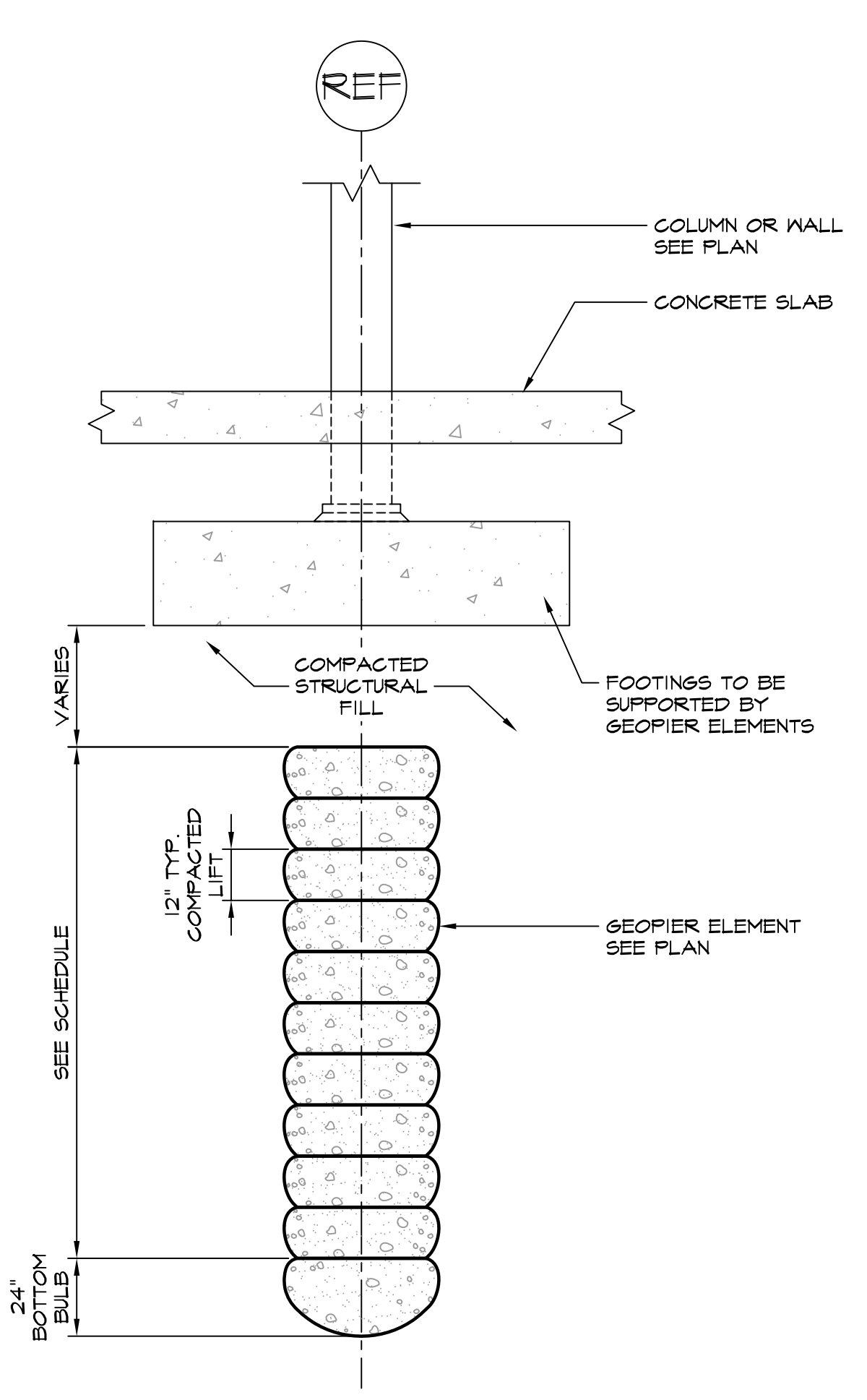
5. Excavation and surface compaction of the sub-grade at all footings shall be the responsibility of the General Contractor.

6. The Geotechnical Consultant shall observe sub-grade preparation immediately prior to placement of concrete, sub-grade protection, or structural fill on Geopier elements. The Geotechnical Consultant's evaluations shall include assessing whether or not the footing bottoms, including matrix soils and top of Geopier element tops have been over-excavated more than three inches below the bottoms of the footing or sub-grade protection layer, and have been kept free of water accumulation, and have been reasonably densified with a hand-held mechanical compactor or twin drum vibratory roller on the same day that the concrete or sub-grade protection layer was placed.

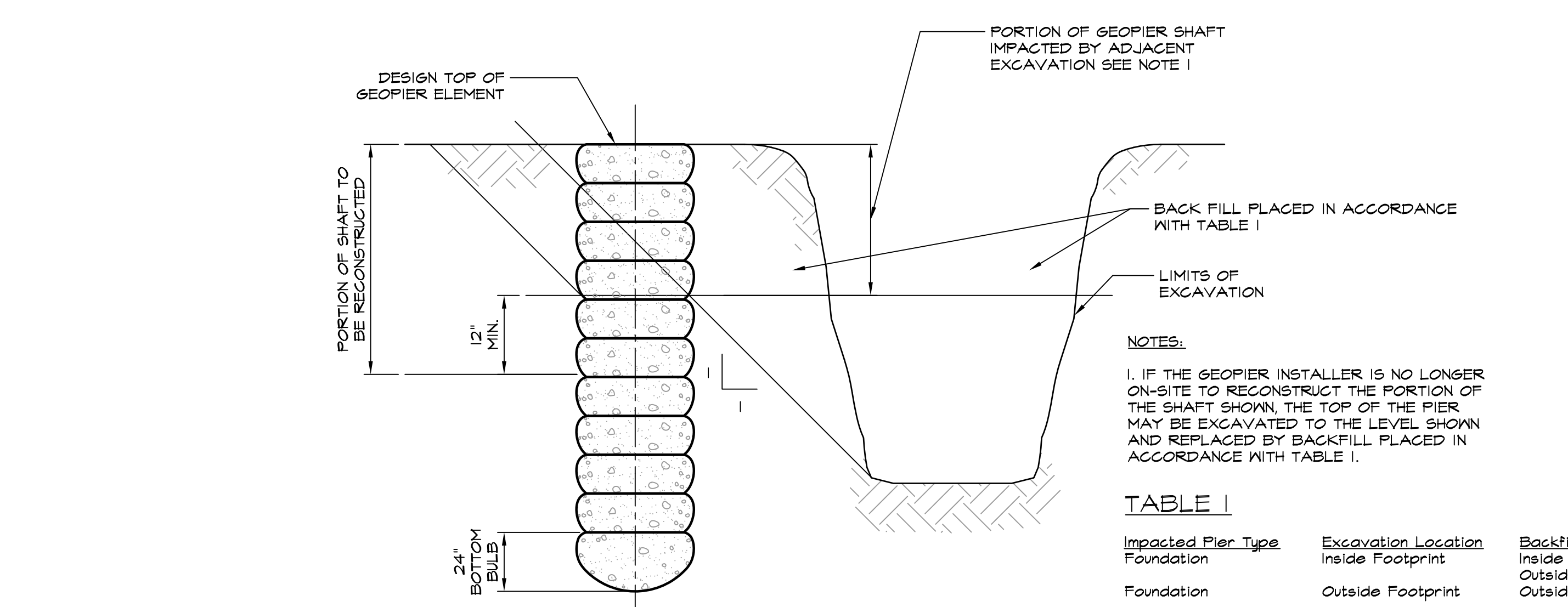
7. In the event that footing bottom preparation, as described above, is not performed or documented in accordance with this section, any written or implied warranty, with respect to Rammed Aggregate Foundation Pier foundation support performance, shall be considered void.



DETAIL 1 - TYPICAL GEOPIER ELEMENT UNDER FOOTING



DETAIL 2 - TYPICAL GEOPIER ELEMENT INDIRECT SUPPORT UNDER FOOTING



DETAIL 4 - LIMITS OF GEOPIER ELEMENT IMPACTED BY ADJACENT EXCAVATION

NOTES:
1. IF THE GEOPIER INSTALLER IS NO LONGER ON-SITE TO RECONSTRUCT THE PORTION OF THE SHAFT SHOWN, THE TOP OF THE PIER MAY BE EXCAVATED TO THE LEVEL SHOWN AND REPLACED BY BACKFILL PLACED IN ACCORDANCE WITH TABLE 1.

Impacted Pier Type	Excavation Location	Backfill Location	Backfill Type
Foundation	Inside Footprint	Inside Footprint	2
	Outside Footprint	Outside Footprint	2

1 = Compacted Structural Fill or Fill provided and placed with written authorization from the Geopier Designer.
2 = Backfill material as required by project specifications or in accordance with recommendations provided by the Owner's Geotechnical Representative.

