

TECHNICAL NOTE NO. 1.2.7

New Fill Compaction Requirements for RAP Construction

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On some jobs, Geopier Rammed Aggregate Piers (RAPs) may have to be installed through newly placed fill. Because this fill is often placed after the geotechnical investigation, it is typically not characterized in the geotechnical report. However, the quality of the fill and degree of compaction can have a significant impact on RAP performance. This Technical Note provides the minimum specifications that new fill must meet for given RAP capacities.

Typically, the material type, gradation, and compaction requirements of new fill is specified by the Geotechnical Engineer of Record (GEOR). This Technical Note is to be used in one of the following ways:

- Correlate RAP capacities to new fill material, gradation, and compaction requirements that are known;
- Or in situations where the above is not provided, state our minimum assumed new fill properties for a given RAP capacity.

In both cases, please consult with the GEOR and their recommendations for additional, potentially more stringent guidelines and please make clear that we are not assuming ownership of the new fill with respect to guidelines or QA/QC.

Introduction

There are several situations in which RAPs may be installed in new fill. These include:

- Raising site grades to a working grade elevation.
- Backfilling:
 - Behind walls or other structures where RAP elements will be installed;
 - Basements;
 - After underground obstruction removal.
- Treating expansive soils. A RAP approach in this situation is described in TN 2.1.5.

Minimum Requirements

The minimum requirements for new compacted fill material are presented in Table 1.2.7. For granular materials, the compacted new fill should have the same or less fines content as that used for RAP design. For example:

- For the left column of granular soils in replacement systems (e.g., GP3®, X1®) and SP-SM left column in displacement systems (e.g., IP®), the new fill must conform to a maximum fines content of 15 percent.
- For the middle column of granular soils in displacement systems (e.g., IP®), the new fill can have a maximum fines content as the soil classification in the table (i.e., SM, SC).

For fine-grained materials (ML and CL), the new fill must have a minimum sand content of 10 percent.

Table 1.2.7. Minimum Compaction Requirements for RAP Design

Equivalent RAP Design	Moisture Content +/-% from Optimum	Max. Lift Thickness (ft)	Min. Compaction, % ¹
1-3	3	12	90
3-4	3	12	92
4-6	3	10	94
7-9	3	10	95
10-12	2	8	95
12+	2	8	95

Note 1: Minimum compaction effort specified as defined by ASTM D1557 (Modified Proctor Test)

Additional Requirements

When RAPs are being installed through newly placed fill, please do the following:

- Request grain size distribution, modified proctor test results (ASTM D1557), and compaction test records of the newly placed fill prior to ground improvement installation.
- Consider fines content of the proposed new fill to appropriately select the ground improvement system – replacement (e.g., GP3®, X1®) or displacement (e.g., IP®).
- Do not over-specify compaction of the new fill, as it could adversely impact constructability (i.e., new fill being too dense for installation or have to pre-drill, unless pre-drilling is already considered in the project).