



Excavation for a structure includes all solid materials encountered and removed from within the limits required for the structure, including excavation for seals, girders, projections, and sub-foundation course. Examination should be made of the excavated footing area to determine the location, elevation, and dimensions are accurate; the foundation is firm with adequate bearing capacity; and it is dry, insofar as practicable, when the concrete is poured.

In examining the excavated footing area, the material encountered should be compared with the borings shown in the plans. If the material is sufficiently different, the engineer should immediately contact the region to determine if any changes in the footing should be made.

Excavation through water for substructure units necessitates the use of cofferdams. Cofferdams are required to be of sufficient size to allow adequate performance of the work, and should be constructed of such material and driven to such depth as necessary to safely protect the work and workers. Where a seal is required, the cofferdam should conform to the lateral dimensions of the seal. Cofferdams, as described in [standard spec 206.1](#), may include approved well-point systems as well as sheet piling and cribs.

The engineer should ensure that any required excavation in the vicinity of piers and abutments is completed to approximately the elevation of the upper limits of the structure excavation at these locations before grading operations are seasonally suspended.

In placing backfill about a structural unit such as an abutment or retaining wall, it is necessary the backfill be placed simultaneously on each side to avoid creating unbalanced stresses in the unit. Backfill about a structural unit, upon which an approach fill will be constructed for the support of a pavement, will require placing and compacting in a manner to ensure against detrimental settlement.

Where water is in the excavated area, satisfactory consolidation of the backfill will be difficult, if not impossible to obtain, unless the water is first removed or the backfill is placed in a manner to force the water out.

To ensure obtaining satisfactory consolidation, backfill material is placed in continuous horizontal layers of a thickness not exceeding that which can be readily and thoroughly compacted with the equipment in use, but not to exceed 8 inches thick, unless otherwise provided by the contract. Backfill may be end dumped from the structure or approach embankment if subsequently spread and placed in 8-inch horizontal layers. Backfill shall be dumped gradually rather than in one mass. Compaction should be done using approved rollers, portable tampers, or vibrators before the next layer is placed.

If structure backfill is not specified by the contract for backfill, material from structural excavation or other sources may be selected to provide the most stable backfill available. Silty materials are to be avoided whenever possible because they drain slowly, become elastic, and are difficult to compact. Clays, although often used, are inferior backfill material as they drain poorly, swell when wet, shrink as they dry out, are apt to be quite compressible, and lead to undesirable settlement. Clays and silty soils, when wet, will exert a pressure against a structure of approximately three times that of a granular soil. Layers of backfill material containing clays or silts should not exceed 6 inches in depth. Whenever it is necessary to construct backfills with clay or silty materials, the region first should be consulted for advice.

Gravels, coarse sands, and free-draining sandy soils provide good backfill material. They compact readily in confined areas and provide satisfactory load support. They are the most suitable materials to use in the presence of water in an excavation.

The following values may be used as a guide in estimating the bearing capacity of various foundation materials in non-critical situations:

Table 1 Bearing Capacity of Soils

Material	Pound per Square Foot
Alluvial Soil	100 - 200
Clays	200 - 800
Sand, Confined	200 - 800
Gravel	400 - 800
Cemented Sand and Gravel	1000 - 2000