Bulk Earthworks Specificaton

Standard Engineered Fill

Earthworks Specification for fills

Supporting Standard Detail Retaining Walls

Mirefield Development

Chartford Homes

Job No: 6533

Last edit date : May 4, 2026

By: Paul Valentine B.Eng(Hons.), C.Eng., M.I.Struct.E

Rutherford House, Warrington Road,

Birchwood, Warrington,

WA3 6ZH

Tel: 01925 945475

Contents

List of Figures

1 Introduction

1.1 Application

This report provides guidance on the provision of engineered fill as a founding soil below the standard retaining wall details presented on Structensor drawings 6533 FZP-S-DWG-B001.

These standard retaining wall details apply to retaining structures that do not form part of a building. The standard details are designed to limit the contact pressure, under the foundation, to 75kPa.

1.2 Purpose

This specification is prepared to ensure that the engineered fill provides sufficient strength and stiffness to support the foundations to the retaining walls. The specification presented in this document is essentially that of an end product specification for the fill. This method of specification has been adopted to allow each site to source a suitable fill material.

1.3 Parties

It is assumed that the engineered fill will be laid by the appointed groundworks contractor for the development. This contractor will be familiar with the adoption of an end product specification.

1.4 Formation assumptions

It is assumed that engineered fill will be placed on clean natural strata comprising sands or clays. It is assumed that the foundation for the engineered fill is a sand with an SPT in excess of 8 or a clay with a shear strength greater than 40kPa when measured with a hand vane. It

is further assumed that the groundwater will be a minimum of 1.2m below formation level for the engineered fill.

1.5 Standards

The works shall be carried out in accordance with BS6031 'Code of Practice for Earthworks' and the DOT Specification for Highway Works (SHW) Volume 1, Series 600 (Earthworks). Fill shall also comply with the NHBC Technical Recommendations detailed within Chapter 4.6 of their standards.

2 Earthworks

2.1 Unacceptable materials

Unacceptable materials shall include topsoil, peat, materials from swamps, marshes or bogs, and any material with an organic content in excess of 5%. Further unacceptable materials are timber and other perishable materials, material in a frozen condition, and clay with a liquid limit exceeding 90% or a plasticity limit greater than 30%. Materials with hazardous chemical or physical properties shall not be used. Clays with a shear strength lower than 40kPa when tested with a hand vane shall not be used.

Cohesive materials that have been excavated from within the influence of trees shall not be used as engineered fill.

2.2 Suitable materials

Suitable materials are those listed in Table 3 of NHBC Chapter 4.6 as suitable sources of fill. Typically, these will be Class 1, 2 or 6 materials as noted in Table 6/1 of SHW Volume 1. For the purpose of definition, granular fills shall be those which contain less than 10% material passing the 63 micron sieve.

2.3 Excavations

Excavations for earthworks shall not go below a temporary 45 degree line of draw from the underside of any foundations to building structure or civil engineering infrastructure. The contractor is responsible for the design of temporary works to facilitate the safe placement of fill.

2.4 Layer placement

The loose laid thickness of the fill material shall be determined by the contractor to meet the end product specification but shall not exceed 300mm. The zone of engineered fill shall extend a minimum of 1m past the toe and heel of the retaining wall foundation. Changes in fill depth shall be facilitated by benching the formation. The fill depth shall be uniform across the width of the foundation and shall not change by more than 300mm in 3m along the length of the foundation without prior agreement with Structensor.

2.5 End Product specification

The end products to be provided for granular and cohesive soils are as detailed below.

Granular fills:

Provide a soil modulus of sub-grade reaction of $10,500 kN/m^3$

Figure 1: End product specification for granular fill

Cohesive fills less than or equal to 600mm deep:

- Provide a soil modulus of sub-grade reaction of $10,500 kN/m^3$
- Provide an undrained shear strength greater than $40 kN/m^2$

Figure 2: End product specification for cohesive fill less than or equal to 600mm deep

Cohesive fills greater than 600mm deep:

- Provide a soil modulus of sub-grade reaction of $10,500 kN/m^3$
- Provide an undrained shear strength greater than $40 kN/m^2$
- Provide an insitu maximum dry density (MDD) > 90% with less than 10% air voids based on both the 2.5 kg and 4.5kg rammer in the standard Proctor compaction test to BS 1377:Part 4 Method 3.6.

Figure 3: End product specification for cohesive fill greater than 600mm deep

3 Verification

3.1 Acceptance criteria

Modulus of sub-grade reaction:

Using a 600mm diameter plate loading test:

- At a pressure of $75 kN/m^2$ demonstrate a static deflection of no more than 7mm
- At a pressure of $115 kN/m^2$ demonstrate that a static deflection of no more than 11mm is attained
- On release of $115 kN/m^2$ demonstrate that the recovery of the plate is greater than 80% of the maximum plate deflection

Figure 4: Verification of modulus of sub-grade reaction

Undrained shear strength:

Provide hand vane shear strength readings greater than $40kN/m^2$ on the surface of the layer.

Figure 5: Verification of undrained shear strength

Verification of maximum dry density and air voids:

- Determine insitu density via BS 1377:9 using the Nuclear Density Meter method calibrated in accordance with the standard
- Determine air voids from the Particle Specific Gravity method of BS 1377:2 Clause 8.
- 100% of the test locations shall pass the MDD based on the 2.5kg rammer and 90% of the tests shall pass based on the 4.5kg rammer

Figure 6: Verification of maximum dry density and air voids

3.2 Sample population

Verification tests as detailed above should be undertaken at a maximum of 20m centers along the length of the wall and should be undertaken at vertical intervals not exceeding 600mm. Testing shall always be undertaken at the formation of the foundation for the retaining wall.

4 Non-compliance

Any placed fill material failing to meet the above criteria shall either be re-compacted and re-tested or, excavated and re-laid.

5 Reporting

The description, grading and source of engineered fill shall be presented together with the test results and location of tests in a completion report to Chartford Homes. Within this report the contractor shall clearly verify that the above criteria have been met.