Annex 1 Backfill materials General information

Backfill categories

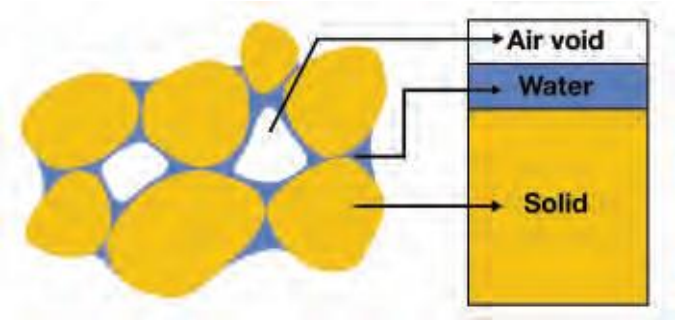
All excavated materials that meet the Specification requirements can be reused as backfill in trenches. Backfill materials are classified into five categories:

- Class A Graded granular materials
- Class B Granular materials
- Class C Cohesive/granular materials
- Class D Cohesive materials
- Class E Unacceptable materials

Ideally, the Class of backfill material should have been established before back-filling starts. Even if a material does not meet the Specification requirements, simple methods can be used to produce a material condition that is acceptable. These include removal of large lumps or foreign material, and increasing or reducing the moisture content.

Composition of backfills

All backfills are made up of three parts:



Solids – the natural soil or rock particles. The solid component of the material cannot be made much denser by compaction.

Water – coating the solid particles and filling voids. The water or moisture content of a material cannot be made denser by compacting.

Air voids – up to 20% of a loose backfill is made up of air. Compaction removes air from the loose soil, and reduces the air content to between 5 and 10%.

Annex 1 Backfill materials
General information (continued)

Moisture content

Moisture content is very important because moisture acts as a lubricant and helps compaction of backfill materials. If there is **not enough moisture**, the material:

- will not compact well
- will have a high air content
- may have high settlements

If the **moisture is correct**, the material will:

- compact well
- have high strength
- have minimum settlement

If there is too **much moisture**, the material:

- will be too wet to compact well
- will have low strength
- may not support traffic loads

Moisture content can be checked on site using the most appropriate of the simple tests. For each Class of backfill, the tests are described in the following pages.

Annex 1 Backfill materials Identification

Identifying materials

The following pages include basic descriptions of the backfill classes in the Specification. For full details, you must refer to NG5 in the Specification.

Class A: Graded Granular

Full identification of Class A on site is difficult (not possible without the help of laboratory backup). For this reason, material excavated from a trench which looks like Class A should be treated as Class B. Granular sub-base (GSB 1) or Type 1 will normally meet the Class A requirements.

Class B: Granular materials

Materials:	Can be crushed rock, sand and gravel or mixtures of these materials.
Sampling:	Select representative samples from beneath the outer surface of the stockpile or from the excavated material.
Size:	Size should generally range from fine sand up to coarse lumps of 50mm. Some 75mm lumps are allowed, but this size should be avoided if possible.
Moisture content:	**Too dry:** No sheen, and fines will be dry and dusty. **Target moisture:** Material has a dull (wet) sheen, fines stick to larger material, and no surplus water runs off the larger aggregate. **Too wet:** Fines will be saturated and water will run off the larger aggregate.
Compaction:	Treat as Granular Material in Table A8.1 (see Annex 6 of this Guide).

Too dry

Target moisture

Too wet

Annex 1 Backfill materials Identification (continued)

Class C: Cohesive/granular materials

Materials:	Can be mixtures of fine and coarse aggregates, gravel, sand, silt and clay, or mixtures of these materials.
Sampling:	Select representative samples of the excavated material.
Size:	The granular content should range from less than 5mm up to 50mm. Some 75mm lumps are allowed, but this size should be avoided if possible
Moisture content:	If the granular content of the material is more than half, check for moisture content as though it was Class B material. If the clay content of the material is more than half, check for moisture content as though it was Class D material.
Compaction:	If the granular content of the material is **less than 20% (a fifth)**, treat as Cohesive Material in Table A8.1 (see Annex 6 of this Guide). If the granular content of the material is **20% or more**, treat as Granular Material in Table A8.1 (see Annex 6 of this Guide).

Cohesive granular

Annex 1 Backfill materials Identification (continued)

Class D: Cohesive materials

Materials:	Clay, silt or mixed fine grained material.
Sampling:	Select representative samples of excavated material.
Size:	The clay must be broken into lumps of 75mm or less and particles should not all be the same size.
Moisture content:	**Too dry:** Take a sample and squeeze together in one hand. If the material crumbles and fails to stay together, it is too dry.
	Target moisture: If you can roll the material between your hands (or on the back of a shovel) to the diameter of a pencil before it starts to break up, the moisture content is in the target range.
	Too wet: When forming a ball of the material in your hand, if the material squeezes easily between your fingers, it is too wet.
	Compaction: Treat as Cohesive Material in Table A8.1 (see Annex 6 of this Guide).

Too dry

Target

Too wet

Annex 1 Backfill materials Identification (continued)

Class E: Unacceptable material

Class E materials **shall not be used** in the reinstatement.

Examples of Class E materials include:

- peat and materials from swamps, marshes or bogs
- logs, stumps or perishable materials (organic matter)
- frozen materials
- materials liable to frost heave (when placed at a depth within 450mm of the pavement surface)
- materials liable to spontaneous combustion
- materials with hazardous chemical or physical properties
- materials which do not meet the requirements for Classes A to D. Some of the materials which fail to meet the requirements of Classes A to D may be suitable for use as Alternative Reinstatement Materials (ARMs), and may be used in the reinstatement after treatment (see Appendix A9 of the Specification)

Class E materials should be stockpiled safely and separate from acceptable materials (to avoid contamination), and removed from site as soon as convenient.