SATIN Case Study - Use of Locally Won ‘As Dug’ Materials for Path Construction

Organisation Name

Paths for All

Infrastructure Location

Oatridge College, West Lothain

Date of Completion

30-Sep-2010

Context

A desire line through the woodland at Oatridge College in West Lothian provided the ideal opportunity to develop a demonstration path based on locally won 'as dug' material within a lowland setting.

The design and construction of lowland paths has traditionally used quarried stone that is transported on to the site, whereas upland paths have traditionally sourced and used locally won 'as dug' material from borrow pits adjacent to the path. The latter provides a more sustainable means of path construction. The aim of this demonstration path was to show whether or not this was a viable proposition in this particular location.

The existing route formed part of a short loop through woodland at Oatridge College.

Mainly used by local residents, staff, and students at the college, it cuts across the side of a steep slope which was muddy and slippery underfoot.

The aim of this demonstration path was to re-align the route to make it more accessible, improve the surface by constructing a new bench cut path and surfacing it using locally won 'as dug' material from borrow pits.

The path is remote from nearby roads and gaining access to it involves crossing a narrow pedestrian bridge. In the first instance, the use of locally won 'as dug' material was therefore considered to be a potential sustainable solution for this path.

The path crosses through mixed deciduous woodland on a steep sided slope, running in a generally East to West direction following the line of the Ecclesmachan Burn. At the eastern end of the path, the burn is crossed by a new timber bridge and rises gently through the woodland from this point. At the western end, the burn is crossed again by another new steel and timber bridge.

Technical Aspects

Phase 1

The 'as dug' path was constructed in 2008. It consisted of a 1.0m wide bench cut path through the woodland, with a total length of 320m. The initial work was to locate 'borrow pits' beside the path and to check if the material from those pits was suitable to use as path surfacing. The contractor advised that the shale material was unsuitable as it would retain water when wet. However, it was decided to continue using the material as it was a demonstration project aiming to illustrate the suitability of materials for path construction.

A bench was cut through the woodland using a 3 ton tracked excavator. The ground was steep and it was therefore difficult to undertake this 'cut and fill' technique. A ditch was constructed for approximately 30 metres alongside the eastern section of the path to catch surface water seepage from the slope, but the remaining length of path has no ditch. The path was constructed with a cross fall and as it was only 1metre wide, was considered to be narrow enough to shed the water off the surface quickly.

The path was constructed in sections from the eastern bridge. Each section was completed as far as the next borrow pit, and then excavation and surfacing commenced again on the next section. In total 3 borrow pits were dug. Initially the won material from the borrow pits was graded into a tracked power barrow. However, the shale material going through the 40mm size grading grid was of poor quality as there was too much clay. As the grading did not work, the contractor used the 'as dug' material without grading. After laying the 'as dug' material, it was compacted using a wacker plate.

Phase 2

As a result of poor condition of the original 'as dug' path (see outcomes below), it was therefore decided to import recycled and quarried materials to upgrade the path and to make it fit for purpose. This path maintenance work was carried out in 2010.

A full tray was first excavated to 100mm depth from west to east, so, effectively, the majority of the poor quality 'as dug' material was removed. The excavated material was landscaped into the fill slope, below the path.

Recycled Type 1 granular sub base was laid on geotextile from the eastern bridge to the western end in order to allow a tracked power barrow to travel along the tray without causing damage to the trays base.

Further recycled Type 1 granular sub base was laid to form 100mm thick sub base layer with a cross fall, level with the adjacent ground. The sub base layer was compacted with a wacker plate.

25mm depth of quarried whin dust was then laid from west to east, and again, compacted with a wacker plate.

Outcomes

Phase 1

The resulting path was satisfactory in dry conditions, but not when it was wet as it became muddy, slippery and therefore hazardous. A lack of granular material in the shale material meant that it did not bind together well, and was not robust enough after rain.

The condition of the original 'as dug' path after drying out.

Phase 2

The resulting path is now dry underfoot and forms a very pleasant walk and ride through the woodland.

The condition of the new 'Type 1 and dust' path on top of the original benched route.

Financing

Phase 1

'As dug' path construction including the bench formation works was £23 per linear metre.

Phase 2

Recycled Type 1 sub base and quarried whin dust path construction was £26 per linear metre.

Both phases of path construction work were funded by Scottish Natural Heritage as part of wider national path demonstration site project.

Evaluation

The 'as dug' material used on upland path contracts is rarely tested to make sure it conforms with the relevant British Standard, but quarried or recycled materials are almost always tested. Normally, trial pits are dug to establish where 'as dug' material can be found and whether it will be suitable or not. This assessment is done by experienced contractors who are used to working in this way.

In lowland path situations where 'as dug' material can be extremely variable, a similar approach could be employed of digging trial pits to examine the material. If it expected that the 'as dug' material may be suitable to surface a path, then it can be graded through a 6mm size grading grid to produce a more suitable surfacing material, that will bind and interlock together to form a durable path surface.

A simple way of 'testing' the material's suitability is to compact it in a container with a hammer and then see how scraping with a sharp-ended tool - e.g. screwdriver and pouring on water can affect it. Testing the material in a laboratory can be expensive and unnecessary if an experienced designer or contractor is used.

To find out how to carry out an easy-to-perform test on a potential surfacing material click on this link: Testing the suitability of surfacing materials.

Key Learning Points

1. Before a contract starts, trial pits should be dug adjacent to a path to establish whether or not 'as dug' material will be suitable for path surfacing;
2. Material testing should be considered on site using the method detailed above;
3. Grade 'as dug' material to produce granular material using a maximum 40mm size grading grid for the path's sub base and a 6mm size grading grid for the path's surfacing, or by hiring in 'Viper Mini Sizer Screen', or similar, with same sized grading grids;
4. After testing is carried out, if the 'as dug' material is not suitable due to poor compaction, displacement and erosion properties, or local geological conditions, then think about using other types of locally sourced material to build the path. First, consider a recycled material, and if not available use a quarried material;
5. A competent designer or contractor will be able to advise on the suitability of 'as dug' material – listen to their advice, it could save you money in the long term.

Contact Details

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