

SATIN Case Study Clyde Walkway - Use of Smart Surface® Soil Stabilisation Technique



Background

The Clyde Walkway is a 65km/40mile route from Glasgow City Centre to the World Heritage Site of New Lanark. It passes through some spectacular scenery and many interesting and important sites which offer insights into the rich cultural, natural and industrial heritage of the Clyde Valley.



Access to this now upgraded section of the Clyde Walkway is typically from Station Road in Blantyre, near the David Livingstone Centre. This visitor attraction is owned and operated by the National Trust for Scotland and it remains a popular attraction for many visitors to the area. Free public carparking is available within the grounds which further facilitates easy and direct access to the Clyde Walkway. Optional access points are located along the route and include paths off Caskie Drive, Rosebank Avenue and John Street.



Part of the route had been subject to past improvement works however the condition of the path surface had deteriorated considerably over those years with significant areas of mud, water erosion, encroaching vegetation and decayed timber edging. Nevertheless, the path remained a popular recreational and active travel asset for the community including pupils travelling to/from school, cyclists, dog walkers and visitors to the area.



Technical Detail

The Ecofast™ Ecoproactive™ soil stabilisation process (currently marketed by Mackenzie Construction Ltd. as '[Smart Surface®](#)') was first used in Scotland by Paths for All to rejuvenate a section of path on the [National Path Demonstration Site](#) at Oatridge College, West Lothian. That work was undertaken in early 2016 and they were impressed by how well the material had performed and how the surface integrity had been maintained throughout the intervening period.



The ability to limit importation of quarried aggregate material, by utilising existing path substrate, was an important consideration in choosing this material however the client and funder were also looking to maximise value for money whilst ensuring that any finished surface was 'fit for purpose' for many years to come. Steep gradients that couldn't be re-routed or stepped, future surface damage from unauthorised motorbikes and restricted resources for ongoing maintenance meant that more traditional path surfacing materials e.g. whin dust would not have provided as effective or durable a solution and tarmac was not an option due to high cost and poor landscape fit.



As previously noted, this section of the Clyde Walkway had been subject to previous improvement works; thought to be around the late 1980's or early 1990's. These works included the construction of a typical 2m wide timber edged Type1/whin dust path throughout the section leading from Station Road to John Street, a length of some 820m, with the remaining 0.5km having had no evidence of any past route improvement works. With nearly 30 years since these works were undertaken, the surface condition had deteriorated considerably and there were notable sections of path which had accumulated surface mud, encroaching verges and surface damage from water erosion.



Construction Phase

For the Ecoproactive™ hydraulic powder to be effective, it requires to be thoroughly mixed within a suitable base substrate material which was, in this case, a very worn and contaminated Type 1 path with significant sections of railway ash to the western half of the route.



Mixing of Ecoproactive powder into base material

Construction typically begins with any surface vegetation being scraped off, to the required width, and arisings landscaped across the adjacent ground. The exposed base is then thoroughly rotovated to a minimum depth of 100mm using specialist equipment shown in the photos. This process ensured that the substrate material is suitably mixed and that any larger aggregate/soil material is crushed to not greater than 40mm in diameter. Ecoproactive™ latent hydraulic powder was then applied to the surface, at an application rate of 7%, before being fully mixed into the prepared base material using the same multi-pass rotovation process. The resultant mixed material is hand raked to required crossfall and compacted to refusal using a typical Type 120 ride-on roller, or larger where space allows. Small quantities of mixed aggregate/Ecoproactive™ were hand dry batched as infill to a flight of sleeper steps (see over).



Sleeper steps infilled with Smart Surface®

With Ecoproactive™ being an hydraulically activated powder, it is necessary to carefully monitor moisture content through the compaction process. The exceptionally dry conditions experienced throughout this construction phase required the application of water to the surface of the mixed and graded base; by means of a power washer which allowed the water to be 'misted' across the surface area rather than soaked using a hose. Where higher levels of ground moisture are present, the additional application of water may not be required.



Completed path with 6mm grit applied and side ditch

Construction Phase (contd.)

To aid the surface finish/aesthetics, a layer of 6mm grit was applied directly to the surface at the time of compaction. This grit can be any colour however it was decided to apply one that was grey in colour to simulate the very familiar whin dust path surface whilst also providing a uniform finish throughout the full route and adding an anti-slip element; something that was of particular value on the steeper gradients.

Whilst the finished path is now impervious to water, and highly durable, an element of open drainage was designed into the project to help keep water off the surface, something that will be beneficial during colder months where water seeping onto the path from adjacent embankments can freeze and make the route treacherous or impassable.

One of the most attractive and sustainable features of this product is the ability to rejuvenate existing paths without the need to import aggregate however it cannot always be guaranteed and this project did require the importation of approx. 1/3 the quantity of aggregate normally expected for a more traditional path build. This was largely a result of having to add some volume and height to the finished base level due to variable substrate quality and excessive crossfall gradients (1:50/2%) which could not be made up by any other means. This was achieved using quarried 20mm scalplings.



Completed path with 6mm grit applied and side ditch

Project Outputs/ Outcomes

The completed works extended to the upgrade of over 1.3km of path, at an average width of 2m. Alongside this, 780m of open drainage channel was installed with 8no. piped culverts to divert collected water under the path at key locations; 5no. new directional signs were erected; 39m of timber ramped steps constructed and 125m of ramped path re-opened to allow path users to by-pass the ramped steps.

FAQ's:

What is the active ingredient, Ecoproactive®?

- Ecoproactive® is an inorganic latent hydraulic binder for soil stabilisation applications and pavement layers.

Performance under freeze/thaw conditions?

- The stabilised material performs well under freeze/thaw conditions, achieving a strength greater than N/mm². It is therefore not deemed to be susceptible to frost heave. This applies even if the constituent parts of the stabilised material may themselves be frost susceptible.

Application parameters e.g. temp, moisture (from rain and within ground)?

- Application is not advised where the temperature is 1°C and falling. Ideal conditions would be 5°C and rising.
- A pre-application laboratory test (Proctor Test – the optimal moisture content at which any given material will become most dense and achieve its maximum dry density) will calculate the MDD (maximum dry density), NMC (natural moisture content) and OMC (optimum moisture content); providing the target figures for the application. To achieve optimum compaction results, an OMC plus 1% is advisable; making additional allowance for some evaporation that will occur when working with the stabilised material and compacting to desired falls/surface profile

Indicative cost per square metre for Ecoproactive®?

- Not unusually, this will vary on a site per site basis and will fluctuate due to access restrictions, type and size of plant, site security requirements, suitability of existing route/path material, requirement for importation of stone to add volume (typically 20mm scalplings), percentage of Ecoproactive® powder required and surface application e.g. 6mm grit (if any). MacKenzie Construction Ltd. are continually developing procedures that will refine and reduce the output cost within a wider range of application.

Ease of application of product to small areas (e.g. <50sqm)?

- Ecoproactive® is typically not designed for this type of application. That said, it is possible to dry batch clean stone with the Ecoproactive® powder; akin to more traditional patching repair work. This process of dry batching limited quantities is being undertaken on the Clyde River Walkway to infill treads on some newly constructed ramped timber sleeper steps.

FAQ's (contd.):

What is the moisture content/absorbency/porosity of the material?

Refer to Proctor test below:

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|-------------------------------------|------------------------------------|
| • Rapid Absorption Test | 24 hours less than 1% |
| • Rapid Absorption Test | 48 hours less than 1.5% |
| • Rapid Absorption Test | 72 hours less than 1.75% |
| • Capillary Absorption Test 7 days | less than 0.3mg/square millimetre |
| • Capillary Absorption Test 28 days | less than 0.50mg/square millimetre |
| • Permeability | 1.45 x 10 ⁻⁹ |

How suitable is it for the application of surface layers or coatings?

- Suitable size for further finish application of 10mm bituminous macadam, spray and chip application. HRA sand carpet finish all with application of tack coat of bituminous emulsion before applications.

Strength of path edges?

- Paths typically need a wider base layer to protect the surface layer from breaking along the edges so how does this material perform without that formed base layer?
- Ecoproactive[®] stabilisation process does not preclude the use of sound engineering principals. It needs to have minimum 150mm overlap for compaction purposes or the edge will roll away and you will not meet profile requirements for wearing course applications if no side restraining i.e. kerb or timber edging in place. If used as a base course or a sub base the material will be held in position by the adjoining material bed.

Will pernicious weeds penetrate this material and will weed growth impact on edge stability?

- If properly compacted to 100% MDD, there will be no opportunity for organic intrusions as there will be no air voids, or moisture, available for plant growth.

Life expectancy of the material/path under normal conditions?

- Under normal path user conditions, the application will have an expected lifespan of 20+ years

For more information, please contact:

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