insulation
that exceeds
expectation

sb
expanded
polystyrene

Product Handbook
Civil Engineering

S and B Fill

The development and use of expanded polystyrene [EPS] in civil engineering is evolving dramatically and is now seen as a viable alternative to traditional fill materials in the construction of road and rail embankments, abutments and backfill, that can cause unacceptable horizontal or vertical stresses in the underlying soil or against the structure.

Using S and B fill expanded polystyrene offers a reliable cost effective lightweight material solution to these problems thus reducing the probability of unacceptable lateral forces and further settlement coupled with the simplification of construction methods.

EPS has a proven track record as a fill material and has been used in the construction of embankments since the 1970s offering the benefits of removing the need to employ specialised foundations, long surcharge periods and reduce settlement problems after construction.

6

The waste EPS produced during manufacture is reground and recycled back into the manufacturing process. Any additional waste can be easily recycled or used in a variety of products.

SC 010/09

No: 02/3943

All civil engineering materials are supplied with a certificate of conformity to standard BSEN 14933:2007.

To meet this challenge S and B EPS Ltd manufacture lightweight structural void forming blocks and profile cut shapes, specifically designed for civil engineering applications that are available in a wide range of sizes and densities, with a high strength-to-weight ratio enabling them to withstand mechanical loads encountered.

Grades

S and B fill is manufactured in the grades shown in the specification data at the back of this guide and is normally supplied as F grade material, but can also be offered in E grade that contains a fire retardant additive, with both types conforming to BSEN 14933:2007.

Dimensions

S and B Fill standard blocks are 2440 x 1220 x 640mm [nominal size] with other sizes being available to alleviate the need for cutting on site [details on request].

Applications

S and B Fill is suitable for use assisting in areas of unstable ground, weak or compressible soil, areas adjacent to existing embankments, bridge construction and areas with difficult and restricted access.

Advantages

S and B fill is a lightweight and easy to handle material with a high compressive strength and around a 1% weight ratio to traditional fill materials.

Its closed-cell structure inhibits water absorption and it is unaffected by the normal range of climatic conditions.

S and B fill is available in a wide range of densities offering bespoke solutions for individual projects.

S and B Fill is both CFC [chlorofluorocarbons] and HCFC [hydrochlorofluorocarbons] free with none of these ozone depleting components being emitted whilst it is the manufacturing process or in situ.

S and B Fill is easily cut and can be shaped to the clients individual requirements using the latest CNC cutting technology.

HA & HB Loadings [BS 5400 Part 2]

The first standard for vehicle loads for roads and bridges was introduced in 1922 with further amendments in 1923 and 1937, with the introduction of HA loadings in 1945 and HB loadings in 1954 respectively, with the concept of notional lanes for the application of the HA and HB loadings being retained and expanded to cover up to six traffic lanes.

Full HA loading was to be applied to two notional lanes with one third HA applied to the rest.

The application of HB loadings changed slightly from the BS 153 requirements, in that the HB vehicle was no longer assumed to have sole occupancy of a lane, but HA loading could also be applied to the lane within 25m from the front of the HB vehicle and 25m behind the vehicle.

Calculations for HA and HB loadings as defined in BS 5400 Part 2 should be carried out to ensure that the correct grade of S and B fill is used in order that it complies within the design compressive strength of the material.

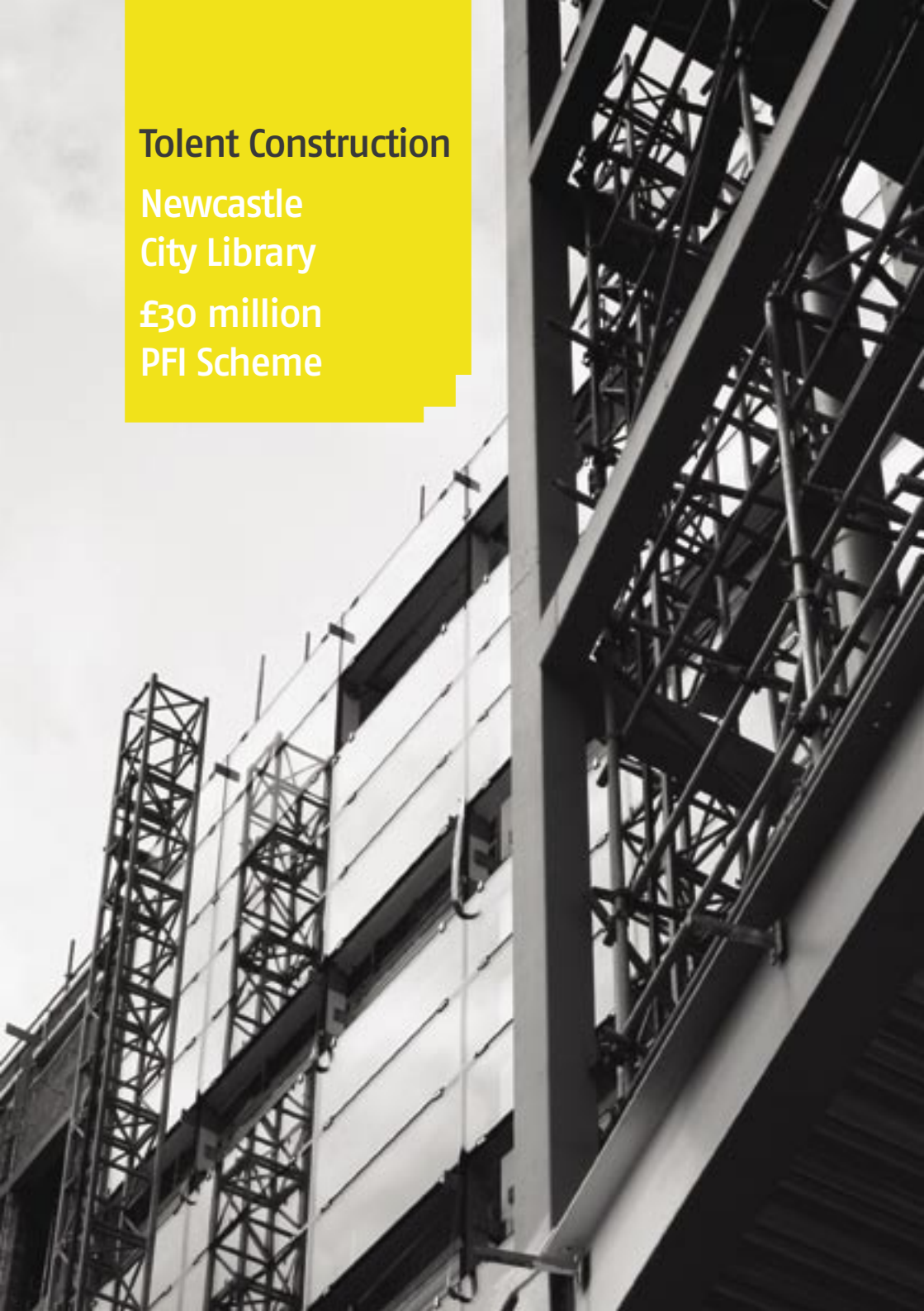
Installation

Details of the correct procedures in the laying, cutting, protection and capping layer of S and B fill are available and where appropriate, a design and drawing layout of an individual project will be supplied.

Tolent Construction

Newcastle City Library

£30 million PFI Scheme



Case study notes for the use of expanded polystyrene structural void formers.

900 cubic metres of S and B Fill 45 EPS were used as light weight structural void formers in the construction of the new Newcastle City Library foundations.

Grids of heavily reinforced foundation cages were built up from a concrete blinded base with the blocks of EPS packed tightly between them. Structural voids typically 10m x 6m x 1.5m deep were formed, against which the foundation concrete was poured. The area was then capped off with a structural concrete floor slab.

Several different schemes were considered for the foundations but it was felt that using EPS would give a number of advantages:

- It simplified the slab DPM tanking details.
- Tanking could be progressed earlier and independently of other construction activities.
- Reinforcement cages could be progressed earlier with improved outputs due to the improved access.
- Reinforcement was kept clean, as there was no interface with granular materials.
- Casting structural concrete against the face of accurately cut blocks of EPS eliminated the need for formwork and afforded minimal wastage.
- The logistics of bringing bulky fill materials on to a tight inner city site were eased and the plant and time that would have been required to place traditional granular fill materials were reduced.

Other benefits were the elimination of fill settlement, improved under floor insulation values and the use of 100% recyclable product assisted in compliance with the Waste Resource Action Plan.

By using expanded polystyrene blocks as lightweight structural void formers within the foundation scheme, the project achieved significant buildability, programme and cost benefits.

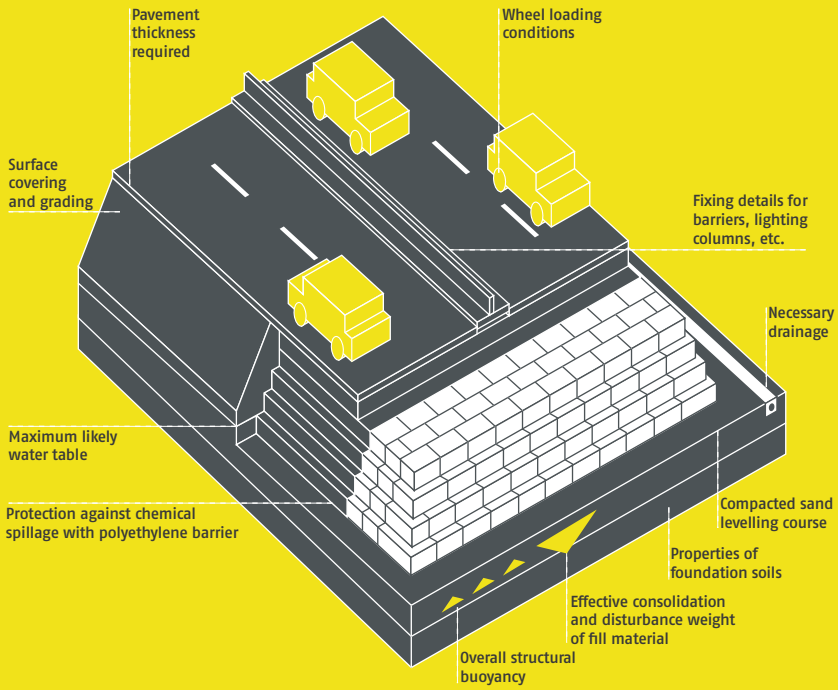
Road Construction

With its high strength-to-weight ratio and ability to withstand mechanical loads, S and B fill can assist in reducing the pressure on soils when taking into account the high unacceptable loadings that can be present, whilst offering a proven economical alternative to piled construction.

Road Widening

S and B fill offers a cost effective lightweight solution that takes away the problem of unacceptable stresses encountered when using traditional fill materials and reduces the probability of settlement.

Road Construction Considerations

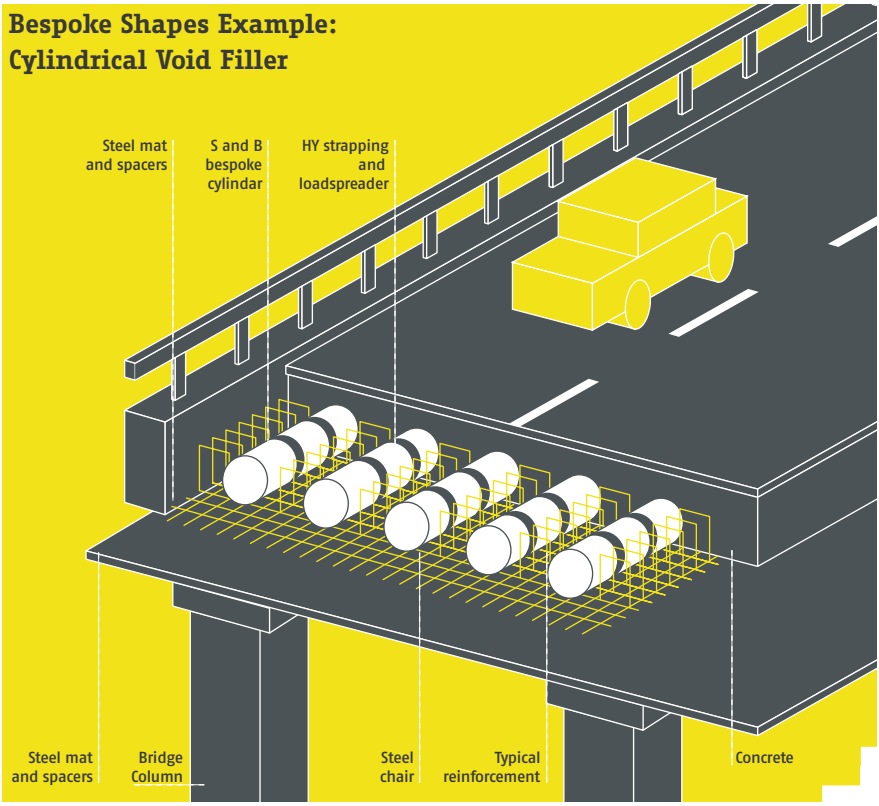


Noise Bunds / Landscaping

S and B fill offers a fast cost effective method of building noise bunds to eliminate sound transfer by means of erecting a barrier between road traffic noise and housing, whilst offering the advantage of a 1% weight ratio to that of traditional materials.

S and B fill when used in landscaping, with its high strength-to-weight ratio, can elevate the pressures on underlying structures and services in both soft and hard landscaping.

Landscaping / Noise Bunds



Bespoke Shapes

S and B fill, with its versatility, can be cut into many bespoke shapes including cylinders that are a major feature of voided concrete structures such as elevated motorways and bridges.

It is widely used to produce sloping ramps in the construction of car parks, for flotation and barriers in marinas raised floors, sloping auditoriums, shuttering, pile locators, pile in-fills, curved or circular walls etc.

Rail Embankments

Traditional fill materials can be liable to unacceptable settlement when used on railway embankments.

S and B Fill with its high strength-to-weight ratio offers a cost effective solution to loads encountered in railway construction.

Lightweight Structural Voidformers
Specification Data

S and B grade	Fill 13	Fill 21	Fill 45	Fill 70	Fill 90	Fill 100	Fill 120
To BS EN 14933:2007							
Compressive strength at 1% compression [kPa]	10	21	45	70	90	100	120
Compressive strength at 10% compression [kPa]	50	70	100	150	200	250	300
Cross breaking strength/ bending strength [kPa]	75	115	150	200	250	350	450
Shear strength [kPa] in correlation to bending strength	35	55	75	100	125	170	225
Nominal density [kg/m^3]	15	15	20	25	30	35	40
Other Physical properties							
Compressive Modulus [Mpa]	1.0	2.0	4.5	7.0	9.0	10.0	12.0
Compressive Modulus [kN/m^2] at 1% compression	1,000	2,000	4,500	7,000	9,000	10,000	12,000
Thermal conductivity value [W/m K]	0.0430	0.0380	0.0360	0.0350	0.0340	0.0330	0.0330
Max depth of concrete [mm]	415	830	1,875	2915	3750	4165	5000

S and B fill is expanded polystyrene manufactured in accordance with BSEN 14933:2007 and used as a load bearing part of a structure.

Applications include raised doors, ramps, sloping auditoriums for cinemas and also civil engineering applications such as road embankments, abutments and backfill.

For further information on these products and others within the S and B EPS range please get in touch.

S and B EPS Limited
Dudley
Cramlington
Tyne and Wear
United Kingdom
NE23 7PY

T +44 [0] 191 250 0818
F +44 [0] 191 250 0548
E company@sandbeps.com

www.sandbeps.com