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HUDDERSFIELD PARISH CHURCH OF ST. PETER

BYRAM STREET

PUBLIC REALM SPACE

DESIGN STATEMENT

12th November 2023

Rev A 29th November 2023 (Extent of trafficking & soak-away)

Rev B 21st January 2024 *(Revised text in italics on pages 1 - 4)* staging proposals deleted

Rev C 18th February 2024 Table 3 of BS 7533-13 "R" value relaxation to 0.4 & base course depth

Rev D Consolidation of revision C highlighted amendments & minor text narrative revisions 26.2.24

BRIEF

The Public Realm Space scheme is to be formed over the site of a mediaeval graveyard on the north side of Huddersfield Parish Church.

The project is to be SuDS compliant not only to meet the planning conditions set by Kirklees MDC but to be of general benefit to the local environment and serviceability of the space.

EXISTING SITUATION

The proposed area for the project that is currently part of the former graveyard has been landscaped in the twentieth century predominantly with grassed areas traversed by stone flag pathways formed from relocated grave markers and tree planting. A small number of grave markers remain in their original position.

There are no gullies collecting run-off from the paved areas, indicating that the present situation is in effect SuDS compliant with all run-off soaking away within the site perimeter,

PROPOSALS

The proposed arrangement is shown on the Project Architect's drawings

Construction details are shown on BJSD drawings 19006/2013/DETAILS Rev B, which is attached to this report

Revised proposals following a meeting with the local authority Planning Officer and her Advisers are now incorporated into the submission.

RESTRAINTS IMPOSED BY THE SITE:

1. The C20th capping layer is likely to be shallow. In the trial trench, an interment was found at shallow depth in a position that was probably just inside the original boundary wall.
2. The ground beneath the capping layer is very likely to contain disarticulated human bones at shallow depth as well as soft spots in former grave positions. Therefore maintaining the integrity of the capping layer below topsoil strip is of paramount importance.
3. Remedial ground consolidation measures have been considered disproportionately expensive for the intended use of the site and the funding available.

REQUIREMENTS IMPOSED BY THE INTENDED USE OF THE FACILITY

1. For most of the time, the area will function as it does now, with causal public use involving very light trafficking.
2. Organised Functions will require vehicular access for installation of equipment.

BACKGROUND TO DESIGN DECISIONS

1 Standard practice in preparing the formation will not be feasible due to the nature of the ground and former use, therefore:
   a. Excavation to remove unsuitable material will not be possible.
   b. Heavy compaction will not be possible.
2 The formation is therefore to be accepted as "weak" throughout and in need of reinforcement.
3 Re-profiling to ensure all falls lead away from the church building will involve some redistribution of existing fill material. In the trial trench, the material was found to be friable but with some clay content, below a rather thin skimming of topsoil. The turf was well developed, enabling it to be rolled and re-laid, indicating the relatively mature age of the landscaping.
4 The filling and compaction of material up to formation level will fortuitously be in compliance with the requirements for the Sustainable Drainage System (SuDS) on the site in that compaction should be limited in order to maintain porosity. Normally, the need to maintain porosity is in conflict with strength requirements.
5 Likewise, imported suitable material to be used below formation level will need to be free draining in performance as laid and lightly compacted.
6 Use of a geotextile composite to provide both strength and separation from the sub-base is intended to compensate for expected low CBR ratings of the lightly compacted material.
7 The use of plant in the construction of the formation should exclude heavy wheeled vehicles to avoid loss of porosity. Compaction by hand guided vibrating plate would minimise the dead-weight and should be adopted with the number of passes being controlled to balance the two opposing requirements
8 A "Bound" solution for the access and delivery vehicle off-loading area had initially been adopted to give rigidity both for construction and thereafter but has subsequently been superseded by a Type B SuDS System for the whole of the works. A French drain near the north perimeter has been incorporated to intercept excess storm water and deliver it to a SuDS compliant planting installation in Byrom Street. Due to concerns about tree roots, the formation on the north side of the French drain has been profiled to fall away from the two copper beech trees with minimal build-up comprised of a regulating course of type 3 sub-base below a sharp sand fille geogrid under the stone flags
9 The project architect's intention is that the York flag paving should complement the listed church building, so a joint filler with a matching colour would be preferrable. The use of local course aggregate of 2 – 6 mm size with no binder needs to be made as this would be visually more acceptable than grey material from an igneous source. The material is acceptable for "Unbound" solutions with trafficking as set down in Edition & (2023) of the MPA document for Concrete Block Permeable Paving. **As the newly quarried paving slabs are to be from a nominated supplier it is essential that they are consulted in this matter.** As reliance has still to be made on BS 7533-13:2009 until publication of the third part of the new code, instances of successful good practice may prevail over the current requirements of the 2009 code. Half filling joints with cemented material and topping up with loose may suffice.

10 The proposal in its final form incorporates an AC 10 open surfaces graded Macadam course on an AC 20 open binder course, which has been adopted to complement Resin Bound wearing courses. It is also proposed for the stones setts where the detail calls for an Unbound bedding and joint filler of 2 – 6 mm particle size aggregate (referred to as sharp sand, which is a product of crushed rock). As stated in item 9 above, it is essential that the nominated supplier of the stone setts accepts the use of material without cementitious bonding, as is deemed suitable for concrete block permeable pavements, as set down in Edition 7 (2018) of the Interpave document.

11 As access for HGV maintenance vehicles will be occasionally required onto the Public Realm Space as well as delivery vehicles for planned events to unload and load, all trafficked areas are to be constructed to Categry 5 strength requirement.. The adoption of this level of loading will have an impact on the existing C20th capping layer, which has an unavoidable risk of disturbing human remains. Provision for dignified reinterment within the site will be made. The capping layer has been consolidated with time and shows no signs of localised settlement. The bearing capacity of the ground almost certainly diminishes with depth due to Interments. Measures that can be taken at and below formation level to stabilise the ground will to some extent mitigate against ground failure but the possibility remains that voids could migrate to the surface in the future to disrupt the construction, however robust. Voids in the trafficked zones under the concrete slab are unlikely to create soft spots large enough to cause failure, but Unbound areas will always be vulnerable. The risk is one that stems from the former use of the site for which the usual remedies (remediation) are neither feasible nor permissible.

12 The proposals for the *permeable* areas call for type 3 sub-base, which is not referred to in the currently available version of the code of practice, although it is deemed suitable for SuDS projects in the latest trade sponsored literature. Achieving the best performance from the material will require carefully controlled compaction to avoid crushing and clogging with fines. Ensuring the material has a suitable Crushing Value (CV) will help with this but compaction passes will have to be limited. The standard required for Type 1 sub-base to pass a sand bottle test for density will obviously not apply. Subject to cost, use of the same Type 3 material to make up to formation level would be desirable. “Suitable” imported material with a clay content would be impermeable, although fitting the general highway classification. A single size hardcore of appropriate hardness may meet the Type 3 spec. The revised thickness of sub-base specified is to be laid over a reinforced geotextile layer of Teram Bodgrid Geocomposite (or similar approved material), effectively compensating for the loss of existing capping layer depth.

13 The use of AC 10 Open Graded Macadam on AC20 Open Binder Course as a porous base is considered far more appropriate to the use of a dense material punctured by intermittent holes, as called for in the code of practice. With a uniformity of infiltration through the full depth of the construction, the results of precipitation will remain very similar to the present situation where rainfall soaks into the ground directly. This would not be the case with punctured holes.

14 Hitherto, the design process had omitted modelling the dispersal of rainfall using percolation test results and the like because the ground functions satisfactorily as a soak-away at present but due to concerns about the porosity of the formation, a Type B system is to be adopted to cater for excess percolation, avoiding the previous need for a staged approach .

15 Installing permeable layers of construction will improve the present situation, particularly in parched conditions when grassed areas become impermeable. The requirement of the Planning Approval Condition will be more than met, whilst the surfacing will be free of ponding and nearby tree roots will be oxygenated and well watered.

16 A 50 mm bedding layer of crushed rock with 2 – 6 mm size material has been specified for the stone paving setts and slabs, following the guidance for similar units in concrete.

17 The resin bound surfacing is to be laid directly over the open graded macadam base.

PAVEMENT CONSTRUCTION STAGE 1 PROPOSALS

See BS 7533 -101 - 2021 Figure 1 -PAVEMENT LAYERS 1 – 8
& Drawing 19006/2023/OPTIONS:-

DETAIL A

1 Aggregate joint filler to comply with suppliers requirements & aesthetic appearance
2 Imported York stone sets, imported York stone flags or relocated York stone flags.
3 Aggregate bedding material
4 Base Course to match Traffic Category 5 comprised of 30 mm AC 10 Open Surface & 40 mm AC 20 Open Binder courses totalling 70 mm.
5 Sub-base reduced to 210 mm as target for porosity
6 Geo-composite membrane
7 Capping Layer target improvement of CBR to min 5% for strength
8 Subgrade as capping layer

DETAIL B

1 Joints to edging
2 Resin bound gravel
3 –
4 Base course to match Traffic Category 5 as above, total 70 mm
9 Sub-base reduced to 210 mm as target for porosity
5
6 Geo-composite membrane
7 Capping layer target improvement of **CBR to min 5% for strength**
8 Subgrade as capping layer
9

DETAIL C - As detail B with embedded grave markers

BS 7533 -101 - 2021 COMPLIANT DESIGN

TABLE 2A TRAFFIC CATEGORY 5 *(*Unbound construction*)*

Pedestrian Areas with occasional over-run of commercial vehicles - Car Parks with occasional commercial traffic Cumulative standard axles ≤ 0.05 (msa) (Road Category N/A)

5.2 Bituminous base materials

A C Open bin 100/150 rec conforming to BS EN 13108-1

6.1.1 Sub-base / capping layer thicknesses related to estimated sub-grade strength

TABLE 1

Construction conditions 100 sa	Table 15 Sandy clay made ground CBR	Table 16 Design Thickness [mm] (sub-base only)	Table 17 Sub-base / capping layer thickness	Reduction with Bodgrid geocomposite (mm)	Net thickness sub-base only (mm)	Proposed thickness of sub-base over stabilised capping layer (mm)
Poor	2.5%	240	150 / 180	25	**215**	**275**
Average	4.5%	170	160	25	**155**	**225**
Good	6%	150	150	zero	**150**	**175**

CBR values to be measured during the works using a portable CBR tester to confirm sub-base thickness required.

TABLE 18 - BITUMINOUS BASE **70 mm minimum for category 5** **(18.2.24)**

"Porous asphalt considered to have the potential to be particularly useful for porous construction"

PERMEABLE PAVEMENTS TO BS 7533 – 13: 2009 **COMPLIANT DESIGN**

4.5 Selection of pavement system

For Systems A and B, the highest recorded groundwater level should be greater than 1 m below the bottom of the sub-base. This is to allow filtration of pollutants in the soil below the pavement and also to prevent groundwater rising and reducing the available storage in the sub-base.

Table 3 Sub-base thickness for System A (&B)

Rainfall M60 B) = 20 mm

I in 100 year storm + 20% for climate change

Ratio r **0.4**

Sub-base thickness required 210mm

PROPOPOSALS RELATED TO CONDITIONS ENCOUNTERED DURING WORKS

FORMATION

1 CBR TESTING DURING WORKS USING MOBILE TESTING UNIT
2 WATER-TABLE MEASUREMENT DURING WORKS TO DETERMINE SUITABILITY FOR TYPE A SYSTEM (NEEDS TO BE LOWER THAN 1 METRE BELOW FORMATION)
3 FORMATION IMPROVEMENT BY IMPORTED PERMEABLE MATERIAL COMPACTED INTO EXISTING CAPPING LAYER
4 BODGRID GEOCOMPOSITE TO IMPROVE CBR VALUE & DISTRIBUTE LOAD DURING CONSTRUCTION

SUB-BASE

1 THICKNESS RANGING FROM 210 TO 275 mm DEPENDENT ON CBR RESULTS BUT WITH THE MINIMUM OF 210 mm SET BY PERMEABILITY CONSIDERATIONS

MACADAM BASE

1 OPEN GRADED MACADAM "POROUS ASPHALT HAVING THE POTENTIAL TO BE PARTICULARLY USEFUL" (BS 7533 -101 - 2021)
2 DENSE BASE AN OPTION IN 2009 CODE

STAGED PROCEDURES WHILST WORKS ON-SITE

TABLE 2 DESIGN

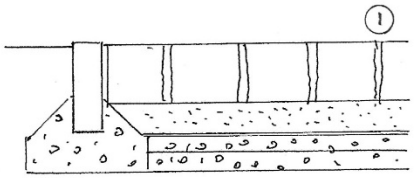
ELEMENT	STRENGTH	REQUIREMENTS	POROSITY	REQUIREMENTS	COMMENTS
FORMATION	CBR TESTING BY MOBILE TESTER DURING WORKS	2.5% 4.5% T 6% 5% target	WATER TABLE DEPTH DURING WORKS	TYPE A SYSTEM REQUIRES 1 METRE DEPTH	
SUB-BASE	CATEGORY 5	215mm 155mm 150mm		210 mm	
MACADAM BASE		70mm		Open texture recommended in 2021 code	
SURFACING	RESILIENCE	WITH BINDER			

TABLE 3 RISK ASSESSMENT

	ACTIVITY	RISK	CONTROL /REMEDY
1	EXCAVATION IN CAPPING LAYER	Exposing weaker ground	Limit with geo-composite
2	EXCAVATION IN CAPPING LAYER	Exposing human remains	More intense archaeological watching brief & Reinterment ceremony
3	FORMATION PREPARATION	Low CBR but > 2.5%)	Import permeable material / increase sub-base thickness
4	PERCOLATION THROUGH SUBSTRATE	Water-logging	Test for water table depth from formation during works
5	MIGRATION OF VOIDS TO SURFACE	Local failure of pavement	Concrete slab to more heavily trafficked zone
6	CONSTRUCTION TRAFFIC	Ground compaction	Work into site to form hard-standing
7	CONSTRUCTION AWAY FROM SLAB	Loss of porosity	Use hand led vibrating plate
8	SUDS COMPLIANCE	High water table	Type B System with porous pipes to north into grey to green scheme Iin Byrom Street.
10	TYPE B SYSTEM WITH GREY TO GREEN	Damage to existing tree roots	Cut off drain moved away from root zone.
11	MAINTENANCE	Damage to resin bound gravel	Treat as footpaths or tennis courts
12	DRAINAGE THROUGH JOINTS	Clogging of joints	Periodic jetting

A B Jones B Eng (Hons) C Eng MICE MIStructE

Chartered Engineer

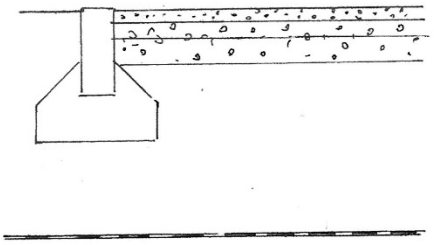


YORK STONE SETTS (2)
50 BEDDING (3)
BASE COURSE (4) 70mm

SUBASE (5) 210mm

TERRAM BOOGRIO GEOCOMPOSITE (TBG) & (6)
CAPPING LAYER (7)&(8)

DETAIL A STONE SETTS (& FLAGS, SIMILAR)



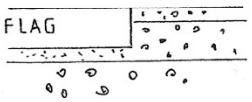
RESIN BOUND GRAVEL (2)
BASE COURSE (4) 70mm

SUB BASE (5) 210mm

TBG (6)
CAPPING LAYER (7)&(8)

DETAIL B RESIN BOUND GRAVEL

BEDDING



AS DETAIL B

DETAIL C EMBEDDED GRAVE MARKERS

NOTE SUB BASE DEPTH AN AVERAGE OVER ALL FORMATION FOR 'PERCOLATION STORE
TYPE 3 SUB BASE TOPPED OFF WITH LAYING COURSE
BASE 30 A10 & 40 A20 OPEN GRADED MACADAM MAX 100/150 PEN BINDER TO BS EN 13108 1:2006
REVB ISSUE 26-2-24
REVA PLANNING CONDITION 3 APPROVAL 29-1-2024

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Title: PCC OF HUDDERSFIELD PARISH CHURCH
PUBLIC REALM SPACE PRELIM. DTLS.
Scale: NTS Date: DEC 23
Drawing No: 19006/2023/DETAILS Rev: B A4

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