Darfield Community Association

Darfield Weir Rock Ramp

Specification - Materials and Workmanship

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September 2008

This report takes into account the particular instructions and requirements of our client.
It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party

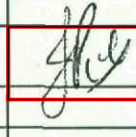
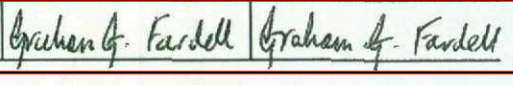
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1 Preamble

All manufacturers and/or suppliers and/or products stated within the Specification are provided for information only and are provided solely for the purpose of providing a qualitative base line. The tenderer may put forward alternatives but where these are at variance with manufacturers and/or suppliers and/or products stated in the Specification then the Project Manager must be given adequate opportunity to review the proposed alternative(s) before procurement by the Contractor. Permission in writing to use the alternative must be obtained by the Contractor from the Project Manager. Where the Contractor intends to use alternatives at tender stage, details must be submitted with his tender. Where comments are made by the Project Manager and/or the Employer and/or members of the design team these comments will not negate or reduce the liability for design insofar as any design liability is borne by the Contractor.

2 General

2.1 Introduction

This specification identifies specific methods, and types, of materials and workmanship to be provided under the contract for the work items generally described in section 2.2 and shown on the drawings listed in Section 3.2 .

This Specification and associated drawings have been prepared by Arup on behalf of the client, Darfield Community Association; in connection with the proposed construction of a rock ramp for the improvement of fish passage at Darfield Weir, River Dearne, Darfield. It takes into account their particular instructions and requirements. They are not intended for and should not be relied on by any third party and no responsibility is undertaken to any third party.

2.2 The project

As part of a larger scheme to improve fish migration in the rivers of South Yorkshire, the Darfield Community Association in collaboration with the Environment Agency, local re-development agencies and other stakeholders, is proposing to improve fish passage at Darfield Weir on the River Dearne by the construction of a rock ramp structure. The project is part of a wider scheme to develop the river corridor as an amenity and recreational asset. The rock ramp provides a sloping river bed and incorporates boulders, pools and projections to disrupt flow and provide suitable water velocities to enable fish to migrate. Provision for migration at low flows is made via shallow channels whilst canoe passage at the weir is facilitated by the provision of a notch and channel. The rock ramp essentially comprises graded armourstone fill retained between a series of offset herringbone pattern rock "groynes" stabilised by dowel bars and a low timber kerb.

The general civil engineering works associated with the construction of the fish passage improvements include:

- Temporary works to provide access to the site and working areas
- Excavation of deposits from the downstream weir apron
- Construction of partially buried boulder toe
- Installation of stainless steel dowels and timber kerb on weir apron
- Construction of herring bone pattern blockstone groynes
- Filling to ramp with graded rock armour stone
- Creation of canoe chute and low flow fish migration channel
- Placing of perturbation boulders and surface features to ramp

- Creation of notches in weir crest
- Construction of blockstone revetment to river bank
- Design and construction of canoe launch/recovery landing and associated paths and bank protection downstream of the weir
- General site reinstatement and clearance

3 Specification for Materials and Workmanship

3.1 Preamble to the specification

1. The Specification shall be the 'Civil Engineering Specification for the Water Industry, 6th Edition', published by UK Water Industry Research Ltd in June 2004, augmented by the Supplementary Clauses.
2. In so far as any Supplementary Clause may conflict, or be inconsistent, with any provision of the 'Civil Engineering Specification for the Water Industry, 6th Edition', the Supplementary Clause shall always prevail.
3. Where a Clause in the Specification relates to work goods or materials which are not required for the Works it shall be deemed not to apply.

3.2 List of Drawings

Drawing number	Rev	Title	Issue	Sheet size
11587-405-3DT	0	Topographical Survey		A1
11587-405_S(1)	0	Section 1 - 4		A0
11587-405_S(2)	0	Section 5 - 8		A0
11587-405_S(3)	0	Section 9 - 12		A0
11587-405_S(4)	0	Section 13 - 14		A0
125949-001		General Arrangement		A1
125949-002		General Details		A1
125949-003		Canoe launch/recovery landing		A1

3.3 List of standard clauses

Section Title	Clause No	Used in this Specification	Clause Heading
General	1.1	Yes	Definitions
	1.2	Yes	Accommodation for the contract
	1.3	Yes	Billposting and advertising
	1.4	Yes	British Standards and other documents
	1.5	Yes	Tidiness of site
	1.6	Yes	Entry onto the site
	1.7	Yes	Survey of highways, properties and lands
	1.8	Yes	Levels and reference points
	1.9	Yes	Site fencing and gates
	1.10	Yes	Interference with land interests

Section Title	Clause No	Used in this Specification	Clause Heading
	1.11	Yes	Interference with any access to property, apparatus or service
	1.12	Yes	Procedure for complaints and claims
	1.12	Yes	Protection against damage
	1.14	Yes	Use of herbicides and pesticides/protection of agricultural land
	1.15	Yes	Works affecting watercourses
	1.16	Yes	Water supply hygiene
	1.17	Yes	Apparatus of statutory undertakers, highway or roads authority and others
	1.18	Yes	Traffic requirements
	1.19	Yes	Emergency arrangements
	1.20	Yes	Hazardous substances
	1.21	Yes	Environment and sustainability
	1.22	Yes	Customer care
	1.23	Yes	Asset records
	1.24	Yes	Training
Materials	2.1		Materials in contact with potable water
	2.2		Acrylonitrile-butadiene-styrene (ABS) pipes and fittings
	2.3		Admixtures for concrete or grout
	2.4		Aggregates for concrete
	2.5		Aggregates for high strength concrete wearing screeds
	2.6		Aggregates for mortar
	2.7		Biological percolating filter media
	2.8		Bitumen road emulsions
	2.9		Bituminous coatings
	2.10		Bituminous jointing strip
	2.11		Boards for panelling
	2.12		Bond breaking compound for dowel bars
	2.13		Bricks and blocks
	2.14		Cast stone
	2.15		Cement
	2.16		Cement grouts
	2.17		Clay puddle
	2.18		Coated macadam
	2.19		Compressible filler and packing for pipelines
	2.20		Concrete – general
	2.21		Concrete containing pfa or ggbs
	2.22		Concrete – ready-mixed
	2.23		Concrete – porous no-fines
	2.24		Concrete – air entrained
	2.25		Concrete – chloride content
	2.26		Concrete pipes and fittings
	2.27	Yes	Connectors for timber
	2.28		Coping units
	2.29		Copper pipes and fittings
	2.30		Cover blocks and spacers for reinforcement
	2.31		Damp-proof course
	2.32		Doors, frames and linings
	2.33	Yes	Dowel bars
	2.34		Draw cord
	2.35		Dressed natural stone kerbs, channels, quadrants and setts
	2.36		Ductile iron, cast iron and steel pipes, flanges and fittings
	2.37		Electrodes, filler rods and wires for welding
	2.38		Expanded metal angle beads
	2.39		Fertiliser
	2.40		Field gates
	2.41		Fixing accessories for building purposes
	2.42		Fixings for metalwork
	2.43		Flashings
	2.44		Floor tiles
	2.45		Foamed concrete
	2.46		Foam swabs
	2.47		Gabions and rockfill mattresses

Section Title	Clause No	Used in this Specification	Clause Heading
	2.48		Gaskets for flanged joints
	2.49		General filling materials
	2.50		Glass for glazing
	2.51		Glass reinforced plastics (GRP) pipes and fittings
	2.52		Glass reinforced plastic products
	2.53		Glazing materials
	2.54	Yes	Granular sub-base material
	2.55		Grass seed
	2.56		Grummets
	2.57		Gullies and gully cover slabs
	2.58		Gully covers, gratings and frames
	2.59		Handrails and balusters
	2.60		Hydrants
	2.61		Imported topsoil
	2.62		Imported turf
	2.63		Industrial flooring, walkways and stair treads
	2.64		Joinery timber
	2.65		Joint filler board
	2.66		Joint sealing compounds and sealants
	2.67		Joint seals and lubricants
	2.68		Joist hangers
	2.69		Ladders
	2.70		Lead
	2.71		Lime for mortar
	2.72		Lintels
	2.73		Manhole covers and frames
	2.74		Manhole steps
	2.75		Marker tape and marker posts
	2.76		Mastic asphalt
	2.77		Mechanical couplings for pipelines and fittings
	2.78		Metal lathing
	2.79		Metal ties
	2.80		Mineral aggregates for flat roofs
	2.81		Mortar
	2.82		Nails
	2.83		Natural stone
	2.84	Yes	Nuts, screws, washers and bolts
	2.85		Packings for tunnels
	2.86		Paints and painting materials for buildings
	2.87		Permanent fencing
	2.88		Pipe surround materials
	2.89		Pipes for ducts
	2.90		Pipes for land drainage and temporary drains
	2.91		Plaster
	2.92		Plastic chambers and rings
	2.93		Plastic sheeting
	2.94		Plywood
	2.95		Polyethylene pipes and fittings
	2.96		Precast concrete slabs and cover frame seating rings
	2.97		Precast concrete flags and paving blocks
	2.98		Precast concrete kerbs, channels, edgings and quadrants
	2.99		Precast concrete manholes and soakaways
	2.100		Precast concrete box culverts
	2.101		Precast concrete segments for tunnels and shafts
	2.102		Precast concrete setting blocks for pipes
	2.103		Precast concrete tanks
	2.104		Prestressed concrete pipes and fittings
	2.105		Prestressed precast concrete floors
	2.106		Profiled steel sheeting
	2.107		Propylene co-polymer pressure pipes
	2.108		PTFE tape
	2.109		Pulverised-fuel ash
	2.110		Rainwater pipes and gutters
	2.111		Rolled asphalt
	2.112		Roof coverings

Section Title	Clause No	Used in this Specification	Clause Heading
	2.113		Safety chains in sewers
	2.114		Sample taps
	2.115		Sands
	2.116		Sewer linings
	2.117		Soil, waste and ventilating pipes
	2.118		Steel reinforcement
	2.119		Steel sheet piles
	2.120		Stiles, bridle gates and kissing gates
	2.121		Structural steel
	2.122		Surface boxes and guards
	2.123		Synthetic resin adhesives
	2.124	Yes	Timber and preservation of timber
	2.125		Trees and shrubs
	2.126		Tying wire
	2.127		Unplasticised PVC pipes and fittings
	2.128		Valves and penstocks
	2.129		Vitreous enamel tanks
	2.130		Vitrified clay pipes and pipeline fittings
	2.131		Wall tiles
	2.132		Water
	2.133		Water fittings and appliances
	2.134		Waterproof paper
	2.135		Waterstops
	2.136		Wet-mix macadam
	2.137		Windows
	2.138		Window sills
	2.139		Wood flooring
	2.140		Wood trim
	2.141		Wrought aluminium and aluminium alloy
Excavation backfilling and restoration	3.1	Yes	Excavation
	3.2	Yes	Relaying turf
	3.3	Yes	Topsoil for re-use
	3.4	Yes	Dealing with water
	3.5	Yes	Temporary drains
	3.6	Yes	Backfilling
	3.7		Reinstatement of maintainable highways
	3.8		Reinstatement of non-maintainable highways
	3.9	Yes	Reinstatement of unpaved land
	3.10	Yes	Trees
	3.11		Reinstatement in highways and roads using foamed concrete
	3.12	Yes	Land drains
	3.13	Yes	Filling above ground
	3.14		Blasting
	3.15	Yes	Piling
Concreting and formwork	4.1		Supply of information
	4.2		Initial testing
	4.3		Identity testing
	4.4		Porous no-fines concrete
	4.5		Transporting, placing and compacting
	4.6		Concreting in cold weather
	4.7		Concrete temperature
	4.8		Curing
	4.9		Records of concreting
	4.10		Construction of formwork
	4.11		Cleaning and treatment of forms
	4.12		Striking of formwork
	4.13		Sloping formwork
	4.14		Cutting and bending of reinforcement
	4.15		Fixing of reinforcement
	4.16		Surface condition of reinforcement
	4.17		Laps and joints
	4.18		Welding of reinforcement
	4.19		Built-in items
	4.20		Construction joints
	4.21		Surface finishes produced without formwork

Section Title	Clause No	Used in this Specification	Clause Heading
	4.22		Surface finishes produced with formwork
	4.23		Wearing screeds
	4.24		Tie bolts for formwork
	4.25		Tolerance for concrete surfaces
	4.26		Grout quality control testing
Construction of pipelines and ancillary works	5.1		Pipelaying generally
	5.2		Pipe bedding
	5.3		Concrete protection to pipes
	5.4		Pipe surround
	5.5		Pipelaying in headings
	5.6		Thrust blocks
	5.7		Pipe jointing generally
	5.8		Welded joints in polyethylene pipes
	5.9		Flanged joints
	5.10		Ogee joints
	5.11		Welded joints in steel pipes
	5.12		Cement mortar joints
	5.13		Run lead joints
	5.14		Protection of ferrous pipes, joints and fittings
	5.15		Cutting pipes
	5.16		Precast concrete manholes
	5.17		Precast concrete segmental manholes
	5.18		Brickwork in concrete manholes and chambers
	5.19		Inverts and benching
	5.20		Pipes and joints adjacent to structures
	5.21		Watertightness of manholes and chambers
	5.22		Setting manhole covers and frames
	5.23		Connections to existing sewers
	5.24		Sewers and manholes to be abandoned
	5.25		Junctions and laterals on sewers
	5.26		Marker and indicator posts
	5.27		Tolerances for pipelines
	5.28		Cable ducts
Building Works	6.1		Brickwork and blockwork generally
	6.2		Brickwork and blockwork, jointing and pointing
	6.3		Cavity walls
	6.4		Damp-proof course
	6.5		Corbelling
	6.6		Bonding to concrete
	6.7		Underpinning
	6.8		Centering and lagging
	6.9		Bricklaying and blocklaying in cold weather
	6.10		Preparation for plastering
	6.11		Fixing of plasterboard
	6.12		Plastering
	6.13		Plastering in cold weather
	6.14		Concrete floor finishes
	6.15		Floor tiling
	6.16		Terazzo
	6.17		External rendering
	6.18		Wall tiling
	6.19		Carpentry and joinery
	6.20		Structural steelwork
	6.21		Roofs
	6.22		Timber floors
	6.23		Door frames
	6.24		Windows
	6.25		Glazing
	6.26		Painting
	6.27		Slating and tiling
	6.28		Lightweight concrete roof screeds
	6.29		Asphalt roofing
	6.30		Bitumen felt roofing
	6.31		Plumbing
	6.32		Openings in walls, floors and ceilings
	6.33		Tolerances for building works

Section Title	Clause No	Used in this Specification	Clause Heading
	6.34		Electrical installations
	6.35		Profiled steel cladding
	6.36		Precast concrete floors
	6.37		Composite floors
Testing and disinfection	7.1		Cleansing of pipelines
	7.2		Precautions prior to testing pipelines
	7.3		Testing method programme and notification
	7.4		Testing non-pressure pipelines
	7.5		Water test for non-pressure pipelines
	7.6		Air test for non-pressure pipelines
	7.7		CCTV inspection of pipelines
	7.8		Infiltration
	7.9		Testing of ductile iron, PVC, GRP and steel pressure pipelines
	7.10		Testing of polyethylene pressure pipelines
	7.11		Swabbing of water mains
	7.12		Disinfection of water mains
	7.13		Cleansing of structures
	7.14		Testing of concrete roofs
	7.15		Testing of concrete structures designed to retain an aqueous liquid
	7.16		Disinfection of structures for potable water
	7.17		Water for testing, swabbing and disinfection
	7.18		Disposal of water from cleansing, testing or disinfection
	7.19		Testing of non-concrete structures for retaining aqueous liquids
Roadworks	8.1		Road formations
	8.2		Sub-base construction
	8.3		Wet-mix macadam construction
	8.4		Lean concrete construction
	8.5		Laying coated macadam
	8.6		Laying hot rolled asphalt
	8.7		Waterproof underlay for concrete carriageways
	8.8		Reinforcement of concrete carriageways
	8.9		Laying concrete carriageways
	8.10		Laying kerbs and channels
	8.11		Foundations for footways
	8.12		Laying concrete paving flags
	8.13		Laying paving blocks
	8.14		Tolerances for finished carriageway surfaces
	8.15		Fixing of gullies
	8.16		Lining and signage
Sewer renovation	9.1		Isolation of flows
	9.2		Preparatory survey
	9.3		Preparation of sewers
	9.4		Jointing generally
	9.5		Connections
	9.6		Chambers
	9.7		Release of curing water
	9.8		Annulus grouting generally
	9.9		Inspection after grouting
	9.10		Lining through control devices
	9.11		Inspection after renovation
	9.12		Lining template
	9.13		Lining design
	9.14		Tolerances for preformed linings
	9.15		Cutting and protection of linings
	9.16		Man-entry preformed GRP and GRC units
	9.17		Cured-in-place lining systems
	9.18		Rendering and local repairs
Water mains renovation	10.1		Preparatory survey
	10.2		Preparation of water mains
	10.3		In-situ linings
	10.4		Sliplining and replacement moling
	10.5		Connections
	10.6		Lining through valves

Section Title	Clause No	Used in this Specification	Clause Heading
	10.7		Inspection after in-situ re-lining
	10.8		Bringing rehabilitated water mains into service
Tunnelling and shaft sinking works	11.1		Headings, tunnels and shafts
	11.2		Shafts
	11.3		Openings in shafts and tunnels
	11.4		Segmental shaft and tunnel linings
	11.5		Unbolted concrete tunnel segments
	11.6		Bolted concrete segmental linings
	11.7		Grouting of segments
	11.8		Caulking
	11.9		Pointing of joints
	11.10		Secondary linings to segments
	11.11		Shafts and tunnels to be watertight
	11.12		Control of groundwater
	11.13		Pipe jacking
	11.14		Microtunnelling
	11.15		Ventilation of tunnels and shafts
	11.16		Work in compressed air
	11.17		Recording of information
	11.18		Tolerances for shafts, tunnels and pipe jacks

3.4 Testing of materials

1. The Contractor is responsible for all testing of materials to be used in the Works.
2. The Contractor shall supply the Project Manager with two certified copies of the results of the tests on materials, from each source of supply, as follows:-
   (a) in respect of all the properties specified for that material, not less than one week before the start of any relevant Works on site,
   (b) and at intervals during the Works in accordance with the frequency of testing stated in this Specification.

   Test results shall show the date of testing, the name of the Works, the source of supply, the nature of the material and, in the case of (a), its proposed use.
3. All test certificates furnished by Suppliers or manufacturers of materials used in the Works shall be submitted to the Project Manager.
4. All testing of materials shall be carried out by a UKAS accredited materials laboratory
5. Representative Samples
   (a) All representative samples shall be delivered to the place of testing not less than 3 weeks prior to the commencement of any works involving the proposed material on site.
   (b) Samples shall be delivered in suitable containers clearly labelled with the name of the works for which the samples are intended, the name of the supplier, the type of material and the use for which it is intended.
6. The Contractor shall be responsible for all the costs involved with the testing of representative samples.

3.5 Supplementary Clauses

3.5.1 Clause 2.27 Connections for timber

2. Fixings and ancillaries to be stainless steel with a minimum design life of 25 years

3.5.2 Clause 2.33 Dowels

3. Dowel bars shall be stainless steel.
4. Dowel bars shall be fixed into pre-drilled holes in the weir apron using a proprietary chemical anchoring system suitable for underwater use.

3.5.3 Clause 2.124 Timber and Preservation of timber

4. Timber to be used in the works is to be a seasoned hardwood, obtained from a certified, sustainable source and of suitable strength grade for the application.
5. Natural durability of timber to be classified at minimum as durable* and to possess high resistance to abrasion.

Grade of durability	Approximate life in contact with the ground (years)
Very durable	More than 25
Durable	15—25
Moderately durable	10—15
Non-durable	5—10
Perishable	Less than 5

6. Minimum basic specific gravity (ovendry weight/green volume) 0.57.
7. Section sizes of timber to be incorporated into the rock ramp are shown on the drawings.
8. Canoe launch/recovery landing design: drawings show section sizes and layout of members for the landing based on a conceptual design. Dimensions and layout of joists and other supporting members shall be determined by the Contractor to suit his preferred design.
9. Design Loads: decking is to be designed to accommodate an applied load of 4KN/m^2 (SLS). Deflection to be less than span/250.
10. Landing planks are to be laid with 5mm gaps between adjacent planks, grooved at right angles to the direction of the deck with non-slip surfacing.

3.5.4 Clause 2.125 Geotextiles used to separate earthwork materials

1. Geotextiles are required beneath the blockstone revetment as shown on the Drawings.
2. Minimum life expectancy of geotextiles to be 50 years.
3. The geotextile to be used as a filter/separator be formed from needlepunched polypropylene fibres, installed in accordance with the manufacturer's recommendations in the positions and to the line and levels described on the drawings.

4. The geotextile shall have the following properties:

Test description	Approved test method	Units	Typical value
Static puncture strength (CBR)	EN ISO 12236	kN	3
Tensile strength	EN ISO 10319	kN/m	20
Tensile extension	EN ISO 10319	%	60
Apparent pore size - 90% finer [O90]	EN ISO 12956	μm	150
Coefficient of permeability	EN ISO 11058	m/s	$10x10^{-3}$

5. Manufacturers' data sheets shall be provided to demonstrate compliance with the criteria detailed on the Drawings
6. Joints shall be formed by overlapping by a minimum of 1000mm
7. Geotextiles shall be protected at all times against ultra-violet light and physical or chemical damage.
8. Production test certificates shall be provided for the geotextile. Test methods employed shall be in accordance with the requirements of BS EN or ISO and be accredited by UKAS to carry out the required tests.

3.6 Additional Clauses

3.6.1 Clause 2.142 Armourstone Rockfill

Grading

The Dn_{50} shall be 250mm.

Based on weight, the grading is to be as below:

W100/W50 = 2 to 5

W85/W50 = 1.7 to 3.3

W15/W50 = 0.1 to 0.4

W85/W15 = 4 to 12

The grading shall be a smooth, well graded distribution curve: a typical grading distribution is shown in Table 1.

% greater than	Stone size (mm)
0	425
15	375
50	250
85	185
100	50

Table 1: Typical grading for armour stone

Shape

Stones shall be angular/ blockish.

No more than 5% of stone in a sample shall have a ratio of maximum to minimum stone dimensions greater than 3.

The minimum stone dimension is defined as the minimum distance between two parallel lines between which the stone can just be passed.

The angle of internal friction shall be between 40 degrees and 45 degrees.

Density

The mean density shall not be less than 2400 kg/m³ with 90% of stones having a density of at least 2200 kg/m³.

Water absorption

The average water absorption must be less than 2%.

Resistance to weathering

The rock shall be resistant to weathering and should have:

- an average freeze- thaw weight loss of below 0.5%
- no deleterious secondary materials

Resistance to impact

The stone should be free from joints/ bedding planes that would cause disintegration of the rock on impact, during placement.

3.6.2 Clause 2.143 Stone Blockwork

Size

Block dimensions and range of acceptable sizes for use in construction of the rock ramp are shown on the drawings.

Shape

Blockstone should be cuboid or blocky in shape with a flat underside (to bear on the weir apron) and with faces abutting other blocks profiled to produce continuous gaps no larger than 50mm between adjacent blocks. It is not anticipated that any cutting or dressing of stone will be required to achieve this tolerance.

Density

The mean density shall not be less than 2400 kg/m³ with 90% of stones having a density of at least 2200 kg/m³.

Water absorption

The average water absorption must be less than 2%.

Resistance to weathering

The rock shall be resistant to weathering and should have:

- an average freeze- thaw weight loss of below 0.5%
- no deleterious secondary materials

Resistance to impact

The stone should be free from joints/ bedding planes that would cause disintegration of the rock on impact, during placement

3.6.3 Clause 2.144 Boulders

Size

Typical boulder dimensions are to suit the specified weight of 1.5 – 2.1 tonnes (equivalent diameter 1.0m to 1.2m).

Shape

Boulders should be rounded in shape to encourage interlock when placed in two layers.

Density

The mean density shall not be less than 2400 kg/m³ with 90% of stones having a density of at least 2200 kg/m³.

Water absorption

The average water absorption must be less than 2%.

Resistance to weathering

The rock shall be resistant to weathering and should have:

- an average freeze- thaw weight loss of below 0.5%
- no deleterious secondary materials

Resistance to impact

The stone should be free from joints/ bedding planes that would cause disintegration of the rock on impact, during placement

3.6.4 Clause 2.145 Concrete Repair materials

Repair materials for the weir crest shall be a proprietary waterproof pre-mixed mortar suitable for the exposed substrate and for application in the prevailing conditions.

3.6.5 Clause 3.16 Construction of rockfill ramp

The design of the works does not specifically require the diversion of flows in the river; the Contractor is to determine the water control arrangements required to suit his preferred method of construction.

The preservation of stability of the partially completed rock ramp structure is a key consideration and the design assumes that the works will be executed in the following general sequence:

- Install boulder toe at downstream end of the ramp
- Construct lowest blockstone groyne including dowels and hardwood kerb
- Fill between boulder toe and blockstone groyne with armour stone
- Construct remaining blockstone groynes in turn and progressively fill advancing upstream

The final profile and surface features of the rock ramp will be determined by the supervisor during construction of the works.

The Contractor is required to devise and install measures to support any sections of the weir disturbed by the rock ramp construction operations, including creation of the crest notches.

3.6.6 Construction of blockstone revetment

Blockstone revetment as shown on the Drawings shall be formed from a variety of selected blocks complying with material specification clause 3.6.2 to create a continuous feature with course height of approximately 750mm and typical thickness of 1.5m. Minimum block size to be 750mm x 750mm x 500mm. Arrangement of blocks and coursing is to suit the Contractor's method of working and preferred width of benching.

4 Useful contacts

4.1 Quarried materials

Darrington Quarries Ltd

Darrington Leys

Cridling Stubbs

Knottingley

West Yorkshire

Tel: 01977 672368

Cadeby Stone

Cadeby Quarry

Garden Lane

Cadeby

Doncaster

South Yorkshire

Tel: 01709 866628

LaFarge Aggregates

Tel: 0844 561 0036

4.2 Timber

Ecochoice LTD

Charlton Lodge

Temple Fortune Lane

London NW11 7TY

Tel: 0845 638 1340

4.3 Geotextiles

GEOfabrics Limited

Skelton Grange Rd

Stourton

Leeds

LS10 1RZ

Tel: 0113 202 5678