

SPECIFICATION FOR GROUTED ANCHORAGES

GENERAL

1. A GROUTED ANCHORAGE MAY BE USED TO:

- ANCHOR ROCKFALL NETTING (TOP, BOTTOM AND INTERMEDIATE FIXING ANCHOR)
- PROVIDE REINFORCEMENT TO A ROCK BLOCK (ROCK REINFORCEMENT DOWEL)

IN ALL CASES, THE GROUTED ANCHORAGE IS AN UNTENSIONED, FULLY BONDED ELEMENT WITH A NUT AND FACE PLATE TIGHTENED TO A NOMINAL LOAD AGAINST THE ROCK FACE.

2. GROUTED ANCHORAGES SHOULD BE CARRIED OUT IN ACCORDANCE WITH THE REQUIREMENTS OF THIS SECTION. SHOULD ANY AMBIGUITY OR CONFUSION EXIST THE CONTRACTOR SHALL CONSULT THE ENGINEER BEFORE PROCEEDING.

3. A METHOD STATEMENT FOR INSTALLATION SHALL BE SUBMITTED TO THE ENGINEER FOR THEIR APPROVAL PRIOR TO COMMENCEMENT OF WORK ON SITE.

SETTING OUT

4. FIXING ANCHORS FOR ACTIVE ROCKFALL NETTING SHALL BE SET OUT ON SITE BY THE ENGINEER AS INDICATED ON THE ACTIVE ROCKFALL NETTING ARRANGEMENT DRAWING.

5. ROCK REINFORCEMENT DOWELS WILL BE REQUIRED ABOVE THE TUNNEL PORTAL IN SLOPE 3. THESE WILL BE MARKED OUT ON SITE BY THE ENGINEER.

WORKMANSHIP AND STABILITY

11. THE CONTRACTOR SHALL MAKE PROVISIONS SUCH THAT THERE IS NO DAMAGE TO INFRASTRUCTURE, STRUCTURES, VEHICLES, PLANT OR SERVICES AS A RESULT OF GROUTED ANCHORAGE OPERATIONS. SHOULD ANY SUCH DAMAGE OCCUR THE CONTRACTOR WILL BE REQUIRED TO RECTIFY THE DAMAGE AT THEIR OWN COST.

12. ALL ANCHORS MUST BE POSITIONED TO AVOID DRILLING INTO OR DAMAGING ANY DENTITION OR BRICKWORK. THE CONTRACTOR SHALL TAKE PHOTOGRAPHS OF DENTITION OR BRICKWORK BEFORE AND AFTER DRILLING OPERATIONS. ANY DAMAGE MUST BE REPORTED IMMEDIATELY.

MATERIALS

13. STEEL BARS:

- THE SPECIFICATION FOR ALL ANCHORS SHALL COMPRISE THE DETAILS PROVIDED ON THIS DRAWING.
- BARs FOR ANCHORS SHALL BE 28mm DIAMETER GALVANISED HIGH YIELD BAR WITH A STEEL GRADE NO LESS THAN 500N/mm².
- BARs SHALL BE DEFORMED AND SOLID.
- THREADS ON DOWELS SHALL COMPLY WITH INTERNATIONAL ORGANISATION FOR STANDARDISATION PATTERNS.
- SHOULD THE CONTRACTOR WISH TO USE A PROPRIETARY SELF-DRILLING ANCHOR BAR SYSTEM, THE BAR SPECIFICATION MUST BE AGREED WITH THE ENGINEER PRIOR TO USE.

14. CEMENT GROUT:

- WHERE CEMENT GROUT IS USED, IN ACCORDANCE WITH BS 8081:2015 CLAUSE 12.3.5.1, A MINIMUM GROUT COVER OF 10mm TO THE BAR IS REQUIRED.
- THE GROUT SHALL CONSIST OF ORDINARY PORTLAND CEMENT AND WATER COMPLYING WITH BS EN 197-1:2011 AND SHALL BE TESTED IN ACCORDANCE WITH BS EN 196 (ALL PARTS). HIGH ALUMINA CEMENT SHALL NOT BE USED.
- THE WATER-CEMENT RATIO OF THE GROUT SHALL BE AS LOW AS POSSIBLE CONSISTENT WITH THE NECESSARY WORKABILITY. HOWEVER, IT SHALL NOT EXCEED 0.45 BY WEIGHT TO REDUCE LOSS OF GROUT INTO THE SURROUNDING AREA.
- A MINIMUM UNCONFINED COMPRESSIVE STRENGTH OF 40N/mm² AT 28 DAYS IS REQUIRED WHEN SAMPLES ARE MANUFACTURED, CURED AND TESTED ACCORDING TO BS 1881-113:2011. A MINIMUM COMPRESSIVE STRENGTH OF 25N/mm² IS REQUIRED PRIOR TO INSTALLATION OF FIXINGS (FACE PLATE, WASHER, NUT ETC.).
- THE USE OF ADMIXTURES SHALL COMPLY WITH BS EN 934-2.
- WATER USED IN THE GROUT SHALL COMPLY WITH BS EN 1008:2002.

15. RESIN GROUT:

- RESIN GROUTS SHALL CONSIST OF APPROVED SYNTHETIC POLYESTER OR EPOXY RESINS WITH APPROPRIATE HARDENERS AND FILLERS MIXED AND APPLIED STRICTLY IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS
- RESIN GROUTS SHALL BE SHOWN TO BE PROVED BY TESTS AND/OR PRACTICAL EXPERIENCE TO HAVE THE FOLLOWING PROPERTIES:

- ADEQUATE STRENGTH TO TRANSFER THE APPLIED STRESS PERMANENTLY.
- SUITABLY INERT IN THE SURROUNDING GROUND CONDITIONS.
- CAPABLE OF PROVIDING A BARRIER AGAINST CORROSION.
- ADEQUATE BOND STRENGTH OR ADHESION IN THE CASE OF SMOOTH SURFACES.
- MINIMAL POST GELATION SHRINKAGE (<5%).
- SUFFICIENTLY FLUID, AT INSTALLATION TEMPERATURE, PRIOR TO SETTING, TO FILL THE VOID COMPLETELY.
- MINIMUM ULTIMATE COMPRESSIVE AND TENSILE STRENGTHS OF NOT LESS THAN 75N/mm², AND 15N/mm² RESPECTIVELY. THE EXTENSION AT FAILURE SHOULD NOT EXCEED 2%.

16. FITTINGS:

- ACTIVE NETTING FIXING ANCHORS SHALL ALL BE FITTED WITH A SUPERCOATED GEOBRUGG P33 SPIKE PLATE (HOLE DIAMETER OF EITHER 40mm OR 50mm TO SUIT THE SITE GEOMETRY REQUIREMENTS.
- ROCK REINFORCEMENT DOWELS SHALL BE FITTED WITH A GALVANISED HARDENED STEEL SQUARE FACE PLATE 100mm × 100mm × 10mm.
- A SECOND DOMED NUT, REVERSED, IS TO BE INSTALLED ONTO THE END OF ALL TOP FIXING ANCHORS FOR THE ROCKFALL NETTING, AND ALL ANCHORS WITHIN 2.5m OF GROUND LEVEL TO PREVENT IMPALEMENT. THE REVERSED NUT IS TO BE SECURED USING LOCTITE TO PREVENT UNAUTHORISED REMOVAL (REFER TO DETAIL A).

STORAGE AND HANDLING

17. ALL MATERIALS FOR BONDED WORK SHALL BE CLEAN AND FREE FROM ANY SUBSTANCE WHICH MAY IMPAIR THE BOND.

18. BARs SHALL BE PROTECTED AGAINST MECHANICAL DAMAGE AND CORROSION DURING ALL STAGES OF MANUFACTURE, FABRICATION, STORAGE AND INSTALLATION.

DRILLING OF DOWELS

19. GROUTED ANCHORAGES SHALL BE BONDED IN PRE-DRILLED HOLES TO A DEPTH OF 3.0m FOR ALL GROUTED ANCHORS.

20. THE BOREHOLE FOR 28mm SOLID BAR INTO ROCK SHALL HAVE DIAMETER OF NOT LESS THAN 41mm WHERE RESIN CAPSULES ARE USED, AND NOT LESS THAN 48mm WHERE CEMENT GROUT IS USED. A LARGER BOREHOLE CAN BE DRILLED HOWEVER MEASURES MAY BE REQUIRED TO ENSURE THE HOLE DOES NOT COLLAPSE.

21. THE LENGTH OF THE HOLE SHALL NOT EXCEED THE INSTALLED LENGTH OF THE GROUTED ANCHORAGE BY MORE THAN 50mm.

22. THE GROUTED ANCHORAGE SHALL BE INSTALLED ON THE SAME DAY AS THE DOWEL HOLE IS COMPLETED.

23. HOLES SHALL BE STABLE AND OF ADEQUATE DIMENSIONS TO ACCOMMODATE THE BAR WITHIN PERMITTED TOLERANCES AND FREE OF OBSTRUCTIONS OR PROTRUSIONS.

24. ALL PLANT SHALL BE OF MODERN DESIGN AND CAPABLE OF DRILLING HOLES OF THE SPECIFIED DIAMETER AND INCLINATION. HOLES SHALL BE DRILLED BY ROTARY PERCUSSIVE.

25. WHERE AN ALTERNATIVE DRILLING AND GROUTING METHOD IS TO BE USED THE CONTRACTOR SHALL SUBMIT A METHOD STATEMENT TO THE ENGINEER FOR APPROVAL PRIOR TO COMMENCEMENT OF WORKS.

INSTALLATION OF DOWELS

26. ON COMPLETION OF DRILLING THE BOREHOLE, THE BAR SHALL BE INSTALLED WITH THE REQUIRED QUANTITY OF GROUT OR RESIN TO ENSURE BONDING OF THE FULL LENGTH OF THE GROUTED ANCHORAGE. WHERE HOLES EXTEND THROUGH AN UPPER LEVEL OF SOIL THE GROUT SHALL BE USED TO INFILL THE HOLE TO THE GROUND SURFACE.

27. GROUTING SHALL BE DISCONTINUED IF THE AMBIENT TEMPERATURE OR GROUT TEMPERATURE FALLS BELOW 5°C UNLESS ADDITIVES ARE APPLIED TO THE GROUT MIX.

28. THE PROXIMAL END OF THE BOREHOLE MUST BE TOPPED UP WITH GROUT TO ENSURE COMPLETE COVERAGE OF GROUT AROUND THE BAR.

29. WHEN THE GROUT HAS ATTAINED A STRENGTH OF AT LEAST 25N/mm² AND NOT LESS THAN FOUR DAYS FOLLOWING COMPLETION OF THE GROUTING OPERATIONS, THE END FIXTURES SHALL BE ATTACHED TO THE PROXIMAL END OF THE BAR.

30. THE NUT SHALL BE TENSIONED AGAINST THE FACE PLATE USING A TORQUE WRENCH TO A NOMINAL LOAD OF 30Nm.

31. TO ENSURE THAT THE LOAD IS TRANSMITTED UNIFORMLY INTO THE ROCK, IT MAY BE NECESSARY FOR FACE PLATES TO BE SEATED INTO THE ROCK FACE WITH DENSE RESIN OR A STIFF GROUT MIX BEFORE TENSIONING.

32. ONCE COMPLETED AND TENSIONED, ANY SURPLUS TENDON LENGTH SHALL BE TRIMMED DOWN AND NOT PROTRUDE MORE THAN 50mm FROM THE FACING.

33. THE EXPOSED END OF SOLID BARS SHALL BE FITTED WITH HEAT SHRINK END CAP, DENSO TAPE OR GALVANISING SPRAY.

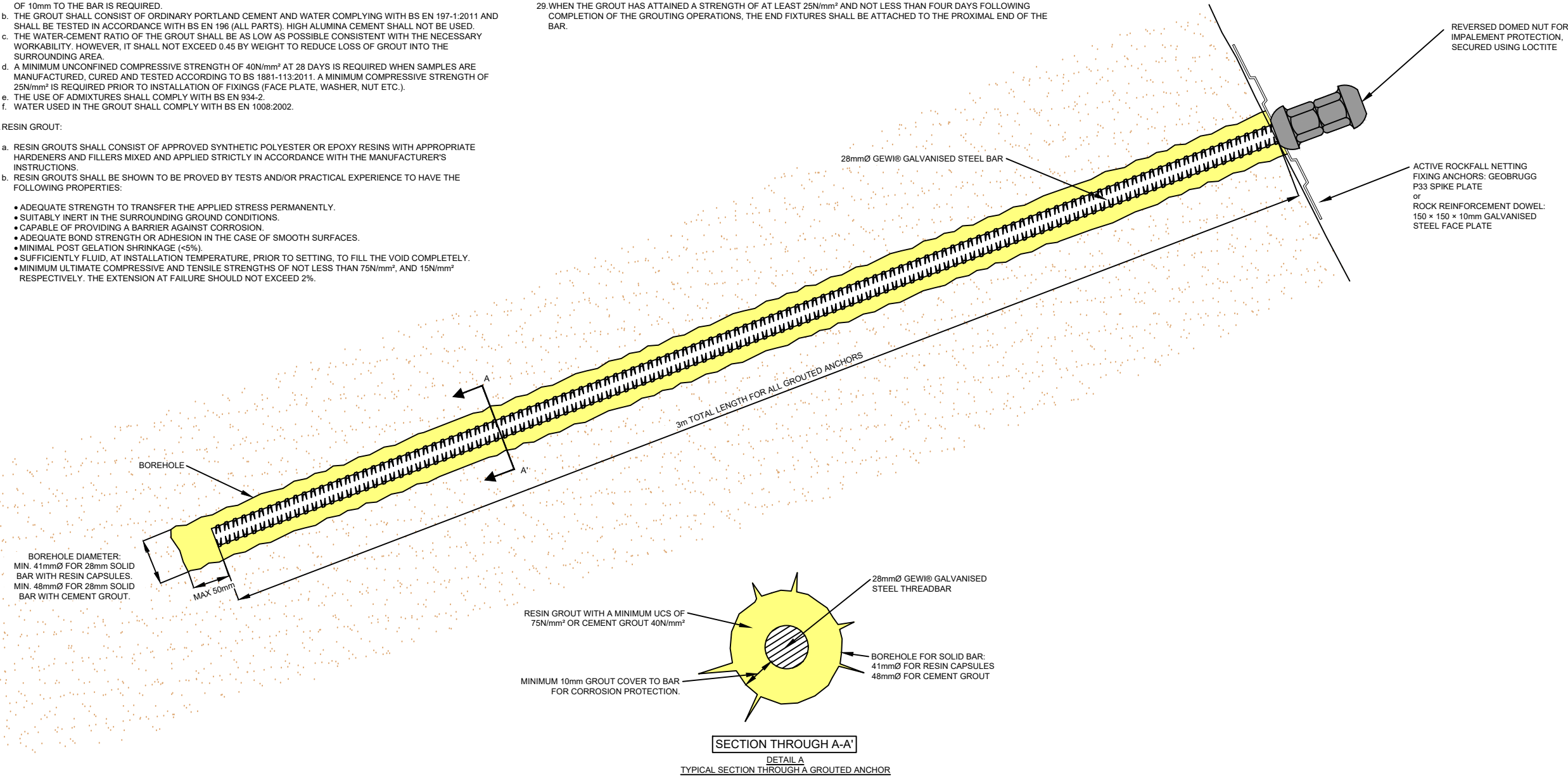
34. THE EXPOSED END OF HOLLOW BARS SHALL BE FITTED WITH HEAT SHRINK END CAP OR DENSO TAPE.

SUPERVISION

35. THE CONTRACTOR SHALL PROVIDE ADEQUATELY EXPERIENCED FULL TIME SUPERVISORY PERSONNEL ON THE SITE FOR THE DURATION OF THE WORKS.

INSPECTION AND TEST PLAN DETAILS

36. REFER TO SEPARATE INSPECTION AND TEST PLAN DETAILS DRAWING.



DO NOT SCALE FROM THIS DRAWING

SAFETY HEALTH AND ENVIRONMENTAL INFORMATION

IN ADDITION TO THE HAZARD/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING RISKS AND INFORMATION.

RISKS LISTED HERE ARE NOT EXHAUSTIVE. REFER TO DRA001.

CONSTRUCTION

- RESTRICTED SITE / WORKING AT HEIGHT
- INTERFACE WITH PUBLIC
- NEAR TO WATERWAYS / TIDAL WORKING
- GROUND INSTABILITY
- SERVICES
- UNSTABLE STRUCTURES
- BOUNDARY MEASURES / VANDALISM
- TRIP HAZARD
- CORROSION
- SITE DESIGNATIONS
- ECOLOG



MAINTENANCE AND INSPECTION

- RESTRICTED SITE
- INTERFACE WITH THE PUBLIC
- TRIP HAZARD



OPERATION

- TRIP HAZARD

FOR INFORMATION RELATING TO USE, CLEANING AND MAINTENANCE SEE THE HEALTH AND SAFETY FILE

IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT.

NOTES

- ENGINEER TO SET OUT WORKS PRIOR TO CONSTRUCTION.
- DO NOT SCALE FROM THIS DRAWING.
- DRAWING TO BE REPRODUCED IN COLOUR.
- ALL DIMENSIONS IN mm UNLESS OTHERWISE STATED.

Rev	Date	Description	Drawn	Chkd	Appd

FOR LISTED BUILDING CONSENT

FAIRHURST

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Fife
COUNCIL

Project Title
**DYSART HARBOUR AND TUNNEL
ROCK SLOPE REMEDIAL WORKS**

Drawing Title
GROUTED ANCHORAGE DETAIL

Drawn AC	Date 21/02/25	Designed ER	Date 21/02/25
Checked HL	Date 21/02/25	Approved ARB	Date 21/02/25

A3	Scale NTS	Fairhurst Ref 160757-9111
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