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[NR CIV/SD/200](#) Rev B

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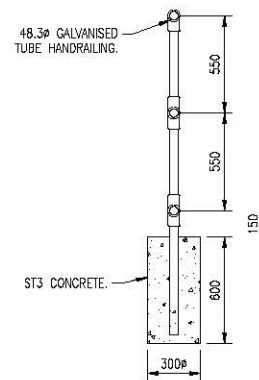
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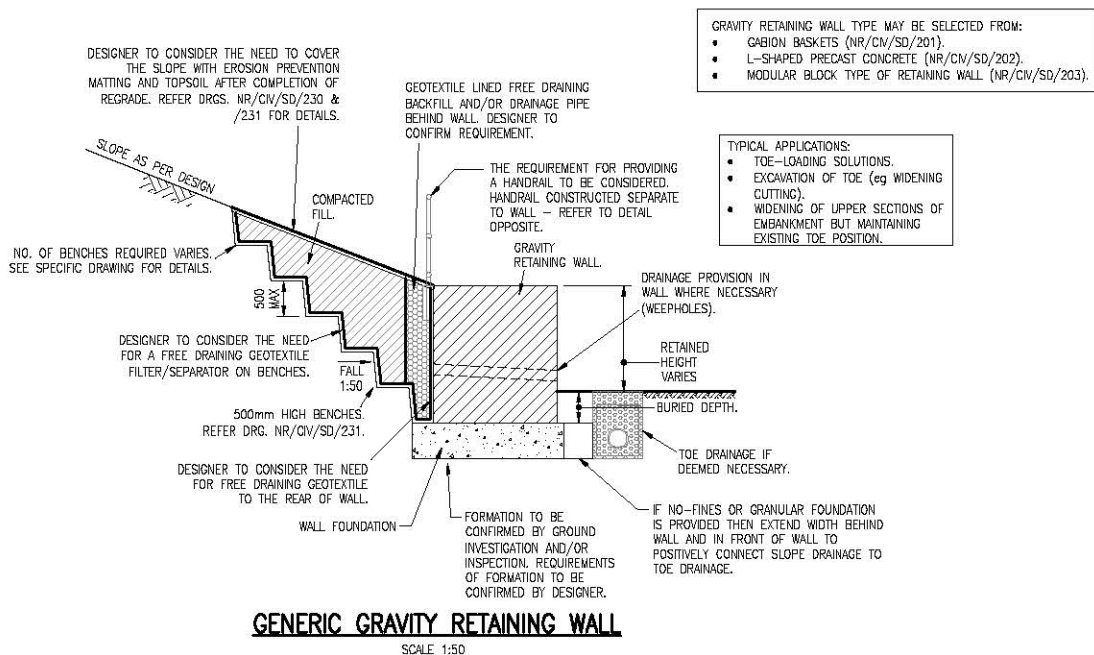
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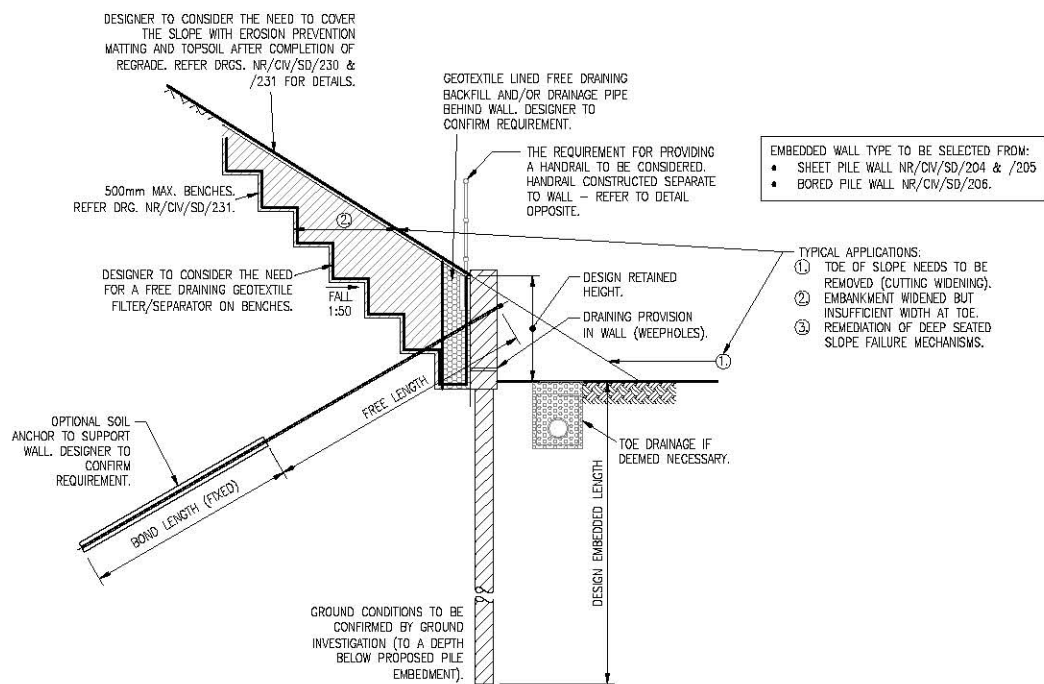
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TABLE 1

SAFETY, HEALTH & ENVIRONMENT RISK ASSESSMENT

DESIGNERS' NOTE - CDM REG. 11

THE FOLLOWING ARE SIGNIFICANT HAZARDS WHICH MIGHT AFFECT THE HEALTH AND SAFETY OF THOSE UNDERTAKING THE WORKS OUTLINED IN THIS SET OF DRAWINGS ON RAILWAY STRUCTURES OR THOSE AFFECTED BY THESE ACTIVITIES. A SITE SPECIFIC RISK ASSESSMENT SHOULD ALWAYS BE UNDERTAKEN PRIOR TO COMMENCING ANY OF THE WORKS DESCRIBED ON SITE.

IT IS ASSUMED THAT A COMPETENT CONTRACTOR IS AWARE OF THE RISKS ASSOCIATED WITH GENERAL CONSTRUCTION ACTIVITIES UNDERTAKEN WITHIN THE RAILWAY ENVIRONMENT.

HAZARD	STAGE	MITIGATING MEASURES
DETRIMENTAL CHANGES IN TRACK GEOMETRY.	C/O	WORKS THAT AFFECT TRACK GEOMETRY SHALL BE MONITORED IN ACCORDANCE WITH NETWORK RAIL LETTER OF INSTRUCTION NR/BS/L/045 MONITORING CIVIL ENGINEERING WORKS THAT MAY AFFECT TRACK GEOMETRY: PROCEDURE AND INTERVENTION LEVELS. TRACK QUALITY RISK ASSESSMENT TO BE COMPLETED AS NECESSARY.
LOCALISED/GLOBAL COLLAPSE OF THE SLOPE FROM THE BENCHING/EXCAVATION ACTIVITIES.	C	ALL WORKS TO BE IN ACCORDANCE WITH NR/PRC/MP/CI0058. EXTENTS OF ANY PERMITTED EXCAVATIONS IN THE SLOPE TO BE CONFIRMED BY DESIGNER. CONTRACTOR TO ENSURE COMPLIANCE ON SITE.
WORKING ON THE CREST OF THE SLOPE CAUSING SLOPE INSTABILITY.	D/C	DESIGNER TO ASSESS WHERE PLANT AND EQUIPMENT CAN BE POSITIONED ON THE SLOPE TO ENSURE STABILITY DURING CONSTRUCTION. CONTRACTOR TO ENSURE COMPLIANCE ON SITE.
NAIL DEFLECTION DURING INSTALLATION (CLOSE TO PERMANENT WAY).	C	CONTRACTOR TO CLOSELY MONITOR INSTALLATION. SOIL ANCHOR TO BE INSTALLED AT A SATISFACTORY ANGLE TO MINIMISE THE RISE OF DEFLECTIONS AFFECTING THE SAFETY OF THE RAILWAY.
ELECTROCUTION FROM AC/DC EQUIPMENT.	D/C/D	ALL STEELWORK TO BE ELECTRICALLY BONDED IN ACCORDANCE WITH NETWORK RAIL STANDARDS.
MATERIAL/PLANT CLASHES WITH RAILWAY TRAINS/INFRASTRUCTURE DURING INSTALLATION.	C	CONTRACTORS METHOD OF WORKING TO BE AGREED WITH NETWORK RAIL. RISK ASSESSMENT TO ADDRESS POSSIBLE MATERIAL/PLANT CLASHES. CONSTRUCTION WORKS TO BE IN ACCORDANCE WITH THE RELEVANT NETWORK RAIL STANDARDS. EG NR/L3/IN/CP0063 'PILING ADJACENT TO THE RUNNING LINE'.
STABILITY OF PRECAST/PREFABRICATED ELEMENTS DURING TRANSPORTATION AND TEMPORARY CONDITIONS	D/C	DESIGNER TO INDICATE POTENTIAL UNSTABLE ELEMENTS ON SITE SPECIFIC DRAWINGS AND CONTRACTOR METHOD OF WORKING TO ENSURE STABILITY OF ELEMENTS AT ALL TIMES.
NOTE : C=CONSTRUCTION, D=DESIGN, O=OPERATION		

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NOTES (CONT.)	
A11	EMBEDDED PILES CAN BE USED ON UPPER SECTIONS OF SLOPING GROUND (E.G. TO DISECT HIGHER POTENTIAL FAILURE PLANES), SUBJECT TO THE NECESSARY DESIGN CHECKS AND ALSO THE CONSTRUCTION CONSIDERATIONS FOR PLANT ACCESS. GRAVITY WALLS ARE MORE SUITED TO LOCATIONS AT THE TOE OF SLOPES; HOWEVER THEY CAN BE ADOPTED FOR UPPER SECTIONS PROVIDING SLOPE FAILURES BENEATH THE WALLS (GLOBAL STABILITY) ARE CHECKED.
A12	REQUIREMENTS OF NR/PRC/MP/CI0058 TO BE ADHERED TO.
A13	DESIGN TO BE IN ACCORDANCE WITH NETWORK RAIL COMPANY STANDARD NR/L3/CIV/071: GEOTECHNICAL DESIGN.
A14	REFERENCE SHOULD BE MADE TO THE 'SELECTION GUIDE FOR RETAINING WALLS' (NR/CIV/SD/56/200).
B	ENVISAGED METHOD OF CONSTRUCTION FOR RETAINING WALLS:-
B1	THE FOLLOWING METHODOLOGY ASSUMES ADEQUATE GROUND INVESTIGATIONS TO DETERMINE EXISTING GROUND CONDITIONS AND PARAMETERS WILL HAVE BEEN COMPLETED AHEAD OF THE MAIN CONSTRUCTION WORKS. THE CONSTRUCTION SEQUENCE IS LIKELY TO BE AS FOLLOWS: • DESK STUDY TO VERIFY THE ANTICIPATED GROUND CONDITIONS AND PRESENCE OF BURIED STRUCTURES / SERVICES. LOCATE, EXPOSE AND IDENTIFY ANY BURIED SERVICES. PROTECT CABLES AS REQUIRED (3RD PARTY AND NETWORK RAIL). • COMPLETE ANY NECESSARY FORM C DESIGNS AS DEEMED NECESSARY (INCLUDING CONSIDERING TYPE AND LOCATION OF PLANT TO BE USED). • LIFT AND SHIFT / PROTECT ANY AFFECTED SERVICES TO TEMPORARY POSITION AS REQUIRED. • PREPARATION OF GROUND SURFACE (BENCHING-IN ETC). • CONSTRUCT FOUNDATIONS FOR RETAINING WALL (SHALLOW OR PILES). CONSTRUCT WALL. • PLACE AND COMPACT FILL AND GRADE SLOPE TO REQUIRED FINAL PROFILE. REINSTATE FENCING.
B2	CONSIDERATION WILL NEED TO BE MADE AS TO THE SAFETY OF WORKING ON A SLOPE BELOW (OR ABOVE) THE RAILWAY. EXCAVATIONS INTO A SLOPE, ALTHOUGH TYPICALLY FOR SHORT DURATIONS, WILL NEED TO CONSIDER THE STABILITY ASPECTS AND TEMPORARY WORKS DESIGNS (FORM C'S) AND SAFE WORKING METHODOLOGIES WILL NEED TO BE CONFIRMED AND AGREED BY NETWORK RAIL.
C	INSTALLATION GUIDANCE
C1	FOR THE EMBEDDED TYPE OF WALL THE METHOD OF PILE INSTALLATION TO BE CONFIRMED BY NETWORK RAIL (E.G. DRIVING OR VIBRATING PILES TO DEPTH).
C2	ALL FILL MATERIAL IS TO BE PLACED AND COMPACTED IN ACCORDANCE WITH THE SPECIFICATION FOR HIGHWAY WORKS. THE TYPE OF PLANT TO BE CONFIRMED PRIOR TO CONSTRUCTION AND BE SUITABLE FOR THE TYPE OF FILL TO BE COMPACTED AND LOCATION.
D	DESIGN ASSUMPTIONS
D1	PRESSURES ON SUBGRADE TO BE CHECKED BY DESIGNER AND DEPTH / AREA OF FOUNDATION INCREASED AS NECESSARY. LOCAL SOFT SPOTS TO BE REMOVED AND REPLACED WITH COMPACTED GRANULAR MATERIAL. CONCRETE OR NO-FINES CONCRETE.
D2	THE ALLOWANCE FOR ANY UNPLANNED EXCAVATIONS SHALL BE IN ACCORDANCE WITH NR/L3/CIV/071.
D3	DESIGNER TO TAKE INTO ACCOUNT THE LIKELY PRESENCE OF A SOFT UPPER LAYER AND/OR THE EFFECT OF A TOE DRAIN IN FRONT OF THE WALL IN THE STABILITY CALCULATIONS.
D4	REQUIREMENTS FOR THE REAR OF WALL AND/OR TOE DRAIN SHALL BE SPECIFIED BY THE DESIGNER. DRAINAGE PROVISION SHALL BE DETAILED IN A PROJECT SPECIFIC FORM A / FORM B SUBMISSION. DESIGNER TO CONSIDER POSITIVE CONNECTIONS BETWEEN THE WALL DRAINAGE AND TOE DRAINAGE.
D5	THE ASSUMED MINIMUM DESIGN LIFE SHALL BE: - SHEET PILES/PILES – 120yrs - STEELWORK – 120yrs - GABION WALLS – 60yrs - OTHER WALLS – 120yrs - SOIL ANCHORS – 60yrs - PRECAST CONCRETE PLANKS – 120yrs - TIMBER PLANKS – 30yrs THESE ARE TO BE CONFIRMED BY THE DESIGNER IN THE PROJECT SPECIFIC FORM A.

DRAWING No. NR/CN/SD/200				
NOTES				
1	THIS DRAWING TO BE READ IN CONJUNCTION WITH THE RELEVANT STANDARD RETAINING WALL DETAIL DRAWINGS NR/CN/SD/201 TO 206.			
A	<u>GENERAL</u>			
A1	ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SPECIFIED.			
A2	ALL DETAILS ON THESE DRAWINGS ARE SUBJECT TO CONFIRMATION BY DETAILED SITE SPECIFIC DESIGN FOLLOWING A COMPREHENSIVE GROUND INVESTIGATION AND TOPOGRAPHICAL SURVEY. DEPTH AND COVERAGE OF GROUND INVESTIGATION TO BE SUITABLE FOR THE RETAINING WALL TYPE, LENGTH AND SITUATION.			
A3	THE TRAJECTORIES OF ANY SLOPE FAILURE SURFACES AND THE GROUND WATER CONDITIONS SHALL BE CONFIRMED BY THE GROUND INVESTIGATION AND THE PERIODIC MONITORING OF INSTALLED SITE INSTRUMENTATION. MONITORING INSTALLATIONS TO BE IN ACCORDANCE WITH THE INSTRUMENTATION DRAWINGS NR/CN/SD/390 AND /391.			
A4	THE DESIGNER SHALL ASSESS WHETHER THE SITE HAS ANY SLOPE INSTABILITY. IT IS ENVISAGED THE EMBEDDED TYPE OF WALLS SHALL BE USED FOR STABILISING DEEP-SEALED FAILURE MECHANISMS. THE GRAVITY OR EMBEDDED WALLS CAN BE ADOPTED FOR SHALLOW FAILURE INSTABILITY REMEDIATION. THE DESIGN REQUIREMENTS AND DETAILS OF THE RETAINING WALLS SHALL BE DEFINED IN THE PROJECT SPECIFIC FORM A.			
A5	DESIGNER TO UNDERTAKE THE NECESSARY DESIGN / CHECK TO ENSURE INTERNAL AND GLOBAL STABILITY OF THE RETAINING WALLS IS IN ACCORDANCE WITH THE RELEVANT EUROCODE.			
A6	ANY ASSOCIATED SLOPE REGRADING AND BENCHING SHALL REFERENCE THE SLOPE REGRADE STANDARD DETAILS DRAWINGS NR/CN/SD/230 AND /231.			
A7	STANDARD DETAILS TO BE USED IN ACCORDANCE WITH NR/I3/CN/151 TECHNICAL APPROVAL OF STANDARD DESIGNS AND DETAILS FOR CIVIL ENGINEERING WORKS'.			
A8	ALL WORKS TO BE COMPLETED IN ACCORDANCE WITH THE REQUIREMENTS OF NETWORK RAIL COMPANY PROCEDURES NR/L2/AMG/1030; WORKING SAFELY IN THE VICINITY OF BURIED SERVICES.			
A9	GUIDANCE FROM NETWORK RAIL EARTHWORKS ENGINEER MUST BE SOUGHT FOR ANY PROPOSED CONSTRUCTIONS OR ALTERATION TO A SLOPE WHERE SIGNIFICANT DEFECTS OR MONITORING INSTRUMENTATION ARE PRESENT.			
A10	TYPICAL RETAINING WALL SOLUTIONS SHOWN ARE APPLICABLE TO CUTTINGS AND EMBANKMENTS IN GRANULAR AND COHESIVE SOILS. RETAINING WALLS CAN BE UTILISED ON SIDE-LONG GROUND SUBJECT TO A DESIGN STABILITY CHECK.			
B	MAY 2012	TABLE 1 UPDATED	MV	RES
A	MAY 2011	FIRST ISSUE	RKA	AW
Rev	Date	Description of revision	Design'd	C'kd
 Network Rail Infrastructure Ltd. Registered Office: Kings Place, 90 York Way, London, N1 9AG				
Approved	P CLARK	Senior Prog. Eng. Manager Investment Projects Building & Civils	PC	MAY 2012
	Name	Position	Signature	Date
Master copy with original signatures held by Network Rail HQ CIVIL ENGINEERING STANDARD DESIGN				
(C) COPYRIGHT NETWORK RAIL 2011				
RETAINING WALLS				
TYPICAL RETAINING WALL KEYS AND GENERAL NOTES				
Scale	A5 SHOWN @ A1			
Drawing Number	NR/CN/SD/200			
	REV.			