STEP 9: DETERMINATION OF PULLOUT RESISTANCE

Refer to Section 8.9 (especially 8.9.2)

Four pullout tests on the distal ends of 6 m-long sacrificial nails have been carried out to assess the bond resistance for the design. The pullout test results are summarised in Table A1.2.

Table A1.2   *Pullout test results*

Test reference	Ultimate pullout load (kN)
1	155
2	135
3	120
4	130
Mean value	135
Lowest value	120

8.9.2   Method 2: pullout tests

It is good practice to carry out "suitability" or "design investigation" pullout tests. This may not always be practicable for small soil-nailing sites, where, if the design is thorough, tests at an early stage on working nails to 1.5 × design load should be sufficient. The requirements for, and interpretation of, "suitability" and/or "design investigation" tests are discussed in Section 11.3. The main purpose of such tests is to measure the (ultimate) pullout resistance, P_{ult}. prEN 14490:2002 and ENV 1997-1 recommend a set of correction factors, ξ, to be applied to the ultimate pullout resistance values obtained from site tests to reduce them to characteristic values and these are summarised in Table 8.5. These correction factors are no longer included in the most recent version of EC7 (BS EN 1997-1:2004), but the authors of this book consider them still to be appropriate.

Analysis based on BS8006:2011

Working load: 34 kN
Design load: 115 kN
Ultimate bond stress: 100 kPa
Allowable Bar tensile capacity: 260 kN (AS2678)
90% yield strength: 360 kN
100mm grout hole

	QLD TMR	VICROADS	NSW RMS	BS8006:2011/ CIRIA C637	HK Geoguide 7
Production test load (kN)	51 (1.5 x working load)	172.5** (1.5 x design load)	51 (1.5 x working load)	38 – 51 (1.1-1.5 x working load)	Non-destructive testing
Time load held (min)	60	240	180	60	-
Sacrificial test load (kN)*	-	32/m of nail (1.5 x ult. bond stress)	230 (2 x design load)	172.5 – 230 (1.5-2 x design load)	360 (2m bond typical)
Time load held (min)	-	240	180	60	60

*Sacrificial load tests always have an upper limit based on bar strength.
**Sacrificial test

CALCULATE DESIGN BOND STRESS

$\tau u = $ Pult / π D L Yp ξ   BOND STRESS

Pult = pullout resistance from pullout test (KN)

Pullout Test Result

Test Reference	Ultimate pullout load
1	155
2	135
3	120
4	130
Mean Value	135
Lowest Value	120

Pult =   120 Lowest Value

L =   LENGTH OF SOIL NAIL
L =   6 m

Yp =   Partial Factor
Yp =   1.25 temporary

ξ =   a correction factor for number of tests