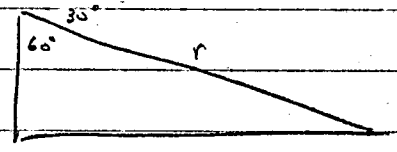
GGE 311

ANCHOR TEST # 22 A EVALUATION

(A) BOREHOLE LOCATION

- length of borehole = 36.4 m
- angle from horizontal = 30°
- top elevation = 91.7 m



$\frac{x}{r} = \cos 60°$

$x = r \cos 60°$

$= 36.4 (0.5)$

$= 18.2$

- top elevation = 91.7 - 18.2 = 73.5
- bond length = 3.0 m (designed)
- top of bond = 91.7 - 16.7 = 75.0 m

(B) ULTIMATE CAPACITY

Creep Test OK @ 605 kN

Ultimate Bond Stress = $\frac{\text{Load}}{\text{Area}}$

Load = 605 kN

Area = $\pi d L$

where $d = 0.14$ m

$L = 3$

$A = 1.32$

$= \frac{605}{1.32}$

$= 458$

(C) CALCULATION OF FREE-STRESSING / BOND LENGTHS

$$L = \frac{\delta A E}{\Delta P}$$

$\delta_1 = (348.9 - 244.7) = 104.2$
$\delta_2 = (122.8 - 31.2) = 91.6$
$\delta_3 = (263.0 - 138.9) = 124.6$
$\Delta P_1 = 605 - 133.4 = 471.6$
$\Delta P_2 = 507 - 133.4 = 373.6$
$\Delta P_3 = (702.8 - 133.4) = 569.4$
$A = 691\ mm^2$
$E = 200\ kN/mm^2$
$\delta_4 = (337.6 - 280.6) = 57$
$\Delta P_4 = (507 - 253.5) = 253.5$

$L_1 = 30.535$
$L_2 = 33.884$
$L_3 = 30.242$
$L_4 = 31.074$

$\delta_5 = (122.8 - 55.1) = 67.7$
$\Delta P_5 = (507 - 177.9) = 329$

$\delta_6 = 502.3 - 310.3 = 192$
$\Delta P_6 = 867.4 - 0 = 867.0$

$L_6 = 30.604$

$L = 33.884$

∴ Bond Length = Borehole − L
= 36.4 − 33.884
= 2.5 m

But calculation may be already used / plays to hold anchors.

(D) CONCLUSION
TOP OF BOND = elev. 75.0 m
ALLOWABLE BOND STRESS = 229 kPa

GO TRANSIT 86 11 12

CONTRACT GGE 311

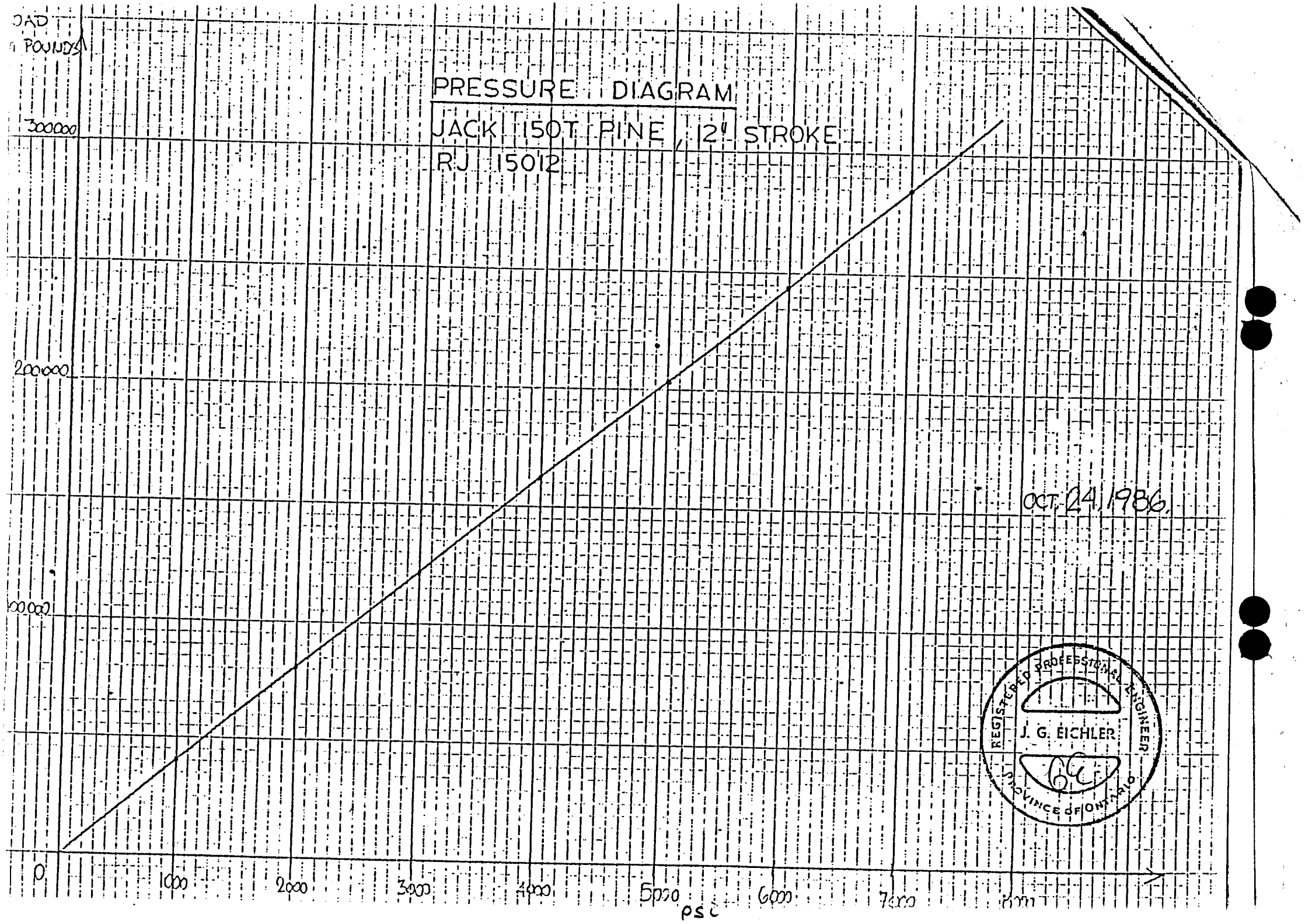
ANCHOR TESTING

T = 500 kN

1 kip = 4.448222 kN

JACK NO. RJ 15012

THEORETICAL LOADS				ACTUAL LOADS		
%T	kN	Kips	pump pressure psi	Kips	kN	%T
.25	125	28.1	700	30	133.4	.27
.5	250	56.2	1400	57	253.5	.51
.75	375	84.3	2100	85	378.1	.76
1.0	500	112.4	2800	114	507.1	1.01
1.25	625	140.5	3500	142.5	633.9	1.27
1.5	750	168.6	4200	171	760.6	1.52
1.75	875	196.7	4800	195	867.4	1.73
2.0	1000	224.8.	5500	229	996.4	1.99


OAD
POUNDS
PRESSURE DIAGRAM
JACK 150T PINE 12" STROKE
RJ 15012
300000
200000
000000
0
1000
2000
3000
4000
5000
6000
7000
psi
OCT. 24, 1986.
REGISTERED PROFESSIONAL ENGINEER
J. G. EICHLER
PROVINCE OF ONTARIO

CONTRACT GTGE-311 Sheet 1 of 13

ANCHOR INSTALLATION RECORD #22A

LOCATION:
Reference Drawing .....
Pile Number Betw. S.P. 22 & 23
Anchor Number 22A

TENDON:
Manufacturer B&R LONA MULTI STRAND
Configuration (~~Diameter~~, # of Strands) 7
Length (excluding tip) 38.8
Modulus of Elasticity .....

BOREHOLE:
Diameter 140 mm
Slope (horizontal/vertical) 2:1
Angle (from horizontal) 30°
Length 36.4
Date Completed OCT 29/86

ANCHOR:
Top Elevation 91.7
Tip Elevation 73.0
Bond Length 3.0m
Free-Stressing Length 33.4m
Date Bond Grout OCT 29/86
Date Free-Stressing Length Fill OCT 29/86

Inspected By JOHN BOHNER

Signature _____

Date OCT 29/86

NOTE: PLEASE SEND COMPLETED FORM OR COPY TO:
FOUNDATION DESIGN SECTION, ROOM 315, CENTRAL BUILDING,
1201 WILSON AVENUE, DOWNSVIEW, M3M 1J8

ANCHOR TEST #22A

Job Identification..G.G.E.-311.....

Anchor Identification.....22A.....

Test Date...8.6.....11.....19-20-21

.001" = .004" HORIZ & VERT DIALS

TIME	LOAD		DEFORMATION			
	pump pressure (psi)	anchor load (units KN)	V vertical (1) (units in)	H horizontal (2) (units in)	D elongation (3) (units in)	Recorded in cm
9:15	/		0.[illegible]	.5:5		
	NO PRESSURE		2.3 cm	* Ram	extension	
	10.6 cm	from	jack to	plugs.		
9:16	56.0	100.1 11°C	0.036	0.307	0.000	R.S. D.L.
9:21 :05	700	133.4 11°C	0.032	0.293	0.471 (12.0)	4.0 D.L.
9:26	300	53.4 12°C	0.031	0.291	0.471 (12.0)	4.0 I.S.
9:26	*700 .25	133.4 12°C	0.032	0.290	0.481 (12.2)	4.1 I.S.
9:31	400	68.9 12°C	0.031	0.290	0.481 (12.2)	4.1 I.S.
9:31	* 700	133.4 12°C	0.031	0.290	0.490 (12.4)	4.1 I.S.
9:36	600	106.8 13°C	0.031	0.290	0.490 (12.4)	4.2 I.S.
5:20 9:36	* 700	133.4 13°C	0.030	0.289	0.499 (12.7mm)	4.2 I.S.
				①		
0:25 9:41	1400 .50	253.5 13°C	0.023	0.216	1.978 (50.2mm)	8.2 I.S.
9:46	1100	195.7 13°C	0.020	0.211	1.975	8.2 I.S.
9:46	* 1400	253.5 13°C	0.020	0.209	1.984	8.2 I.S.
9:51	1400	13°C	0.018	0.207	1.984	8.2 I.S.
0:40 9:56	1400	253.5 13°C	0.017	0.207	1.984	8.2 I.S.
9:57	*1500	13°C	0.017	0.203	2.042 (51.9)	8.4 D.L.
	GAUGE	RESET	TO	0.000.		
0:45 10:01	2100 .75	378.1 14°C	0.005	0.127	1.237 (91.0)	11.6 I.S.
10:06	2100	14°C	0.002	0.117	1.232	11.6 I.S.
10:11	2100	14°C	0.002	0.112	1.229	11.6 I.S.
10:16	2100	15°C	0.002	0.110	1.227	11.6 I.S.
0:05 10:21	2100	378.1 15°C	0.002	0.009	1.227 (90.7)	11.6 I.S.
1:05 10:21	2800 1.0	507.1 15°C	0.002	0.025	2.500 (123.0)	15.0 I.S.
10:26	2800	15°C	0.002	0.012	2.493	15.0 I.S.
10:31	2800	16°C	0.002	0.012	2.491	15.0 I.S.
10:36	2800	16°C	0.002	0.007	2.488	15.0 I.S.
1:25 10:41	2800	507.1 17°C	0.002	0.003	2.486	15.0 I.S.

22A

ANCHOR TEST

Job Identification.....GGE-311.....

Anchor Identification.....22A.....

Test Date...86/11/3-19-21.

TIME	LOAD		DEFORMATION			
	pump pressure (psi)	anchor load (units KN)	V vertical (1) (units in)	H horizontal (2) (units in)	D elongation (3) (units in)	Recorded cm
10:46	2800	507.1 16°C	0.002	0.001	2.485 (122.6)	15.0 IS
10:						
10:51	2750	496.0	0.002	0.001	2.484 (122.6)	15.0 IS
10:	ADJUSTED GAUGES - VERTICAL		0.002	changed to		0.111
			- HORIZON	0.001	changed to	0.384
10:52			- ELONG	2.484	changed to	0.110
11:16	2550	458.2 15°C	0.111	0.384	0.110 (122.6)	15.0 IS
11:16	* 2800	507.1 15°C	0.111	0.384	0.116	15.0 IS
11:21	2800	15°C	0.110	0.384	0.117	15.0
11:26	2800	15°C	0.109	0.384	0.117 (122.8)	15.0 JB
*	ADJUSTED ELONG GAUGE			0.117 =	2.731	15.0 JB
11:32	2800	507.1 15°C	0.109	0.384	2.731 (122.8)	15.0 IS
11:32	2100	378.1 15°C	0.116	0.399	2.165 (108.4)	13.6 IS
11:37	2100	378.1 15°C	0.116	0.399	2.165	13.6 JB
11:37	1400	253.5 15°C	0.125	0.440	0.940 (77.3)	10.4 JB
11:42	1400	253.5 15°	0.126	0436	0.940	10.4 JB
11:42	1000	177.9 15°	0.141	0.466	0.065 (55.1)	8.0 JB
* 11:42	AJUST GAUGE AT 1000. = 0.065 =			②	2.670 (55.1)	8.0 JB
11:47	700	133.4 15°C	0.154	0.481	1.728 (31.2)	6.3 JB
11:52	700	133.4 15°C	0.162	0.482	1.728	6.3 JB

22A

ANCHOR TEST

Job Identification..... GCE-311

Anchor Identification..... 22A

Test Date..... 8-Nov-11/19-21

TIME	LOAD		DEFORMATION			
	pump pressure (psi)	anchor load (units kN)	V vertical (1) (units in)	H horizontal(2) (units in)	D elongation(3) (units in)	Recorded B cm
				②		
2:41 11:58	1700 =	133.4 ELONG GAUGE RESET		1.728 =	0.030 (31.2)	6.7 JB
12:00						
2:54 12:10	1400	253.5 18°c	0.128	0.381	1.104 (58.5)	8.2 JB.
2:59 12:15	1300	235.8 18°c	0.129	0.381	1.104	8.2 JB
12:20	*1400	253.5 18°c	0.129	0.381	1.111	8.2 JB.
3:09 12:25	1400	253.5 19°	0.129	0.381	1.111 (58.7)	8.2 JB
	Reset	HORIZ. GAUGE		0.341		
3:14 12:30	2100	378.1 19°c	0.123	0.341	2.333 (82.7)	11.6 JB.
12:35	2,000	20°c	0.123	0.341	2.336	11.6 JB
12:40	* 2,100	20°	0.123	0.341	2.336	11.6 JB.
3:29 12:45	2,100	378.1 20°	0.122	0.339	2.356 (89.8)	11.6 JB
3:29 12:45	2100	378.1 ELONG GAUGE	RESET	2.336 =	0.000 (89.8)	11.6 JB.
3:30 12:46	2800	507.1 20°c	0.113	0.267	1.320	15.0 JB
12:51	2800	507.1 20°c	0.111	0.260	1.318	15.0 D.L.
12:56	2750	496.0 20°c	0.111	0.257	1.316	15.0 D.L.
3:45 13:01	2750	496.0 19°c	0.108	0.255	1.316 (123.2)	15.0 D.L.
3:45 13:01	3500 1.25	633.9 19°c	0.097	0.172	2.523 (153.9)	18.3 D.L.
13:06	3350	605.0 20°c	0.092	0.163	2.515	IS
13:11	* 3500	633.9 20°c	0.092	0.152	2.579	18.4 I.S.
13:16	3500	633.9 20°c	0.089	0.146	2.579	18.4 IS
13:21	3450	622.8 20°c	0.088	0.142	2.577	18.4 IS
13:26	3450	21°c	0.087	0.139	2.576	18.5 I.S.
4:15 13:31	3450	622.8 21°c	0.085	0.136	2.576 (155.2)	18.5 I.S.
4:20 13:36	3450	622.8 ELONG GAUGE	RESET	2.576 =	0.201 (155.2)	18.5 I.S.
13:37						
4:22 13:38	4200 1.5	760.6 20°C	0.068	0.030	1.544 (189.3)	22.1 I.S.
4:27 13:43	4000	725.1 19°C	0.066	0.024	1.542	22.1 IS

247-3334

ANCHOR TEST #22A

Job Identification GGE-311

Anchor Identification 22A

Test Date 8.6...11.....19-20-21

.001" = .004" HORIZ & VERT

TIME	LOAD		DEFORMATION			
	pump pressure (psi)	anchor load (units KN)	V vertical (1) (units in.)	H horizontal(2) (units in.)	D elongation(3) (units in.)	Recorded cm.
4:33 13:49	FEW TRAINS 3500	633.9 19°C	WENT BY 0.068	0.048	1.600 (190.8)	22.1 I.S.
4:36 13:52	* 3900	702.8 17°C	0.068	0.027	2.999 (226.3)	25.8 I.S.
	STOPPED @ 3900 IN ORDER TO RESET				GAUGE	
		RESET ELONG GAUGE		2.999	= 0.683 (226.3)	25.8 I.S.
4:41 13:57	* 4200	760.6 17°C	0.063	-0.005	1.685	28.4 I.S.
4:46 14:02	3975	720.6 17°C	0.061	-0.004	1.691 (251.8)	28.5 I.S.
14:02	* 4200	760.6 17°C	0.060	-0.006	2.097 (262.1)	29.5 I.S.
4:51 14:07	4075	738.4 17°C	0.060	-0.006	2.102	29.5 I.S.
4:56 14:12	4000	725.1 16°C	0.058	-0.007	2.105	29.5 I.S.
5:01 14:17	4000	16°C	0.055	-0.008	2.108	29.5 I.S.
5:06 14:22	4000	725.1 16°C	0.055	-0.009	2.109	29.5 I.S.
5:16 14:32	3950	ARM HIT 713.9 16°C	0.055	-0.010	2.111	29.5 I.S.
5:26 14:42	3975	720.6 17°C	0.058	-0.010	2.114	29.5 I.S.
5:41 14:57	3925	707.3 17°C	0.057	-0.009	2.118	29.5 I.S.
5:56 15:12	3925	17°C	0.056	-0.008	2.123	29.5 I.S.
6:11 15:27	3925	707.3 19°C	0.057	-0.007	2.126	29.5 I.S.
6:26 15:42	3900	702.8 19°C	0.057	-0.004	2.131	29.5 I.S.
6:41 15:57	3900	702.8 19°C	0.057	-0.003	2.134 (263.0)	29.5 I.S.
6:46 16:02	3500	633.9 19°C	0.056	+0.005	1.977 (259.0)	29.2 D.L.
16:07	3500	19°C	0.054	+0.005	1.978	29.2 D.L.
6:56 16:12	3500	633.9 19°C	0.051	+0.005	1.977	29.2 D.L.
6:56 16:12	2800	507.1 19°C	0.054	+0.036	1.512 (242.1)	27.3 D.L.
7:01 16:17	2800	507.1 19°C	0.054	+0.036	1.312	27.3 D.L.
4:22					.142	24.2 D.L.
7:01 16:17	2100	378.1 18°C	0.061	0.095	0.142 (213.4)	24.2 D.L.
7:06 16:22	2100	378.1	0.061	0.098	0.142	24.2 D.L.
	GAUGE	RESET	TO	2.577		

ANCHOR TEST #22A

Job Identification...G.G.E.-311

Anchor Identification...22A

Test Date...8...6...11...19-20-21

TIME	LOAD		DEFORMATION			
	pump pressure (psi)	anchor load (units KN:)	V vertical (1) (units in)	H horizontal(2) (units in)	D elongation(3) (units in)	Recorded i cm.
7:09 16:25	~~1400~~	253.5 19°C	0.072	0.190	1.088 (174.5)	20.2 D.L.
7:14 16:30	1400	253.5 19°C	0.072	0.191	1.088	20.2 D.L.
	GAUGE	RESET	TO	2.655		
7:16 16:32	700	133.4 19°C	0.088	0.307	1.248 (138.8)	16.3 D.L.
16:37	700	19°C	0.086	0.313	1.251	16.3 D.L.
7:26 16:42	700	133.4 19°C	0.084	0.315	1.251 (138.9)	16.3 D.L.
					③	
	GAUGE	RESET	TO	2.910		
					④	
7:32 16:48	AT NO	PRESSURE		GAUGE =	1.359 (99.5)	
	RAM =	12.1 cm	V=0.116 = H	H=.453		
	RAM MOVED TO		0.0cm	PLUGS	= 8.6 cm.	
	GAUGE	SET	TO	0.003.	V=0.119	H=.461
7:39 16:55	700	133.4 19°C	0.091	0.393.	1.265 (131.6)	3.3 D.L.
7:44 17:00	700	133.4 19°C	0.090	0.392.	1.265	3.3 D.L.
7:49 17:00	1400	253.5 18°C	0.077	0.286.	2.717 (168.5)	7.1 D.L.
17:05	1300	235.8 18°C	0.077	0.284.	2.714	7.1 D.L.
17:05	~~1400~~	253.5 18°C	0.077	0.282	2.745	7.2 D.L.
7:54 17:10	1400	253.5	0.077	0.281	2.745 (169.2)	7.2 D.L.
17:	GAUGE	RESET	TO	0.181		
7:56 17:12	2100	378.1 18°C	0.069	0.204.	1.298 (197.6)	10.3 D.L.
8:01 17:17	2000	360.3 18°C	0.069	0.201.	1.298	10.3 D.L.
8:01 17:17	~~2100~~	378.1 18°C	0.069	0.200	1.308 (197.9)	10.3 D.L.
8:06 17:22	2100	378.1 18°C	0.069	0.200	1.308	10.3 D.L.

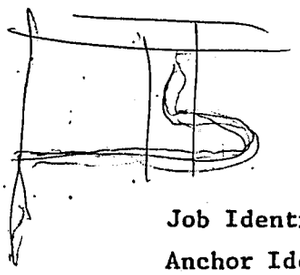
ANCHOR TEST # 22A

Job Identification...G.G.E.-311.....

Anchor Identification.....22A.....

Test Date.....8.6.....11.....1.9-21

TIME	LOAD		DEFORMATION			
	pump pressure (psi)	anchor load (units KN)	V vertical (1) (units in)	H horizontal (2) (units in)	D elongation (3) (units in)	Recorded B cm
8:09						
17:25	2800	507.1 18°C	0.065	0.123	2.521 (278.7)	13.6 D.L.
17:30	2700	484.9 18°C	0.057	0.121	2.531	13.6 D.L.
17:30	*2800	507.1 18°C	0.057	0.119	2.532	13.6 D.L.
8:19 17:35	2800	507.1 18°C	0.057	0.118	2.532 (230.0)	13.6 D.L.
	RESET	GAUGE	TO	0.070		
17:37						
8:21 17:37	3500	633.9 18°C	0.048	0.045	1.375 (263.1)	17.1 D.L.
17:42	3400	609.4 18°C	0.046	0.039	1.375	17.1 D.L.
17:42	3500	633.9 18°C	0.047	0.037	1.378	17.1 D.L.
8:31 17:47	3500	633.9 18°C	0.046	0.035	1.378 (263.2)	17.1 D.L.
8:31 17:47	4200 → 3700	760.6 → 669.5 18°C	0.040	-0.001	2.977	21.2 D.L.
8:36 17:52	3500	633.9 18°C	0.041	+0.002	2.992 (303.8)	21.2 D.L.
	RESET	GAUGE	TO	0.298.	V=0.49	H=+.002
8:39 17:55	3800	687.2 18°C	0.041	-0.014	1.657 (338.3)	24.7 D.L.
8:49 18:00	3600	651.7 18°C	0.041	-0.012	1.672	24.8 D.L.
8:49 18:05	3550	640.5 18°C	0.040	-0.009	1.680	24.8 D.L.
8:51 18:10	3500	633.9 18°C	0.040	-0.008	1.683	24.8 D.L.
18:15	3500	18°C	0.039	-0.007	1.685	24.8 D.L.
18:20	3500	18°C	0.039	-0.006	1.688	24.8 D.L.
18:25	3500	18°C	0.039	-0.006	1.690	24.8 D.L.
18:30	3500	633.9 18°C	0.039	-0.005	1.691	24.8 D.L.
18:45	3400	609.4 19°C	0.038	-0.009	1.695 (339.3)	24.8 D.L.
9:59 18:45	*3500	633.9 19°C	0.038	-0.006	1.777 (341.4)	25.0 D.L.
18:50	3450	622.8 19°C	0.038	-0.006	1.780 (341.5)	25.0 D.L.
9:59 18:50	*3500	633.9 18°C	0.038	-0.007	1.849 (343.1)	25.2 D.L.
9:39 18:55	3500	633.9 18°C	0.038	-0.007	1.847 (343.2)	25.2 D.L.



22A

ANCHOR TEST

Job Identification.....G.G.E-311.....

Anchor Identification.....22.A.....

Test Date...86/11/15 - 19-21.

TIME	LOAD		DEFORMATION			
	pump pressure (psi)	anchor load (units KN)	V vertical (1) (units in)	H horizontal(2) (units in)	D elongation(3) (units in)	Recorded B cm.
9:44 19:00	~~3500~~	633.9 18°C	0.037	-0.006	1.849	25.2 JB
9:59 19:15	3450	627.2 18°C	0.037	-0.006.	1.852	25.2 DL
10:04 19:20	3400	609.4 17°C	0.036	-0.005	1.855	25.3 DL
19:30	3400	17°C	0.035	-0.005	1.856	25.3 DL.
19:45	3400	17°C	0.036	-0.003	1.860	25.3 D.L
10:44 20:00	3400	609.4 17°C	TRAIN 0.032	WENT BY -0.003	1.063 (343.6)	25.3 DL
	86 11	20				
7:15	2000	360.3 0°C	0.030	-0.002	1.762 (341.0)	25.1 J.B
7:30	2650	480.4 6°C	0.035	0.003	1.762	25.1 J.B
7:45	2975	10°C	0.040	0.011	1.764	25.1 J.B.
10:49 8:00	3100	560.5 11°C	0.041	0.014	1.765 (341.4)	25.1 J.B.
10:59 8:15	3150	12°C	0.040	0.017	1.768	25.1 J.B
11:19 8:30	3175	13°C	0.040	0.017	1.773	25.1 JB.
11:29 8:45	3200	14°C	0.038	0.019	1.779	25.1 JB
11:49 9:00	3200	15°C	0.039	0.017	1.781	25.1 JB
11:59 9:15	3200	578.3 15°C	0037	0.018	1.786	25.1 D.L.
9:15	* 3400	609.4 15°C	0.035	0.011	2.014 (347.4)	25.7 DL
12:19 9:30	3400	15°C	0.036	0.008	2.022	25.7 JB
12:29 10:00	3400	16°C	0.036	0.008	2.032	25.8 DL.
10:30	3400	17°C	0.034	0.008	2.044	25.8 D.L.
11:00	3400	17°C	0.034	0.007	2.051	25.8 DL
12:00	3400	17°C	0.032	0.006.	2.064	25.8 D.L.
13:00	3400	17°C	0.030	0.004	2.075	25.8 JB
14:00	3400	609.4 16°C	0.029	0.006	2.084	25.8 D.L.
17:29 15:00	3350	605.0 14°C	0.022	0.003	2.092	25.8 JB
16:00	3350	18°C	0.023	0.003.	2.090	25.8 D.L
17:00	3350	605.0 16°C	0.027	0.003	2.092	25.8 JB
20:39 18:00	3400	609.4 18°C	0.025	0.003	2.095	25.8 D.L.
19:00	3450	622.8 17°C	0.025.	0.003	2.097	25.8. JB
22:29 20:00	3400	609.4 18°C	0.024	0.003	2.098 (349.5)	25.8 D.L.

ANCHOR TEST #22A

Job Identification..... GGE-311

Anchor Identification..... 22A

Test Date... 8/Nov/86 19-21

TIME	LOAD		DEFORMATION			
	pump pressure (psi)	anchor load (units KN)	V vertical (1) (units in)	H horizontal(2) (units in)	D elongation(3) (units in)	Recorded cm
7:30	2,100	378.1 -2°C	0.020	0.003	2.002	25.7 JB
22:29 8:00	3200	578.3 +10°C	0.027	0.003	(347.2) 2.006	25.7 JB
22:44 8:15	3225	+12°C	0.028	0.007	2.009	25.7 JB
22:59 8:30	3250	+13°C	0.027	0.010	2.012	25.7 JB
23:14 8:45	3250	+15°C	0.028	0.012	2.015	25.7 JB
23:29 9:00	3300	+16°C	0.027	0.014	2.023	25.7 JB
23:44 9:15	3325	+17°C	0.027	0.016	2.027	25.7 JB
23:59 9:30	3325	+18°C	0.027	0.017	2.032	25.7 JB
24:29 10:00	3325	+19°C	0.026	0.019	2.041	25.7 IS
25:29 11:00	3350	605.0 +21°C	0.027	0.022	2.062	25.7 J.B.
26:29 12:00	3350	605.0 19°C	0.024	0.018	(348.9) 2.074	25.7 I.S.
12:00	2800					
26:29 12:08	2800	507.1 18°C	0.025	0.042	(337.5) 1.624	25.4 D.L.
26:34 12:05	2800	18°C	0.022	0.041	1.626	25.4 D.L.
26:39 12:10	2800	507.1 18°C	0.021	0.041	337.6 1.626	25.4 D.L.
26:39 12:10	2100	378.1 18°C	0.025	0.083	(318.3) 0.866	22.7 D.L.
26:44 12:15	2175	18°C	0.024	0.084	0.866	22.7 D.L.
26:44 12:15	2100	18°C	0.024	0.087	0.807	22.5 D.L.
26:49 12:20	2100	18°C	0.024	0.087	0.806	22.5 D.L.
26:54 12:25	2100	378.1 18°C	0.023	0.087	(316.8) 0.806	22.5 D.L.
	GAUGE	RESET	TO	2.852		
26:59 12:31	1400	253.5 18°C	0.032	0.172	(280.6) 1.427	18.7 D.L.
27:04 12:36	1400	18°C	0.032	0.173	1.427	18.7 D.L.
	GAUGE	RESET	TO	3.022		
27:09 12:41	700	133.4 18°C	0.044	0.291	(244.7) 1.608	14.8 D.L.
27:14 12:46	700	133.4 18°C	0.045	0.296	1.612	14.8 D.L.
					④	

ANCHOR TEST #22A

Job Identification...GGE-311

Anchor Identification...22A

Test Date..8.6.....1.1.....1.9-21

TIME	LOAD		DEFORMATION			
	pump pressure (psi)	anchor load (units KN)	V vertical (1) (units in)	H horizontal (2) (units in)	D elongation (3) (units in)	Recorded cm
	\				(5)	
27:19 12:51	700	133.4 18°C	0.043	0.297	1.619	14.8 DL
27:24 12:56	700	18°C	0.041	0.297	1.616	14.8 DL
27:29 13:01	700	133.4 18°C	0.040	0.295	(244.8) 1.616	14.8 I.S.
27:29 13:01	560	100.1 18°C	0.046	0.342	(229.8) 1.026	13.3 I.S.
27:34 13:06	500	89.0 18°C	0.045	0.343	1.027	13.3 I.S.
27:39 13:11	500	18°C	0.045	0.343	(229.9) 1.028	13.3 I.S.
	RELEASED	PRESSURE	TO ZERO BACK			
	0	DISTANCE TO GRIPPERS 18.0				10.6 T.S
	RESET RAM	"	"	" 7.5		0 I.S.
	RESET	ELONGATION TO		ZERO		
27:39 13:27	560	17°C	0.038	0.389	(254.9) 0.985	2.8 I.S.
27:44 13:32	375	17°C	0.038	0.386	0.985	
27:44 13:32	560	17°C	0.038	0.386	0.995	2.8 I.S.
27:49 13:37	525	17°C	0.039	0.385	(255.2) 0.995	2.8 I.S.
27:49 13:37	700	17°C	0.037	0.365	1.287	3.7 I.S.
27:54 13:42	700	17°C	0.037	0.364	(262.6) 1.287	3.8 I.S.
27:54 13:42	1400	253.5 16°C	0.027	0.279	(291.6) 2.430	6.8 I.S.
27:59 13:47	1250	16°C	0.026	0.277	2.429	6.8 I.S.
27:59 13:47	*1400	16°C	0.026	0.275	2.442	6.9 I.S.
28:04 13:52	1400	16°C	0.025	0.274	2.443	6.9 I.S.
28:09 13:57	1400	16°C	0.027	0.272	(291.9) 2.443	6.9 JB
					TROUBLE WITH GAUGE NEEDLE STUCK - BROKE FACE TO TURN NEEDLE	
	Reset	GAUGE	2.443 =	0.000		
28:31 14:19	2100	378.1 15°C	0.022	0.192	(314.9) 0.907	10.3 I.S.
28:36 14:24	2000	15°C	0.021	0.185	0.907	10.3 I.S.
28:36 14:24	2100	15°C	0.021	0.179	0.944	10.5 I.S.
28:41 14:29	2100	15°C	0.022	0.179	(315.8) 0.944	10.5 I.S.

ANCHOR TEST #22A

Job Identification....G.G.E. - 311

Anchor Identification.....22A

Test Date..8.6.....11.....19-21

TIME	LOAD		DEFORMATION			
	pump pressure (psi)	anchor load (units KN)	V vertical (1) (units in)	H horizontal(2) (units in)	D elongation(3) (units in)	Recorded cm
28:41 14:29	2800	507.1 15°C	0.014	0.103	(348.0) 2.210	13.8 I.S.
28:46 14:34	2800	16°C	0.014	0.101	2.210	13.8 I.S.
14:34	*2800	PRESSURE 17°C	ACCIDENTALLY 0.015	ADDED BEFORE 0.103	GAUGE CHANGE 2.241 (348.8)	13.8 I.S.
	RESET	TENDON	GAUGE	TO 0.000		
28:55 14:43	2750	18°C	0.010	0.097	0.000 (348.8)	13.8 I.S.
14:43	3500	633.9 18°C	0.009	0.023	(382.8) 0.337	17.5 I.S.
29:00 14:48	3500	18°C	0.007	0.022	1.338	17.5 I.S.
29:05 14:53	3400	17°C	0.002	0.026	1.335	17.5 I.S.
14:53	* 3500	17°C	0.002	0.025	1.344	17.5 I.S.
29:10 14:58	3450	TRAIN WENT BY 17°C	0.002	0.023	1.348	17.5 I.S.
14:58	* 3500	17°C	0.003	0.022	1.352	17.5 I.S.
29:15 15:03	3500	17°C	0.003	0.022	(383.2) 1.352	17.5 I.S.
	RESET	GAUGE	1.352 =	0.001		
29:20 15:08	4200	760.6 17°C	0.002	-0.029	438.0 2.158	23.1 I.S.
29:25 15:13	4000	17°C	0.002	-0.029	2.171	23.2 I.S.
15:13	* 4200	17°C	0.002	-0.029	2.589	24.2 I.S.
29:30 15:18	4100	17°C	0.002	-0.029	2.594	24.2 I.S.
15:18	* 4200	17°C	0.002	-0.029	(456.5) 2.878	25.0 I.S.
		TOOK	GAUGE	OFF		
		USE	RAM	MEASUREMENTS		
29:34 15:22	4800	867.4 17°C			(502.3)	29.6 I.S.
29:36 15:23	4600	17°C			(504.3)	29.8 I.S.
29:36 15:24	* 4900	17°C			(507.3)	30.1 I.S.
29:41 15:29	4850	18°C			1.351	30.1 I.S.
29:46 15:34	4850	18°C			1.351	30.1 I.S.
	DROPPED	PRESSURE	TO	ZERO		
29:46 15:34	0	DISTANCE	TO PLUGS = 19.0		(310.8)	10.4 I.S.
	RESET	RAM	" "	" = 9.0		0 I.S.

ANCHOR TEST # 22A

Job Identification..GGE-311

Anchor Identification.....22A

Test Date...8.6.....11.....19-21

TIME	LOAD		DEFORMATION			
	pump pressure (psi)	anchor load (units KN)	V vertical (1) (units in)	H horizontal(2) (units in)	D elongation(3) (units in)	Recorded cm
	BRINGING PRESSURE UP IN ONE SHOT					
29:46 15:48	4850	17°C			(570.3)	26.0 I.S.
29:51 15:53	4400	796.2 17°C				26.0 I.S.
29:51 15:53	5500	996.4 17°C				30.1 I.S
29:56 15:58	5200	938.6 17°C				30.1 I.S.
30:01 16:03	4900	8896 17°C				30.1 D.L
30:06 16:08	4850	17°C			(621.3)	30.1 D.L.
16:08	4800	16°C	PRESSURE RELEASED.			30.1 D.L
16:13	4550	16°C				30.1 D.L.
16:13	4200.	16°C	PRESSURE RELEASED.			30.1 D.L.
NOTE: FROM 16:08 PRESSURE IS ACTUALLY						5000 psi
*** 30:06 16:15	5000	907.4 16°C				30.1 D.L
29:50 16:20	4900	8896 16°C				30.1 D.L
30:11 16:20	4800	867.4 16°C				30.1 D.L
30:17 16:21	4800	16°C				30.1 D.L
30:02 16:21	* 4200	760.6 16°C	PRESSURE	RELEASED	(564.3)	29.5 D.L.
30:07 16:26	4200	16°C			2.395 (564.3)	29.5 D.L
30:22 16:31	4250	16°C			2.395	29.5 D.L.
30:22 16:31	3500	633.2 16°C			1.445 (540.2)	27.2 D.L.
30:27 16:36	3475	15°C			1.449.5	27.2 D.L
30:27 16:36	2800	507.1 15°C			0.376 (513.0)	24.1 D.L
30:28 16:37	2800	15°C			0,376	24.1 D.L
30:28 16:37	2100	378.1 15°C			473.0	20.1 D.L.
30:29 16:38	2100	15°C				20.1 D.L
30:29 16:38	1400	253.5 15°C			(434.0)	16.2 D.L.
30:30 16:39	1400	15°C				16.2 D.L.

ANCHOR TEST #22A

Job Identification.....GGE-311.....

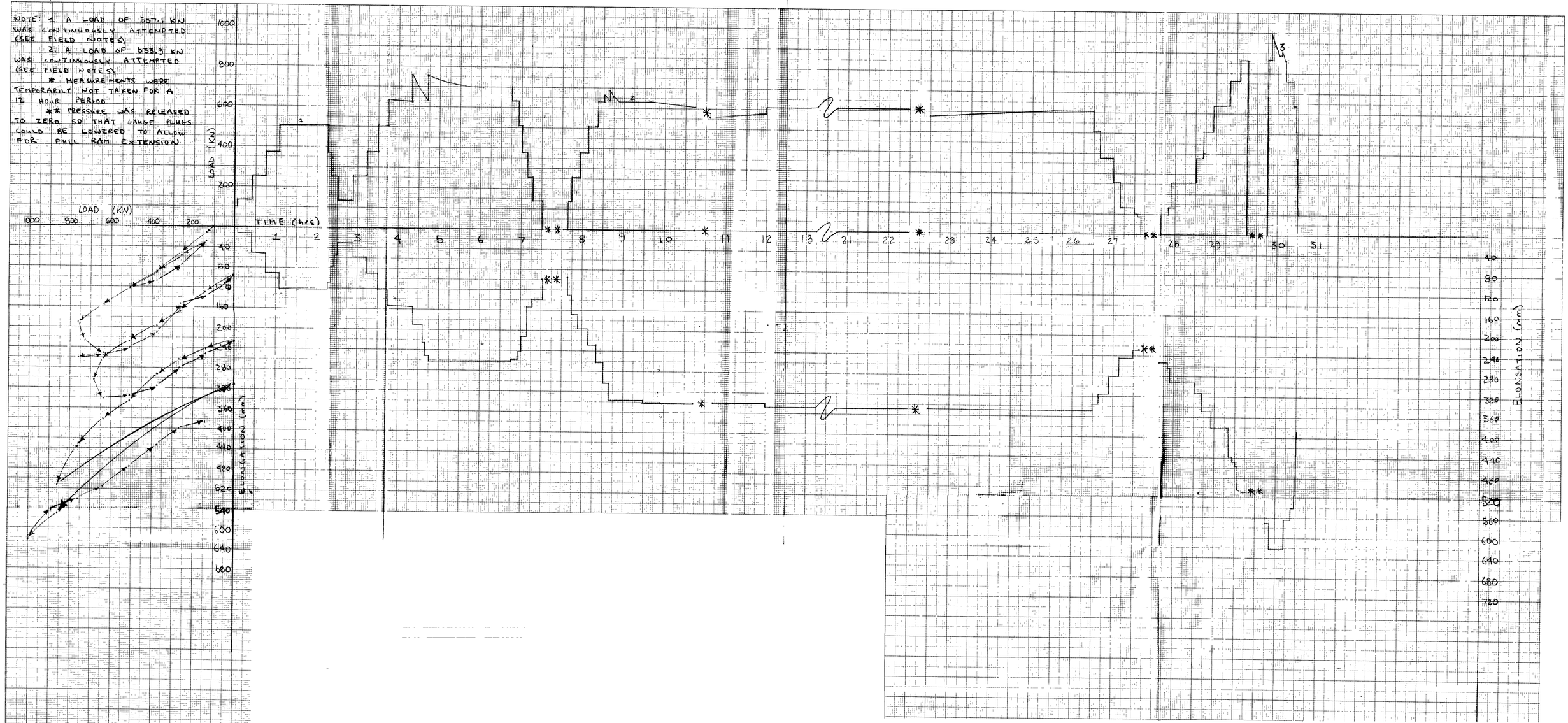
Anchor Identification.....22A.....

Test Date.....8.6.....11.....19-21

TIME	LOAD		DEFORMATION			
	pump pressure (psi)	anchor load (units KN)	V vertical (1) (units in)	H horizontal(2) (units in)	D elongation(3) (units in)	Recorded i cm
	\					
30:30 16:39	700	133.4			(398)	12.6 D.L.
30:31 16:40	700					12.6 D.L.
30:31 16:40	560	100.1			(385.0)	11.3 D.L.
30:32 16:41	560					11.3 D.L.
	END OF TEST					

GIGE-511
ANCHOR # 22A Betw SP 22 & 23 initial pump pressure - 0.69 MPa
86 11 19-21

NOTE: 1 A LOAD OF 507.1 KN WAS CONTINUOUSLY ATTEMPTED (SEE FIELD NOTES)
2. A LOAD OF 633.9 KN WAS CONTINUOUSLY ATTEMPTED (SEE FIELD NOTES)
* MEASUREMENTS WERE TEMPORARILY NOT TAKEN FOR A 12 HOUR PERIOD
** PRESSURE WAS RELEASED TO ZERO SO THAT GAUGE PLUGS COULD BE LOWERED TO ALLOW FOR FULL RAM EXTENSION



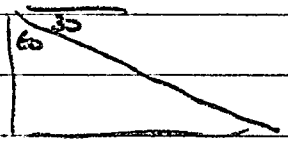
47 1510

K+E 10 X 10 TO THE CENTIMETER • 25 X 38 CM
KEUFFEL & ESSER CO MADE IN U.S.A.

GGE 311
ANCHOR TEST # 4A EVALUATION

(A) BOREHOLE LOCATION

- length of borehole 29.4 m
- angle from horizontal = 30°
- top elevation = 91.7 m



$\frac{x}{r} = \cos 60°$

$x = r(\cos 60°)$

$= 29.4\ (0.5)$

$= 14.7$ m

- tip elevation = 91.7 - 14.7
= 77 m

- bond length = 6.0 m designed
- top of bond = 91.7 - 11.7
= 80 m

(B) ULTIMATE CAPACITY

Creep Test OK @ 760 kN

Ultimate Bond Stress = $\frac{\text{Load}}{\text{Area}}$

$= \frac{760}{2.64}$

$= 288$ kN

Load = 760 kN
Area = $\pi d L$
$d = 0.14$
$L = 6$
$A = 2.64$

(C) CALCULATION OF FREE-STRESSING / BOND LENGTHS

$L = \frac{\delta AE}{\Delta P}$

$\delta_1 = (93.9 - 24.9) = 69$
$P_1 = 507.1 - 133.4 = 373.6$

$\delta_2 = 154.0 - 32.4 = 121.6$
$P_1 = 760.6 - 133.4 = 627.2$

$L_1 = 25.524$
$L_2 = 26.794$

$A = 691\ mm^2$
$E = 200\ kN/mm^2$

Say $L = 26\ m$

$\therefore$ Bond Length = $36.4 - 26.0 = 10.4$

(D) CONCLUSION

TOP OF BOND = elev. 80
ALLOWABLE BOND STRESS = 144 kPa

GO TRANSIT 86 11 12

CONTRACT GGE 311

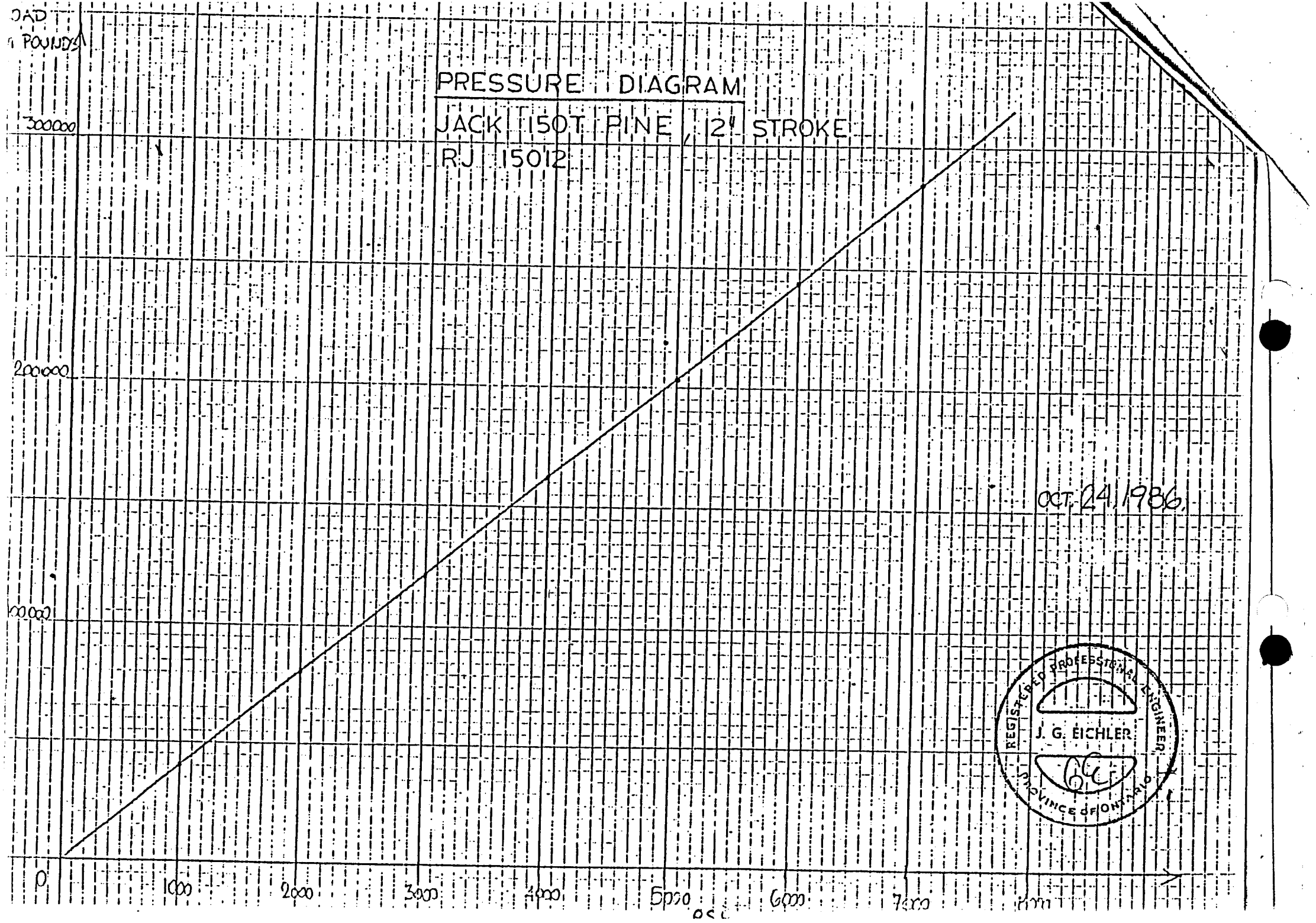
ANCHOR TESTING

T = 500 kN

1 kip = 4.448222 kN

JACK NO. RJ 15012

THEORETICAL LOADS			ACTUAL LOADS			
%T	kN	Kips	pump pressure psi	Kips	kN	%T
.25	125	28.1	700	30	133.4	.27
.5	250	56.2	1400	57	253.5	.51
.75	375	84.3	2100	85	378.1	.76
1.0	500	112.4	2800	114	507.1	1.01
1.25	625	140.5	3500	142.5	633.9	1.27
1.5	750	168.6	4200	171	760.6	1.52
1.75	875	196.7	4800	195	867.4	1.73
2.0	1000	224.8	5500	224	996.4	1.99


OAD
POUNDS
PRESSURE DIAGRAM
JACK 150T PINE, 12" STROKE
RJ 15012
300000
200000
000000
1000
2000
3000
4000
5000
6000
7000
OCT. 24, 1986.
REGISTERED PROFESSIONAL ENGINEER
J. G. EICHLER
PROVINCE of ONTARIO

CONTRACT GGE-311 Sheet 1 of 5

ANCHOR INSTALLATION RECORD #4A

LOCATION:
- Reference Drawing .....
- Pile Number Bet. S.P. 4 & 5
- Anchor Number 4A

TENDON:
- Manufacturer B&R CONA MULTI-STRAND
- Configuration (~~Diameter~~, # of Strands) 7 (15.7 mm each strand)
- Length (excluding tip) 31.8
- Modulus of Elasticity .....

BOREHOLE:
- Diameter 140 mm
- Slope (horizontal/vertical) 2:1
- Angle (from horizontal) 30°
- Length 29.4
- Date Completed OCT. 28/86

ANCHOR:
- Top Elevation 91.7
- Tip Elevation 76.0
- Bond Length 6.0 m
- Free-Stressing Length 23.4 m
- Date Bond Grout OCT. 28/86
- Date Free-Stressing Length Fill OCT. 28/86

Inspected By JOHN BOHNER

Signature _____

Date OCT 28/86

NOTE: PLEASE SEND COMPLETED FORM OR COPY TO:
FOUNDATION DESIGN SECTION, ROOM 315, CENTRAL BUILDING,
1201 WILSON AVENUE, DOWNSVIEW, M3M 1J8

ANCHOR TEST #4A

Job Identification....GGE-311

Anchor Identification....#4A

Test Date..86.....11.....25.....

	TIME	LOAD		DEFORMATION (1)			
		pump pressure (psi)	anchor load (units KN)	V vertical (1) (units in)	H horizontal (2) (units in)	D elongation (3) (units in)	Recorded B cm
0	8:27	~~0~~	18°C	0.141	0.376	0.000	2.5 D.L.
0:05	8:32	560	100.1 18°C	0.140	0.360	0.375 (9.5)	3.6 D.L.
0:10	8:37	560	18°C	0.140	0.360	0.375 (9.5)	36 D.L.
0:10	8:37	700 .25T	133.4 19°C	0.138	0.351	0.556 (14.1)	3.9 D.L.
0:15	8:42	700	19°C	0.139	0.351	0.556	3.9 D.L.
0:15	8:42	1400	253.5 20°C	0.129	0.290	1.693 (43.0)	6.8 D.L.
0:20	8:47	1400	20°C	0.128	0.288	1.693	6.8 D.L.
2							
0:20	8:47	2100	378.1 20°C	0.104	0.238	2.637 (66.9)	9.6 D.L.
0:25	8:52	2050	20°C	0.101	0.234	2.633	9.6 D.L.
	8:52	*2100	20°C	0.101	0.233	2.644 (67.1)	9.6 D.L.
0:30	8:57	2100	378.1 21°C	0.100	0.231	2.641	9.6 D.L.
		GAUGE	RESET	TO	0.000		
0:35	9:02	2800	507.1 21°C	0.105	0.166	1.055 (93.9)	12.6 D.L.
0:40	9:07	2800	21°C	0.103	0.163	1.055	12.6 D.L.
0:40	9:07	2100	378.1 21°C	0.122	0.174	0.330 (75.5)	10.4 D.L.
0:45	9:12	2100	21°C	0.122	0.174	0.330	10.4 D.L.
0:45	9:12	1900	342.5			0.040 (68.1)	9.6 D.L.
C							
		GAUGE	RESET	TO	2.700		
0:50	9:17	1400	253.5 21°C	0.128	0.214	2.028 (61.4)	D.L. 7.8
0:55	9:22	1400	21°C	0.128	0.215	2.028	D.L. 7.8
0:55	9:22	700	133.4 21°C	0.135	0.274	1.036 (25.8)	5.2 D.L.
1:00	9:27	775	21°C	0.135	0.273	1.038 (25.9)	5.2 D.L.
1:00	9:27	*700	21°C	0.135	0.277	1.001 (24.9)	5.1 D.L.

ANCHOR TEST #4A

Job Identification.....GGE-311.....

Anchor Identification.....#4A.....

Test Date.....86...11...25.....

TIME	LOAD		DEFORMATION ②			
	pump pressure (psi)	anchor load (units KN)	V vertical (1) (units in)	H horizontal (2) (units in)	D elongation (3) (units in)	Recorded B cm
1:05 9:32	700	133.4 21°C	0.135	0.178	1.001 (24.9)	5.1 D.L.
9						
1:03 9:32	1400	253.5 21°C	0.130	0.239	1.820 (45.7)	7.3 D.L.
1:10 9:37	1400	21°C	0.130	0.238	1.820	7.3 D.L.
9: GAUGE	RESET		TO	0.000		
1:15 9:42	2100	378.1 21°C	0.125	0.193	0.989 (70.8)	9.8 D.L.
1:28 9:47	2100	21°C	0.122	0.193	0.989	9.8 D.L.
1:20 9:47	2800	507.1 21°C	0.099	0.158	2.028 (97.2)	12.5 D.L.
1:38 9:57	2800	21°C	0.098	0.155	2.025	12.5 D.L.
1:35 10:02	2800	21°C	0.096	0.155	2.025 (97.1)	12.5 D.L.
RESET	GAUGE		TO	0.000		
1:40 10:07	3500	633.9 21°C	0.107	0.097	1.060 (124.0)	15.1 D.L.
1:45 10:12	3500	23°C	0.106	0.090	1.052 (123.8)	15.1 D.L.
1:50 10:17	3400	23°C	0.101	0.090	1.052	15.1 D.L.
1:50 10:17	3500	23°C	0.101	0.087	1.115	15.4 D.L.
1:55 10:22	3500	633.9 23°C	0.101	0.084	1.115 (125.4)	15.4 D.L.
	RESET	GAUGE	TO	0.000		
2:05 10:32	4200	760.6 22°C	0.106	0.016	1.125 (154.0)	18.3 D.L.
2:10 10:37	4175	22°C	0.105	0.006	1.122 (153.9)	18.3 D.L.
2:10 10:37	4200	22°C	0.105	0.006	1.126	18.3 D.L.
2:15 10:42	4200	760.6 22°C	0.100	0.001	1.126 (154.0)	18.3 D.L.
2:20 10:47	3500	633.9 22°C	0.122	0.001	0.518 (138.6)	16.7 D.L.
2:25 10:52	3500	22°C	0.122	0.001	0.518	16.7 D.L.
	RESET	GAUGE	TO	2.835		

ANCHOR TEST #4A

Job Identification..... GGE-311

Anchor Identification..... #4A

Test Date....86....11....25.....

TIME	LOAD		DEFORMATION			
	pump pressure (psi)	anchor load (units KN)	V vertical (1) (units in)	H horizontal(2) (units in)	D elongation(3) (units in)	Recorded B cm
	\					
2:30 10:57	2800	507.1 22°C	0.129	0.033	1.792 (112.1)	14.0 D.L
2:35 11:02	2800	22°C	0.128	0.035	1.792	14.0 D.L.
2:35 11:02	2100	378.1 22°C	0.131	0.077	0.829 (87.6)	11.6 D.C.
2:40 11:07	2100	22°C	0.131	0.079	0.829	11.6 D.L.
2:40 11:07	150 »	271.3			-0.048 (165.4)	9.2 D.L
	RESET	GAUGE	TO	1.875		
2:45 11:12	1400	253.5 22°C	0.143	0.140	1.640 (59.4)	8.6 D.L.
2:50 11:17	1400	22°C	0.142	0.143	1.642	8.6 D.L.
2:55 11:22	1400	22°C	0.142	0.143	1.642 (59.5)	8.6 D.L.
2:55 11:22	700	133.4 23°C	0.150	0.223	0.575 (32.4)	5.8 D.L.
3:00 11:27	700	23°C	0.151	0.226	0.580	5.8 D.L.
3:05 11:32	700	24°C	0.151	0.229	0.582	5.8 DL
3:10 11:37	700	24°C	0.151	0.230	0.582 (32.6)	5.8 D.L.
					(3)	
3:10 11:37	1400	253.5 24°C	0.145	0.192	1.440 (54.4)	7.9 D.L.
3:15 11:42	1400	24°C	0.145	0.192	1.441	7.9 D.L.
3:20 11:47	1400	24°C	0.144	0.192	1.441 (54.4)	7.9 D.L.
3:20 11:47	1900	342.5			2.156 (72.5)	9.9 D.L.
	RESET	GAUGE	TO	.200		
3:25 11:52	2100	378.1 24°C	0.138	0.129	0.514 80.5	10.7 DL
3:30 11:57	2100	24°C	0.136	0.129	0.514	10.7 D.L.

ANCHOR TEST #4A

Job Identification.....GGE-311.....

Anchor Identification.....#4A.....

Test Date.....86 11 25.....

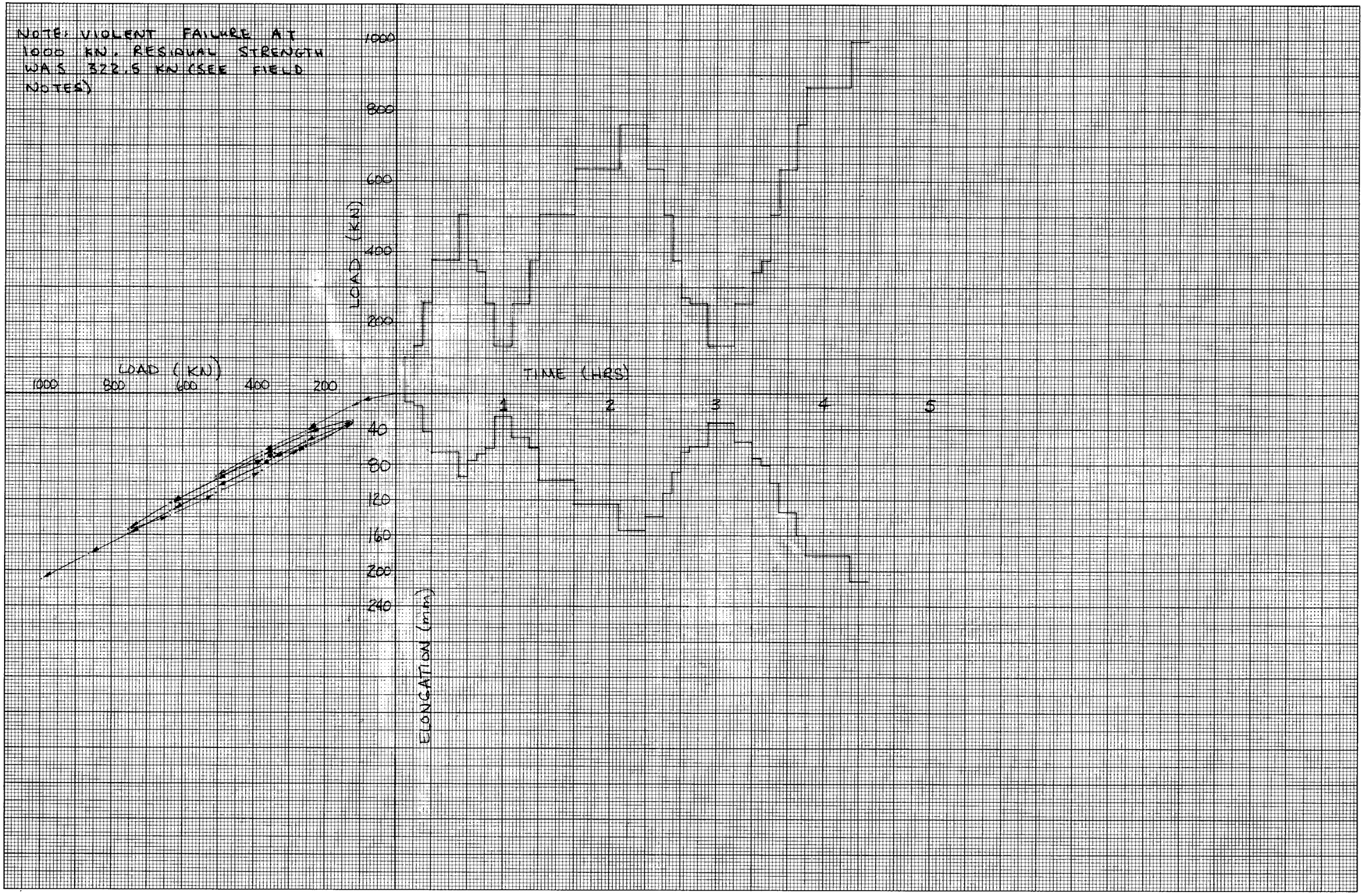
TIME	LOAD		DEFORMATION			
	pump pressure (psi)	anchor load (units KN)	V vertical (1) (units in)	H horizontal (2) (units in)	D elongation (3) (units in)	Recorded B cm
3:30						
11:57	2800	507.1 24°C	0.131	0.081	1.503 (105.6)	13.3 D.L.
3:35 12:02	2800	24°C	0.129	0.079	1.503	13.3 D.L.
3:35 12:02	3500	633.9 24°C	0.123	0.030	2.603 (133.5)	16.1 D.L.
3:40 12:07	3500	24°C	0.122	0.028	2.603	16.1 D.L.
	RESET	GAUGE	TO	.400		
3:45 12:12	4200	760.6 24°C	0.108	-0.006	1.424 (159.5)	18.8 D.L.
3:50 12:17	4200	24°C	0.100	-0.006	1.424	18.8 DL
3:50 12:17	4800	867.4 24°C	0.093	-0.062	12.31 S (182.1)	21.1 D.L.
	RESET	HORIZONTAL	GAUGE	TO 0.045		
3:55 12:22	4800	867.4 25°C	0.122	0.045	2.298 (181.7)	21.1 D.L.
4:00 12:27	4800	25°C	0.116	0.093	2.298	21.1 D.L.
4:05 12:32	4700	24°C	0.111	0.042	2.298 (181.7)	21.1 D.L.
4:05 12:32	4800	24°C	0.109	0.091	2.342 (182.8)	21.3 D.L.
4:10 12:37	4800	867.4 24°C	0.105	0.091	2.342	21.3 D.L.
	RESET	GAUGE	TO	0.000		
4:15 12:42	5500	996.4 24°C	0.100	-0.006	1.132 (211.6)	24.1 D.L.
4:20 12:47	5500	24°C	0.094	-0.015	1.127 (211.4)	24.1 D.L.
4:25 12:52	5350	23°C	0.091	-0.017	1.128 (211.5)	24.1 T.S.
4:25 12:52	* 5500	996.4	0.092	-0.022		T.S.
		VIOLENT	FAILURE			
		JACK FELL OFF - LOST PRESSURE - GAUGES FLEW OFF				
		NOTE - APPROXIMATELY 15-20 SEC REQUIRED TO PUMP FROM				
		5350	TO 5500	AND STABILIZE @ 5500		
	NOTE: TENDONS HELD 1800 psi after failure.					
	END OF TEST.					

GGE - 311
ANCHOR #4A
86 11 25.

Betw. S P 4 & 5

initial pump pressure ^ psi

NOTE: VIOLENT FAILURE AT 1000 KN. RESIDUAL STRENGTH WAS 322.5 KN (SEE FIELD NOTES)

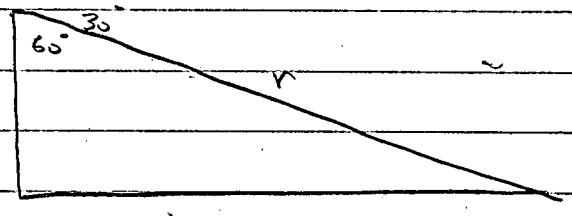


GGE - 31

ANCHOR TEST # 3A EVALUATION

(A) BOREHOLE LOCATION

- length of borehole = 36.4 m
- angle from horizontal = 30°
- top elevation = 91.7 m



$\frac{x}{r} = \cos 60^\circ$

$x = r \cos 60^\circ$

$= 36.4 (0.5)$

$= 18.2$

- tip elevation = 91.7 - 18.2 = 73.5
- bond length = 3 m (designed)
- top of bond = 91.7 - 16.7 = 75.0 m

(B) ULTIMATE CAPACITY

Creep Test OK @ 730 kN

Ultimate Bond Stress = $\frac{\text{Load}}{\text{Area}}$

$= \frac{730}{1.34}$

$= 545$ kPa

Load = 730 kN

Area = $(2\pi r) L$

$= \pi d L$

where $d = 0.14$ m

$L = 3.05$ m

Area = $1.34\ m^2$

GGE-311
Anchor #3A

(C) CALCULATION OF FREE-STRESSING / BOND LENGTHS

$$L = \frac{\int A E}{\Delta P}$$

$\int = 236.9 - 90.6 = 146.3$

$A = 651\ mm^2$

$A = \frac{\pi d^2}{4} = 0.153$ sq in

$\therefore d = 0.441367$ in

$= 11.21$ mm

$A = 98.7\ mm^2$

$\times 7$ strands $= 651\ mm^2$

$E = 28.6 \times 10^6$ psi

say $= 200\ kN/mm^2$

$\Delta P = 738.4 - 133.4 = 605$ kN

$L = 33.35$

$\therefore$ Bond Length = Borehole $- L$

$= 36.4 - 33.35$

$= 3.05$ m

(D) CONCLUSION

TOP OF BOND = elev. 75.0 m

ALLOWABLE BOND STRESS = 272 kPa

GGtE - 311
Anchor # 3A Betw SP 3 1/4
86 11 14-17

initial pump pressure = 560 psi

NOTE: 1. A LOAD OF 760.6 KN WAS CONTINUOUSLY ATTEMPTED (SEE FIELD NOTES)

2. A LOAD OF 738.4 KN WAS CONTINUOUSLY ATTEMPTED (SEE FIELD NOTES)

* MEASUREMENTS WERE TEMPORARILY NOT TAKEN FOR A 99 HOUR PERIOD

** PRESSURE WAS RELEASED TO ZERO SO THAT GAUGE PLUGS COULD BE LOWERED TO ALLOW FOR FULL RAM EXTENSION.

LOAD (KN)

1000 800 600 400 200

TIME (hrs)

1 2 5 9 10 12 19 20 21 22

LOAD (KN)

1000 800 600 400 200

ELONGATION (mm)

40 80 120 160 200 240 280 320 360

47 1510

K+E 10 X 10 TO THE CENTIMETER • 25 X 38 CM.
KEUFFEL & ESSER CO. MADE IN U.S.A.

GO TRANSIT 86 11 12

CONTRACT GGE 311

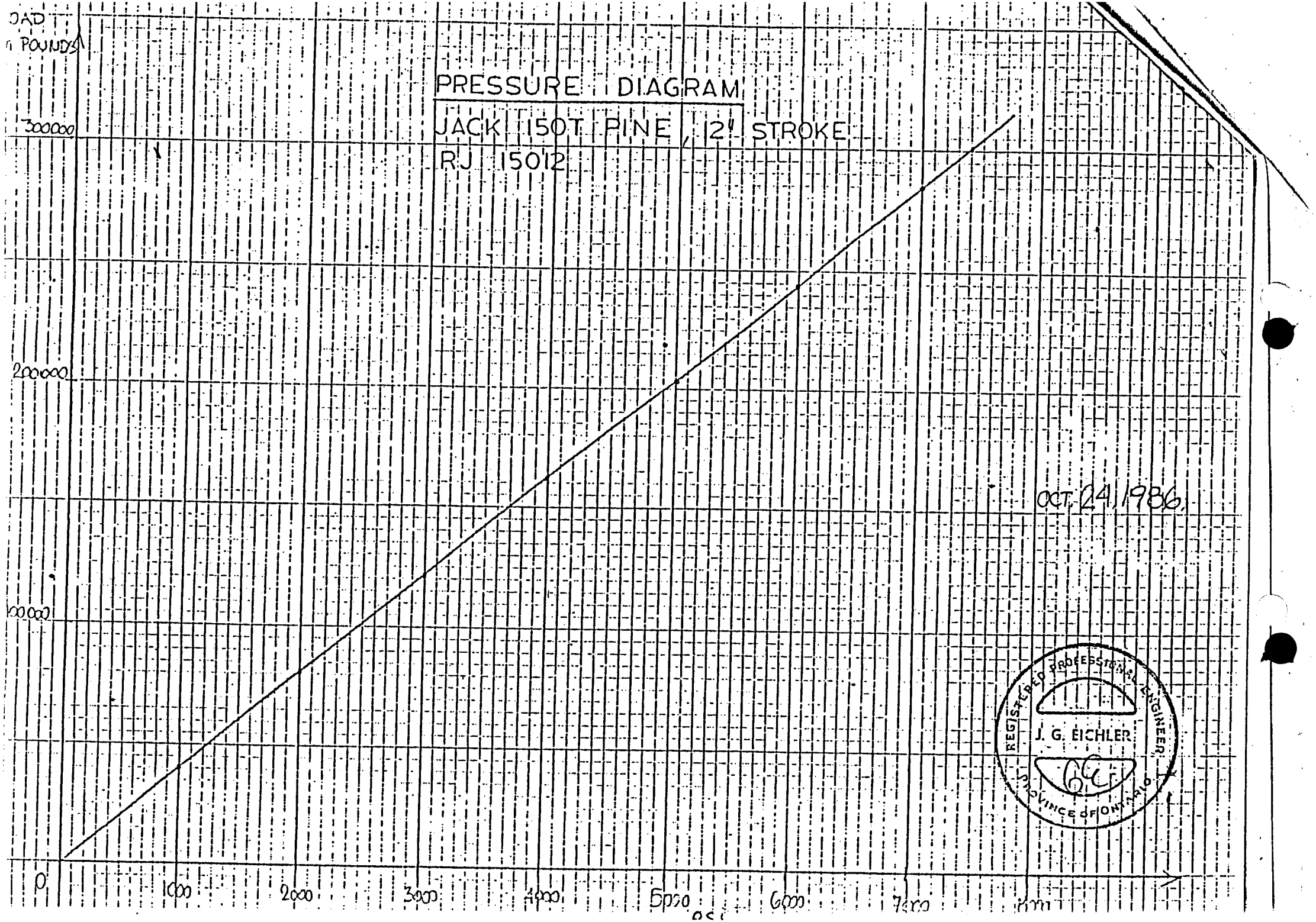
ANCHOR TESTING

T = 500 KN

1 kip = 4.448222 KN

JACK NO. RJ 15012

THEORETICAL LOADS				ACTUAL LOADS		
%T	KN	Kips	pump pressure psi	Kips	KN	%T
.25	125	28.1	700	30	133.4	.27
.5	250	56.2	1400	57	253.5	.51
.75	375	84.3	2100	85	378.1	.76
1.0	500	112.4	2800	114	507.1	1.01
1.25	625	140.5	3500	142.5	633.9	1.27
1.5	750	168.6	4200	171	760.6	1.52
1.75	875	196.7	4800	195	867.4	1.73
2.0	1000	224.8	5500	224	996.4	1.99


PRESSURE DIAGRAM
JACK 150T PINE 12" STROKE
RJ 15012
OAD
POUNDS
300000
200000
1000
2000
3000
4000
6000
OCT. 24, 1986.
REGISTERED PROFESSIONAL ENGINEER
J. G. EICHLER
PROVINCE OF ONTARIO

CONTRACT GGE311 Sheet 1 of 7

ANCHOR INSTALLATION RECORD #3A

LOCATION: Reference Drawing .....
Pile Number .... Between 3 & 4 .....
Anchor Number ..... 3A .....

TENDON: Manufacturer BBR ..... CONA ..... MULTI ... STRAND
Configuration (~~Diameter~~, # of Strands) ... 7 .....
Length (excluding tip) ..... 38.6m .....
Modulus of Elasticity .....

BOREHOLE: Diameter ..... 140 mm .....
Slope (horizontal/vertical) ... 2:1 .....
Angle (from horizontal) ..... 30° .....
Length ..... 36.4 m .....
Date Completed ... OCT ... 28.1.86 .....

ANCHOR: Top Elevation ..... 91.7 .....
Tip Elevation ..... 73.0 .....
Bond Length ..... 3.0 m .....
Free-Stressing Length ... 33.4 m .....
Date Bond Grout ..... OCT .. 28/86 .....
Date Free-Stressing Length Fill OCT .. 28/86 .....

Inspected By JOHN BOHNER

Signature _____

Date OCT 28/86

NOTE: PLEASE SEND COMPLETED FORM OR COPY TO:
FOUNDATION DESIGN SECTION, ROOM 315, CENTRAL BUILDING,
1201 WILSON AVENUE, DOWNSVIEW, M3M 1J8

ANCHOR TEST #3A

Job Identification.....GGE-311.....

Anchor Identification.....3A.....

Test Date.....86.....11.....14..... 86 11 17

TIME	LOAD		DEFORMATION			
	pump pressure (psi)	anchor load (units kN)	V vertical (1) (units in)	H horizontal(2) (units in)	D elongation(3) (units in/mm)	Recorded B cm
850	~~560~~	100.1 0°C	0.001	0.496	0.000	5.1cm D.D.
0 850	700	133.4 0°C	0.001	0.496	0.013	D.D.
05 855	700	133.4 0°C	0.001	0.497	0.014	D.D.
900	700	133.4 0°C	0.001	0.499	0.017	D.D.
15 905	700	133.4 1°C	0.001	0.498	0.016 (0.406)	I.S.
905	1400	253.5 1°C	0.001	0.453	1.276	9.0cm I.S.
20 910	* 1400	253.5 1°C	0.001	0.451	1.286	I.S.
25 915	1300	240.2 1°C	0.001	0.448	1.281	I.S.
915	1400	253.5 1°C	0.001	0.447	1.285 (32.639)	I.S.
HOSE LEAKING 28 918	2100	378.1 1°C	0.001	0.384	2.631 (66.827)	12.5cm I.S.
33 923	1950	351.4 1°C	0.001	0.381	2.609	I.S.
38 928	*1900	338.1 1°C	0.001	0.378	2.585 (65.659)	I.S.
	NOTE: HYDRAULIC		HOSE LEAKING - HOSE CHANGED			
			NOTE:	2.585=0		
38 1019	2100	378.1 3°C	0.001	0.355	0.000 (74.000)**	12.5cm I.S.
43 1019	2025	360.3 3°C	0.001	0.351	0.000	12.5cm I.S.
47 1023	2800	507.1 5°C	0.001	0.287	1.260 (106.904)	16 cm I.S.
52 1028	2700	484.9 4°C	0.001	0.231	1.321	I.S.
54 1030	*2800	507.1 4°C	0.001	0.221	1.320	16.1 cm IS
57 1033	2800	507.1 4°C	0.001	0.223	1.320 (107.528)	16.1cm I.S.
	NOTE: NOW USING RAM			MEASUREMENT FOR ELONGATION		
	GAUGE ONLY USED FOR			DIFFERENCES		FOR
	EACH PRESSURE.			0=0.350		
1102 1038	3500	633.9 5°C	0.001	0.231	0.350 (146.000)**	19.7cm I.S.
1107 1043	3400	5°C	0.001	0.211	0.349	I.S.
1043	*3500	633.9 5°C	0.001	0.211	0.352	I.S.
1112 1048	3450	627.2 6°C	0.001	0.204	0.352	I.S.
1048	3500	633.9 6°C	0.001	0.202	0.352 (146.051)	19.7cm I.S.
	RESET GAUGE			1.325=0.		
1118 1054	4200	760.6 6°C	0.001	0.213	1.325 (184.000)**	23.5cm I.S.

** VALUES WERE OBTAINED USING RAM ROD LENGTH.

ANCHOR TEST #3A

Job Identification..... GGE-311

Anchor Identification..... 3A

Test Date..... 86 11 14 - 86 11 17

TIME	LOAD		DEFORMATION			
	pump pressure (psi)	anchor load (units KN)	V vertical (1) (units in)	H horizontal (2) (units in)	D elongation (3) (units in)	Recorded B cm
1:23 10:59	~~4200~~	760.6 6°C	0.001	1.195	1.322	23.4cm IS
10:59	4200	760.6 6°C	0.001	1.190	1.343 (184.957)	23.5cm IS
1:28 11:04	4150	751.7 6°C	0.001	1.184	1.349	
11:04	*4200	760.6 6°C	0.001	1.182	1.360	23.6 cm IS
1:33 11:09	4100	738.4 6°C	0.001	1.179	1.362 (184.787)	23.6 cm IS
11:09	*4200	760.6 6°C	0.001	1.176	1.412	23.7 cm IS
1:38 11:14	4100	738.4 6°C	0.001	1.175	1.412 (186.057)	23.7 cm IS
11:14	*4200	760.6 6°C	0.001	1.173	1.453	23.9 cm IS
1:43 11:19	4050	729.5 6°C	0.001	1.172	1.460	23.9 cm DL
1:48 11:24	4000	720.6 TRAIN WENT BY			1.495 (187.276)	23.9 cm DL
1:53 11:29	3900	707.3 DUMP TRUCK WENT BY			1.509	23.9 cm DL
1:58 11:34	3850	693.9 6°C	0.001	1.196	1.509	23.9 cm DL
2:03 11:39	3700	667.3 6°C	0.001	1.189	1.504	23.9 cm DL
2:08 11:44	3700	667.3 6°C	0.001	1.190	1.507	23.9 cm DL
2:13 11:49	3700	667.3 6°C	0.001	1.189	1.508 (187.886)	23.9 cm DL
2:16 11:52	4200	760.6 6°C	0.001	1.169	2.404 (216.364)	26.3 cm IS
2:17 11:53	4100	TRUCK WENT BY 738.4			2.423	IS
2:22 11:58	4050	729.5 5°C	0.001	1.166	2.423 (216.847)	26.3 cm IS
11:58	*4200	760.6 5°C	0.001	1.162	2.605	26.9 cm IS
2:27 12:03	4050	729.5 5°C	0.001	1.160	2.606	26.9 cm IS
2:32 12:08	4050	729.5 6°C	0.001	1.158	2.606	26.9 cm IS
2:37 12:13	4100	738.4 6°C	0.001	1.158	2.606	26.9 cm IS
2:42 12:18	4100	738.4 TRAIN 6°C	WENT BY 0.001	1.155	2.606 (221.495)	26.9 cm IS
12:18	*4200	760.6 6°C	0.001	1.152	2.776	27.1 cm IS
2:47 12:23	4100	738.4 6°C	0.001	1.151	2.777	27.1 cm IS
2:53 12:28	4100	738.4 7°C	0.001	1.150	2.723	27.1 cm IS
2:59 12:35	4150	751.7 6°C	0.001	1.121	2.777 (224.314)	27.1 cm IS
3:04 12:40	4150	751.7 6°C	0.001	1.093	2.796 (226.321)	27.1 cm IS
3:09 12:45	4100	738.4 7°C	TRAIN WENT 0.001	P - TRUCKS WENT 1.133	BY 227.108 2.827	27.1 cm IS
3:14 12:50	4100	738.4 7°C	0.001	1.110	2.872	27.1 cm IS
3:19 12:55	4100	738.4 7°C	0.001	1.105	2.799	IS
3:22 12:58	4100	738.4 B.C 7°C	STRUCTURE 0.001	HIT 0.786	2.783	27.2 cm IS
3:27 13:03	4100	738.4 8°C	0.001	0.721	2.830	27.2 cm IS

ANCHOR TEST #3A

Job Identification..... GGE-311

Anchor Identification..... #3A

Test Date.. 86 11 14 - 86 11 17

TIME	LOAD		DEFORMATION			
	pump pressure (psi)	anchor load (units KN)	V vertical (1) (units in)	H horizontal(2) (units in)	D elongation(3) (units in)	Recorded B cm
3:32 13:08	4100	9°C	0.001	0.819	2.825	27.2cm I.S.
3:37 13:13	4100	9°C	0.001	0.811	2.822	I.S
3:42 13:18	4100	9°C	0.001	0.706	2.817	27.2 I.S.
	Adjusted gauge -		gauge not	screwed on	tight enough	
				2.817	= 1.860	
3:53 13:29	4100	10°	0.001	0.791	1.860	27.2 I.S.
3:58 13:34	4100	10°	0.001	0.792	1.861	I.S
4:03 13:39	4100	10°	0.001	0.791	1.861	27.2 I.S
4:08 13.44	4100	10°	0.001	0.789	1.861	I.S
4:13 13.49	4100	10°	0.001	0.787	1.861	I.S
14:09	4100	10°	0.001	0.785	1.860	27.2 I.S
4:43 14:39	4050	729.5 10°	0.001	0.776	226.879 1.861	I.S
14:39	* 4100	738.9 10°	0.001	0.777	227.488 1.885	27.3 I.S.
5:04 15:00	4050	729.5 9°	0.001	0.771	227.640 1.891	27.4 I.S
	*4100	738.9 9°	0.001	0.769	227.970 1.9041	27.4 I.S.
5:34 15:30	4100	738.9 9°	0.001	0.767	1.910	27.4 I.S.
6:04 16:00	4050	729.5 9°	0.001	0.752	1.912	27.4 D.L.
7:04 17:00	4050	729.5 8°C	0.001	0.745	1.918	27.4 J.B.
8:04 18:00	4050	729.5 8°C	0.001	0.742	1.921	27.4 D.L.
18:00	4100	738.9 9°C	0.001	0.740	1.949	27.4 D.L.
9:04 19:00	4050	729.5 9°C	0.001	0.739	1.951	27.5 D.L.
10:04 20:00	4050	729.5 9°C	0.001	0.737	228.367 1.959	27.5 DL.
	A HOLD WAS		PLACED	ON TEST	FOR	THE
	WEEK-END.	A TOTAL OF	59	HRS.		
	MONDAY NOV. 17 /86:					
POSSIBLE TEMP. 10:04 7:00	3650	656.1 7°C	0.001	0.703	228.071 1.908	27.4 J.B.
11:04 8:00	3700	667.2 14°C	0.001	0.720	1.915	27.5 D.L.
12:04 9:00	3850	693.9 17°C	0.001	0.724	228.417 1.924	27.5 I.S.
9:00	*4100	738.9 17°C	0.001	0.715	2.142	28.0 I.S.
12:19 9:15	4025	725.1 19°C	0.001	0.715	234.369 2.155	28.1 D.L.
12:34 9:30	4000	720.6 20°C	0.001	0.716	234.446 2.156	28.1 DL.

ANCHOR TEST # 3A

Job Identification..... GGE-311

Anchor Identification..... #3A

Test Date..86.11.14-86.11.17

TIME	LOAD		DEFORMATION			
	pump pressure (psi)	anchor load (units KN)	V vertical (1) (units in)	H horizontal (2) (units in)	D elongation (3) (units in)	Recorded B cm
12:34 9:30	*4100	738.4 20°C	0.001	0.715	2.182 (235.105)	28.2 D.L.
12:49 9:45	4075	734.0 20°C	0.001	0.714	2.189	28.2 D.L.
13:04 10:00	4075	21°C	0.001	0.714	2.197	28.2 D.L.
13:19 10:15	4075	18°C	0.001	0.710	2.199	28.2 D.L.
10:15	4075	18°C	DO ZERO 0.001	WENT BY 0.710	2.204	28.2 D.L.
10:30	4100	738.4 20°C	0.001	0.711	2.207	28.2 J.B
10:45	4100	21°C	0.001	0.710	2.211	28.2 J.B.
14:04 11:00	4100	20°C	0.001	0.708	2.214	28.2 J.B.
11:30	4100	24°C	0.001	0.711	2.217	28.2 I.S.
15:04 12:00	4100	20°C	0.001	0.706	2.223	28.3 JB
16:04 13:00	4100	22°C	0.001	0.702	2.233	28.3 IS
17:04 14:00	4100	21°C	0.001	0.695	2.248	28.3 JB
14:15	4100	20°C	0.001	0.692	2.248	28.35 IS
14:30	4100	20°C	0.001	0.691	2.248	28.35 IS.
14:45	4100	TRAIN WENT BY 20°C	0.001	0.687	2.249	28.35 JB
18:04 15:00	4100	PICKUP WENT BY 20C	0.001	0.688	2.252	28.35 IS.
19:04 16:00	4100	18°C	0.001	0.683	2.255 (236.208)	28.35 D.L.
16:00	3500	633.9 18C	0.001	0.689	2.156 (234.495)	28.1 D.L
19:09 16:05	3500	18°C	0.001	0.690	2.156	28.1 D.L
1605	2800	507.1 18°C	0.001	0.723	1.000 (205.083)	25.6 D.L.
19:14 16:10	2800	18°C	0.001	0.723	0.998	25.6 D.L.
19:19 16:15	2800	18°C	0.001	0.724	0.998	25.6 D.L.
16:15	2100	GAUGE WENT PAST			0.000	
		RESET TO		2.250		
19:24 16:20	2100	378.1 18°C	0.001	0.779	2.035 (164.00)	21.5 D.L.
19:29 16:25	2100	18°C	0.001	0.772	2.035	21.5 D.L.
1625	1400	253.5 18°C	0.001	0.734	0.632 (128.364)	17.8 D.L.
19:34 16:30	1400	18°C	0.001	0.735	0.632	17.8 D.L.
16:30	GAUGE	RESET TO			1.769	
19:39 16:35	700	133.4 18°C	0.001	0.767	0.284 (90.645)	13.9 D.L.
19:44 16:40	700	18°C	0.001	0.767	0.284	13.9 D.L.
	PRESSURE WAS RELEASED AND PLUGS					
	PUSHED TO		LOWER	POINT	ON TENDONS.	
	** THIS VALUE WAS		OBTAINED	BY CONVERTING	21.5 cm-5.1to mm,	

ANCHOR TEST #3A

Job Identification..... GGE-311

Anchor Identification..... #3A

Test Date..86 11 14 - 86 11 17

TIME	LOAD		DEFORMATION			
	pump pressure (psi)	anchor load (units KN)	V vertical (1) (units in)	H horizontal (2) (units in)	D elongation (3) (units in)	Recorded B cm
	THE	PLUGS	AT	NO	PRESSURE	
	WAS	AT	A DIS	TANCE	OF 17.8	cm
	OF	9.8 cm	from	Ram and	Back	Anchor.
20:01 1657	560 16°C	100.1	0.001	1.048	0.000	4.4 D.L.
20:06 1702	560 16°	100.1	0.001	1.048	0.000	4.4 D.L.
20:06 1702	700 16°C	133.4	0.001	1.035	90.645 0.236	5.0 D.L.
20:11 1707	700 16°C	133.4	0.001	1.035	0.236	5.0 D.L.
20:11 1707	1400 15°	253.5	0.001	1.046	124.732 1.578	8.3 D.L.
20:16 1712	1400 15°	253.5	0.001	1.045	1.578	8.3 D.L.
20:16 1712	GAUGE	RESET	TO	.010		
20:21 1717	2100 16°C	378.1	0.001	0.858	160.927 1.435	12.0 D.L.
20:26 1722	2100	378.1	0.001	0.856	1.435	12.0 D.L.
20:26 1722	2800 16°	507.1	0.001	0.784	193.109 2.702	15.2 D.L.
20:31 1727	2800	507.1	0.001	0.781	2.702	15.2 D.L.
20:31 1727	GAUGE	RESET	TO	0.502		
20:34 1730	3500 16°C	633.9	0.001	0.718	224.554 1.740	18.6 D.L.
20:39 1735	3500 16°C	633.9	0.001	0.713	1.740	18.6 D.L.
20:39 1735	GAUGE	RESET	TO	0.019		
20:42 1738	4200	760.6	0.001	0.641	259.479 1.394	22.2 D.L.
20:47 1743	4200		0.001	0.640	1.394	22.2 D.L.
20:47 1743	4800	867.4	0.001	0.582	285.793 2.430	25.2 D.L.
20:52 1748	4725	854.1	0.001	0.576	2.430	25.2 D.L.
20:52 1748	4800	867.4	0.001	0.569	292.651 2.700	25.7 D.L.
20:56 1752	4700	849.6	0.001	0.561	2.700	25.7 D.L.
20:56 1752	4800 GAUGE	REMOVED 867.4	0.001	0.559		26.0 D.L.
21:01 1757	4750	860.7	0.001	0.558		26.0 D.L.
21:01 1757	WENT	TO	5600	psi	and	ram extended
	to max	332mm. Pressure		continued	to	drop.
21:06 1802	5500 16°C	996.4	0.001	0.499	248+90.645 =338.645mm	29.8 D.L.
21:11 1807	5500 16°C	996.4	0.001	0.498		29.8 D.L.
1807	GAUGE	NEEDLE	ATTEMPTED	TO		BE
IE	PLACED	ON	BROKE	CHANGE	OF	
	GAUGES	FROM	REAR	TO	FRONT	
	FOR ASSUME THAT VALUE IS SAME AS BEFORE PRESSURE DROPPED					

ANCHOR TEST #3A

Job Identification..... GGE-311

Anchor Identification..... #3A

Test Date..86.11.14-86.11.17.

TIME	LOAD		DEFORMATION			
	pump pressure (psi)	anchor load (units KN)	V vertical (1) (units in)	H horizontal(2) (units in)	D elongation(3) (units in)	Recorded B cm
21:16 18:12	5475	992.0 16k			2.699	29.8 DL
21:21 18:17	5450	987.5			2.699	29.8 DL
21:26 18:22	5450	987.5	0.001		2.699	29.8 DL
18:22	4800	867.4	0.001		2.438	29.3 DL
21:27 18:23	4750	860.7	0.001		2.440	29.3 DL
21:28 18:24	4725	854.1	0.001		2.492	29.3 DL
21:29 18:25	4700 16k	849.6	0.001		2.492	29.3 DL
21:30 18:26	4700	849.6	0.001		293-50+30.695-333 2.442	29.3 DL
18:26	4200	760.6	0.001		331.695 2.366	29.1 DL
21:31 18:27	4200	760.6	0.001		2.366	29.1 DL
18:27	3500	633.9	0.001		301.695 1.241	26.1 DL
21:32 18:28	3500		0.001		1.240	26.1 DL
21:33 18:29	3500	633.9	0.001		1.240	26.1 DL
18:29	3200	578.3	0.001		269.695 0.000	22.9 DL
GAUGE RESET			2.702			
21:34 18:34	2800	507.1	0.001		264.645 2.588	22.4 DL
21:35 18:35	2800	507.1	0.001		2.588	22.4 DL
21:35 18:35	2100 16k	378.1	0.001		227.645 1.356	18.9 DL
21:36 18:36	2100 16k	378.1	0.001		1.356	18.9 DL
18:36	1400	253.5	0.001		193.695 0.048	15.2 DL
21:37 18:37	1400	253.5	0.001		0.048	
18:37	700	133.4	0.001		155.695	11.5 DL
21:38 18:38	700	133.4	0.001			11.5 DL
18:38	560	100.1	0.001		146.695	10.6 DL
21:39 18:39	560	100.1	0.001			10.6 DL
AT NO PRESSURE RAM LENGTH IS 7.8 CM. PLUGS ARE 5.4 cm away from ram.						
END OF TEST						

memorandum

Ontario

To: J. G. Ashbee
Civil & Signals Design Co-Ordinator
Go Transit
555 Wilson Avenue

Date: 86 04 30

This package was hand delivered
86 05 01.
D.D.

From: Engineering Materials Office
Foundation Design Section
Central Building, Room 315

Re: Go Transit Extension
Pickering to Whitby
Special Provisions for
Contract GGE-311
Brock Road Retaining Wall

Enclosed are SP's for test and production anchors as well as an instruction memo to contractors detailing specific instructions for the test program. All of these documents should be included in the contract package. The Instructions to Contractors memo should be appended to the SP for 'Soil or Rock Test Anchors.'

If there are any questions, please contact this office.

D.H. Dundas

D. H. Dundas, P. Eng.
Sr. Foundations Engineer

DHD:gp

Encl.

INSTRUCTIONS TO CONTRACTORS

Go Transit Contract GGE-311
Brock Road Retaining Walls
Anchor Testing Program

These instructions are in addition to the Special Provision "Soil or Rock Test Anchors" and provide specific details for this anchor testing program.

1. The Contractor shall install a total of 3 anchors for testing purposes. The 3 test anchors shall be either Dywidag Tendons or BBR Strands. The test anchors must be equipped with permanent (double corrosion) protection.

2. Anchor test locations, top of anchor elevations (i.e. connection with wall), top of bond zones and bond zone lengths are as specified in the following Table:

Test No.	Test Location	Elevation Top of Anchor	Elevation Top of Bond	Bond Length	
				102 mm Ø	152 mm Ø
# 1	Bay 3- 4	93.55 m	75.0 m	3 m	2 m
# 2	Bay 4- 5	93.55 m	80.0 m	6 m	6 m
# 3	Bay 22-23	93.55 m	75.0 m	3 m	2 m

Test locations are referenced to Sheet #66 of the Contract Drawings.

The test anchors shall be installed in the bays between soldier piles, as identified by their soldier pile number. Test loads shall react against wales, spanning the bays between soldier piles.

3. The test anchor holes shall be oriented perpendicular to the Hwy. 401 ramps at an angle of 30° from the horizontal. The diameter of the free-stressing zone shall be less than 300 mm. The acceptable range in bond zone diameters shall be 102 mm to 152 mm. However, all installations shall be in strict accordance with the installation procedures and borehole diameters specified in the Contractor's approved proposal.

4. The test anchor program shall be completed after Step #4 and before Step #5 of the Construction Sequence For Tie Back Wall indicated on Sheet #64 of the Contract Drawings.

5. The working load (T) for the test anchors shall be 500 kN.

...2

6. Subsurface information for this site is provided in the Foundation Investigation Report for this contract. Refer to the Borehole Location and Soil Strata Drawing and Record of Borehole Sheets #1 to #15, and #1B and #1A. Note that occasional boulders may be encountered in the glacial till overburden.

7. The Contractor is required to have at least one skilled person at the site during the anchor installation and test program. His responsibilities will include maintaining and adjusting anchor loads, and recording anchor movements as directed by the Engineer.

8. The Contractor shall restore the site after completion of the test program. Restoration will include cutting off the test anchors behind the wall.

9. The Contractor shall submit a proposed schedule for the test anchor installation and for the test anchor program at least 10 days prior to commencement of the work.

SOIL OR ROCK TEST ANCHORS

1.0 General

.1 This document specifies the requirements for the design, supply, installation and testing of soil or rock test anchors.

1.1 Definitions

.1 Anchor - the entire stressing assembly including tendon/strand and grout.

.2 Tendon/Strand - the assembly consisting of the prestressing steel, the corrosion protection system and the end anchorage.

.3 Bond length - the anchor zone bonding with the soil or rock.

.4 Free-stressing length - the anchor zone not bonding with the soil or rock.

1.2 References

This Special Provision refers to the following standards, specifications or publications:

.1 MTC Form 903 - "Construction Specification for Piling".

.2 MTC Form 910 - "Construction Specification for Prestressed Concrete, Cast-In-Place Construction".

.3 ASTM A722 - "Uncoated High-Strength Steel Bar for Prestressing Concrete".

.4 CSA G279 M1982 - "Steel for Prestressed Concrete Tendons".

.5 MTC Form 906 - "Structural Steel".

2.0 Materials

2.1 Anchor System

.1 The contract documents are based on Dywidag Threadbar Anchors, or BBR Cona Multi-Strand Anchors.

2.2 Tendons for Anchors

.1 Description

Anchors shall be Dywidag Threadbar Anchors or BBR Cona Multi-Strand Anchors with double corrosion protection, in accordance with the drawings and specifications and shall be encased for their full length in corrugated PVC sheathing. A smooth PVC tubing fitting snugly over the corrugated sheathing in the free stressing length shall guarantee unobstructed enlongation during stressing. The annular space between bar and corrugated sheathing shall be grouted over its full length prior to installation of single bar tendons. The anchor load shall be transferred to the soil or rock by bond.

.2 Prestressing Steel

For Dywidag anchors the prestress steel shall be Dywidag Threadbars grade 1030 MPa (150,000 psi), grade 1100 MPa (160,000 psi) or grade 1230 MPa (178,000 psi), conforming to ASTM Designation A722 (latest revision) "Uncoated High-Strength Steel Bar for Prestressing Concrete".

For BBR anchors the prestress steel shall be BBR Cona Multi-Strand grade 1720 MPa (250,000 psi), grade 1760 MPa (255,000 psi) or grade 1860 MPa (270,000 psi), conforming to CSA Standard G279 (latest revision): "Steel for Prestressed Concrete Tendons".

.3 Anchorages

Steel anchorages (anchor plates, anchor nuts, blocks, wedges, etc.) shall be compatible with the Dywidag Post-tensioning System or the BBR Post-tensioning System. Anchorage components shall develop at least 95% of the minimum guaranteed ultimate strength of the tendon.

.4 Couplers

Couplers for tendon sections shall develop 100% of the guaranteed minimum ultimate tensile strength of the tendon.

.5 Corrosion Protection

The corrosion protection shall be Dywidag double corrosion protection system, or equivalent.

Corrugated and smooth plastic sheathing shall be made of hard PVC material with a minimum compressive strength of 102 MPa and a minimum tensile strength of 48 MPa. Material shall be free of water soluble chlorides and other ingredients which might enhance corrosion, hydrogen embrittlement or stress corrosion of the prestressing steel. The plastic sheathing shall be such that a minimum bond of 4.8 MPa at a minimum compressive strength of the grout of 27 MPa is developed.

The materials for the sheathing accessories like end cap, grouting cap, grout tube and sealing cap shall be equivalent to the plastic sheathing.

2.3 Tendons for Temporary Anchors

Provisions for "Tendons for Permanent Anchors" apply, except that the double corrosion protection system is not required. The prestressing steel must retain adequate structural strength during the construction period, and the provisions for corrosion protection must be sufficient for this purpose.

2.4 Grout

.1 The grout for the bond length shall satisfy the requirements for grout of Form 910. The cube strength of grout shall be at least 20 MPa at 7 days and 35 MPa at 28 days.

.2 The Contractor shall be responsible for collecting samples of the bond grout to verify the grout strength. Test results verifying the 28 day grout strength, signed and sealed by a Professional Engineer licensed by the Association of Professional Engineers of Ontario, shall be submitted to the Engineer before acceptance testing proceeds.

.3 The grout for the free-stressing length shall completely fill the annular space between the tendon and the borehole wall. The grout material shall be suitable to provide adequate corrosion protection and to prevent any transfer of the anchor load to the free stressing zone to the satisfaction of the Engineer. The grout for the free-stressing length shall be bentonite slurry, unless otherwise agreed by the Engineer.

3.0 EQUIPMENT

3.1 All equipment for the installation of soil anchors shall be suitable for the intended purposes and capable of working on the site under the prevailing access and clearance conditions.

3.2 The equipment shall not cause damage to the anchor tendon and corrosion protection.

3.3 The equipment for stressing and grouting shall satisfy the requirements of Form 910.

3.4 The equipment for load testing shall satisfy the requirements of Form 903.

4.0 INSTALLATION

4.1 Tendon Fabrication

.1 Tendons shall be either shop fabricated or field fabricated in accordance with approved shop drawings, using personnel trained and qualified in this type of work.

.2 Tendons shall be handled and protected prior to installation in such a manner as to avoid corrosion and physical damage.

4.2 Construction of Holes

.1 The Contractor shall propose the methods for constructing the holes, maintaining the holes, and placing tendons, grout and other materials in the holes. These proposals shall be submitted to the Engineer for review, and shall include details of casing sizes, bit sizes and grout pressure.

.2 Holes for anchors shall be constructed by a method to suit the subsurface conditions at the site. All excavated materials shall be removed from the site.

.3 The holes shall be maintained without any cave-in until anchor tendon and grout are satisfactorily placed. If any unwatering is required, it shall be part of work under this tender item.

.4 Use of liners is permitted. The liners shall be withdrawn from the bond length to ensure complete filling of the hole and proper bonding of grout to soil or rock. The liners may be left in place for the free stressing length. When a liner is removed, the placing of the grout during liner removal shall be so arranged that the head of grout will be at least equal to the hydrostatic pressure at the top of the liner and prevent ingress of deleterious material.

.5 The centreline of hole shall not deviate from that specified by more than 2% of the distance between the point considered and the top of the anchor.

.6 The hole diameters and lengths for this project are as specified in the contract instructions. The Contractor shall devise procedures to verify hole length. Records of this measurement shall be provided to the Engineer.

.7 The Contractor shall keep a record of all drilling procedures, soil, rock and groundwater conditions encountered, and installation times, which shall be made available to the Engineer.

4.3 Tendon Installation

.1 Anchor tendons shall be installed in accordance with the specifications and the shop drawings.

.2 The tendon and its corrosion protection shall not be damaged during installation.

.3 The tendon shall be free of dirt, detrimental rust or any deleterious matter.

.4 Centering devices shall be provided to ensure that the bond length of the anchor is located centrally in the hole. Centring devices are required at the end of the anchor and at the bond length/free stressing length interface. The maximum distance between centring devices shall be 5 m.

4.4 Grouting of Bond Length

.1 The Contractor shall select and use suitable grouting methods to completely fill the hole with grout and to obtain the required bond to the soil or rock.

.2 The grout shall be pumped into the anchor hole through a grout pipe provided for that purpose until the hole is filled over the bond length. No bond grout shall be placed above this point.

.3 The grout shall always be injected at the lowest point on the bond length. Provisions shall be made for determining the elevation of the top of grout. If liners are used the provisions of Clause 4.2 "Construction of Holes" shall be observed.

.4 The Contractor shall devise procedures to verify the elevation of the top of the bond zone grout. Records of this measurement shall be provided to the Engineer.

.5 After grouting, the anchors shall remain in an undisturbed condition until the necessary grout strengths have been achieved.

.6 The Contractor shall keep records for each anchor showing type of grout, grout pressure and volume of grout used. These records shall be submitted to the Engineer for review.

4.5 Grouting of Free-Stressing Length

.1 The grout in the free-stressing length in the annular space between the anchor and the borehole wall between the bond length and the tendon anchorage shall be placed similarly to grout for the bond length, to complelety fill the hole, and leave no voids at the top of the free-stressing length.

5.0 Test Anchors

.1 Refer to the attached Instructions to Contractors for specific test details.

.2 The Contractor shall install the number of anchors specified in the contract documents for testing purposes. The purpose of these test anchors is to prove the adequacy of the proposed anchor configuration and installation procedures under the site conditions, and to provide design parameters.

.3 The test anchors shall be constructed in strict accordance with the Contractor's proposed procedures. The proposed procedures shall bear the seal and signature of a Professional Engineer licensed by the Association of Professional Engineers of Ontario. These procedures shall be submitted to the Engineer for review, prior to commencement of the test program.

.4 The test anchors shall be constructed at locations specified by the Engineer. If site conditions dictate, changes to the test locations will be considered. The installation of test anchors shall be inspected by the Engineer.

.5 For the test anchors, the working load, the anchor inclination, the bond zone length and the elevation of the top of the bond zone shall be as specified by the Engineer.

.6 The test anchors shall not be incorporated in permanent or temporary works. After testing, the test anchors will be cut off 1 m below the ground surface.

.7 The Contractor shall design and provide suitable reaction systems for the applied test loads. Shop drawings and design calculations for the reaction system shall bear the seal and signature of a Professional Engineer licensed by the Association of Professional Engineers of Ontario. This reaction system design shall be submitted to the Engineer for review.

.8 The Contractor shall supply equipment, materials and skilled personnel to conduct the anchor tests. The equipment and materials shall be capable of stressing the test anchor to an ultimate load of 1000 kN. It shall be the responsibility of the Contractor to constantly monitor the test, maintain specified test loads and to record test measurements as specified by the Engineer.

.9 Anchor tests shall be conducted concurrently, as scheduled by the Engineer. The tests shall normally be conducted between 8:00 hrs. and 20:00 hrs. from Monday to Friday, unless otherwise directed by the Engineer.

.10 Each Anchor Test shall be conducted as follows:

.1 The Anchor Tests will be carried out under the direction of the Engineer, generally in accordance with the prevailing requirements of A.S.T.M. (Designation D1143-81) and the procedures specified in this document.

.2 Records of vertical movement of the reaction system, horizontal movement of the reaction system, and tendon elongation are required. These shall be recorded with respect to an independant fixed reference point. A record of test enclosure temperature is also required.

.3 All reference beams shall be independently supported with the support firmly embedded in the ground at a distance of not less than 2.44 m (8.0 ft.) from the reaction system. Reference beams shall be sufficiently rigid to support instrumentation such that variations in readings do not occur. Details of the reference system arrangement shall be submitted to the Engineer for approval.

.4 Dial gauges shall have at least a 76.2 mm (3.0 in.) travel. Longer gauge stems or sufficient gauge blocks shall be provided to allow for greater travel if required. Gauges shall have precision of at least 0.025 mm (0.001 in.). The dial gauges shall be placed on smooth bearing surfaces mounted perpendicular to the direction of movement.

Current calibration curves, signed and sealed by an Engineer, shall be provided for all gauges.

All gauges, scales or reference points attached to the test anchor shall be mounted so as to prevent movement relative to the test anchor during the test.

.5 Jacks used for stressing tendons shall have a minimum ram extension of 152.4 mm (6.0 inches).

Current calibration curves, signed and sealed by an Engineer, shall be provided for all jacks.

.6 The Contractor shall construct suitable enclosures to provide complete protection for personnel, equipment and instruments, from variations in the weather conditions and disturbances during the test program. These provisions must meet the approval of the Engineer and will include the following specific requirements:

- the test enclosures must be weather-proof and provide adequate lighting and consistent and controllable heat in order to eliminate temperature variations

- the test enclosure must be provided with a level dry floor

- the jacks must be secured with chains to provide adequate protection to personnel in the event of breakage of the anchor or stressing system

- a field office, equipped with tables, chairs, heating and lighting shall be provided adjacent to the test anchors.

.7 The Anchor Test shall be conducted by incrementally loading and unloading in accordance with the following schedule, or until the anchor fails, with measurements recorded at intervals as directed by the Engineer.

T = Working Load of Anchor.

0.00T, 0.25T, 0.50T, 0.75T, 1.00T,
0.75T, 0.50T, 0.25T,
0.50T, 0.75T, 1.00T, 1.25T, 1.50T,
1.25T, 1.00T, 0.75T, 0.50T, 0.25T,
0.50T, 0.75T, 1.00T, 1.25T, 1.50T, 1.75T, 2.00T*,
1.75T, 1.50T, 1.25T, 1.00T, 0.75T, 0.50T, 0.25T,
0.00T.**

*At 2.00T, the load shall be maintained for 24 hours.

**At this point, an additonal loading cycle, directly to a load up to 1000 kN shall be conducted as directed by the Engineer.

.8 The following acceptance criteria apply:

Each load shall be maintained for a minimum time of 15 minutes, and until the rate of displacement is not greater than 0.25 mm (0.01 inches) per hour. Test results and interpretation are subject to the approval of the Engineer.

.9 The test site shall be restored to its pre-test condition.

6.0 Payment

Test Anchors shall be payable on an each basis. Payment at the contract price for the item "Soil or Rock Test Anchors" shall be full compensation for all labour, equipment and materials to design, supply and install and test soil or rock test anchors as specified in the contract.

SOIL OR ROCK PRODUCTION ANCHORS

1.0 GENERAL

1.1 Scope

This Special Provision specifies the requirements for the design, supply, installation and testing of prestressed soil or rock production anchors in temporary and permanent anchor installations.

1.2 Qualifications

This work shall be undertaken by a recognized specialist sub-Contractor with at least 5 years of proven satisfactory experience in work of this type and magnitude.

1.3 Responsibilities of the Contractor

.1 The Contractor shall detail, specify, supply and install soil or rock anchors in strict accordance with the Contract and identically to the test anchors at this site.

.2 The allowable bond stress shall be proven by anchor tests (refer to the Contract item "Soil or Rock Test Anchors") on non-production anchors. Bond lengths for production anchors will be determined by the Engineer, based on the test results.

.3 If the Contractor shall suggest an alternative method of anchor installation, or an alterante anchor configuration, the allowable bond stress of the new proposal shall be proven by anchor tests, as directed by the Engineer, on a minimum three non-production test anchors. Bond lengths for production anchors shall be determined by the Engineer, based on the test results. The cost of these anchor tests shall be the reponsibility of the Contractor.

.4 The Contractor shall also check the details of attachments on soldier piles on which the anchorages are seated to ensure the adequacy of such attachments for their intended purpose. The Contractor shall design suitable bearing plates for those anchorages which bear on concrete surfaces.

.5 The Contractor shall supply equipment, materials and skilled personnel to install production anchors and conduct the specified acceptance tests. It shall be the responsibility of the Contractor to constantly monitor the acceptance tests, maintain specified test loads and to record test measurements as specified by the Engineer.

.6 The Contractor is responsible for materials and workmanship. Any remedial measures, required because of defects in materials or workmanship, shall be done by the Contractor at no cost to the Owner.

.7 The Contractor shall submit 6 copies of design calculations, specifications and shop drawings covering all aspects of fabrication, installation and acceptance testing of anchors to the Engineer for review a minimum of 10 days before commencement of anchor related work.

Shop drawings and design calculations shall bear the seal and signature of a Professional Engineer licensed by the Association of Professional Engineers of Ontario.

1.5 Subsurface Conditions

Soil, rock and groundwater conditions are described in the Foundation Investigation Report for this contract.

1.6 Definitions

.1 Anchor - the entire stressing assembly including tendon/strand and grout.

.2 Tendon/Strand - the assembly consisting of the prestressing steel, the corrosion protection system and the end anchorage.

.3 Bond length - the anchor zone bonding with the soil or rock.

.4 Free stressing length - the anchor zone not bonding with the soil or rock.

1.7 References

This Special Provision refers to the following standards, specifications or publications:

.1 MTC Form 903 - "Construction Specification for Piling".

.2 MTC Form 910 - "Construction Specification for Prestressed Concrete, Cast-In-Place Construction".

.3 ASTM A722 - "Uncoated High-Strength Steel Bar for Prestressing Concrete".

.4 CSA G279 M1982 - "Steel for Prestressed Concrete Tendons."

.5 MTC Form 906 - "Structural Steel".

2.0 MATERIALS

2.1 Anchor System

.1 The contract documents are based on Dywidag Threadbar Anchors, or BBR Cona Multi-Strand Anchors.

.2 Alternate anchors may be used only if approved as equivalent by the Engineer.

2.2 Tendons for Permanent Anchors

.1 Description

Anchors shall be Dywidag Threadbar Anchors or BBR Cona Multi-Strand Anchors with double corrosion protection, in accordance with the

drawings and specifications and shall be encased for their full length in corrugated PVC sheathing. A smooth PVC tubing fitting snugly over the corrugated sheathing in the free stressing length shall guarantee unobstructed elongation during stressing. The annular space between tendon/strand and corrugated sheathing shall be grouted over its full length prior to installation of tendons/strands. The anchor load shall be transferred to the soil or rock by bond.

.2 Prestressing Steel

For Dywidag anchors the prestress steel shall be Dywidag Threadbars grade 1030 MPa (150,000 psi), grade 1100 MPa (160,000 psi) or grade 1230 MPa (178,000 psi), conforming to ASTM Designation A722 (latest revision) "Uncoated High-Strength Steel Bar for Prestressing Concrete".

For BBR anchors the prestress steel shall be BBR Cona Multi-Strand grade 1720 MPa (250,000 psi), grade 1760 MPa (255,000 psi) or grade 1860 MPa (270,000 psi), conforming to CSA Standard G279 (latest revision): "Steel for Prestressed Concrete Tendons".

.3 Anchorages

Steel anchorages (anchor plates, anchor nuts, blocks, wedges, etc.) shall be compatible with the Dywidag Post-tensioning System or the BBR Post-tensioning System. Anchorage components shall develop at least 95% of the minimum guaranteed ultimate strength of the tendon.

.4 Couplers

Couplers for tendon sections shall develop 100% of the guaranteed minimum ultimate tensile strength of the tendon.

.5 Corrosion Protection

The corrosion protection shall be Dywidag double corrosion protection system, or equivalent.

Corrugated and smooth plastic sheathing shall be made of hard PVC material with a minimum compressive strength of 102 MPa and a minimum tensile strength of 48 MPa. Material shall be free of water soluble chlorides and other ingredients which might enhance corrosion, hydrogen embrittlement or stress corrosion of the prestressing steel. The plastic sheathing shall be such that a minimum bond of 4.8 MPa at a minimum compressive strength of the grout of 27 MPa is developed.

The materials for the sheathing accessories like end cap, grouting cap, grout tube and sealing cap shall be equivalent to the plastic sheathing.

2.3 Tendons for Temporary Anchors

Provisions for "Tendons for Permanent Anchors" apply, except that the double corrosion protection system is not required. The prestressing steel must retain adequate structural strength during the construction period, and the provisions for corrosion protection must be sufficient for this purpose.

2.4 Grout

.1 The grout for the bond length shall satisfy the requirements for grout of Form 910 except that Type 50 (sulphate resistant) Portland Cement shall be used for the grouting of the space within the plastic tube around the prestressing bar. The cube strength of grout shall be at least 20 MPa at 7 days and 35 MPa at 28 days. For rock anchors alternative materials such as resin-bonded epoxy anchors or split anchors may be proposed by the Contractor, subject to the approval of the Engineer.

.2 The Contractor shall be responsible for collecting samples of the bond grout to verify the grout strength. Test results verifying the 28 day grout strength, signed and sealed by a Professional Engineer licensed by the Association of Professional Engineers of Ontario, shall be submitted to the Engineer before acceptance testing proceeds.

.3 The grout for the free-stressing length shall completely fill the annular space between the tendon and the borehole wall. The grout material shall be suitable to provide adequate corrosion protection and to prevent any transfer of the anchor load to the free stressing zone to the satisfaction of the Engineer. The grout for the free-stressing length shall be bentonite slurry, unless otherwise agreed by the Engineer.

3.0 EQUIPMENT

3.1 All equipment for the installation of soil anchors shall be suitable for the intended purposes and capable of working on the site under the prevailing access and clearance conditions.

3.2 The equipment shall not cause damage to the anchor tendon and corrosion protection.

3.3 The equipment for stressing and grouting shall satisfy the requirements of Form 910.

3.4 The equipment for load testing shall satisfy the requirements of Form 903.

4.0 INSTALLATION

4.1 Tendon Fabrication

.1 Tendons shall be either shop fabricated or field fabricated in accordance with approved shop drawings, using personnel trained and qualified in this type of work.

.2 Tendons shall be handled and protected prior to installation in such a manner as to avoid corrosion and physical damage.

.3 All joints in the corrosion protection system shall be made watertight by an epoxy bonding compound or equivalent.

4.2 Construction of Holes

.1 The Contractor shall construct holes as specified for the test anchors for this project. All excavated material shall be removed from the site.

.2 The centreline of hole shall not deviate from that shown on drawings by more than 2% of the distance between the point considered and the top of the anchor.

.3 The hole diameters and hole length for this project are as specified on the Contract Drawings. The Contractor shall devise procedures to verify hole length. Records of this measurement shall be provided to the Engineer.

.4 The Contractor shall keep a record of all drilling procedures, soil, rock and groundwater conditions encountered, and installation times, which shall be made available to the Engineer.

4.3 Tendon Installation

.1 Anchor tendons shall be installed in strict accordance with the procedures for the test anchors for this project.

.2 The tendon and its corrosion protection shall not be damaged during installation.

.3 The tendon shall be free of dirt, detrimental rust or any deleterious matter.

.4 Centering devices shall be provided to ensure that the bond length of the anchor is located centrally in the hole. Centring devices are required at the end of the anchor and at the bond length/free stressing length interface. The maximum distance between centring devices shall be 5 m.

4.4 Grouting of Bond Length

.1 Grouting of the bond length shall be conducted in strict accordance with the procedures for the test anchors for this project.

.2 The Contractor shall devise procedures to verify the elevation of the top of the bone zone grout. Records of this measurement shall be provided to the Engineer.

.3 The Contractor shall keep records for each anchor showing type of grout, grout pressure and volume of grout used. These records shall be submitted to the Engineer for review.

4.5 Grouting of Free-Stressing Length

.1 Grouting of the free-stressing length shall be in strict accordance with the procedures for the test anchors for this project.

5.0 ANCHOR STRESSING AND ACCEPTANCE TESTING

5.1 General

.1 The requirements of Form 910 for stressing and stressing equipment shall apply, unless otherwise specified herein.

.2 The stressing shall not commence until the grout has reached the specified 28 day strength.

.3 The maximum anchor load shall not exceed 0.80 of the guaranteed ultimate tensile strength of the tendon.

.4 During all tests, a record of load, time and movement is to be maintained at intervals as directed by the Engineer. The Contractor shall provide to the Engineer complete test records for all tests including plots of tendon movement versus tendon load, tendon load versus time, and tendon movement versus time.

.5 All reference beams shall be independently supported with the support firmly supported on the ground at a distance of not less than 2.44 m (8.0 ft.) from the test anchor or reaction system. Reference beams shall be sufficiently rigid to support instrumentation such that variations in readings do not occur . Details of the reference system arrangement shall be submitted to the Engineer for approval.

.6 Dial gauges shall have at least a 76.2 mm (3.0 in.) travel. Longer gauge stems or sufficient gauge blocks shall be provided to allow for greater travel if required. Gauges shall have precision of at least 0.025 mm (0.001 in.). The dial gauges shall be placed on smooth bearing surfaces mounted perpendicular to the direction of movement

Current calibration curves, signed and sealed by an Engineer, shall be provided for all gaugers.

All gauges, scales or reference points attached to the test anchor shall be mounted so as to prevent movement relative to the test anchor during the test.

.7 Jacks used for stressing tendons shall have a minimum ram extension of 152.4 mm (6.0 inches).

Current calibration curves, signed and sealed by an Engineer, shall be provided for all jacks.

.8 The Contractor is responsible for maintaining loads and recording measurements as directed by the Engineer. The Contractor is responsible for providing the necessary skilled staff to perform these tests to the satisfaction of the Engineer.

5.2 Acceptance Tests (Production Anchors)

.1 The following Acceptance Tests are required on production anchors.

.1 Conduct Proof Tests on all anchors.

.2 Conduct Lift-Off tests on 25% of anchors at locations selected by the Engineer. A minimum of 3 Lift-Off Tests is required at each site.

.2 Proof Tests

.1 After pre-loading the anchor to 1.5T for 30 minutes, the proof test shall be conducted by incrementally loading and unloading in accordance with the following schedule, or until the anchor fails, as determined by the Engineer. The acceptance criteria apply to only the peak loading.

T = Working Load of Anchor as shown on drawings.

0.25T, 1.00T, 1.50T*, 1.00T, 0.25T

*At 1.50T, the load shall be maintained for a minimum time of 30 minutes. Measurements shall be recorded in accordance with the following time increment schedule.

0 min, 1 min, 2 min, 3 min, 6 min, 9 min, 12 min, 15 min, 18 min, 30 min.

If the acceptance criteria are not met by 30 minutes, extend the test as required, with readings at 30 minutes increments, up to 180 minutes.

.2 If the acceptance criteria for proof tests (Clause 5.4.1) are met, restress the anchor to 1.50T, then lock-off the anchor at a transfer load of 1.10T.

.3 If the acceptance criteria for proof tests (Clause 5.4.1) are not met, the provisions of Clause 5.5.1 "Unacceptable Stressing Results" apply.

.3 Lift-Off Tests

.1 Lift-off tests for checking the tendon load shall be conducted at times and locations determined by the Engineer. The minimum time between locking in the transfer load and conducting the lift-off test is 24 hours. The method of testing shall be approved by the Engineer, but will generally involve restressing the anchor until tendon movement in the locked-in zone occurs, in order to determine the locked-in anchor load. The locked-in load is defined by the load at which the recorded movement of the tendon exceeds the theoretical elongation of the portion of the tendon outside the locked-in zone.

.2 The stressing anchorages shall be suitable for conducting lift-off tests until the locked-in anchor load has been verified.

.3 Acceptance criteria for lift-off tests are defined in Clause 5.4.2.

.4 If acceptance criteria for lift-off tests (Clause 5.4.2) are not met, the provisions of Clause 5.5.2 "Unacceptable Stressing Results" apply.

.4 Acceptance Criteria

.1 The Engineer shall evaluate the anchor proof test results and determine whether the anchor is acceptable. An anchor shall be acceptable when:

a) the tendon movement for the last log time cycle is less than 1.5 mm where log time cycle is defined as 1/10 final time to final time.*

*(eg 3 - 30 min, 6 - 60 min, 9 - 90 min, 12 - 120 min, 15 - 150 min, 18 - 180 min)

AND

b) the recorded elastic movement of the tendon exceeds 0.80 of the theoretical elongation of the free-stressing length.

.2 The Engineer shall evaluate the anchor lift-off test results and determine whether the anchor is acceptable.

An anchor shall be acceptable when the load measured in the lift-off test is within 10% of the locked-in transfer load.

.5 Unacceptable Stressing Results

.1 The soil anchors which do not meet the acceptance criteria for proof tests shall be dealt with as determined by the Engineer but generally as follows:

a) Abandon the deficient anchor and install new anchor(s) to Engineer's approval.

OR

b) Remove the deficient anchor and replace with an acceptable anchor;

OR

c) Use the deficient anchor at a reduced working load and add a new anchor to make up the load deficiency to Engineer's approval. In this case the acceptable working load for the anchor shall be determined by conducting modified Proof Tests for reduced loads until acceptance criteria are met. The acceptable working load shall be 50% of the load achieved in the acceptable modified Proof Test. The modified Proof Test will involve maintaining the test load for up to 12 hours for permanent anchors, and up to 6 hours for temporary anchors.

OR

d) Use post-grouting techniques to increase the anchor capacity in order to meet the acceptance criteria.

.2 The anchors which do not meet the acceptance criteria for lift-off tests shall be dealt with as determined by the Engineer but generally as follows:

a) Adjust the transfer load to 1.10T. Repeat the lift-off test after a minimum time of 24 hours.

b) If the criteria for the lift-off test are not met after completing the procedures specified in Clause 5.5.2a, the provisions of Clause 5.5.1 apply.

6.0 PAYMENT

Production anchors (including Proof Testing and Lift-off Testing) shall be payable on a per metre basis. Payment at the contract price for the item "Soil or Rock Production Anchors" shall be full compensation for all labour, equipment and materials to design, supply and install production anchors as specified in the Contract, including proof tests and lift-off tests.

Where re-testing of production anchors is required, payment for re-testing anchors shall be payable on a pre-negotiated price per test basis.

Remedial work for unacceptable anchors shall be payable on a pre-negotiated price per metre basis.

GGE-311 ANCHORS AT BROCK ROAD 88 04 17

① CALCULATION OF REQUIRED BOND LENGTH

(A) SOIL ANCHORS

$$(A)(l)(S) = (L)$$

assumed working stress = 100 kPa

$A = 2\pi r = \pi d$

$d = 6'' = 0.1524$ m

$A = 0.4788$ m^2

$L = 500$ kN

$$l = \frac{L}{AS} = 10.44 \text{ m}$$

say 10 m

(B) ROCK ANCHORS

$$(A)(l)(S) = (L)$$

assumed working stress = 500 kPa

$A = 2\pi r = \pi d$

$d = 4\frac{1}{2}'' = 0.1143$ m

$A = 0.3591$ m^2

$L = 500$ kN

$$l = \frac{L}{AS} = 2.78 \text{ m}$$

say 3 m

BROCK ROAD & HWY 401

W.P. 29-67-06

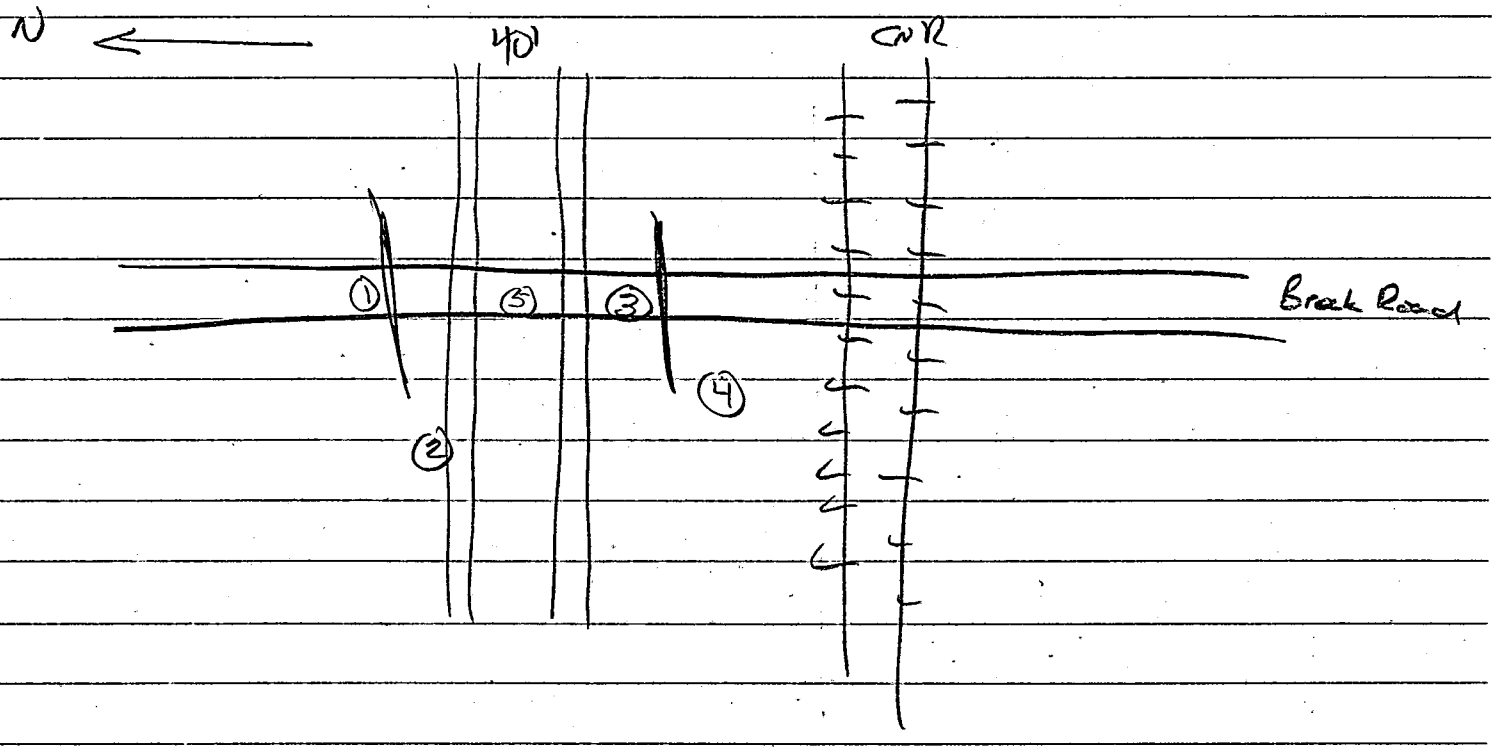
Shale Bedrock

- elev 253 to elev 259 across site
- upper 2 to 10 ft. weathered with occ. mud seams up to 4 inches thick

groundwater 2' to 6' below surface

BH 1	289.8 - 283.0	cl si fill
	283.0 - 261.8	cl si
	261.8 - 254.8	till si & sd gr
	- 254.8 - 244.8	weathered shale
	244.8	sound shale
BH 2	288.2 - 284.0	fill
	284.0 - 273.2	cl si
	273.2 - 253.2	till si sa & gr.
	- 253.2 - 246.7	weathered shale
	246.7 -	sound shale
BH 3	287.6 - 286.1	topsoil
	286.1 - 269.6	cl si
	269.6 - 258.6	till si & sd gr.
	- 258.6 - 253.5	weathered shale
	253.5 -	sound shale

BH 4	289.6 - 288.1	topsoil
	288.1 - 280.0	cl si
	280.0 - 256.0	till silty sa & gr
	256.0 - 250.0	weathered shale
	250.0 -	sound shale



BH #1	261.8 - 254.8	Glacial Till	N = 33 & 100/5"
BH #2	273.2 - 253.2	Glacial Till	N = 17, 55, 84, 93
BH #3	269.6 - 258.6	Glacial Till	N = 29, 100/3"
BH #4	280.0 - 256.0	Glacial Till	N = 77, 66, 100/6" 183/5" 175/8"

GO TRANSIT

555 Wilson Avenue, Downsview, Ontario M3H 5Y6
(416) 630-5220 Telex 06-217508

24 April, 1986

Ministry of Transportation
And Communications
Foundation Design Section
1201 Wilson Avenue
3rd Floor, Central Building
Downsview, Ontario
M3M 1J8

Attention: Mr. M.S. Devata,
Chief Foundations Engineer - East

Dear Sir:

At the Final Review Meeting for Contract GGE311 it was decided to use rock anchors at the Brock Road Retaining Wall. As discussed with your representative, I am writing to request a testing special for rock anchors at this site for inclusion in the contract document.

We are also requesting your supervision of the rock anchor testing at the Brock Road site during construction as per your similar involvement at Westney Road.

Thank you for your co-operation. If you have any questions regarding the above, please do not hesitate to contact us.

Yours very truly,

J. Greg Ashbee

J.G. Ashbee
Civil & Signals Design Co-Ordinator

cc: P. Johannsson - GO Transit
J. Lyle - M.M. Dillon
D. Batchelor - Planmac

Ontario

memorandum

Ontario

To: Mr. J. B. Ashbee
Civil & Signals Design Co-ord.
GO TRANSIT
555 Wilson Avenue

Date: 86 04 07

Note:
This covering letter was issued but not the rest of the package. Go Transit rescheduled tenders to "During Construction" and this package was revised.

D. Dundas 86 04 29

From: Engineering Materials Office,
Foundation Design Section,
Central Building, Room 315

Re: Central Package
Invitational Bids
Anchor Testing for GO TRANSIT
Contract GGE-311 (Brock Road Retaining Walls)

As agreed, this office has prepared contract documents for anchor testing at Go Transit Contract GGE-311.

Please find enclosed the following information which we have complied for this contract: *

1. Instruction memo to the Contractor
2. Soil or Rock Anchor SP
3. Figure 1 (Site Plan)
4. Figure 2 (Test Arrangement)
5. Subsurface Information
6. List of 6 Contractors to be included in invitational bid.

As you are aware, this contract will include construction of an access ramp, and relocation of existing overhead utilities. We have assumed that Go Transit will assist the Contractor in arranging permission to enter properties, and agreements with the utility companies.

It is our understanding that the contract will be let in a similar manner to the anchor test contract for GGE-310 and we recommend that you make the necessary arrangements with MTC District #6 (Attention: Mr. A. Galloway, Head, Engineering Services). With this arrangement, MTC may proceed as with their normal procedures, including payments, then charge back to Go Transit through accounting code EGG 411-100. We estimate that the cost for this anchor test program will be in the order of $40,000. However, there will be additional costs for construction of access roads and relocation of utilities. As a rough approximation, we anticipate the cost of the additional work to be in the order of $30,000.

If there are any questions, please contact this office.

M. Devata

M. Devata, P. Eng.,
Chief Foundations Engineer
(East)

MD:gp
encl.

7540-1318 (10/78)

* Further to our telephone conversation of 86 04 07 in which you indicated that Go Transit may not allocate funds for this program: We have this package together. Should you decide to go ahead with the work, please advise. D. Dundas

ANCHOR TEST INSTRUCTIONS
Go Transit Contract GGE-311
Brock Road Retaining Walls
Anchor Testing Program

These instructions are in addition to the Special Provision "Soil or Rock Test Anchors".

1) The site is located on the south side of the Brock Road ramps of Hwy. 401 Eastbound, in the Town of Pickering. A site plan and location map are illustrated on the attached Figure 1.

2) The Contractor shall install a total of (four) 4 permanent anchors at the above-noted site. Portions of the bond zone may be in overburden or bedrock as conditions dictate. The anchors shall be located near the toe of the Hwy. 401 ramp embankments in accordance with clearance constraints for equipment imposed by C N R. Test Anchors #1 and #2 shall be located to the west of the Brock Road structure at distances of 15 m and 10 m respectively from the west edge of the bridge, measured parallel to the C N R tracks. Test Anchors #3 and #4 shall be located to the east of the Brock Road structure at distances of 10 m and 15 m respectively from the east edge of the bridge, measured parallel to the C N R tracks. Approximate test locations are illustrated on the attached Figure 1.

3) Approximate anchor test locations, elevations of top of bond zones, and bond zone lengths are specified in the following table:

Test No.	Approximate Location N	E	Elevation Top of Bond Zone	Bond Length
#1	4 855 217	339 336	82 m	8 m
#2	4 855 219	339 340	82 m	10 m
#3	4 855 247	339 383	79 m	8 m
#4	4 855 249	339 387	79 m	10 m

If site conditions or clearance restraints dictate, the tests may be moved within a 5 m radius of their specified locations. However, the distance between each test shall be a minimum of 5 m.

4) The Contractor is responsible for providing survey data for the actual test locations, including North and East co-ordinates, and ground surface elevations.

5) The anchor holes shall be oriented perpendicular to the Hwy. 401 ramps at an angle of 30° from the horizontal. The diameter of the free-stressing zone shall be less than 230 mm. The diameter of the bond zone shall be 152 ± mm in overburden and not less than 102 ± mm in bedrock. However, all installations shall be in strict accordance with the installation procedures and borehole diameters specified in the Contractor's approved proposal.

...2

14) The Contractor shall restore the site to the original condition as directed by the Engineer. In this case, the access road and ramps may be left in place. However, the test anchors must be cut-off a minimum of 1 m below the ground surface and the working areas must be restored to their original conditions.

15) The Contractor shall submit a proposed schedule for the anchor installation and test program with their quotation.

16) Technical queries may be directed to Mr. M. Devata, Chief Foundations Engineer, MTC (248-3282).

6) The working load [T] for the test anchors shall be 500 kN. The test anchor tendons/strands shall have the structural capacity for loads up to 1250 kN.

7) A possible test arrangements is illustrated in Figure 2.

8) Subsurface information for this site is provided. Refer to the enclosed Borehole Location and Soil Strata Drawing and Record of Borehole Sheets #1 to #15, and #1B and #1A. Note that occasional boulders may be encountered in the glacial till overburden.

9) The Contractor is responsible for locating, maintaining, relocating and restoring all underground and above ground utilities as required. Proposals [4 copies] for this aspect of the work shall be submitted to the Engineer for review a minimum of (ten) 10 days before this work is scheduled to commence.

10) The Contractor is responsible for constructing access ramps and roads, and working areas. The integrity of the Hwy. 401 embankments and the C N R must be protected at all times. Proposals (4 copies) for this aspect of the work, signed and sealed by a Professional Engineer licensed by the Association of Professional Engineers of Ontario shall be submitted to the Engineer a minimum of (ten) 10 days before this work is scheduled to commence.

11) The Contractor is responsible for completing the work described in this Contract within the constraints imposed by C N R regarding clearances for operating equipment. Where equipment is operating within 6 m of the C N R track, the operation will proceed under the conditions of C N R Rule 42 in which the scheduling of operations will be under the direction of a C N R Flagman. As a result, equipment may periodically be required to move in order to avoid disruption to CN rail traffic. The Engineer shall be provided with notice of any intended equipment operation within 6 m of the C N R rails a minimum of (four) 4 days before this work is scheduled to commence so that arrangements can be made to provide a C N R Flagman.

12) The Contractor is responsible for arranging with the Engineer for road and rail traffic protection. MTC will assist in these arrangements.

13) The Contractor is required to have at least one skilled person at the site during the anchor installation and test program. His responsibilities will include maintaining and adjusting anchor loads, and recording anchor movements as directed by the Engineer.

...3

SOIL OR ROCK TEST ANCHORS

1.0 General

.1 This document specifies the requirements for the design, supply, installation and testing of soil or rock test anchors.

1.1 Definitions

.1 Anchor - the entire stressing assembly including tendon/strand and grout.

.2 Tendon/Strand - the assembly consisting of the prestressing steel, the corrosion protection system and the end anchorage.

.3 Bond length - the anchor zone bonding with the soil or rock.

.4 Free-stressing length - the anchor zone not bonding with the soil or rock.

1.2 References

This Special Provision refers to the following standards, specifications or publications:

.1 MTC Form 903 - "Construction Specification for Piling".

.2 MTC Form 910 - "Construction Specification for Prestressed Concrete, Cast-In-Place Construction".

.3 ASTM A722 - "Uncoated High-Strength Steel Bar for Prestressing Concrete".

.4 CSA G279 M1982 - "Steel for Prestressed Concrete Tendons".

.5 MTC Form 906 - "Structural Steel".

2.0 Materials

2.1 Anchor System

.1 The contract documents are based on Dywidag Threadbar Anchors, or BBR Cona Multi-Strand Anchors.

2.2 Tendons for Anchors

.1 Description

Anchors shall be Dywidag Threadbar Anchors or BBR Cona Multi-Strand Anchors with double corrosion protection, in accordance with the drawings and specifications and shall be encased for their full length in corrugated PVC sheathing. A smooth PVC tubing fitting snugly over the corrugated sheathing in the free stressing length shall guarantee unobstructed enlongation during stressing. The annular space between bar and corrugated sheathing shall be grouted over its full length prior to installation of single bar tendons. The anchor load shall be transferred to the soil or rock by bond.

.2 Prestressing Steel

For Dywidag anchors the prestress steel shall be Dywidag Threadbars grade 1030 MPa (150,000 psi), grade 1100 MPa (160,000 psi) or grade 1230 MPa (178,000 psi), conforming to ASTM Designation A722 (latest revision) "Uncoated High-Strength Steel Bar for Prestressing Concrete".

For BBR anchors the prestress steel shall be BBR Cona Multi-Strand grade 1720 MPa (250,000 psi), grade 1760 MPa (255,000 psi) or grade 1860 MPa (270,000 psi), conforming to CSA Standard G279 (latest revision): "Steel for Prestressed Concrete Tendons".

.3 Anchorages

Steel anchorages (anchor plates, anchor nuts, blocks, wedges, etc.) shall be compatible with the Dywidag Post-tensioning System or the BBR Post-tensioning System. Anchorage components shall develop at least 95% of the minimum guaranteed ultimate strength of the tendon.

.4 Couplers

Couplers for tendon sections shall develop 100% of the guaranteed minimum ultimate tensile strength of the tendon.

.5 Corrosion Protection

The corrosion protection shall be Dywidag double corrosion protection system, or equivalent.

Corrugated and smooth plastic sheathing shall be made of hard PVC material with a minimum compressive strength of 102 MPa and a minimum tensile strength of 48 MPa. Material shall be free of water soluble chlorides and other ingredients which might enhance corrosion, hydrogen embrittlement or stress corrosion of the prestressing steel. The plastic sheathing shall be such that a minimum bond of 4.8 MPa at a minimum compressive strength of the grout of 27 MPa is developed.

The materials for the sheathing accessories like end cap, grouting cap, grout tube and sealing cap shall be equivalent to the plastic sheathing.

2.3 Tendons for Temporary Anchors

Provisions for "Tendons for Permanent Anchors" apply, except that the double corrosion protection system is not required. The prestressing steel must retain adequate structural strength during the construction period, and the provisions for corrosion protection must be sufficient for this purpose.

2.4 Grout

.1 The grout for the bond length shall satisfy the requirements for grout of Form 910. The cube strength of grout shall be at least 20 MPa at 7 days and 35 MPa at 28 days.

.2 The Contractor shall be responsible for collecting samples of the bond grout to verify the grout strength. Test results verifying the 28 day grout strength, signed and sealed by a Professional Engineer licensed by the Association of Professional Engineers of Ontario, shall be submitted to the Engineer before acceptance testing proceeds.

.3 The grout for the free-stressing length shall completely fill the annular space between the tendon and the borehole wall. The grout material shall be suitable to provide adequate corrosion protection and to prevent any transfer of the anchor load to the free stressing zone to the satisfaction of the Engineer. The grout for the free-stressing length shall be bentonite slurry, unless otherwise agreed by the Engineer.

3.0 EQUIPMENT

3.1 All equipment for the installation of soil anchors shall be suitable for the intended purposes and capable of working on the site under the prevailing access and clearance conditions.

3.2 The equipment shall not cause damage to the anchor tendon and corrosion protection.

3.3 The equipment for stressing and grouting shall satisfy the requirements of Form 910.

3.4 The equipment for load testing shall satisfy the requirements of Form 903.

4.0 INSTALLATION

4.1 Tendon Fabrication

.1 Tendons shall be either shop fabricated or field fabricated in accordance with approved shop drawings, using personnel trained and qualified in this type of work.

.2 Tendons shall be handled and protected prior to installation in such a manner as to avoid corrosion and physical damage.

4.2 Construction of Holes

.1 The Contractor shall propose the methods for constructing the holes, maintaining the holes, and placing tendons, grout and other materials in the holes. These proposals shall be submitted to the Engineer for review, and shall include details of casing sizes, bit sizes and grout pressure.

.2 Holes for anchors shall be constructed by a method to suit the subsurface conditions at the site. All excavated materials shall be removed from the site.

.3 The holes shall be maintained without any cave-in until anchor tendon and grout are satisfactorily placed. If any unwatering is required, it shall be part of work under this tender item.

.4 Use of liners is permitted. The liners shall be withdrawn from the bond length to ensure complete filling of the hole and proper bonding of grout to soil or rock. The liners may be left in place for the free stressing length. When a liner is removed, the placing of the grout during liner removal shall be so arranged that the head of grout will be at least equal to the hydrostatic pressure at the top of the liner and prevent ingress of deleterious material.

.5 The centreline of hole shall not deviate from that specified by more than 2% of the distance between the point considered and the top of the anchor.

.6 The hole diameters and lengths for this project are as specified in the contract instructions. The Contractor shall devise procedures to verify hole length. Records of this measurement shall be provided to the Engineer.

.7 The Contractor shall keep a record of all drilling procedures, soil, rock and groundwater conditions encountered, and installation times, which shall be made available to the Engineer.

4.3 Tendon Installation

.1 Anchor tendons shall be installed in accordance with the specifications and the shop drawings.

.2 The tendon and its corrosion protection shall not be damaged during installation.

.3 The tendon shall be free of dirt, detrimental rust or any deleterious matter.

.4 Centering devices shall be provided to ensure that the bond length of the anchor is located centrally in the hole. Centring devices are required at the end of the anchor and at the bond length/free stressing length interface. The maximum distance between centring devices shall be 5 m.

4.4 Grouting of Bond Length

.1 The Contractor shall select and use suitable grouting methods to completely fill the hole with grout and to obtain the required bond to the soil or rock.

.2 The grout shall be pumped into the anchor hole through a grout pipe provided for that purpose until the hole is filled over the bond length. No bond grout shall be placed above this point.

.3 The grout shall always be injected at the lowest point on the bond length. Provisions shall be made for determining the elevation of the top of grout. If liners are used the provisions of Clause 4.2 "Construction of Holes" shall be observed.

.4 The Contractor shall devise procedures to verify the elevation of the top of the bond zone grout. Records of this measurement shall be provided to the Engineer.

.5 After grouting, the anchors shall remain in an undisturbed condition until the necessary grout strengths have been achieved.

.6 The Contractor shall keep records for each anchor showing type of grout, grout pressure and volume of grout used. These records shall be submitted to the Engineer for review.

4.5 Grouting of Free-Stressing Length

.1 The grout in the free-stressing length in the annular space between the anchor and the borehole wall between the bond length and the tendon anchorage shall be placed similarly to grout for the bond length, to complelety fill the hole, and leave no voids at the top of the free-stressing length.

5.0 Test Anchors

.1 The Contractor shall install the number of anchors specified in the contract documents for testing purposes. The purpose of these test anchors is to prove the adequacy of the proposed anchor configuration and installation procedures under the site conditions, and to provide design parameters.

.2 The test anchors shall be constructed in strict accordance with the Contractor's proposed procedures. The proposed procedures shall bear the seal and signature of a Professional Engineer licensed by the Association of Professional Engineers of Ontario. These procedures shall be submitted to the Engineer for review, prior to commencement of the test program.

.3 The test anchors shall be constructed at locations specified by the Engineer. If site conditions dictate, changes to the test locations will be considered. The installation of test anchors shall be inspected by the Engineer.

.4 For the test anchors, the working load, the anchor inclination, the bond zone length and the elevation of the top of the bond zone shall be as specified by the Engineer.

.5 The test anchors shall not be incorporated in permanent or temporary works. After testing, the test anchors will be cut off 1 m below the ground surface.

.6 The Contractor shall design and provide suitable reaction systems for the applied test loads. Shop drawings and design calculations for the reaction system shall bear the seal and signature of a Professional Engineer licensed by the Association of Professional Engineers of Ontario. This reaction system design shall be submitted to the Engineer for review.

.7 The Contractor shall supply equipment, materials and skilled personnel to conduct the anchor tests. The equipment and materials shall be capable of stressing the test anchor to an ultimate load of 1000 kN. It shall be the responsibility of the Contractor to constantly monitor the test, maintain specified test loads and to record test measurements as specified by the Engineer.

.8 Anchor tests shall be conducted concurrently, as scheduled by the Engineer. The tests shall normally be conducted between 8:00 hrs. and 20:00 hrs. from Monday to Friday, unless otherwise directed by the Engineer.

.9 Each Anchor Test shall be conducted as follows:

.1 The Anchor Tests will be carried out under the direction of the Engineer, generally in accordance with the prevailing requirements of A.S.T.M. (Designation D1143-81) and the procedures specified in this document.

.2 Records of vertical movement of the reaction system, horizontal movement of the reaction system, and tendon elongation are required. These shall be recorded with respect to an independant fixed reference point. A record of test enclosure temperature is also required.

.3 All reference beams shall be independently supported with the support firmly embedded in the ground at a distance of not less than 2.44 m (8.0 ft.) from the reaction system. Reference beams shall be sufficiently rigid to support instrumentation such that variations in readings do not occur. Details of the reference system arrangement shall be submitted to the Engineer for approval.

.4 Dial gauges shall have at least a 76.2 mm (3.0 in.) travel. Longer gauge stems or sufficient gauge blocks shall be provided to allow for greater travel if required. Gauges shall have precision of at least 0.025 mm (0.001 in.). The dial gauges shall be placed on smooth bearing surfaces mounted perpendicular to the direction of movement.

Current calibration curves, signed and sealed by an Engineer, shall be provided for all gauges.

All gauges, scales or reference points attached to the test anchor shall be mounted so as to prevent movement relative to the test anchor during the test.

.5 Jacks used for stressing tendons shall have a minimum ram extension of 152.4 mm (6.0 inches).

Current calibration curves, signed and sealed by an Engineer, shall be provided for all jacks.

.6 The Contractor shall construct suitable enclosures to provide complete protection for personnel, equipment and instruments, from variations in the weather conditions and disturbances during the test program. These provisions must meet the approval of the Engineer and will include the following specific requirements:

- the test enclosures must be weather-proof and provide adequate lighting and consistent and controllable heat in order to eliminate temperature variations

- the test enclosure must be provided with a level dry floor

- the jacks must be secured with chains to provide adequate protection to personnel in the event of breakage of the anchor or stressing system

- a field office, equipped with tables, chairs, heating and lighting shall be provided adjacent to the test anchors.

.7 The Anchor Test shall be conducted by incrementally loading and unloading in accordance with the following schedule, or until the anchor fails, with measurements recorded at intervals as directed by the Engineer.

T = Working Load of Anchor.

0.00T, 0.25T, 0.50T, 0.75T, 1.00T,
0.75T, 0.50T, 0.25T,
0.50T, 0.75T, 1.00T, 1.25T, 1.50T,
1.25T, 1.00T, 0.75T, 0.50T, 0.25T,
0.50T, 0.75T, 1.00T, 1.25T, 1.50T, 1.75T, 2.00T*,
1.75T, 1.50T, 1.25T, 1.00T, 0.75T, 0.50T, 0.25T,
0.00T.**

*At 2.00T, the load shall be maintained for 24 hours.

**At this point, an additonal loading cycle, directly to a load up to 1000 kN shall be conducted as directed by the Engineer.

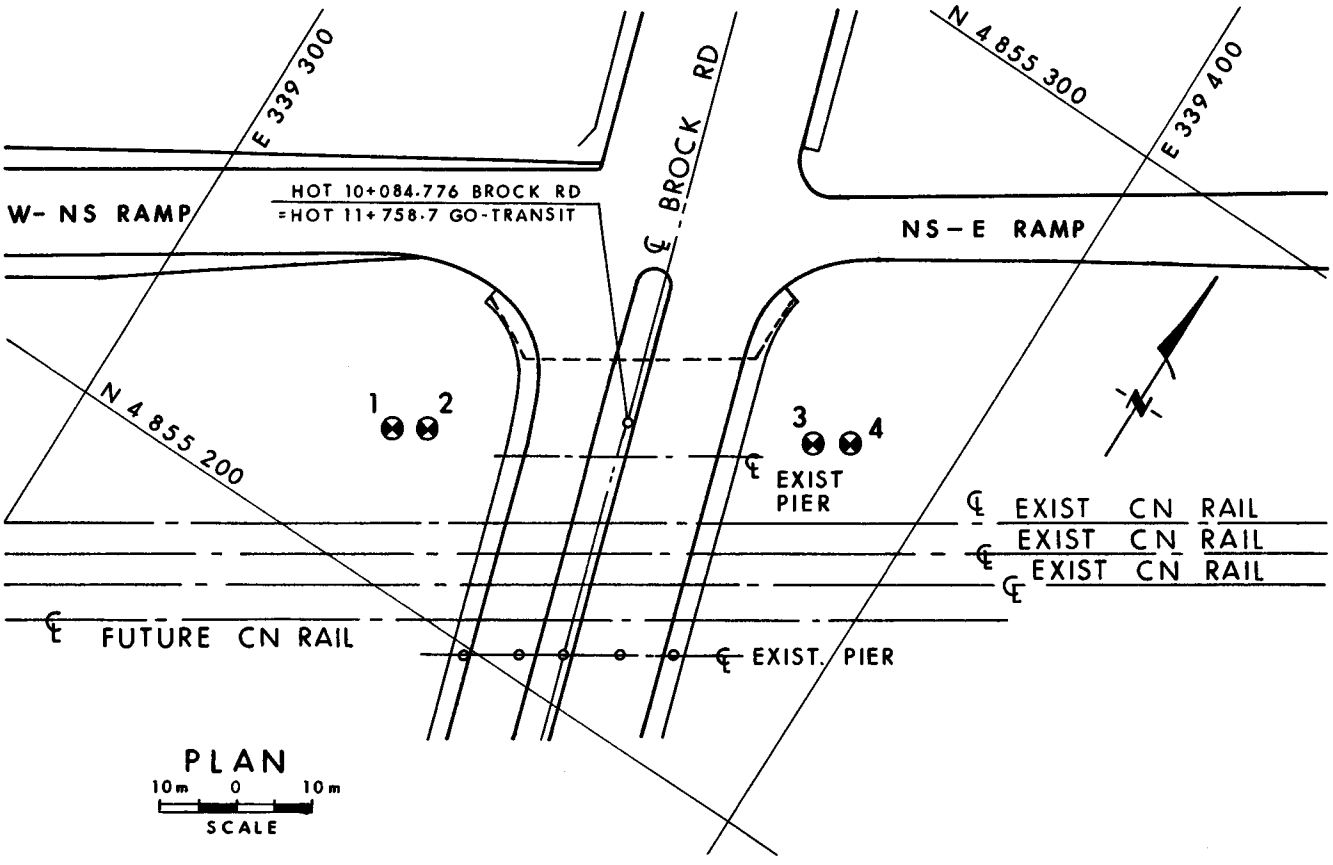
.8 The following acceptance criteria apply:

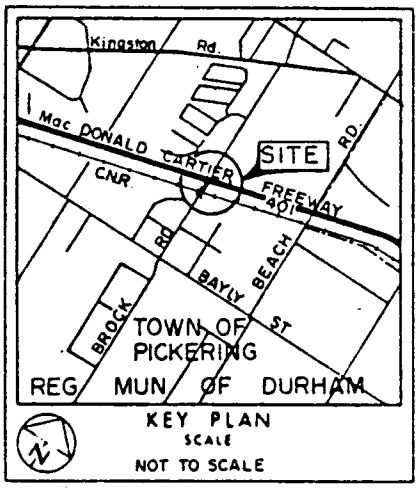
Each load shall be maintained for a minimum time of 15 minutes, and until the rate of displacement is not greater than 0.25 mm (0.01 inches) per hour. Test results and interpretation are subject to the approval of the Engineer.

.9 The test site shall be restored to its pre-test condition.

6.0 Payment

Test Anchors shall be payable on an each basis. Payment at the contract price for the item "Soil or Rock Test Anchors" shall be full compensation for all labour, equipment and materials to design, supply and install and test soil or rock test anchors as specified in the contract.





LEGEND

⊗ ANCHOR TEST LOCATION

Fig. 1

CONT. GGE-311

GO TRANSIT CONTRACT NO GGE-311
BROCK ROAD RETAINING WALLS
ANCHOR TESTING

ANCHOR TEST CONFIGURATION
(SCHEMATIC)

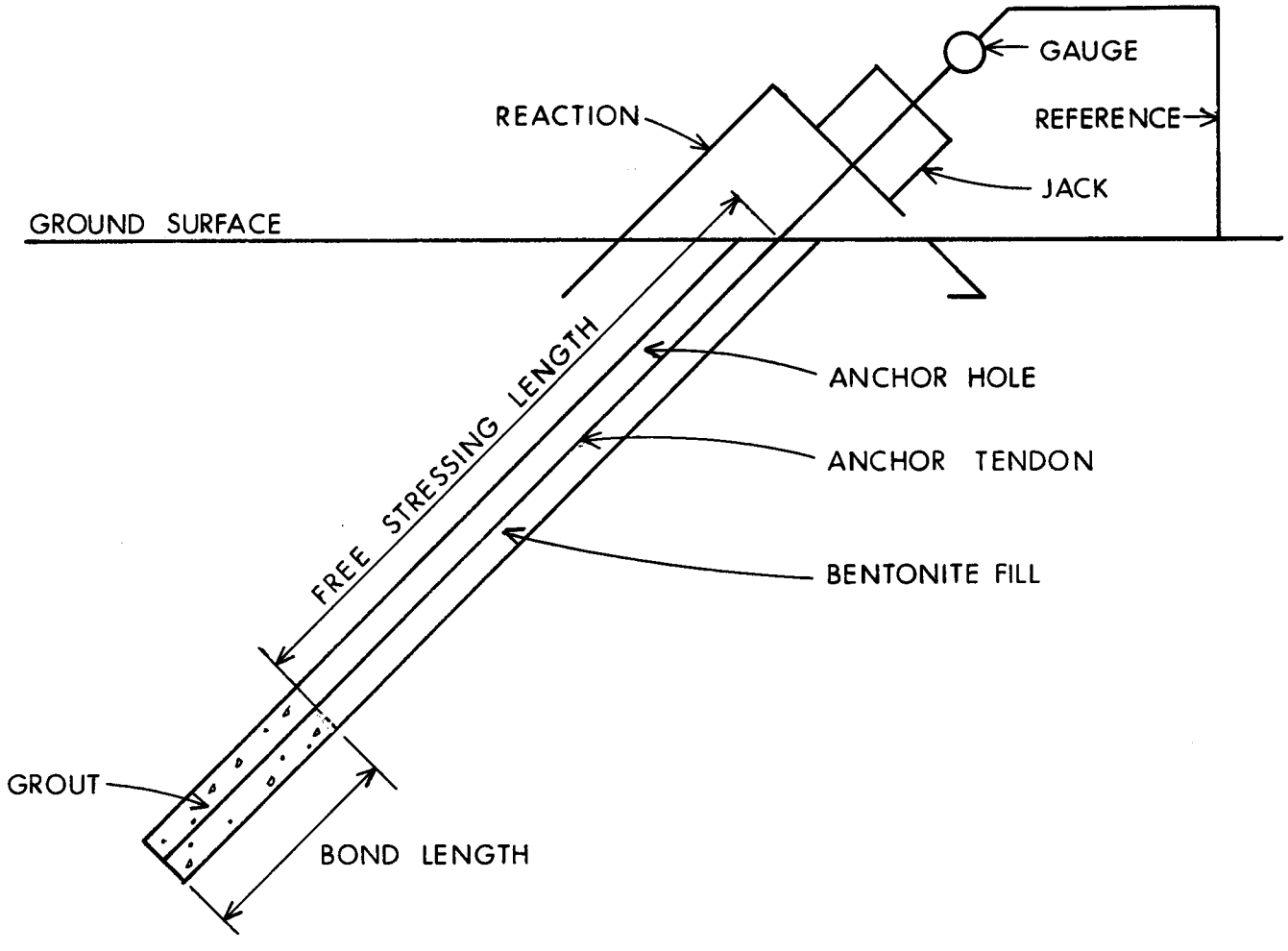


FIG. 2

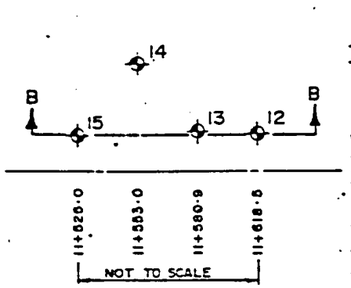
SUBSURFACE INFORMATION

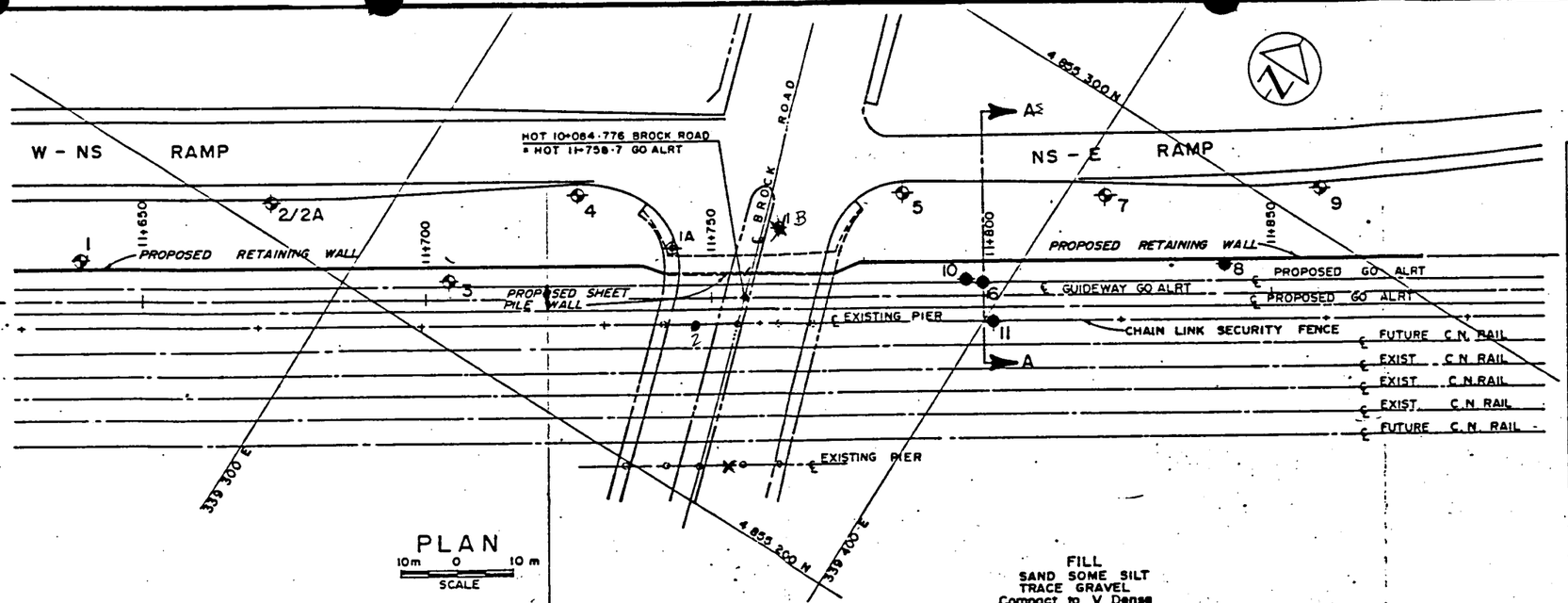
GO TRANSIT
CONTRACT GGE-311
BROCK ROAD RETAINING WALLS

ANCHOR TESTING

METRIC

ALL DIMENSIONS SHOWN ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE NOTED.

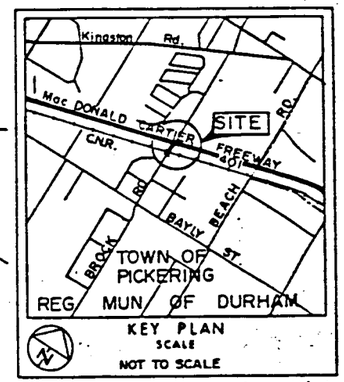




PLAN

10m 0 10 m

SCALE



KEY PLAN

SCALE

NOT TO SCALE

LEGEND

- Bore Hole
- Dynamic Cone Penetration Test (Cone)
- Bore Hole & Cone
- 'N' Blows/0.3m (Std Pen Test, 475 J/blow)
- CONE Blows/0.3m (60° Cone, 475 J/blow)
- W.L. at time of investigation 83.08
- Cone Test *(Previous Investigation)
- Bore Hole & Cone *(Previous Investigation)

No	ELEVATION	CO-ORDINATES NORTH	EAST
1	91·6	4 855 178·5	339 259·0
2	96·3	4 855 205·0	339 281·5
2A	96·3	4 855 205·0	339 281·5
3	90·9	4 855 210·0	339 315·8
4	97·6	4 855 235·0	339 327·0
5	97·6	4 855 266·5	339 375·9
6	90·1	4 855 260·5	339 396·5
7	96·6	4 855 285·0	339 406·0
8	88·0	4 855 286·4	339 430·0
9	95·4	4 855 306·5	339 437·4
10	90·3	4 855 259·5	339 393·2
11	88·3	4 855 255·7	339 401·5
12	91·2	4 855 165·7	339 239·1
13	90·9	4 855 103·2	339 251·0
14	94·1	4 855 142·0	339 246·0
15	91·0	4 855 055·9	339 221·2
* 1	87·9	4 855 249·1	339 359·7
* 1A	88·8	4 855 236·0	339 344·0

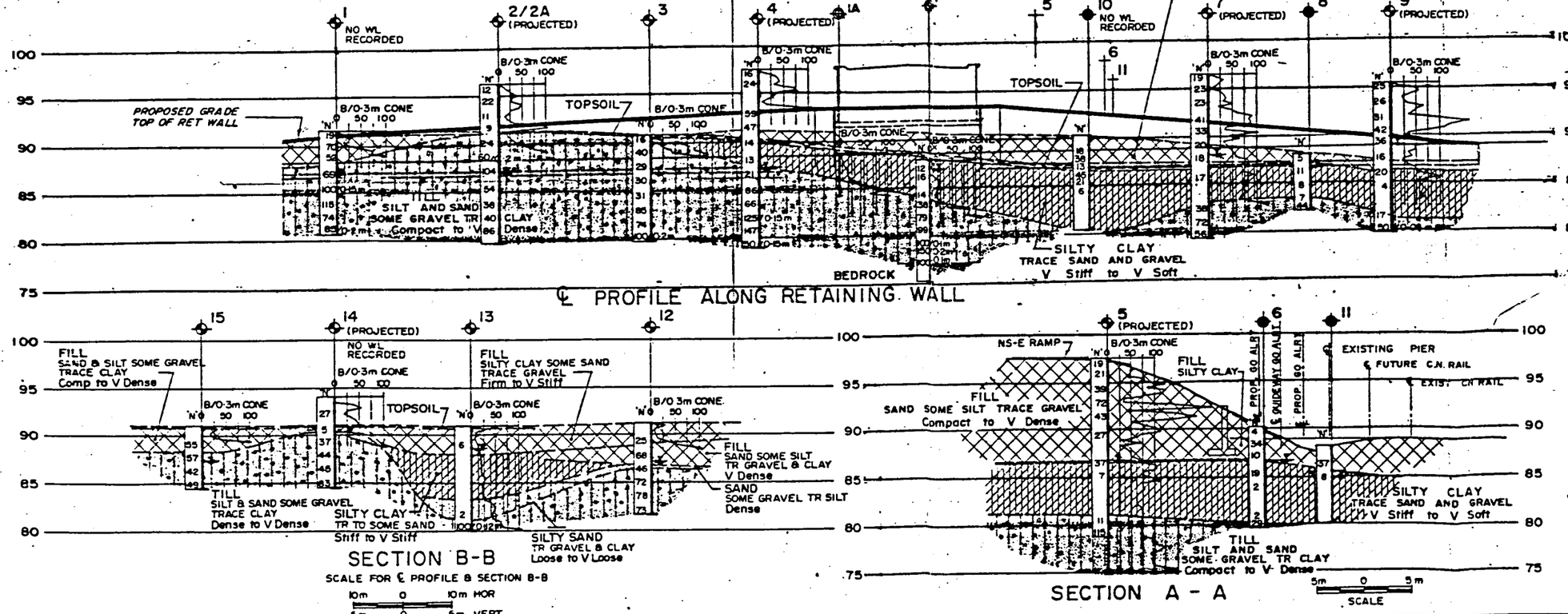
Geocres No

NOTE

The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence.

NOTE: The complete foundation investigation and design report for this project and other related documents may be examined at the Engineering Materials Office, Downsview. Information contained in this report and related documents is specifically excluded in accordance with the conditions of Section 102-2 of Form 100

GO-ALRT REF _____



℄ PROFILE ALONG RETAINING WALL

SECTION B-B

SCALE FOR ℄ PROFILE & SECTION B-B

10m 0 10m HOR

5m 0 5m VERT

SECTION A - A

5m 0 5m

SCALE

REFERENCE DRAWINGS		REVISIONS			
PD 600 222	STANDARD PLANNING REPORT				
	GO ALRT EXTENTION				
	BROCK RD. RETAINING WALL				

DRAWN BY: A.E. LOCKHART 84 02 23	DESIGNED BY: RB
CHK'D BY: RB	APPROVED BY:
SCALE:	FULL SIZE ONLY

REGISTERED PROFESSIONAL ENGINEER PROVINCE OF ONTARIO W. BROWNE

GEOCON INC.

GO-ALRT Ministry of Transportation and Communications PICKERING - OSHAWA SECTION

BORE HOLE LOCATION & SOIL STRATA

GO ALRT EXTENTION

BROCK ROAD RETAINING WALL

CONTRACT NO | DWG NO | REV | SHEET

Ministry of Transportation and Communications
Ontario

RECORD OF BOREHOLE No 1 METRIC

W P 470-711-609 LOCATION 4 855 178.5N : 339 259.0E ORIGINATED BY TH
DIST 6 HWY GO ALRT BOREHOLE TYPE Hollow Stem Auger & Cone Test COMPILED BY GAB
DATUM Geodetic DATE 1983 07 20 CHECKED BY RWB

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH o UNCONFINED + FIELD VANE • QUICK TRIAXIAL x LAB VANE 20 40 60 80 100	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT Wl / WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
91.6	Ground Level										
0.0	Topsoil										
0.3	Sand, some silt, trace gravel (fill) Very Dense Brown		1	SS	19						
			2	SS	70		90				
87.9			3	SS	52			136/0.3m			
3.7	Silt and Sand, some Gravel, trace clay (till) Very dense Brown to Grey		4	SS	69	No Water Level Recorded	88				
			5	SS	110/0.15m		86				
			6	SS	115		84				
			7	SS	74		82				
80.7			8	SS	85/0.2m						
10.9	End of Borehole										

+3, x5 : Numbers refer to Sensitivity

15 20/10 5 (%) STRAIN AT FAILURE

Ministry of Transportation and Communications
Ontario

RECORD OF BOREHOLE No 2 METRIC

W P 470-711-609 LOCATION 4 855 205.0N ; 339 281.5E ORIGINATED BY TH

DIST 6 HWY GO ALRT BOREHOLE TYPE Hollow Stem Auger & Cone Test COMPILED BY GAB

DATUM Geodetic DATE 1983 07 21 CHECKED BY RWB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE 20 40 60 80 100	PLASTIC LIMIT Wp — NATURAL MOISTURE CONTENT W — LIQUID LIMIT Wl / WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
96.3	Ground Level										
0.0	Topsoil										
0.2	Sand, some silt, trace gravel (fill) Compact Brown		1	SS	12	No Water Level Recorded	96				
94.6											
1.7	Silty Clay, some sand trace gravel (fill) occasional sand layers Stiff to Very Stiff Brown		2	SS	22		94				
			3	SS	11						
91.6							92				
4.7	Silty Clay, some Sand and Organics		4	SS	9						
5.2	Silt and Sand some Gravel, trace clay (till) Compact to Very Dense Brown to Grey		5	SS	24		90	124 20/0.25m			
88.2			6	SS	60/0.2m						
8.1	End of Borehole										

Note: Borehole 2 terminated upon auger refusal in cobbles. See Record of Borehole 2A for continuation of stratigraphy.

+3, ×5 : Numbers refer to Sensitivity

20 / 15 ◇ 5 / 10 (%) STRAIN AT FAILURE

Ministry of Transportation and Communications
Ontario

RECORD OF BOREHOLE No 2A METRIC

W P 470-711-609 LOCATION 4 855 205.0N ; 339 281.5E ORIGINATED BY TH
DIST 6 HWY GO ALRT BOREHOLE TYPE Hollow Stem Auger COMPILED BY GAB
DATUM Geodetic DATE 1983 07 22 CHECKED BY RWB

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT Wl — WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
96.3	Ground Level										
0.0	Not Sampled. See Borehole No. 2						96				
							94				
							92				
91.1	Silty Clay, some Sand and Organics		7	TW	PH			205		18.46	
5.2							90				
							88				
			8	SS	104	▼					
	Silt and Sand some Gravel, trace clay (till)		9	SS	54		86				
	Dense to Very Dense		10	SS	38		84				1 49 48 2
	Brown to Grey		11	SS	40						
							82				
			12	SS	86						
79.5							80				
16.8	End of Borehole										

Note: Borehole 2A located adjacent to Borehole 2. See Record of Borehole 2 for stratigraphy from 0.0 to 8.1 metres

+³, ×⁵ : Numbers refer to Sensitivity

20 / 15 ◇ 5 / 10 (%) STRAIN AT FAILURE

Ministry of Transportation and Communications
Ontario

RECORD OF BOREHOLE No 3 METRIC

W P 470-711-609 LOCATION 4 855 210.0N ; 339 315.8E ORIGINATED BY TH
DIST 6 HWY GO ALRT BOREHOLE TYPE Hollow Stem Auger & Cone Test COMPILED BY GAB
DATUM Geodetic DATE 1983 07 21 CHECKED BY RWB

SOIL PROFILE ELEV/DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH o UNCONFINED + FIELD VANE • QUICK TRIAXIAL x LAB VANE 20 40 60 80 100	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT Wl / WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
90.9	Ground Level									
0.0	Topsoil		1	SS	16		90	140		
0.3	Silt and Sand, some gravel, trace clay (till) Compact to Very Dense Brown to Grey		2	SS	40			130		
			3	SS	29	▼	88			
			4	SS	30		86			
			5	SS	31		84			
			6	SS	85					
			7	SS	74		82			
79.8			8	SS	100/0.2m		80			
11.1	End of Borehole									

+3, x5 : Numbers refer to Sensitivity

15 20 10 5 (%) STRAIN AT FAILURE

Ministry of Transportation and Communications
Ontario

RECORD OF BOREHOLE No 4 METRIC

W P 470-711-609 LOCATION 4 855 235.0N ; 339 327.0E ORIGINATED BY TH

DIST 6 HWY GO ALRT BOREHOLE TYPE Hollow Stem Auger & Cone Test COMPILED BY GAB

DATUM Geodetic DATE 1983 07 25 CHECKED BY RWB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT Wl — WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
97.6	Ground Level										
0.0	Sand, some silt, trace to some gravel (fill) Compact to Dense Brown		1	SS	16						
			2	SS	24		96				
	Layer of silty clay		3	TW	PH		94				
			4	SS	59			166 175 250/0.13m	○		8 81 (11)
			5	SS	47		92				
90.0											
7.6	Silty Clay, some Sand and Organics		6	SS	14		90		○		
7.9	Silty Clay, trace sand and gravel stiff										
			7	SS	13		88				
87.2	Brown					▼					
10.4	Silt and Sand, some gravel, trace clay (till) Compact to Very Dense Brown to Grey		8	SS	21		86				
			9	SS	86						
			10	SS	66		84				
			11	SS	125/0.15m		82		○		17 59 22 2
			12	SS	147		80				
78.9											
18.7	End of Borehole		13	SS	50/0.15m						

+3, ×5 : Numbers refer to Sensitivity

15 20 10 5 (%) STRAIN AT FAILURE

Ministry of Transportation and Communications
Ontario

RECORD OF BOREHOLE No 5 METRIC

W P 470-711-609 LOCATION 4 855 266.5N ; 339 375.5E ORIGINATED BY TH
DIST 6 HWY GO ALRT BOREHOLE TYPE Hollow Stem Auger & Cone Test COMPILED BY GAB
DATUM Geodetic DATE 1983 07 26 CHECKED BY RWB

ELEV / DEPTH	SOIL PROFILE: DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	TYPE	'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT WL — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
97.6	Ground Level										
0.0	Sand, some silt to Sand and Silt, trace to some gravel (fill) Compact to Very Dense Brown		1	SS	19						
			2	SS	21		96				
			3	SS	39		94				
			4	SS	72			125			
							92	214 135 179 140			
			5	SS	43						
			6	SS	27		90				
	Layer of silt clay		7	TW	PH						
86.6	Silty Clay, some Sand and Organics		8	SS	37	▼	88				
11.0	Silty Clay, trace sand and gravel, varves 11.1 to 13.0 m (CL) Firm to Hard Grey		9	SS	7		86				
			10	TW	PH		84		o	19.76	
			11	TW	PH		82				
81.1											
16.5	Silt and Sand, some gravel, trace clay (till) Compact to Very Dense Grey		12	SS	11		80				
78.9			13	SS	115						
18.7	End of Borehole						78				
							76	138 143 138			
75.0											
22.6	End of Cone Test										

+3, ×5 : Numbers refer to Sensitivity

20
15 ◇ 5 (%) STRAIN AT FAILURE
10

Ministry of Transportation and Communications
Ontario

RECORD OF BOREHOLE No 6 METRIC

W P 470-711-609 LOCATION 4 855 260.5N ; 339 396.5E ORIGINATED BY TH

DIST 6 HWY GO ALRT BOREHOLE TYPE Motorized Tripod Drill COMPILED BY GAB

DATUM Geodetic DATE 1983 07 26 CHECKED BY RWB

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (o UNCONFINED, • QUICK TRIAXIAL, + FIELD VANE, x LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT WL — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
90.1	Ground Level						90				
0.1	100 Topsoil										
88.9	Sand, some silt, trace gravel (fill) Loose Brown		1	SS	4						
1.2	Silty Clay, some sand trace gravel (fill)		2	S	34		88				
86.7	Hard Brown		3	SS	10	▼					
1.4	Silty Clay, some Sand and Organics						86				
3.7			4	SS	19						
	Silty Clay, trace sand and gravel, varves 3.7 to 5.7 m (CL)		5	SS	2		84				
	Very Stiff to Very Soft Grey		6	TW	PM		82	•	o	17.91	
80.1			7	SS	2						
10.0											
79.5	Silt and Sand (till)		8	SS	29		80				
10.6	End of Borehole										

+3, x5 : Numbers refer to Sensitivity

20 / 15 ◇ 5 (%) STRAIN AT FAILURE / 10

Ministry of Transportation and Communications
Ontario

RECORD OF BOREHOLE No 7 METRIC

W P 470-711-609 LOCATION 4 855 285.0N ; 339 406.0E ORIGINATED BY TH
DIST 6 HWY GO ALRT BOREHOLE TYPE Hollow Stem Auger & Cone Test COMPILED BY GAB
DATUM Geodetic DATE 1983 07 27 CHECKED BY RWB

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	'N' VALUES	GROUND WATER CONDITIONS
96.6	Ground Level					
0.0	100 Topsoil		1	SS	19	
			2	SS	23	
	Sand, some silt to Sand and Silt, trace gravel (fill) Compact to Dense Brown		3	SS	23	
			4	SS	41	
			5	SS	33	
			6	SS	20	
87.2						
9.4	Silty Clay, some Sand and Organics		7	SS	18	
	Silty Clay, trace sand and gravel (CL) Firm to Very Stiff Brown to Grey		8	SS	17	
			9	TW	PH	
83.5						
13.1	Silt and Sand, some gravel, trace clay (till) Dense to Very Dense Grey		10	SS	38	
			11	SS	72	
79.4						
			12	SS	56	
17.2	End of Borehole					

ELEVATION SCALE: 96, 94, 92, 90, 88, 86, 84, 82, 80

DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100

SHEAR STRENGTH kPa
o UNCONFINED + FIELD VANE
● QUICK TRIAXIAL x LAB VANE
20 40 60 80 100

PLASTIC LIMIT Wp | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W_L
WATER CONTENT (%) 10 20 30

137
175

UNIT WEIGHT γ kN/m³ 21.40

REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
2 49 45 4

$+^3$, $\times^5$: Numbers refer to Sensitivity

20
15 ◇ 5 (%) STRAIN AT FAILURE
10

Ministry of Transportation and Communications
Ontario

RECORD OF BOREHOLE No 8 METRIC

W P 470-711-609 LOCATION 4 855 286.4N ; 339 430.0E ORIGINATED BY TH
DIST 6 HWY GO ALRT BOREHOLE TYPE Motorized Tripod Drill COMPILED BY GAB
DATUM Geodetic DATE 1983 07 27 CHECKED BY RWB

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE 20 40 60 80 100	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT WL / WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
88.0	Ground Level									
0.0 / 87.1	Sand, some silt, trace gravel (fill) Loose Brown		1	SS	5					
0.9	Silty Clay, trace sand and gravel (CL) Stiff Brown to Grey		2	SS	11	▼	86			
			3	SS	8		84			
4.6 / 82.1	Silt and Sand, some gravel, trace clay (till) Loose to Dense Grey		4	SS	7					
			5	SS	44					
5.9	End of Borehole									

+3, ×5 : Numbers refer to Sensitivity

15 20 10 5 (%) STRAIN AT FAILURE

Ministry of Transportation and Communications
Ontario

RECORD OF BOREHOLE No 9 METRIC

W P 470-711-609 LOCATION 4 855 306.5N ; 339 437.4E ORIGINATED BY TH

DIST 6 HWY GO ALRT BOREHOLE TYPE Hollow Stem Auger & Cone Test COMPILED BY GAB

DATUM Geodetic DATE 1983 07 28 CHECKED BY RWB

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT WL — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
95.4	Ground Level										
0.0	90 Topsoil		1	SS	25		94				
	Sand, some silt to sand and silt, trace gravel (fill)		2	SS	26						
			3	SS	31		92	160 125			
	Compact to Dense		4	SS	42						
	Brown		5	SS	36	▼	90				6 50 39 5
			6	SS	16		88				
86.3	Silty Clay, some Sand										
9.1	and Organics		7	SS	20		86				
9.4	Silty Clay, trace sand and gravel (CL)		8	SS	4						
	Firm to Very Soft						84				
	Grey		9	TW	PH					18.32	
81.4							82				
14.0	Silt and Sand, some gravel trace clay (till)		10	SS	17						
79.8	Very Dense Grey		11	SS	50/0.08m		80				10 50 36 4
15.6	End of Borehole										

+3, ×5 : Numbers refer to Sensitivity

15 20 10 5 (%) STRAIN AT FAILURE

Ministry of Transportation and Communications
Ontario

RECORD OF BOREHOLE No 10 METRIC

W P 470-711-609 LOCATION 4 855 259.5N ; 339 393.2E ORIGINATED BY JZ
DIST 6 HWY GO ALRT BOREHOLE TYPE MOTORIZED TRIPOD DRILL COMPILED BY GAB
DATUM Geodetic DATE 1983 08 30 CHECKED BY RWB

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE 20 40 60 80 100	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT WL / WATER CONTENT (%)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
90.3	Ground Level										
0.0	Sand, some silt trace gravel (fill) Compact Brown		1	SS	18	No Water Level Recorded	90				
			2	SS	38		88				
86.8			3	SS	13						
3.5	Silty Clay, some Sand and Organics										
3.7	Silty Clay, trace sand and gravel (CL) Very Stiff to Firm Brown to Grey		4	SS	45		86				
			5	SS	21						
			6	SS	6		84	+6			
								+3			
							82	+5			
								+3			
80.3								+2			
10.0	End of Borehole										

+3, ×5 : Numbers refer to Sensitivity

20
15 ◇ 5 (%) STRAIN AT FAILURE
10

Ministry of Transportation and Communications
Ontario

RECORD OF BOREHOLE No 11. METRIC

W P 470-711-609 LOCATION 4 855 255.7N ; 339 401.5E ORIGINATED BY JZ

DIST 6 HWY GO ALRT BOREHOLE TYPE MOTORIZED TRIPOD DRILL COMPILED BY GAB

DATUM Geodetic DATE 1983 08 31 CHECKED BY RWB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE 20 40 60 80 100	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT WL / WATER CONTENT (%)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
88.3	Ground Level										
0.0	Sand, some silt trace gravel (fill) Dense Brown		1	SS	37		88				
85.7							86				
2.6	Silty Clay, trace sand and gravel (CL) Stiff to Soft Brown to Grey		2	SS	8	▽	84	+4			
							82	+5, +4, +6, +4			
80.0							80	+3			
8.3	End of Borehole										

+3, x5 : Numbers refer to Sensitivity

20 / 15 ◇ 5 (%) STRAIN AT FAILURE / 10

Ministry of Transportation and Communications
Ontario

RECORD OF BOREHOLE No 12 METRIC

W P 470-711-609 LOCATION 4 855 165.7 N ; 339 239.1 E ORIGINATED BY SRP
DIST 6 HWY GO ALRT BOREHOLE TYPE Hollow Stem Auger and Cone Test COMPILED BY AEL
DATUM Geodetic DATE 1984 01 20 CHECKED BY RWB

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT WL / WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
91.2	Ground Level										
0.0	Topsoil										
0.2	Silty Clay, some sand, trace gravel (fill) Firm to very stiff Brown		1	SS	25		91				
89.1							90				
2.1	Sand, some silt to Sand and Silt trace gravel, trace clay (fill) Very Dense Brown to Grey Brown		2	SS	68		89				
86.7							88				
4.5	Sand, some gravel trace silt Dense Grey		3	SS	46		87				
86.4							86				
4.8	Silt and Sand, some gravel, trace clay (till) Dense to Very Dense Grey		4	SS	72		85				
			5	SS	78		84				
							83				
81.6			6	SS	73		82				
9.6	End of Borehole										

+3, ×5 : Numbers refer to Sensitivity

20 / 15 ◇ 5 (%) STRAIN AT FAILURE / 10

Ministry of Transportation and Communications
Ontario

RECORD OF BOREHOLE No 13 METRIC

W P 470-711-609 LOCATION 4 855 103.2 N ; 339 251.0 E ORIGINATED BY SRP
DIST 6 HWY GO ALRT BOREHOLE TYPE Hollow Stem Auger and Cone Test COMPILED BY AEL
DATUM Geodetic DATE 1984 01 20 CHECKED BY RWB

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT WL — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
90.9	Ground Level										
0.0	Topsoil										
0.2	Silty Clay, some sand, trace gravel (fill) Firm Brown		1	SS	6	▼	90				
87.9							89				
3.0	Silty Clay, trace to some sand Stiff to Very Stiff Grey		2	TW	PM		88				
			3	TW	PM		87	3.5 (122+)			
			4	TW	PM		86	+ 4.5			
83.3							85	+ 2.5			
7.6	Silty Sand, trace gravel, trace clay Loose to Very Loose Grey		5	TW	PM		84				
			6	SS	2		83				
81.1							82				
9.8	Silt and Sand, some clay trace of gravel (till) Occasional shale fragments Very Dense Grey		7	SS	100/0.12m		81	100/0.23 m			
80.1											
10.8	End of Borehole										

+3, ×5 : Numbers refer to Sensitivity

20
15 ⊹ 5 (%) STRAIN AT FAILURE
10

Ministry of Transportation and Communications
Ontario

RECORD OF BOREHOLE No 14 METRIC

W P 470-711-609 LOCATION 4 855 142.0 N; 339 246.0 E ORIGINATED BY SRP
DIST 6 HWY GO ALRT BOREHOLE TYPE Hollow Stem Auger and Cone Test COMPILED BY AEL
DATUM Geodetic DATE 1984 01 31 CHECKED BY RWB

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT WL — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
94.1	Ground Level										
0.0	Sand and Silt, some gravel, trace clay (Fill) Compact Brown		1	SS	27	No Water Level Recorded	94	Augered			
91.0	100 mm Sand Layer						93				
3.1							92				
90.4	Silty Clay, some Sand and Organics		2	SS	5		91				
3.7	Silt and Sand, some gravel, trace clay (Till) Dense to Very Dense Grey		3	SS	37		90				
			4	SS	44		89				
			5	SS	45		88				
			6	SS	83		87				
84.5							86				
9.6	End of Borehole						85				

+3, ×5 : Numbers refer to Sensitivity

20
15 ◇ 5 (%) STRAIN AT FAILURE
10

Ministry of Transportation and Communications
Ontario

RECORD OF BOREHOLE No 15 METRIC

W P 470-711-609 LOCATION 4 855 055.9 N ; 339 221.2 E ORIGINATED BY SRP
DIST 6 HWY GO ALRT BOREHOLE TYPE Hollow Stem Auger and Cone Test COMPILED BY AEL
DATUM Geodetic DATE 1984 01 31 CHECKED BY RWB

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT W_L — WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
91.0	Ground Level						91				
0.0	Topsoil										
0.2	Sand and Silt, some gravel, trace clay (Fill) Very Dense Brown		1	SS	55		90				
88.3							89				
2.7	Silt and Sand, some gravel, trace clay (Till) Dense to Very Dense Grey		2	SS	57	▼	88				
			3	SS	42		87				
84.4			4	SS	49		86				
6.6	End of Borehole						85				

+3, ×5 : Numbers refer to Sensitivity

20 / 15 ◇ 5 / 10 (%) STRAIN AT FAILURE

Ministry of Transportation and Communications
Ontario

RECORD OF BOREHOLE No 1B
(Previous Investigation)

METRIC

W P 29-67-07 (470-711-609) LOCATION 4 855 249.1N; 339 359.7E ORIGINATED BY Others
DIST 6 HWY GO ALRT BOREHOLE TYPE Washboring - NX Casing; Cone COMPILED BY
DATUM Geodetic DATE 1969 08 08 (1984 02 23) CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (o UNCONFINED, • QUICK TRIAXIAL, + FIELD VANE, x LAB VANE)	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT WL — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ kg/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
87.9	Ground Level										
0.0	Topsoil										
0.3	Silty Clay with some sand trace gravel. Stiff to Very Stiff		1	SS	12	▼	86				
			2	SS	16						
84.8			3	TW	PM					2290	9 44 39 8
3.1	Glacial Till, Het-mix. silt, sand & gravel, trace to some clay Compact to Very Dense Grey		4	SS	14		84				12 43 41 4
			5	SS	38						
			6	SS	79		82				24 48 (28)
			7	SS	99						
79.3							80				
8.6	with occ. boulders up to 240 mm size & shale fragments		8	SS	100/0.1m						
			9	RC							
			10	SS	150/0.2m		78				6 44 44 6
			11	RC							
77.2											
76.8	Weathered		12	SS	100/0.1m						
11.1	Shale Bedrock Sound		13	RC AXT	80%		76				
75.1			14	RC AXT	90%						
12.8	End of Borehole										

+3, x5 : Numbers refer to Sensitivity

15 20 10 5 (%) STRAIN AT FAILURE

Ministry of Transportation and Communications
Ontario

RECORD OF BOREHOLE No 1A

METRIC

(Previous Investigation)

W P 29-67-07 (470-711-609) LOCATION 4 855 236 N; 339 346.0E ORIGINATED BY Others

DIST 6 HWY GO ALRT BOREHOLE TYPE Dynamic Cone Test COMPILED BY

DATUM Geodetic DATE 1969 08 08 (1984 02 23) CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE)	PLASTIC LIMIT W_p / NATURAL MOISTURE CONTENT W / LIQUID LIMIT W_L — WATER CONTENT (%)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
88.8	Ground Level										
0.0	Probably Silty Clay						88				
86.3											
2.4	Probably Glacial Till						86				
84.3											
4.5	End of Cone Test										Practical refusal

$+^3$, $\times^5$: Numbers refer to Sensitivity

20
15 ◇ 5 (%) STRAIN AT FAILURE
10

Go Transit Contract GGE-311
Brock Road Retaining Walls
Anchor Testing

List of Contractors-Invitational Blds

1. Anchor Shoring Limited
   P.O. Box 249
   Milliken, Ontario
   L0H 1K0

2. Bermingham Construction Limited
   Wellington Street
   Marine Terminal
   Hamilton, Ontario
   L8L 4Z9

3. Deep Foundations Contractors
   29 Ruggles Ave.
   Thornhill, Ontraio
   L3T 3S4

4. Dominion Soil Investigation Inc.
   104 Crockford Blvd.
   Scarborough, Ontario
   M1R 3C6

5. Dywidag Stystems
   International Canada Ltd.
   65 Bowes Road, Unit 8
   Concord, Ontario
   L4K 1H5

6. Franki Canada Limited
   105 Nautucket Blvd.
   Scarborough, Ontario
   M1P 2N5

GGE - 311 BROCK ROAD ANCHOR TEST

86 03 26

1) CALCULATION OF REQUIRED BOND LENGTH

$$(A)(l)(S) = (L)$$

assumed working stress $(S) = 100\ kPa$

$$A = 2\pi r = \pi d$$

$$d = 6'' = 0.1524\ m$$

$$A = 0.4788\ m^2$$

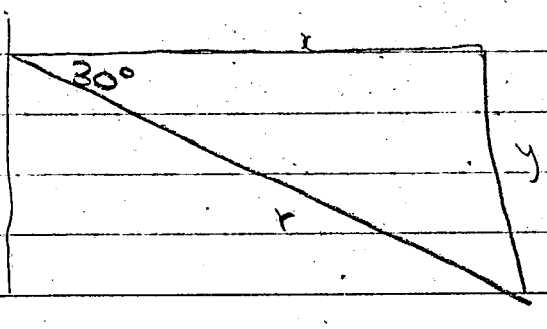
$$L = 500\ kN$$

$$l = \frac{L}{AS}$$

$$= \frac{500\ kPa/m}{(0.4788\ m^2)(100\ kPa)}$$

$$= 10.44\ m$$

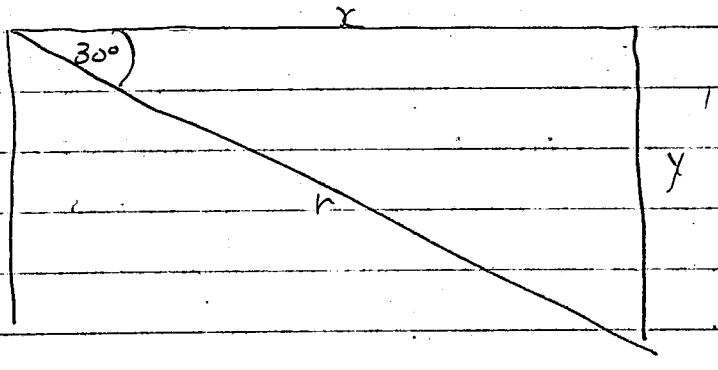
2) CALCULATION OF CHANGE IN ELEVATION OVER ANCHOR ZONE



$$\frac{y}{r} = \sin 30° \qquad y = \sin 30°\,(r)$$

$$= (0.5)(r)$$

3) CALCULATION OF ANCHOR LENGTH



$\frac{y}{r} = \sin 30°$

$r = \frac{y}{\sin 30} = \frac{y}{0.5} = 2y$

top of anchor = elev. 92'

top of bond = elev. $\frac{80'\pm}{12}$

r = 44m

∴ top elev. = 92' − 22'

= 70'

4) BEDROCK ELEVATION = 77

5) HORIZONTAL EXTENT OF ANCHOR WALL

STA. 11+742 & STA 11+793

LOCATION	Elev. N=100	Elev. BR
11+750	80	77
11+775	80	77
11+800	78	77

Ministry of Transportation and Communications
Ontario

REGIONAL CONTRACT CLEARANCE REQUEST

District/Region #6, Toronto Hwy. No. GO-TRANSIT Tender Contract No. Date:

Location Contract No: GGE-311, Brock Road Retaining Walls

Description of Work Installation and Testing of Soil Anchors

Estimated Tender Value $40,000 Completion Required by ASAP
Date

☐ ADVERTISED CONTRACT (List Publications)

- ☐ Local Papers
- ☐ Builders Exchange
- ☐ Daily Commercial News
- ☐ MTC Contract Bulletin

☒ INVITATION BID CONTRACT

Contractors to be invited to bid (minimum 3)

Name	Mailing Address
(1) Anchor Shoring Ltd.	(1) P.O. Box 249, Milliken, Ontario L0H 1K0
(2) Deep Foundations Contractors	(2) 29 Ruggles Ave. Thornhill, Ontario L3T 3S4
(3) Dominion Soil Investigation Inc.	(3) 104 Crockford Blvd., Scarborough, Ontario M1R 3C6
(4) Franki Canada Ltd.	(4) 105 Nantucket Blvd., Scarborough, Ontario M1P 2N5

Proposed Advertising Date Proposed Tender Closing Date

working days commencing ,or fixed date of completion of Liquidated Damages $ Per. Day

REMARKS: (NOTE: A.D.M. Approval Required if Estimated Tender Value Exceeds $100,000. If So State Reason for Local Tendering)

Performance and Payment Bonds

Bid Deposit

Recommended: Date
District Eng'r/Construction Mgr.

Approved: Date
Regional Director

DISTRIBUTION:

1. Region Copy
2. Estimating Office ☐ Check if Cost Estimate and Working Day Assessment by Estimating Office is required.
3. Contract Management Office

PH-CC-777 83/05

Ontario

Ministry of Transportation and Communications

REGIONAL / DISTRICT CONTRACT

Tenders will be received by: Administrative Services Main Reception

5000 Yonge Street Willowdale, Ontario M2N 6E9

Tender Closing 1:30 p.m. Local _____ Time _____ Date

Tender Opening 2:00 p.m. The Same Day.

TENDER FOR Installation and Testing of Soil Anchors
(Description of the work)

AT GO TRANSIT Contract GGE-311, Brock Road Retaining Walls
(Location)

UNDER ~~CONTRACT NO.~~ Tender No. _____

BY

_____
NAME OF FIRM OR INDIVIDUAL (Hereafter referred to as "THE CONTRACTOR")

_____
Address City

_____
~~ADDRESS~~ Postal Code Telephone No.

_____
NAME OF PERSON SIGNING FOR FIRM

_____
OFFICE OF PERSON SIGNING FOR FIRM

PH-CC-779 83-05

Head, Engineering Services
5000 Yonge Street
Willowdale, Ontario
M2N 6E9

TENDER FOR CONTRACT

NO. _____

Sir:

The Contractor has carefully examined the Provisions, Plans, Specifications and Conditions referred to in the Schedule of Provisions, Plans, Specifications and Conditions attached hereto as part of this Tender and has carefully examined the site and location of the work to be done under this Contract, and the Contractor understands and accepts the said Provisions, Plans, Specifications and Contitions and, for the prices set forth in this Tender, hereby offers to furnish all machinery, tools, apparatus and other means of construction, furnish all materials, except as otherwise specified in the Contract, and to complete the work in strict accordance with the Provisions, Plans, Specifications and Conditions referred to in the said Schedule.

Attached to this Tender is a certified cheque in the amount specified in the "Tendering and Bonding Requirements", made payable to the Treasurer of Ontario. The proceeds of this cheque shall, upon acceptance of the Tender, constitute a deposit which shall be forfeit to the Ministry if the Contractor fails to file with the Ministry the completed Performance Bond and Payment Bond specified in the Instructions to Bidders within (14) working days from the date of receipt by the Contractor of the Notice of Acceptance of Tender.

This offer shall be irrevocable for a period of thirty days following the date of the Tender Closing.

Notification of Acceptance may be given and delivery of the form of Agreement made by prepaid post addressed to the Contractor at the address contained in this Tender.

If the Contractor, or equipment owner, fails to fulfill the work in its entirety to the satisfaction of the Engineer, all in accordance with Form 107-4, the Regional Director may suspend his bidding privileges for a period not exceeding 12 months.

Ministry of Transportation and Communications

Ontario

TENDER

IN ACCORDANCE WITH THE FIRST PARAGRAPH OF THIS TENDER THE CONTRACTOR HEREBY OFFERS TO COMPLETE THE WORK SPECIFIED IN THE CONTRACT FOR THE FOLLOWING PRICES FOR

~~CONTRACT No~~ TENDER NO. _____

ITEM	SPEC	ITEM	UNIT	QUANTITY	UNIT PRICE	TOTAL
1						
2						

SP - SPECIAL PROVISION

PAGE TOTAL _____

TOTAL TENDER _____

PH-CC-789 84-03

Ministry of Transportation and Communications
Ontario

The work specified in the Contract will be performed in strict accordance with the following Provisions, Plans, Standard Drawings, Specifications and General Conditions for

~~CONTRACT NO~~ TENDER NO. _____

SCHEDULE OF PROVISIONS, PLANS, STANDARD DRAWINGS, SPECIFICATIONS AND GENERAL CONDITIONS

A. SPECIAL PROVISIONS:

B. PLANS:

Attached

C. HIGHWAY ENGINEERING STANDARD DRAWINGS

STD NO	REV NO	STD NO	REV NO	STD NO	REV NO	STD NO	REV NO

D. SUPPLEMENTAL SPECIFICATIONS:

E. STANDARD SPECIFICATIONS:

SPEC NO	DATE	SPEC NO	DATE	SPEC NO	DATE	SPEC NO	DATE

F. GENERAL CONDITIONS:

M T C FORM NO 100 – (Attached)

SIGNED STATEMENT BY BIDDER THAT THE BID IS PREPARED AND SUBMITTED WITHOUT COLLUSION OR DECEIT

The Bidder expressly warrants that the prices contained in his tender whether as unit prices or lump sums, and whether for transportation or supply of materials or for services, are quoted in utmost good faith on his part, without any collusive arrangement or agreement with any other person, or partnership or corporation.

The Bidder expressly represents that he is not party or privy to any deceit tending to mislead the Ministry into accepting his tender as a truly competitive tender whether to the prejudice, injury or benefit of the Ministry.

THE CONTRACTOR BY THIS TENDER OFFERS TO COMPLETE THIS CONTRACT IN ACCORDANCE WITH THE TERMS CONTAINED HEREIN.

DATED AT: This day of 19

Contractor signs here and Seal where Applicable.

Position.

This is the 5th and last page of 5 pages to be submitted as the Tender Bid for the Contract.

SECTION (B)

LOCATION AND STORAGE OF MATERIALS AND EQUIPMENT

Materials shall not be stored within 4 m of the travelled portion of any roadway except in the medians where the minimum clearance required is 2.5 m. Equipment shall not be stored within 4 mof the travelled portion of any roadway.

Notwithstanding the foregoing, the Contractor shall, at his own expense, remove any equipment or material which in the Engineer's opinion, constitutes a traffic hazard.

PROTECTION OF PUBLIC TRAFFIC

Restriction On The Use of Construction Equipment and Unlicenced Vehicles

Unlicenced vehicles and construction equipment shall not travel, work or stop within 4 m of a lane carrying traffic except where construction operations necessitates the working area be less than 4 m from the traffic in which case, the Contractor shall erect delineators along the edge of the travelled lane, in accordance with Sub-section 106-4 of Form 100. In no case, shall the distance between traffic and working area be less than 1.5 m.

Working Hours Limitation

The Contractor shall adhere to the provisions of the Ministry of the Environment's "Model Municipal Noise Control By-Law" (August 1978). All construction equipment operating within 1000 ft. of any residence shall be well maintained and equipped with mufflers in good operating condition. The Contractor shall not operate construction vehicles/equipment outside the hours of 7:00 a.m. to 9:00 p.m. No additional Payment will be made for adherence to this provision.

CONTRACTOR'S NOTE

The Contractor is advised that all timber is to be salvaged in accordance with sub-section 206.02 of Section 200.

REVISION TO FORM 100

Aggregate Sources List

Where the term "Strip Map" is used throughout this contract, it shall be deemed to be replaced by the new term "Aggregate Sources List".

Definitions

Sub-section 101-2 of Form 100 is amended by the addition of the following definitions:

"Authority" - Means the Authority for whom the work is being done. i.e., the municipality, or municipalities or Ontario Ministry of the Environment or the Ontario Ministry of Transportation and Communications.

'Commercial Sources - Aggregates' - means a quarry, sand/gravel pit, industrial slag source or any location or site from which a business organization or enterprise provides aggregates and/or combinations of these in the form of asphalt or concrete products commercially as required throughout the year.

'Delineators' - means TC-52 construction markers as described in The Manual of Uniform Traffic Control Devices.

'Rate(s) of Interest' - means the rate(s) determined by the Treasurer of Ontario and issued by and available from the Ministry.

Section 106-4 is amended by the revision of the third paragraph to:

"When in accordance with Sub-section 106-5 it is the Contractor's responsibility to maintain a road through the work, traffic within, entering or leaving the construction zone shall be controlled by and at the expense of the Contractor, by the erection and maintenance and relocation where necessary of such signs, delineators, barricades, lanterns and flashing lights and by the provision of such flagmen and/or policemen as are required for the proper notification and protection of the public."

Section 106-7 is amended by the removal of the last paragraph and replacement with the following:

"The Contractor shall provide and pay for all protection and flagging required in accordance with Sub-section 106-4 and shall pay for all flagging and other traffic control required and provided by the Railway Company as a direct consequence of the Contractor's operations outside the contract limits. The Ministry will pay for all flagging and other traffic control required and provided by the Railway Company within the contract limits."

Advance Payments to Contractor

Point 2. of Section 108-2 of Form 100 is deleted and replaced with the following:

2. The value of aggregates, processed and stockpiled shall be assessed by the following procedure:

   (a) Granular 'A', 'B' and 'M' shall be assessed at the rate of 60 percent of the contract price.

   (b) Coarse and fine aggregates for hot mix asphaltic concrete, surface treatment and Portland cement concrete shall be assessed at the rate of 25 percent of the contract price for each aggregate stockpiled.

   Payment for separated coarse and fine aggregates will be considered, for payment at the above rate, when such materials are stockpiled at a commercial source where further processing is to be carried out before incorporating such materials into a final product. No advance payments for other materials located at a commercial source will be made.

Force Account Payment

Sub-section 108.4 "Force Account Payment" of Form 100 is amended by inserting the following as paragraph 10.

Payments in respect of payroll burden will be made at the rates current at time of the force account work. The following rate are effective April 1, 1984:

   (i) Road work - 26 percent of the wages and salary portion of the labour costs.

   (ii) Structure work - 30 percent of the wages and salary portion of the labour costs.

Where the total of all force account labour costs exceeds $15,000 per contract for road/structure work, and upon a written request by the Contractor for payment of payroll burden in excess of that prescribed herein, the Ministry will make payment for all force account work on the contract at the Contractor's actual cost of payroll burden as defined in Form 108-4.

The Contractor's request shall be accompanied by a confirming statement certified by the senior company financial officer/auditor. At the Ministry's discretion an audit may be conducted, in which case, the actual payroll burden so determined shall be applied to all force account work on the contract.

Sub-section 108-4 "FORCE ACCOUNT PAYMENT' of Form 100 is amended by deleting the first sentence of the fifth last paragraph and replacing it with the following:

Where the Contractor arranges for force account work to be carried out by others and has received approval prior to the commencement of the work, the Ministry will pay the Contractor 120 percent of the first $1,000, 115 percent of the portion from $1,000 to $5,000, and 105 percent of the portion in excess of $5,000 of the compensation as herein provided.

Major Item Overruns

Sub-section 108-3 of Form 100 is amended by adding the following paragraph after paragraph 2:

Where the Ministry and the Contractor, under Sub-section 103-1, clause (a), have not reached agreement, the Ministry will make payment to the Contractor at the contract unit price for the quantity exceeding 120 percent. Pending completion of negotiations, the holdback will be retained or, if necessary, increased sufficiently to cover the estimated reduction.

Accounts Receivable

Section 108 of Form 100 is revised by the addition of the following:

108-12 Accounts Receivable

The Contractor will be charged interest after 30 days on overdue accounts receivable (s). The rate of interest shall be identical to that which is determined by the Treasurer of Ontario for later payment by the Ministry.

PRICES AND PAYMENTS

The Contractor shall provide an invoice to the Engineer, at least once a month after commencing work on the Tender. The invoice shall show the amount of work done, material furnished, and the value thereof according to the terms of the Tender.

Upon receiving each invoice, which shall be checked and approved by the Engineer, the Ministry, subject to subsections 106-1 and 107-5, shall pay the Contractor 90% of the amount of such invoice, and shall retain the 10% holdback reducing to 5% when the work is 95% complete and to 2 1/2 % when the work is complete. This holdback shall be retained until final verification of payment quantities.

SCHEDULE OF MINIMUM TRUCK HAUL RATES FOR SINGLE AND DUAL REAR AXLE TRUCKS

Pursuant to Sub-section 108-8 of Form 100, the following schedule of minimum truck haul rates shall apply to the contract:

	BY MASS (Per Tonne)	BY HOUR (Per Hour)
For the first 3 km or any portion thereof	85 cents	Single Rear Axle $28.50
For each km, or any portion thereof, in excess of 3 km, up to and including the 16th km.	10 1/2 cents	Dual Rear Axle $35.30
For each km, or any portion thereof, in excess of 16 km up to and including the 32nd km.	7 cents	
For each km or any portion thereof in excess of 32 km.	5 1/2 cents	

Where tarping of loads is required:

(a) for all trucks hauling by weight; a separate and additional payment of 1 cent per tonne per load.

(b) for all trucks used on an hourly basis; 15 cents per hour in addition to the normal hourly rental.

ONTARIO PROVINCIAL STANDARDS

Ontario Provincial Standard Specifications (OPSS) and Ontario Provincial Standard Drawings (OPSD) as well as MTC Standard Specifications and Standard Drawings, form part of this contract.

The text of all OPSS's are contained in the Manual "Ontario Provincial Standard Specifications:

Volume 1 Construction
Volume 2 Materials

When a current MTC standard specification contains a reference to an MTC standard specification which has been superseded by an OPSS, the reference shall be deemed to be the OPSS of the same number except that reference to MTC Form 1000 shall be deemed to mean OPSS 1001 and that reference to MTC Form 527 shall be deemed to mean OPSS 127.

When an OPSS contains a reference to an OPSS which has not yet been published, the reference shall be deemed to mean the MTC Standard specifications of the same number.

Regardless of which standards are contained in the OPS Manuals, the Standards applicable to this contract are listed in the schedule of Provisions, Plans, Standard Drawings, Specifications and General Conditions.

The OPSD's are contained in the Manual of Ontario Provincial Standard Drawings.

When the Contract drawings make reference to an MTC DD standard drawing, the appropriate OPSD is determined using the cross reference list contained in the MTC Highway Engineer Standard Drawings Manual, Roads, Barrier and Drainage Book 1.

When there is no OPSD listed in the cross reference the MTC DD standard drawing remains in effect.

SPECIAL PROVISIONS

TENDER NO. 25-85-89

SECTION (C)
LIQUIDATED DAMAGES

1. Time

Time shall be the essence of the Tender.

2. Progress Of The Work And Time For Completion

The charging of working days shall commence on Nov. 27/85 1985 and the Contractor shall diligently prosecute the work on this contract to completion on or before the expiration of eight (8) working days from the date of commencement.

3. Working Day

A Working Day is defined as any day:

(a) Except Saturdays, Sundays and Statutory Holidays.

(b) Except a day as determined by the Engineer, on which the Contractor is prevented by inclement weather or conditions resulting immediately therefrom, from proceeding with the operation.

(c) Except a day on which the Contractor is prevented from proceeding with the controlling operation, as determined by the Engineer, by reason of:

(i) any breach of Contract or prevention by the Ministry, by any other Contractor of the Ministry or by any employee of any one of them.

(ii) non-delivery of Ministry supplied materials.

(iii) any cause beyond the reasonable control the Contractor as substantiated by him to the satisfaction of the Engineer.

5. LIQUIDATED DAMAGES

It is agreed by the parties to the Contract that in case the work called for under the Contract is not completed within the number of days as set forth in the special provisions or as extended in accordance with Sub-section 107-2 of MTC Form 100, a loss or damage will be sustained by the Ministry. Since it is difficult to ascertain and determine the actual loss or damage which the Ministry will suffer in the event of and by reason of such delay, the parties hereto agree that the Contractor will pay to the Ministry the sum of $100.00 as liquidated damages for each and every calendar day's delay in completing the work in excess of the number of working days prescribed. It is agreed that this amount is an estimate of the actual loss or damage to the Ministry which will accrue during the period.

INSTRUCTION TO BIDDERS

Bidders must conform to the following conditions. Those failing to do so may be subject to disqualification.

1. TENDERING REQUIREMENTS

(a) The Tender form and envelope as supplied by the Ministry must be used and must be in the possession of the Ministry official indicated on Page 1 of the tender prior to 1:30 p.m. local time on the tender closing date.

(b) The Tender must be legible and ALL ITEMS MUST BE BID with the unit price for every item and other entries being fully clear.

(c) The Tender must not be restricted by a covering letter or by alterations or additions to the tender form. Adjustments will not be considered. A bidder may void a tender by superseding it with a later tender.

(d) A tender may be withdrawn under certain circumstances.

(e) The Tender form must be signed and sealed in the spaces provided by a responsible official of the bidding organization. If a joint tender is submitted, it must be signed and sealed separately on behalf of each Company.

(f) A certified cheque made payable to the TREASURER OF ONTARIO equal to, or greater than, the amount shown in the following table must be enclosed in the same envelope as the tender.

Total Tender Amount	Deposit Required
$ 10,000.00 or less	$ Nil
10,000.01 to 20,000.00	500.00
20,000.01 to 50,000.00	1,000.00
50,000.01 to 100,000.00	2,000.00
100,000.01 and over	3,000.00

2. BONDING REQUIREMENTS

If the tender value is less than $10,000.00, Performance and Payment Bonds are not required.

If the tender value is greater than $10,000.00, a Performance Bond for 50% of the amount of tender and a Payment Bond for 50% of the amount of tender, issued by an approved guaranty company on bond forms supplied to such companies by the Ministry, or a Letter of Credit, or a Certified Cheque equivalent to the total of the Performance and Payment Bonds must be furnished by the Contractor prior to acceptance of the contract. The Payment Bond will be retained by the Ministry for 120 days after acceptance of the work.

3. ENQUIRIES DURING SIDDING

All enquiries relative to the contract shall be directed to A.A.Galloway 224-7475

4. CONTRACT AWARD PROCEDURES

(a) Following the opening and checking of tenders, the Ministry will retain the deposit cheques of the low and second low bidders, and will return all other bidders' deposit cheques.

(b) The Ministry will notify the successful bidder that his tender has been accepted within 30 days of the tender opening. The deposit cheque of the successful bidder will be retained and the other deposit cheque will be returned to the second bidder upon execution of the contract.

(c) Notice of Acceptance of Tender will be by telephone and by written form of notice.

(d) The successful bidder shall deliver by hand or by mail within (14) fourteen working days of receiving written notice, Performance and Payment Bonds in the prescribed amount to G.A. York, Head, Financial Services 5000 Yonge Street, Willowdale, Ontario M2N 6P6

Satisfactory proof of Public Liability and Property Damage Insurance in accordance with 105.3 of the General Conditions shall also be provided. ~~The successful bidder has the option of providing the required documentation by~~ ~~by providing the above documents in advance~~ The bid deposit cheque shall be forfeit if the successful bidder fails to enter into the contract following Notice of Acceptance of Tender.

(e) Following receipt of satisfactory bonds and insurance certificate, the Contractor will receive written Notification of Award of Contract which, with the submitted tender, shall constitute the contractual agreement and which will authorize the Contractor to proceed with the work. The District Engineer or the Manager of the Regional Construction Office will be advised that such authority has been issued, and the Contractor's deposit cheque will be returned.