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TEST REPORT

Title: : The Testing of Composite Manhole
Chambers

Laboratory No. : Sw384.05

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THE TESTING OF COMPOSITE MANHOLE COVERS

1. INTRODUCTION

A set of 2 No. composite manhole covers were received from the client for structural testing based on CERAM Research Special Publications 108 1995.

2. SAMPLE DESCRIPTION

Each sample was of similar construction with the first sample having nominal dimensions of 600x600x2800mm and the second sample having nominal dimensions of 600x600x1400mm, as shown in Figures 1 and 2 respectively.

3. METHOD OF TEST

Each sample was subjected to a set of tests to simulate the accumulative loading applied via the increasing depths of soil with the use of air bags, as each composite manhole cover is submerged into the ground.

3.1 Initial Test

As shown in Figures 1 and 2, each sample is constructed from for separate sections. For each sample, each section was allocated a pressure ratio based on its depth when installed for use. This ratio with respect to depth is 1:3:5:7.

Initially, each sample was tested to the required depth of 0.525m. This was achieved by regulating the pressures in each section so that this simulated pressure due to a depth of 0.525m was obtained in 5 increments over a period of 45 minutes.

After this test was completed, the pressure was released and the sample allowed to recover.

3.2 Second Test

Each sample was then subjected to the same loading conditions, this time based on a depth of 2.0m, over a period of 45 minutes. Again, after this test was completed, the pressure was released and the sample allowed to recover.

3.3 Final Test

Finally, each sample was tested beyond the scope of its design requirements. This was achieved as described in section 3.2 with simulated final depths of 7.50 metres and 5.25 metres for the 600x600x2800mm sample and 600x600x1400mm sample respectively.

3.4 Instrumentation

Each pressure zone was monitored via the use of an electronic manometer and deflections measured at points, indicated within Figure 3, using linear voltage

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transducers. All data was recorded automatically and continuously throughout the tests, by the use of a load cell connected to a data logging system.

4. RESULTS

Tables 1 – 3 show the pressure applied to the corresponding sections and the deflection measurements recorded for the 600x600x1400mm composite manhole cover sample.

Tables 4 – 6 show the pressure applied to the corresponding sections and the deflection measurements recorded for the 600x600x2800mm composite manhole cover sample.

Table 6 shows the pressures applied to both samples and the corresponding depths of each section.

Authorised by

John Goodfellow
Product Development / Research Engineer, Structures Group

TABLES

Table 1

Summary of Results for the RDT 600x1400mm Chamber – First Loading Cycle

Pressure-Zone Pressure kPa				linear displacement position mm											
1	2	3	4	tr1	tr2	tr3	tr4	tr5	tr6	tr7	tr8	tr9	tr10	tr11	tr12
0	0	0	0	0.09	0.00	0.01	0.16	0.00	0.09	0.09	0.16	0.08	0.01	0.09	0.00
0.1	0.3	0.5	0.7	0.10	0.01	0.01	0.17	0.01	0.09	0.09	0.24	0.09	0.02	0.18	0.13
0.2	0.6	1.0	1.4	0.10	0.01	0.09	0.19	0.01	0.09	0.18	0.24	0.10	0.02	0.27	0.14
0.3	0.9	1.5	2.1	0.11	0.01	0.18	0.21	0.01	0.18	0.18	0.24	0.10	0.03	0.28	0.20
0.4	1.2	2.0	2.8	0.11	0.02	0.18	0.24	0.03	0.28	0.18	0.39	0.10	0.07	0.34	0.31
0.5	1.5	2.5	3.5	0.12	0.02	0.18	0.28	0.03	0.28	0.27	0.56	0.10	0.12	0.43	0.44

Table 2

Summary of Results for the RDT 600x1400mm Chamber – Second Loading Cycle

Pressure-Zone Pressure kPa				linear displacement position mm											
1	2	3	4	tr1	tr2	tr3	tr4	tr5	tr6	tr7	tr8	tr9	tr10	tr11	tr12
0	0.0	0.0	0	0.01	0.00	0.03	0.06	0.04	0.00	0.07	0.10	0.05	0.07	0.05	0.04
0.4	1.1	1.9	2.66	0.13	0.05	0.27	0.30	0.07	0.28	0.36	0.87	0.11	0.18	0.52	0.32
0.8	2.3	3.8	5.32	0.14	0.13	0.27	0.31	0.14	0.28	0.37	0.99	0.12	0.20	0.52	0.76
1.1	3.4	5.7	7.98	0.17	0.17	0.28	0.34	0.20	0.28	0.46	1.18	0.13	0.21	0.62	1.01
1.5	4.6	7.6	10.64	0.18	0.19	0.37	0.39	0.22	0.28	0.63	1.28	0.15	0.22	0.62	1.05
1.9	5.7	9.5	13.3	0.17	0.19	0.37	0.38	0.23	0.37	0.82	1.35	0.16	0.25	0.71	1.11

Table 3

Summary of Results for the RDT 600x1400mm Chamber – Final Loading Cycle

Pressure-Zone Pressure kPa				linear displacement position mm											
1	2	3	4	tr1	tr2	tr3	tr4	tr5	tr6	tr7	tr8	tr9	tr10	tr11	tr12
0	0.0	0.0	0	0.07	0.11	0.00	0.00	0.01	0.08	0.05	0.00	0.12	0.00	0.00	0.00
2.2	6.4	11.0	13.6	0.12	0.19	0.25	0.31	0.13	0.23	0.63	0.79	0.25	0.19	0.63	0.57
2.1	6.4	10.7	15	0.81	0.51	0.72	0.41	0.90	1.14	1.81	2.08	0.36	0.27	1.18	1.27
2.6	7.7	12.9	18	0.81	0.66	0.92	0.89	2.58	2.92	5.19	6.20	0.49	0.73	1.89	2.41
3.0	9.0	15.0	21	0.89	1.08	1.51	2.56	4.76	4.58	9.79	9.91	1.12	1.04	2.18	2.85
4.0	12.0	20.0	28	1.12	2.14	2.66	2.68	5.37	6.87	13.79	14.19	2.26	2.20	2.93	3.28
5.0	15.0	25.0	35	1.84	2.69	2.74	3.02	5.88	8.86	14.29	15.48	2.87	3.61	4.92	4.39

Table 4

Summary of Results for the RDT 600x2800mm Chamber – First Loading Cycle

Pressure-Zone Pressure kPa				linear displacement position mm											
1	2	3	4	tr1	tr2	tr3	tr4	tr5	tr6	tr7	tr8	tr9	tr10	tr11	tr12
0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.1	0.3	0.5	0.7	0.00	0.00	0.00	0.05	0.04	0.03	0.00	0.01	4.43	0.00	0.00	0.00
0.2	0.6	1.0	1.4	0.00	0.03	0.08	0.02	0.14	0.15	0.00	0.02	4.36	0.00	0.00	0.00
0.3	0.9	1.5	2.1	0.00	0.03	0.08	0.05	0.34	0.23	0.00	0.02	4.31	0.00	0.00	0.00
0.4	1.2	2.0	2.8	0.01	0.08	0.08	0.06	0.63	0.46	0.10	0.02	4.71	0.02	0.00	0.00
0.5	1.5	2.5	3.5	0.07	0.08	0.08	0.06	1.21	0.84	0.19	0.02	4.14	0.07	0.01	0.00

Table 5

Summary of Results for the RDT 600x2800mm Chamber – Second Loading Cycle

Pressure-Zone Pressure kPa				linear displacement position mm											
1	2	3	4	tr1	tr2	tr3	tr4	tr5	tr6	tr7	tr8	tr9	tr10	tr11	tr12
0	0.0	0.0	0	0.00	0.01	0.08	0.00	0.05	0.08	0.00	0.02	5.27	0.00	0.00	0.00
0.4	1.1	1.9	2.66	0.00	0.03	0.08	0.06	0.53	0.40	0.10	0.02	5.33	0.01	0.01	0.00
0.8	2.3	3.8	5.32	0.11	0.12	0.08	0.06	2.17	1.45	0.29	0.02	4.58	0.07	0.05	0.00
1.1	3.4	5.7	7.98	0.29	0.23	0.08	0.00	4.31	2.67	0.67	0.07	5.59	0.21	0.06	0.07
1.5	4.6	7.6	10.64	0.42	0.32	0.08	0.00	5.65	3.43	0.96	0.13	5.61	0.26	0.06	0.07
1.9	5.7	9.5	13.3	0.63	0.38	0.09	0.05	7.69	4.72	1.35	0.16	2.92	0.35	0.12	0.01

Table 6

Summary of Results for the RDT 600x2800mm Chamber – Final Loading Cycle

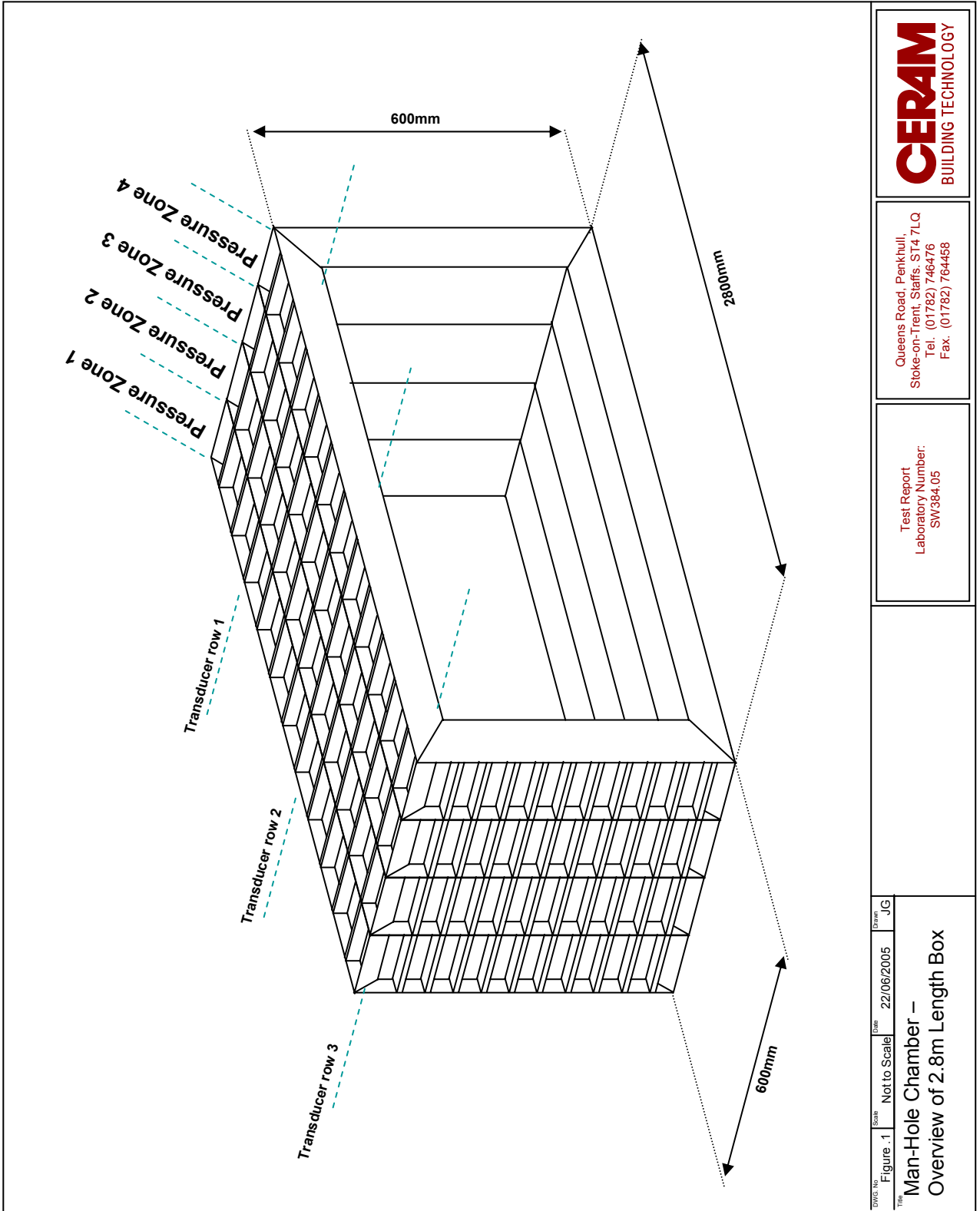
Pressure-Zone Pressure kPa				linear displacement position mm											
1	2	3	4	tr1	tr2	tr3	tr4	tr5	tr6	tr7	tr8	tr9	tr10	tr11	tr12
0	0.0	0.0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.2	6.4	11.0	13.6	0.57	0.38	0.15	0.00	7.28	4.90	1.55	0.21	5.41	0.36	0.13	0.07
2.1	6.4	10.7	15	0.63	0.40	0.17	0.00	7.76	5.12	1.63	0.21	5.42	0.36	0.13	0.07
2.6	7.7	12.9	18	0.77	0.52	0.17	0.00	9.21	6.05	1.91	0.23	4.62	0.43	0.18	0.07
3.0	9.0	15.0	21	1.00	0.68	0.26	0.00	11.90	7.96	2.60	0.34	5.11	0.57	0.19	0.07
4.0	12.0	20.0	28	1.56	1.02	0.43	0.00	17.18	11.54	3.82	0.50	5.91	0.85	0.31	0.00
5.0	15.0	25.0	35	2.25	1.40	0.44	0.06	23.24	15.05	4.77	0.58	5.68	1.00	0.38	0.08
6.0	18.0	30.0	42	2.74	1.72	0.61	0.06	27.95	18.03	6.01	0.82	6.09	1.28	0.45	0.09
7.1	21.4	35.7	50	3.37	2.33	0.87	0.06	33.15	23.04	8.44	1.58	5.85	1.69	0.65	0.00

Table 7

Applied Pressure and Corresponding Simulated Soil Depths

Pressure zone 1		Pressure zone 2		Pressure zone 3		Pressure zone 4	
Pressure kPa	Simulated Depth m	Pressure kPa	Simulated Depth m	Pressure kPa	Simulated Depth m	Pressure kPa	Simulated Depth m
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.10	0.02	0.30	0.05	0.50	0.08	0.70	0.11
0.20	0.03	0.60	0.09	1.00	0.15	1.40	0.21
0.30	0.05	0.90	0.14	1.50	0.23	2.10	0.32
0.40	0.06	1.20	0.18	2.00	0.30	2.80	0.42
0.50	0.08	1.50	0.23	2.50	0.38	3.50	0.53
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.38	0.06	1.14	0.17	1.90	0.29	2.66	0.40
0.76	0.11	2.28	0.34	3.80	0.57	5.32	0.80
1.14	0.17	3.42	0.51	5.70	0.86	7.98	1.20
1.52	0.23	4.56	0.68	7.60	1.14	10.64	1.60
1.90	0.29	5.70	0.86	9.50	1.43	13.30	2.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.20	0.33	6.40	0.96	11.00	1.65	13.60	2.04
2.14	0.32	6.43	0.96	10.71	1.61	15.00	2.25
2.57	0.39	7.71	1.16	12.86	1.93	18.00	2.70
3.00	0.45	9.00	1.35	15.00	2.25	21.00	3.15
4.00	0.60	12.00	1.80	20.00	3.00	28.00	4.20
5.00	0.75	15.00	2.25	25.00	3.75	35.00	5.25
6.00	0.90	18.00	2.70	30.00	4.50	42.00	6.30
7.14	1.07	21.43	3.21	35.71	5.36	50.00	7.50

FIGURES



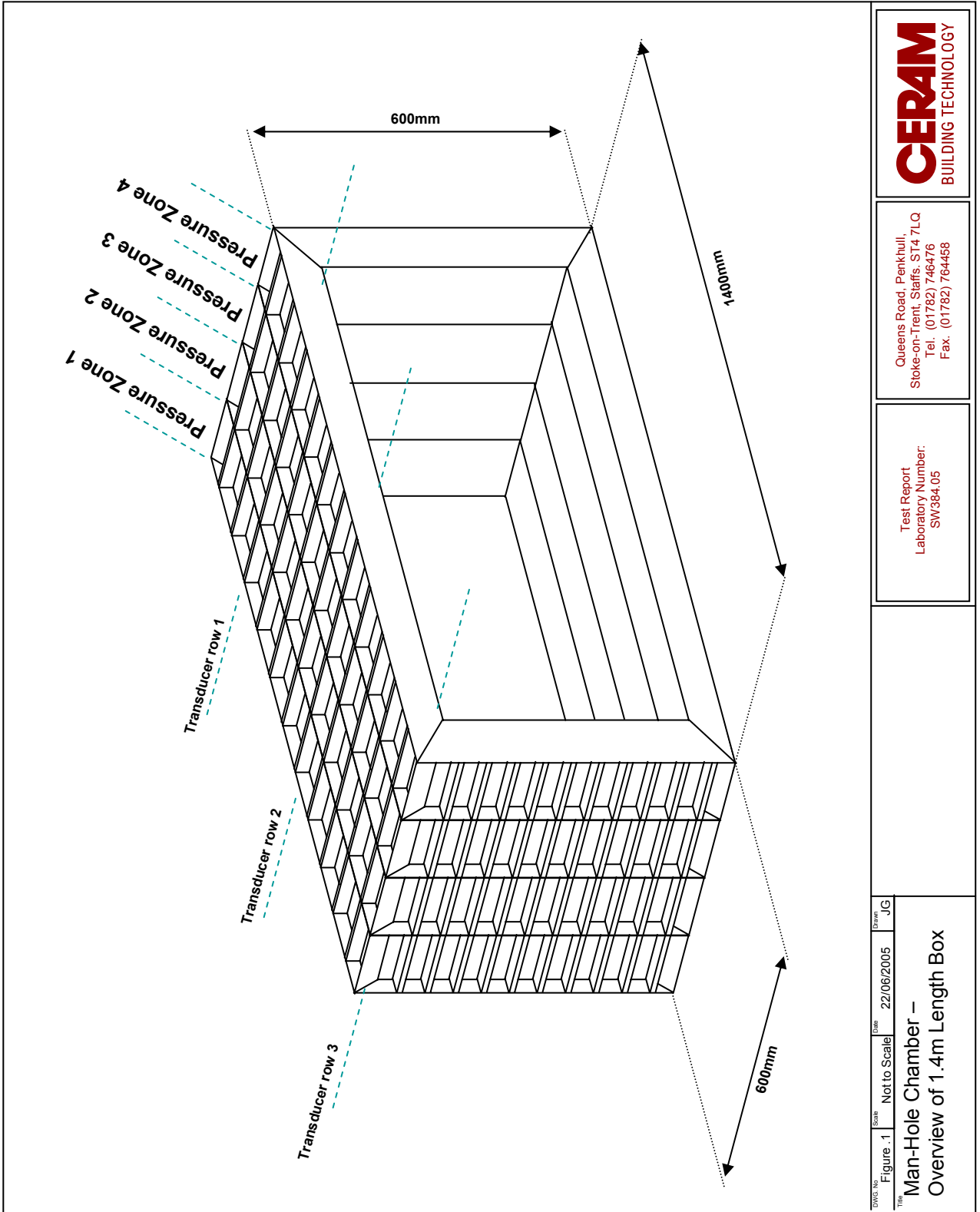
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Figure .1

Scale: Not to Scale Date: 22/06/2005 Drawn: JG
Title: Man-Hole Chamber – Overview of 2.8m Length Box



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Figure .1

Scale: Not to Scale Date: 22/06/2005 Drawn: JG
Title: Man-Hole Chamber – Overview of 1.4m Length Box

