

DIST. 6 REGION                     

W.P. No. 2501-93-00

CONT. No. \_\_\_\_\_

W. O. No. \_\_\_\_\_

STR. SITE No. \_\_\_\_\_

HWY. No. 400

LOCATION Truck Inspection Station

Hwy 400 SBL; 1.8 Km S of Aurora

No of PAGES - — Sidlroad

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. \_\_\_\_\_

REMARKS: \_\_\_\_\_

ENGINEERING MATERIALS OFFICE  
FOUNDATION DESIGN SECTION

WP 2501-93-00

DIST 6

HWY 400 SBL

STR SITE -

Truck Inspection Station on Highway 400 SBL  
1.8 km South of Aurora Sideroad

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# FOUNDATION INVESTIGATION REPORT

For

Truck Inspection Station on Highway 400 SBL

1.8 km South of Aurora Sideroad

W.P. 2501-93-00

District 6, Toronto

## INTRODUCTION

This report summarizes the results of the foundation investigation conducted at Highway 400 SBL, about 1.8 km south of Aurora Sideroad. The investigation was carried out upon the request of the Central Region Structural Section for the proposed truck inspection station. The field work for the investigation was carried out between 93 03 15 and 93 03 16 and consisted of three(3) sampled boreholes.

## SITE INVESTIGATION

The site is located on the SBL of Highway 400, about 1.8 km south of Aurora Sideroad, in the Township of King, Region of York.

Physiographically, the site lies in a region known as the "Oak Ridges" (after Chapman and Putnam, 1984). This region is basically covered by an end moraine composed of sandy material with occasional layers of glacial till.

The site is located to the west of Highway 400. The area is of gently undulating to rolling terrain. The site is generally vegetated with isolated groups of trees or shrubs. The land apparently serves as agricultural farmland.

## INVESTIGATION PROCEDURE

Soil data and inherent properties were obtained by in situ and laboratory testing. The procedures employed are discussed below.

### Field

The fieldwork for the investigation was carried out between 93 03 15 and 93 03 16 and consisted of three(3) sampled boreholes which were advanced to depths of 12.5 to 15.7 m.

The boreholes were advanced using conventional hollow stem augering techniques. A track mounted continuous flight auger drill rig was employed. The sampling program consisted of split spoon samples collected in the overburden. Disturbed subsoil samples were retrieved by a split spoon sample in accordance with the Standard Penetration Test (ASTM D1586). They provided Standard Penetration Resistance ('N') values for assessment of the denseness of non-cohesive material. All the samples collected were used for identification and laboratory testing purposes. Dynamic Cone Penetration test was also carried out in all the boreholes.

All subsoil samples were identified in the field and returned to the laboratory for further examination and appropriate testing.

The groundwater condition was monitored in open-boreholes. All the boreholes were backfilled upon completion of the fieldwork.

Survey information related to the location and elevation of boreholes was provided by the Central Region, Surveys and Plans Section.

### Laboratory

The laboratory testing program for selected soil samples consisted of:

- Atterberg Limit Test
- Grain Size Distribution
- Natural Moisture Content Determinations

Laboratory test results are given in the following section of this report and are illustrated on the Record of Borehole sheets included in the Appendix.

## SUBSURFACE CONDITIONS

### General

The Record of Borehole sheets in the Appendix illustrate the subsurface conditions at the borehole locations. The locations of the boreholes are shown on Drawing No. 25019300-A.

The predominant soil strata encountered in the boreholes consisted of a surficial layer of topsoil overlying a clayey silt stratum which is underlain by a major deposit of silty sand. The sand deposit was penetrated at 9 to 12 m depths and a non-cohesive glacial till deposit was encountered. Bedrock was not contacted at the termination depths of the boreholes.

Following are the specific descriptions of the material encountered in the investigation.

### Topsoil

This organic layer is contacted at the surface with thickness ranging from 0.8 to 1.4 m. The material has been described as clayey silt, trace to some sand and organics.

### Clayey Silt, Trace of Some Sand

This cohesive layer extends to a depth of 3.0 to 3.4 m. The material is typically described as clayey silt, trace of some sand. Typical properties of the material, as determined by laboratory

tests on representative samples are summarized as follows:

<u>Property</u>	<u>Range</u>	<u>No. of Tests</u>
Natural Moisture Content (w)	10.5-20.5	3
Liquid Limit ( $w_L$ )	12-21	3
Plastic Limit ( $w_p$ )	11-20	3
Grain Size Distribution (%)		
- Gravel	0-1	
- Sand	1-34	
- Silt and Clay	66-98	

Based on the Standard Penetration Resistance 'N' value which ranged from 6 to 35 blows/0.3 m, the consistency of this layer is firm to hard.

#### Silty Sand, Trace of Clay

This non-cohesive deposit is encountered below the clayey silt stratum. It extends to a depth of 9.1 to 12.2 m. It is generally described as silty sand, trace of clay. In BH 3 however, the silt content is higher than sand and the material is described as silt with sand, trace clay. Typical properties of the material, as determined by laboratory tests on representative samples are summarized as follows:

<u>Property</u>	<u>Range</u>	<u>No. of Tests</u>
Natural Moisture Content (w)	3.0-23.0	4
Grain Size Distribution (%)		4
- Gravel	0-1	
- Sand	40-66	
- Silt and Clay	34-60	

Based on Standard Penetration Resistance 'N' values which ranged from 10-62 blows/0.3 m, but

typically greater than 30 blows/0.3 m, the denseness of this stratum is dense to very dense.

Heterogeneous Mixture of Sandy Silt, Trace of Clay and Gravel (Glacial Till)

Underlying all the above layers is a non-cohesive glacial till stratum. The maximum thickness of this stratum drilled was 3.5 m. This layer was not penetrated at the maximum termination depth of the boreholes (15.7 m depth, El. 305.6 m). It is typically described as a heterogeneous mixture of sandy silt, trace of clay and gravel with occasional cobbles and boulders. Typical properties of the material, as determined by laboratory tests on representative samples are summarized as follows:

<u>Property</u>	<u>Range</u>	<u>No. of Tests</u>
Natural Moisture Content (w)	8-15	5
Liquid Limit ( $w_L$ )	13-15	3
Plastic Limit ( $w_P$ )	12	3
Grain Size Distribution (%)		5
- Gravel	1-9	
- Sand	22-38	
- Silt and Clay	57-77	

Based on Standard Penetration Resistance 'N' values which ranged from 30 blows/0.3 m to over 100 blows/0.3 m, the denseness of this stratum is typically very dense.

Groundwater

Groundwater level was monitored in the open boreholes during the investigation. It was measured to be around El. 312 to 313 m, typically 6 to 9 m below existing ground surface.

Groundwater level is subject to seasonal fluctuations and may vary from the elevations given in this report.

## DISCUSSION AND RECOMMENDATIONS

### General

The project comprises construction of a truck inspection station to the west of Highway 400, about 1.8 km south of Aurora Sideroad. The proposed ramp will have an offset of about 55 m from the centerline of Highway 400 at the proposed scale house location.

The project will involve construction of a scale house, a weigh-in-motion scale and a static scale in ramp-scale-ramp systems. It is understood that the scale house will be one storey with a basement. The static scale pit and the weigh-in-motion scale pit will be about 2.5 m and 1 m deep respectively.

### Foundation

Due to the existence of competent subsoil at the site, the foundation for the structure and scales may be founded on conventional shallow footings to achieve a cost effective design.

#### Scale House -

For footings founded at El. 318 m and assuming a footing width of 1 m, the bearing capacities as per the O.H.B.D.C. are as follows:

Factored Bearing Capacity at U.L.S. = 750 kPa

Bearing Capacity at S.L.S. Type II = 300 kPa

#### Static Scale -

For footings founded at El. 318 m and assuming a footing width of 4 m, the bearing capacities as per the O.H.B.D.C. are as follows:



Factored Bearing Capacity at U.L.S. = 1200 kPa

Bearing Capacity at S.L.S. Type II = 350 kPa

#### Weigh-in-Motion Scale -

For footings founded at El. 316.5 m and assuming a footing width of 4 m, the bearing capacities as per the O.H.B.D.C. are as follows:

Factored Bearing Capacity at U.L.S. = 1200 kPa

Bearing Capacity at S.L.S. Type II = 350 kPa

#### General -

All footings should have a minimum earth cover of 1.4 m for frost protection.

Reduction for the inclination of loading on the shallow foundation shall be carried out in accordance with Section 6.7.3.3.5 of the O.H.B.D.C.

The computation of the sliding resistance of the foundation shall be carried out in accordance with Section 6-7.3.3.2 of the O.H.B.D.C., with an unfactored friction angle of  $28^\circ$ .

In order to control differential settlement in the ramp-scale-ramp system so that the load cells can operate properly, it is recommended that the scales be placed on a raft type of foundation. If the actual bearing pressure is less than the recommended bearing capacity at S.L.S. Type II, the total and differential settlements will be reduced accordingly.

#### Backfill

Backfill to the scale house should consist of granular material in accordance with MTO Standard

Special Provision No. 121 (83 10). Computation of earth pressures should be in accordance with Section 6-6.1.2.1 of the O.H.B.D.C. The at-rest condition will govern earth pressure design in this case. For design purposes, the following properties for backfill are recommended:

<u>Material</u>	<u><math>\phi</math></u>	<u><math>\gamma</math></u>	<u><math>K_o</math></u>
Granular 'A'	35°	22.8 kN/m <sup>3</sup>	0.43
Granular 'B'	30°	21.2 kN/m <sup>3</sup>	0.50

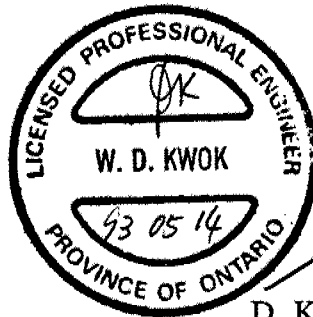
#### Construction Consideration

Temporary excavation will be in the order of 2 to 3 ± m and can be carried out with 1H:1V gradient. No shoring or dewatering is considered necessary. Minor seepage from sand seams or surface runoff can be handled by conventional sump pumping.

MISCELLANEOUS

The fieldwork for this investigation was carried out under the supervision of D. Kwok, Project Foundation Engineer. The equipment was owned and operated by Malones Soil Samples Co. Ltd.

The project was carried out by D. Kwok under the supervision of B. Iyer, Senior Foundation Engineer. This report was prepared by D. Kwok, reviewed by B. Iyer, and approved by M. Devata, Chief Foundation Engineer.



D. Kwok, P. Eng.

Project Foundation Engineer

A handwritten signature in black ink, appearing to read "M. Devata".

M. Devata, P. Eng.

Chief Foundation Engineer

## APPENDIX

## EXPLANATION OF TERMS USED IN REPORT

**N VALUE:** THE STANDARD PENETRATION TEST (SPT) N VALUE IS THE NUMBER OF BLOWS REQUIRED TO CAUSE A STANDARD 51mm O.D. SPLIT BARREL SAMPLER TO PENETRATE 0.3m INTO UNDISTURBED GROUND IN A BOREHOLE WHEN DRIVEN BY A HAMMER WITH A MASS OF 63.5kg, FALLING FREELY A DISTANCE OF 0.76m. FOR PENETRATIONS OF LESS THAN 0.3m N VALUES ARE INDICATED AS THE NUMBER OF BLOWS FOR THE PENETRATION ACHIEVED. AVERAGE N VALUE IS DENOTED THUS  $\bar{N}$ .

**DYNAMIC CONE PENETRATION TEST:** CONTINUOUS PENETRATION OF A CONICAL STEEL POINT (51mm O.D. 60° CONE ANGLE) DRIVEN BY 475 J IMPACT ENERGY ON 'A' SIZE DRILL RODS. THE RESISTANCE TO CONE PENETRATION IS MEASURED AS THE NUMBER OF BLOWS FOR EACH 0.3m ADVANCE OF THE CONICAL POINT INTO THE UNDISTURBED GROUND.

SOILS ARE DESCRIBED BY THEIR COMPOSITION AND CONSISTENCY OR DENSENESS.

**CONSISTENCY:** COHESIVE SOILS ARE DESCRIBED ON THE BASIS OF THEIR UNDRAINED SHEAR STRENGTH ( $c_u$ ) AS FOLLOWS:

$c_u$ (kPa)	0 - 12	12 - 25	25 - 50	50 - 100	100 - 200	> 200
	VERY SOFT	SOFT	FIRM	STIFF	VERY STIFF	HARD

**DENSENESS:** COHESIONLESS SOILS ARE DESCRIBED ON THE BASIS OF DENSENESS AS INDICATED BY SPT N VALUES AS FOLLOWS:

N (BLOWS/0.3m)	0 - 5	5 - 10	10 - 30	30 - 50	> 50
	VERY LOOSE	LOOSE	COMPACT	DENSE	VERY DENSE

ROCKS ARE DESCRIBED BY THEIR COMPOSITION AND STRUCTURAL FEATURES AND / OR STRENGTH.

**RECOVERY:** SUM OF ALL RECOVERED ROCK CORE PIECES FROM A CORING RUN EXPRESSED AS A PERCENT OF THE TOTAL LENGTH OF THE CORING RUN.

**MODIFIED RECOVERY:** SUM OF THOSE INTACT CORE PIECES, 100mm+ IN LENGTH EXPRESSED AS A PERCENT OF THE LENGTH OF THE CORING RUN. THE ROCK QUALITY DESIGNATION (RQD), FOR MODIFIED RECOVERY, IS:

RQD (%)	0 - 25	25 - 50	50 - 75	75 - 90	90 - 100
	VERY POOR	POOR	FAIR	GOOD	EXCELLENT

**JOINTING AND BEDDING:**

SPACING	50mm	50 - 300mm	0.3m - 1m	1m - 3m	> 3m
JOINTING	VERY CLOSE	CLOSE	MOD. CLOSE	WIDE	VERY WIDE
BEDDING	VERY THIN	THIN	MEDIUM	THICK	VERY THICK

## ABBREVIATIONS AND SYMBOLS

### FIELD SAMPLING

S S	SPLIT SPOON	T P	THINWALL PISTON
W S	WASH SAMPLE	O S	OSTERBERG SAMPLE
S T	SLOTTED TUBE SAMPLE	R C	ROCK CORE
B S	BLOCK SAMPLE	P H	T W ADVANCED HYDRAULICALLY
C S	CHUNK SAMPLE	P M	T W ADVANCED MANUALLY
T W	THINWALL OPEN	F S	FOIL SAMPLE

### MECHANICAL PROPERTIES OF SOIL

$m_v$	$\text{kPa}^{-1}$	COEFFICIENT OF VOLUME CHANGE
$C_c$	1	COMPRESSION INDEX
$C_s$	1	SWELLING INDEX
$C_\alpha$	1	RATE OF SECONDARY CONSOLIDATION
$c_v$	$\text{m}^2/\text{s}$	COEFFICIENT OF CONSOLIDATION
H	m	DRAINAGE PATH
$T_v$	1	TIME FACTOR
U	%	DEGREE OF CONSOLIDATION
$\sigma'_{vo}$	kPa	EFFECTIVE OVERBURDEN PRESSURE
$\sigma'_p$	kPa	PRECONSOLIDATION PRESSURE
$\tau_f$	kPa	SHEAR STRENGTH
$c'$	kPa	EFFECTIVE COHESION INTERCEPT
$\phi'$	-°	EFFECTIVE ANGLE OF INTERNAL FRICTION
$c_u$	kPa	APPARENT COHESION INTERCEPT
$\phi_u$	-°	APPARENT ANGLE OF INTERNAL FRICTION
$\tau_R$	kPa	RESIDUAL SHEAR STRENGTH
$\tau_r$	kPa	REMOULDED SHEAR STRENGTH
$S_t$	1	SENSITIVITY = $\frac{c_u}{\tau_r}$

### STRESS AND STRAIN

$u_w$	kPa	PORE WATER PRESSURE
$r_u$	1	PORE PRESSURE RATIO
$\sigma$	kPa	TOTAL NORMAL STRESS
$\sigma'$	kPa	EFFECTIVE NORMAL STRESS
$\tau$	kPa	SHEAR STRESS
$\sigma_1, \sigma_2, \sigma_3$	kPa	PRINCIPAL STRESSES
$\epsilon$	%	LINEAR STRAIN
$\epsilon_1, \epsilon_2, \epsilon_3$	%	PRINCIPAL STRAINS
E	kPa	MODULUS OF LINEAR DEFORMATION
G	kPa	MODULUS OF SHEAR DEFORMATION
$\mu$	1	COEFFICIENT OF FRICTION

### PHYSICAL PROPERTIES OF SOIL

$\rho_s$	$\text{kg}/\text{m}^3$	DENSITY OF SOLID PARTICLES	e	1, %	VOID RATIO	$e_{\min}$	1, %	VOID RATIO IN DENSEST STATE
$\gamma_s$	$\text{kN}/\text{m}^3$	UNIT WEIGHT OF SOLID PARTICLES	n	1, %	POROSITY	$I_D$	1	DENSITY INDEX = $\frac{e_{\max} - e}{e_{\max} - e_{\min}}$
$\rho_w$	$\text{kg}/\text{m}^3$	DENSITY OF WATER	w	1, %	WATER CONTENT	D	mm	GRAIN DIAMETER
$\gamma_w$	$\text{kN}/\text{m}^3$	UNIT WEIGHT OF WATER	$S_r$	%	DEGREE OF SATURATION	$D_n$	mm	n PERCENT - DIAMETER
$\rho$	$\text{kg}/\text{m}^3$	DENSITY OF SOIL	$w_L$	%	LIQUID LIMIT	$C_u$	1	UNIFORMITY COEFFICIENT
$\gamma$	$\text{kN}/\text{m}^3$	UNIT WEIGHT OF SOIL	$w_p$	%	PLASTIC LIMIT	h	m	HYDRAULIC HEAD OR POTENTIAL
$\rho_d$	$\text{kg}/\text{m}^3$	DENSITY OF DRY SOIL	$w_s$	%	SHRINKAGE LIMIT	q	$\text{m}^3/\text{s}$	RATE OF DISCHARGE
$\gamma_d$	$\text{kN}/\text{m}^3$	UNIT WEIGHT OF DRY SOIL	$I_p$	%	PLASTICITY INDEX = $w_L - w_p$	v	m/s	DISCHARGE VELOCITY
$\rho_{\text{sat}}$	$\text{kg}/\text{m}^3$	DENSITY OF SATURATED SOIL	$I_L$	1	LIQUIDITY INDEX = $\frac{w - w_p}{I_p}$	i	1	HYDRAULIC GRADIENT
$\gamma_{\text{sat}}$	$\text{kN}/\text{m}^3$	UNIT WEIGHT OF SATURATED SOIL	$I_C$	1	CONSISTENCY INDEX = $\frac{w_L - w}{I_p}$	k	m/s	HYDRAULIC CONDUCTIVITY
$\rho'$	$\text{kg}/\text{m}^3$	DENSITY OF SUBMERGED SOIL	$e_{\max}$	1, %	VOID RATIO IN LOOSEST STATE	j	$\text{kN}/\text{m}^2$	SEEPAGE FORCE
$\gamma'$	$\text{kN}/\text{m}^3$	UNIT WEIGHT OF SUBMERGED SOIL						

RECORD OF BOREHOLE No 1

1 OF 1

METRIC

W.P. 2501-93-00 LOCATION Co-ords N 4 871 253.0 E 298 228.0 ORIGINATED BY DK  
DIST 5 HWY 400 BOREHOLE TYPE H.S. Auger, Cone COMPILED BY DK  
DATUM Geodetic DATE 93 03 16 CHECKED BY BI

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT 7 KN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	10 20 30 40 50	10 20 30	10 20 30	10 20 30	10 20 30	10 20 30		
321.3	Ground Surface															
0.0 320.5	Clayey Silt, Trace Sand and Organics (Topsoil)		1	AS	-											
0.8	Clayey Silt some organics		2	SS	9											
	Stiff to Hard numerous silt zones		3	SS	12											
	Brown		4	SS	26											
317.8			5	SS	31											
3.4			6	SS	28											
	Silty Sand, Trace Clay		7	SS	59											
	Light Olive Grey		8	SS	53											
	Dense to Very Dense ( Lacustrine )		9	SS	30											
			10	SS	37											
309.1			11	SS	45											
12.2	Heterogeneous Mixture of Sandy Silt Dense Sand		12	SS	30											
	Trace Gravel and Clay Trace Silt															
	Very Dense															
	Light Grey to Grey															
305.6	( Glacial Till )		13	SS	77											
15.7	End of Borehole															
	* Water level at bottom of cave one hour after completion of drilling															

# RECORD OF BOREHOLE No 2

1 OF 1

METRIC

W.P. 2501-93-00 LOCATION Co-ords N 4 871 275.0 E 298 224.0 ORIGINATED BY DK  
DIST 6 HWY 400 BOREHOLE TYPE H.S. Auger, Cone COMPILED BY DK  
DATUM Geodetic DATE 93 03 15 CHECKED BY BI

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT      NATURAL MOISTURE CONTENT      LIQUID LIMIT			UNIT WEIGHT  γ  kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20    40    60    80    100		w <sub>p</sub> w                      w <sub>L</sub>					
								SHEAR STRENGTH kPa		WATER CONTENT (%)					
								○ UNCONFINED      + FIELD VANE ● QUICK TRIAXIAL      x LAB VANE							
320.6	Ground Surface														
0.0	Clayey Silt, Some Sand Some Organics, Brown, Firm ( Topsoil )		1	AS	-		320								
319.2			2	SS	5										
1.4	Clayey Silt, Trace Sand Light Olive Grey, Firm to Hard Occasional Silt Zones		3	SS	6		318							1 12 77 10	
			4	SS	16										
317.2			5	SS	35										
3.4	Silty Sand, Trace Clay  Light Olive Grey  Dense to Very Dense		6	SS	58		316							1 65 29 5	
			7	SS	62										
			8	SS	56		314								
			9	SS	31		312								
			10	SS	10		310								
308.4			11	SS	36		308							8 32 56 4	
12.2		Heterogeneous Mixture of Sandy Silt, Trace Clay and Gravel Dense to Very Dense, Grey ( Glacial Till )		12	SS	130		306							
305.1			13	SS	110	23cm								1 35 54 8	
15.5		End of Borehole													
		* Assumed Water Level at bottom of wet core measured on 93 03 16													

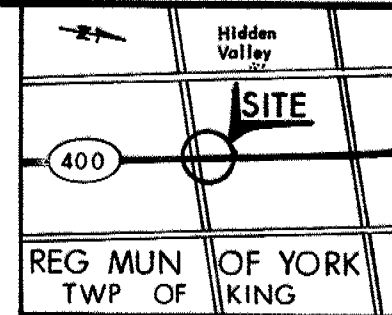
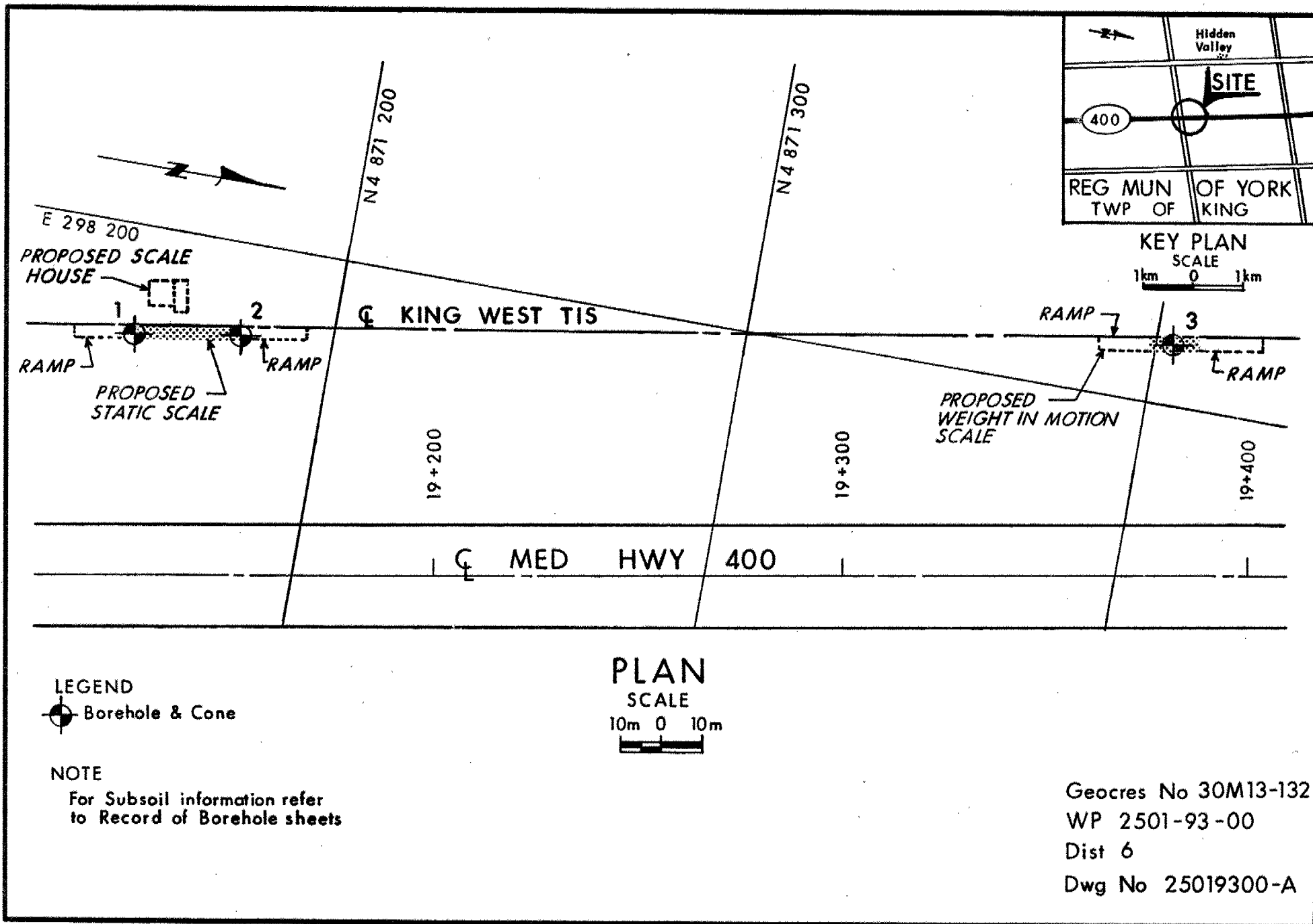
# RECORD OF BOREHOLE No 3

1 OF 1 METRIC

W.P. 2501-93-00 LOCATION Co-ords N 4 871 504.0 E 298 185.0 ORIGINATED BY DK  
 DIST 6 HWY 400 BOREHOLE TYPE H.S. Auger, Cone COMPILED BY DK  
 DATUM Geodetic DATE 93 03 15 CHECKED BY BI

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT w <sub>p</sub>	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			20 40 60 80 100						
318.2	Ground Surface												
317.4	Clayey Silt, Trace Organics Brown ( Topsoil )		1	AS		318	SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE		WATER CONTENT (%) 10 20 30				
0.8	Clayey Silt with Sand Occasional Silt Zones Light Olive Grey Firm to Very Stiff		2	SS	7		High blowcounts due to frozen ground						0 34 55 11
			3	SS	16	316							0 40 57 3
315.2			4	SS	29								
3.0			5	SS	48	314							
	Silt with Sand Trace Clay Light Olive Grey Dense to Very Dense		6	SS	49	312							0 40 56 4
			7	SS	41	310							
			8	SS	43	308							
309.1			9	SS	88	306							
9.1	Heterogeneous Mixture of Sandy Silt Trace Gravel and Clay Occasional Cobbles and Boulders Some Silt Zones Grey, Very Dense ( Glacial Till )		10	SS	100								1 22 64 13
305.7			11	SS	100	306							
12.5	End of Borehole  • Assumed Water Level at the bottom of the wet cave measured after completion of drilling												





**LEGEND**  
● Borehole & Cone

**NOTE**  
For Subsoil information refer  
to Record of Borehole sheets

**KEY PLAN**  
SCALE  
1km 0 1km

Geocres No 30M13-132  
WP 2501-93-00  
Dist 6  
Dwg No 25019300-A

# memorandum



To: V.F. Boehnke, P. Eng.  
Head, Structural Section  
Central Region

Attn: Dennis Wong, P. Eng.

From: Foundation Design Section  
Room 315, Central Building

Subject: Proposed Truck Inspection Station  
Hwy 400 SBL  
W.P. 2501-93-00  
District 6, Toronto

Date: 93 12 02

We have reviewed the design drawings received from Harish Rupal of Planning and Design Section for the above project, and have the following comments:

- From a foundation point of view, the granular pad for the static pit can be replaced by a concrete levelling pad as discussed in the meeting on 93 10 05.
- With reference to our memorandum dated 93 10 07 (copy attached), the concrete levelling pad should extend a minimum of 500 mm beyond the peripheral edges of the pit. It is noted from the drawings that the base slab of the sorter scale pit also extends out with the concrete pad. This is not a foundation requirement.

A handwritten signature in black ink, appearing to read "David Kwok".

David Kwok, P. Eng.  
Project Foundation Engineer  
for  
Balu Iyer, P. Eng.  
Senior Foundation Engineer

c.c. Harish Rupal

# memorandum



To: Ed Ellard  
Head(Acting), Planning and Design Section  
Central Region

Date: 93 10 07

Attn: Harish Rupal

From: Foundation Design Section  
Room 315, Central Building

Subject: Proposed Truck Inspection Station  
Hwy 400 SBL  
W.P. 2501-93-00  
District 6, Toronto

We refer to your memorandum dated 93 10 05 regarding the static scale foundation for the above project, and have the following comments on the sketch attached therein:

- The 150 mm concrete levelling pad should extend a minimum of 500 mm beyond the peripheral edges of the static pit.
- The sump pit at the bottom of the static pit shown in the previous drawings is missing.
- For the side slopes, a note should be included to indicate 'temporary cuts to be formed at safe slope angles'.

A handwritten signature in black ink, appearing to read "David Kwok".

David Kwok, P. Eng.  
Project Foundation Engineer  
for  
Balu Iyer, P. Eng.  
Senior Foundation Engineer

SEND  
TO

Dave Kwok

Foundation Design

3rd Floor Central Bldg

93 10 05

FROM

Harish Rupal Area / Pd 4th Fl. Atrium

SUBJECT

WP 2501-93-00 STATIC SCALE FOUNDATION

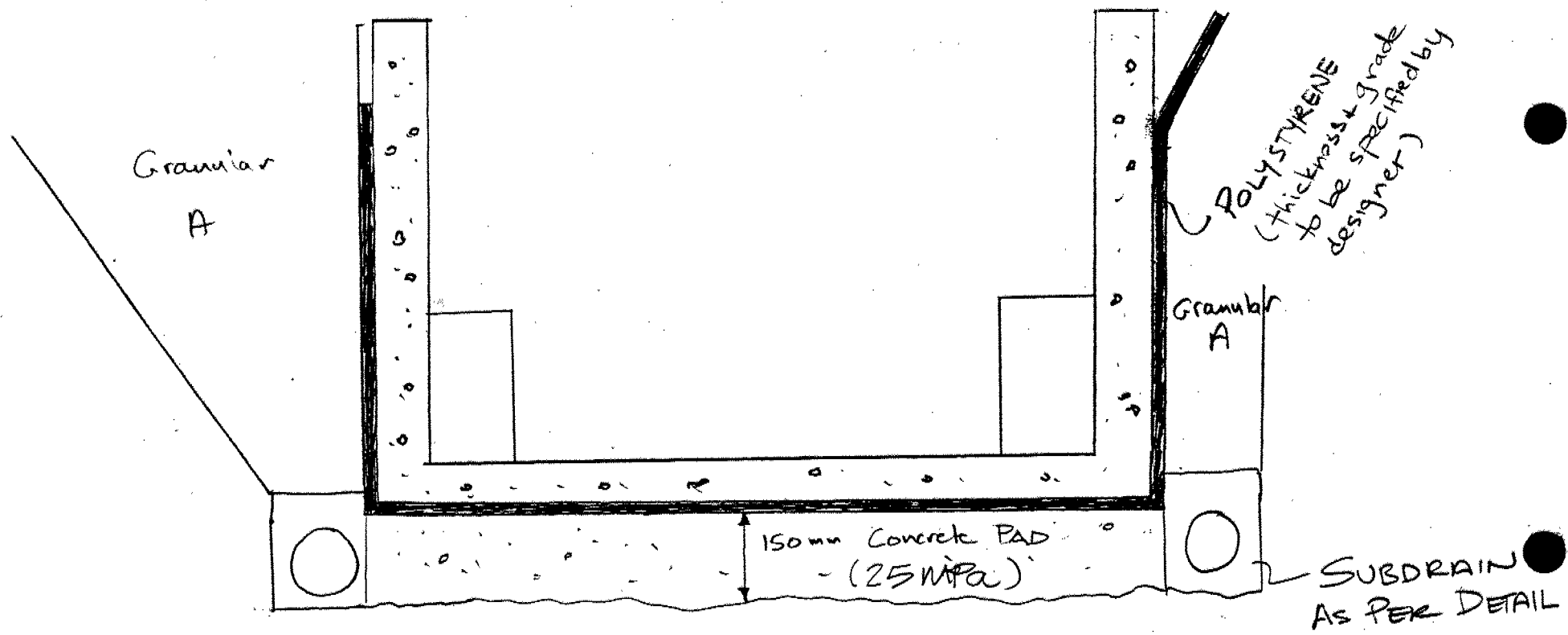
- As discussed at our meeting this morning rather than use the 250 mm Gran 'A' pad below the pit as proposed by mmm, we will use a 25 MPa, 150 mm thick concrete pad. Polystyrene will also be used. The attached drawing shows this. Subdrains will also be used as recommended by geotechnical section. If this detail (attached) does not agree with what you understood please contact me immediately.

cc: F. Tannous (Geotechnical)  
D. Wong (Structural)

REPLY

REPLY FROM

REPLY DATE



Granular  
A

POLYSTYRENE  
(thickness & grade  
to be specified by  
designer)

Granular  
A

150mm Concrete PAD  
- (25MPa)

SUBDRAIN  
AS PER DETAIL

N.T.S

Sample pit  
0.5 m  
side slopes

93 10 05

**METRIC**  
DIMENSIONS ARE IN METRES  
AND/OR MILLIMETRES  
UNLESS OTHERWISE SHOWN

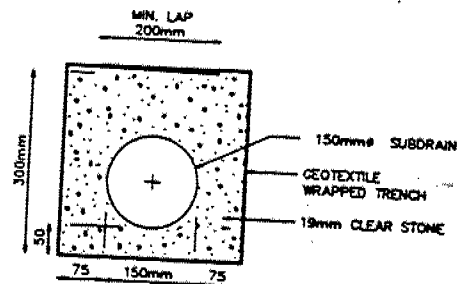
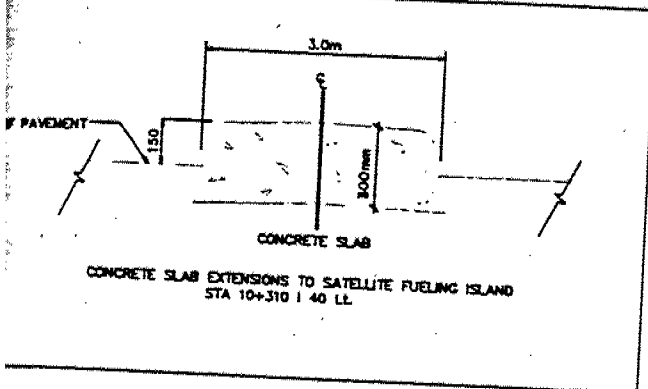
CONT No 93-401  
WPNo 2655-90-00

DETAILS

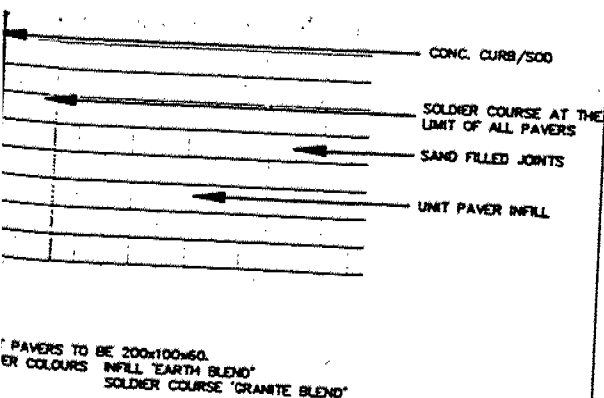
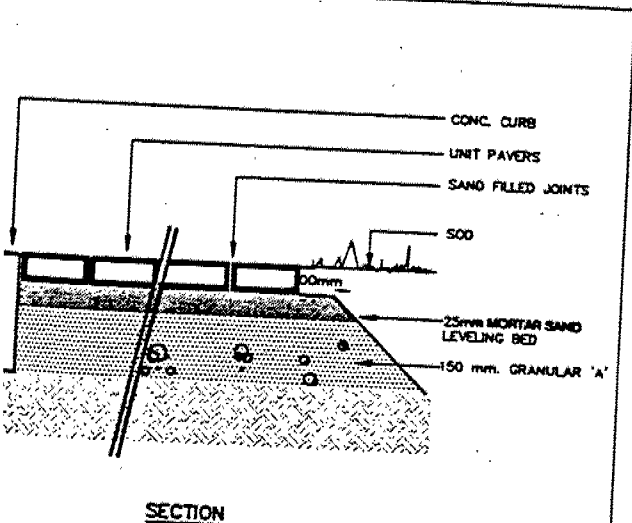
SHEET  
19

**REINDERS**

F.J.Reinders and Associates Canada Limited.  
Architects, Engineers, Planners, Project Managers



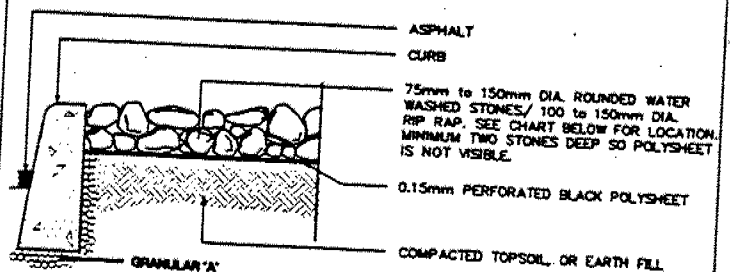
SUBDRAIN DETAIL (NTS)



PAVERS TO BE 200x100x60.  
INFILL "EARTH BLEND"  
SOLDIER COURSE "GRANITE BLEND"

CONCRETE UNIT PAVER DETAIL

N.T.S.



SECTION

BED LOCATIONS:

- RIP RAP BEDS**
- 1) STA. 20+010 to 20+047  
1 to 29 LL
  - 2) STA. 20+015 to 20+033  
3.7 to 18.3 RL
  - 3) STA. 30+887 to 30+906  
1 to 19 RL
  - 4) STA. 30+940 to 30+960  
18 to 40 Rt.

- RIVERSTONE BEDS**
- 1) STA. 10+401 to 10+463  
4.7 to 28.5 LL
  - 1) STA. 20+107 to 20+118  
5.7 to 22 Rt.

RIVERSTONE / RIP RAP BED DETAIL

N.T.S.

### GENERAL NOTES

- 1 CLASS OF CONCRETE 30MPa
- 2 CLEAR COVER TO REINFORCING STEEL
- FOOTINGS 100 ± 25
- REINFORCER 70 ± 20 UNLESS OTHERWISE SPECIFIED
- 3 REINFORCING STEEL SHALL BE GRADE 400 UNLESS OTHERWISE SPECIFIED. BAR MARKS WITH SUFFIX C DENOTE COATED BARS.
- 4 LEGEND:
- |       |                         |
|-------|-------------------------|
| HORIZ | HORIZONTAL              |
| VERT  | VERTICAL                |
| I.F.  | INSIDE FACE             |
| O.F.  | OUTSIDE FACE            |
| TUL   | TOP UPPER LAYER         |
| TLL   | TOP LOWER LAYER         |
| BUL   | BOTTOM UPPER LAYER      |
| BLL   | BOTTOM LOWER LAYER      |
| WP    | DENOTES WORKING POINT   |
| T/P   | DENOTES TOP OF PAVEMENT |
- 5 SCALE AND RAMP TO BE CONSTRUCTED WITH NO CROSSFALL
- 6 GRANULAR BACKFILL FOR APPROACH SLAB AND LEVELING PAD TO BE EXCAVATED FOR AND PLACED AFTER GENERAL FILLING OF SITE COMPLETE AND SETTLEMENT TIME ALLOWANCE HAS ELAPSED

MARK	NO. °	LENGTH	TYPE	A	B	C
A15001	46	4300	STR			
A20002	64	5900	STR			
A15003 C	48	1200	17	530	530	16
A15004	68	4300	STR			
A15005	64	5300	STR			
A15006C	42	4300	STR			
A15007C	32	5900	STR			
A15008C	54	790	2	190	600	
A15009C	5	9800	STR			
A15010C	5	5800	STR			

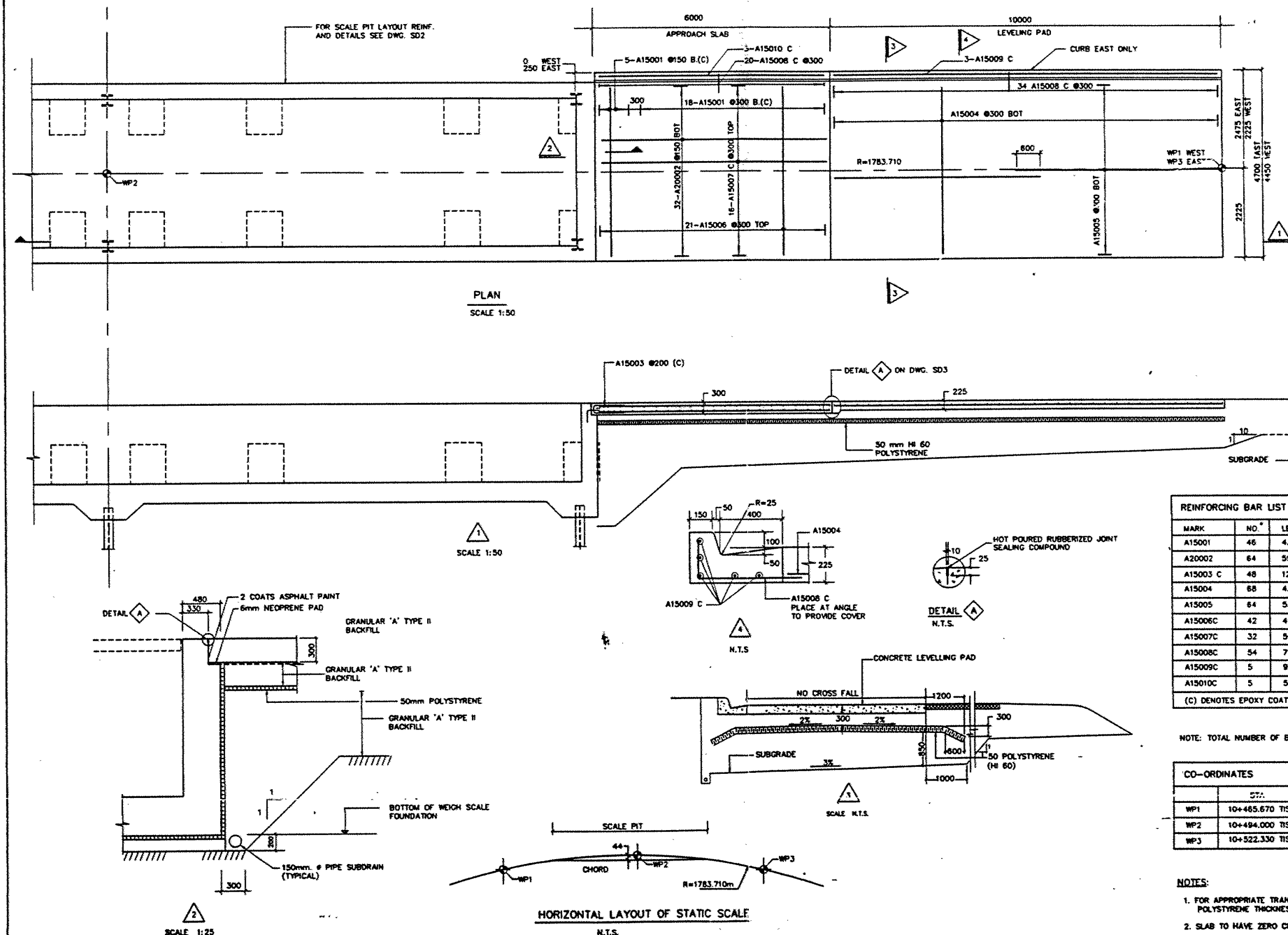
(C) DENOTES EPOXY COATED BARS

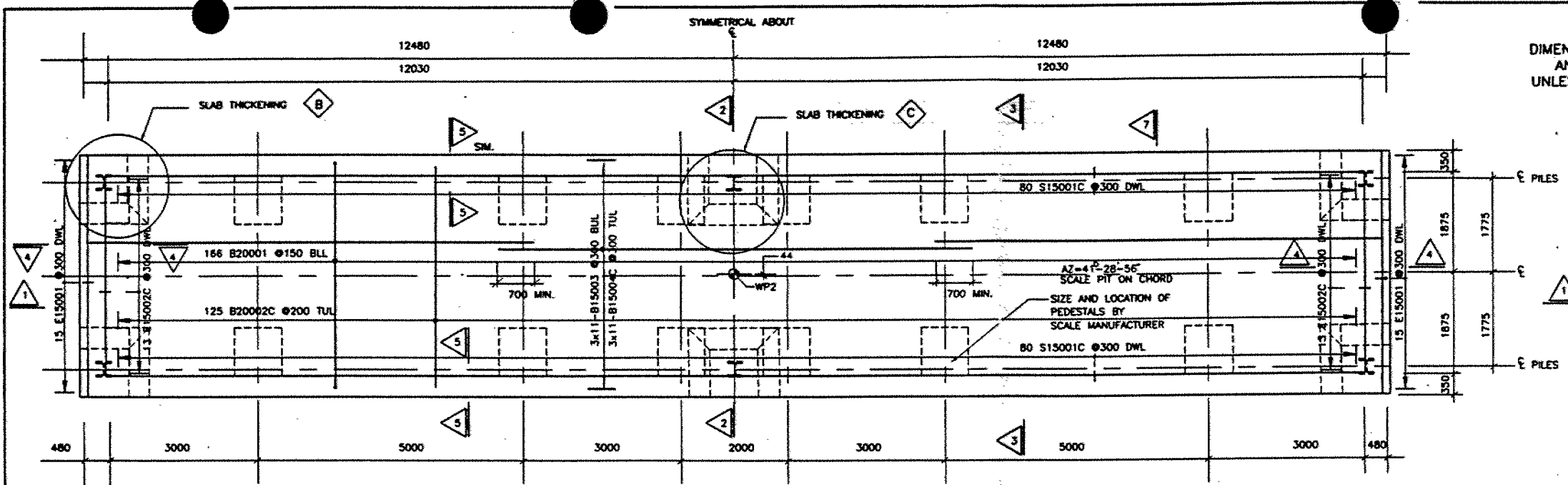
NOTE: TOTAL NUMBER OF BARS FOR STATIC SCALE RAMP.

CO-ORDINATES			
	STA	N	E
WP1	10+465.670 TS	5000647.175	227273.895
WP2	10+494.000 TS	5000868.664	227292.591
WP3	10+522.330 TS	5000889.851	227311.628

**NOTES:**

1. FOR APPROPRIATE TRANSITION REFER TO THE POLYSTYRENE STANDARD OF REQUIRED POLYSTYRENE THICKNESS. SEE DD - 422.
2. SLAB TO HAVE ZERO CROSSFALL.

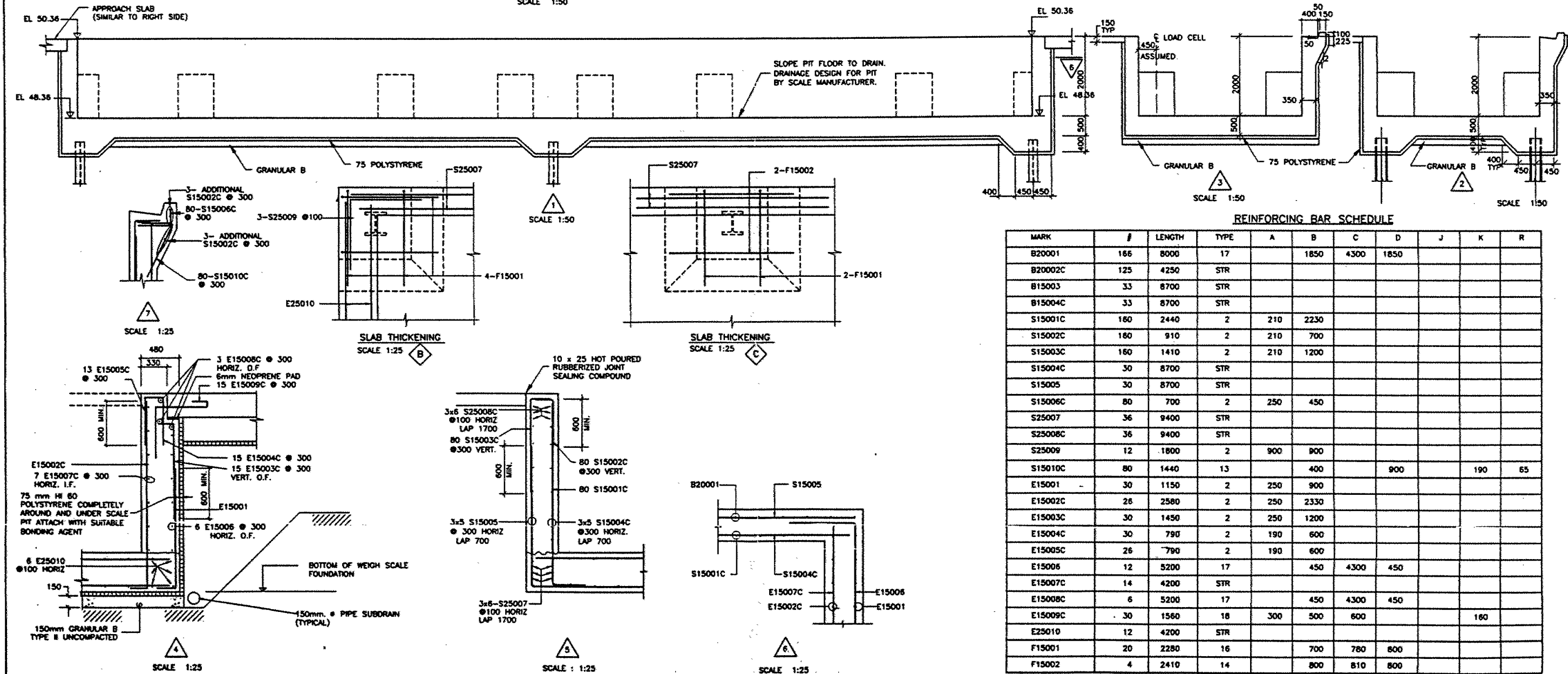




PLAN - SCALE PIT REINFORCEMENT

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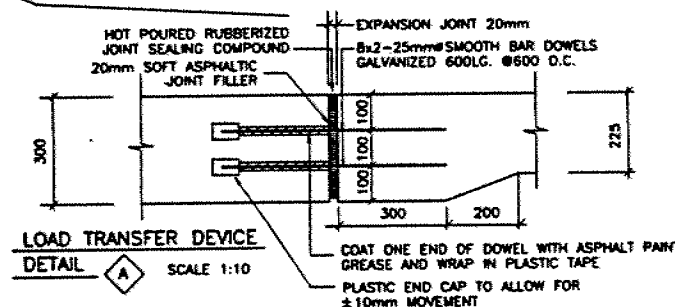
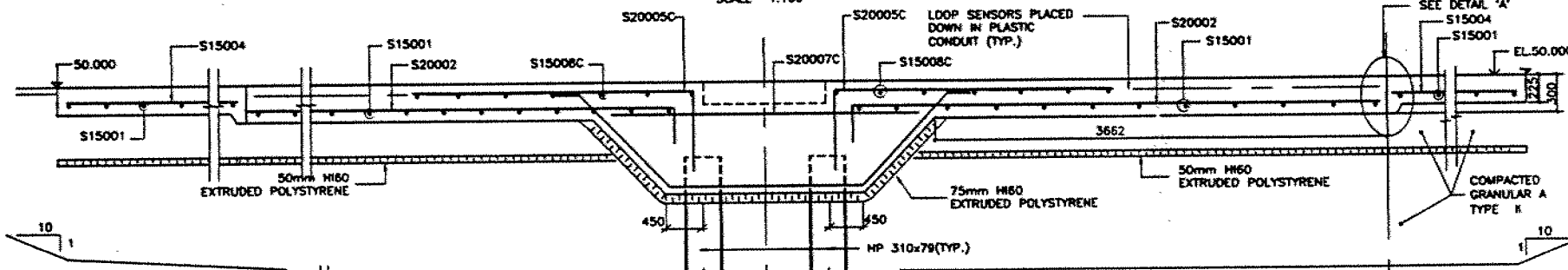
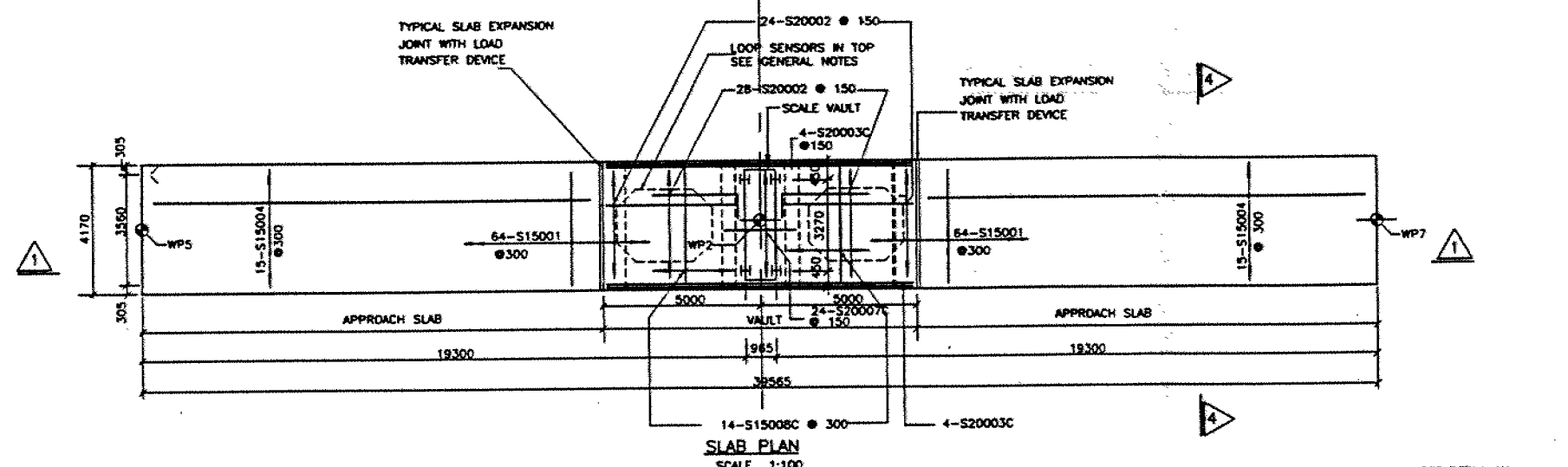
SCALE 1:50



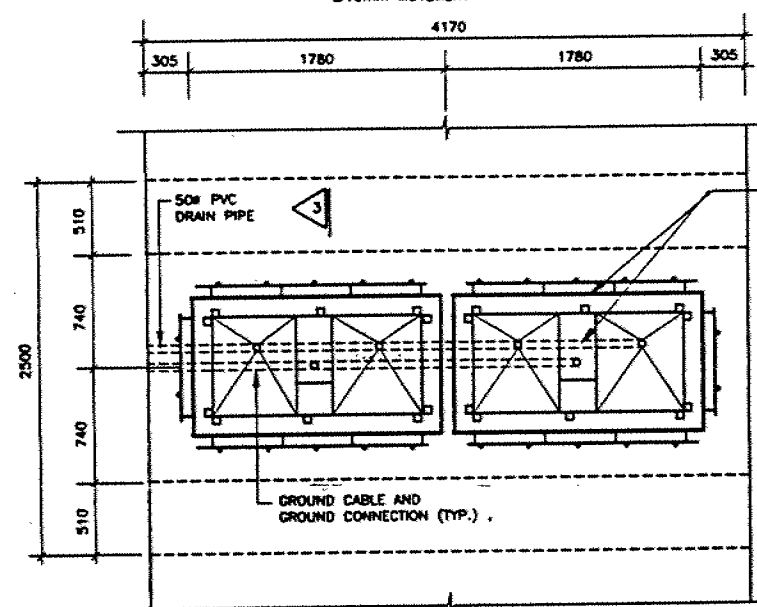
REINFORCING BAR SCHEDULE

MARK	#	LENGTH	TYPE	A	B	C	D	J	K	R
B20001	166	8000	17		1850	4300	1850			
B20002C	125	4250	STR							
B15003	33	8700	STR							
B15004C	33	8700	STR							
S15001C	160	2440	2	210	2230					
S15002C	160	910	2	210	700					
S15003C	160	1410	2	210	1200					
S15004C	30	8700	STR							
S15005	30	8700	STR							
S15006C	80	700	2	250	450					
S25007	36	9400	STR							
S25008C	36	9400	STR							
S25009	12	1800	2	900	900					
S15010C	80	1440	13		400		900		190	65
E15001	30	1150	2	250	900					
E15002C	26	2580	2	250	2330					
E15003C	30	1450	2	250	1200					
E15004C	30	790	2	190	600					
E15005C	26	790	2	190	600					
E15006	12	5200	17		450	4300	450			
E15007C	14	4200	STR							
E15008C	6	5200	17		450	4300	450			
E15009C	30	1560	18	300	500	600			160	
E25010	12	4200	STR							
F15001	20	2280	16		700	780	800			
F15002	4	2410	14		800	810	800			

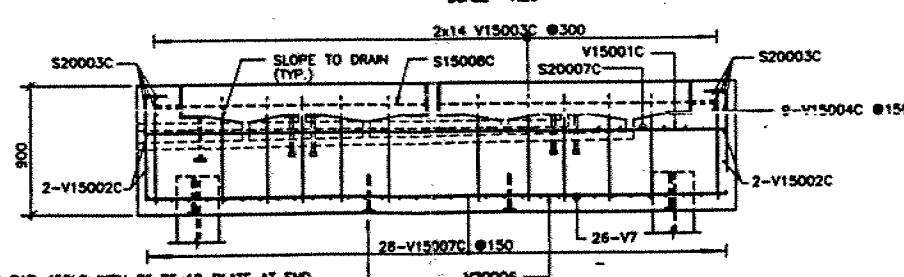
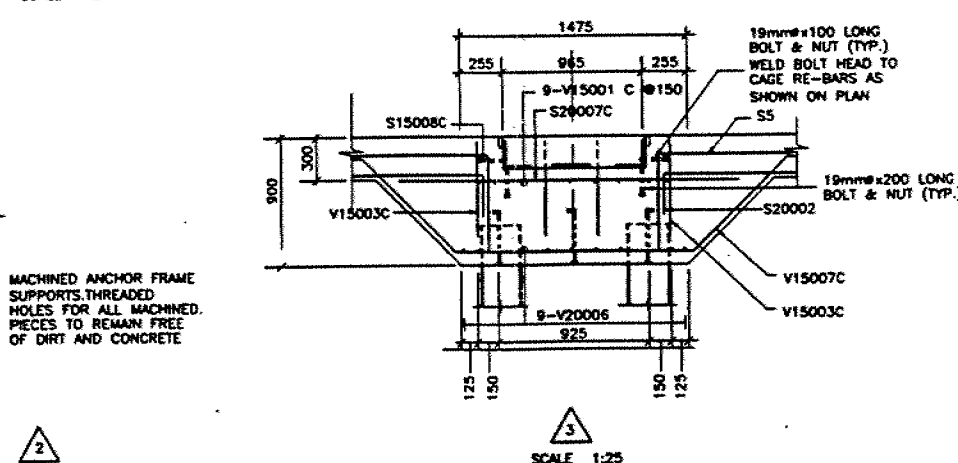




PILE DATA HP 310x79			
NO.	APPROX. LENGTH	CUT OFF ELEV.	BAITER
4	14.30	49.400	NONE



**VAULT PLAN**  
**SCALE : 1=25**



15M BAR 450LG WITH 75x75x12 PLATE AT END  
(PLATE TO BE EPOXY COATED) WELDED TO  
SEPERATE GRIDS AND KEEP RE-BARS ABOVE  
BASE OF EXCAVATION. 12 REQUIRED

## METRIC

DIMENSIONS ARE IN METRES  
AND/OR MILLIMETRES  
UNLESS OTHERWISE SHOWN

PLATE No  
CONT No .  
WP No. 2501-86-00

SORTER SCALE PIT

134

**M Marshall Macklin Monaghan Limited**  
Consulting Engineers, Planners  
275 Duncan Mill Road, Don Mills, Ont. 449-2500

## REINFORCING BAR SCHEDULE

Vault	Bar	Schedule
01	01	01
02	02	02
03	03	03
04	04	04
05	05	05
06	06	06
07	07	07
08	08	08
09	09	09
10	10	10
11	11	11
12	12	12
13	13	13
14	14	14
15	15	15
16	16	16
17	17	17
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94	94	94
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96	96	96
97	97	97
98	98	98
99	99	99
100	100	100

[illegible]

SLAB	BAR	SCHEDULE
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[illegible]

### GENERAL NOTES

CHECK ALL DIMENSIONS AND REPORT ANY DISCREPANCIES BEFORE PROCEEDING WITH WORK. DRAWING NOT TO BE SCALE.  
REFER TO MECHANICAL AND ELECTRICAL DRAWINGS FOR SIZE AND LOCATION OF FLOOR, WALL AND OPENINGS. COORDINATE OPENINGS AS REQUIRED BY MANUFACTURER OF SCALE EQUIPMENT.  
ALL STANDARDS REFERRED TO ARE LATEST EDITIONS THEREOF.  
REFER TO SITE PLAN FOR LOCATION, ELEVATION & ALIGNMENT OF ANCHOR FRAME AND GROUND RODS TO BE SUPPLIED BY SCALE MANUFACTURER.

## FOUNDATION

VAULE AND APPROACH SLABS TO REST ON  
GRANULAR 'A' TYPE # COMPACTED TO 100 % STD. PROCTOR  
MAX. DRY DENSITY.

## CONCRETE AND REINFORCING STEEL

GLASS OF CONCRETE 30 MPa IN 28 DAYS. ALL CONCRETE EXPOSED TO WEATHER TO HAVE 4 TO 6 % AIR ENTRAINMENT. CONCRETE PROTECTION FOR REINFORCING STEEL (UNLESS OTHERWISE NOTED ON DRAWINGS OR IN SPECIFICATIONS).

- OTHERWISE NOTED ON DRAWINGS OR IN SPECIFICATIONS).
1. UNFORMED SURFACES IN CONTACT WITH EARTH : 75mm.
  2. FORMED SURFACES EXPOSED TO WEATHER OR IN CONTACT WITH EARTH : 40mm.  
FOR BARS 20MM AND LARGER  
FOR BARS 15M, 16mm WIRE AND SMALLER
  3. FORMED SURFACES NOT EXPOSED TO THE WEATHER OR EARTH :  
25mm FOR 35M BARS AND SMALLER IN SLABS, WALLS AND JOISTS.

WALLS AND JOISTS.  
38mm FOR ALL OTHER REINFORCING.  
REINFORCING STEEL TO BE DEFORMED BARS CONFORMING TO  
THE REQUIREMENTS OF C.S.A. G30 SERIES. DETAILING,  
FABRICATION AND PLACING OF REINFORCEMENT TO CONFORM  
TO CAN3A23.1, CONCRETE MATERIALS AND METHODS OF  
CONCRETE CONSTRUCTION.

REINFORCING STEEL : YIELD STRENGTH 400 Mpa  
PROVIDED WALLS FOR DUCTS, PIPING AND CONDUITS  
THROUGH ALL LEVEL SLABS AS BASED ON THE  
MECHANICAL DRAWINGS OR AS REQUIRED BY OTHER TRADES.  
LOCATIONS AND DETAILS OF CONSTRUCTION JOINTS TO BE  
ESTABLISHED WITH THE ENGINEER WELL IN ADVANCE OF  
CONSTRUCTION.  
OPENINGS TO BE FORMED AS SHOWN ON THE DRAWINGS  
PRIOR TO STEEL PLACEMENT. FOR ADDITIONAL OPENINGS  
NOT SHOWN ON THE STRUCTURAL DRAWINGS, CONSULT WITH  
THE ENGINEER BEFORE PLACING CONCRETE. DO NOT CUT  
OPENINGS OR HOLES AFTER CONCRETING UNLESS SPECIFICALLY  
REVIEWED BY THE ENGINEER.  
WELD VAULT REINFORCING BARS TOGETHER TO FORM CAGE  
AS DETAILLED

## LOOP SENSORS

LOOP SENSORS CONSISTING OF 3 TURNS 14 WIRE IN PLASTIC RIGID CONDUIT TO BE PLACED DURING CONCRETING. CHAIRS SUPPORTING THE LOOPS TO BE OF NON-MAGNETIC MATERIAL. THE FINISHED SURFACE OF THE SLAB SHALL NOT VARY MORE THAN 3mm UNDER A 3.000m LONG STRAIGHT EDGE.

## CO ORDINATES

	STA.	N	E
WP5	10+735.216	5001038.090	227465.000
WP6	10+750.000	5001047.326	227476.541
WP7	10+769.782	5001056.686	227491.986