PROJECT

CALCULATION SHEET

FOR

SHEET PILE
FOR PIT SIZING 7.5W x 23.0L x 3.5D

A	19 Nov'2008	For Review			
REV.	**DATE**	**DESCRIPTION**	**BY**	**CHK**	**APP**

Revision History Sheet

03 Nov 08	1. Verified and design sheet pile type III use for pit sizing 9.00Wx9.50x5.95D,7.00Wx7.50Lx5.75D AND 7.60Wx13.90Lx5.75D. 2. Verified and design bracing, one layer at elev. -0.50 from top of sheet pile as strut member

CONTENT

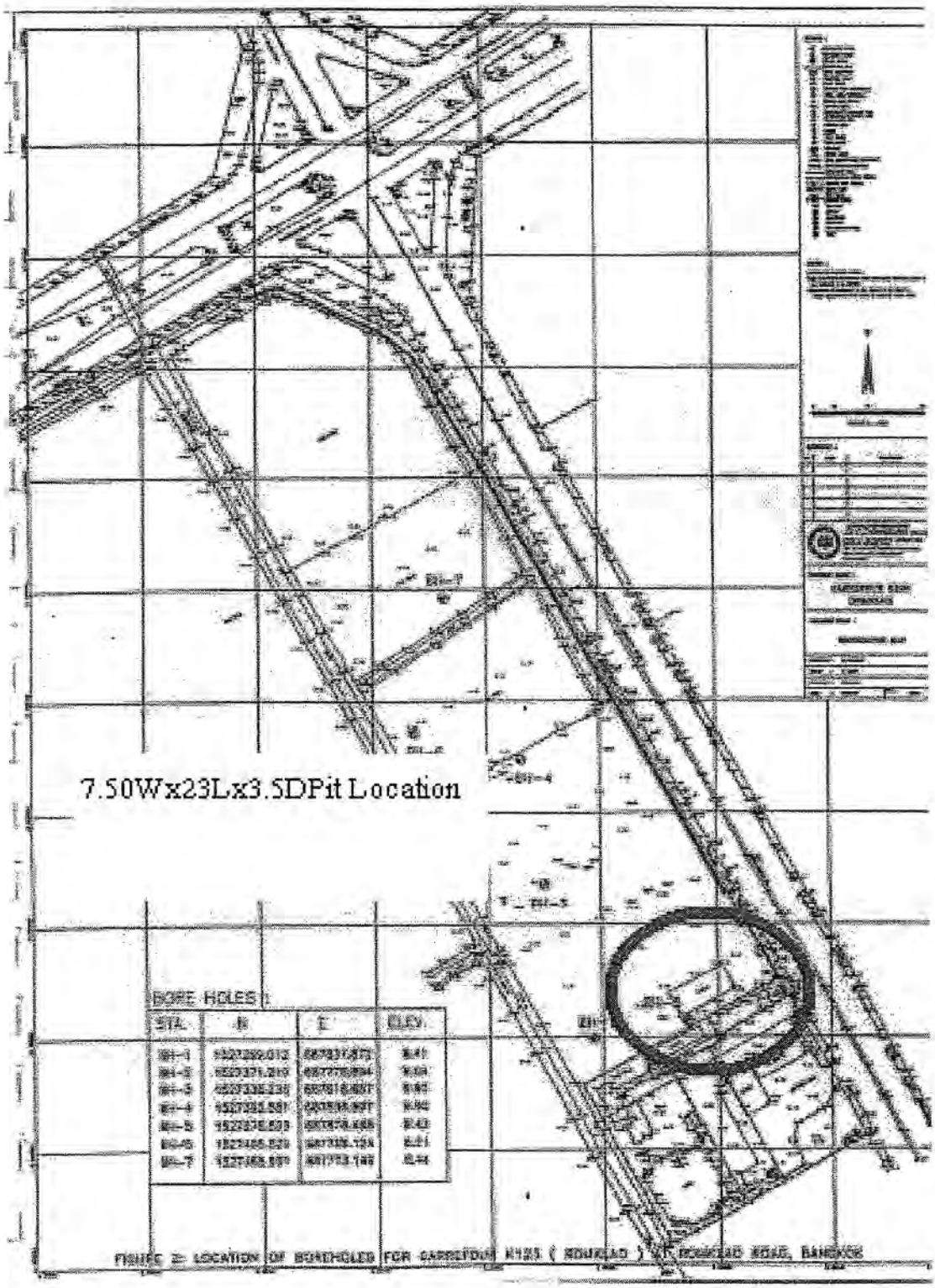
1.0 DESIGN PHILOSOPHY

1.1 SCOPE OF WORK

1.1.1 Verified and design sheet pile type III use for pit sizing 7.5W x 23.0L x 3.5D

1.1.2 Verified displacement at top sheet pile.

1.2 LOCATION FOR CALCULATION FOUNDATION/STRUCTURE



2.0 CODES AND STANDARDS

2.1 DESIGN CODES

AASHTO	American Association of Highway Transportation Officials
ACI	American Concrete Institute
ACPA	American Concrete Pipe Association
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ANSI	American National Standard Institute
API	American Petroleum Institute
ASCE	American Society of Civil Engineering
NFPA	National Fire Protection Association
OSHA	Occupational Safety and Health Administration
RCSC	Specification for Structural Joints Using ASTM A325 and A490 Bolts
SJI	Steel Joist Institute
UBC	Uniform Building Code

2.2 MATERIAL STANDARDS AND TESTINGS

ASTM	American Society for Testing and Materials
AWS	American Welding Society
PCA	Portland Cement Association
TIS	Thai Industrial Standard
JIS	Japanese Industrial Standard

3.0 PROJECT SPECIFICATIONS

3.1 PROJECT SPECIFICATION

4.0 MATERIALS FOR CONSTRUCTION

4.1 MATERIAL FOR CONSTRUCTION

Lean Concrete	: fc' = 180 Kg/cm2
Structural Concrete	: fc' = 280 Kg/cm2
Reinforcing Bar (DB)	: F_y = 4000 Kgcm2, SD40 of TIS-24
Reinforcing Bar (RB)	: F_y = 2450 Kg/cm2, SR24 of TIS-24
Structural Steel	: F_y = 2450 Kg/cm2, ASTM A36 or JIS G3101 SS400
Anchor Bolt	: ASTM A36 (Hot Dip Galvanized)
High Strength Bolt	: ASTM A325 (F8.8T) (Hot Dip Galvanized)

5.0 DESIGN CONCEPT AND ANALYTICAL MODEL

5.1 DESIGN CONCEPT

This calculation document contains the analysis and design of the steel and steel sheet pile members, SP-type III 400x125x13 min. for underground work at Carrefour K123 Project Romklao, Bangkok, Thailand.

This calculation is cover 1 pits as 7.5Wx23.0Lx3.50D. The max. depth of pit is EL. -3.50 m. from elevation ± 0.000 top of sheet pile. The stage of construction were excavation sequence that considered displacement of sheet pile in each stage.

The analysis and design of this will cover the following items:

- The plaxis 7.2 is used in sheet pile analysis of soil mechanics, both steel sheet pile and soil are assumed to be elastic materials.
- Soil parameters are obtained from soil investigated method of testing to find out water unit weigth, sieve analysis, N-SPT, undrained shear strength and atterberg test by STS Instrucment company limitedAs BH-5

• Supper-structure	:	-
• Sub-structure	:	Steel structure, Not used this pit
• Foundation	:	Steel sheet pile type III

6.0 STRUCTURAL LOADING CRITERIA

Structural loading criteria shall follow project specification and soil parameters from soil test are explanation in this calculation report.

7.0 LOAD COMBINATION

FOR CHECK SHEET PILE CAPACITY AND DESIGN OF STEEL STRUCTURE MEMBER

Working Load Combinations shall be used in sheet pile check and member design of steel structure. Working Load Combinations are shown in the following table.

Load Combination for Check Pile Capacity and Design of Steel Structure Member

Loading Condition	Working Load Combinations
1).Operating Condition	Gravity Load (Selfweight + Operated load 500 kg/sq.m.) Gravity Load + Struts load (From plaxis analysis)

8.0 SUPPORT AND CONNECTION TYPE

- **SUPPORT AND CONNECTION TYPE**

Struts member supports	: Pinned (Simply Support)
All Framing Members	: Rigid/Pinned Connection
All Non-Framing Secondary Members	: Pinned (Simply Support)

- **DEFLECTION CRITERIA AND ALLOWABLE EFFECTIVE LENGTH**

The maximum allowable deflection in beams/girders are defined as follows (where, L = theoretical span of beam.

- **VERTICAL DEFLECTION**

The deflection of structural steel members shall not exceeding the following values:

Longitudinal and transverse pipe rack beam L/250

Note that; when member is cantilever, replace "L" by "2L" to archive same allowable deflection with simple span.

- **ALLOWABLE EFFECTIVE LENGTH (KL)**

Allowable limitation of the radio of effective length (kl) to the appropriate radius of gyration (r) is tabulated below;

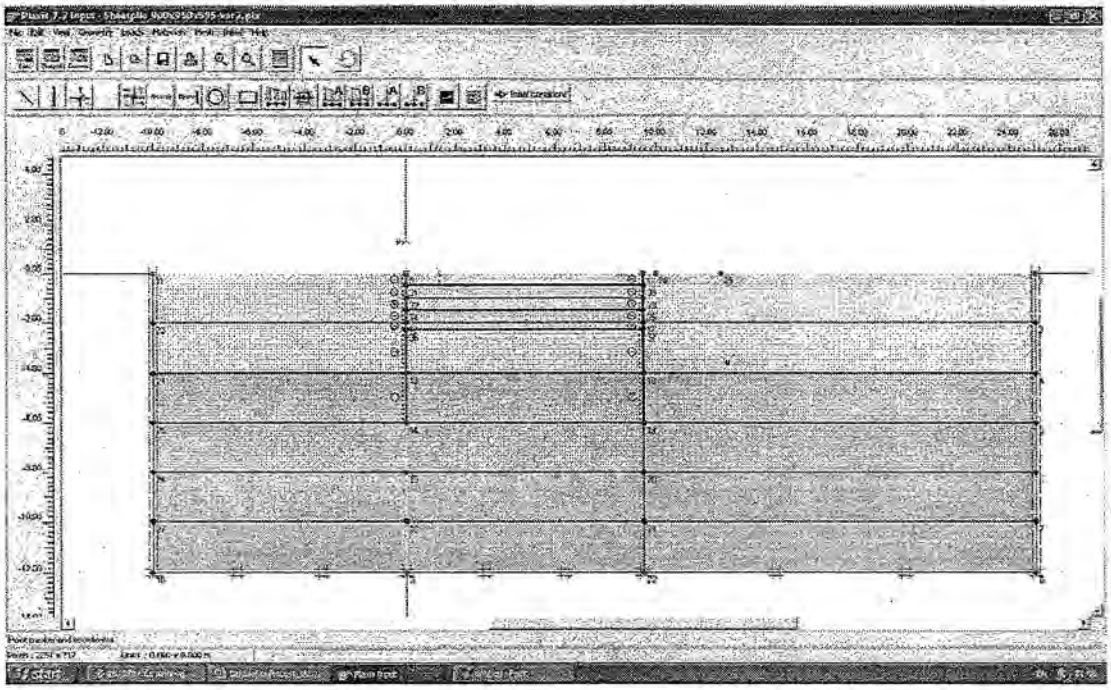
Main compressive members $kl/r \leq 200$

Main tension members $kl/r \leq 300$

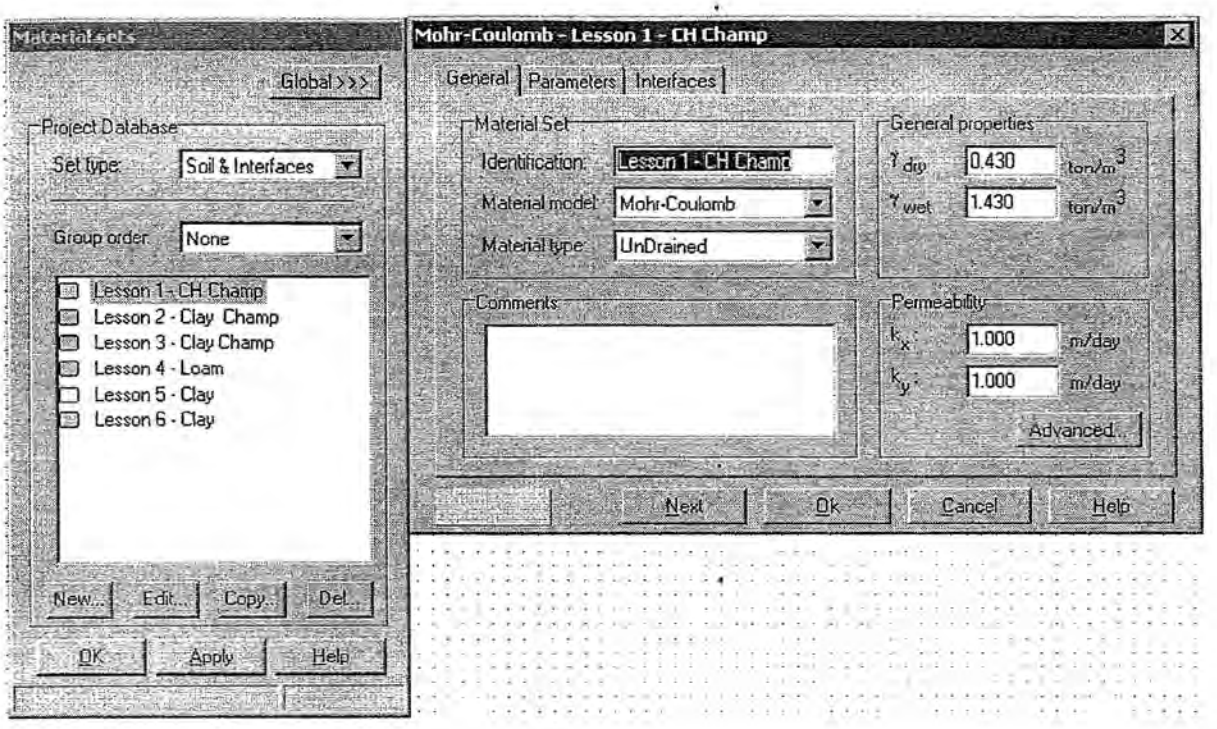
9.0 SHEET PILE CALCULATION

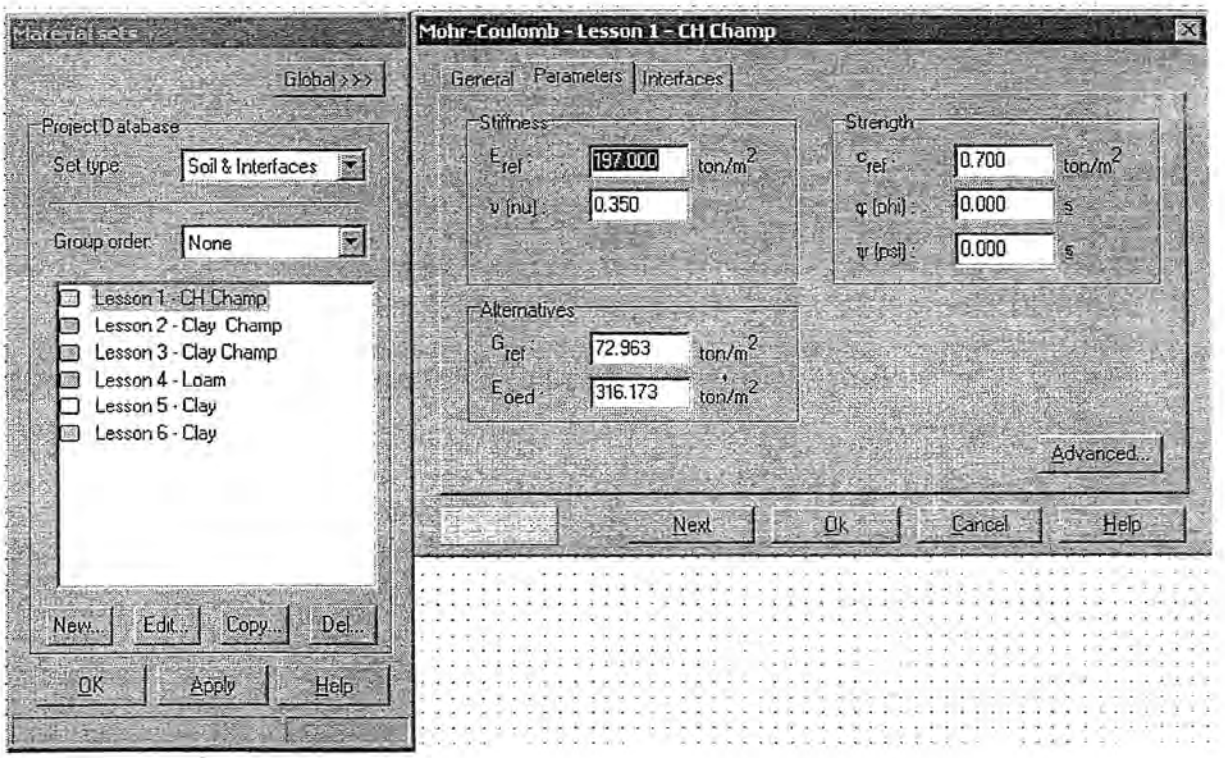
1.1 SHEET PILE CALCULATION

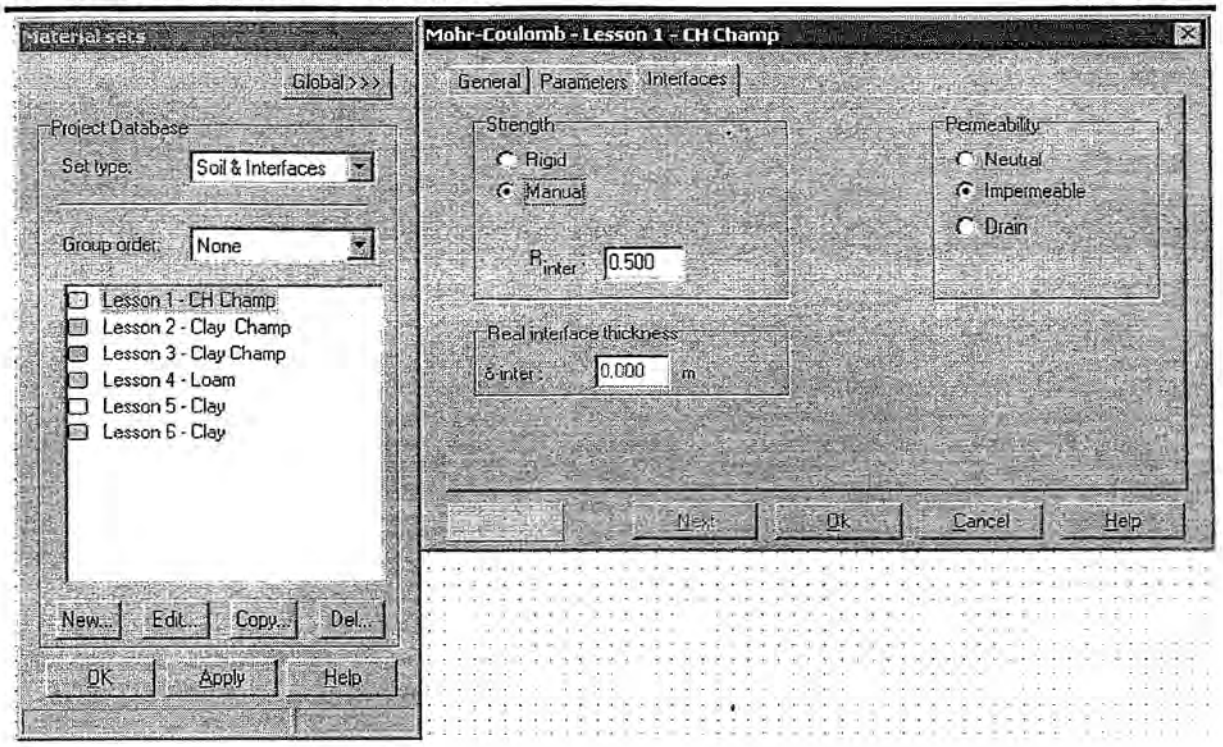
- Geometry line and material properties
  Open cut EL. -2.30 m. from top of sheet pile and 1st layer brace.



- 1st layer soil properties



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Project Database
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Soil & Interfaces
Group order:
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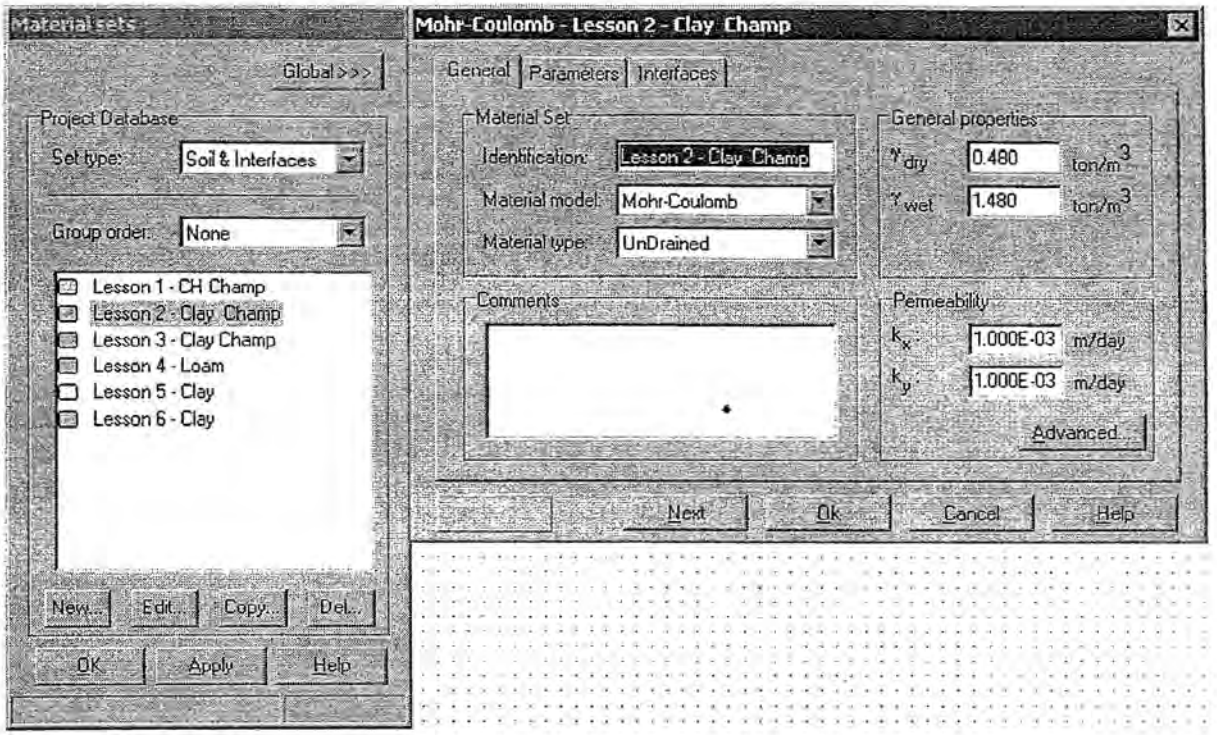
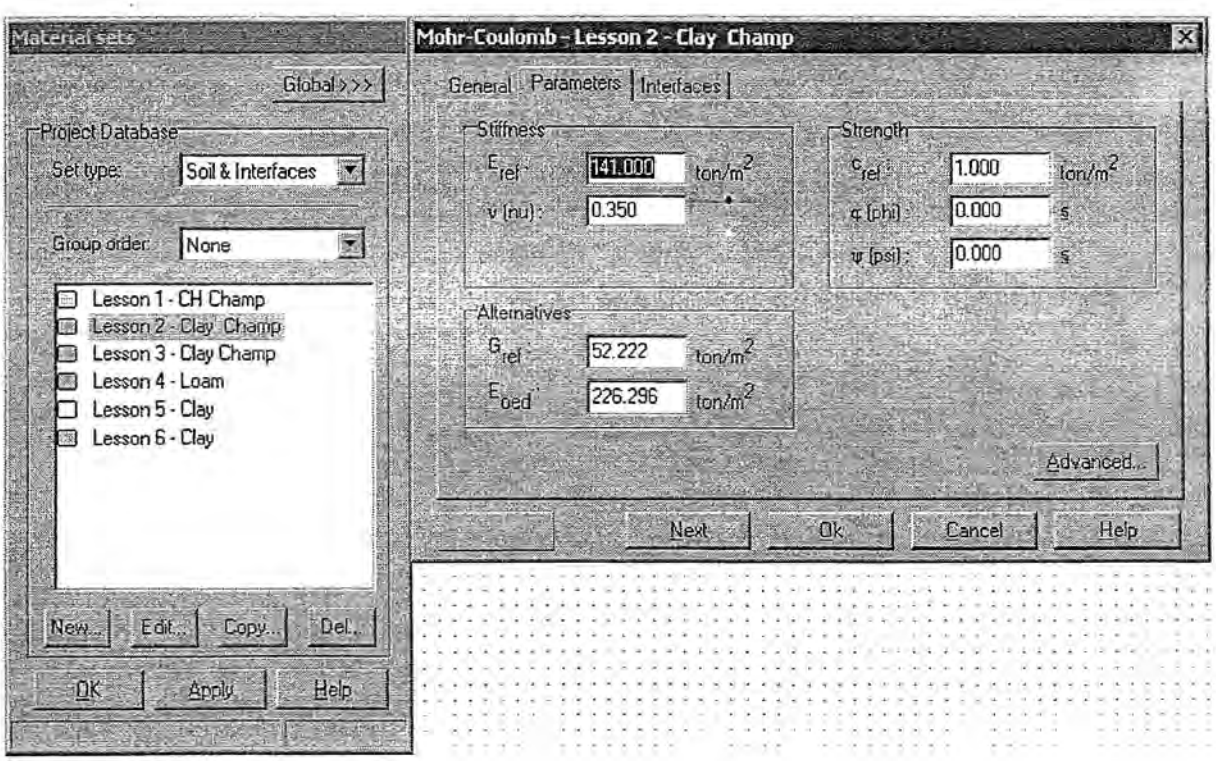
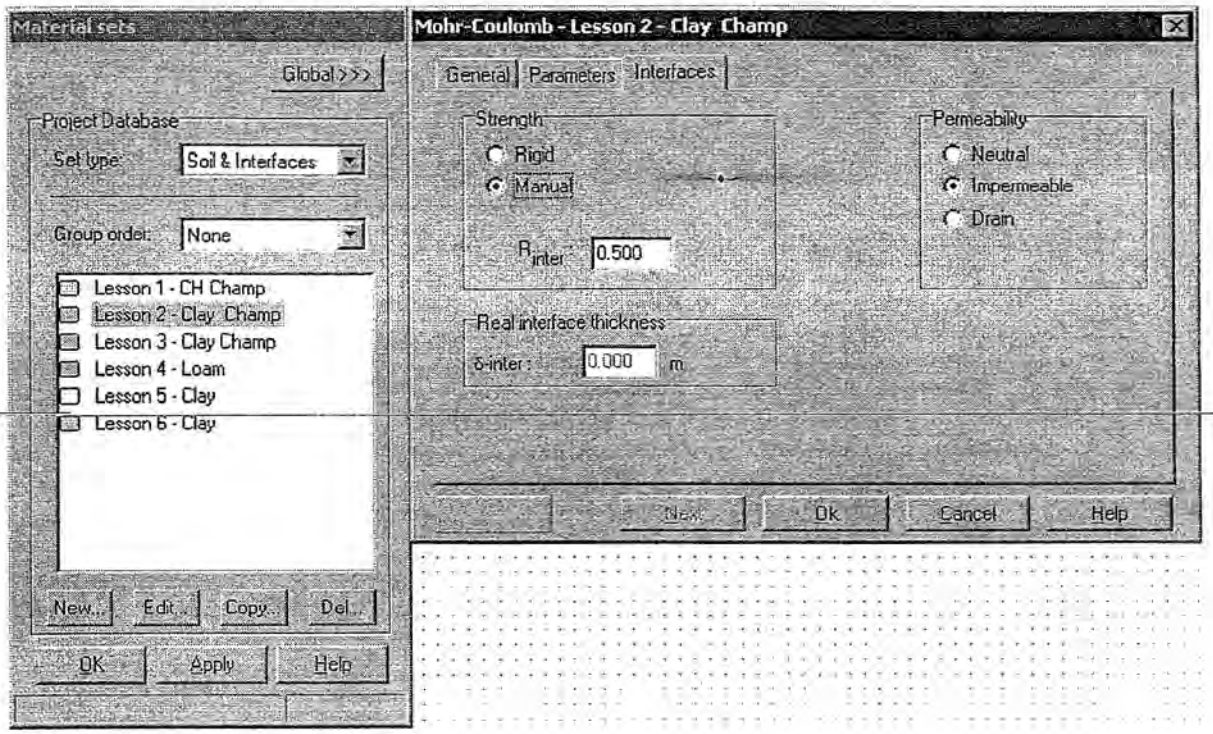
Lesson 1 - CH Champ
Lesson 2 - Clay Champ
Lesson 3 - Clay Champ
Lesson 4 - Loam
Lesson 5 - Clay
Lesson 6 - Clay
New...
Edit...
Copy...
Del...
OK
Apply
Help
Mohr-Coulomb - Lesson 1 - CH Champ
General
Parameters
Interfaces
Strength
Rigid
Manual
R inter : 0.500
Permeability
Neutral
Impermeable
Drain
Real interface thickness
δ inter : 0.000 m
Next
Ok
Cancel
Help

- 2nd layer soil properties



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Lesson 4 - Loam
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Permeability
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Impermeable
Drain
Real interface thickness
δ-inter :
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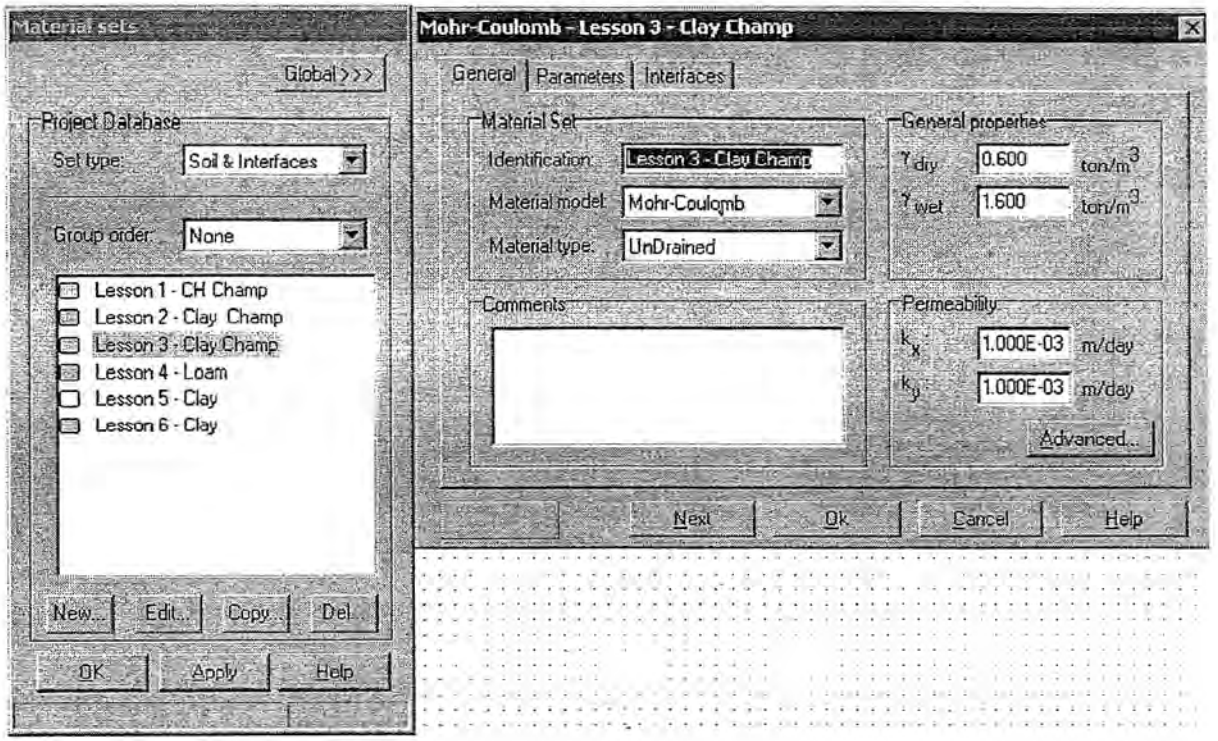
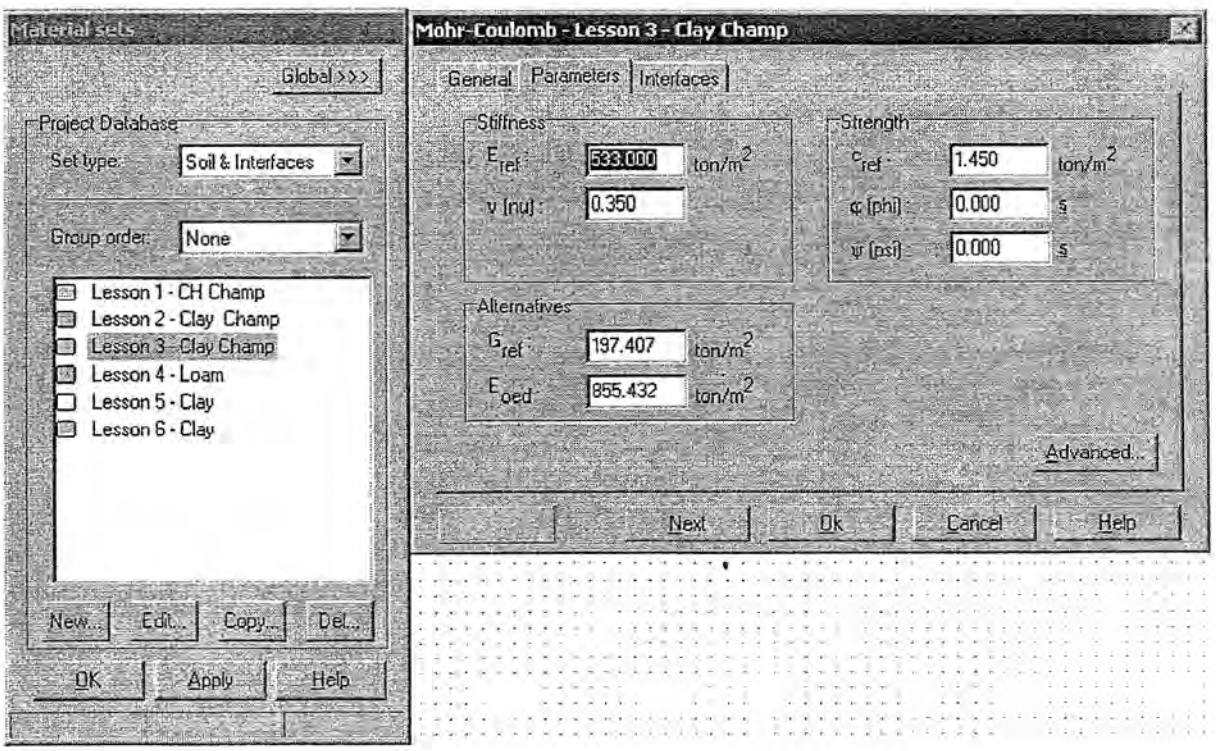
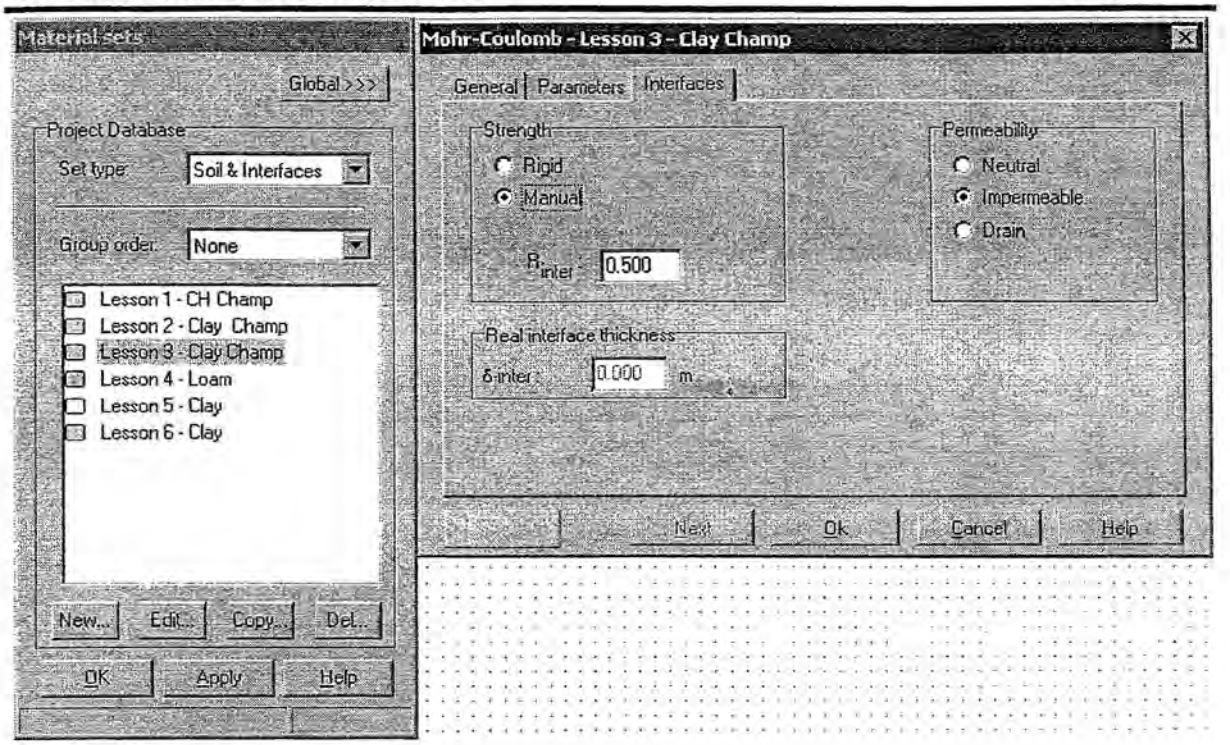
New..
Ok
Cancel
Help

- 3rd layer soil



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Global >>>
Project Database
Set type:
Soil & Interfaces
Group order:
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Lesson 1 - CH Champ
Lesson 2 - Clay Champ
Lesson 3 - Clay Champ
Lesson 4 - Loam
Lesson 5 - Clay
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New...
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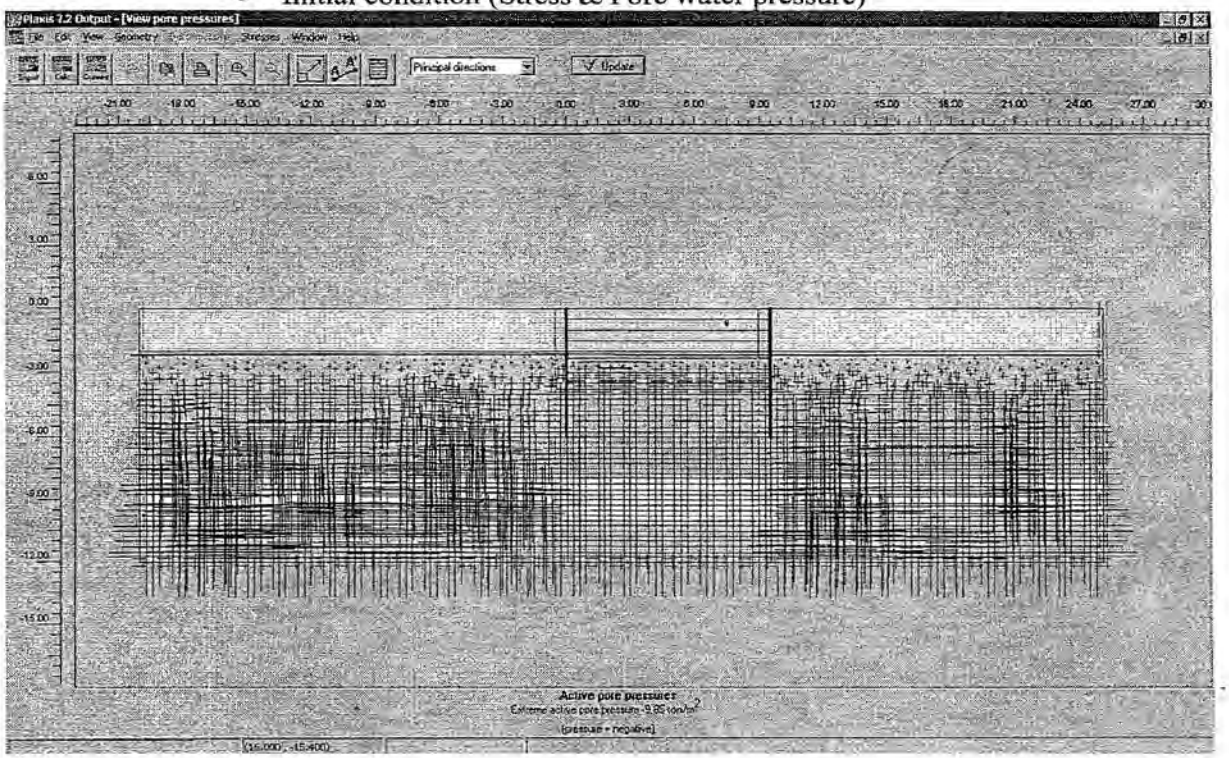
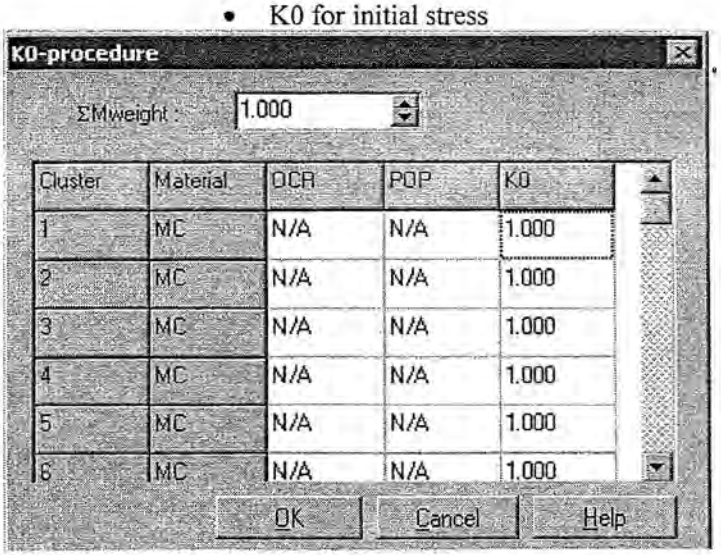
0.500
Permeability
Neutral
Impermeable
Drain
Real interface thickness
δ inter
0.000
m
Next
Ok
Cancel
Help

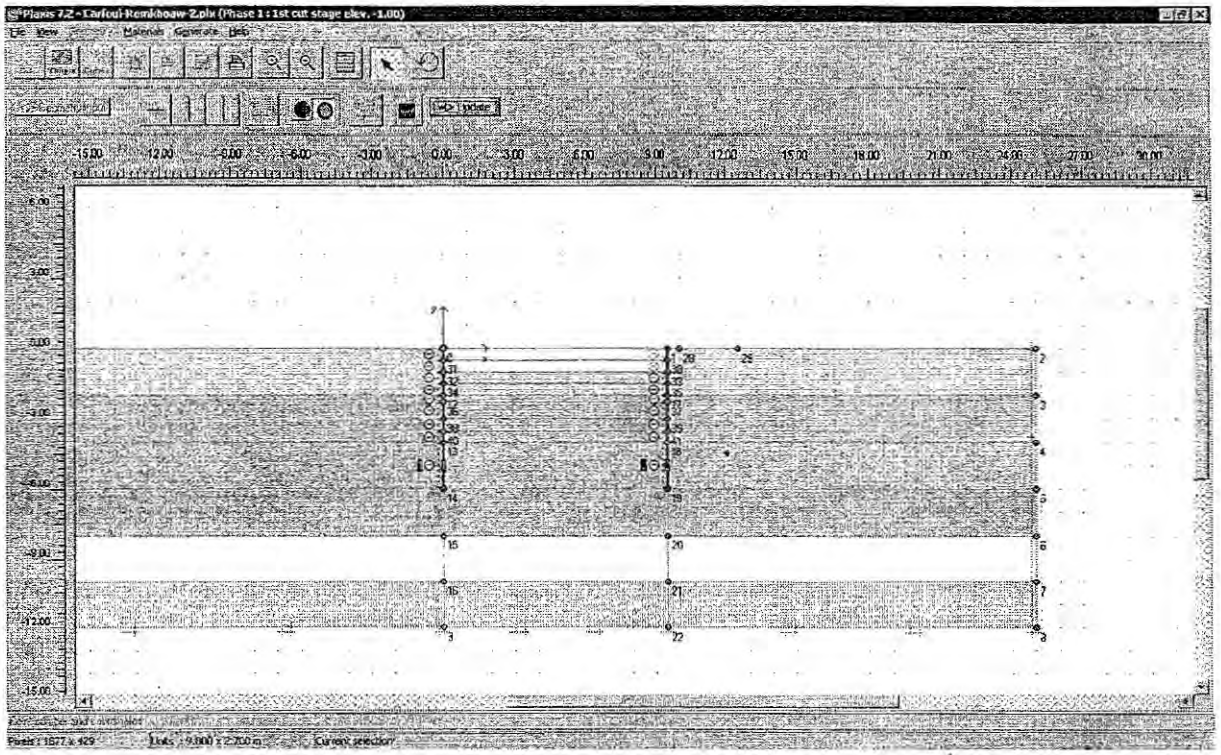
- Generate soil mechanics
- Initial condition (Stress & Pore water pressure)



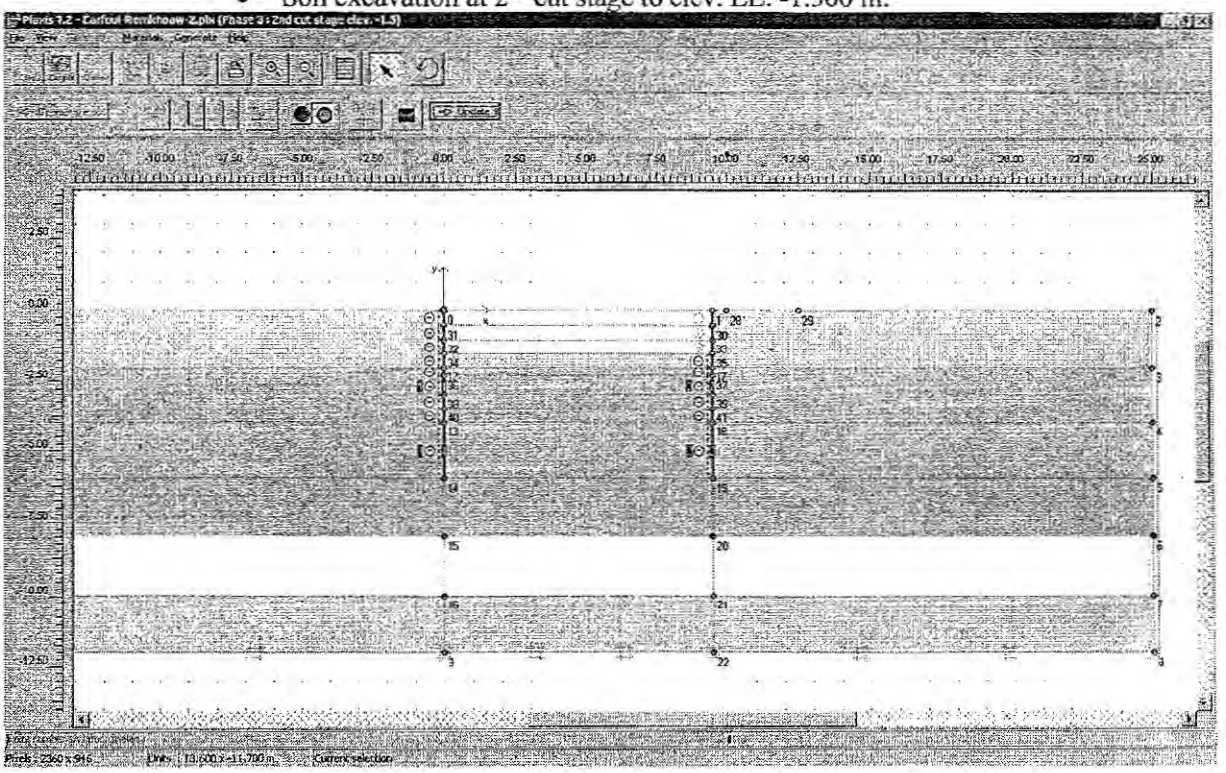
- K0 for initial stress



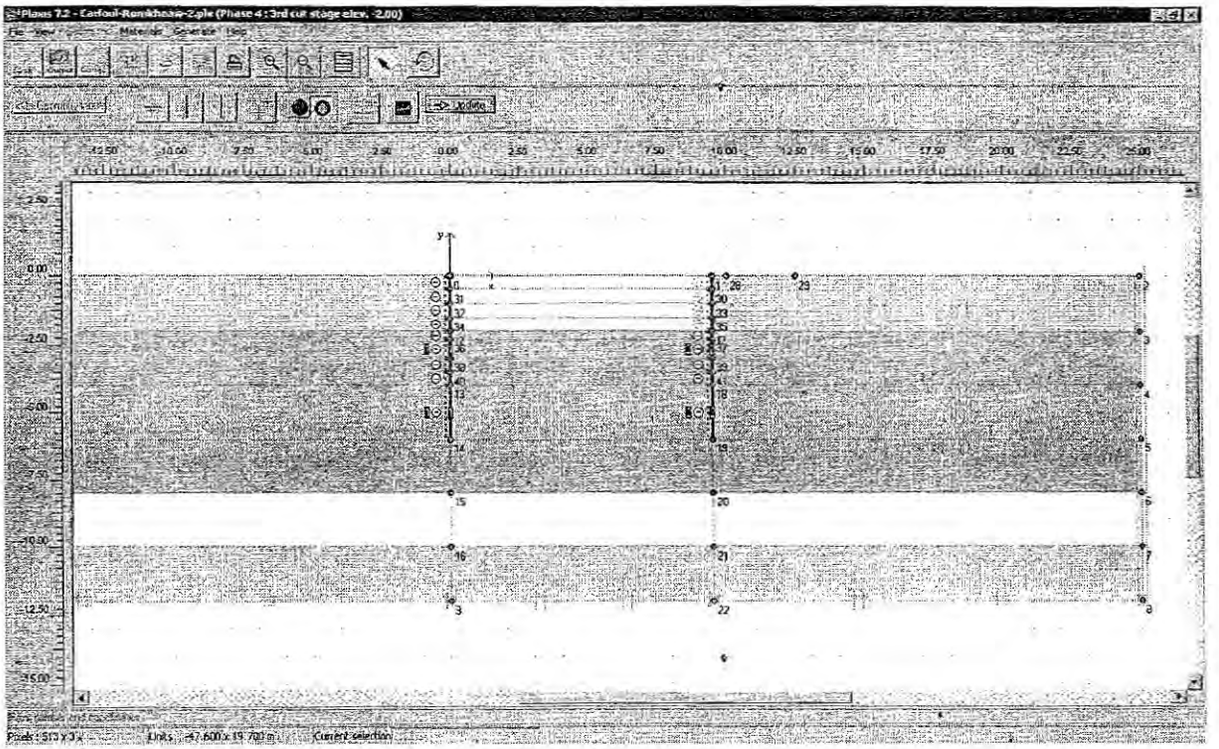
- Soil excavation at 1st cut stage to EL. -1.50 m.



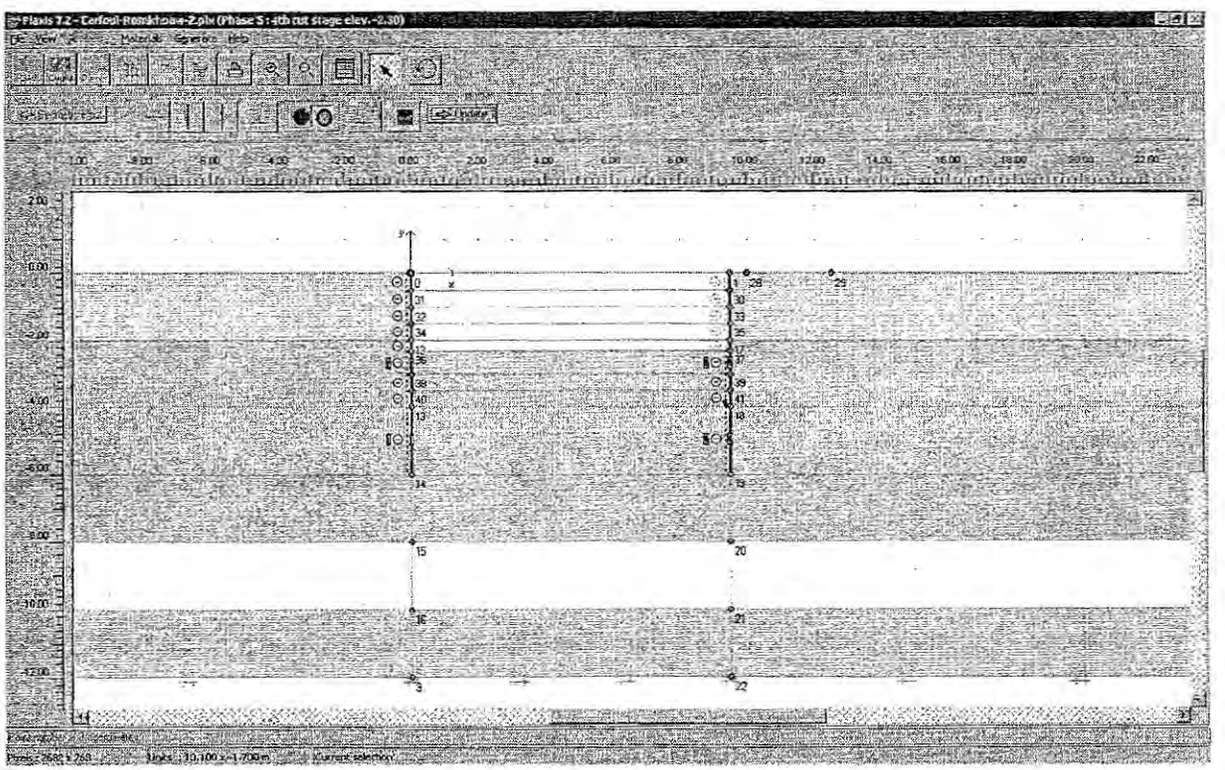
- Soil excavation at 2nd cut stage to elev. EL. -1.500 m.



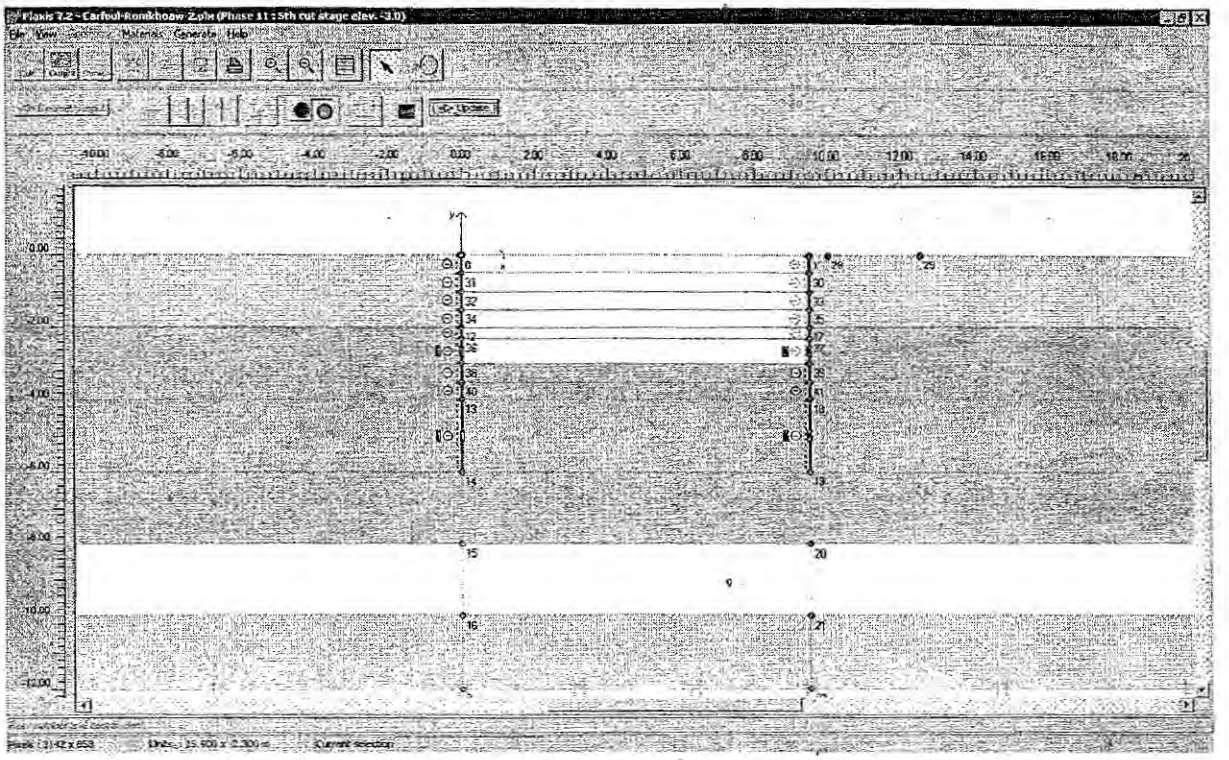
- Soil excavation at 3rd cut stage to elev. EL. -2.00 m.



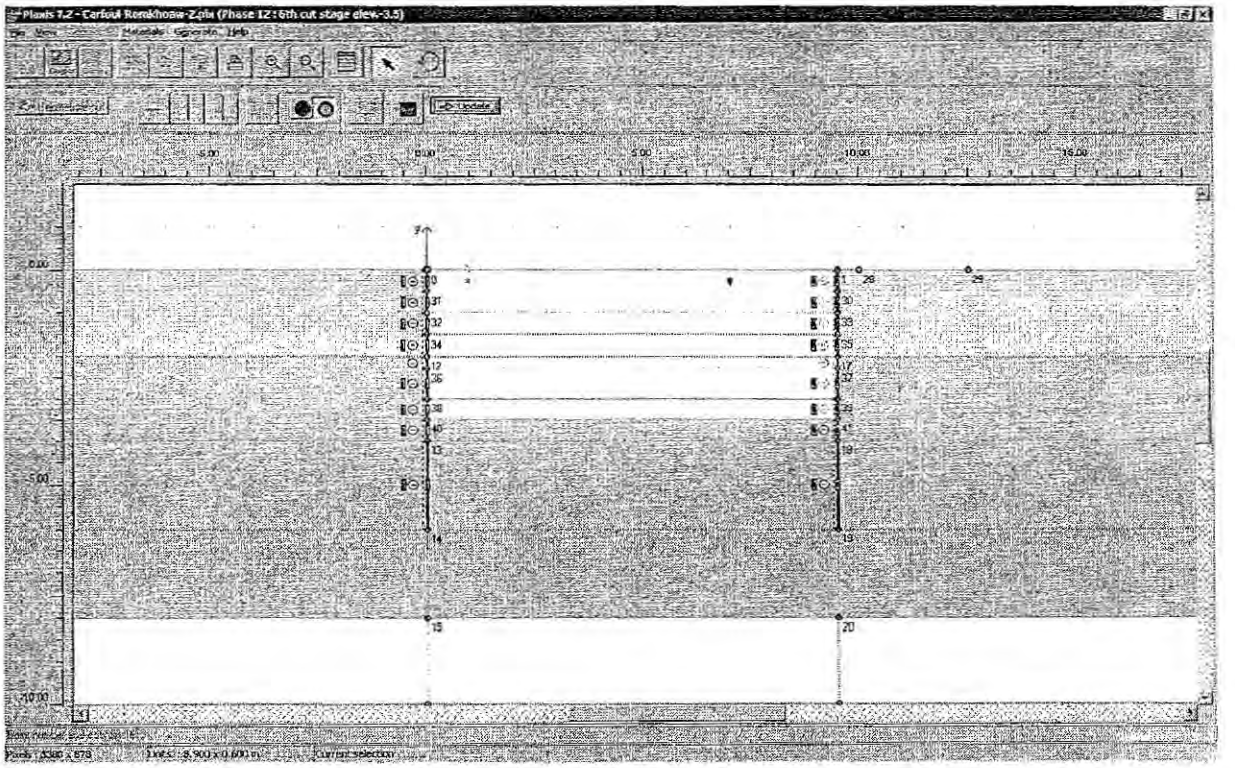
- Soil excavation at 4th cut stage to elev. EL. -2.30 m.



- Soil excavation at 5th cut stage to elev. EL. -3.00 m.

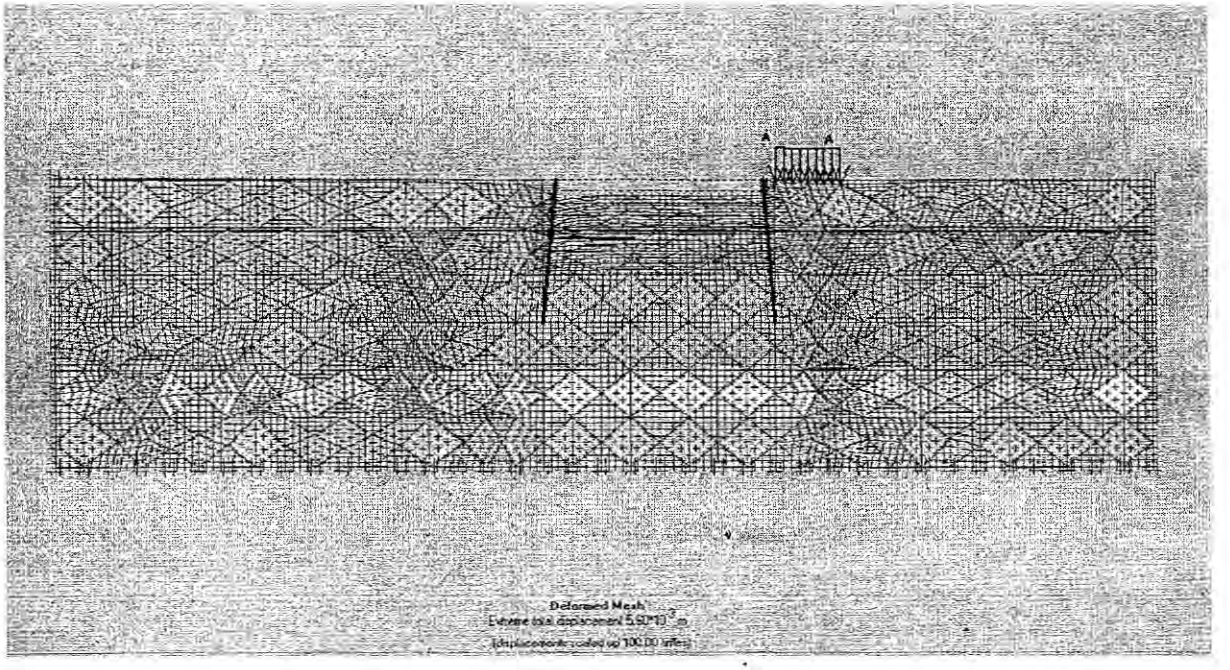


- Soil excavation at 6th cut stage to elev. EL. -3.50 m.

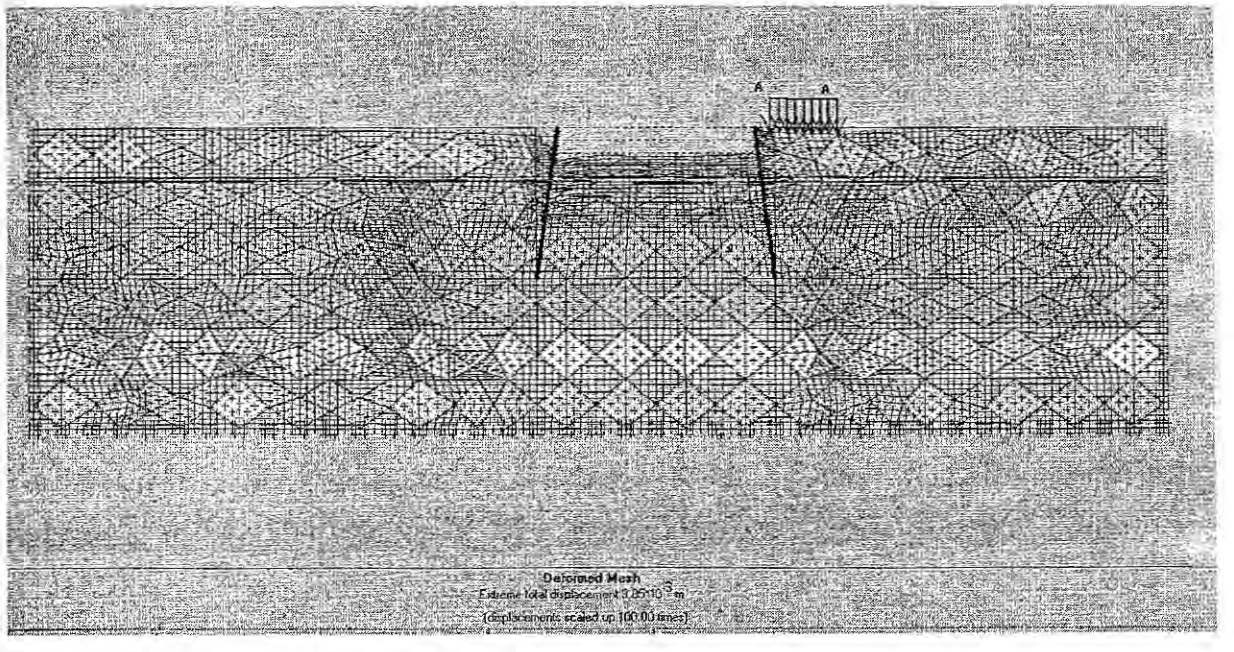


10.0 ANALYTICAL MODEL for sheet pile displacement

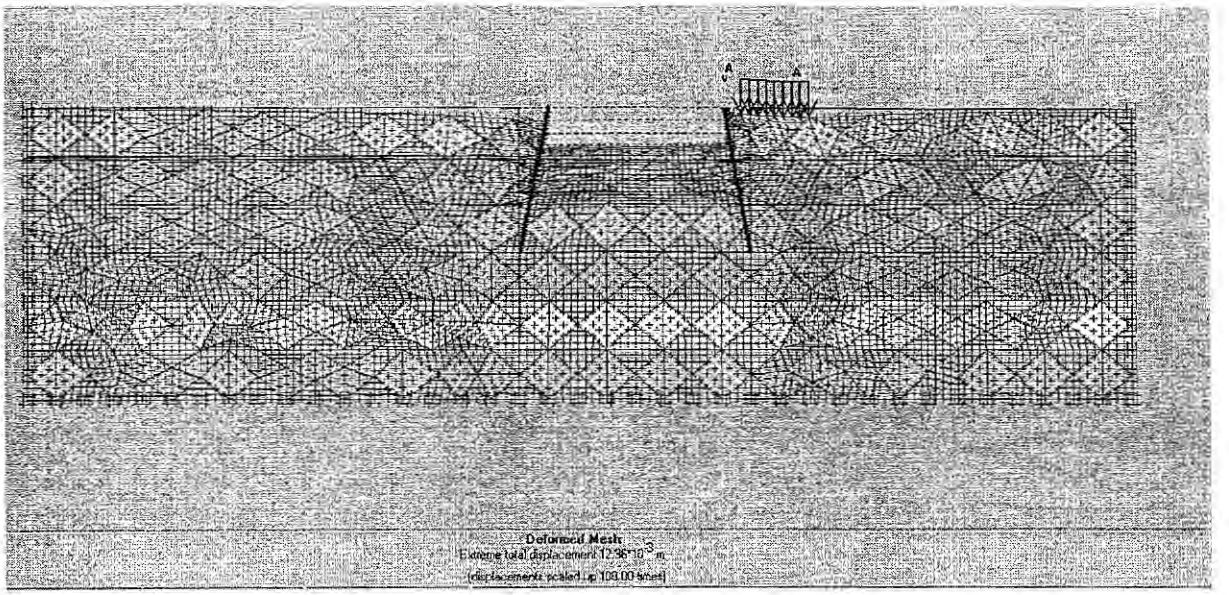
10.1.1 Pit sizing 7.5Wx23.0Lx3.50D, 1st Stage excavation



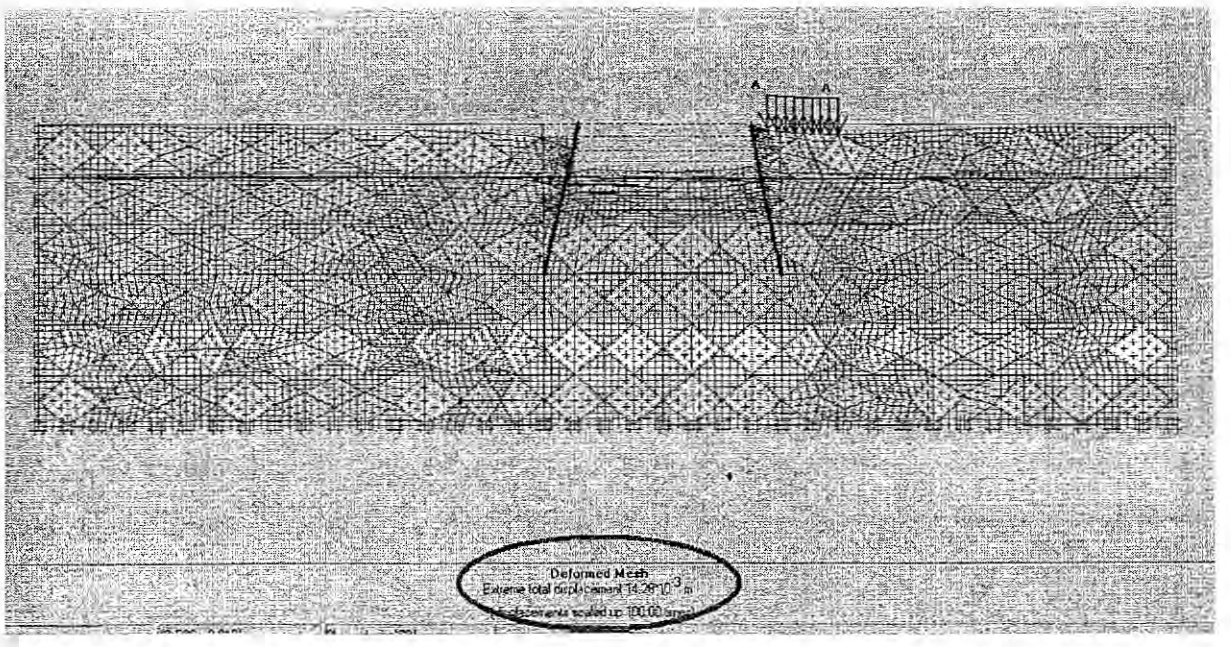
10.1.2 Pit sizing 7.00W x7.5Wx23.0Lx3.50D, 2nd Stage excavation



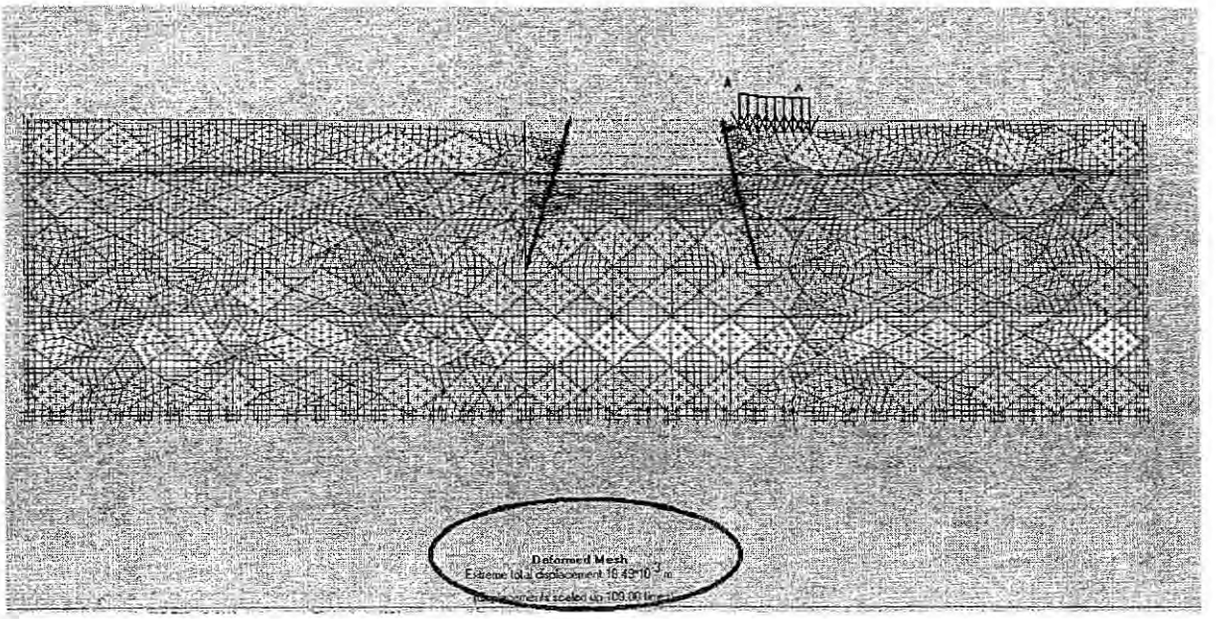
10.1.3 Pit sizing 7.00W x7.5Wx23.0Lx3.50D, 3rd Stage excavation



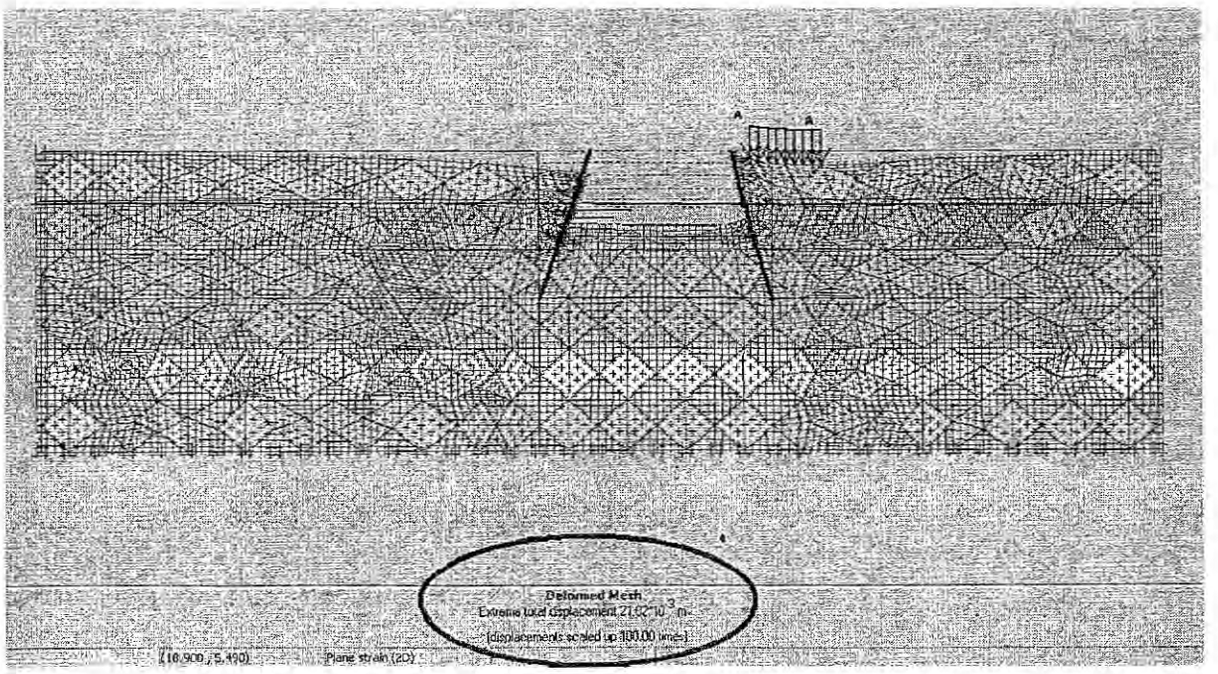
10.1.4 Pit sizing 7.00W x7.5Wx23.0Lx3.50D, 4th Stage excavation



10.1.5 Pit sizing 7.00W x7.5Wx23.0Lx3.50D, 5th Stage excavation

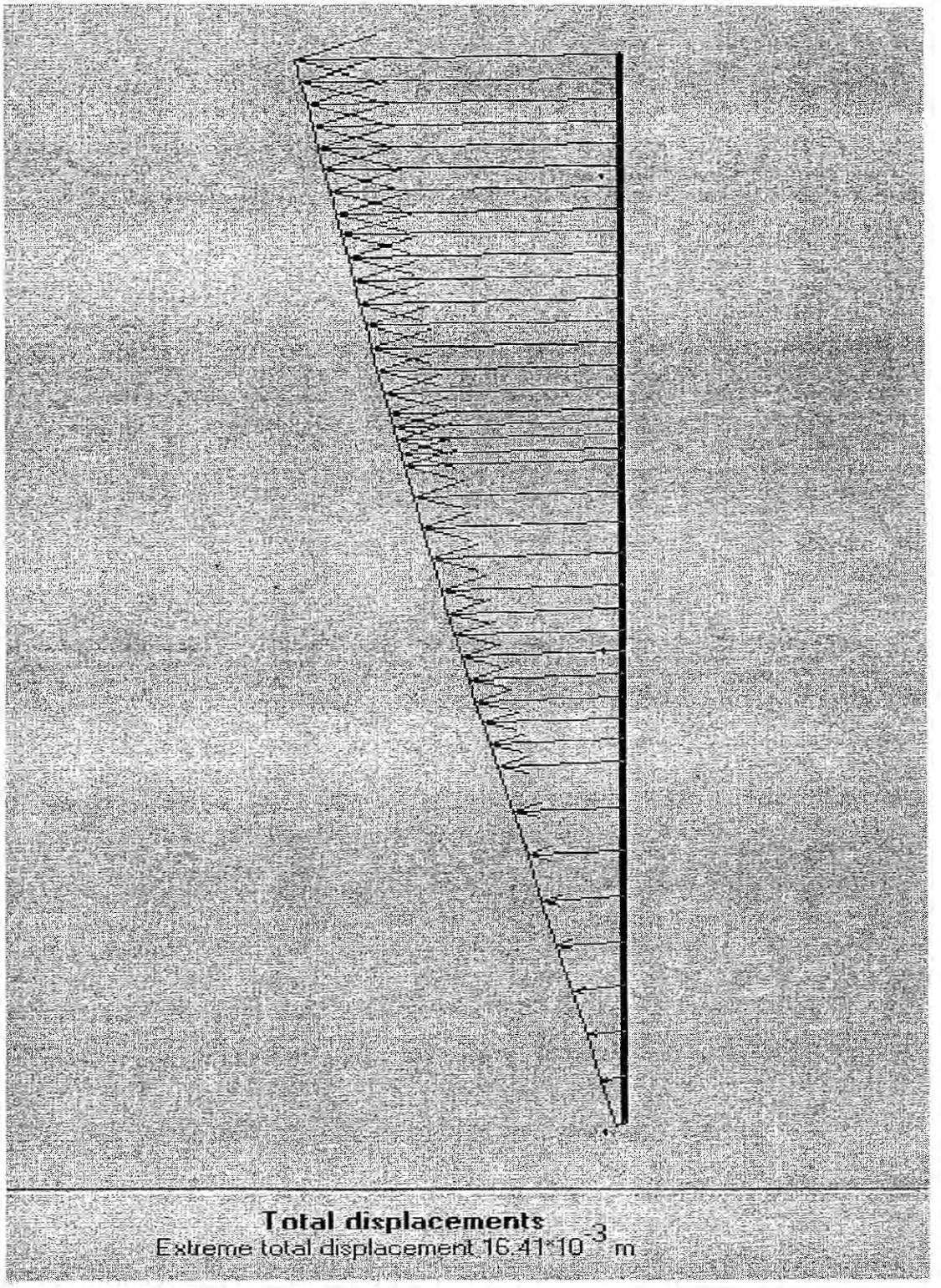


10.1.6 Pit sizing 7.00W x7.5Wx23.0Lx3.50D, 6th Stage excavation

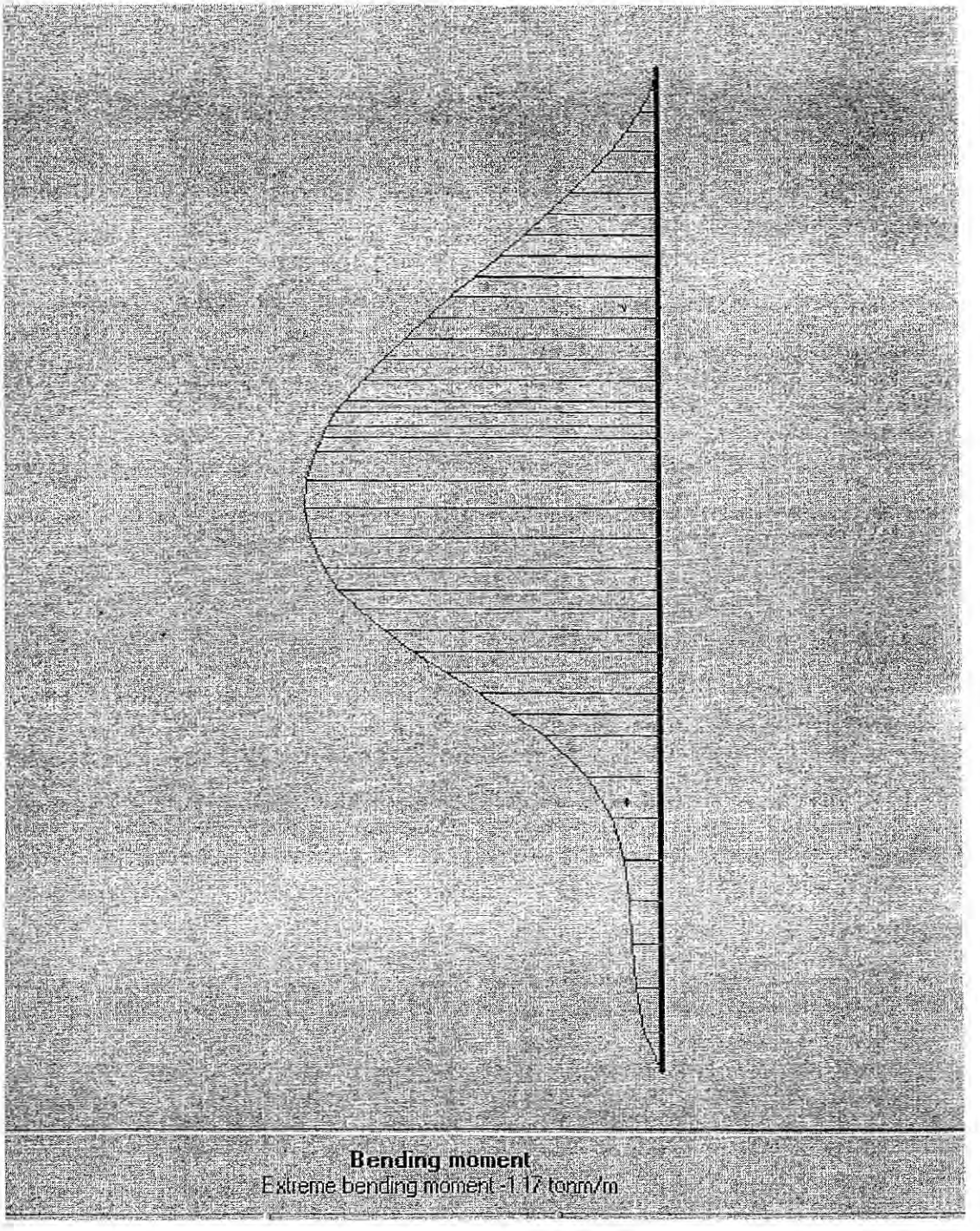


11.0 ANALYTICAL MODEL for Shear and Bending Moment Diagram

- Shear Diagram at Sheet pile



- Bending Moment Diagram



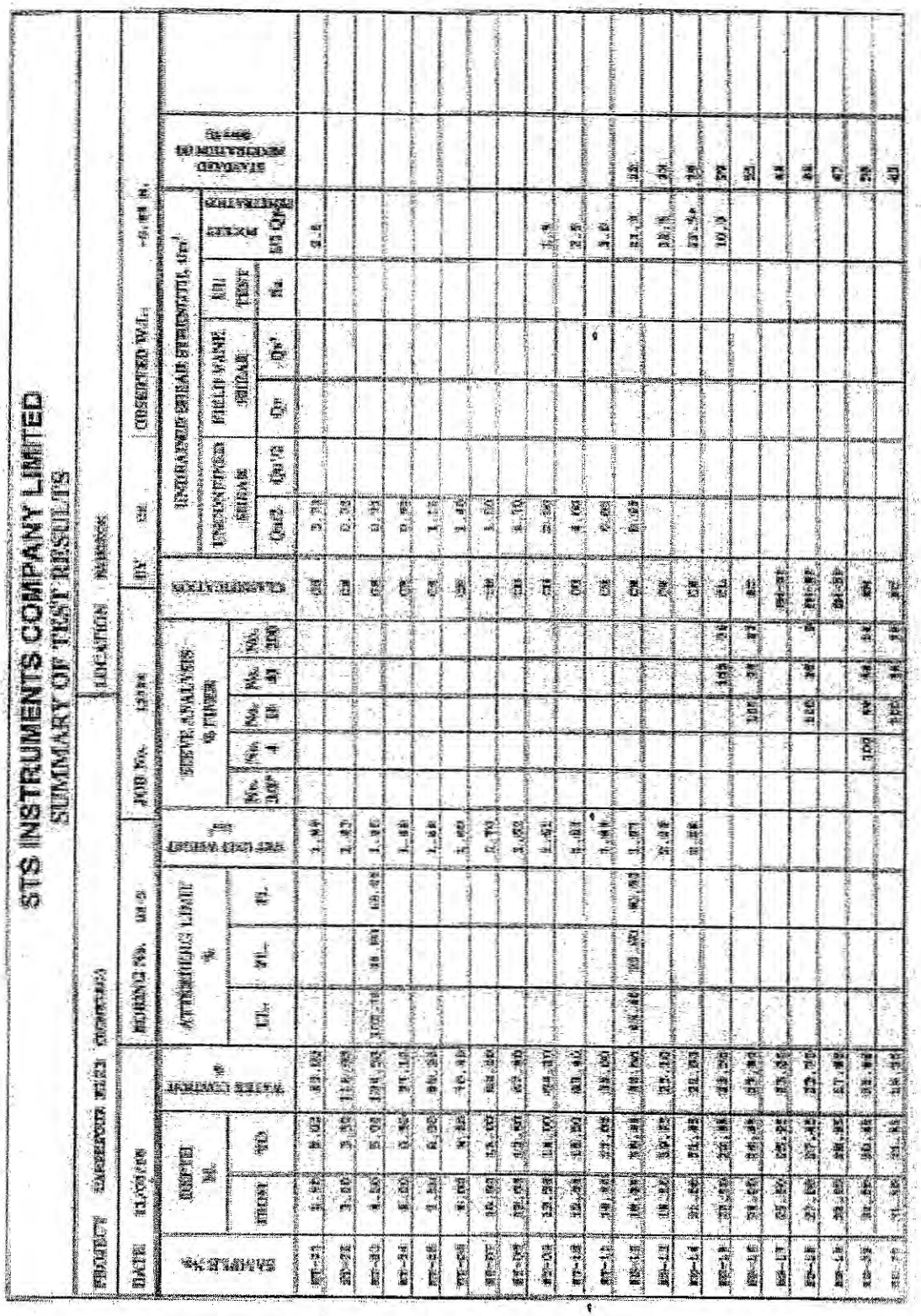
Section modulus required = $\frac{1.74*100}{0.60*2.400}$ = 120.83 cm.^{3}/m. < 223 cm.^{3}/m. of SP type III OK.

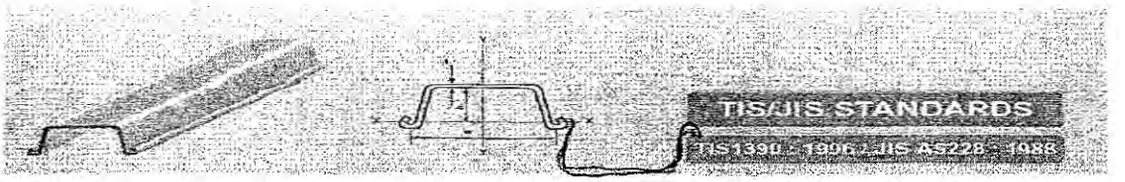
12.0 CONCLUSION

1) Sheet pile type III as follow TIS 1390:1996 or JIS A5228:1988 can used for all pits.
2) The maximum displacement at top sheet pile is 21.02 mm. < L/150 that is OK and details of displacement were shown as below;

Stage of construction	Elev. (m.)	Displacement at top of sheet pile (mm.)
1	-1.00	5
2	-1.50	8.55
3	-2.00	12.36
4	-2.30	14.28
5	-3.00	18.49
6	-3.50	21.02

13.0 REFERENCE SOIL REPORT





STEEL SHEET PILES (Grade SY295 or SY390)

Section	Dimensions			Sectional Area	Weight		Moment of Inertia		Section Modulus	
	w	h	t	per pile	per pile	per wall width	per pile	per wall width	per pile	per wall width
	mm	mm	mm	cm²	kg/m	kg/m²	cm⁴	cm⁴/m	cm³	cm³/m
	in	in	in	in²	lbs/ft	lbs/ft²	in⁴	in⁴/ft	in³	in³/ft
SP-IIIA	400	150	13.1	74.40	58.4	146	2,790.0	22,800	250.0	1,520.0
	15.7	5.91	0.516	11.53	39.2	29.9	67.0	167	15.3	28.3
SP-IIE	400	125	13.0	76.42	60.0	150.0	2,220.0	16,800	223.0	1,340.0
	15.7	4.92	0.512	11.85	40.3	30.7	53.3	123	13.6	24.9