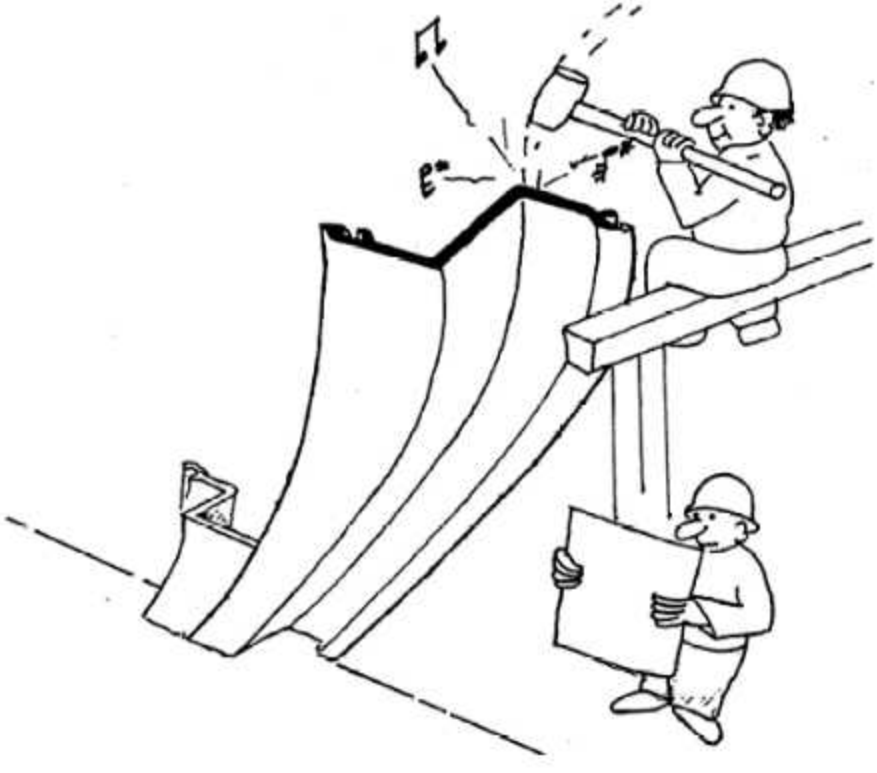
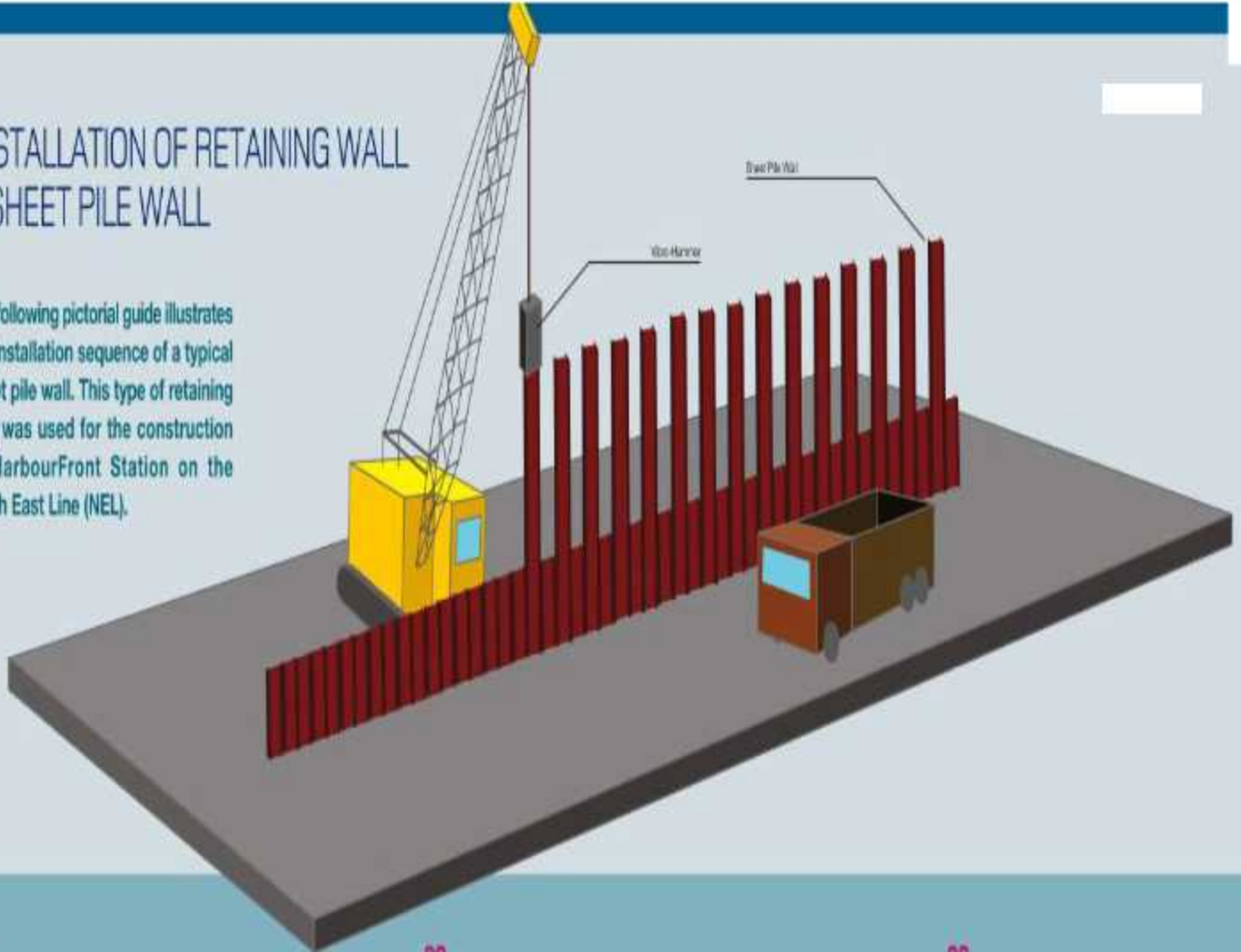
SHEET PILING



INSTALLATION OF RETAINING WALL - SHEET PILE WALL

The following pictorial guide illustrates the installation sequence of a typical sheet pile wall. This type of retaining wall was used for the construction of HarbourFront Station on the North East Line (NEL).



انواع منشات السند

Sheet Pile Wall (SPW)

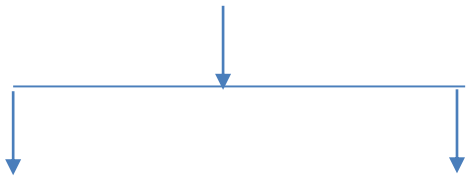
1-Type according to Materials

A-Timber B- Precast Rc. C- Steel

2-Type according to Structure Systems

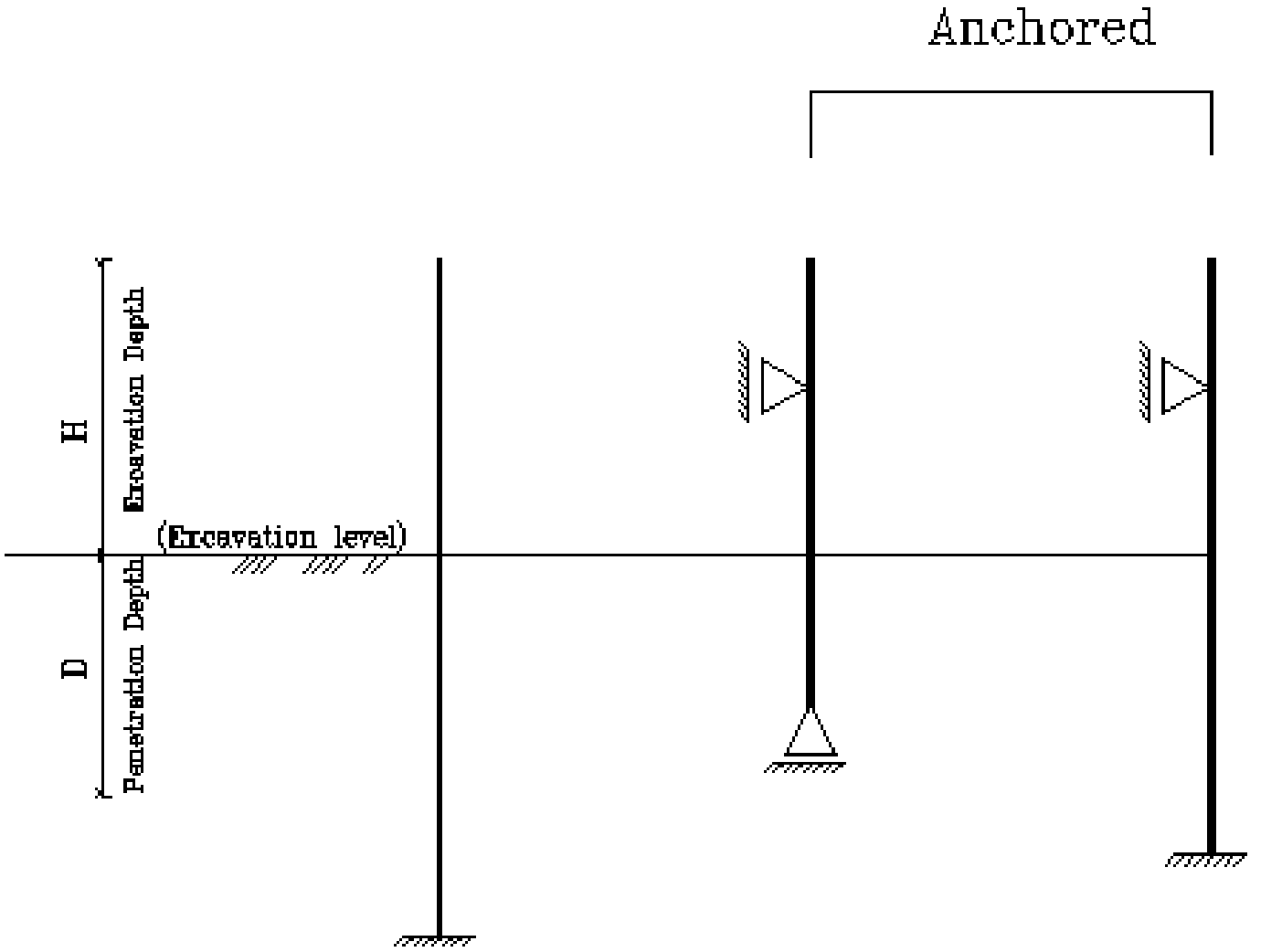
a- Cantilever

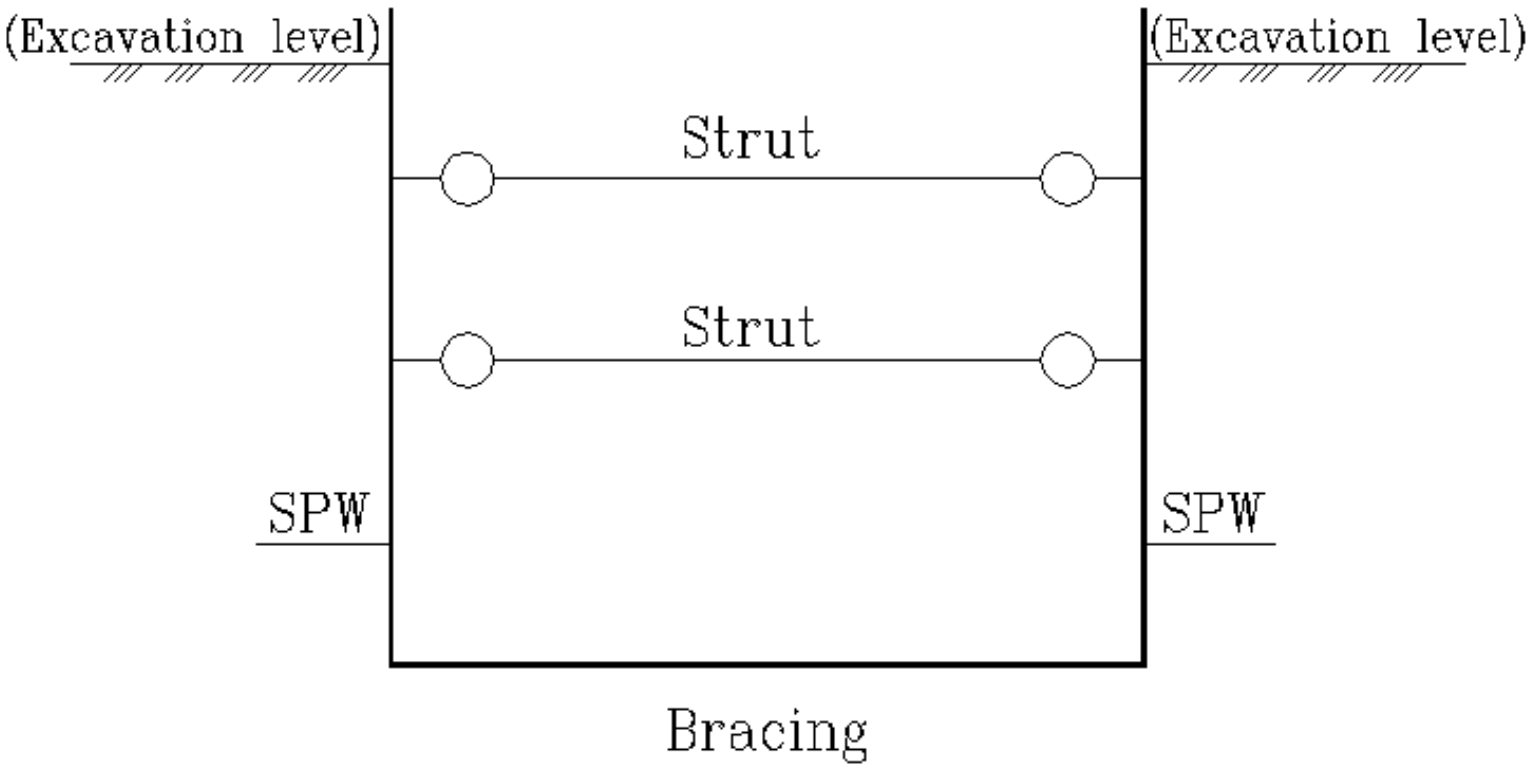
b- Anchored



Free Fixed

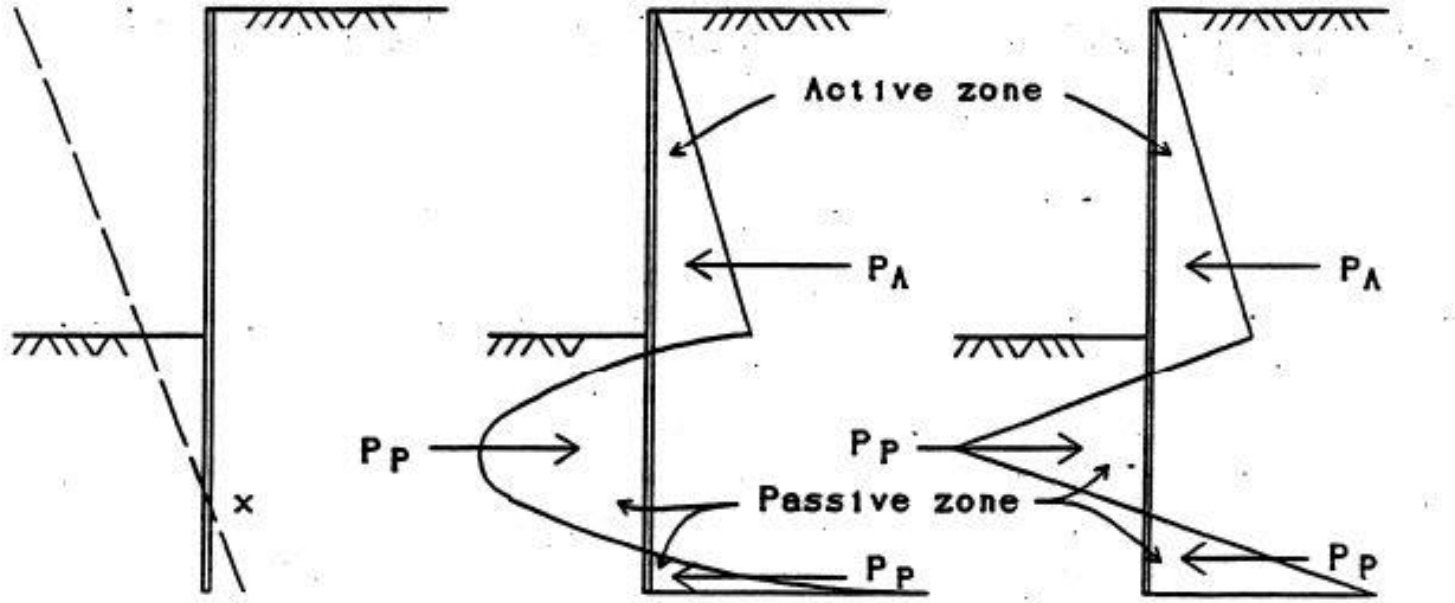
C- Braced Excavation


Anchored
H
Excavation Depth
(Excavation level)
D
Penetration Depth
Cantilever
Free Earth
Support
Fixed



Bracing

CANTILEVER SHEET PILING - GRANULAR SOIL

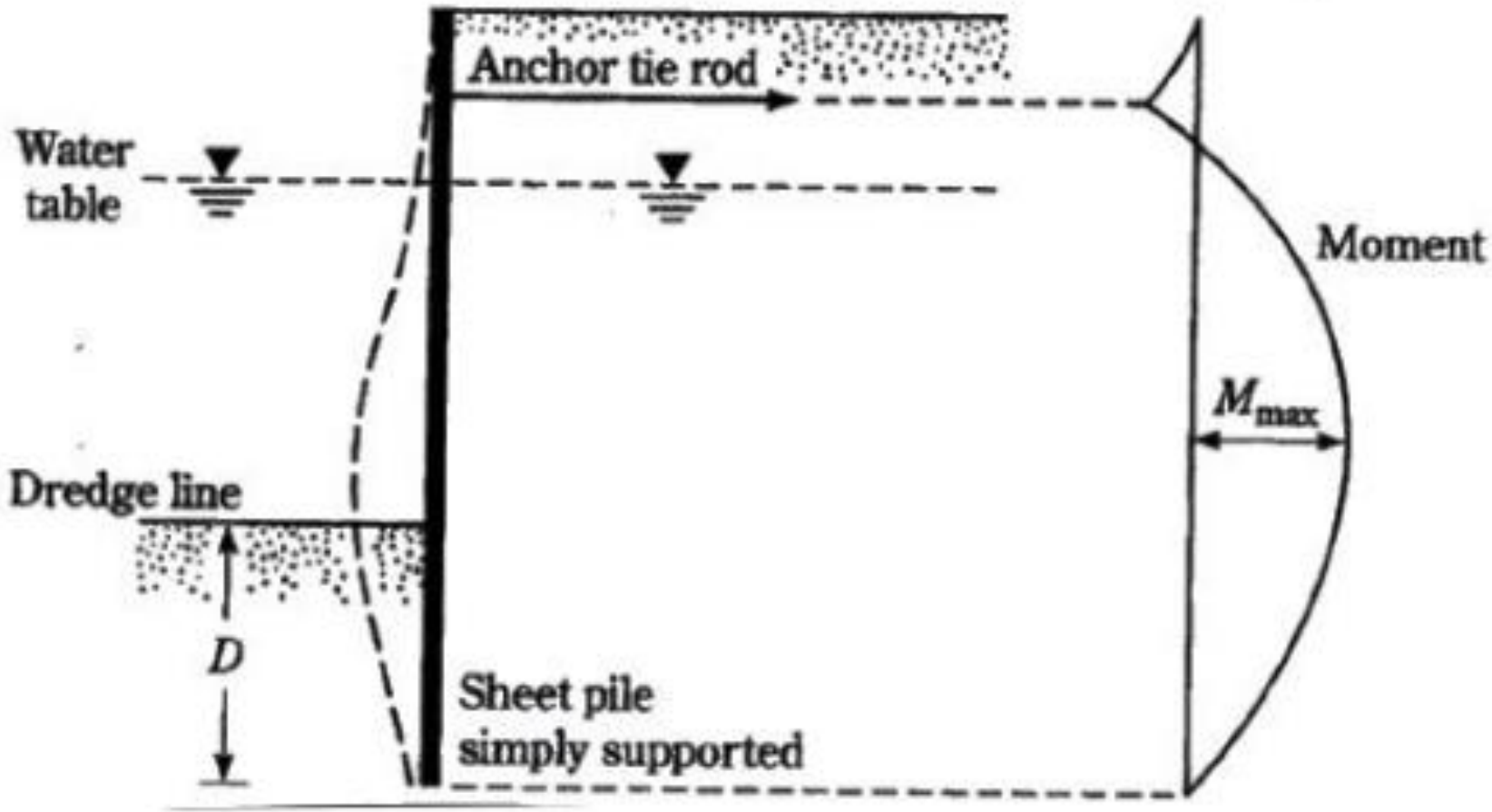


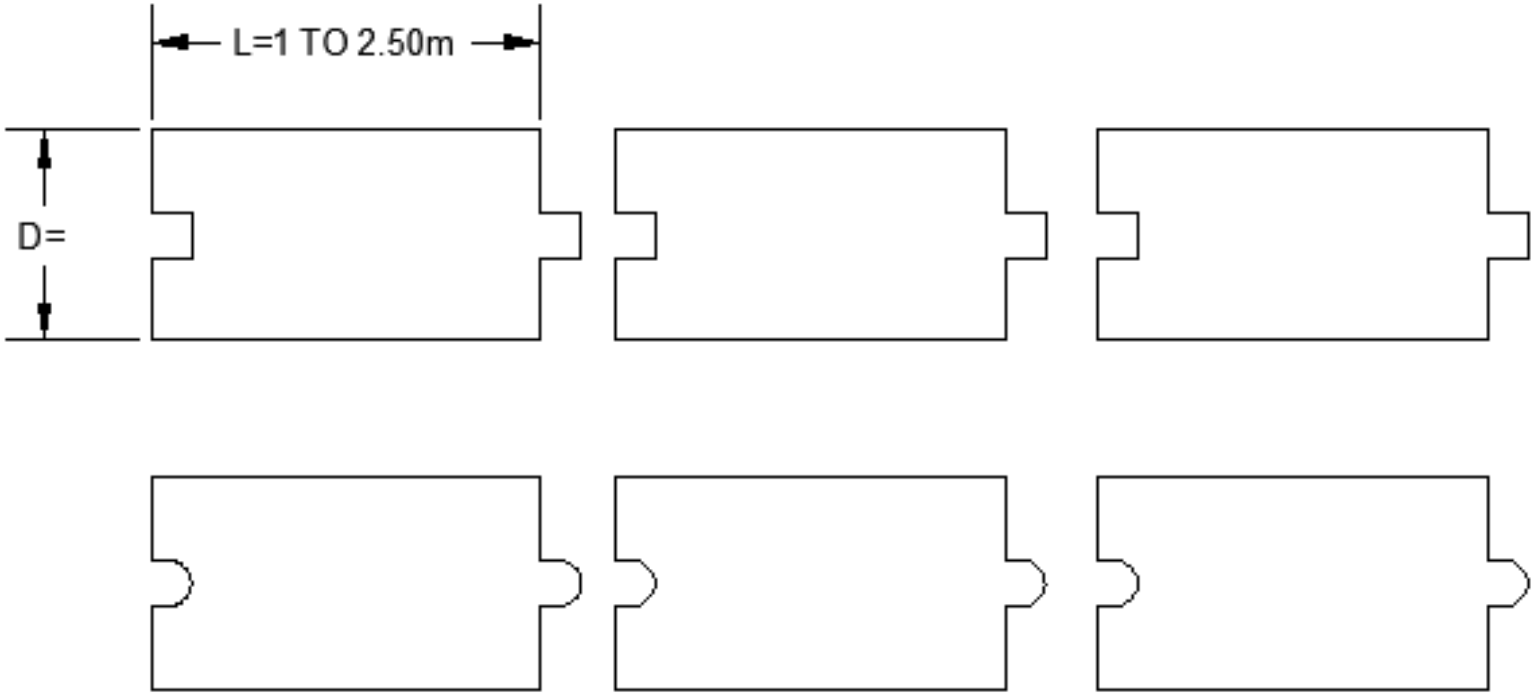
Assumed elastic line of sheet piling with rotation about pt. x

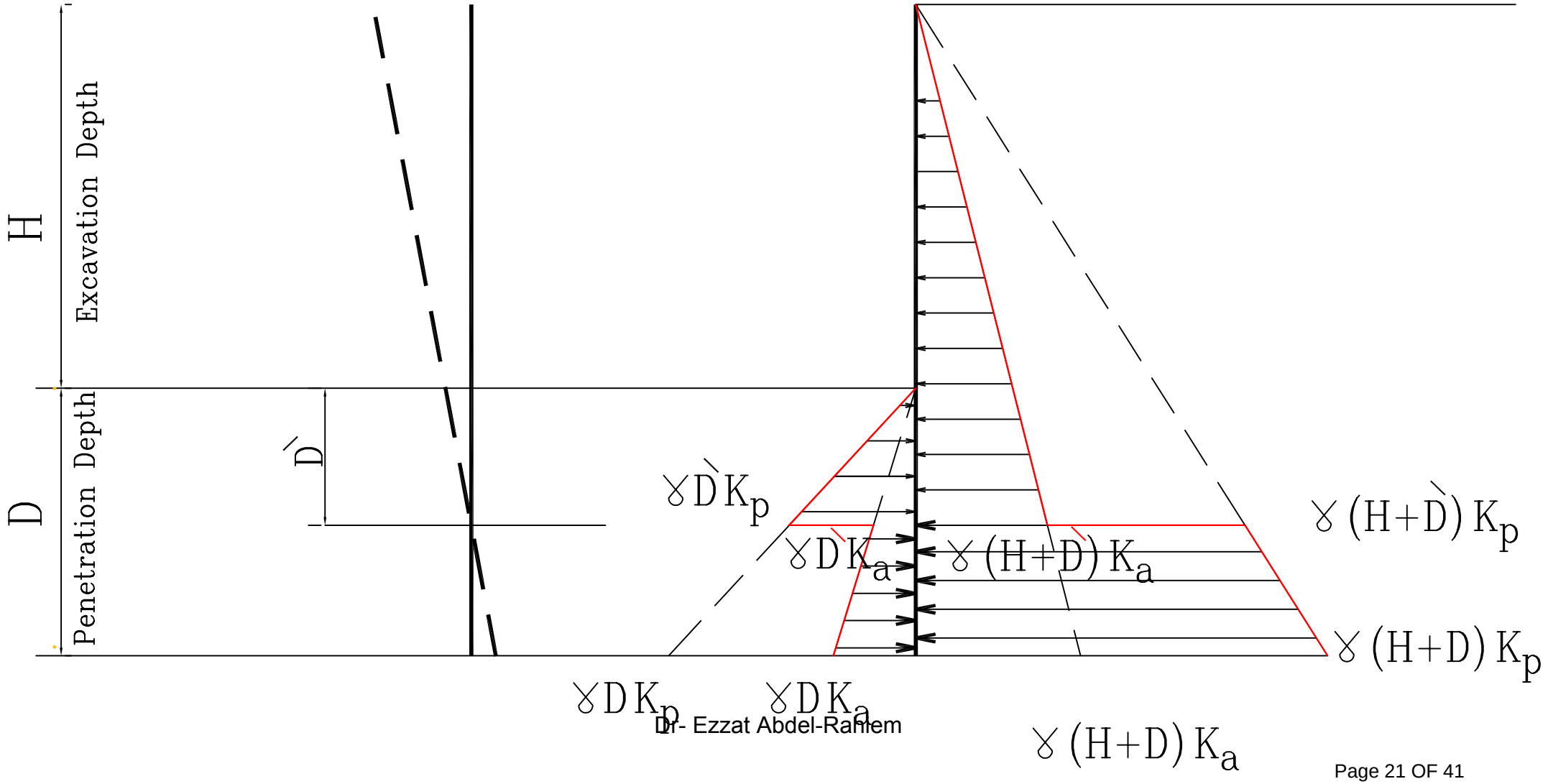
Probable soil pressure distribution

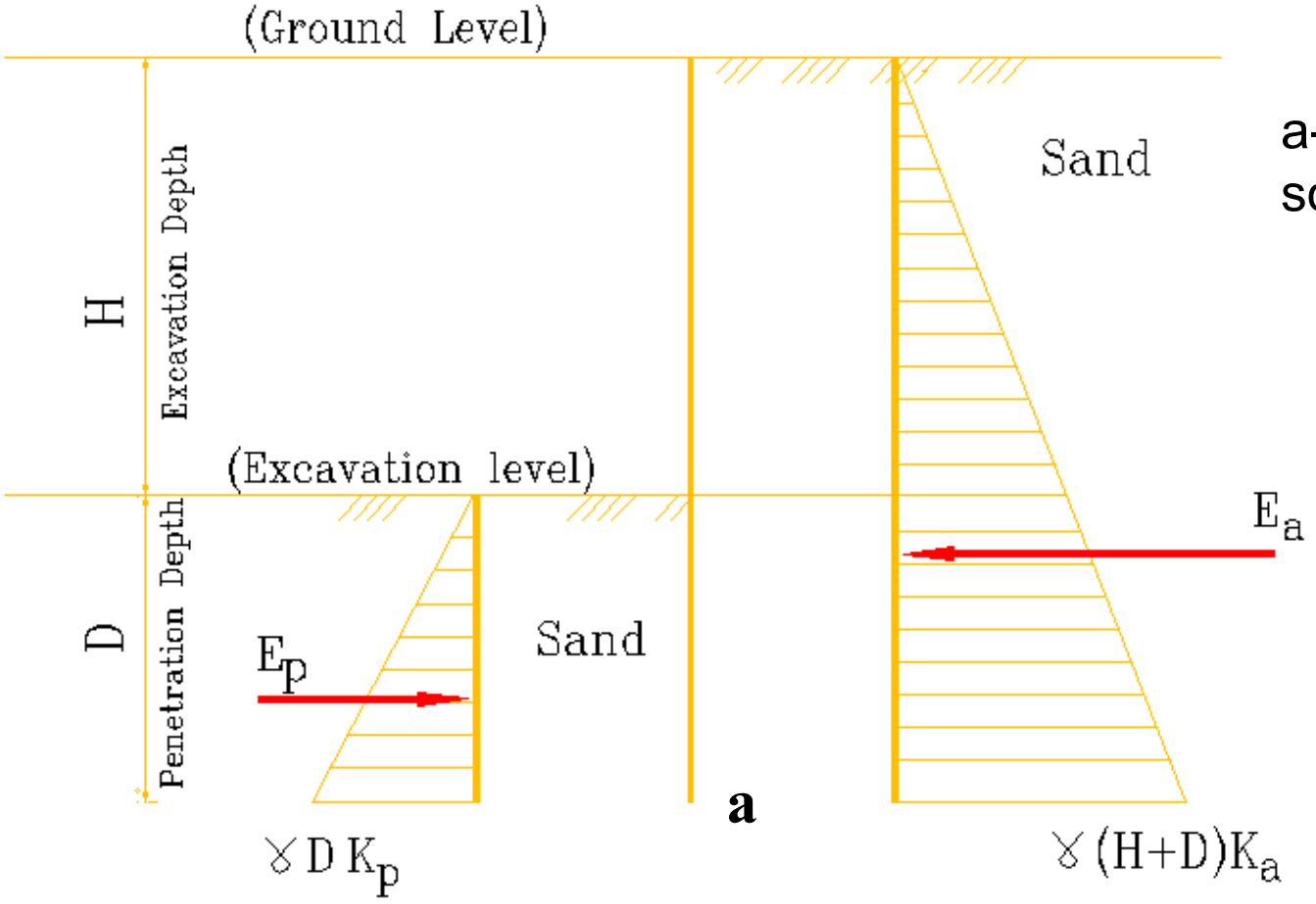
Simulated pressure diagram (Granular soil, no ground water)

Deformation and moment distribution over the sheet pile.




L=1 TO 2.50m
D=

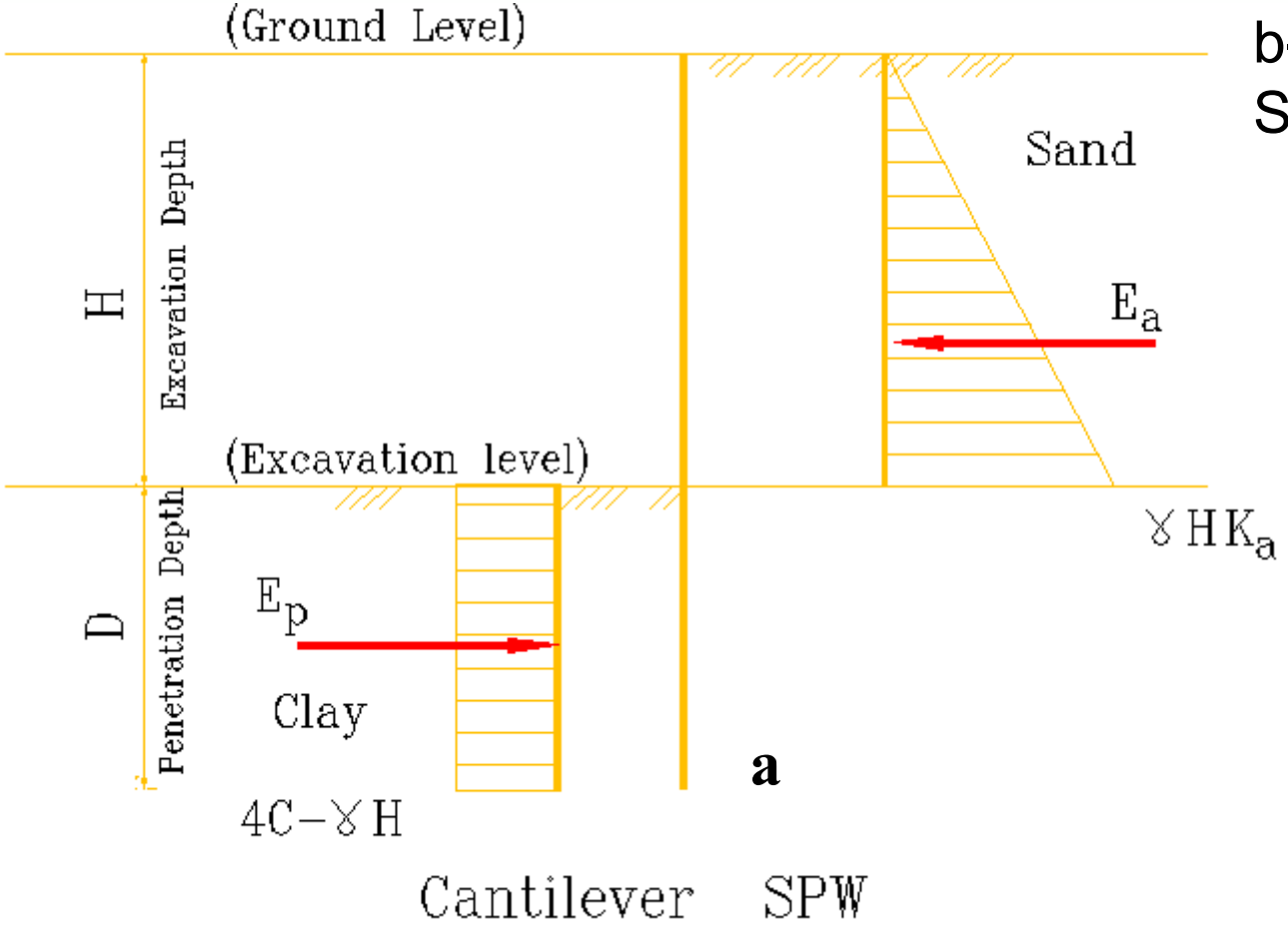

H
Excavation Depth
D
Penetration Depth
D`
γD`Kp
γDKa
γ(H+D`)Kp
γ(H+D)Ka
γ(H+D)Kp
γDKp
γDKa
γ(H+D)Ka



a- Sandy soil

$$E_a = \gamma (H+D)^2 K_a / 2 \qquad t/m\backslash$$

$$E_P = \gamma D^2 K_p / 2 \qquad t/m\backslash$$



b- Clay Under Sand

$E_a = \gamma H^2 K_a / 2$ t/m\

$E_P = (4c-\gamma H) D$ t/m\

Cantilever Sheet piles (SPW)

1- Σ Ma = zero Find D (Penetration depth)

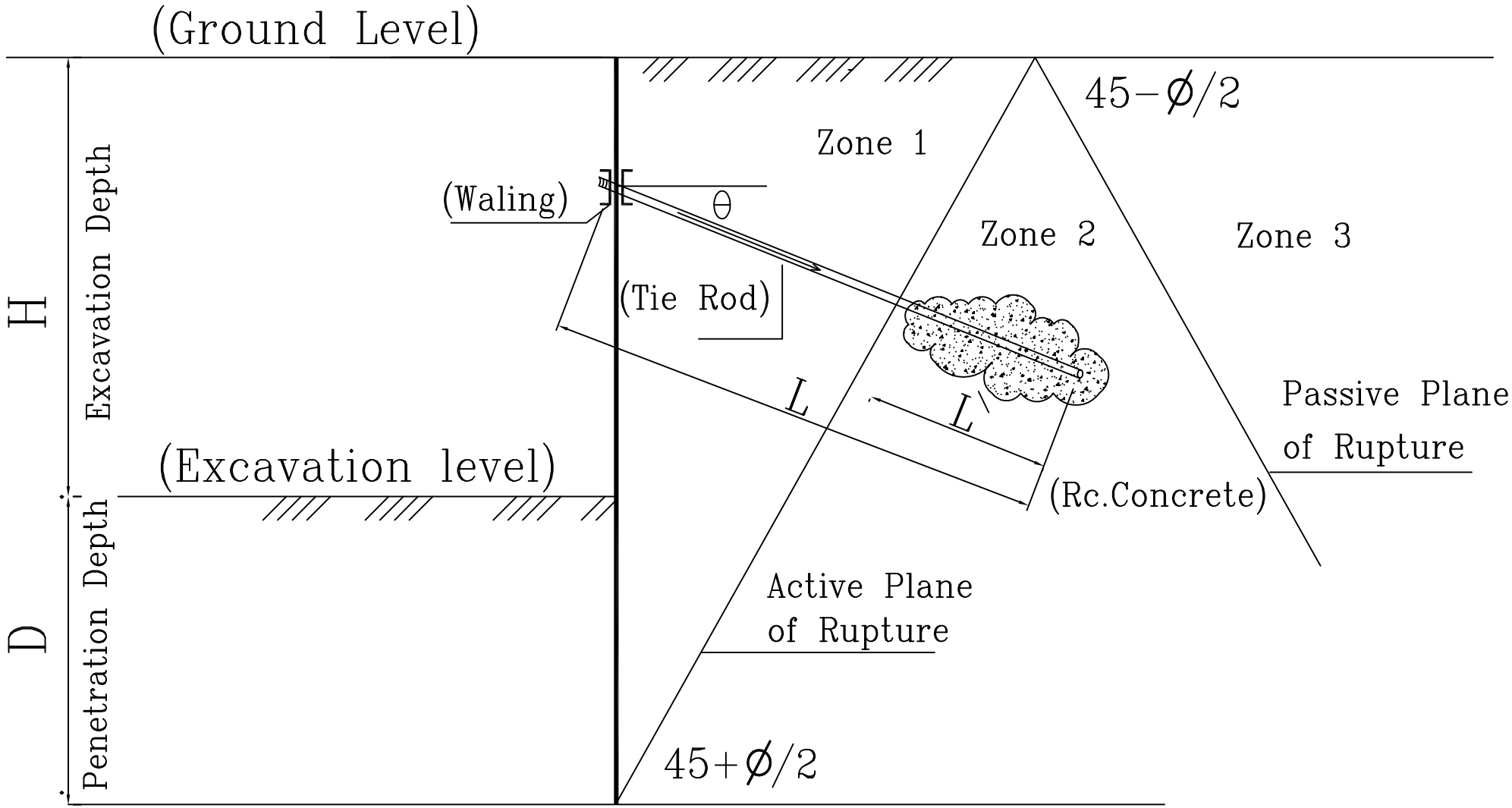
2- Find Point of zero shear

3- Find max bending moment (M_{max})

at point of zero shear

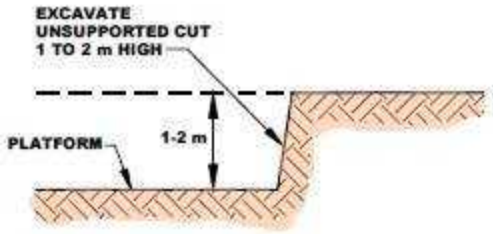
4- To Find Sec Dimensions

Z = M / Allowable stresses



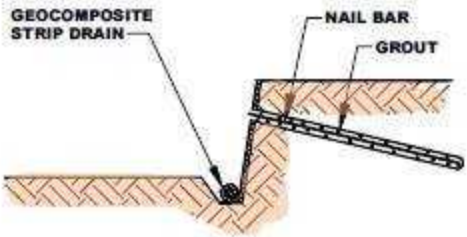
Anchored sheet pile wall

Dr- Ezzat Abdel-Rahiem

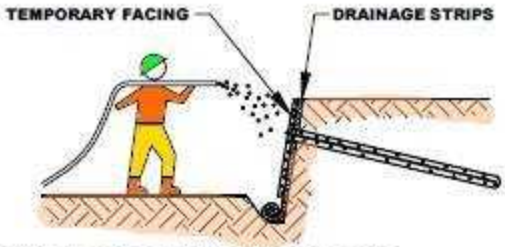


STEP 1. EXCAVATE SMALL CUT

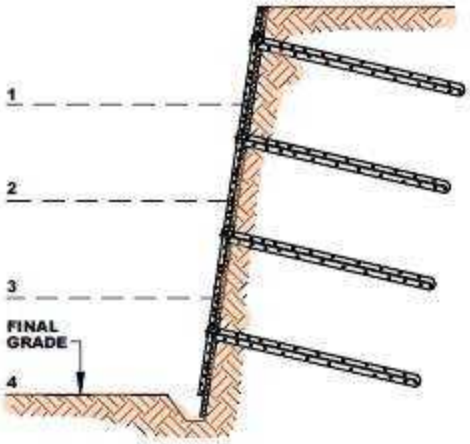
STEP 2. DRILL NAIL HOLE



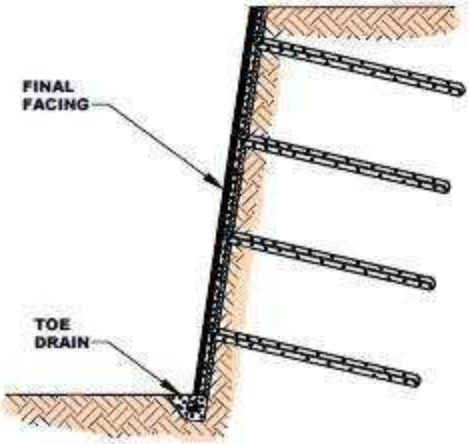
STEP 3. INSTALL AND GROUT NAIL
(INCLUDES STRIP DRAIN INSTALLATI(



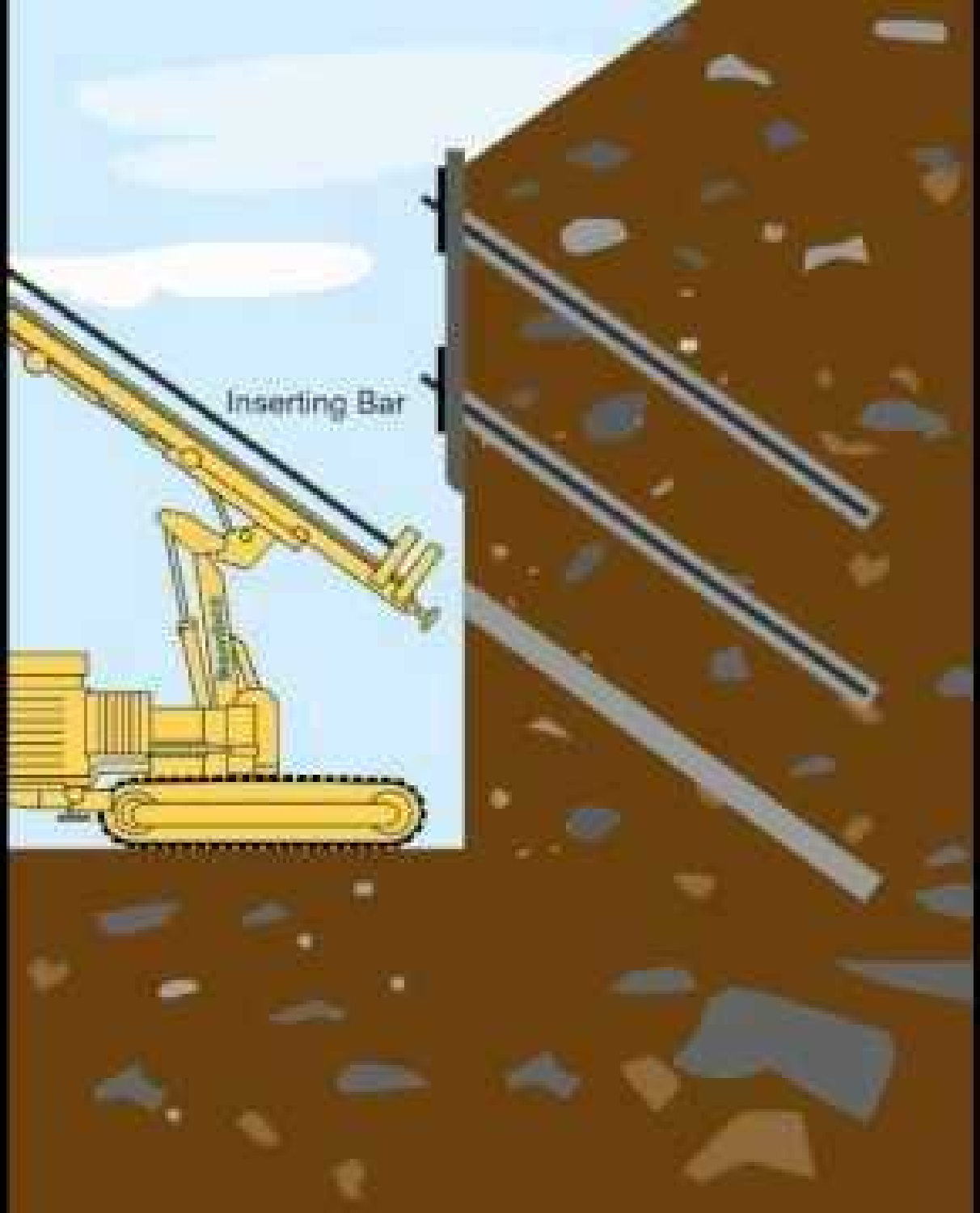
STEP 4. PLACE TEMPORARY FACING
(INCLUDES SHOTCRETE,
REINFORCEMENT,
BEARING PLATE, HEX NUT, AND
WASHERS INSTALLATION)

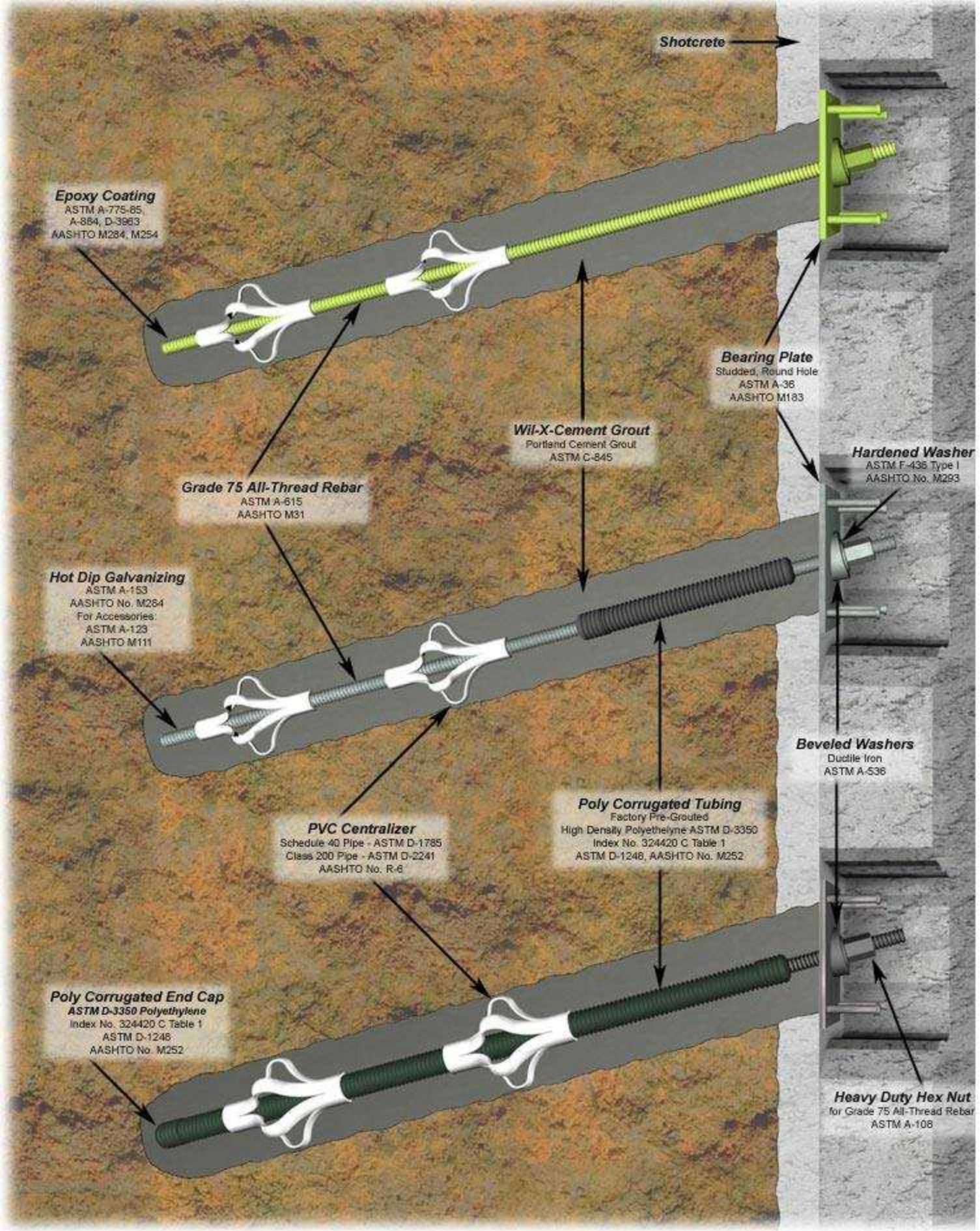


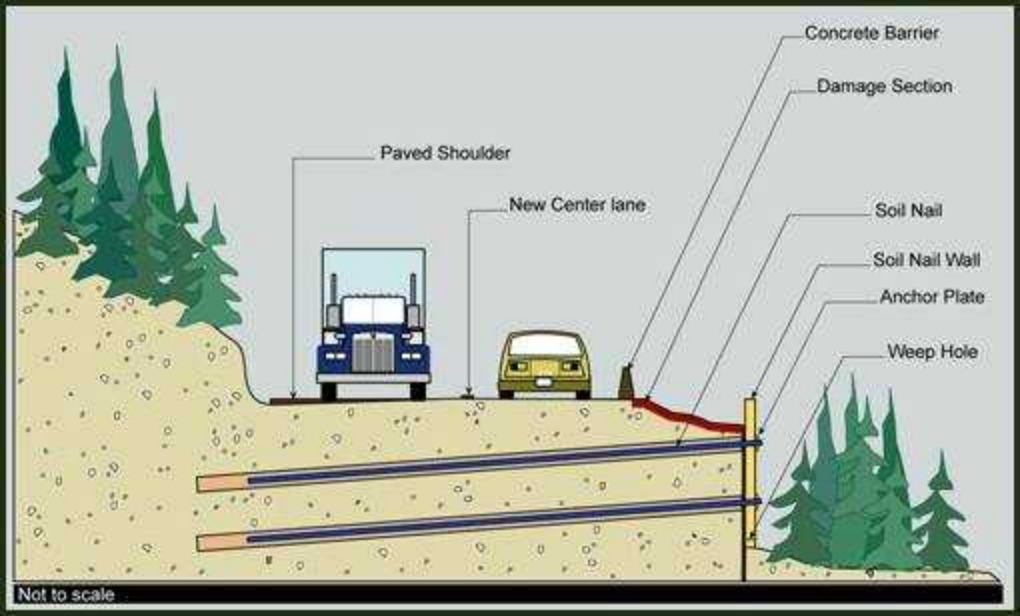
STEP 5. CONSTRUCTION OF
SUBSEQUENT LEVELS

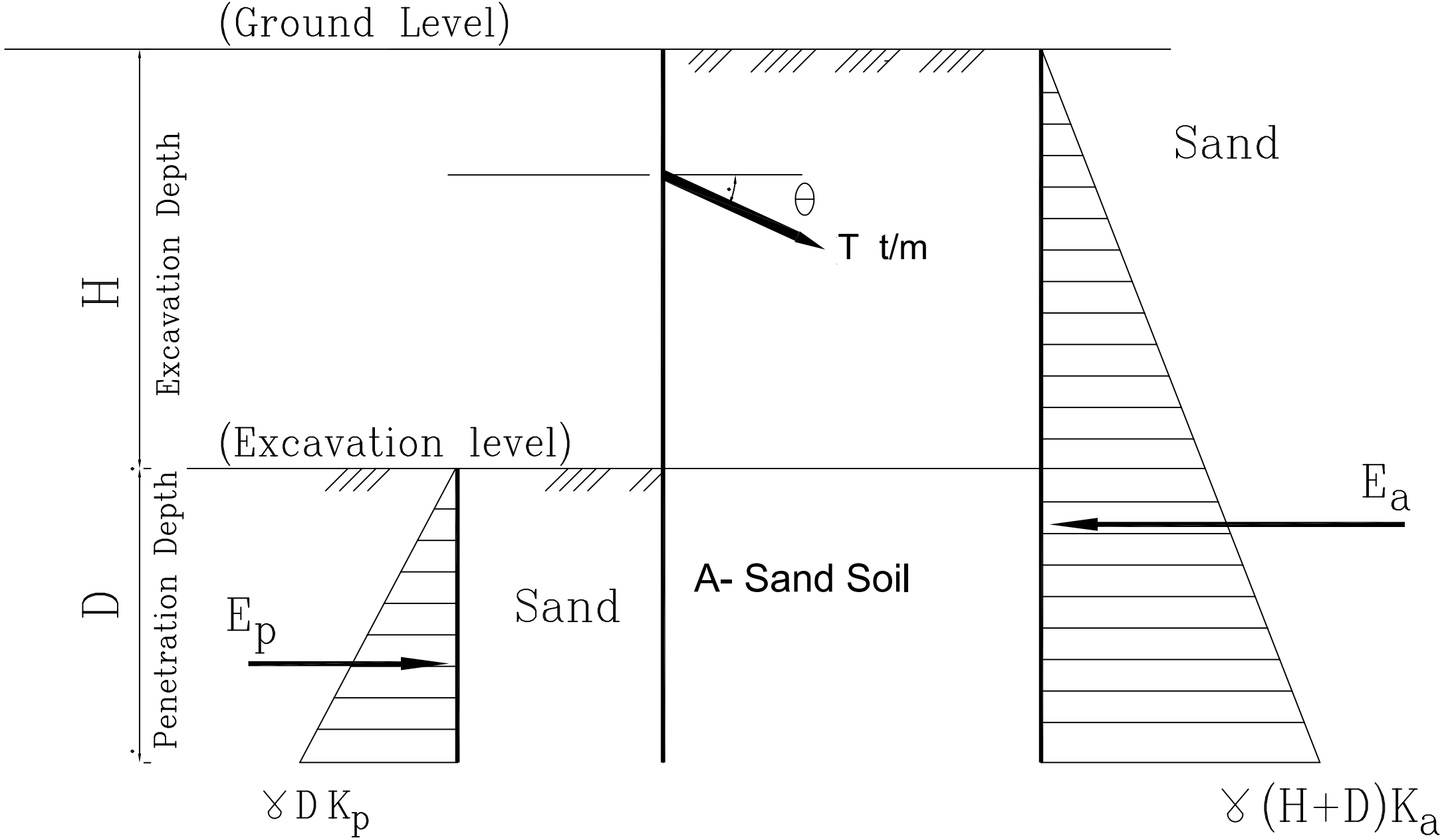


STEP 6. PLACE FINAL FACING
ON PERMANENT WALLS
(INCLUDES BUILDING
OF TOE DRAIN)


Inserting Bar

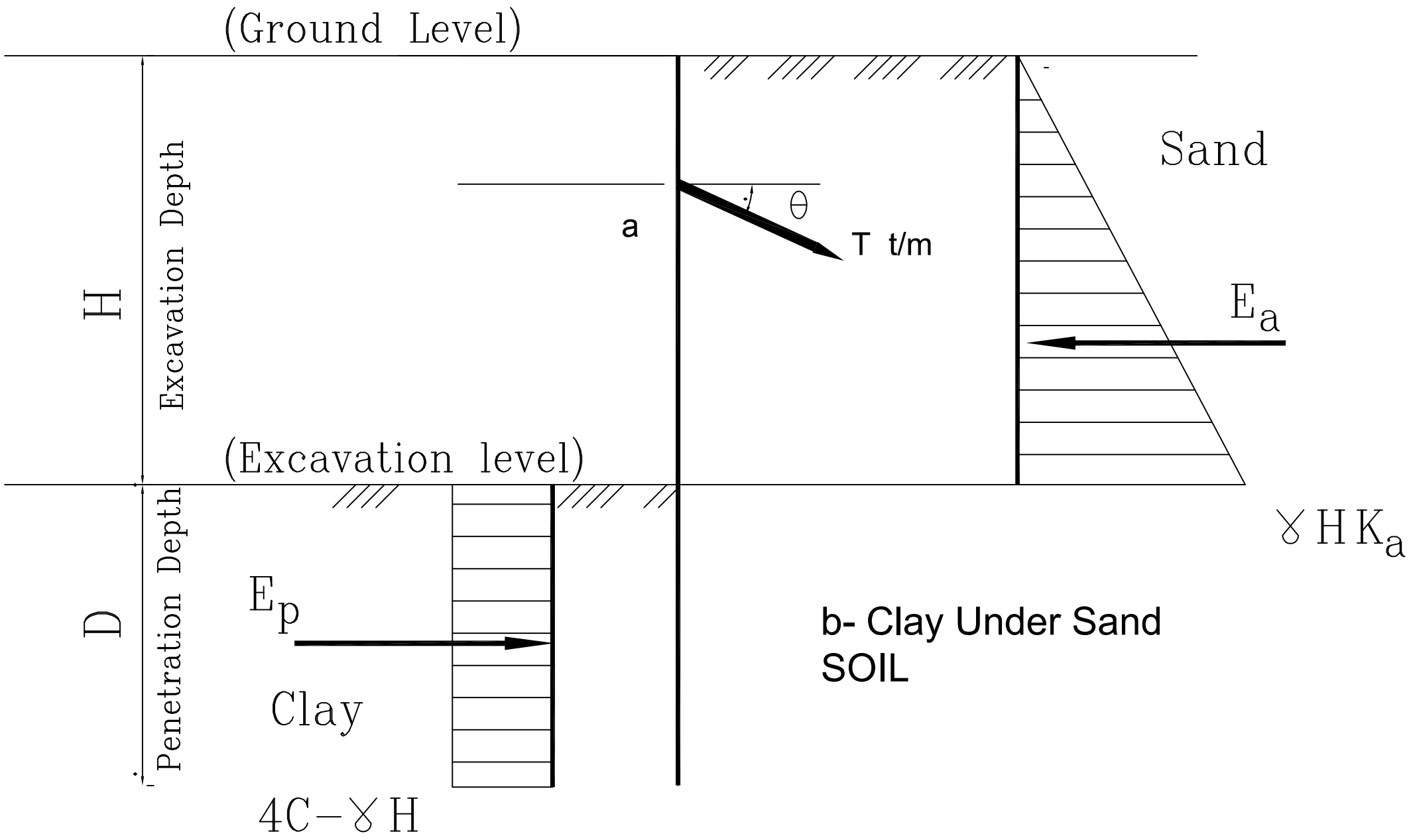

Shotcrete
Epoxy Coating
ASTM A-775-85,
A-884, D-3963
AASHTO M284, M254
Bearing Plate
Studded, Round Hole
ASTM A-36
AASHTO M183
Wil-X-Cement Grout
Portland Cement Grout
ASTM C-845
Hardened Washer
ASTM F-436 Type I
AASHTO No. M293
Grade 75 All-Thread Rebar
ASTM A-615
AASHTO M31
Hot Dip Galvanizing
ASTM A-153
AASHTO No. M284
For Accessories:
ASTM A-123
AASHTO M111
Beveled Washers
Ductile Iron
ASTM A-536
Poly Corrugated Tubing
Factory Pre-Grouted
High Density Polyethelyne ASTM D-3350
Index No. 324420 C Table 1
ASTM D-1248, AASHTO No. M252
PVC Centralizer
Schedule 40 Pipe - ASTM D-1785
Class 200 Pipe - ASTM D-2241
AASHTO No. R-6
Poly Corrugated End Cap
ASTM D-3350 Polyethylene
Index No. 324420 C Table 1
ASTM D-1248
AASHTO No. M252
Heavy Duty Hex Nut
for Grade 75 All-Thread Rebar
ASTM A-108


Concrete Barrier
Damage Section
Paved Shoulder
New Center lane
Soil Nail
Soil Nail Wall
Anchor Plate
Weep Hole
Not to scale



Free Earth Support SPW

Dr- Ezzat Abdel-Rahiem


(Ground Level)
H
Excavation Depth
(Excavation level)
D
Penetration Depth
a
θ
T t/m
Sand
E_a
$\gamma H K_a$
E_p
Clay
$4C-\gamma H$
b- Clay Under Sand
SOIL

Anchored Sheet piles (SPW)

1- Σ Ma = zero

2- Σ H = zero $E_P+T- E_a=0$

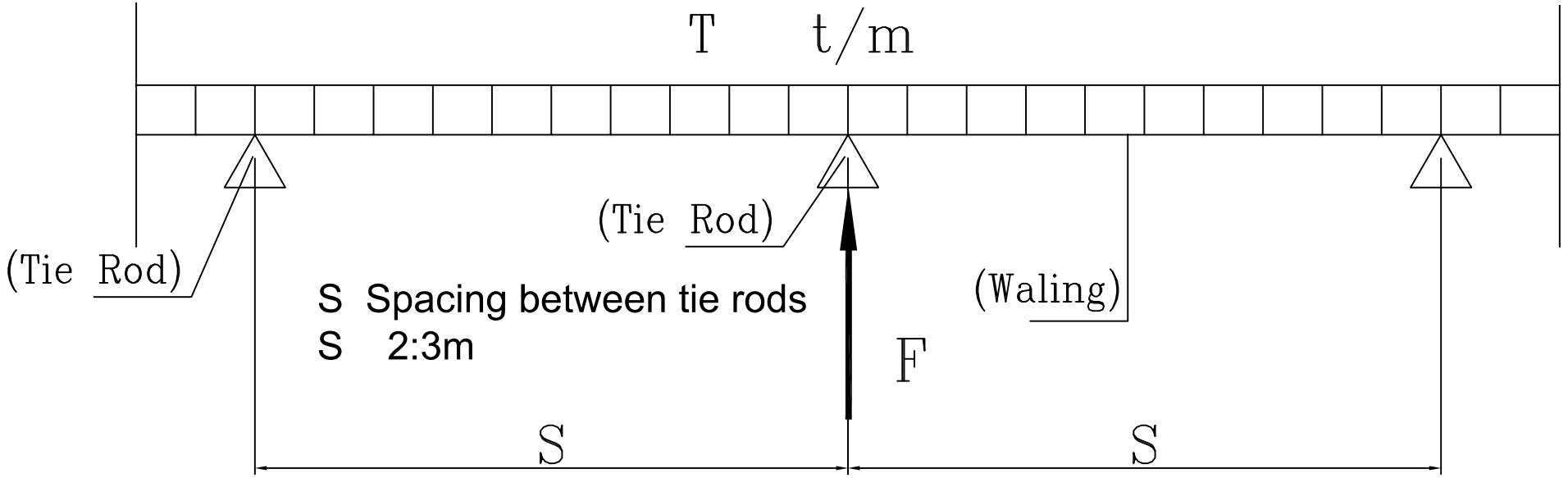
From 1,2 find D , T

3- Find Point of zero shear

4- Find max bending moment (M_{max})

at point of zero shear

a- Design Of Waling



$$M_{waling} = T * S^2 / 10 \quad m.t$$

$$F\ (tie\ rod) = 1.1 * T * S \quad ton$$

$$F\ (tie\ rod) = F/\cos\theta \quad ton$$

For inclined tie

Injection pressure ≈20 Bar = 200 t/m^2

$q_u = C + \bar{P} \tan \bar{\Phi}$

$\bar{\Phi} = \frac{3}{4} \Phi$

$\bar{P} = \frac{1}{2} h$ (1 st method)

$\bar{P}$ = 20% Injection pressure (2 nd method)

$q_w = q_u / 2$

$F(tie) = \pi D \bar{L} q_w$

D = 0.10 TO 0.20 m

For prestressed tie rod

max 7 strand p/all / strand =15 t

then max F not more than 105 t

other wise use second row of ties

To Find $L^{`}$

Injection pressure ≈20 Bar = 200 t/m^2

$q_u = C + P^{`} \tan \Phi^{`}$

$\Phi^{`} = ¾ \Phi$

$P^{`} = ϒ h$ (1 st method)

$P^{`}$ = 20% Injection pressure (2 nd method)

$q_w = q_u / 2$

$F(tie) = \pi D L^{`} q_w$

D = 0.10 TO 0.20 m