

DESIGN CRITERIA:

AASHTO simplified method MSE wall for extensible reinforcement and coherent gravity method for inextensible reinforcement

phi=34 degrees
Class I Backfill friction angle
gamma soil=125(LB/CF)
PCF unit weight with 95% AASHTO T180

Beta=atan(0.5)
Backfill angle
Ka=[1-sin(phi)]/[1+sin(phi)]
Ko=1-sin(phi)
For Inextensible see B-504-H1

Kaf=cos(beta)*cos(beta)-cos^2(beta)-cos^2(phi)
Rankine Active Earth Pressure Kaf

For Inextensible reinforcement equations listed below Kaf shall be replaced by Kr(z) for sigma AH1 computation.

Rv(z)=1/2*gamma_v*gamma_soil*RL(z)*tan(beta)+gamma_v*gamma_soil*z
Resultant of Soil

sigma AH1(z,DH)=1/2*Kaf*gamma_h*gamma_soil*x
Overburden Earth Pressure at back face of active zone

Mo(z)=1/2*(z+RL(z)*tan(beta))*cos(beta)*sigma AH1
Overturning Moment

Mr(z)=Rv(z)*RL(z)^2/2+RL(z)*sin(beta)*sigma AH1
Righting Moment

Ecc(z)=RL(z)/2 - Mr(z)-Mo(z)/(Rv(z)*RL(z)+sin(beta)*sigma AH1)
Eccentricity of Resultant

sigma v1(z)=Rv(z)
Overburden with LS

sigma v2(z)=Rv(z)/gamma_v
Unfactored Overburden

sigma H(z)=sigma AH1
Lateral Earth Pressure
AASHTO LRFD Eq 11.10.6.2.1-1 (Lb/Ft)

Sum sigma H(z)=sigma H(z)*spacing(z)
Summation of Eq 11.10.6.2.1-1

Tmax(z)=sigma H(z)*spacing(z)/12
AASHTO LRFD Eq 11.10.6.2.1-2

alpha=0.6
Scale Correction Factor
Rc=1.0
Coverage Ratio
phi_p=0.9
Resistance Factor Reinforcing Pullout
Cp=2.0
Both Top and Bottom
Fp=0.67*tan(phi)
Pullout Friction Factor

Le(z)=(Tmax(z))/(phi_p*Fp*alpha*sigma v2(z)*Cp*Rc)
AASHTO LRFD Eq 11.10.6.3.2-1

Bear(z)=1/2*gamma_soil*RL(z)*Rv(z)+sin(beta)*sigma AH1
AASHTO LRFD Eq 11.6.3.2.-1 (Bearing Pressure In TSF)

With the accompanied earthquake (EQ) resistance wall details, MSE wall design without EQ load combination meets LRFD Seismic Performance Zones (SPZ) 1 through 3. For avoiding seismic induced backfill leaks due to roadway tension cracks, block topping or panel splitting; these details including coping, panel joint, rail anchor slab/beam, leveling pad and end of wall treatment shall be used.

Star symbol: Additional layer required for example extensible reinforcement, see example 3a.

Table values are per linear feet of wall.

Table with columns: DH or Z (Ft), Spacing (In.), sigma H (Lb/Ft), Sum sigma H*spacing (Lb/Ft), Le (Ft). Rows range from 0.667 to 40.000.

Note: Table is for both extensible and inextensible soil reinforcement, but values are only good for 40' wall. See figure to the right for lower walls.

* Example spacing for inextensible reinforcement.

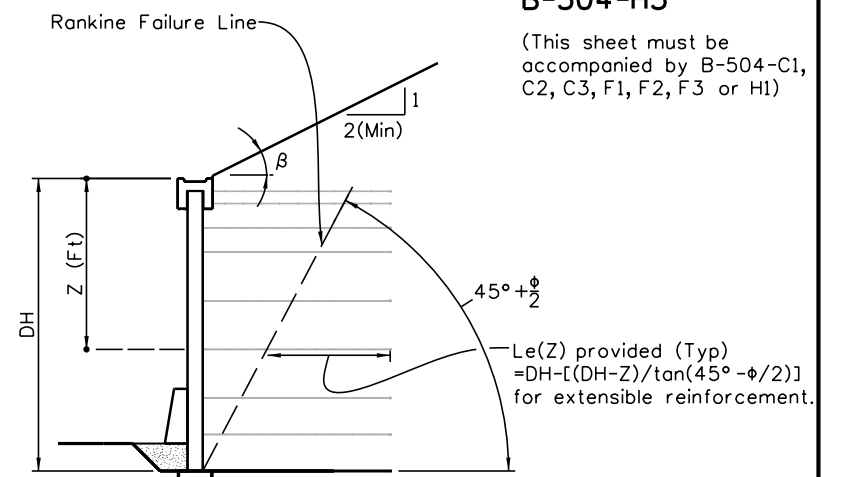
** Summation of sigma H above Z for DH=40' only

*** Le based on extensible for DH=40' only, 0.8*Le for inextensible. Le of top two layers are not developed, layers used for avoiding roadway tension cracks.

EXAMPLES:

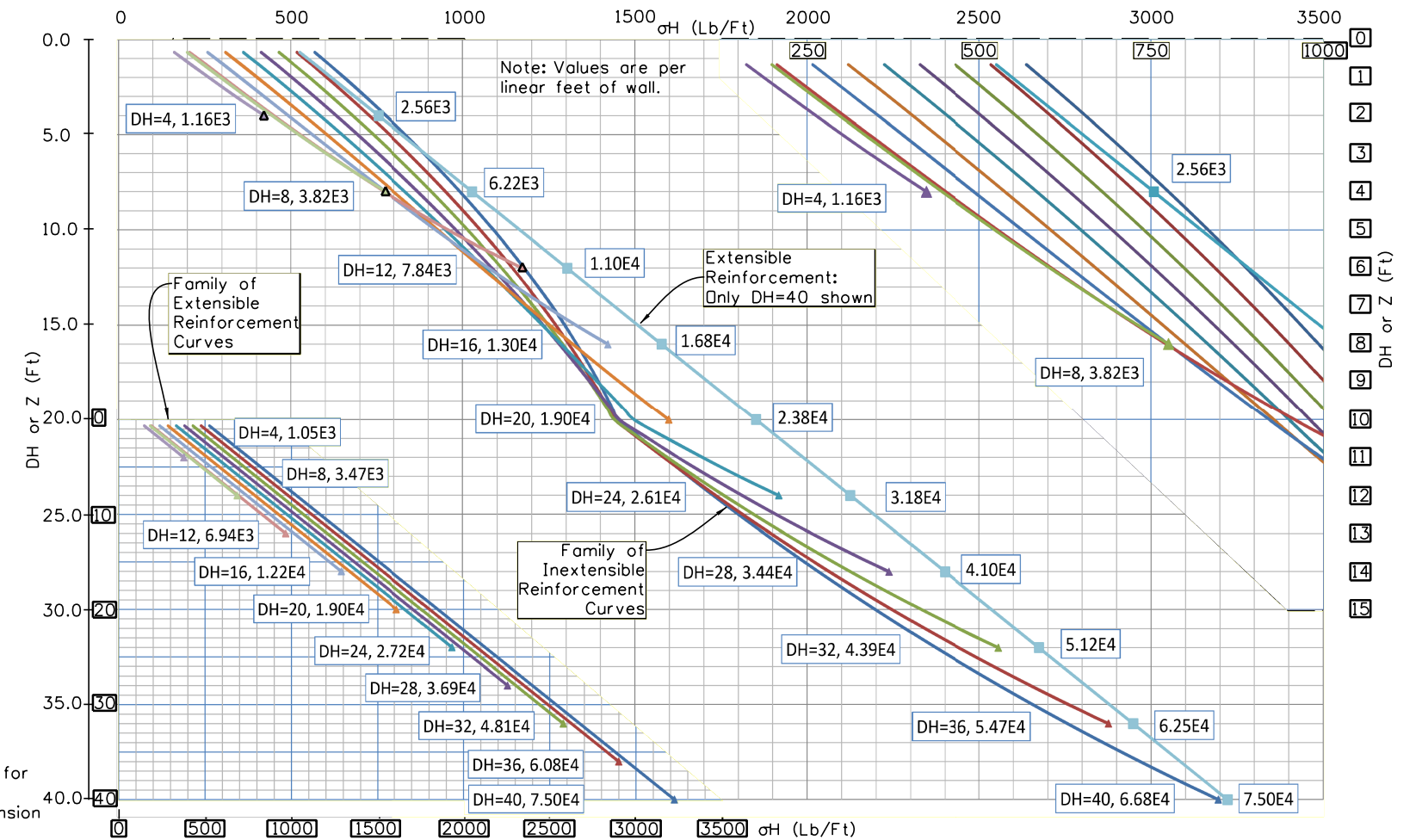
Biaxial woven polypropylene (PP) geotextile with an ultimate strength of 4,800 Lb/Ft is used for the top two reinforcing layers...

- 1. Geotextile: T_al = T_ult * K
Steel: T_al = A_c * F_y / b
where b = 1.969" A_c = 200"
phi_steel = 0.75 vs phi_geotextile = 0.90
AASHTO 11.10.6.4.1-1
AASHTO 11.10.6.4.3b-1
AASHTO 11.10.6.4.3a-1
After 75 years loss
E_c = 0.102"
AASHTO 11.10.6.4.3b-2



APPLICATION DIAGRAM (DH=16' AS SHOWN)

- 5. Factored bearing pressure (BP) for DH=40'
From B-504-C1 or F1 BP=6.808 TSF
From B-504-C2 or F2 BP=13.218 TSF
From B-504-C3 or F3 BP=13.644 TSF
Must check against ultimate bearing capacity in geotechnical report.



Revision Dates table with columns: Revision, Date, Description.

Design Details table with columns: Design, Date, Detail, Quantity, Date.

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Bottom section containing Sheet Revisions, Colorado Department of Transportation logo, As Constructed/Revised/Void status, and Project No./Code.