

DESIGN CRITERIA:

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

φ=34° Class I Backfill friction angle
γsoil=125(LB/CF) PCF unit weight with 95% AASHTO T180
η=1.5 Horizontal Earth Pressure Factor
γv=1.35 Vertical Earth Pressure Factor
LS=1.75 Live Load Surcharge Factor
LLSurg=2' Live Load Surcharge
dmax=2" CDDT Class I Backfill Max Size
HMAthk=12" HMA Thickness
HMA=140(LB/CF) HMA unit weight
γHMA= max:1.5 min:0.65 HMA design factor
β=atan(0.5) Backfill angle
B1=if β<atan(6×tan(β)/2×z), β ASHTO Fig C 3.11.5.8.1-3 Broken otherwise B1=atan(6×tan(β)/2×z) Backfill 6' Typ set back and 3' Max. fill height

Ka=[1-sin(φ)]/[1+sin(φ)] For inextensible see B-504-H1
Ko=1-sin(φ) For inextensible see B-504-H1
Kc(z)=if z<20', Ko-z/20(Ko-Ka), otherwise Ka Neglect rail impact load due to 3' Max. fill height

Kaf=c0s(B1)×c0s(B1)-√c0s²(B1)-c0s²(φ) Rankine Active
c0s(B1)+√c0s²(B1)-c0s²(φ) Earth Pressure Kaf

For inextensible reinforcement equations listed below Kaf shall be replaced by Kr(z) for σAH1 computation.

Rv(z)=γsoil×[γv×(z+3.0)+LS×LLSurg] Resultant of Soil & Surcharge

σAH1=1/2Kaf×γh×γsoil×(z+3.0)² Overburden Earth Pressure at back face of active zone

σAH2=Kaf×LS×LLSurg×γsoil×(z+3.0) Surcharge pressure at back face of active zone

Mo(z)=1/2(z+3)×c0s(B1)×σAH1 + 1/2(z+3)×c0s(B1)×σAH2 Overturning Moment

Mr(z)=[γv×γsoil×(z+3)]×RL²/2 + RL×sin(B1)×σAH1+RL×sin(B1)×σAH2 Righting Moment

Ecc(z)=[RL(z)-Mr(z)-Mo(z)]/[Rv(z)×RL(z)+sin(B1)×(σAH1+σAH2)] Eccentricity of Resultant

σv1(z)=γv×γsoil×(z+3) + LS×γsoil×LLSurg Overburden with LS

σv2(z)=γsoil×(z+3) + LLSurg×γsoil Unfactored Overburden without LS

σH(z)=Kaf×σv1(z) Lateral Earth Pressure

σh(z)=σH(z) AASHTO LRFD Eq 11.10.6.2.1-1 (Lb/Ft)

Sumσh(z)=σh(z)×spacing(z) Summation of Eq 11.10.6.2.1-1

Tmax(z)=σh(z) × spacing(z) / 12 AASHTO LRFD Eq 11.10.6.2.1-2

α=0.6 Scale Correction Factor
Rc=1.0 Coverage Ratio
φp=0.9 Resistance Factor Reinforcing Pullout
Cp=2.0 Both Top and Bottom
Fp=0.67×Tan(φ) Pullout Friction Factor

Le(z)=(φp×Fp×α × γsoil×(z+3) × Cp×Rc) / Tmax(z) AASHTO LRFD Eq 11.10.6.3.2-1
AASHTO LRFD Eq 11.6.3.2.-1

Bear(z)=1/2×1000×Rv(z)×RL(z)+sin(B1)[σAH1+σAH2] / (RL(z)-2×ecc(z)) (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, extended top two layers of soil reinforcing, panel joint, rail anchor slab/beam, leveling pad and end of wall treatment shall be used.

Table values are per linear feet of wall.

Table with 5 columns: DH or Z (Ft), Spacing (In.), σH (Lb/Ft), ΣσH×spacing (Lb/Ft), Le (Ft). Rows show values for various heights and spacings.

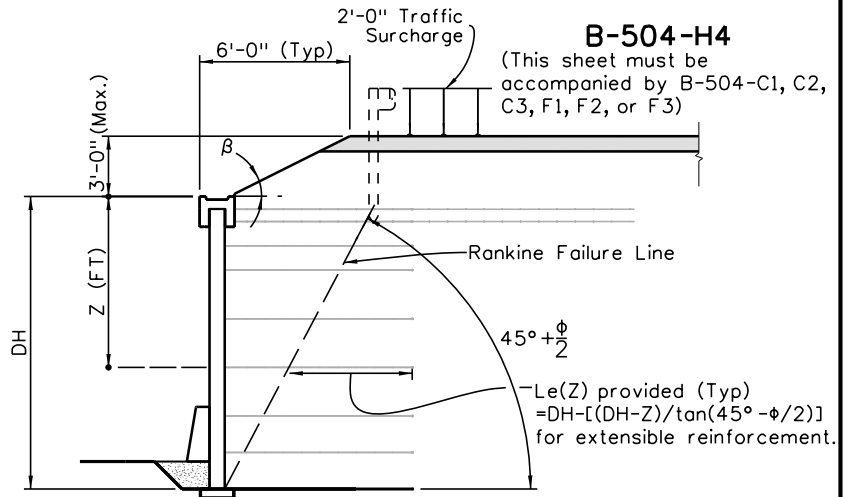
Note: Table is for both extensible and inextensible soil reinforcement, but values are only good for 40' wall. See figure to the right for lower inextensible walls.

\* Example spacing
\*\* Summation of σH above Z neglecting rail impact
\*\*\* Le based on extensible, 0.8×Le for inextensible. Le of top two layers are not developed, layers used for avoiding roadway tension cracks.

EXAMPLES:

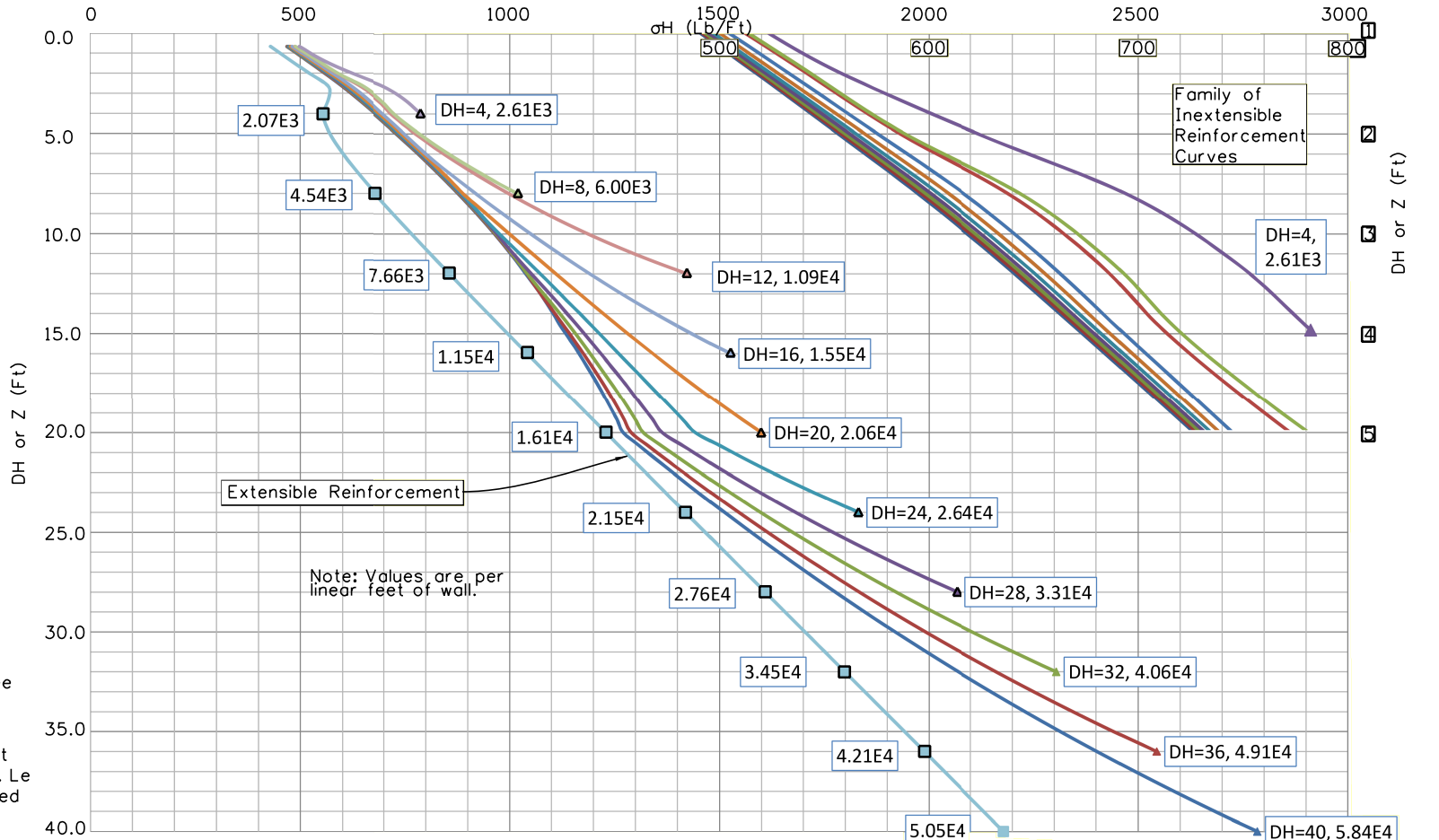
Biaxial woven polypropylene (PP) geotextile with an ultimate strength of 4,800 Lb/Ft is used for the top two reinforcing layers, other layers are 7,800 Lb/Ft HDPE grids, 12,000 Lb/Ft HDPE, or grade 65 steelstrips hot dipped zinc coated ribbed(50mmx4mm or 1.969"x0.157"). See Standard Special for K values.

- 1. Geotextile: Tal = Tult x K, Steel: Tal = Ac x Fy / b
2. For DH=12' Check Tmax at Z=9.333', spacing=32", Rc=1 (For 100% coverage) φ=0.9 Tmax ≤ φTAL x Rc (AASHTO 11.10.6.4.1-1)
3. DH=40', Check Tmax @ z=26' for grid and strip and ΣσH: a. Tmax = σH×Spacing=1514×24/2=3128 (Within 3% of 12000 HDPE strength)
4. For DH=8' Truncated Base wall on B-504-C3/F3. Check 1st layer down z=0.667 Le (Required from Table) = 1.918' Le(Provided with 2.0 RL Max) = 8-(8-0.667)/tan(45°+φ/2) = 8-3.9 = 4.1' > 1.918'



APPLICATION DIAGRAM (DH=16' AS SHOWN)

- 5. Factored bearing pressure (BP) for DH=40' From B-504-C1 or F1 BP=5.673 TSF From B-504-C2 or F2 BP=10.778 TSF From B-504-C3 or F3 BP=10.122 TSF Must check against ultimate bearing capacity in geotechnical report.



Note: Values are per linear feet of wall.

Revision Dates table with columns: Revision Dates, 09-16, 10-24.

Design Detail Date Quantity Date table with columns: INITIALS, DESIGN, DATE, DETAIL, DATE, QUANTITY, DATE.

Bottom section containing Print Date, Sheet Revisions table, Colorado Department of Transportation logo, As Constructed/Revised/Void status, LRFD MSE WALL FOR BLOCK/PANEL FACING WITH 2(H)(Min):1(V) SLOPE & ROADWAY DESIGN CHARTS/TABLE, and Project No./Code/Sheet Number.