CSC TEDDS	Project: Dept. Human Services				Job Ref.	
	Section: 12-C				Sheet no./rev.: 1	
	Calc. by: R	Date: 4/26/2011	Chk'd by	Date	App'd by	Date

Fence Load on Wall

Wall / Block Properties

Block Hieght;	bh=8in;	
Block Depth;	bd=12in;	
Block Length;	bl=18in;	
Batter;	ω=7.13deg;	
Unit Weight;	γb=120pcf;	
Total Height of wall Courses;	H_{wall}=12;	$H_{wallft}=H_{wall}*bh$; H_{wallft}=**8.0000**
Setback per course;	u=bh*tan(ω);	u=**1.0007**in

Soil Properties / Surcharge;

Unit weight;	γ=120pcf;	
Active Pressure Coeffcient;	Ka=0.27;	
Reinforced Backfill Friction Angle;	ϕ=28deg;	
Foundation Soil Friction Angle (for short walls);	ϕf=28deg;	
Live Load Surcharge;	qLL=250psf;	
Passive Coeffcient (short walls with soil below wall infront of foundation);	Kp'=1/Ka;	Kp'=**3.7037**
Factor of Saftey for Passive Coeffcient above;	KpFS=2.0;	Kp=Kp'/KpFS; Kp=**1.8519**

Loading and Post Dimensions

Depth of foundation;	Dfdn=4ft;	
Diameter of Foundation;	Dia=8in;	
Spacing of posts;	Sp=6ft;	
Distance from back of wall to fdn;	Xp=1ft;	
Surcharge offset;	Xqo=2.0ft;	
Wind Load;	$w_{windpsf}$=0psf;	
Railing Distributed Load;	P_{railw}=50plf;	
Railing Point Load;	P_{prail}=200lbs;	
Height of rail;	H_{rail}=3ft;	
Height of Fence;	H_{fence}=6ft;	
Use Soil Resistance Btwn block/post? "Yes=1 No=0";	PS=1;	
Railing load on Post;	P_{rail}=max(P_{prail},P_{railw}*Sp);	P_{rail}=**300.0000**
Wind load on Post;	$w_{windplf}=w_{windpsf}*H_{fence}$;	$P_{wind}=w_{windplf}$* Sp; P_{wind}=**0.0000**

Effective Length, Width, Height (run calc multiple times and manually enter changes)

Height of Wall Effected;

No of courses effected by post;	Hce'=min(Dfdn/bh,H_{wall});	Hce'=**6**
Enter Hce' manually to eliminate round off;	Hce=6;	Hceft=Hce*bh; Hceft=**4.0000**
Height effected in feet;	Hceft=Min(H_{wallft},Hce*bh);	Hceft=**4.0000**ft
Passive soil below wall effected;	Hps=max(0ft,Dfdn-H_{wallft});	Hps=**0.0000**ft

Length of Wall Effected (assumes 45 degree distribution)

# of Courses at top of wall effected;	Ltop'=max(1,(Dia+2*Xp)/bl);	Ltop'=**2**
Enter Ltop' manually to eliminate round off;	Ltop=2;	Ltopft=Ltop*bl; Ltopft=**3.0000**

# of Courses at bottom of trangular distribution down through the face of the wall (assumes top block effects 2 blocks below);	Lbot'=(Hce+Ltop-1);	Lbot'=**7**;
Enter Lbot' manually to eliminate round off (run calc twice to obtain corect values);	Lbot=7;	Lbotft=Lbot*bl; Lbotft=**11**ft
Lengh of wall effected avg;	Lavg'=(Ltop+Lbot)/2;	Lavg'=**4.5**
Enter Lavg' manually to eliminate round off;	Lavg=4.5;	Lavgft=Lavg*bl; Lavgft=**6.7500**ft
Distributed load on wall;		
Rail load;	$w_{rail}=P_{rail}/Lavgft$;	w_{rail}=**44.4444**plf;
Wind Load;	$w_{wind}= P_{wind}/Lavgft$;	w_{wind}=**0.0000**plf;
Load on wall;	$w_{post}=max(w_{rail},w_{wind})$;	w_{post}=**44.4444**plf

Overall Sliding and Overturning With Fence Load (Not a Global Stability Check)

*For short walls (Foundation Depth > Wall Height See Short Wall Results Only);

Values from retaining wall analysis;

Total horiztonal forces;	Fh=1593plf;
Total overturing moment;	Mot=5213lbs;
Resistance to sliding;	Rs'=2634plf
Overturning Resistance;	Mr'=14888lbs;

Destabilizing Forces;

Sliding;	$Fhtot=w_{post}+Fh$;	Fhtot=**1637.4444**;
Overturing Moment from rail;	$M_{rail}=w_{rail}*(H_{wallft}+H_{rail})$;	M_{rail}=**488.8889**
Overturing Moment from wind;	$M_{wind}=w_{wind}*(H_{wallft}+H_{fence}/2)$;	M_{wind}=**0.0000**
Total Overturing;	$Mottot=Mot+max(M_{rail},M_{wind})$;	Mottot=**5701.8889**

Factors of Safey;

FSsliding=Rs'/Fhtot;	FSsliding=**1.6086**
FSot=Mr'/Mottot;	FSot=**2.6111**

Grid Layout/Strength;

Grid layout is from bottom course that is affected by the post (the bottom of this course is location 0, bottom of next course up is location 1, etc.)

No of courses from top effected by post;	Hce=**6**
Height effected in feet;	Hceft=**4.0000**ft
Grid1 "course" location bottom;	GL1=2;
Grid2 "course" location top;	GL2=4;

Least allowable value among pullout, sliding, and connection for each grid location;

Grid1 bottom;	Ga1=371plf;
Grid2 top;	Ga2=462plf;
Shear Strength Connection of Units;	Vw=700plf;

Local Overturning and Sliding;

Driving Forces, Moment Arms and Moments;

Active Soil Force;	Fs=.5*Ka*γ*Dfdn^2;	Fs=**259.2000**plf
Surcharge Force distributed down @ 45deg;	Fq=qLL*Ka*(Dfdn-Xqo);	Fq=**135.0000**plf
Equivalent Railing Force;		w_{rail}=**44.4444**plf

Equivalent Wind Force;		w_{wind}=**0.0000**plf
Soil Moment Arm;	Xs=Dfdn/3;	Xs=**1.3333**ft
Surcharge Moment Arm;	Xq=(Dfdn-Xqo)/2;	Xq=**1.0000**ft
Railing Force Moment Arm;	Xr=Dfdn+H_{rail};	Xr=**7.0000**
Wind Force Moment Arm;	Xw=Dfdn+H_{fence}/2;	Xw=**7.0000**
Soil Pressure Moment;	Ms=Fs*Xs;	Ms=**345.6000**
Surcharge Moment;	Mq=Fq*Xq;	Mq=**135.0000**
Railing Moment;	Mra=w_{rail}*Xr;	Mra=**311.1111**
Wind Moment;	Mw=w_{wind}*Xw;	Mw=**0.0000**

Resisting Forces, Moment Arms and Moment (Includes Wall Units, Grid, and Passive Pressure Between Units and Fdn);

Weight of Wall;	Www=γb*Hceft*bd;	Www=**480.0000**
Effective Grid strength 1;	Ga1e=Ga1*(Lavgft-Dia)/Lavgft;	Ga1e=**334.3580**
Effective Grid strength 2;	Ga2e=Ga2*(Lavgft-Dia)/Lavgft;	Ga2e=**416.3704**
Passive soil height;	psh=(Dfdn+Dfdn-Xp)/2;	psh=**3.5000**
Passive soil length;	psl=(2*Xp+Dia);	psl=**2.6667**
Passive soil depth;	psd=Xp;	psd=**1.0000**
Passive soil weight;	Wps=γ*psh*psl*psd/Lavgft;	Wps=**165.9259**
Passive soil Force;	Fps=if(PS==1,Wps*tan(ϕ),0);	Fps=**88.2244**
Weight of wall moment arm;	Xww=(bd/2+.5*Hceft*tan(ω))-.5*u;	Xww=**0.7085**
Moment arm of grid 1;	Xg1= GL1*bh;	Xg1=**1.3333**
Moment arm of grid 2;	Xg2= GL2*bh;	Xg2=**2.6667**
Passive soil moment arm;	Xps=Hceft-psh;	Xps=**0.5000**
Weight of wall Moment;	Mww=Www*Xww;	Mww=**340.0707**
Grid1 Moment;	Mg1=Ga1*Xg1;	Mg1=**494.6667**
Grid2 Moment;	Mg2=Ga2*Xg2;	Mg2=**1232.0000**
Passive soil Moment;	Mps=Fps*Xps;	Mps=**44.1122**

Short Wall Evaluation (use only if Foundation of Fence Post is below Bottom of Wall)

*Assumes wall is part of passive soil in front of founation;

Resisting Forces;

Passive soil between units and fdn;

Between Passive soil height;	pshsw=(H_{wallft}+H_{wallft}-Xp)/2;	pshsw=**7.5000**
Between Passive soil length;	pslsw=(2*Xp+Dia);	pslsw=**2.6667**
Between Passive soil depth;	psdsw=Xp;	psdsw=**1.0000**
Between Passive soil weight;	Wpssw=γ*pshsw*pslsw*psdsw/Lavgft;	Wps=**165.9259**
Between Passive soil Force;	Fpssw=if(PS==1,Wps*tan(ϕ),0);	Fpssw=**88.2244**
Between Passive Moment Arm;	Xpssw= Dfdn-Hpsw;	Xpssw=**2.3333**
Resisting moment of between passive;	Mpssw=Xpssw*Fpssw;	Mpssw=**205.8569**
Passive soil below wall;	Fpsbw=0.5*Kp*γ*Hps^2*3*Dia/Lavgft;	Fpsbw=**0.0000**
Passive soil below wall moment arm;	Xpsbw=Hps/3;	Xpsbw=**0.0000**ft
Resisting moment of passive soil below wall;	Mpsbw=Fpsbw*Xpsbw;	Mpsbw=**0.0000**

Force of Wall Units;

Weight of Wall;	Wsw=γb*H_{wallft}*bd;	Wsw=**960.0000**

Sliding Resistance;	Fsw=Wsw*tan(ϕf);	Fsw=**510.4411**
Moment arm to sliding resistance force;	Xsw=Dfdn-H_{wallft};	Xsw=**-4.0000**
Resisting moment from sliding resistance force;	Msw=Fsw*Xsw;	Msw=**-2041.7642**
Moment arm of grid 1;	Xg1=Dfdn-(Hce-GL1)*bh;	Xg1=**1.3333**
Moment arm of grid 2;	Xg2=Dfdn-(Hce-GL2)*bh;	Xg2=**2.6667**
Grid1 Moment;	Mg1=Ga1*Xg1;	Mg1=**494.6667**
Grid2 Moment;	Mg2=Ga2*Xg2;	Mg2=**1232.0000**

Total Local Values

Total Driving Sliding Forces (local);	Flocal=Fs+Fq+w_{post};	Flocal=**438.6444**
Total Resisting Sliding Forces (local);	Rslocal=Fps+Ga1+Ga2+Vw;	Rslocal=**1621.2244**
Total Driving OT Moment (local);	Mdlocal=Ms+Mq+max(Mra,Mw);	Mdlocal=**791.7111**
Total Resisting OT Moment (local);	Mrlocal=Mww+Mg1+Mg2+Mps;	Mrlocal=**2110.8495**
Local Sliding FoS;	FSslocal=Rslocal/Flocal;	FSslocal=**3.6960**
Local OT Factor of Safety;	FSotlocal=Mrlocal/Mdlocal;	FSotlocal=**2.6662**

Short Wall Summary;

Total Driving Sliding Forces (local);	Flocal=Fs+Fq+w_{post};	Flocal=**438.6444**
Total Resisting Sliding Forces (local);	Rshort=Fpsbw+Fpssw+Fsw+Ga1+Ga2;	Rshort=**1431.6654**
Total Driving OT Moment (local);	Mdlocal=Ms+Mq+max(Mra,Mw);	Mdlocal=**791.7111**
Total Resisting OT Moment (local);	Mrshort=Mpssw+Mpsbw+Msw+Mg1+Mg2;	Mrshort=**-109.2407**
Short wall sliding FS;	FSsshort=Rshort/Flocal;	FSsshort=**3.2638**
Short wall OT FS;	FSotshort=Mrshort/Mdlocal;	FSotshort=**-0.1380**

Summary*;

Global Sliding Check;	GSC=if(FSsliding>1.5,"OK","NG");	GSC=**"OK"**
Global OT Check;	GOT=if(FSot>1.5,"OK","NG");	GOT=**"OK"**
Local Sliding Check;	LS=if(FSslocal>1.5,"OK","NG");	LS=**"OK"**;
Local OT Check;	LOT=if(FSotlocal>1.5,"OK","NG");	LOT=**"OK"**
Short Wall Sliding Check;	SS=if(FSsshort>1.5,"OK","NG");	SS=**"OK"**;
Short Wall OT Check;	SOT=if(FSotshort>1.5,"OK","NG");	SOT=**"NG"**

*For short walls (Foundation Depth > Wall Height) Use Short Wall Results;