December 23, 2005

Project No. 05-1574

MSE
Mortarless Systems Engineering
An SRW Design Firm

To: GLS Industries
7200 Highway 63 N
Rochester, MN 55906-8978

Attention: Jeffery Price

Subject: Moderra Siding System Analysis, Generic Wainscoat Application

In accordance with the request of your representative (Dustin Boettcher), Mortarless Systems Engineering, Inc. (MSE) has prepared an analysis of a typical wainscoat application (4' high) of the subject siding system.

Based upon a review of the subject system, and the design specifications presented in *National Design Specification (NDS) for Wood Construction*, it is MSE's opinion that the subject system will be stable provided the specific recommendations contained herein this report, and the general construction recommendations of *Moderra's Installation Manual*, are incorporated in wainscoat construction.

Although the *NDS* is a national recognized standard, there may be instances where the governing authority requires a locally registered engineer to review and approve the attached calculations.

Respectfully,

REGISTERED PROFESSIONAL ENGINEER
CAMERON ROBERSON
No. 17246
Exp. 12/31/05
CIVIL
STATE OF IOWA

Cameron Roberson, MN 43483, WI 37113-6, IA 17246
President

Enclosed: Figure: *Moderra Stability Analysis*
Calculations (4'0" Wainscoat)

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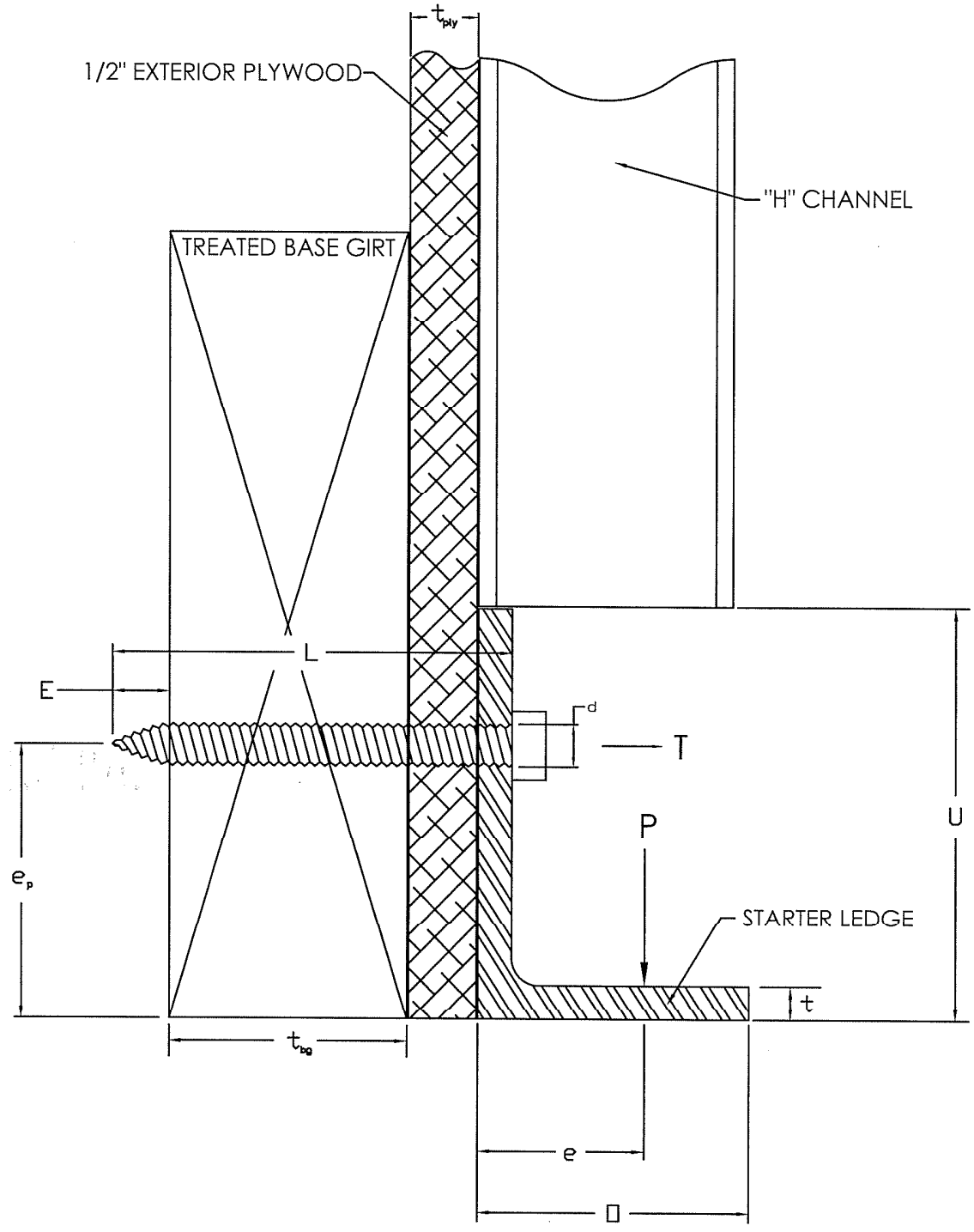
MODERRA STABILITY ANALYSIS



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NO.	DATE	REVISION	BY

MSE Mechanically Stabilized Earth

LEGEND

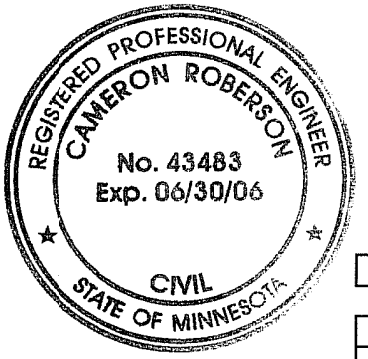
MODERRA

MODERRA STABILITY ANALYSIS

9/16/15

12/23/2005

Moderra Stability Analysis v.02



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C_D	Duration coefficient	/	0.90	
C_m	Moisture coefficient		1	
C_{eg}	End grain coefficient		1	
C_g	Group Action Factor		1	
C_Δ	Geometry Coefficient		1	
C_t	Temperature coefficent		1	
s	Lag screw spacing (in) (along length of starter ledge)		16	
d	Lag screw diameter (in), typ. 3/8" = 0.375"		0.375	
L	Lag screw length (in), use only fully threaded screws		2.50	
E	Length of tapered tip (in)		0.22	
w	unit weight of Moderra (psf)		28	
t	Starter ledge thickness (in)		0.25	
H	Moderra Wall height (ft)		4.25	
F_y	Youngs Modulus for A36 angle iron (psi)		36000	
U	Leg up distance (in), typ. 3" or 4"		2	
O	Leg out distance (in), typ. 2" or 3"		3	
e_p	Pullout moment arm (in), dist from bttm of angle to lag screw, typ. 2"		1	
t_{bg}	Thickness of Base Girt (in), typ. 1.75" for 2by6, 2by8, etc.		1.75	
t_{ply}	Thickness of plywood (in), typ. 1/2" exterior plywood		0.5	
e	Moment arm (in)		0.75	0.75

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Ab	Area of angle iron resisting shear due to bending (in^2/ft)	= (t)(12in)		3
S_x	Section modulus of angle iron (in^3/ft)	= (1/6) (12in) (t^2)		0.125
I_x	Moment of Inertia of angle iron (in^4/ft)	= $(S_x)^2$		0.016
Vb	Shear capacity of angle iron against bending (lb/ft)	= 0.4 (F_y)(A)		43200
$H_{Vb\ all}$	Allowable wall height considering Vb (ft)	= (Vb)/(w)	O.K.	1543
Mb	Moment capacity of angle iron against bending (ft-lb/ft)	= 0.6(F_y)(Sx)/(12in)		225
$H_{Mb\ all}$	Allowable wall height considering Mb (ft)	= (Mb)/(w * e/(12"/ft))	O.K.	129
D	Depth of thread penetration (in), can not exceed $t_{bg} + t_{ply}$	= lesser of (L-E-t) or ($t_{bg} + t_{ply}$)		2.03
W	Pullout capacity of lag screw from spruce-pine-fir (SPF), (#/in of thread)	= Interpreted from NDS Manual		235
W'	Modified pullout capacity of lag screw from SPF, (#)	= W * C_D * C_m * C_t * C_{eg} * D		211.50
C_d	depth coefficient	= D / (8 * d)		0.68
Z	Shear capacity of SPF against lag screw (#)	= Interpreted from NDS Manual		450
Z'	Modified shear capacity of SPF against lag screw (#/lag screw)	= Z * C_D * C_m * C_g * C_Δ * C_d * C_{eg}		274
P	Wall Load (#/ft)	= w * H		119
T	Pullout Force on lag screws (#/ft)	= P * (e / e_p) * (s / 12in)		119

Cameron Roberson

UNITY FORMULA = (T / W') + (P / Z') <= 1

(T / W') + (P / Z') = 1.00 <= 1 O.K.

Moderra Starter Ledge to Base Girt thru Plywood (i.e., Pole Frame Bldg)