RES
ENGINEERING + DESIGN

RELEASE FOR CONSTRUCTION
AS NOTED ON PLANS REVIEW
DEVELOPMENT SERVICES
LEE'S SUMMIT, MISSOURI
04/22/2021

Brandon Kalwei
Digitally signed by Brandon Kalwei
Date: 2021.04.22 12:38:21-05'00'

April 22, 2021

Summit Homes
120 SE 30th St.
Lee's Summit, MO 64082

Retaining wall design for Lot # 62 Woodside Ridge – 103 NW Joshua Drive Lee's Summit, MO 64082

The following specification for retaining wall design for Lot # 62 Woodside Ridge is noted on sheet A3 of plans and is summarized below:

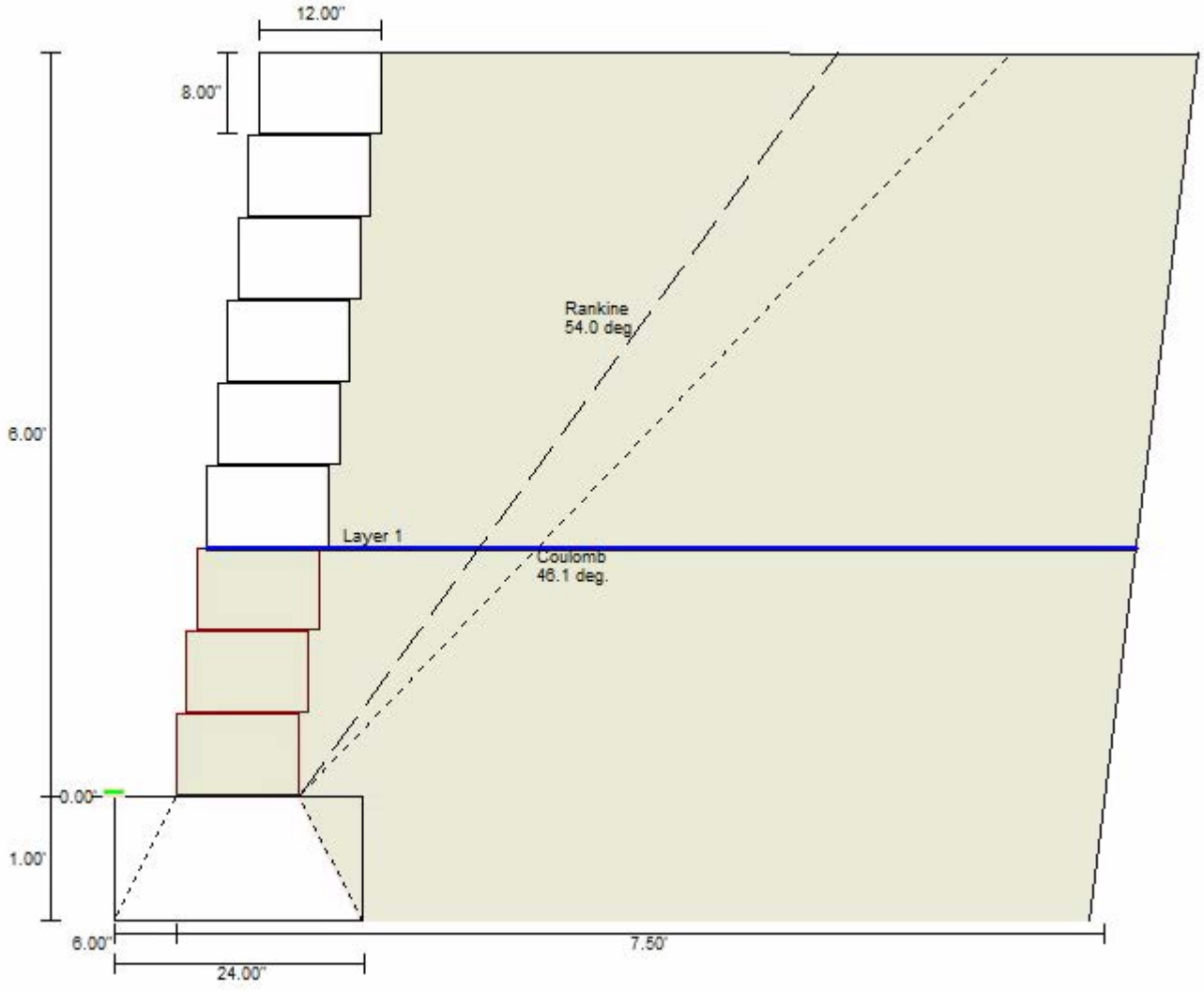
- Keystone Retaining wall – Compac III
- 9 blocks offset by 1" per block (for 6'-0" tall section)
- 7'-6" base width mirafi geogrid – miragrid 3XT (base width includes width of retaining wall block)
- (1)Geogrid layer on 3rd block per construction drawing
- Base pad 12" deep x 24" wide per construction drawing
- Grade required to cover base pad only per construction drawing

Sincerely,

Bradley Huxol, PE

STATE OF MISSOURI
BRADLEY HUXOL
NUMBER PE-2011000203
PROFESSIONAL ENGINEER

Block Vendor: Keystone Retaining Wall
Block Type: Compac III
Geogrid Vendor: Mirafi Geogrid
Geogrid Type: Miragrid 3XT
Offset per Block: 1"



This Wall in File.

Project Name/Number :
Title **Kiser Ultra Build Retaining Wall**
Dsgnr:
Description....

Date: 14 APR 2021

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Segmental Retaining Wall with Geogrids

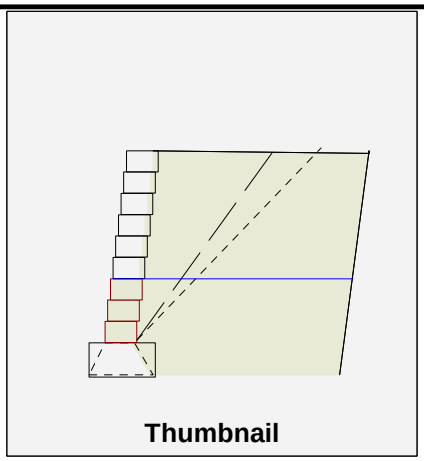
Code: NCMA 3rd

Criteria

Wall height (retained height)	6.00 ft
Backfill slope	Level
Backfill angle	0.0 deg
Embedment	0.0 ft

Soil data

External Soil, Phi_e	18 deg
External soil density (In situ)	110 pcf
Internal Soil, Phi_i	18 deg
Internal soil density	110 pcf
Wall Soil Friction Angle	12 deg
K_a(Horiz)	0.43



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Dead load	0 psf
Live load	0 psf
Seismic Factor, A	0.00
d_seismic	0.00 in

Segmental block data

Vendor selection	Keystone Retaining Wall		
Vendor ESR	ICC ESR-2113	Valid through	08/01/18
Block selection type	Compac III		
Block height	8.00 in	alpha(u_1)	1543.00 lb
Block depth	12.00 in	tan(lambda_u1)	0.74
Offset per block	1.00 in	Max_1	4138.00 lb
Batter angle	7.13 deg	alpha(u_2)	1543.00 lb
Wall weight	72.00 psf	tan(lambda_u2)	0.74
		Max_2	4138.00 lb

Stability

Base length	7.50 ft
Base Sliding Force (w/o Seismic)	804.15 lb
Base Resisting Force (w/o Seismic)	1,444.10 lb
Base Sliding (w/o Seismic) FS	1.80
Overturning Moment (w/o Seismic)	1,608.30 ft lb
Resisting Moment (w/o Seismic)	18,714.80 ft lb
Overturning (w/o Seismic) FS	11.64
Applied Bearing Pressure (w/o Seismic)	577.37 psf
Allowable Bearing Pressure (w/o Seismic)	1,500.00 psf
Bearing (w/o Seismic) FS	2.60
Eccentricity of Vert. Force (w/o Seismic)	0.10 ft
Effective Base Width (w/o Seismic)	7.70 ft

Geogrid material

Vendor Selection	Mirafi Geogrid		
Geogrid type	Miragrid 3XT		
LTDS	1,999.00 lb/ft		
Ci	0.90		
RF_CR	1.58		
alpha_u	1,271.00 lb		
tan(lambda_u)	0.65		
Max	3,539.00 lb		
alpha_cs1	1,345.22 lb	alpha_cs2	2,020.24 lb
tan(lambda_cs1)	0.27	tan(lambda_cs2)	0.00
Max_1	2,020.24 lb	Max_2	2,020.24 lb

Factors of Safety

Failure Mode	Static Condition Min Acceptable	Actual	Status	Acceptable
Base Sliding	1.50	1.80	OK	
Overturning	2.00	11.64	OK	
Bearing	2.00	2.60	OK	
Internal Sliding	1.50	4.08	OK	
Tensile Overstress	1.50	2.12	OK	
Pullout	1.50	1.88	OK	
Connection	1.50	1.51	OK	

This Wall in File:

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Segmental Retaining Wall with Geogrids

Code: NCMA 3rd

Wall Analysis Table:

Layer	Height ft	Trib Height	Depth to Midpoint	Tension From Surcharge Soil	DL	LL	Static Total Fg	LTDS	LTDS (Seismic)	Total Tension (W/seismic), Fi	FS Tensile Overstress (Static)	w/Seismic)
1	2.00	5.00	4.00	940.8	0.0	0.0	940.8	1,999.0	1,265.2	940.8	2.12	1.34

Wall Analysis Table Continued:

Layer	Pullout Strength	FS Pullout (Static)	(Seismic)	Connection Strength	FS Conn (Static)	(Seismic)	Internal Sliding Force (Static)	FS Internal Sliding (Static)	Internal Sliding Force (Seismic)	FS Internal Sliding (Seismic)
1	1,766.7	1.88	0.00	1,423.0	1.51	1.51	357.4	4.08	357.4	4.08

ASSUMPTIONS AND CRITERIA USED

1. References used include *Design Manual for Segmental Retaining Walls*, *3rd Edition*, by NCMA.
2. Blocks are all same size and uniform offsets (batter) for full wall height.
3. Coulomb earth pressure theory used for earth pressures and failure plane angle.
4. Refer to geotechnical report for backfill material, compaction, and other design data and recommendations.
5. Cap blocks if used are above the retained height and are neglected in this design.
6. Geogrid LTDS and connection values for block vendors obtained from ICC Evaluation Service (ES Legacy Reports) or as provided by vendors. Since these may change or be updated, verification of values is recommended.
7. Block sizes obtained from vendors' literature and may vary with locality.
8. Geogrid layers are equally spaced vertically, all same length, and laid horizontally.
9. Average weight of block and cell infill assumed to be 120 pcf.
10. See vendor web sites (on input screen) for more information and specifications.
11. Vendor specifications or project specifications, whichever is most restrictive, to be followed for construction procedures.
12. Add notes and details for proper drainage.
13. See *User's Manual* Design Example #10 for methodology and sample verification calculations.
14. Final design responsibility is with the project Engineer-of-Record.