Aria Lee's Summit Retaining Walls

Lee's Summit, Jackson County, Missouri

1. MATERIALS

A. BACKFILL SOILS

a. REINFORCED STRUCTURAL BACKFILL MATERIALS SHALL BE APPROVED BY THE OWNER OR OWNER'S REPRESENTATIVE AND SHALL MEET THE STRENGTH REQUIREMENTS AS DEFINED IN SECTION 5.0. THE REINFORCED BACKFILL MATERIAL SHALL BE:

MODOT TYPE 1, TYPE 5, OR 1" CLEAN.

b. FURTHERMORE, REINFORCED BACKFILL AND RETAINED SOIL/FILL MATERIALS SHALL BE FREE OF EXCESS MOISTURE, ROOTS, MUCK, SOD, SNOW, FROZEN LUMPS, ORGANIC MATTER OR OTHER DELETERIOUS MATERIALS. ALL ROCK PARTICLES AND HARD EARTH CLODS SHALL BE LESS THAN THREE INCHES IN THE LONGEST DIMENSION. REINFORCED BACKFILL MATERIALS WHICH DO NOT MEET THIS CRITERION SHALL BE CONSIDERED UNSUITABLE AND SHALL BE REMOVED.

c. DRAINAGE FILL BEHIND BASKET FACE SHALL CONSIST OF CLEAN CRUSHED STONE OR CRUSHED GRAVEL (1" CLEAN).

B. GEOGRID REINFORCING SHALL BE SYNTEEN GEOGRIDS AS SHOWN OR APPROVED EQUAL

2. TECHNICAL REQUIREMENTS

A. PRIOR TO CONSTRUCTION OF THE WALLS, THE GRADING CONTRACTOR SHALL CLEAR AND GRUB THE REINFORCED BACKFILL ZONE AREA, REMOVING TOP SOILS, BRUSH, SOD OR OTHER ORGANIC MATERIALS. ANY UNSUITABLE SOILS SHALL BE OVER-EXCAVATED, REPLACED AND COMPACTED WITH REINFORCED BACKFILL MATERIAL TO PROTECT SPECIFICATIONS OR OTHERWISE DIRECTED BY THE OWNER'S GEOTECHNICAL ENGINEER.

B. THE GEOTECHNICAL ENGINEER SHALL CONFIRM THAT THE SITE HAS BEEN PROPERLY PREPARED AND THE DESIGN PARAMETERS IN SECTION 5 ARE APPROPRIATE PRIOR TO FILL PLACEMENT. A WRITTEN CONFIRMATION SHALL BE PROVIDED TO CROCKETT ENGINEERING PRIOR TO FILL PLACEMENT.

C. FILL SHALL BE PLACED IN HORIZONTAL LAYERS NOT EXCEEDING 10 INCHES IN UNCOMPACTED THICKNESS FOR HEAVY COMPACTION EQUIPMENT. FOR ZONES WHERE COMPACTION IS ACCOMPLISHED WITH HAND OPERATED EQUIPMENT, FILL SHALL BE PLACED IN HORIZONTAL LAYERS NOT EXCEEDING 6 INCHES IN UNCOMPACTED THICKNESS. ONLY HAND-OPERATED EQUIPMENT SHALL BE ALLOWED WITHIN THREE FEET OF THE BACK FACE WALL.

D. FILL MATERIALS SHALL BE PLACED FROM THE BACK OF THE FACING UNITS TOWARDS THE ENDS OF THE GEOGRID TO ENSURE FURTHER TENSIONING.

E. FILL SHALL BE COMPACTED AS SPECIFIED BY PROJECT SPECIFICATIONS OR TO A MINIMUM 95 PERCENT OF THE MAXIMUM DRY DENSITY AS DETERMINED IN ACCORDANCE WITH ASTM D-698.

F. TESTING METHODS, FREQUENCY, VERIFICATION OF MATERIAL SPECIFICATIONS, AND COMPACTION SHALL BE THE RESPONSIBILITY OF THE OWNER'S GEOTECHNICAL ENGINEER. A COPY OF THE REPORT SHALL BE PROVIDED TO CROCKETT ENGINEERING.

G. CAP UNITS SHALL BE PERMANENTLY SECURED TO THE BLOCK UNITS USING AN OUTDOOR CONSTRUCTION ADHESIVE.

3. GEOGRID PLACEMENT

A. GEOGRID SHALL BE PLACED AT THE LOCATIONS AND ELEVATIONS SHOWN ON THE DRAWINGS. REINFORCED FILL ZONE LENGTH IS MEASURED FROM THE BACK FACE OF THE WALL UNITS, EXTENDING TO THE END OF THE GEOGRID.

B. GEOGRID REINFORCEMENT SHALL BE CONTINUOUS THROUGHOUT THEIR EMBEDMENT LENGTH(S).

C. PRIOR TO PLACING FILL, THE GEOGRID MATERIALS SHALL BE PLACED IN BETWEEN BLOCK COURSES, THE SLACK REMOVED AND ANCHORED.

D. CONSTRUCTION EQUIPMENT SHALL NOT BE OPERATED DIRECTLY ON THE GEOGRID. A MINIMUM FILL THICKNESS OF SIX INCHES IS REQUIRED FOR OPERATION OF TRACKED VEHICLES OVER THE GEOGRID. TURNING OF TRACKED VEHICLES SHOULD BE KEPT TO A MINIMUM TO PREVENT TRACKS FROM DISPLACING THE FILL AND/OR THE GEOGRID.

E. GEOGRID SHALL BE ROLLED OUT WITH THE LONG AXIS OF THE APERTURES (MACHINE DIRECTION) PERPENDICULAR TO THE WALL FACE.

F. A MINIMUM OF 3 INCHES OF FILL MATERIAL SHALL BE REQUIRED BETWEEN OVERLAPPING LAYERS OF GEOGRID AND FILTER FABRIC, UNLESS OTHERWISE SHOWN.

4. DRAINAGE

A. AT THE END OF EACH WORK DAY, BACKFILL SURFACE SHALL BE COMPACTED WITH A SMOOTH PLATE COMPACTOR TO MINIMIZE PONDING OF WATER AND SATURATION OF THE BACKFILL.

B. PERMANENT SURFACE WATER DIVERSION SHALL BE AS REQUIRED AND PROVIDED BY THE OWNER OR OWNER'S REPRESENTATIVE.

5. DESIGN PARAMETERS

A. DESIGN OF THE REINFORCED SOIL STRUCTURE IS BASED ON THE FOLLOWING PARAMETERS BASED ON SITE EXPOSED ROCK ENTIRE WALL SURFACE:

	EFFECTIVE FRICTION ANGLE	EFFECTIVE COHESION	MOIST UNIT WT
REINFORCED FILL	34	0	125
RETAINED SOILS	23	0	120
FOUNDATION SOILS	23	0	120

MINIMUM BEARING CAPACITY 2,500 PSF

B. DESIGN METHODOLOGY: NCMA GUIDELINES

C. FACTOR OF SAFETY:

INTERNAL STABILITY: STATIC

MINIMUM FACTOR OF SAFETY (FOS) FOR UNCERTAINTIES = 1.5
MINIMUM FOS FOR GEOGRID PULLOUT = 1.5
MINIMUM FOS FOR CONNECTION = 1.5
MINIMUM FOS FOR FACING STABILITY = 1.5
MINIMUM FOS FOR SLIDING AT LOWEST GEOGRID = 1.5
SOIL – GEOGRID INTERACTION COEFFICIENT = 0.8
PERCENT COVERAGE OF GEOGRID = 100%

D. EXTERNAL STABILITY

MINIMUM FACTOR OF SAFETY FOR OVERTURNING = 1.5
MINIMUM FACTOR OF SAFETY FOR SLIDING = 1.5

E. SURCHARGE LOADING

100 PSF SIDEWALKS/PARKING LOTS

6. SPECIAL PROVISIONS

A. THE DESIGN PRESENTED HEREIN IS BASED ON SOIL PARAMETERS, FOUNDATION CONDITIONS, GROUNDWATER CONDITIONS, AND LOADINGS STATED IN SECTION 5.

B. WALL ELEVATION VIEWS AND LOCATIONS AND GEOMETRY OF EXISTING STRUCTURES AND GRADE ABOVE AND BELOW WALLS MUST BE VERIFIED BY THE CONTRACTOR, TO MATCH ELEVATIONS SHOWN IN THE CONTRACT DOCUMENTS, PRIOR TO CONSTRUCTION.

C. THE ENGINEER OF RECORD IS RESPONSIBLE FOR THE SEGMENTED RETAINING WALL & REINFORCED SOIL IN ITS FINAL CONDITION ONLY. GLOBAL STABILITY, BEARING CAPACITY, AND SETTLEMENT ANALYSIS IS THE RESPONSIBILITY OF THE OWNER'S GEOTECHNICAL ENGINEER. ANY CHANGES TO THE WALL REQUIRED BASED ON THE GEOTECHNICAL ANALYSIS SHOULD BE COORDINATED BY THE GEOTECHNICAL ENGINEER PRIOR TO WALL CONSTRUCTION.

D. REFER TO BLOCK MANUFACTURE'S WRITTEN INSTALLATION INSTRUCTIONS FOR SEGMENTED RETAINING WALL INSTALLATION, SPECIFICALLY REGARDING CONNECTIONS FROM BLOCK TO BLOCK AND GEOGRID INSTALLATION.

E. THE SOIL DESIGN PARAMETERS STATED IN SECTION 5.0 SHALL BE VERIFIED BY THE PROJECT GEOTECHNICAL ENGINEER. WRITTEN VERIFICATION OF DESIGN PARAMETERS SHALL BE SUBMITTED TO CROCKETT ENGINEERING AND PRIOR TO COMMENCING WITH CONSTRUCTION.

F. ANY REVISIONS TO DESIGN PARAMETERS STATED IN SECTION 5.0 OR STRUCTURE GEOMETRY SHALL REQUIRE DESIGN MODIFICATIONS PRIOR TO PROCEEDING WITH CONSTRUCTION.

7. GUARDRAIL SPEC

A. SHALL BE 42" TALL ABOVE ADJACENT WALKING SURFACE.

B. SHALL NOT HAVE OPENINGS LARGE ENOUGH TO PASS A 4" SPHERE.

C. MAIN RAILS SHALL RESIST 50 POUND PER LINEAL FOOT LATERALLY AT THE TOP RAIL OR 200 POUNDS CONCENTRATED LOAD LATERALLY.

D. INTERMEDIATE RAILS SHALL RESIST A CONCENTRATED LOAD OF 50 POUNDS LATERALLY.

INDEX OF SHEETS

REVISIONS:

No.	Date
PHASE 1-PERMIT	02/04/2021

THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY

STATE OF MISSOURI
GREGORY L LINNEMAN
NUMBER PE-2005001013

GREGORY L. LINNEMAN - PE
MO LICENSE - 2005001013

STRUCTURAL ENGINEER:
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Crockett Engineering Consultants, LLC
Missouri Certificate of Authority
#2006015501

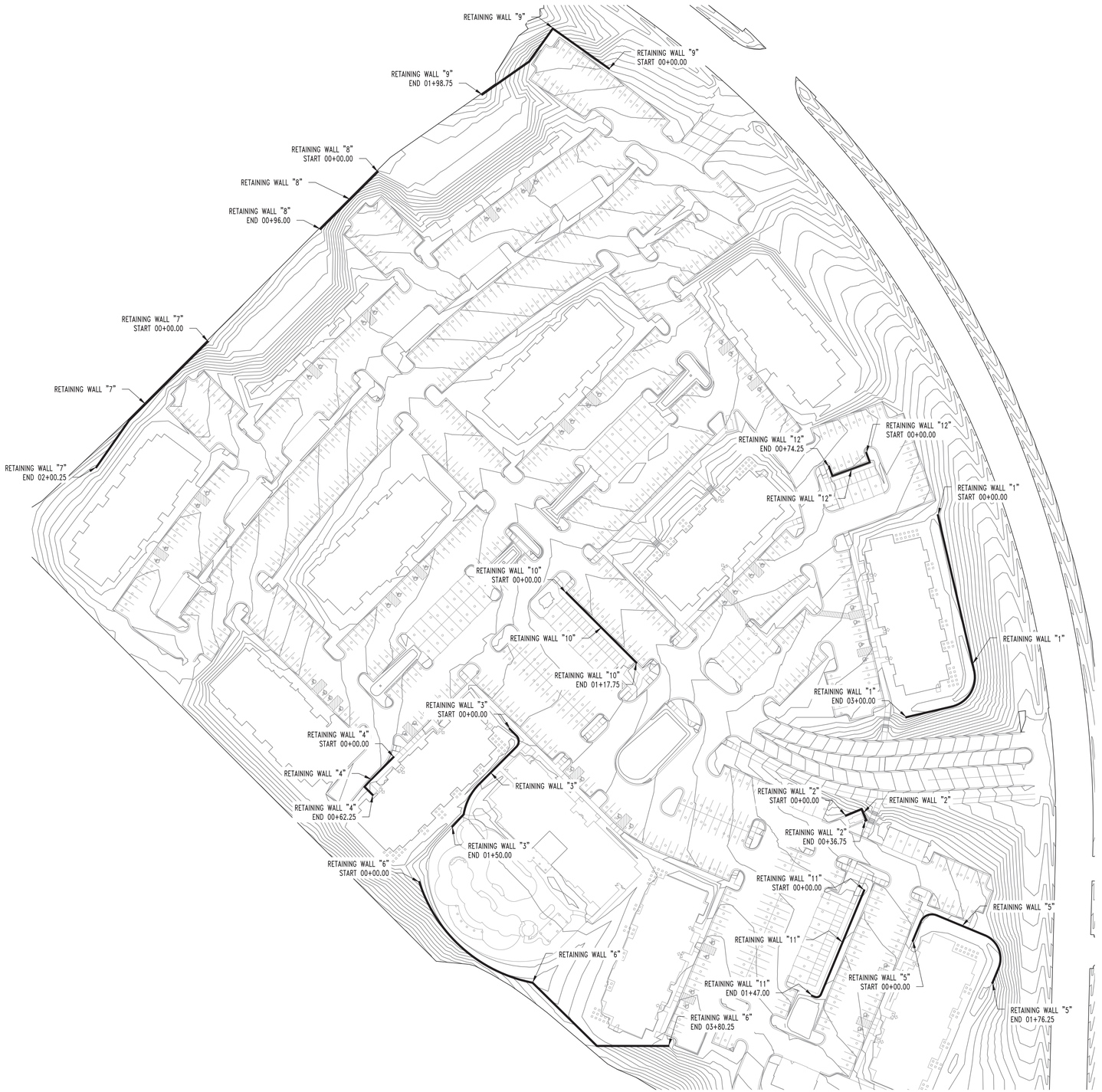
CLIENT:
CENTRAL STATES CONSTRUCTION
4215 PHILIPS FARM RD
COLUMBIA, MISSOURI

ARIA LEE'S SUMMIT APARTMENTS
LEE'S SUMMIT, JACKSON COUNTY, MISSOURI

DRAWING INCLUDES:
GENERAL
STRUCTURAL DATA

DESIGNED:	JWV
DRAWN:	SEH
PROJECT NO.:	190299

SHEET:
RW1



1 RW2 RETAINING WALL PLAN

NOT TO SCALE

N PLAN NORTH

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PARTIAL SITE PLAN

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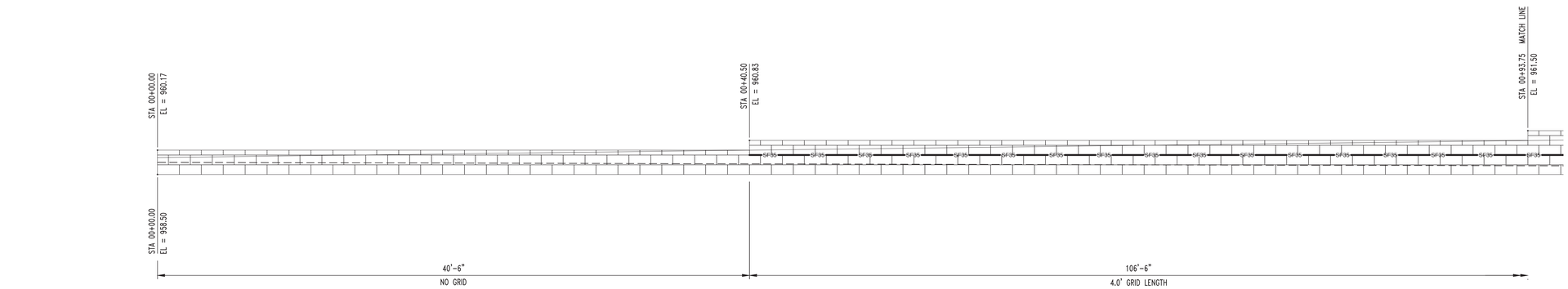
DRAWN:	SEH
PROJECT NO.:	190299

SHEET: RW2



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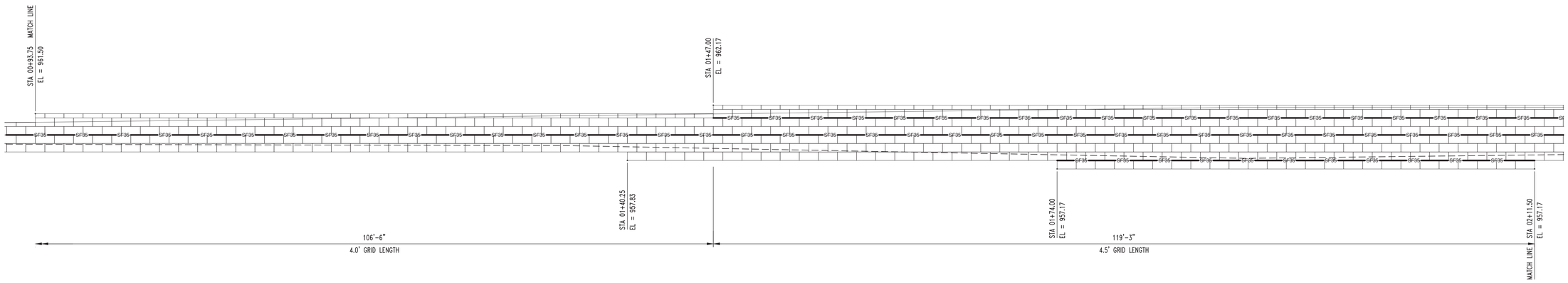
SCALE: ¼" = 1'-0"



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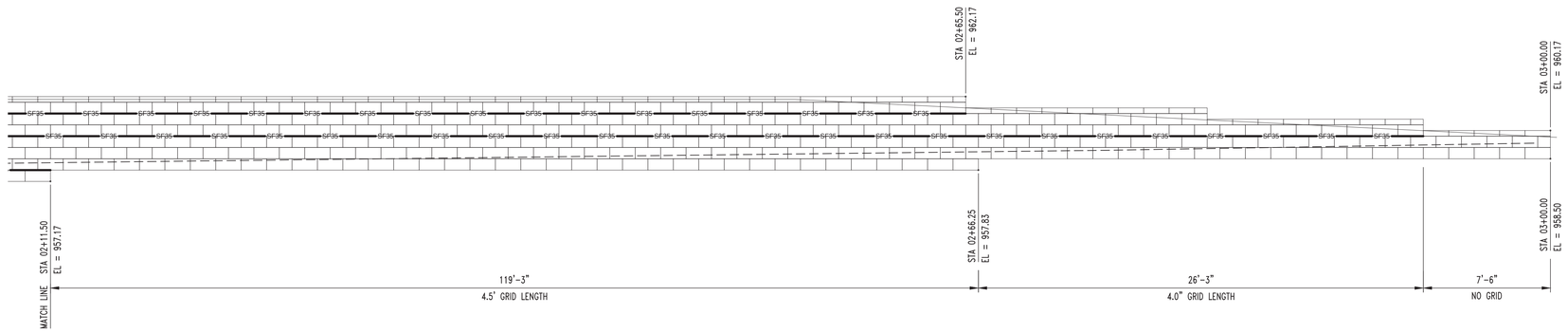
SCALE: ¼" = 1'-0"



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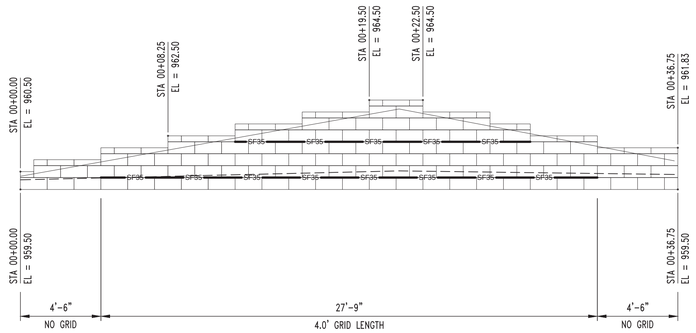

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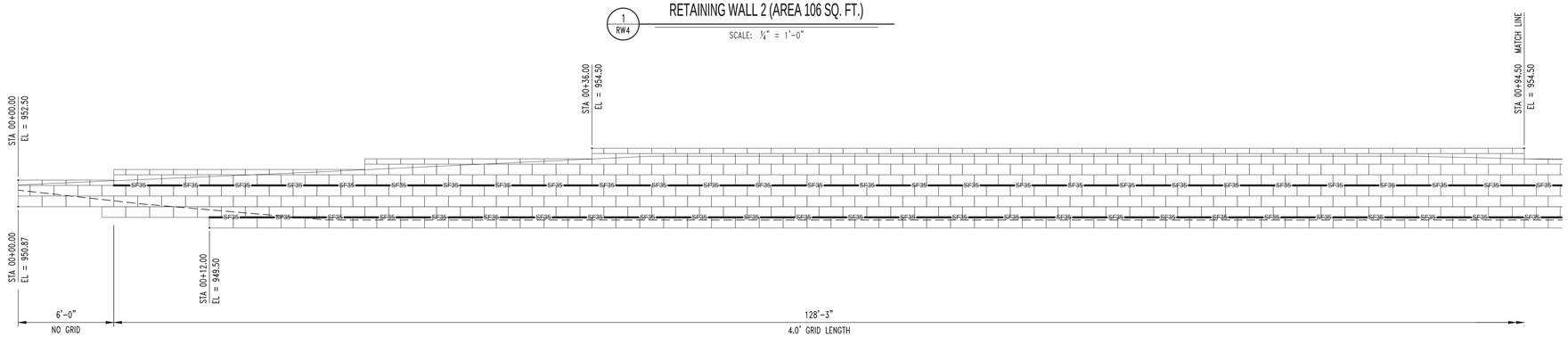

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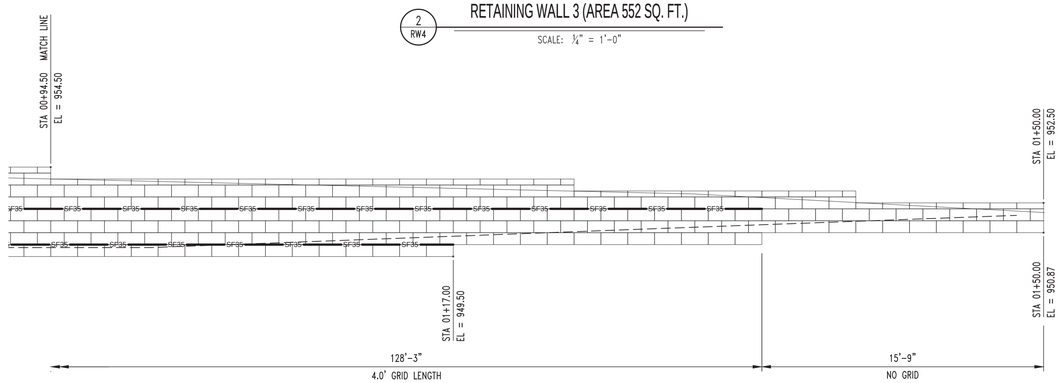

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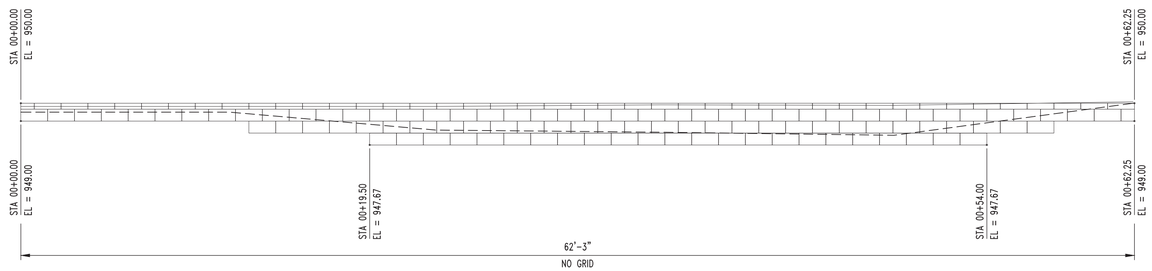

4 RW4 RETAINING WALL 4 (AREA 95 SQ. FT.)

SCALE: ¼" = 1'-0"

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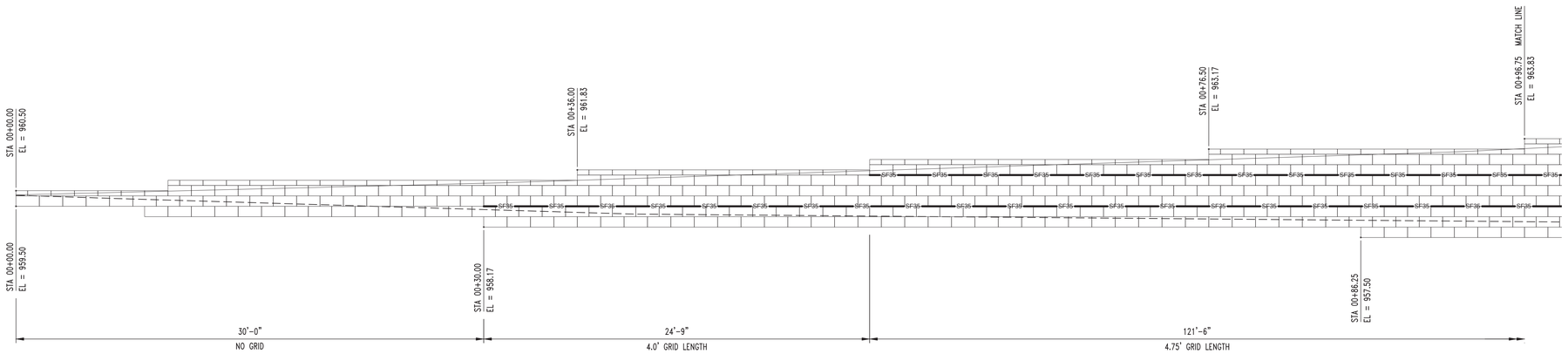

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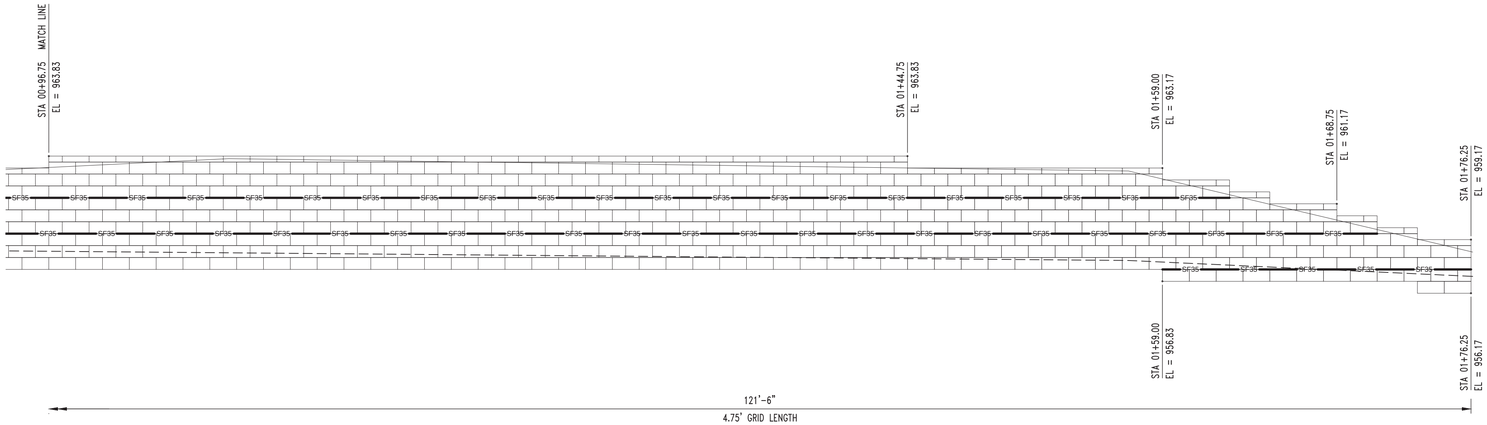

2 RW5 RETAINING WALL 5 (AREA 746 SQ. FT.)

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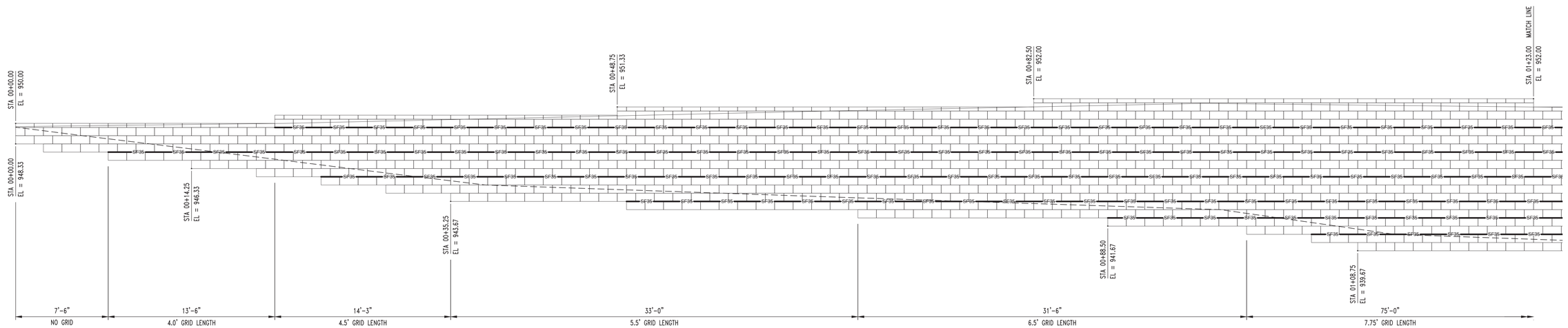

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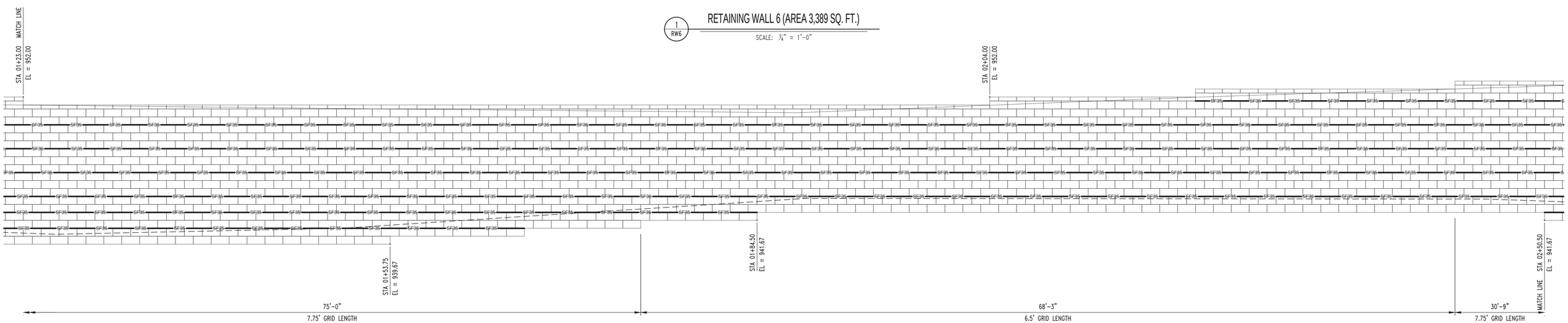

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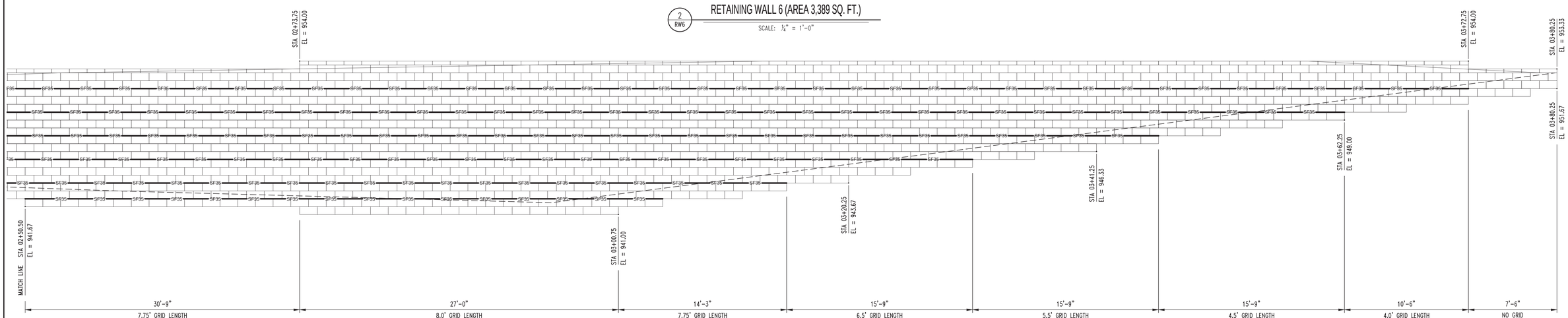

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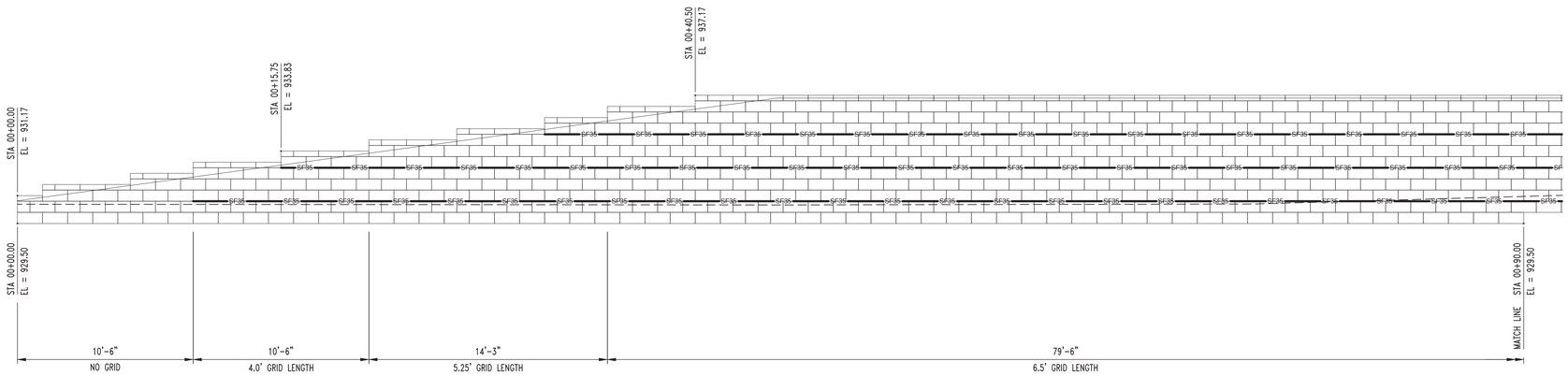

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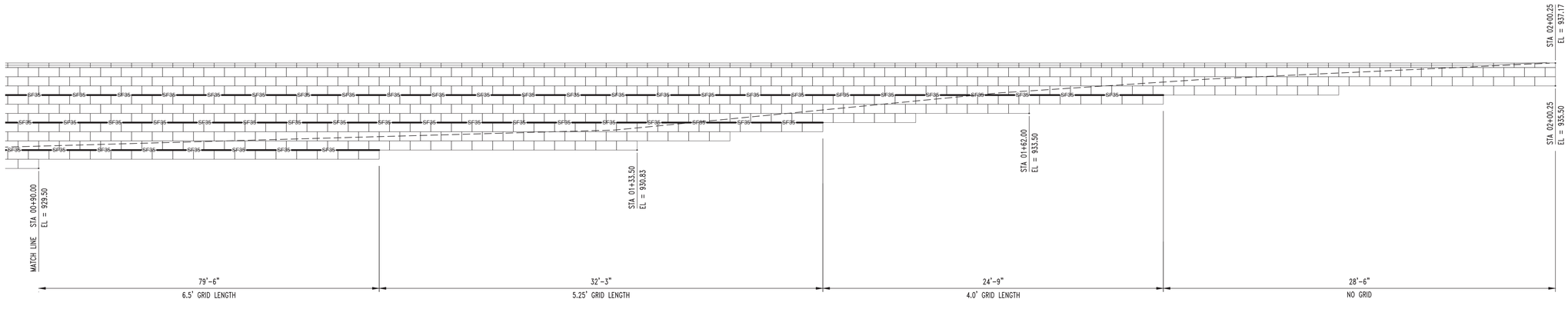

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PROJECT NO.:	190299

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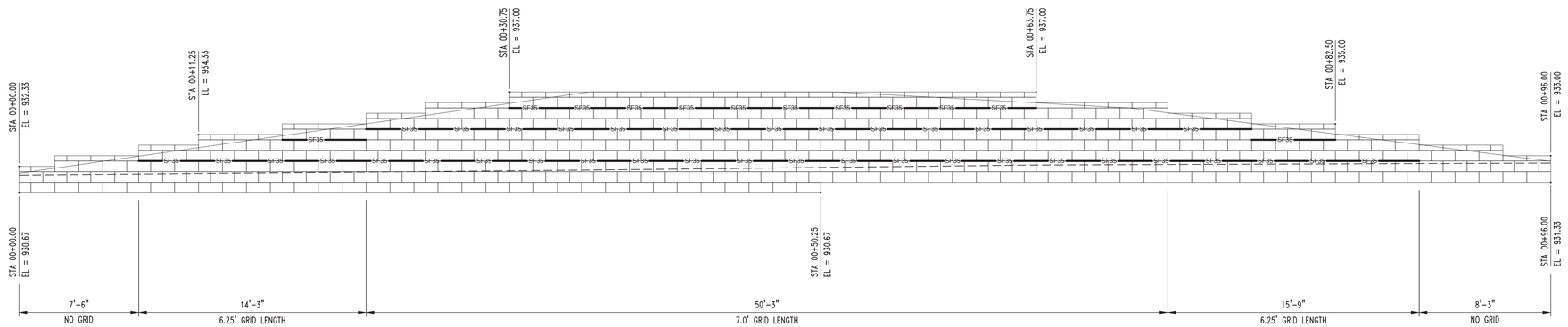

1 RW8 RETAINING WALL 8 (AREA 402 SQ. FT.)

SCALE: ¼" = 1'-0"

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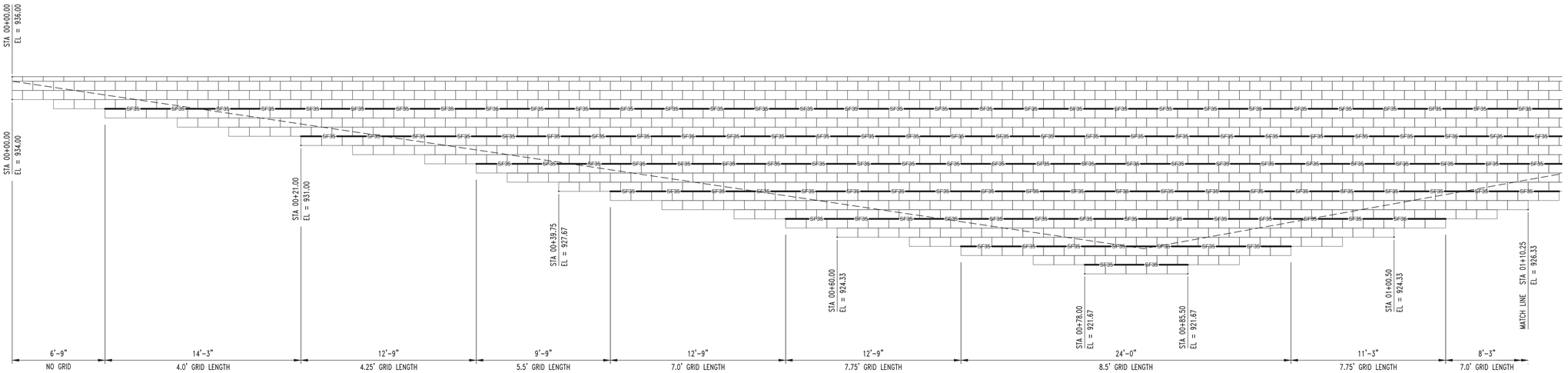

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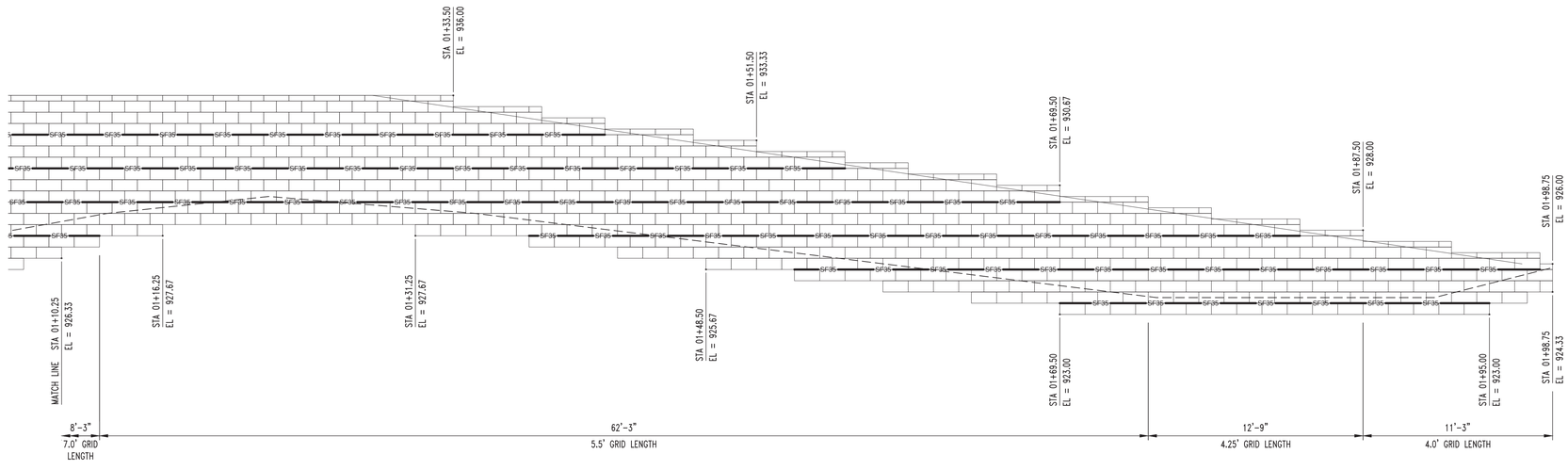

2 RW9 RETAINING WALL 9 (AREA 1,541 SQ. FT.)

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RW9

1 RW10 RETAINING WALL 10 (AREA 253 SQ. FT.)

SCALE: ¼" = 1'-0"

2 RW10 RETAINING WALL 11 (AREA 276 SQ. FT.)

SCALE: ¼" = 1'-0"

3 RW10 RETAINING WALL 11 (AREA 276 SQ. FT.)

SCALE: ¼" = 1'-0"

4 RW10 RETAINING WALL 12 (AREA 107 SQ. FT.)

SCALE: ¼" = 1'-0"

REVISIONS:

No.	Date
PHASE 1-PERMIT	02/04/2021

THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY

STATE OF MISSOURI
GREGORY L LINNEMAN
NUMBER PE-2005001013

GREGORY L. LINNEMAN - PE
MO LICENSE - 2005001013

STRUCTURAL ENGINEER:
CROCKETT
ENGINEERING CONSULTANTS
1000 West Nifong Blvd. Bldg. 1
Columbia, Missouri 65203
(573) 447-0292
www.crockettengineering.com
Crockett Engineering Consultants, LLC
Missouri Certificate of Authority
2006015501

CLIENT:
CENTRAL STATES CONSTRUCTION
4215 PHILIPS FARM RD
COLUMBIA, MISSOURI

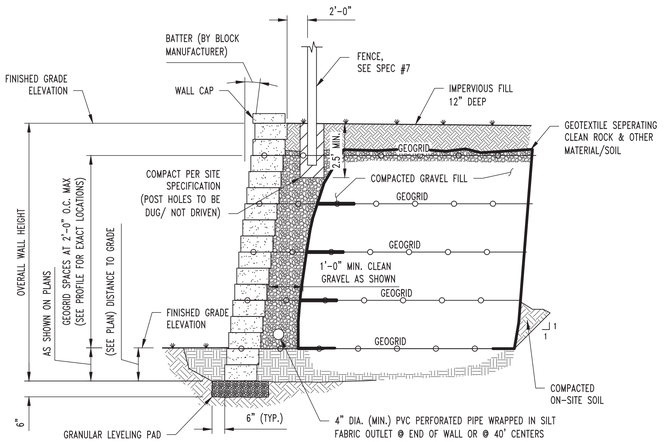
ARIA LEE'S SUMMIT APARTMENTS

LEE'S SUMMIT, JACKSON COUNTY, MISSOURI

DRAWING INCLUDES:

RETAINING WALL PROFILE

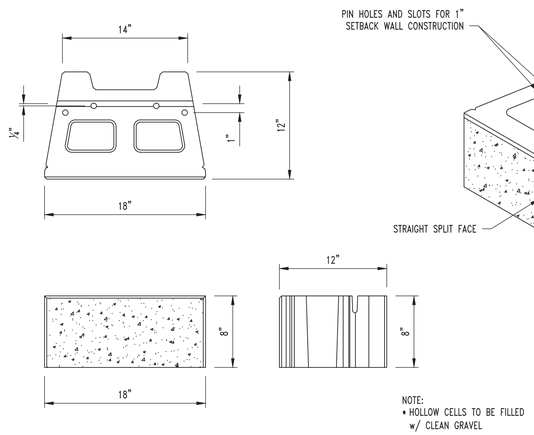
DESIGNED:	JWV
DRAWN:	SEH
PROJECT NO.:	190299
SHEET:	RW10



REINFORCED RETAINING WALL

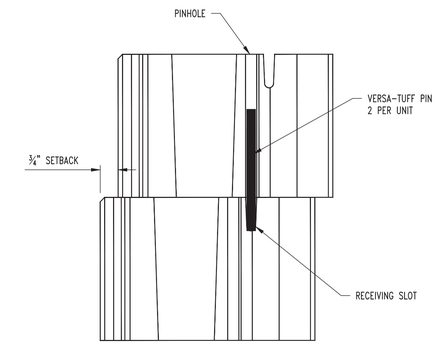
SCALE: NONE

NOTE:
THIS WALL SECTION IS GENERIC IN NATURE & REPRESENTS BASIC WALL CONSTRUCTION & COMPONENTS ONLY. ACTUAL DESIGN IS BASED ON ACTUAL PROJECT PARAMETERS, WHICH MAY NOT BE REPRESENTED IN THIS SECTION. REFER TO CIVIL DRAWINGS FOR ACTUAL SITE SPECIFIC SECTIONS & REQUIREMENTS.



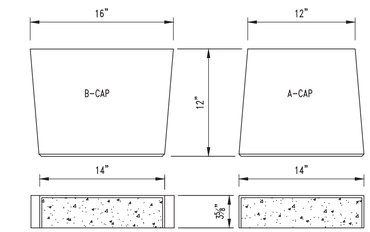
VERSA-LOK SQUARE FOOT UNIT

SCALE: NONE



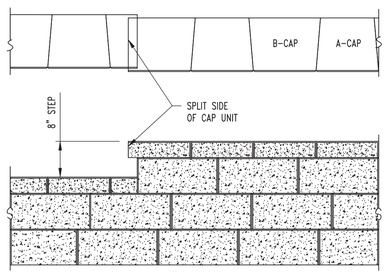
PINNING DETAIL

SCALE: NONE



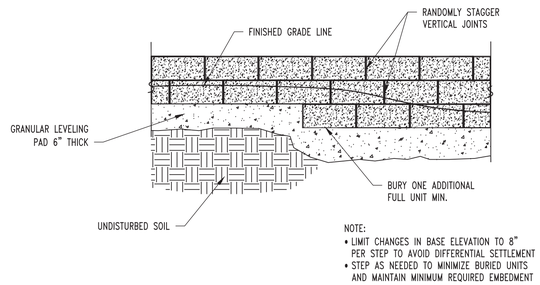
VERSA-LOK CAP UNITS

SCALE: NONE



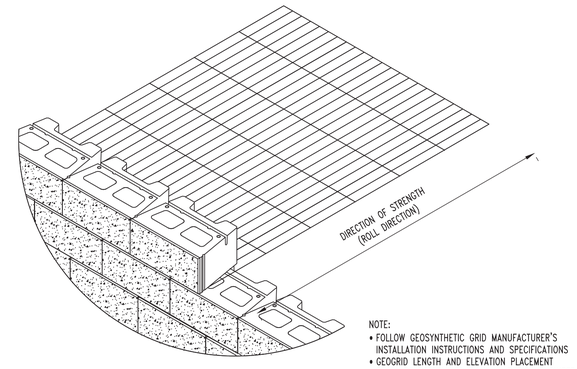
CAPPING DETAIL-PROFILE

SCALE: NONE



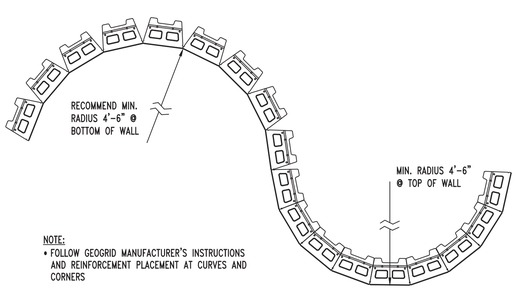
STEPPING BASE DETAIL

SCALE: NONE



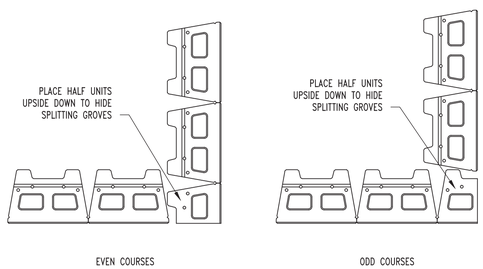
GEOSYNTHETIC INSTALLATION DETAIL

SCALE: NONE



CURVE DETAIL

SCALE: NONE



CORNER DETAIL

SCALE: NONE

REVISIONS:

No.	Date
PHASE 1-PERMIT	02/04/2021

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GREGORY L. LINNEMAN
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ARIA LEE'S SUMMIT APARTMENTS

LEE'S SUMMIT, JACKSON COUNTY, MISSOURI

DRAWING INCLUDES:
RETAINING WALL DETAILS

DESIGNED: JWV
DRAWN: SEH
PROJECT NO.: 190299

SHEET:
RW11