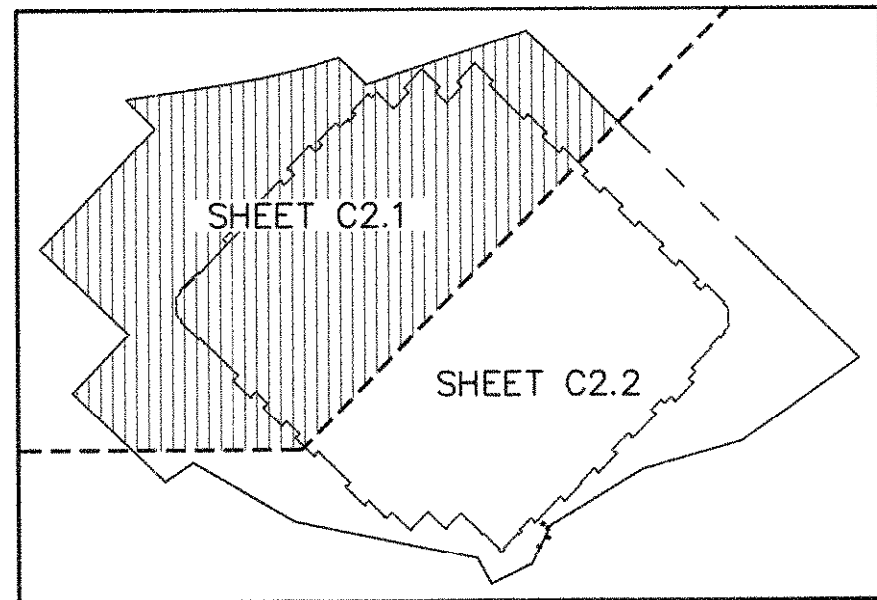


Finished Floor Elevations

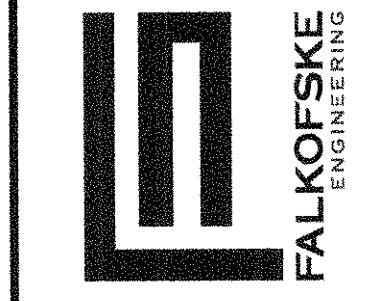
Building Level 4	= 555.83
Building Level 3	= 545.33
Building Level 2	= 534.83
Building Level 1	= 524.33
Garage Level -1	= 513.33
Garage Level -2	= 503.00

NOTE FROM FALKOFSKE: This plan was developed directly from the Cross Engineering Consultants, Inc. Grading Plan dated Jan. 9, 2020 and last revised on May 20, 2020, sheet C2.1. This plan is for the sole purpose of showing what retaining wall sections to use where and to comment on the site as necessary with regards to the retaining walls. Contractor shall review final Civil Plans for other notes with regard to the site prior to constructing Masonry Stone Retaining Walls.



DATE	BY	NO.	DATE	REVISION
03-20-20	AMB	1	06-07-20	UPDATED CALL OUTS
03-20-20	RL	2	07-17-20	UPDATED CIVIL GRADING PLAN CALLOUTS
03-20-20	AMB	3	08-26-20	UPDATED CIVIL GRADING PLAN

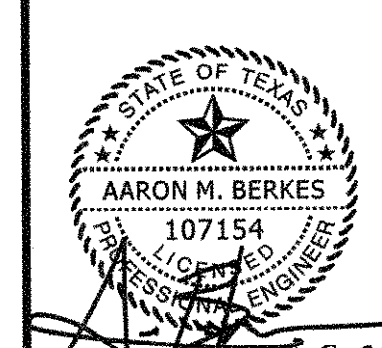
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Structural Engineering Consultants
TX Reg. Engineering Firm F-4038
722 North Fielder Road
Arlington, Texas 76012
(817) 261-8300



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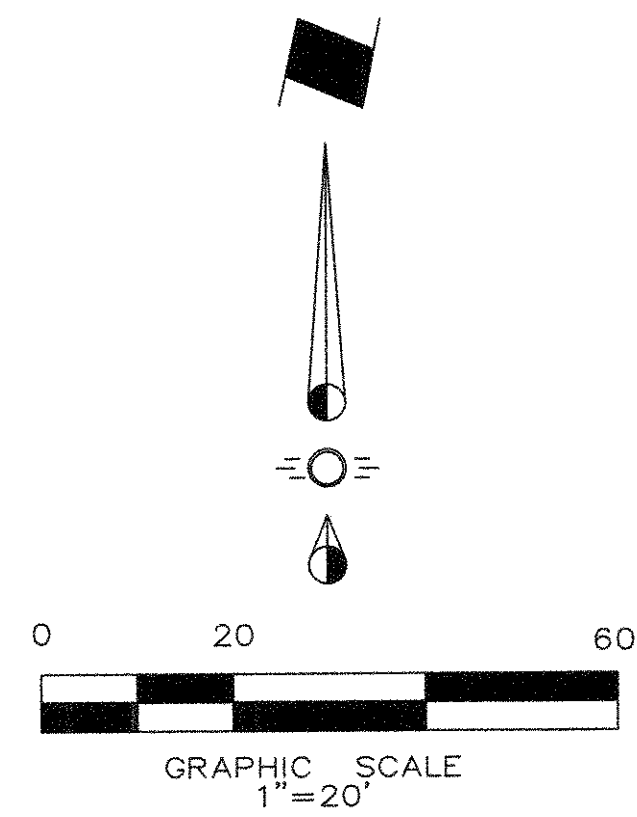
MASONRY RETAINING WALLS - SITE PLAN MARKUP
HARBOR HILLS
SUMMER LEE DRIVE
ROCKWALL, TEXAS

WALCO RETAINING WALLS, INC.
4800 S.E. LOOP 820
FORT WORTH, TEXAS 76140



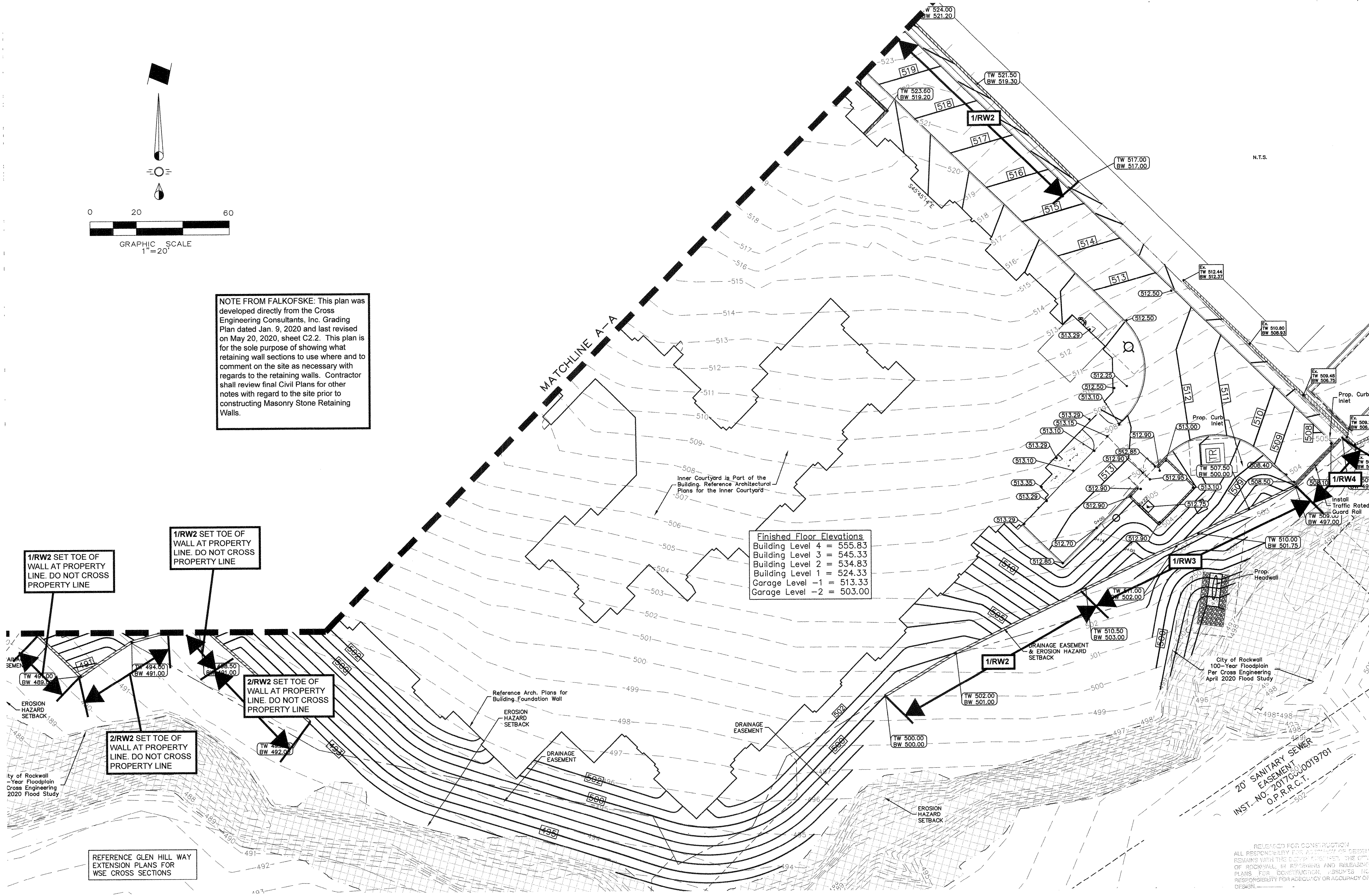
JOB NO. 151.20

SP1



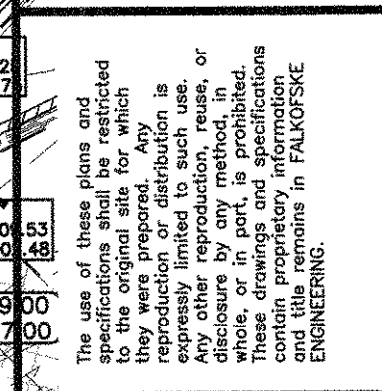
NOTE FROM FALKOFSKE: This plan was developed directly from the Cross Engineering Consultants, Inc. Grading Plan dated Jan. 9, 2020 and last revised on May 20, 2020, sheet C2.2. This plan is for the sole purpose of showing what retaining wall sections to use where and to comment on the site as necessary with regards to the retaining walls. Contractor shall review final Civil Plans for other notes with regard to the site prior to constructing Masonry Stone Retaining Walls.

Finished Floor Elevations	
Building Level 4 =	555.83
Building Level 3 =	545.33
Building Level 2 =	534.83
Building Level 1 =	524.33
Garage Level -1 =	513.33
Garage Level -2 =	503.00



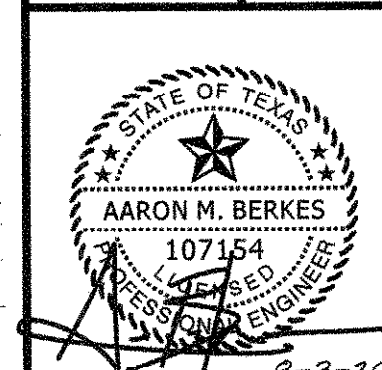
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03-20-20	AMB	1	06-09-20	2	06-09-20	RLB
03-20-20	RL	2	07-17-20	3	07-17-20	EG
03-20-20	AMB	3	08-26-20	4	08-26-20	RL

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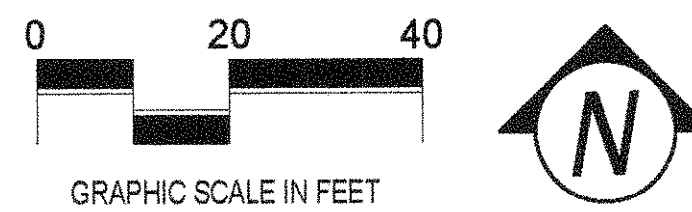
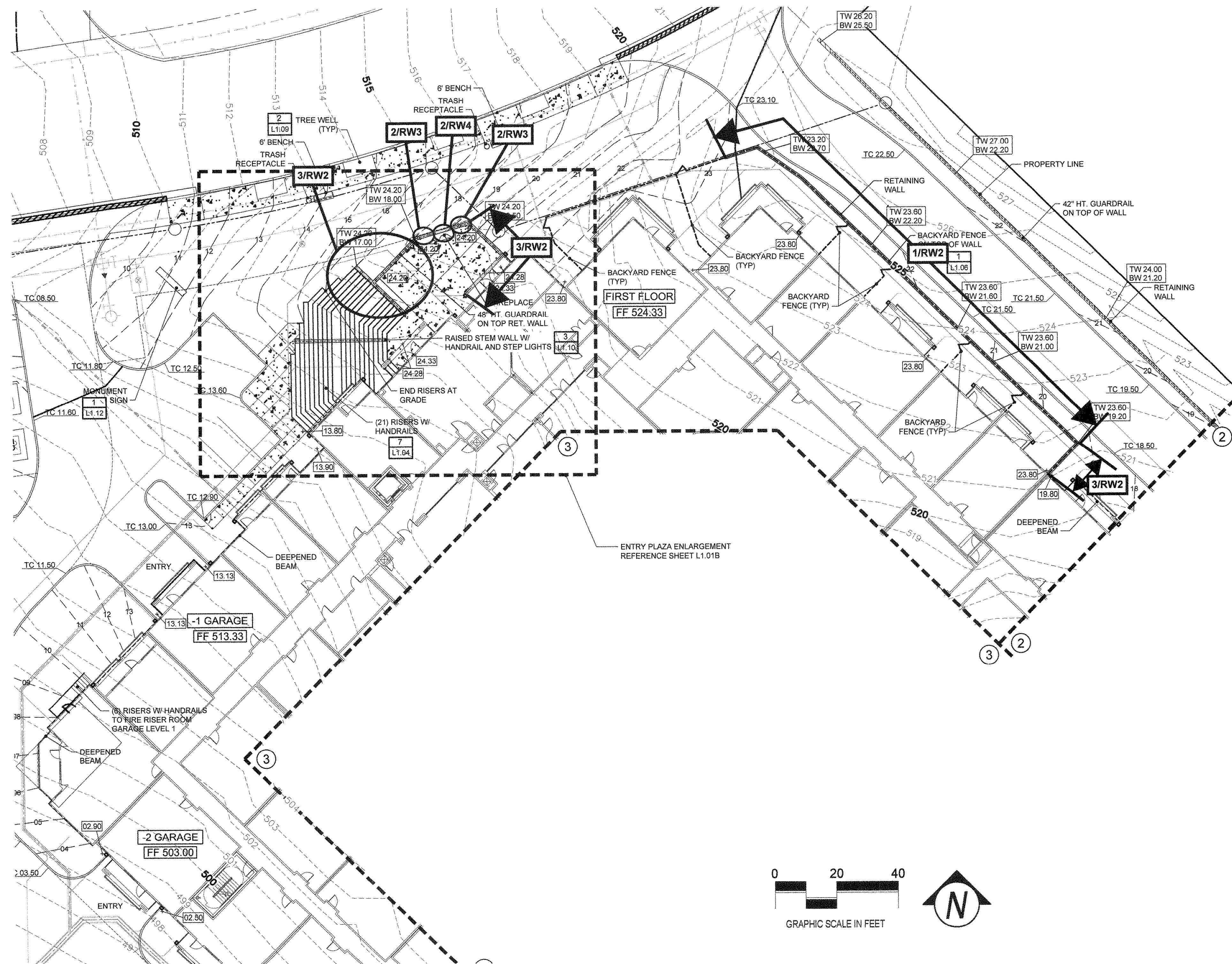


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MASONRY RETAINING WALLS - SITE PLAN MARKUP
HARBOR HILLS
SUMMER LEE DRIVE
ROCKWALL, TEXAS
WALCO RETAINING WALLS, INC.
4800 S.E. LOOP 820
FORT WORTH, TEXAS 76140



JOB NO. 151.20
SP2



DATE	BY	NO.	DATE	REVISION	BY
03-20-20	AMB				
03-20-20	RL				
03-20-20	AMB				
06-07-20		1		UPDATED CALL OUTS	RLB

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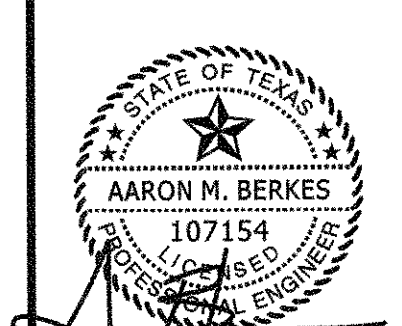
MASONRY RETAINING WALLS - SITE PLAN MARKUP
 HARBOR HILLS
 SUMMER LEE DRIVE
 ROCKWALL, TEXAS

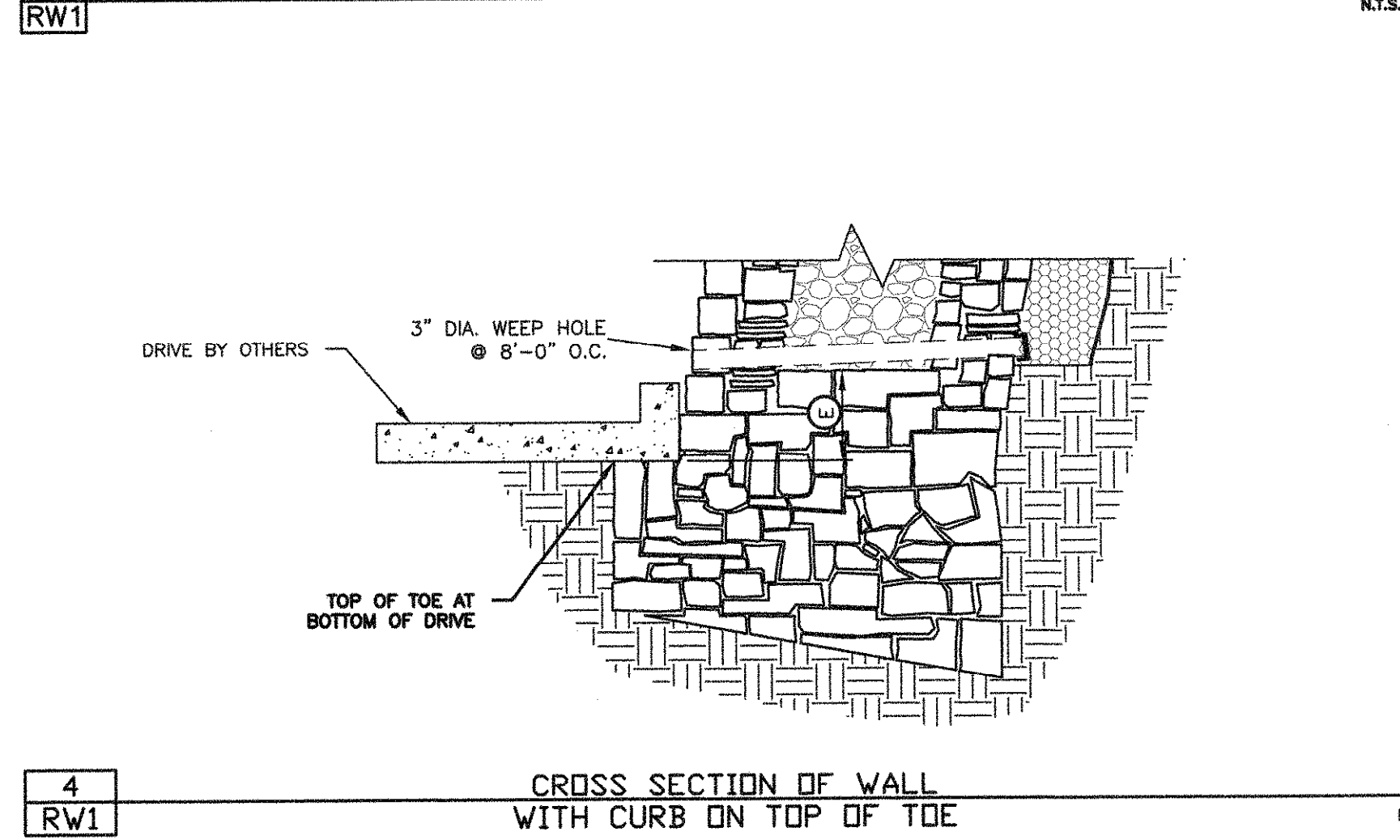
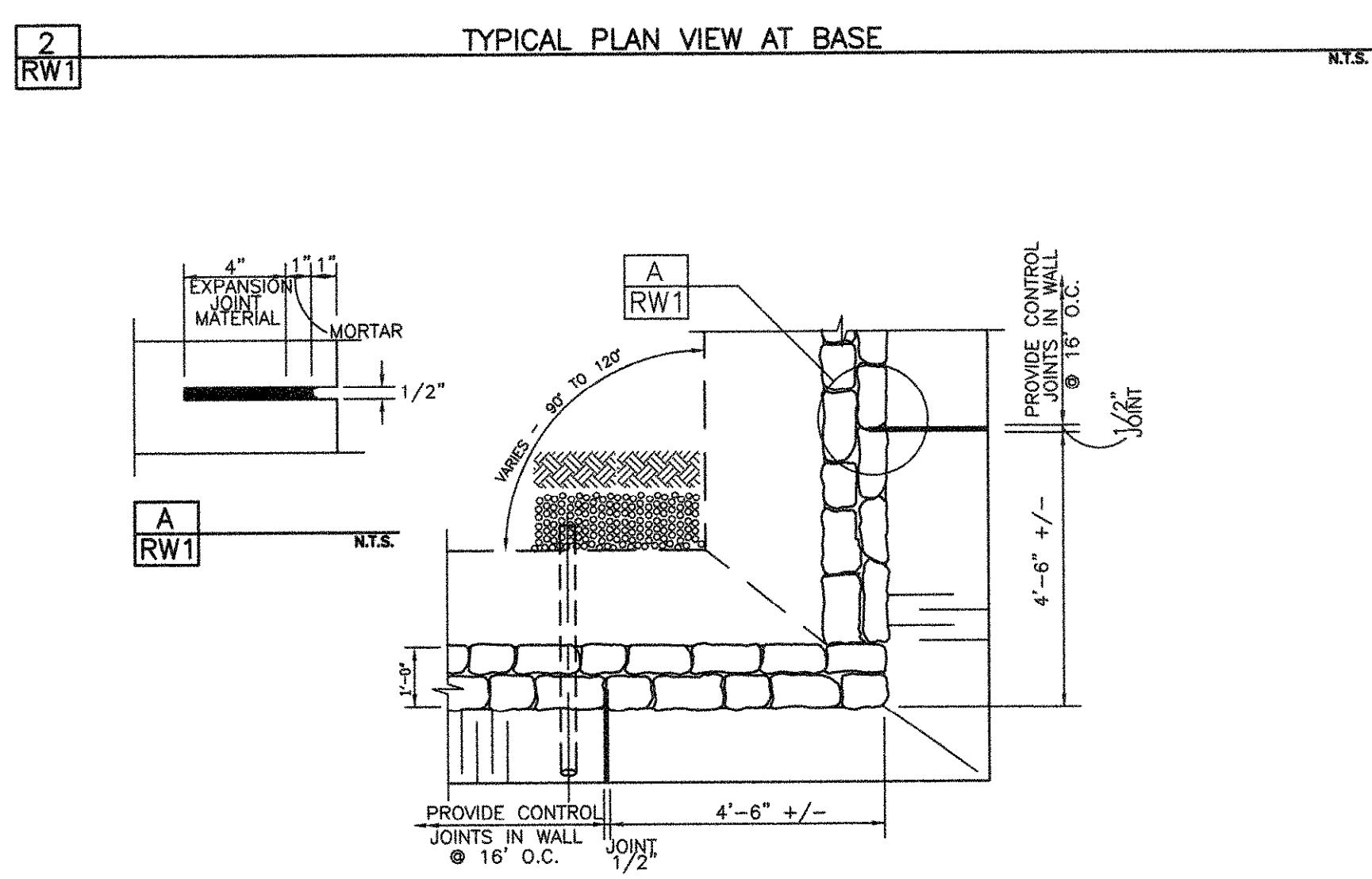
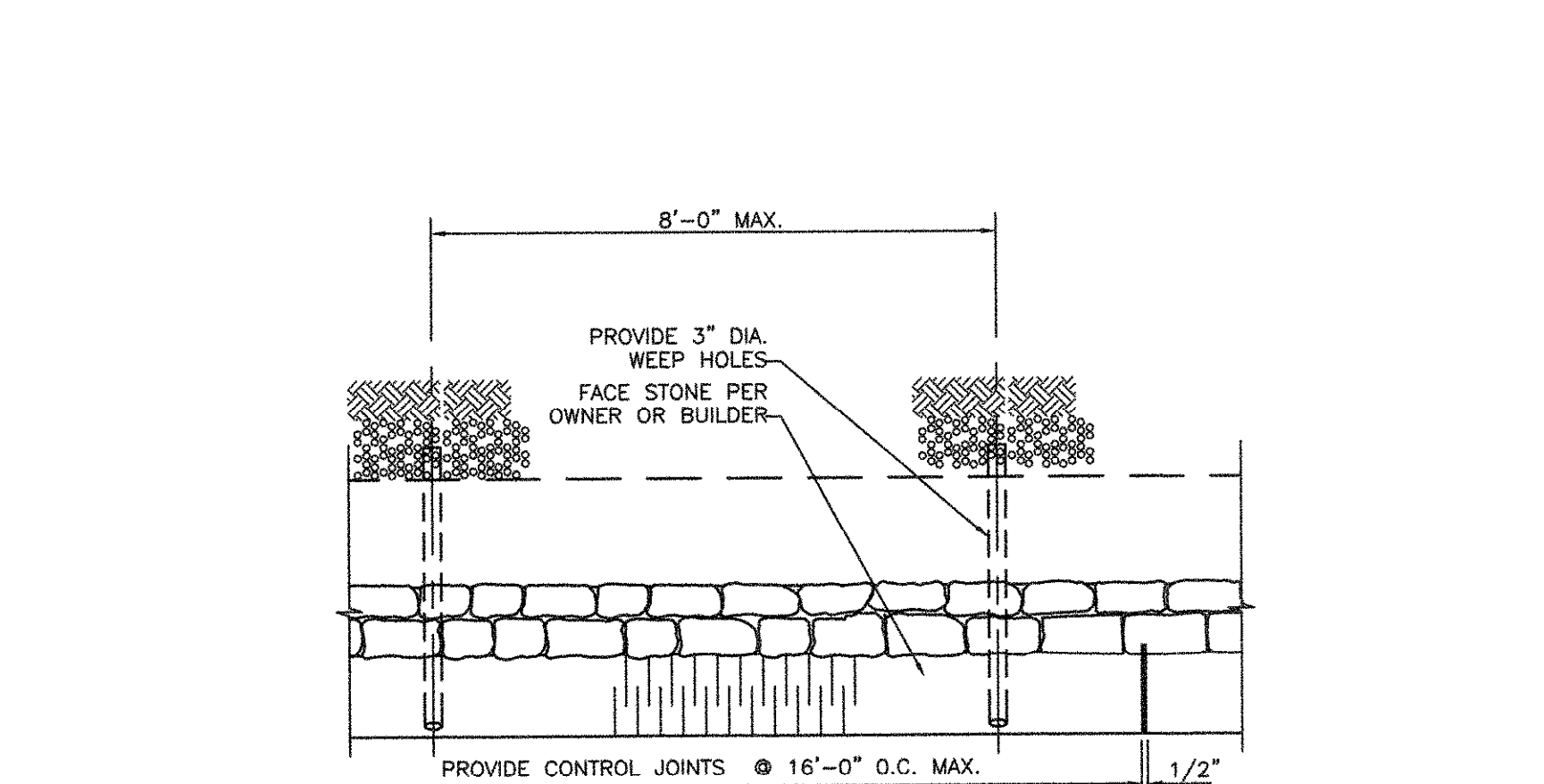
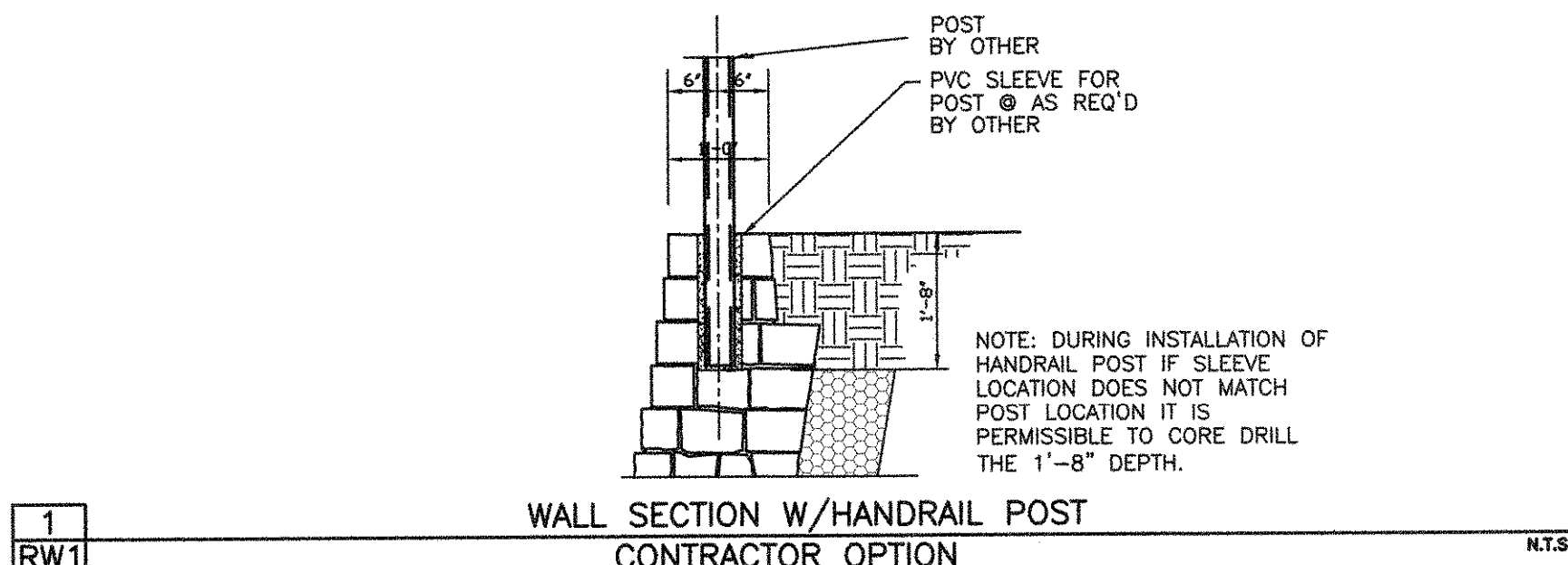
WALLCO RETAINING WALLS, INC.
 4800 S.E. LOOP 820
 FORT WORTH, TEXAS 76140

RELEASED FOR CONSTRUCTION
 ALL RESPONSIBILITY FOR ACCURACY OR COMPLETION OF THIS PLAN REMAINS WITH THE CLIENT. THE CITY OF ROCKWALL, IN REVIEWING AND APPROVING THESE PLANS FOR CONSTRUCTION, ASSUMES NO RESPONSIBILITY FOR ADEQUACY OR ACCURACY OF DESIGN.

CITY _____ DATE _____

JOB NO. 151.20
SP3





GENERAL NOTES

1. Design

1.1. Design Codes

International Building Code, 2015 Edition

1.2. Geotechnical Report

Firm: RONE ENGINEERING, Inc.
 Report No: 19-21094 Date: May 12, 2016
 Allowable Bearing Capacity: 1500 pcf

1.3. Design Parameters

Soil Parameters:

Soil Type*	Friction Angle	Cohesion (psf)	Unit Weight (pcf)
Retained Backfill (On site clay)	26 deg	0 pcf	120 pcf
Foundation Soils (1500 pcf)	26 deg	0 pcf	120 pcf

*See materials below for a description of each Soil Type.

Factors of Safety:

External Stability	Factor of Safety
a. Minimum Factor of Safety Against Base Sliding (Static Condition)	1.5
b. Minimum Factor of Safety Against Overturning	2.0
c. Minimum Factor of Safety Against Global Stability	1.5
d. Minimum Factor of Safety for Bearing Capacity	3.0

Design Loading:

Lateral earth pressures are calculated using Coulombs Lateral Earth Pressure Theory. Designs have been performed to accept loading per the proposed loading conditions based on the Civil Grading Plans. A live loading of 250 pcf has been used for all walls supporting areas subject to freeloading.

Retaining walls should not have solid fence (such as wood fence) placed on top of wall other than that shown on these plans. Retaining walls shall not have additional surcharge placed above wall other than that shown on these plans. Retaining walls shall not have slope at base or top of wall that exceed that which is shown on these plans. The retaining walls noted above require special design.

2. Materials

2.1. Soil Types

- a. Retained Backfill
 - a.a. On site clayey soils
 - a.b. Properly compacted on-site fill soils, verification by others.
- b. Foundation Soils (Allowable Bearing = 1500 psf min)
 - b.a. Bearing on Stiff Natural Undisturbed Clayey or Sandy Soils or Compacted and Tested Fill Soils
 - b.b. Friction Angle between Base of Wall and Soil - 17 deg
 - b.c. Bearing in fill soils. Fill soils supporting the retaining walls shall be placed in accordance with the recommendations for the fill placement per the geotechnical report.
- c. Drainage Material
 - c.a. Free draining granular backfill, clean, non-plastic, relatively well-graded.

2.2. Dimension Stone

- a. Average Density of masonry wall varies from 135pcf to 145pcf.
- b. Stone size varies from 4" to 18"
- c. Face stone shall be coordinated between contractor and owner/developer.
- d. Recycled concrete 4" to 18" may be used in place of dimension stone, contractors option.

2.3. Rebar/Welded Wire Fabric (If Required)

- a. All steel reinforcement shall be new billet steel conforming to ASTM A-615, Grade 60 with fy=60ksi.
- b. All reinforcement shall not have deleterious material on it
- c. All welded wire fabric shall have minimum fy=65ksi and be hot dip galvanized.

2.4. Drainage Materials

- a. Weep pipes shall be PVC or corrugated HDPE pipe.
- b. Drainage zone shall be separated from retained backfill by mirafix 140N filter fabric or approved equal.

2.5. Portland Cement Mortar for Retaining Wall Construction.

The portland cement mortar used for construction of the masonry stone retaining walls shall be provided with the following proportions per cubic yard of concrete. The portland cement mortar supplier shall provide "batch tickets" clearly indicating that the appropriate amount of materials are provided in each truck load. The batch tickets shall clearly indicate the amount batched, the date, the project name and shall be provided to Falkofske Engineering, Inc. for review, documentation, and file.

Contents	Amount per cubic yard	Specific Gravity	Volume ft ³
Type 1 Portland cement	451 lbs	3.15	2.29
Type F Fly Ash	113 lbs	2.93	0.62
Fine Aggregate (sand)	2746 lbs	2.59	15.99
Potable Water	367 lbs	44 Gallons	5.88
Sika Air (or equivalent)	(AS REQ'D) oz	4.5%	1.22
			27.0 Total

Note: the portland cement mortar supplier material weights may vary slightly based on the specific gravity of the materials used.

Concrete retarders may be used at the discretion of the masonry wall contractor. A greater amount of retarder is typically used during hot periods and a less amount of retarder is typically used during cool weather.

Please note that the above proportions will provide a portland cement mortar with a compressive strength of about fc = 2500 psi. Falkofske Engineering, Inc. does not require any concrete testing provided the above proportions are verified by way of the "batch tickets"

3. Construction

3.1 Preparation Work

- a. Prior to grading or excavation of the site, confirm the location of the retaining walls and all underground features, including utility location within the area of construction. Ensure surrounding structures are protected from effects of wall excavation, and construction.
- b. Coordinate installation of underground utilities and other improvements with wall installation.

3.2 Excavation

- a. If a mortared footing is over-excavated, then the dimension stone shall be placed mortared. If a dry stone footing is over excavated, then the dimension stone does not need to be mortared.
- b. Fill over-excavated area in front of the wall footing with compacted on site soils before the wall construction exceeds 4 feet in height.
- c. In areas where the walls are installed in a cut, the required excavation shall extend horizontally to the extent of the width of the retaining wall. The wall may be built to the cut. If the wall is over cut, then soil shall either be compacted or the drainage zone may be widened.

3.3 Wall Construction

- a. The wall shall be constructed to the dimensions as shown on these plans. Front leads, back leads, and string lines shall be set for each wall. Care shall be taken to install the mortar zones the correct thickness, and to place drainage behind the wall as required.
- b. Control joints shall be installed at a maximum of 16'-0" o.c. per these plans.
- c. Weep pipes shall be placed at 8'-0" o.c. max.
- d. Face rock type shall be coordinated between the architect, owner, and retaining wall contractor.

3.4 Retained Backfill Placement

- a. Retained backfill shall be placed per the recommendations of the geotechnical engineer, but should not be less than 93% Standard Proctor Maximum Dry Density (ASTM D698).
- b. Fill should be placed in maximum 8" thick compacted lifts.
- c. Large compaction equipment (equipment heavier than 7,500 lb) shall remain a minimum of 1.5x the height of the wall away from the back of the wall for a period of 2 weeks from the time of construction.
- d. After a period of 2 weeks from the time of construction large compaction equipment may be used behind the wall but shall stay a minimum of 5'-0" away from the back of the wall.
- e. Soil placed with in 5'-0" of the back of the wall shall be placed using handheld compaction equipment.
- f. If the wall is in a cut situation the wall may be built up to the cut. If the wall is overcut the drainage zone may be widened to the cut or compacted fill may be placed between the drainage zone and the cut.

3.6 Retaining Wall Performance, Maintenance, and Other Comments

- a. Control joints are provided in the retaining wall to allow for minor movements due to settlement and shrink swell of the soils. Some cracking may occur in the face of the retaining wall. This cracking, if minor (less than 3/8"), may be cosmetically repaired as desired.
- b. The retaining walls are designed to allow surface water to flow over the tops of the retaining walls. Care should be taken during and after construction to not allow water to pond behind the retaining walls, as this can have a negative impact on the stability of the retaining walls.
- c. If downspouts are located near the back of the retaining wall they should either be plumbed through the retaining wall to drain below the wall or collected and tied into the storm sewer system. Perforated subsurface pipes shall not be used behind the retaining walls.
- d. Positive drainage over the top of the walls shall be maintained throughout the life of the structure. If swales are placed behind the wall they shall remain clean and free draining. If water is found to be ponding in the swale it shall be fixed to allow water to freely drain as soon as possible.
- e. Any broken sprinklers behind the retaining wall shall be turned off and repaired as soon as possible.

3.7 Cold Weather Construction of Retaining Walls

Construction Requirements for temperatures between 40°F and 32°F:

- a. Water and aggregates used in mortar shall not be heated above 140°F.
- b. Mortar sand or mixing water shall be heated to produce mortar temperatures between 40°F and 120°F at the time of mixing.

Construction Requirements for temperatures between 32°F and 25°F:

- a. The guidelines above for construction requirements for temperatures between 40°F and 32°F and the following shall be met.
- b. The mortar temperature shall be maintained above freezing until used in masonry stone retaining wall.
- c. Visible ice and snow shall be removed from the top surface of existing foundations and masonry to receive new construction. These surfaces shall be heated to above freezing, using methods that do not result in damage.
- d. Newly constructed masonry shall be completely covered with weather-resistive membrane for 48 hours after being completed.

Construction Requirements for temperatures between 25°F and 20°F:

- a. The guidelines above for construction requirements for temperatures between 40°F and 32°F, the construction guidelines for temperatures between 32°F and 25°F, and the following shall be met.
- b. Masonry (raw stone) surfaces under construction shall be heated to 40°F.
- c. Wind breaks or enclosures shall be provided when the wind velocity exceeds 15 miles per hour.
- d. Newly constructed masonry shall be completely covered with weather-resistive insulating blankets, or equal protection, for 48 hours after being completed.

The above procedures comes from sections 2104.3.2.1, 2104.3.2.2, 2104.3.2.3, 2104.3.3.3, and 2104.3.3.4 of the International Building Code, and is in compliance with Masonry Standards Joint Committee recommendations for cold weather construction of masonry structures.

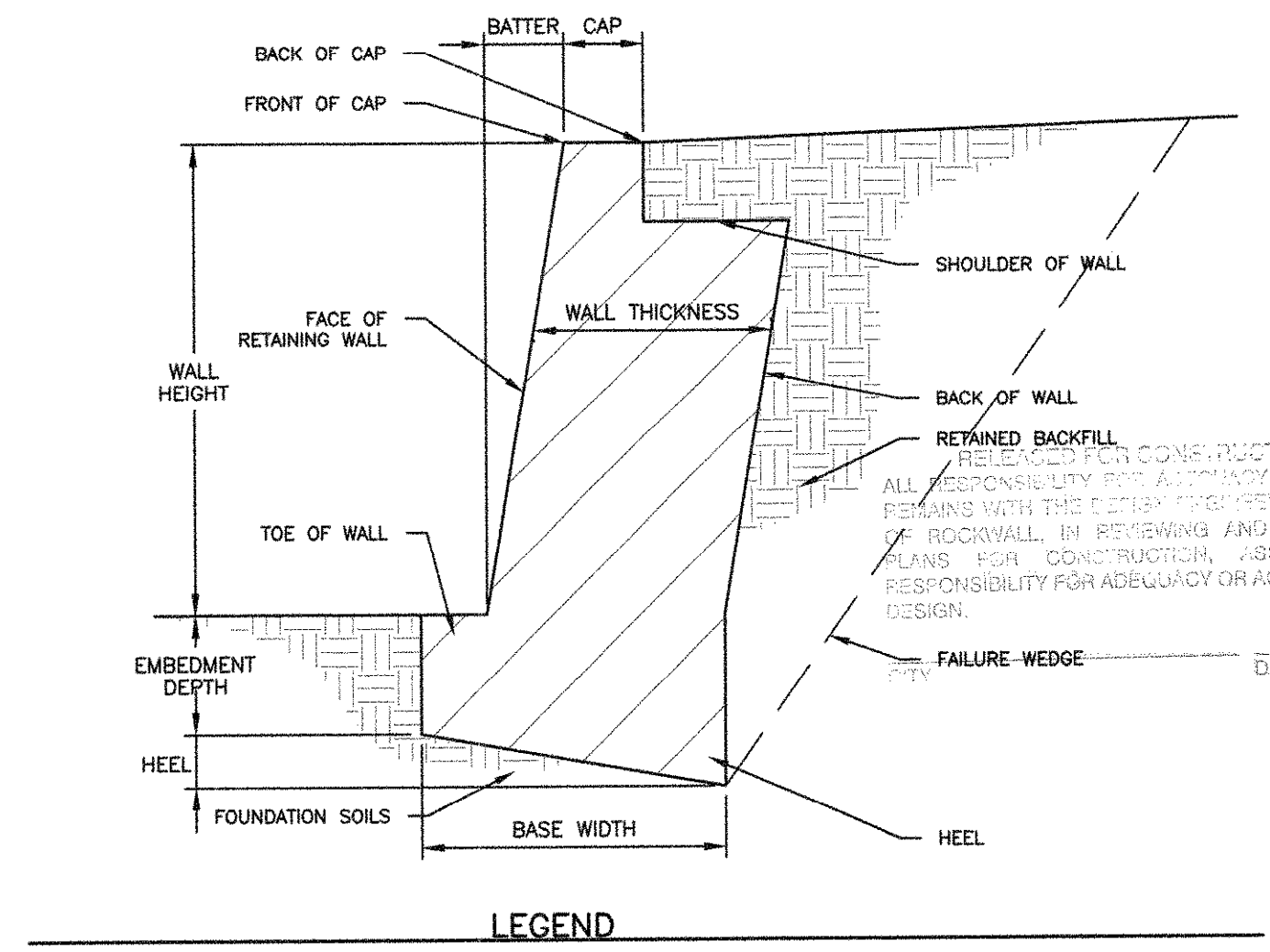
4. Construction Observations

4.1 Construction Observations by Falkofske Engineering, Inc.

- a. Falkofske Engineering, Inc. will perform construction observation, but only as a means of verification of the contractors quality control performance.
- b. Falkofske Engineering, Inc. will act as the Special Inspector for this project. Contractor shall contact Falkofske Engineering to set up inspections, at least 1 day before construction starts.
- c. All required materials testing shall be performed by an approved materials testing laboratory.
- d. Falkofske Engineering, Inc. is not responsible for means, methods, and material furnished by the retaining wall contractor.

4.2 Construction Observations by Others

- a. Construction observations as required by the city shall be coordinated by the contractor.



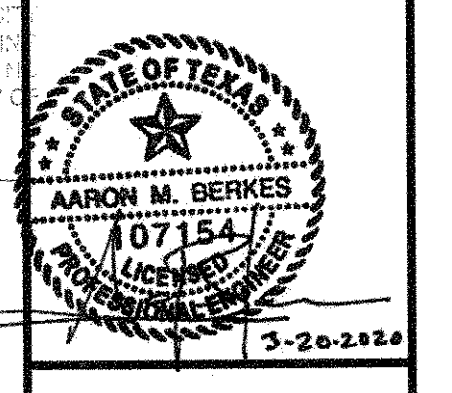
DATE	BY	NO.	DATE	REVISION	BY
03-20-20	AMB				
03-20-20	RL				
03-20-20	AMB				

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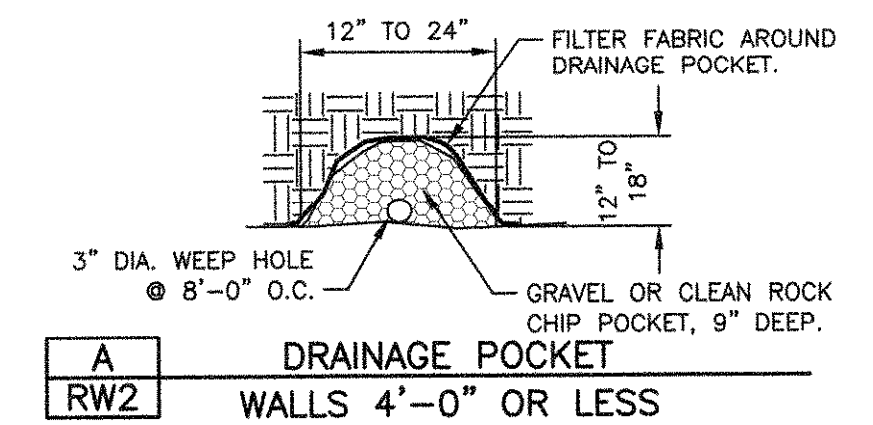
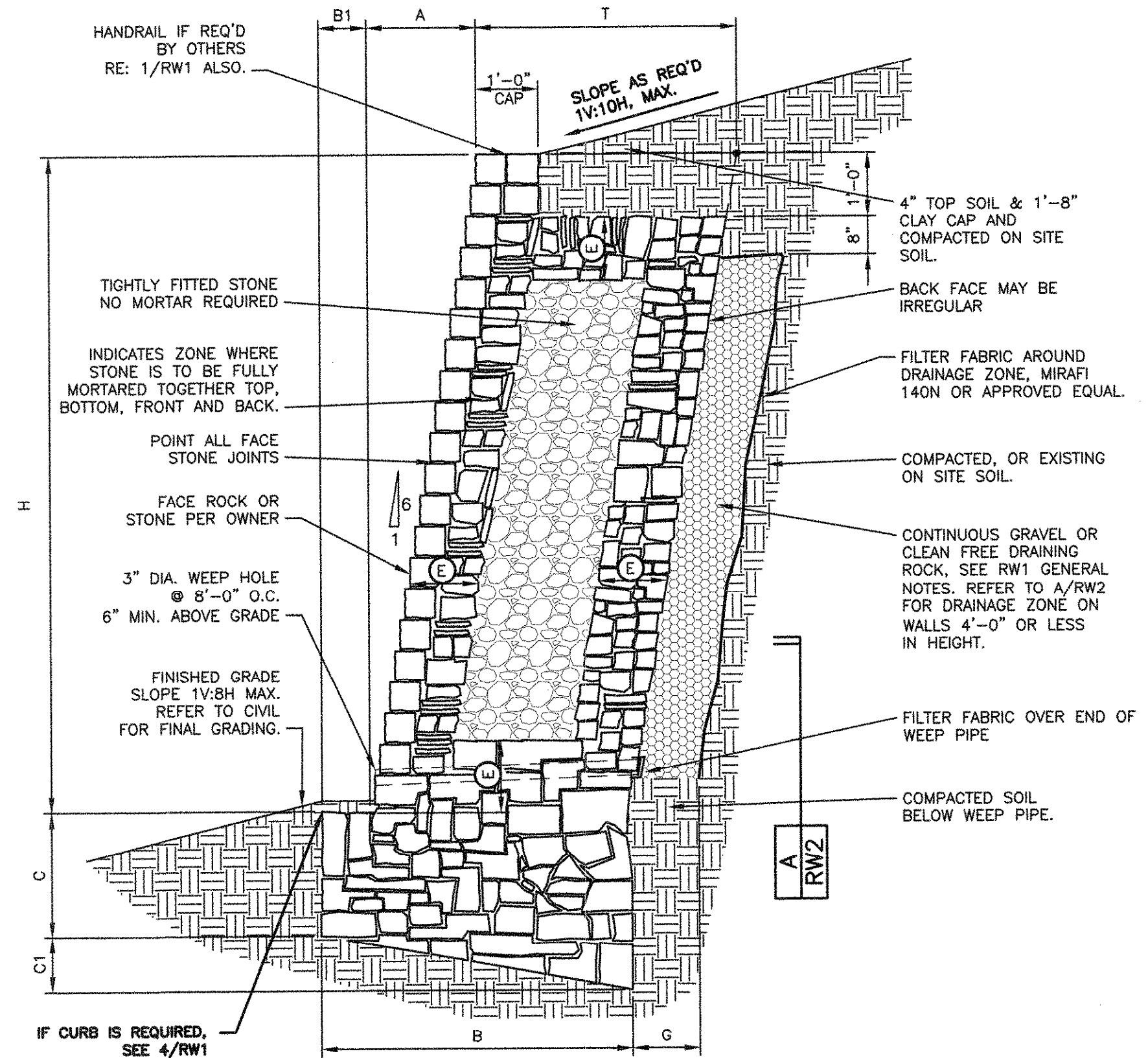
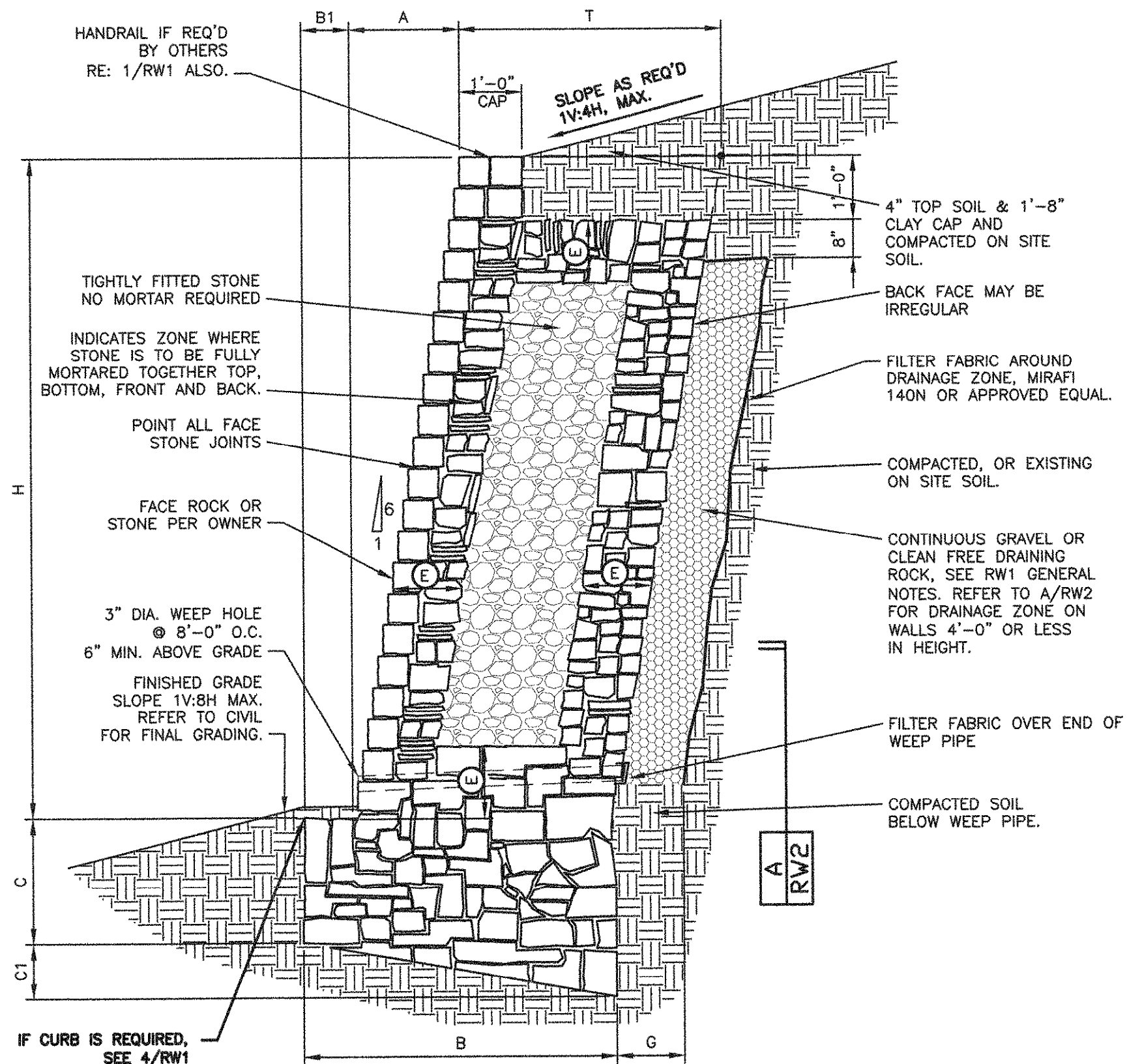
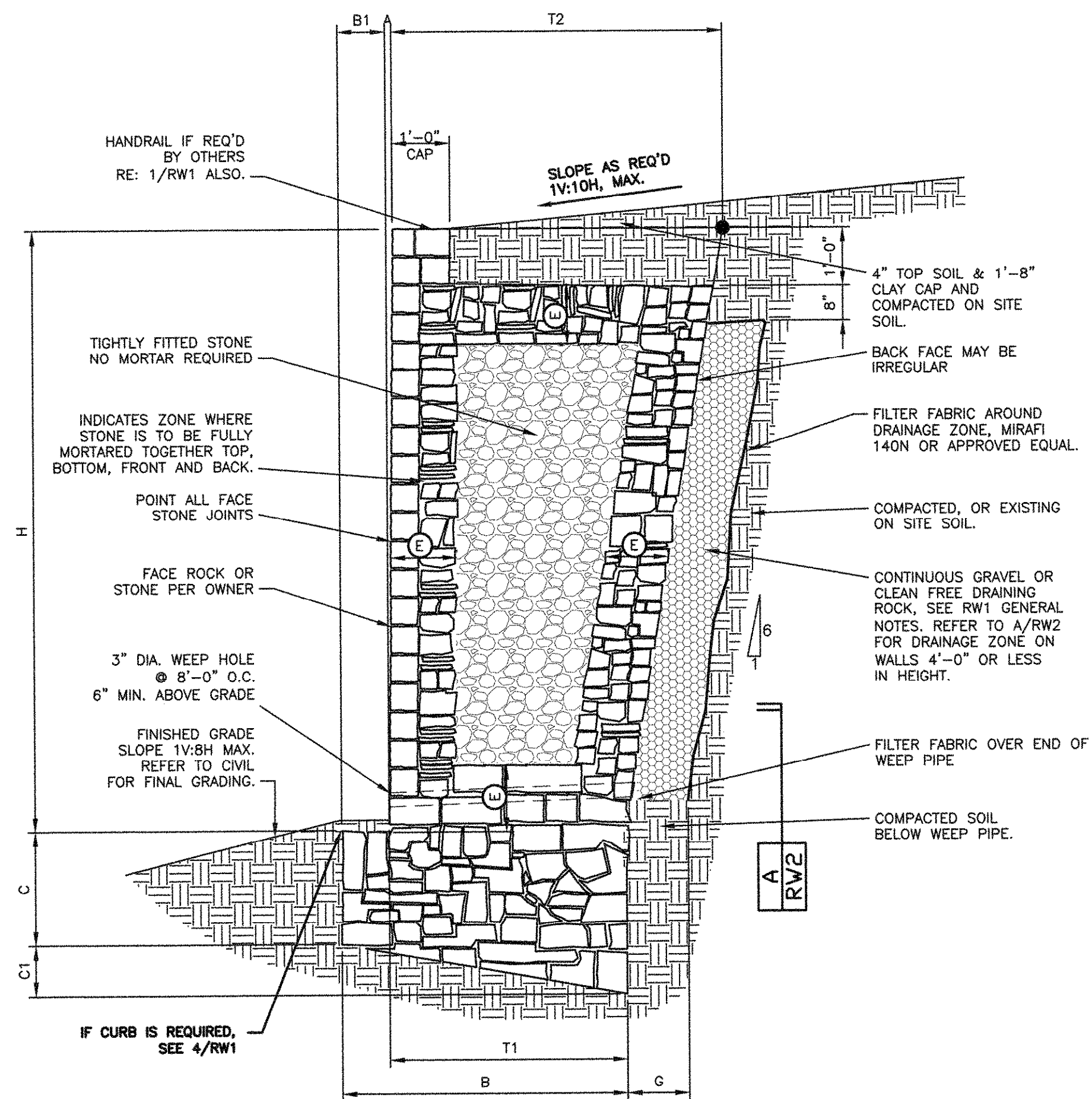
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MASONRY RETAINING WALLS - NOTES & STANDARD DETAILS
 HARBOR HILLS
 SUMMER LEE DRIVE
 ROCKWALL, TEXAS

WALCO RETAINING WALLS, INC.
 4800 S.E. LOOP 820
 FORT WORTH, TEXAS 76140



JOB NO. 151.20
 RW1



MASONRY WALL SCHEDULE											
1600 psf - BEARING CAPACITY (STIFF NATURAL UNDISTURBED SOILS OR COMPACTED AND TESTED SOILS SEE GENERAL NOTES SHEET RW1)											
WALL HEIGHT H	BASE WIDTH B	TOE B1	BASE DEPTH (TOE) C	BASE DEPTH (HEEL) C1	BATTER A	FULLY MORTARED ZONE E	THICKNESS OF WALL T1	THICKNESS OF WALL T2	DRAINAGE ZONE THICKNESS G	BEARING CAPACITY	
1'-0"	1'-0"	0'-0"	0'-6"	0'-2"	1/4"	DAILY MORTARED	1'-0"	1'-2"	SEE A/RW2	1500 psf	
2'-0"	1'-2"	0'-2"	0'-9"	0'-3"	1/2"	DAILY MORTARED	1'-0"	1'-4"	SEE A/RW2		
3'-0"	1'-6"	0'-3"	0'-9"	0'-4"	3/4"	DAILY MORTARED	1'-3"	1'-9"	SEE A/RW2		
4'-0"	2'-1"	0'-5"	1'-0"	0'-5"	1"	DAILY MORTARED	1'-8"	2'-4"	SEE A/RW2		
5'-0"	2'-9"	0'-7"	1'-3"	0'-6"	0'-1 1/4"	DAILY MORTARED	0'-8"	2'-2"	3'-0"		1'-0"
6'-0"	3'-5"	0'-10"	1'-6"	0'-8"	0'-1 1/2"	DAILY MORTARED	0'-10"	2'-7"	3'-7"		1'-0"
7'-0"	4'-0"	1'-0"	1'-9"	0'-9"	0'-1 3/4"	DAILY MORTARED	0'-10"	3'-0"	4'-2"		1'-0"
8'-0"	4'-10"	1'-4"	2'-3"	0'-11"	0'-2"	DAILY MORTARED	1'-0"	3'-8"	4'-10"		1'-0"

WALL DESIGN CRITERIA						
BEARING Q _u	SLOPE TOP β	SLOPE BOT β ₁	ACTIVE PRESSURE α _a	PASSIVE PRESSURE α _p	FRICTION ANGLE BASE δ	SLOPE OF BACK OF WALL α
1500PSF	5.71 deg	7.13 deg	26 deg	26 deg	17 deg	99.46 deg

USE THIS SCHEDULE FOR 3/RW2

MASONRY WALL SCHEDULE										
1600 psf - BEARING CAPACITY (STIFF NATURAL UNDISTURBED SOILS SEE GENERAL NOTES SHEET RW1)										
WALL HEIGHT H	BASE WIDTH B	TOE B1	BASE DEPTH (TOE) C	BASE DEPTH (HEEL) C1	BATTER A	FULLY MORTARED ZONE E	THICKNESS OF WALL T1	THICKNESS OF WALL T2	DRAINAGE ZONE THICKNESS G	BEARING CAPACITY
1'-0"	1'-0"	0'-0"	0'-6"	0'-2"	0'-2"	DAILY MORTARED	1'-0"	1'-2"	1'-0"	1500 psf
2'-0"	1'-4"	0'-2"	0'-9"	0'-3"	0'-4"	DAILY MORTARED	1'-2"	1'-4"	1'-0"	
3'-0"	1'-9"	0'-3"	0'-9"	0'-4"	0'-6"	DAILY MORTARED	1'-6"	1'-9"	1'-0"	
4'-0"	2'-7"	0'-4"	1'-0"	0'-6"	0'-8"	DAILY MORTARED	2'-3"	1'-0"	1'-0"	
5'-0"	3'-3"	0'-5"	1'-3"	0'-7"	0'-10"	DAILY MORTARED	0'-8"	2'-10"	1'-0"	
6'-0"	4'-0"	0'-7"	1'-6"	0'-9"	0'-10"	DAILY MORTARED	0'-10"	3'-5"	1'-0"	
7'-0"	4'-10"	0'-9"	1'-9"	0'-10"	1'-2"	DAILY MORTARED	0'-10"	4'-1"	1'-0"	
8'-0"	5'-8"	0'-10"	2'-3"	1'-0"	1'-4"	DAILY MORTARED	1'-0"	4'-10"	1'-0"	
9'-0"	6'-10"	0'-11"	2'-6"	1'-3"	1'-6"	DAILY MORTARED	1'-0"	5'-11"	1'-0"	
10'-0"	7'-7"	1'-0"	3'-0"	1'-5"	1'-8"	DAILY MORTARED	1'-2"	6'-7"	1'-0"	
11'-0"	8'-5"	1'-1"	3'-6"	1'-6"	1'-10"	DAILY MORTARED	1'-2"	7'-4"	1'-0"	

WALL DESIGN CRITERIA						
BEARING Q _u	SLOPE TOP β	SLOPE BOT β ₁	ACTIVE PRESSURE α _a	PASSIVE PRESSURE α _p	FRICTION ANGLE BASE δ	SLOPE OF BACK OF WALL α
1500PSF	14 deg	7.13 deg	26 deg	26 deg	17 deg	99.46 deg

USE THIS SCHEDULE FOR 2/RW2

MASONRY WALL SCHEDULE										
1600 psf - BEARING CAPACITY (STIFF NATURAL UNDISTURBED SOILS SEE GENERAL NOTES SHEET RW1)										
WALL HEIGHT H	BASE WIDTH B	TOE B1	BASE DEPTH (TOE) C	BASE DEPTH (HEEL) C1	BATTER A	FULLY MORTARED ZONE E	THICKNESS OF WALL T1	THICKNESS OF WALL T2	DRAINAGE ZONE THICKNESS G	BEARING CAPACITY
1'-0"	1'-0"	0'-0"	0'-6"	0'-2"	0'-2"	DAILY MORTARED	1'-0"	1'-2"	1'-0"	1500 psf
2'-0"	1'-2"	0'-2"	0'-9"	0'-3"	0'-4"	DAILY MORTARED	1'-2"	1'-4"	1'-0"	
3'-0"	1'-7"	0'-3"	0'-9"	0'-4"	0'-6"	DAILY MORTARED	1'-6"	1'-9"	1'-0"	
4'-0"	2'-3"	0'-4"	1'-0"	0'-5"	0'-8"	DAILY MORTARED	2'-3"	1'-0"	1'-0"	
5'-0"	2'-9"	0'-5"	1'-3"	0'-6"	0'-10"	DAILY MORTARED	0'-8"	2'-4"	1'-0"	
6'-0"	3'-5"	0'-7"	1'-6"	0'-8"	1'-0"	DAILY MORTARED	0'-10"	2'-10"	1'-0"	
7'-0"	4'-1"	0'-9"	1'-9"	0'-9"	1'-2"	DAILY MORTARED	0'-10"	3'-4"	1'-0"	
8'-0"	4'-11"	0'-11"	2'-3"	0'-11"	1'-4"	DAILY MORTARED	1'-0"	4'-0"	1'-0"	
9'-0"	5'-11"	1'-1"	2'-6"	1'-1"	1'-6"	DAILY MORTARED	1'-0"	4'-10"	1'-0"	
10'-0"	6'-8"	1'-3"	3'-0"	1'-2"	1'-8"	DAILY MORTARED	1'-2"	5'-5"	1'-0"	
11'-0"	7'-4"	1'-4"	3'-6"	1'-4"	1'-10"	DAILY MORTARED	1'-2"	6'-0"	1'-0"	

WALL DESIGN CRITERIA						
BEARING Q _u	SLOPE TOP β	SLOPE BOT β ₁	ACTIVE PRESSURE α _a	PASSIVE PRESSURE α _p	FRICTION ANGLE BASE δ	SLOPE OF BACK OF WALL α
1500PSF	5.71 deg	7.13 deg	26 deg	26 deg	17 deg	99.46 deg

USE THIS SCHEDULE FOR 1/RW2

3 RW2 TYPICAL VERTICAL WALL SECTION - 1V:10H MAX SLOPE ABOVE WALL BEARING IN CLAYEY OR SANDY SOILS 3/4" = 1'-0"

2 RW2 TYPICAL WALL SECTION BEARING IN CLAYS MAX. SLOPE ABOVE WALL 1V:4H MAX. SLOPE BELOW WALL 1V:8H

1 RW2 TYPICAL WALL SECTION - 1V:8H MAX SLOPE ABOVE WALL BEARING IN CLAYEY OR SANDY SOILS 1/2" = 1'-0"

DATE	BY	CHK	DATE	BY	CHK
03-20-20	AMB	RL	03-20-20	AMB	RL
03-20-20	RL	AMB	03-20-20	AMB	RL
03-20-20	AMB	RL	03-20-20	AMB	RL

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CITY _____ DATE _____

5-26-20

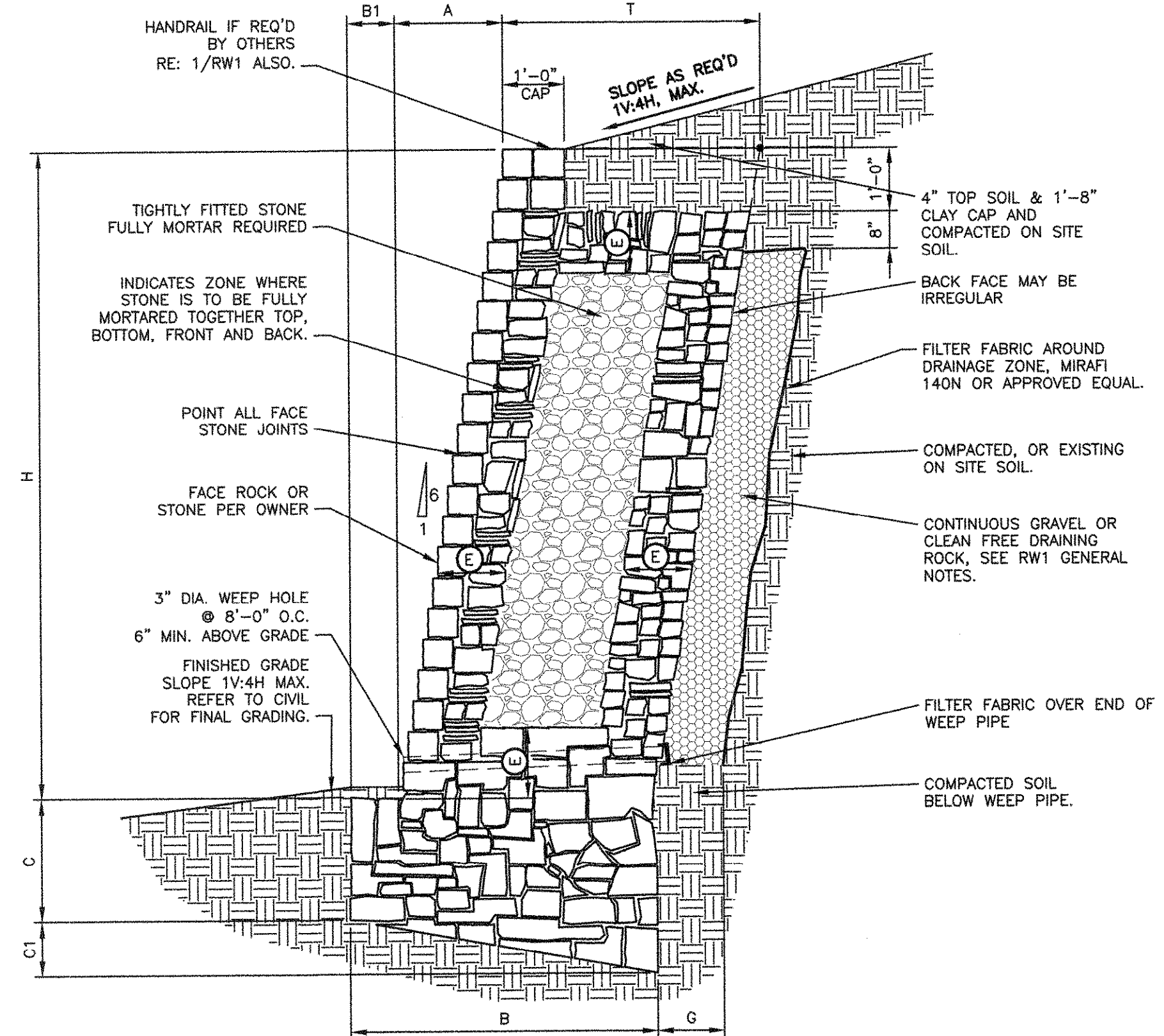
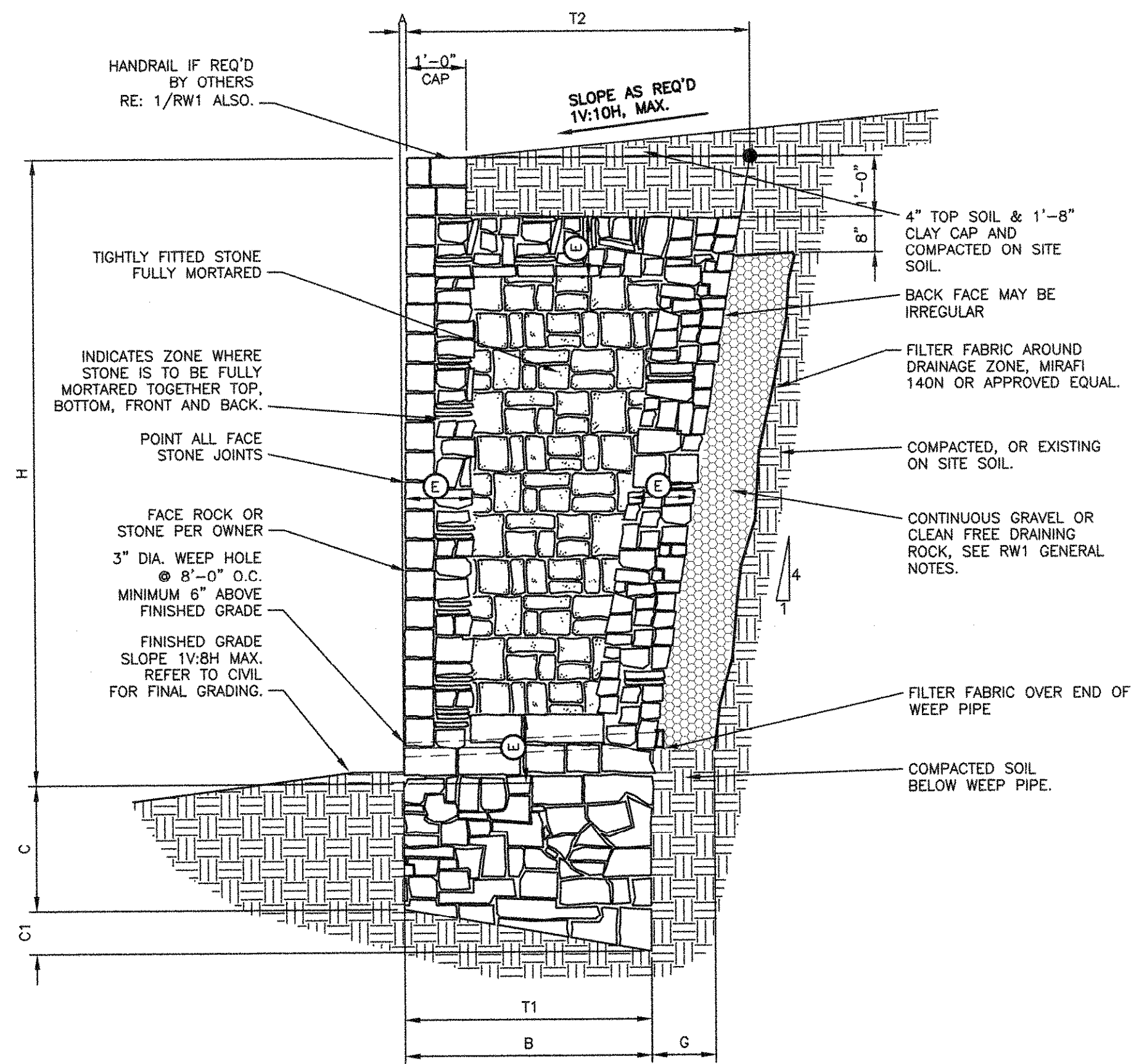
STATE OF TEXAS
AARON M. BERKES
107154
Professional Engineer

MASONRY RETAINING WALLS
HARBOR HILLS
SUMMER LEE DRIVE
ROCKWALL, TEXAS

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4800 S.E. LOOP 820
FORT WORTH, TEXAS 76140

JOB NO. 151.20

RW2



MASONRY WALL SCHEDULE
1800 psf - BEARING CAPACITY (STIFF NATURAL UNDISTURBED SOILS OR COMPACTED AND TESTED SOILS SEE GENERAL NOTES SHEET RW1)

WALL HEIGHT H	BASE WIDTH B	TOE DEPTH (TOE) C1	HEEL DEPTH (HEEL) C2	BATTER A	FULLY MORTARED ZONE E	THICKNESS OF WALL T1	THICKNESS OF WALL T2	DRAINAGE ZONE THICKNESS G	BEARING CAPACITY
4'-0"	2'-0"	1'-0"	0'-5"	0'-1"	DAILY MORTARED	2'-0"	3'-0"	1'-0"	1500 psf
5'-0"	2'-6"	1'-3"	0'-6"	0'-1 1/4"	DAILY MORTARED	2'-6"	3'-9"	1'-0"	1500 psf
6'-0"	3'-0"	1'-6"	0'-7"	0'-1 1/2"	DAILY MORTARED	3'-0"	4'-6"	1'-0"	1850 psf
7'-0"	3'-6"	1'-9"	0'-8"	0'-1 1/2"	DAILY MORTARED	3'-6"	5'-3"	1'-0"	2150 psf

WALL DESIGN CRITERIA

BEARING Q_u	SLOPE TOP β	SLOPE BOT β_1	ACTIVE PRESSURE α_a	PASSIVE PRESSURE α_p	FRICTION ANGLE BASE δ	SLOPE OF BACK OF WALL θ	SURCHARGE q
1500PSF	5.71 deg	7.13 deg	26 deg	26 deg	17 deg	104.04 deg	0 psf

USE THIS SCHEDULE FOR 2/RW3

MASONRY WALL SCHEDULE
1800 psf - BEARING CAPACITY (STIFF NATURAL UNDISTURBED SOILS OR COMPACTED AND TESTED SOILS SEE GENERAL NOTES SHEET RW1)

WALL HEIGHT H	BASE WIDTH B	TOE DEPTH (TOE) C1	HEEL DEPTH (HEEL) C2	BATTER A	FULLY MORTARED ZONE E	THICKNESS OF WALL T1	DRAINAGE ZONE THICKNESS G	BEARING CAPACITY
5'-0"	3'-6"	0'-5"	3'-0"	0'-8"	0'-10"	0'-9"	3'-1"	1'-0"
6'-0"	4'-3"	0'-6"	3'-6"	0'-9"	1'-0"	1'-0"	3'-9"	1'-0"
7'-0"	5'-2"	0'-7"	4'-0"	0'-11"	1'-2"	1'-0"	4'-7"	1'-0"
8'-0"	6'-1"	0'-8"	4'-6"	1'-1"	1'-4"	1'-3"	5'-5"	1'-0"
9'-0"	7'-3"	0'-9"	5'-0"	1'-3"	1'-6"	1'-3"	6'-6"	1'-0"
10'-0"	8'-1"	0'-10"	6'-0"	1'-6"	1'-8"	1'-6"	7'-3"	1'-0"
11'-0"	9'-0"	1'-0"	7'-0"	1'-7"	1'-10"	1'-6"	8'-0"	1'-0"

WALL DESIGN CRITERIA

BEARING Q_u	SLOPE TOP β	SLOPE BOT β_1	ACTIVE PRESSURE α_a	PASSIVE PRESSURE α_p	FRICTION ANGLE BASE δ	SLOPE OF BACK OF WALL θ	SURCHARGE q
1500psf	14 deg	14 deg	26 deg	26 deg	17 deg	99.46 deg	0 psf

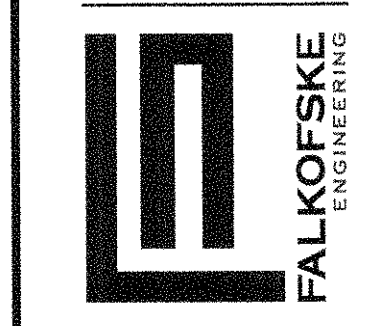
USE THIS SCHEDULE FOR 1/RW3

2 RW3 TYPICAL VERTICAL WALL SECTION - 1V:10H MAX SLOPE ABOVE WALL BEARING IN CLAYEY OR SANDY SOILS 3/4" = 1'-0"

1 RW3 TYPICAL WALL SECTION - 1V:4H MAX SLOPE ABOVE WALL 1V:4H MAX SLOPE BELOW WALL BEARING IN CLAYEY SOILS 1/2" = 1'-0"

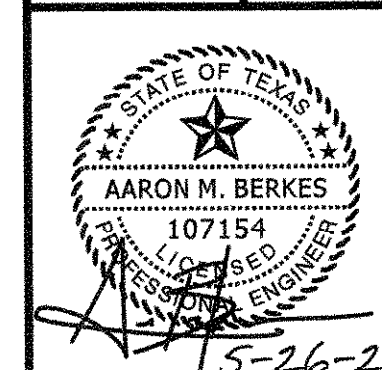
DATE	BY	CHK	DATE	REVISION
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03-20-20	RL			
03-20-20	AMB			

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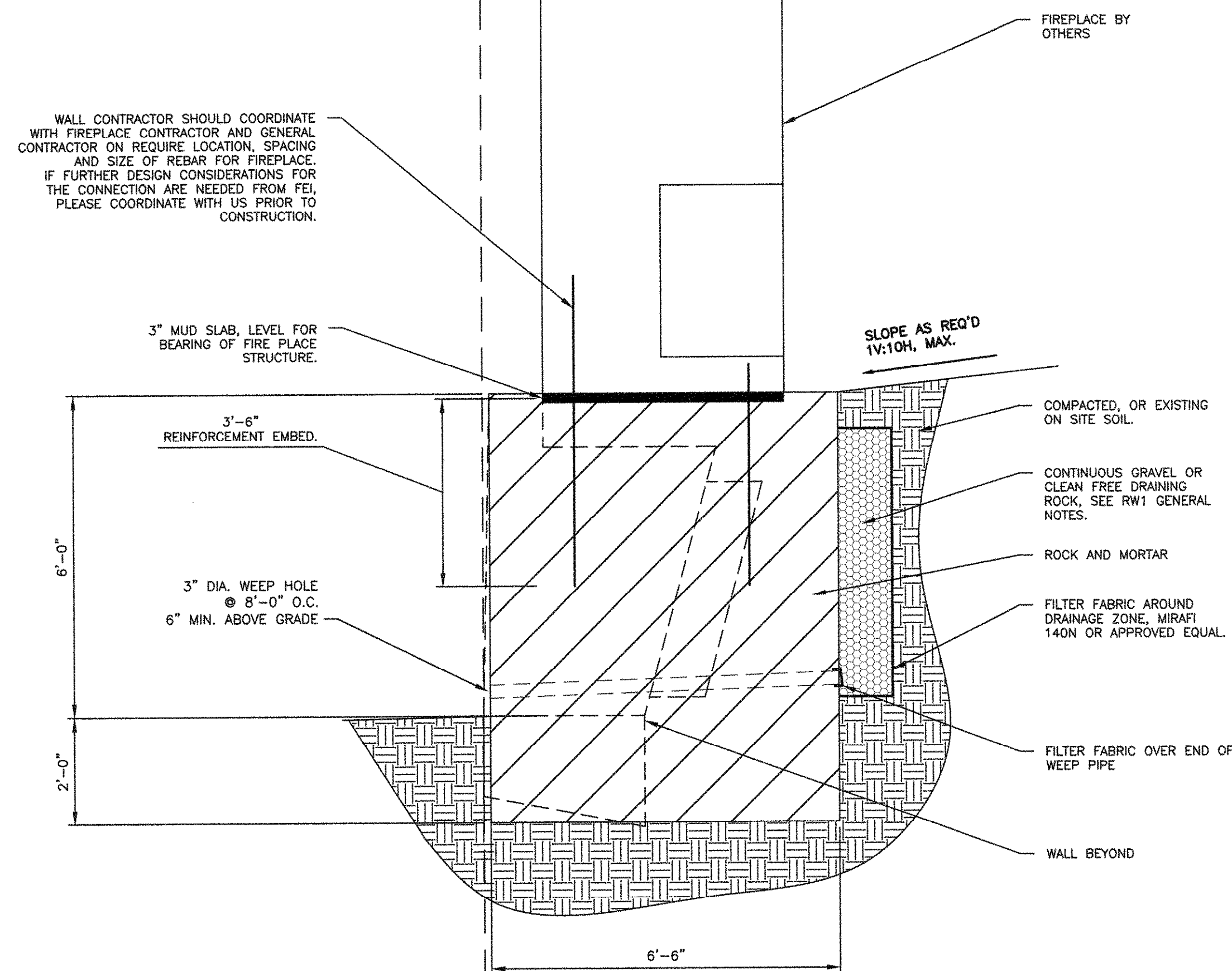


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5-26-20
JOB NO. 151.20
RW3



WALL CONTRACTOR SHOULD COORDINATE WITH FIREPLACE CONTRACTOR AND GENERAL CONTRACTOR ON REQUIRE LOCATION, SPACING AND SIZE OF REBAR FOR FIREPLACE. IF FURTHER DESIGN CONSIDERATIONS FOR THE CONNECTION ARE NEEDED FROM FEL PLEASE COORDINATE WITH US PRIOR TO CONSTRUCTION.

3" MUD SLAB, LEVEL FOR BEARING OF FIRE PLACE STRUCTURE.

SLOPE AS REQ'D 1V:10H, MAX.

COMPACTED, OR EXISTING ON SITE SOIL.

CONTINUOUS GRAVEL OR CLEAN FREE DRAINING ROCK, SEE RW1 GENERAL NOTES.

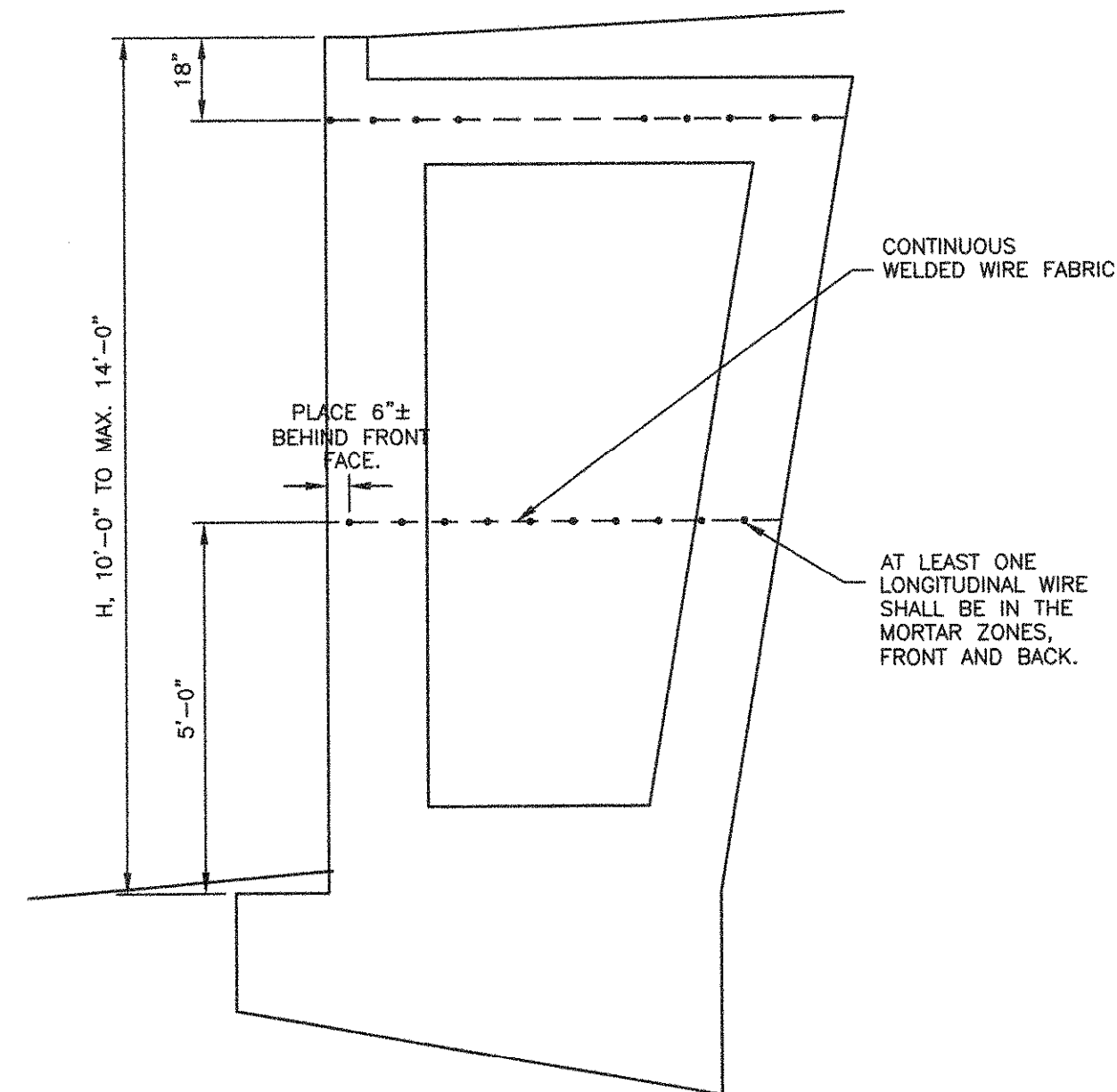
ROCK AND MORTAR

FILTER FABRIC AROUND DRAINAGE ZONE, MIRAFI 140N OR APPROVED EQUAL.

FILTER FABRIC OVER END OF WEEP PIPE

WALL BEYOND

PROPERTY LINE



WALLS 10'-0" TO 12'-0" TALL

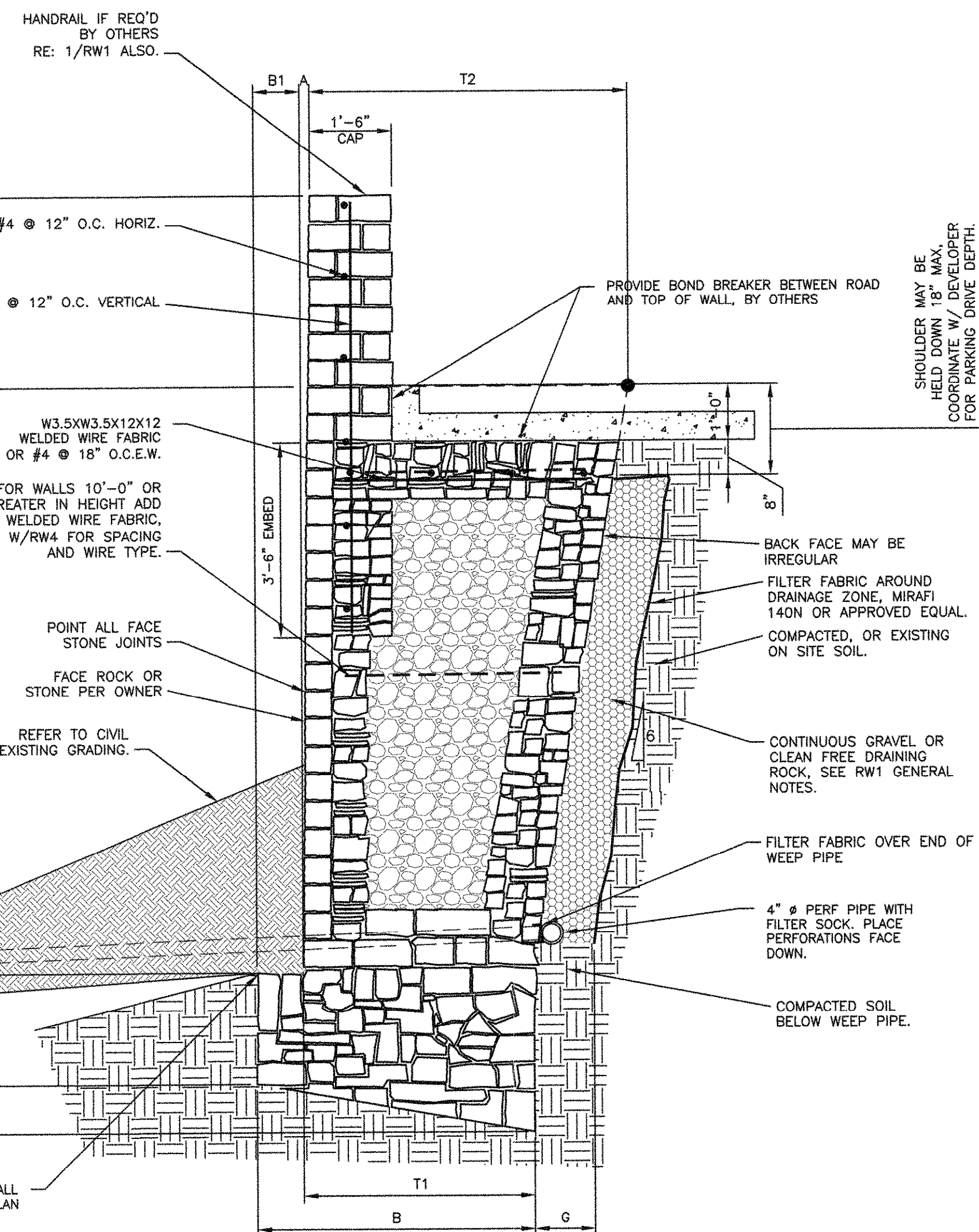
LEGEND

NOTES:

- USE WELDED WIRE FABRIC W3.5xW3.5x12x12
- W3.5 HAS A DIAMETER = 0.211", SIZE MAY BE LARGER.
- WIRE SPACING MAY BE 1'-0" OR LESS
- WIRE SHALL BE GALVANIZED.
- WIRE SHALL BE CONTINUOUS IN WALLS 10'-0" AND GREATER.

AT POINT AT WHICH GRADE AT BOTTOM OF WALL IS LOWEST, PROVIDE 4" SOLID SCH 40 PVC DRAIN

PER CIVIL GRADING PLAN



HANDRAIL IF REQ'D BY OTHERS RE: 1/RW1 ALSO.

B1

T2

1'-6" CAP

#4 @ 12" O.C. HORIZ.

#5 @ 12" O.C. VERTICAL

W3.5xW3.5x12x12 WELDED WIRE FABRIC OR #4 @ 18" O.C.E.W.

FOR WALLS 10'-0" OR GREATER IN HEIGHT ADD WELDED WIRE FABRIC, RE: W/RW4 FOR SPACING AND WIRE TYPE.

POINT ALL FACE STONE JOINTS

FACE ROCK OR STONE PER OWNER

REFER TO CIVIL FOR EXISTING GRADING.

2'-6" PARAPET VARIES

H

C

INTO BEDROCK

C1

BOTTOM OF WALL PER CIVIL GRADING PLAN

T1

B

G

PROVIDE BOND BREAKER BETWEEN ROAD AND TOP OF WALL, BY OTHERS

SHOULDER MAY BE HELD DOWN 18" MAX. COORDINATE W/ DEVELOPER FOR PARKING DRIVE DEPTH.

BACK FACE MAY BE IRREGULAR

FILTER FABRIC AROUND DRAINAGE ZONE, MIRAFI 140N OR APPROVED EQUAL.

COMPACTED, OR EXISTING ON SITE SOIL.

CONTINUOUS GRAVEL OR CLEAN FREE DRAINING ROCK, SEE RW1 GENERAL NOTES.

FILTER FABRIC OVER END OF WEEP PIPE

4" @ PER FOOT PIPE WITH FILTER SOCK. PLACE PERFORATIONS FACE DOWN.

COMPACTED SOIL BELOW WEEP PIPE.

CONTRACTOR OPTION: WALL MAY BE FULLY MORTARED WITH NO WIRE.

NOTE: RETAINING WALL HAS BEEN DESIGNED FOR FIRELANE SURCHARGE AND FOR VEHICULAR IMPACT LOADING.

MASONRY WALL SCHEDULE
1000 psf - BEARING CAPACITY (STIFF NATURAL UNDISTURBED SOILS OR COMPACTED AND TESTED SOILS SEE GENERAL NOTES SHEET RW1)

WALL HEIGHT H	BASE WIDTH B	TOE B1	BASE DEPTH (TOE) C	BASE DEPTH (HEEL) C1	BATTER A	MORTAR ZONE E	THICKNESS OF WALL T1	THICKNESS OF WALL T2	DRAINAGE ZONE THICKNESS G	BEARING CAPACITY
10'-0"	7'-1"	1'-10"	4'-0"	1'-3"	0'-2 1/2"	DUAL MORTARED	5'-3"	6'-11"	1'-0"	3050 psf
11'-0"	7'-6"	2'-0"	4'-0"	1'-4"	0'-2 3/4"	DUAL MORTARED	5'-6"	7'-4"	1'-3"	3150 psf
12'-0"	8'-1"	2'-2"	4'-0"	1'-6"	0'-3"	DUAL MORTARED	5'-11"	7'-11"	1'-3"	3200 psf

WALL DESIGN CRITERIA

BEARING CAPACITY	SLOPE TOP	SLOPE BOT	ACTIVE PRESSURE	PASSIVE PRESSURE	FRICITION ANGLE	SLOPE OF BACK OF WALL	SURCHARGE
1500PSF	0 deg	7.13 deg	26 deg	26 deg	17 deg	99.46 deg	250 psf

USE THIS SCHEDULE FOR 1/RW4

DATE	BY	CHK.	DATE	BY	CHK.
03-20-20	AMB	RL	03-20-20	AMB	RL
03-20-20	RL	AMB	03-20-20	AMB	RL

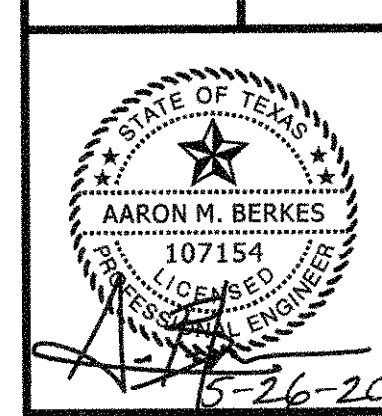
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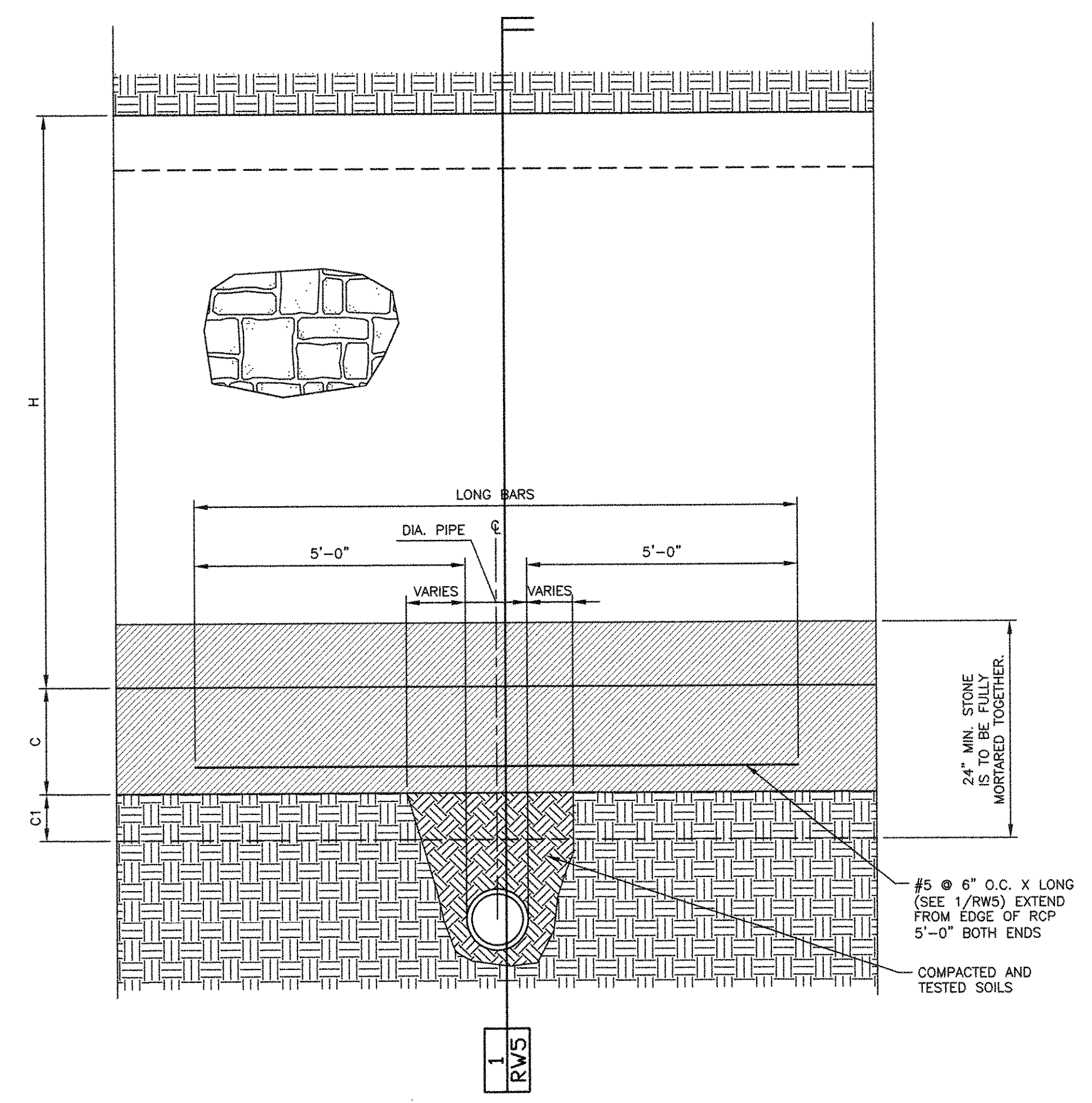


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RW4

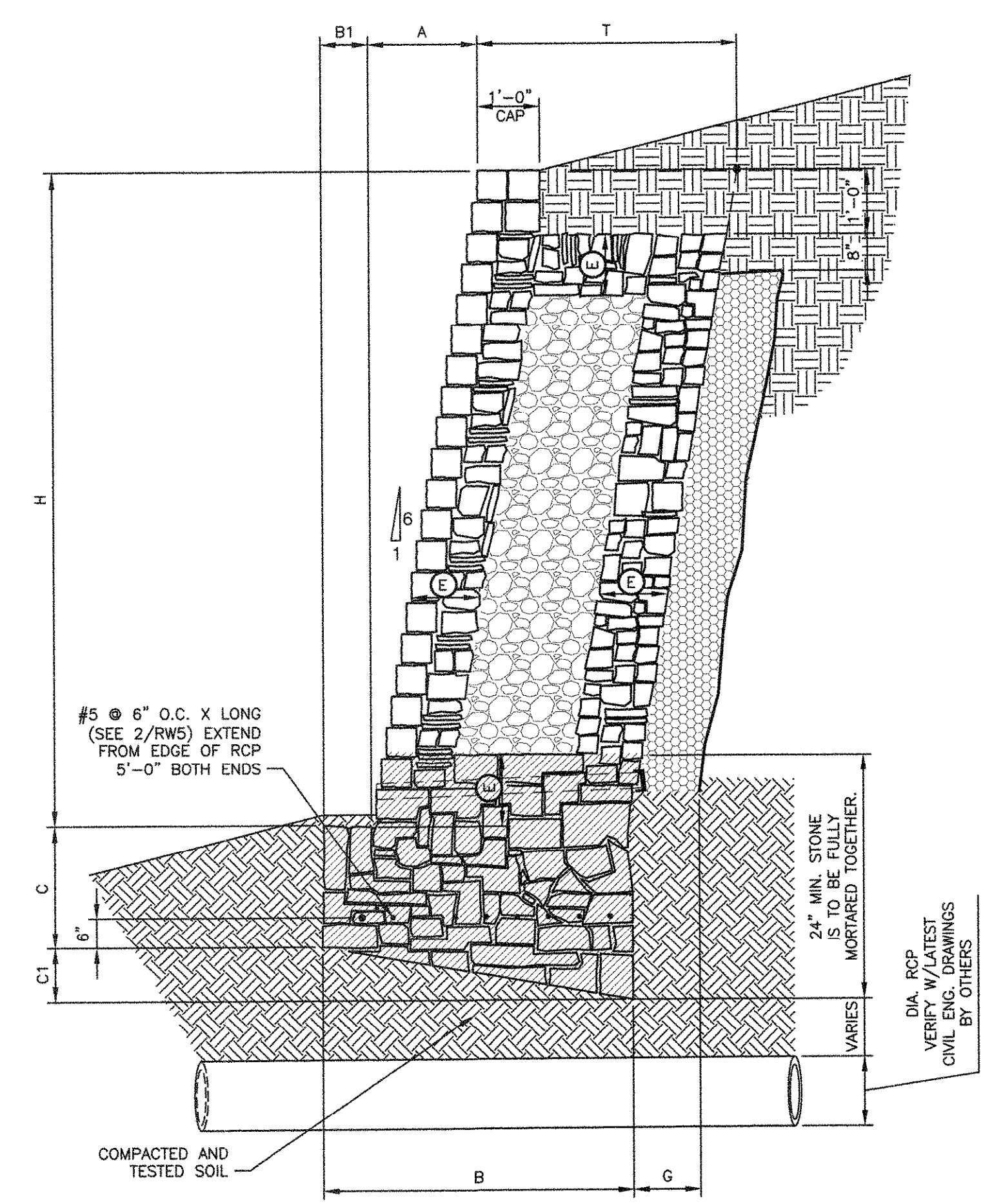
2 RETAINING WALL, PEDESTAL FOR FIREPLACE STRUCTURE
RW4

W WIRE SPACING FOR WALLS - VERTICAL FACE WALLS
RW4 10'-0" AND GREATER

1 TYPICAL VERTICAL WALL SECTION - 250 PSF FIRELANE SURCHARGE
RW4 1V:8H MAX SLOPE BELOW WALL BEARING IN CLAYEY OR SANDY SOILS 3/4" = 1'-0"

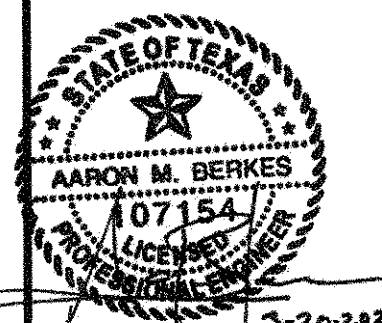


2
RW5 WALL ELEVATION W/RCP BELOW WALL



1
RW5 WALL SECTION W/RCP BELOW WALL

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REMAINS WITH THE DESIGN CONTRACTOR. THE CITY
OF ROCKWALL, IN REVIEWING AND RELEASING
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DESIGN.
CITY _____ DATE _____



JOB NO. 151.20

RW5

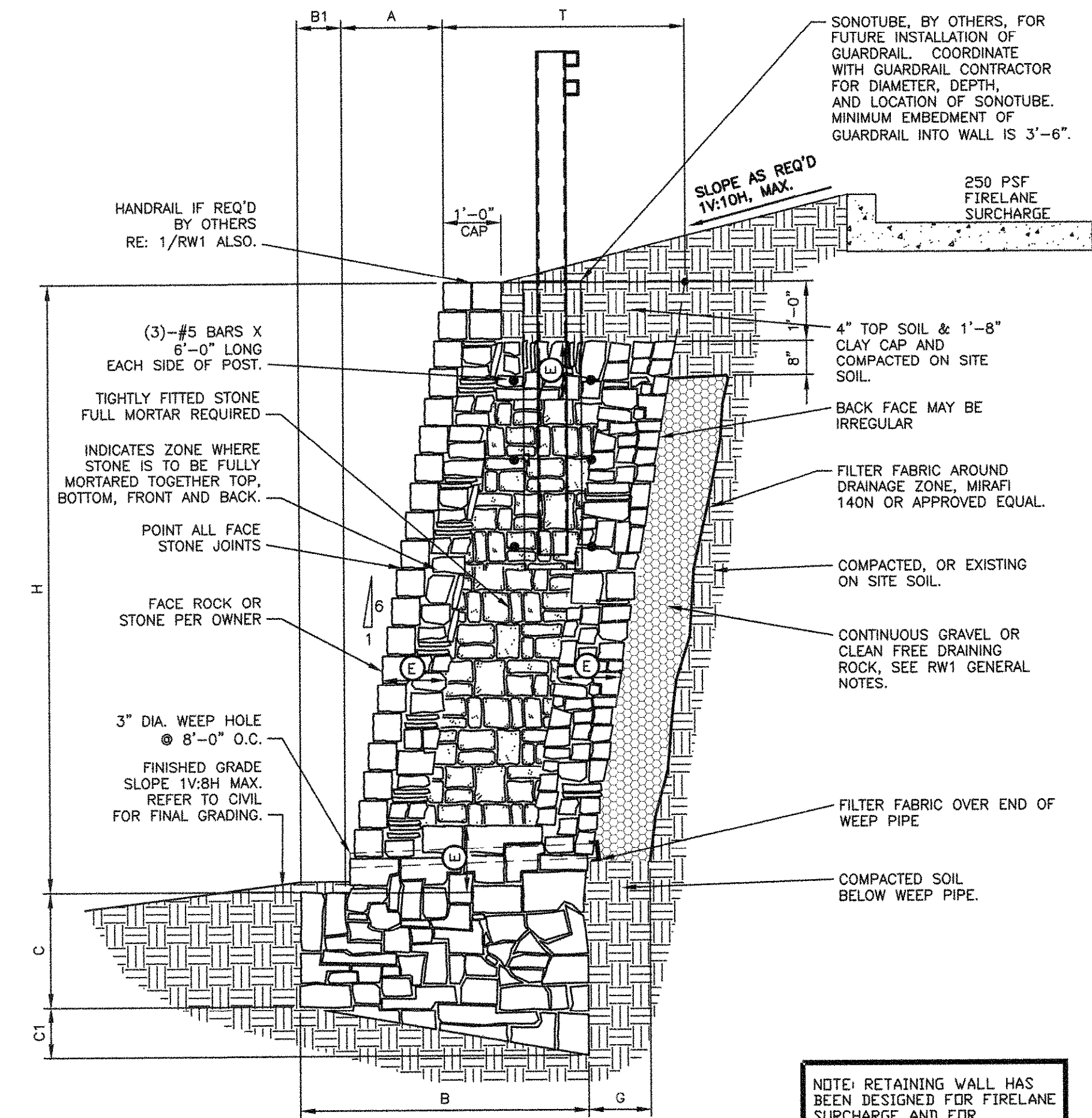
DATE	BY	NO.	DATE	REVISION	BY
03-20-20	AMB				
03-20-20	EJC				
03-20-20	AMB				

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NOTE: RETAINING WALL HAS BEEN DESIGNED FOR FIRELANE SURCHARGE AND FOR VEHICULAR IMPACT LOADING.

MASONRY WALL SCHEDULE
1500 psf - BEARING CAPACITY (STIFF NATURAL UNDISTURBED SOILS OR COMPACTED AND TESTED SOILS SEE GENERAL NOTES SHEET RW6)

WALL HEIGHT H	BASE WIDTH B	TOE B1	BASE DEPTH (TOE) C	BASE DEPTH (HEEL) C1	BATTER A	FULLY MORTARED ZONE E	THICKNESS OF WALL T	DRAINAGE ZONE THICKNESS G	BEARING CAPACITY
6'-0"	5'-3"	1'-6"	2'-0"	1'-0"	1'-0"	DRY MORTARED	3'-9"	1'-0"	1500 psf
7'-0"	5'-7"	1'-6"	2'-0"	1'-1"	1'-2"	DRY MORTARED	4'-1"	1'-0"	1500 psf
8'-0"	6'-4"	1'-6"	2'-0"	1'-2"	1'-4"	DRY MORTARED	4'-11"	1'-0"	1500 psf
9'-0"	7'-0"	1'-6"	2'-3"	1'-3"	1'-6"	DRY MORTARED	5'-6"	1'-0"	1800 psf
10'-0"	7'-6"	1'-6"	2'-6"	1'-4"	1'-8"	DRY MORTARED	6'-0"	1'-0"	1800 psf
11'-0"	8'-0"	1'-6"	2'-9"	1'-5"	1'-10"	DRY MORTARED	6'-6"	1'-3"	2000 psf

WALL DESIGN CRITERIA							
BEARING q_u	SLOPE TOP β_1	SLOPE BOT β_2	ACTIVE PRESSURE e_a	PASSIVE PRESSURE e_p	FRICTION ANGLE BASE δ	SLOPE OF BACK OF WALL α	SURCHARGE s
1500PSF	0 deg	7.13 deg	26 deg	26 deg	17 deg	99.46 deg	250 psf

USE THIS SCHEDULE FOR 2/RW6

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DATE: 5-26-20

1
RW6 TYPICAL WALL SECTION - 250PSF FIRELANE SURCHARGE
1V:10H MAX SLOPE ABOVE WALL, 1V:8H MAX SLOPE BELOW WALL
BEARING IN CLAYEY SOILS 1/2" = 1'-0"

DATE	BY	CHK	NO.	DATE	REVISION	BY
05-26-20	AMB	RL				
05-26-20	RL	AMB				

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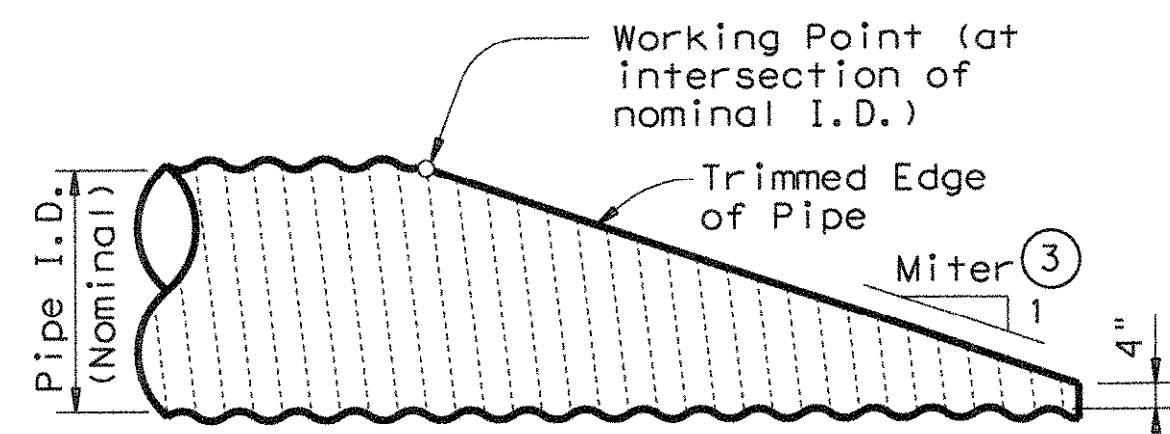
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ROCKWALL, TEXAS

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MARK M. BERNKES
107154
MECHANICAL ENGINEERING
5-26-20

JOB NO. 151.20
RW6

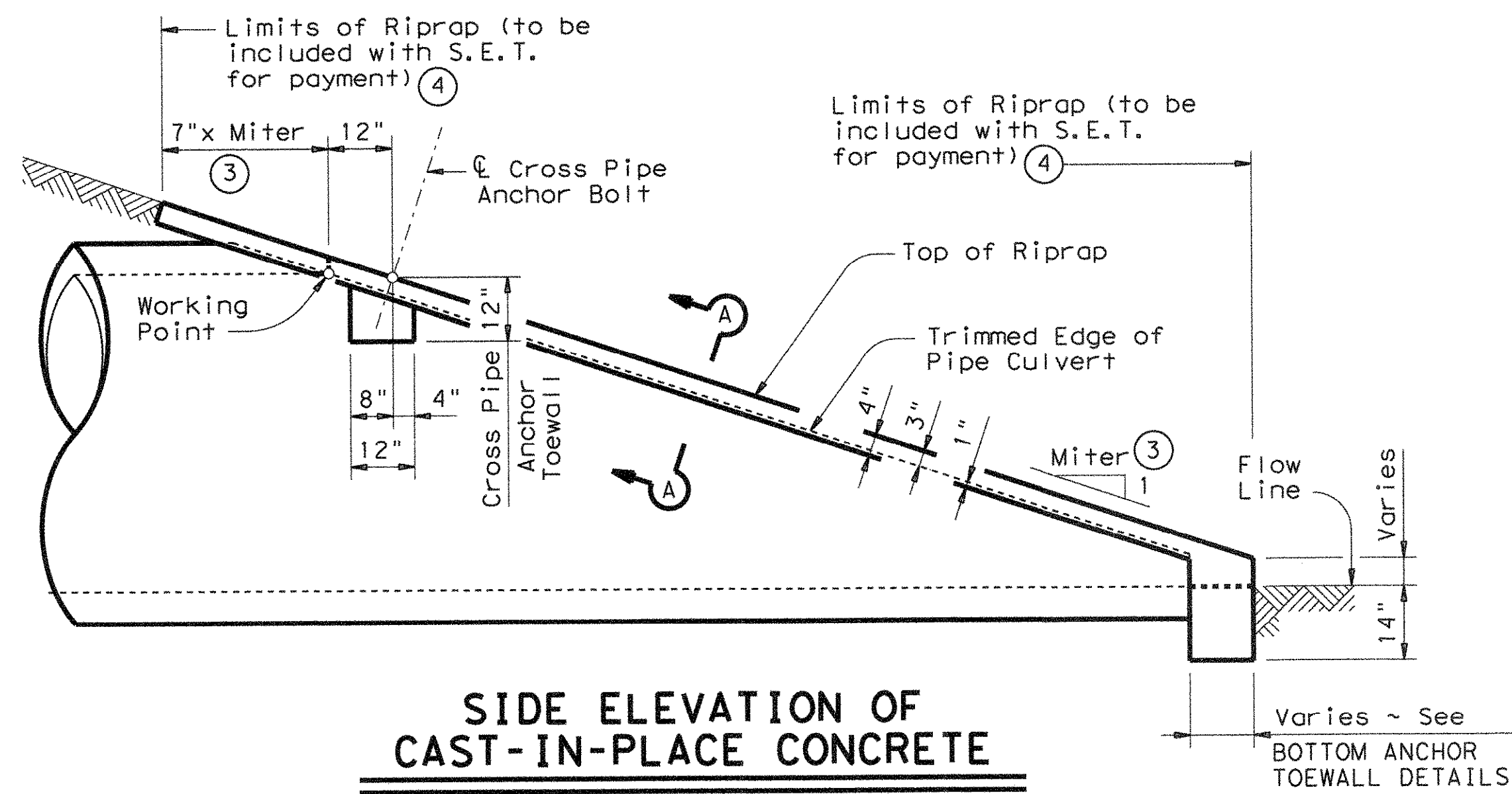
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NOTE: All Pipe Runners, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

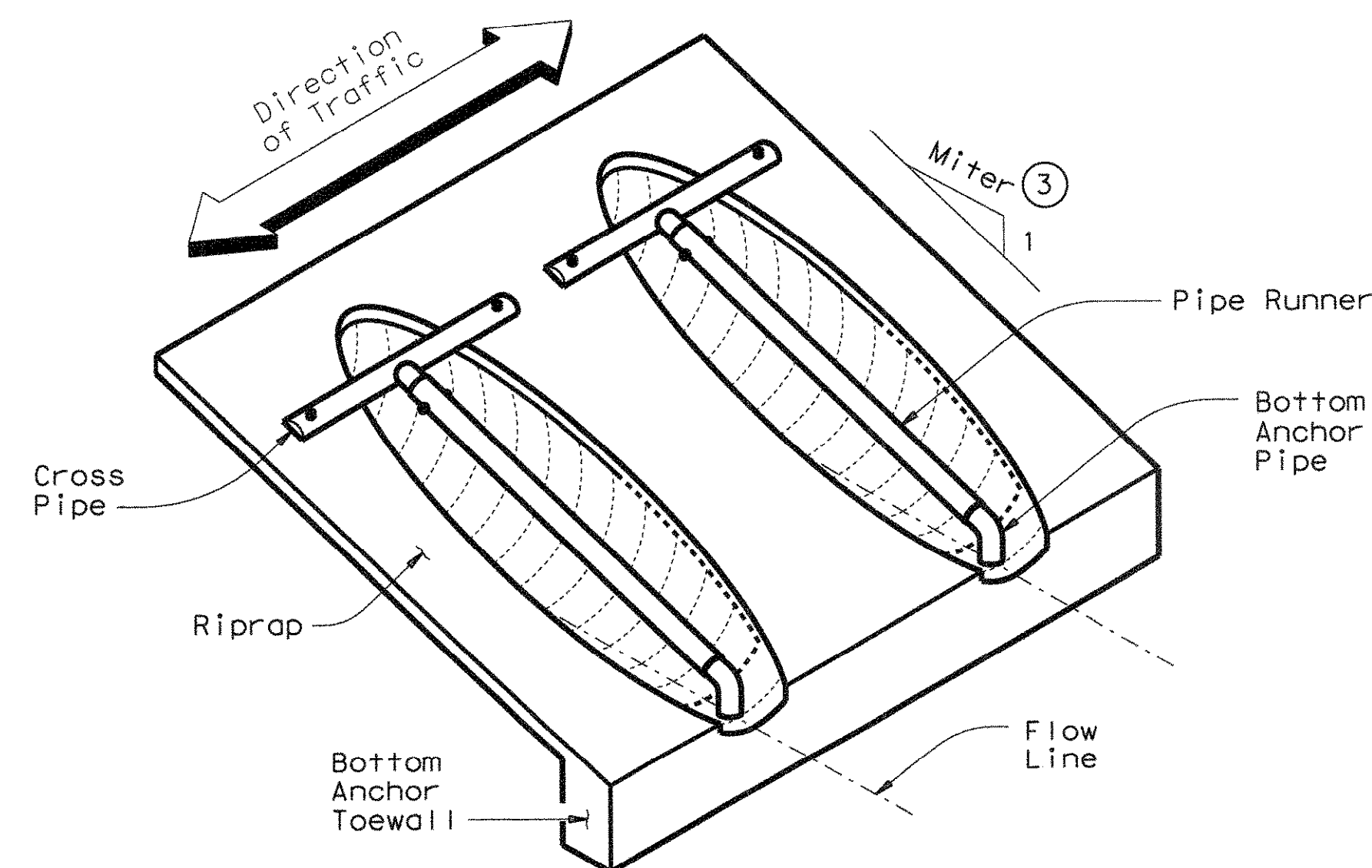
SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

(Showing Corrugated Metal Pipe Culvert. Details of Concrete Pipe Culvert are similar.)



SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

(Showing Concrete Pipe Culvert. Details of Corrugated Metal Pipe Culvert are similar. Pipe Runners not shown for clarity)



ISOMETRIC VIEW OF TYPICAL INSTALLATION

(Showing installation with no skew.)

CROSS PIPE LENGTHS & PIPE RUNNER LENGTHS (1)(2)

Nominal Culvert I.D.	Pipe Culvert Spa ~ G	Cross Pipe Length	Pipe Runner Length											
			3:1 Side Slope				4:1 Side Slope				6:1 Side Slope			
			0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew
24"	1'-7"	3'-5"	N/A	N/A	N/A	5'-10"	N/A	N/A	N/A	8'-1"	N/A	N/A	N/A	12'-9"
27"	1'-8"	3'-8"	N/A	N/A	5'-5"	6'-11"	N/A	N/A	7'-7"	9'-7"	N/A	N/A	11'-11"	14'-11"
30"	1'-10"	3'-11"	N/A	N/A	6'-4"	8'-0"	N/A	N/A	8'-9"	11'-0"	N/A	N/A	13'-8"	17'-0"
33"	1'-11"	4'-2"	6'-2"	6'-5"	7'-3"	9'-1"	8'-6"	8'-10"	10'-0"	12'-5"	13'-3"	13'-9"	15'-5"	19'-2"
36"	2'-1"	4'-5"	6'-11"	7'-3"	8'-2"	10'-2"	9'-6"	9'-11"	11'-2"	13'-10"	14'-9"	15'-3"	17'-2"	21'-3"
42"	2'-4"	4'-11"	8'-6"	8'-10"	9'-11"	12'-4"	11'-7"	12'-0"	13'-6"	16'-8"	17'-9"	18'-5"	20'-8"	25'-7"
48"	2'-7"	5'-5"	10'-1"	10'-5"	11'-9"	N/A	13'-7"	14'-2"	15'-10"	N/A	20'-9"	21'-6"	24'-2"	N/A
54"	3'-0"	5'-11"	11'-8"	12'-1"	N/A	N/A	N/A	15'-8"	16'-3"	N/A	23'-10"	24'-8"	N/A	N/A
60"	3'-3"	6'-5"	13'-3"	N/A	N/A	N/A	17'-9"	N/A	N/A	N/A	26'-10"	N/A	N/A	N/A

TYPICAL PIPE CULVERT MITERS (3)

Side Slope	0° Skew	15° Skew	30° Skew	45° Skew
3:1	3:1	3.106:1	3.464:1	4.243:1
4:1	4:1	4.141:1	4.619:1	5.657:1
6:1	6:1	6.212:1	6.928:1	8.485:1

CONDITIONS WHERE PIPE RUNNERS ARE NOT REQUIRED (2)

Nominal Culvert I.D.	Single Pipe Culvert	Multiple Pipe Culverts
12" thru 21"	Skews thru 45°	Skews thru 45°
24"	Skews thru 45°	Skews thru 30°
27"	Skews thru 30°	Skews thru 15°
30"	Skews thru 15°	Skews thru 15°
33"	Skews thru 15°	Always required
36"	Normal (No Skew)	Always required
42" to 60"	Always required	Always required

STANDARD PIPE SIZES & MAX PIPE RUNNER LENGTHS (1)

Pipe Size	Pipe O.D.	Pipe I.D.	Max Pipe Runner Length
2" STD	2.375"	2.067"	N/A
3" STD	3.500"	3.068"	10'-0"
4" STD	4.500"	4.026"	19'-8"
5" STD	5.563"	5.047"	34'-2"

ESTIMATED CONCRETE RIPRAP QUANTITIES (CY) (5)

Nominal Culvert I.D.	3:1 Side Slope				4:1 Side Slope				6:1 Side Slope			
	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew
12"	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.6	0.7	0.7	0.7	0.8
15"	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.9
18"	0.5	0.5	0.6	0.6	0.6	0.7	0.7	0.8	0.8	0.8	0.9	1.0
21"	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.9	0.9	0.9	1.0	1.2
24"	0.6	0.7	0.7	0.8	0.8	0.8	0.8	1.0	1.0	1.0	1.1	1.3
27"	0.7	0.7	0.8	0.9	0.8	0.9	0.9	1.1	1.1	1.1	1.2	1.4
30"	0.8	0.8	0.8	0.9	0.9	0.9	1.0	1.2	1.2	1.2	1.3	1.6
33"	0.8	0.8	0.9	1.0	1.0	1.0	1.1	1.3	1.3	1.4	1.5	1.7
36"	0.9	0.9	0.9	1.1	1.1	1.1	1.2	1.4	1.4	1.5	1.6	1.8
42"	1.0	1.0	1.1	1.3	1.2	1.3	1.3	1.6	1.6	1.7	1.8	2.1
48"	1.1	1.1	1.2	N/A	1.4	1.4	1.5	N/A	1.9	1.9	2.1	N/A
54"	1.3	1.3	N/A	N/A	1.6	1.6	N/A	N/A	2.1	2.1	N/A	N/A
60"	1.4	N/A	N/A	N/A	1.7	N/A	N/A	N/A	2.3	N/A	N/A	N/A

(1) Size of Pipe Runner shall be as shown in the tables. Cross Pipe shall be the same size as the Pipe Runner. Cross Pipe Stub Out and Bottom Anchor Pipe shall be the next smaller size pipe as shown in the STANDARD PIPE SIZES table.

(2) This standard allows for the placement of only one pipe runner across each culvert pipe opening. In order to limit the clear opening to be traversed by an errant vehicle, the following conditions must be met:

- For 60" culvert pipes, the skew must not exceed 0°.
- For 54" culvert pipes, the skew must not exceed 15°.
- For 48" culvert pipes, the skew must not exceed 30°.
- For all culvert pipe sizes 42" and less, the skew must not exceed 45°.

If the above conditions cannot be met, the designer should consider using a safety end treatment with flared wings. For further information, refer to the TxDOT "Roadway Design Manual".


(3) Miter = Slope of Mitered Pipe Culvert End

(4) Riprap placed beyond the limits shown will be paid as Concrete Riprap in accordance with Item 432, "Riprap".

(5) Quantities shown are for one end of one reinforced Concrete Pipe Culvert. For multiple Pipe Culverts or for Corrugated Metal Pipe Culverts, quantities will need to be adjusted. Riprap quantities are for Contractor's information only.

- All Concrete for Structure Shall be Class F (4200 psi 7.0 sack Cement).
- No Fly Ash is Allowed for Structures.

SHEET 1 OF 2



SAFETY END TREATMENT
 FOR 12" DIA TO 60" DIA
 PIPE CULVERTS
 TYPE II ~ CROSS DRAINAGE

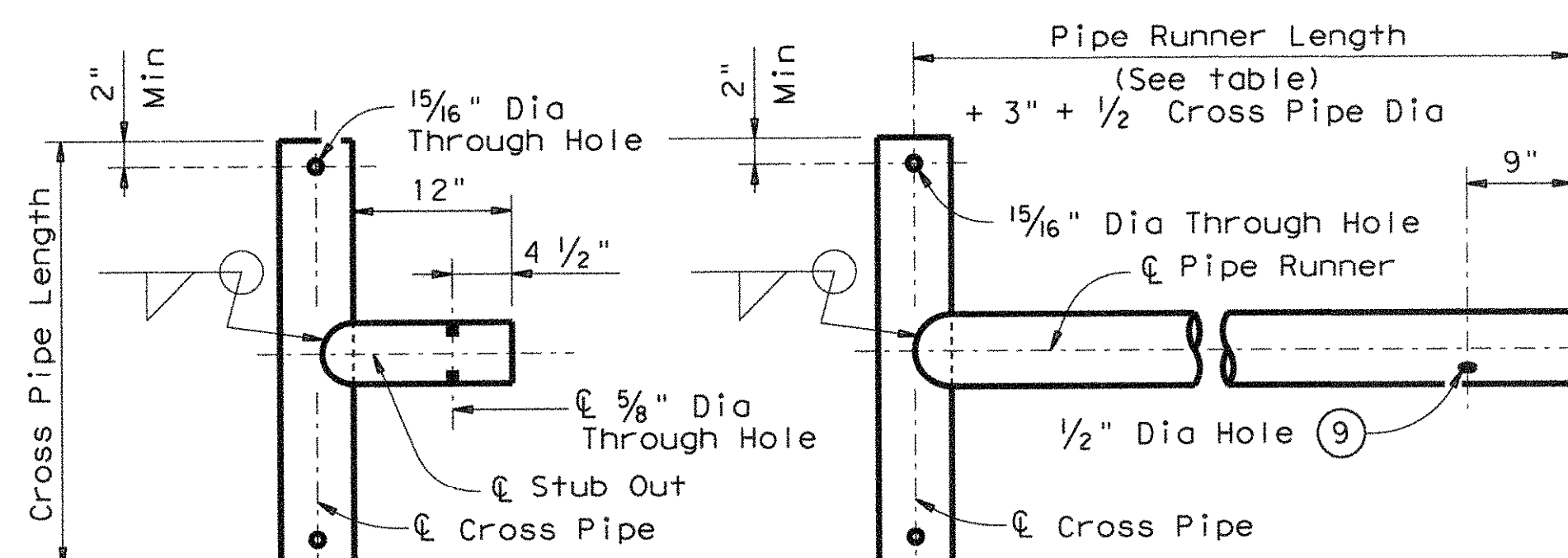
SETP-CD

FILE: setpcdse.dgn DW: GAF CK: CAT DW: JRP CK: GAF
 ©TxDOT February 2010 CONT SECT JOB HIGHWAY
 REVISIONS
 11-10: Add note for synthetic fibers. DIST COUNTY SHEET NO.

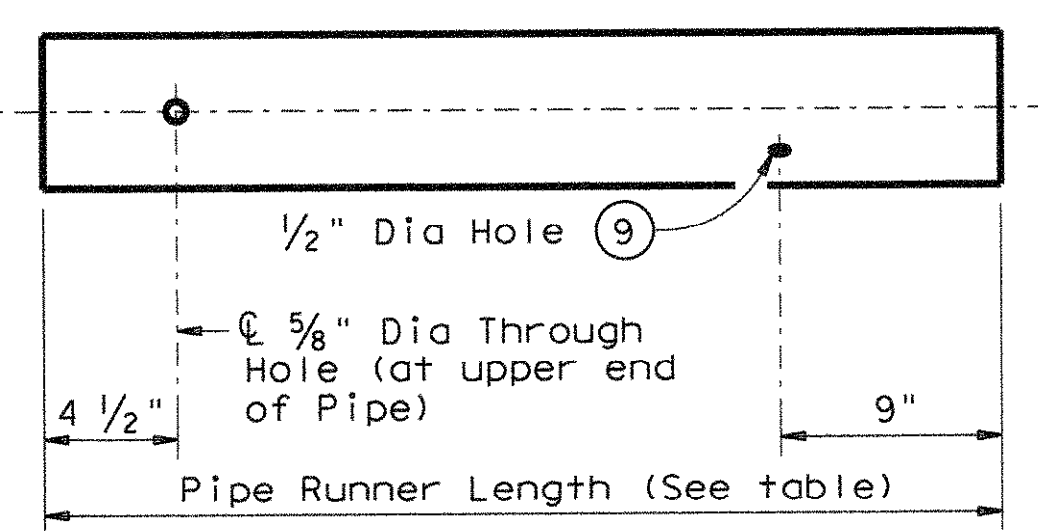
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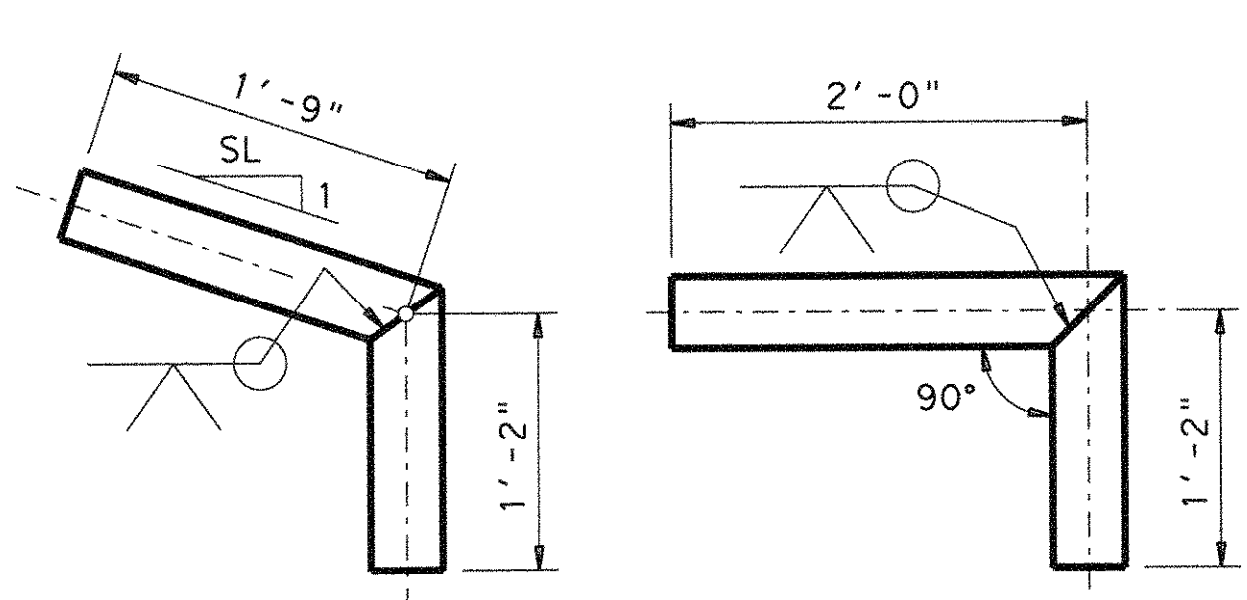
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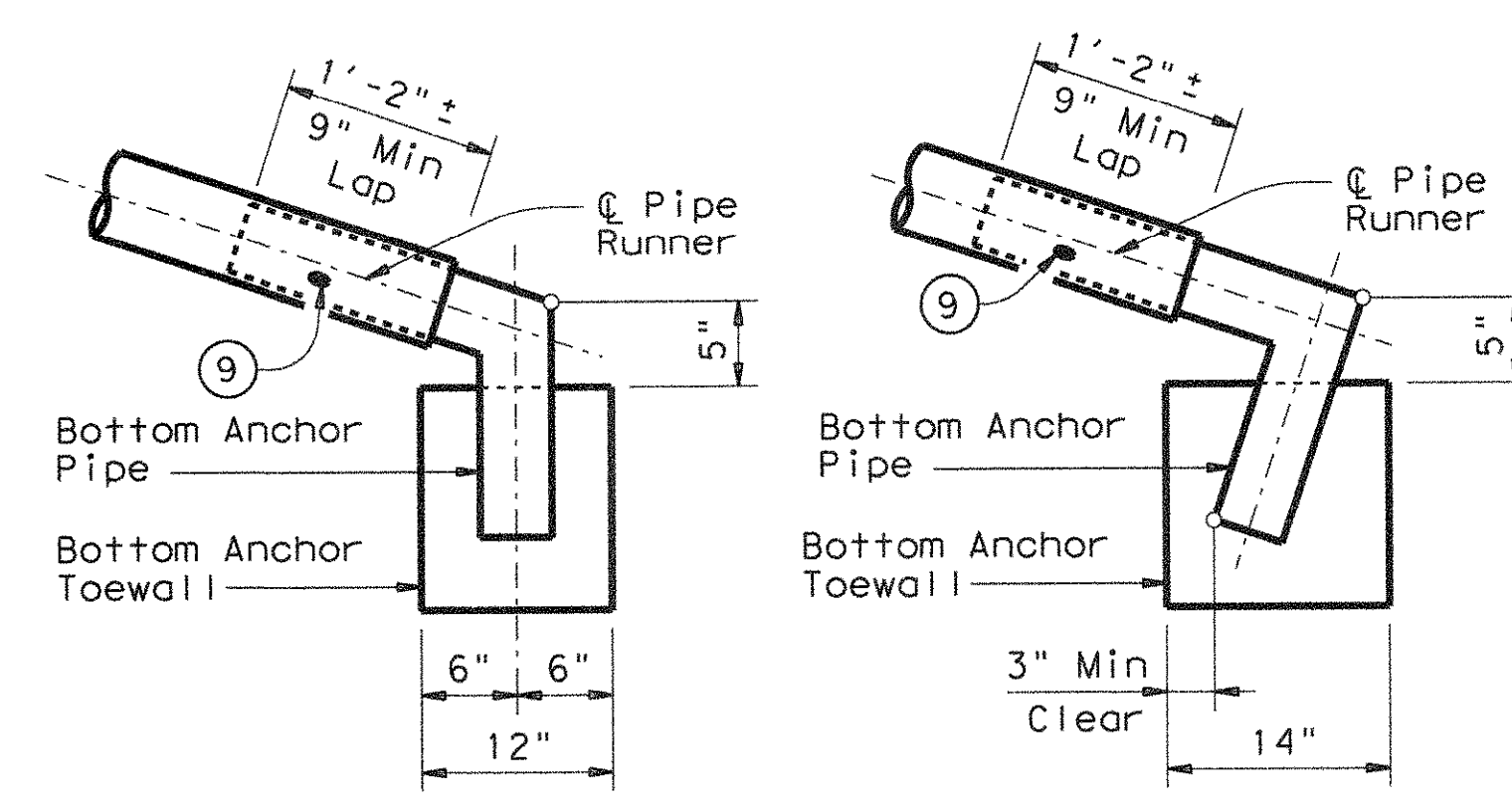
OPTION A1 **OPTION A2**
CROSS PIPE AND CONNECTIONS DETAILS



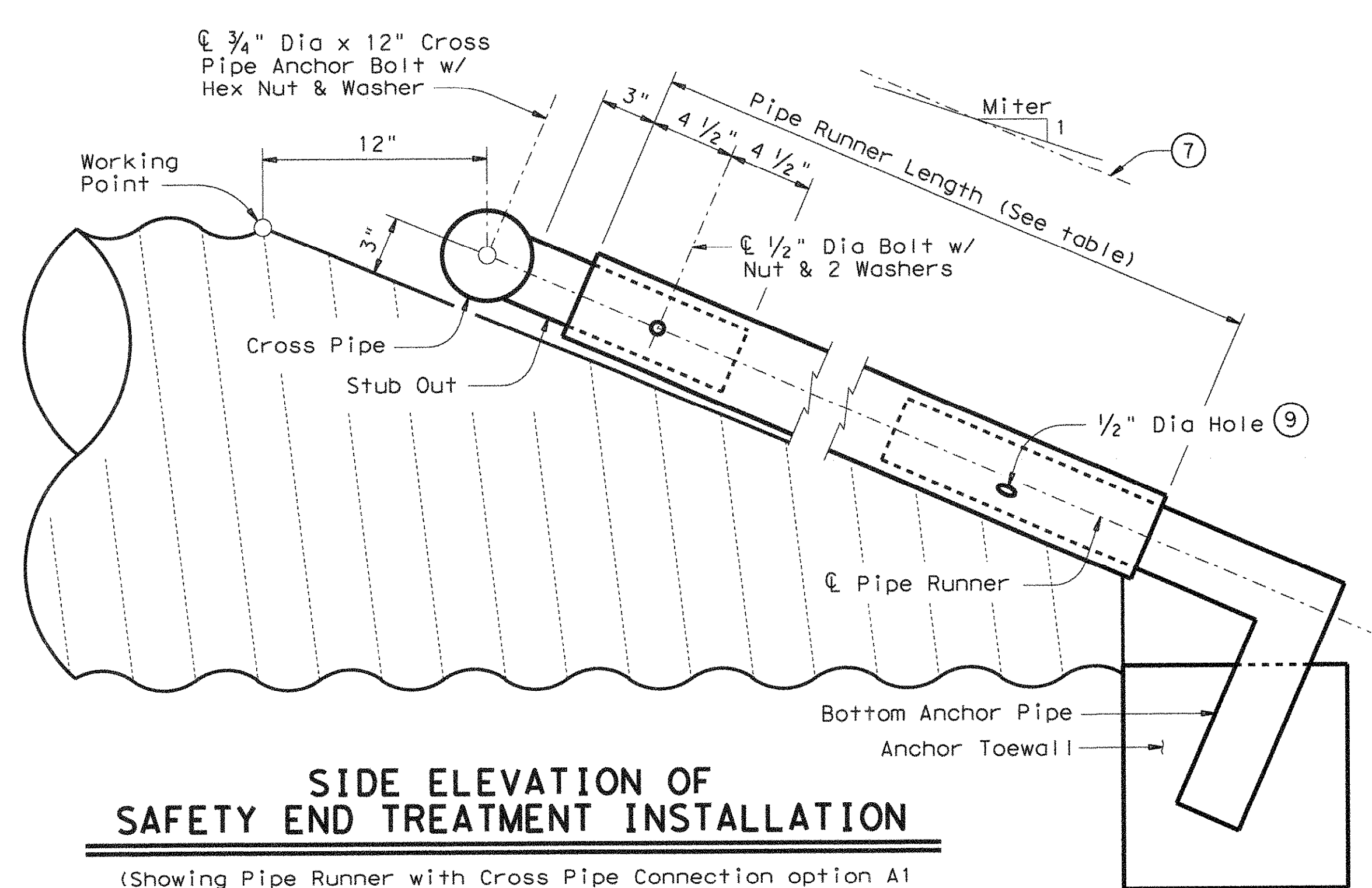
PIPE RUNNER DETAILS



OPTION B1 **OPTION B2**
BOTTOM ANCHOR PIPE DETAILS ⑩

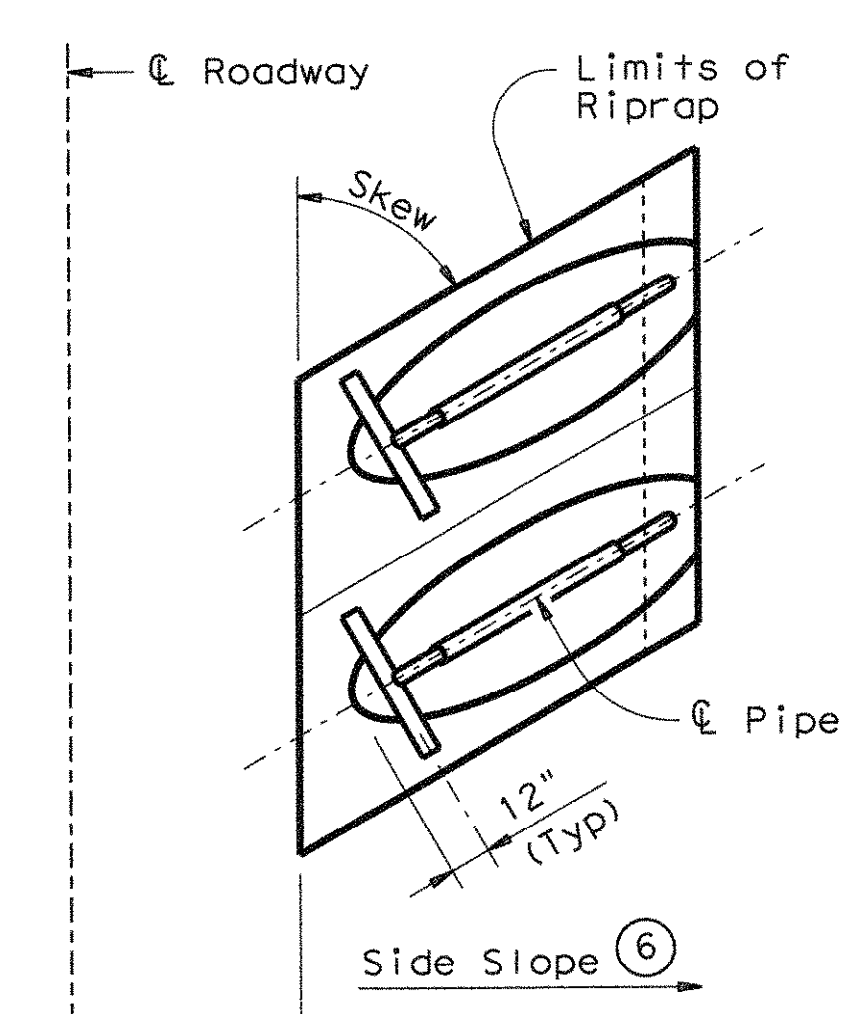


OPTION B1 **OPTION B2**
BOTTOM ANCHOR TOEWALL DETAILS
(Culvert & Riprap not shown for clarity)

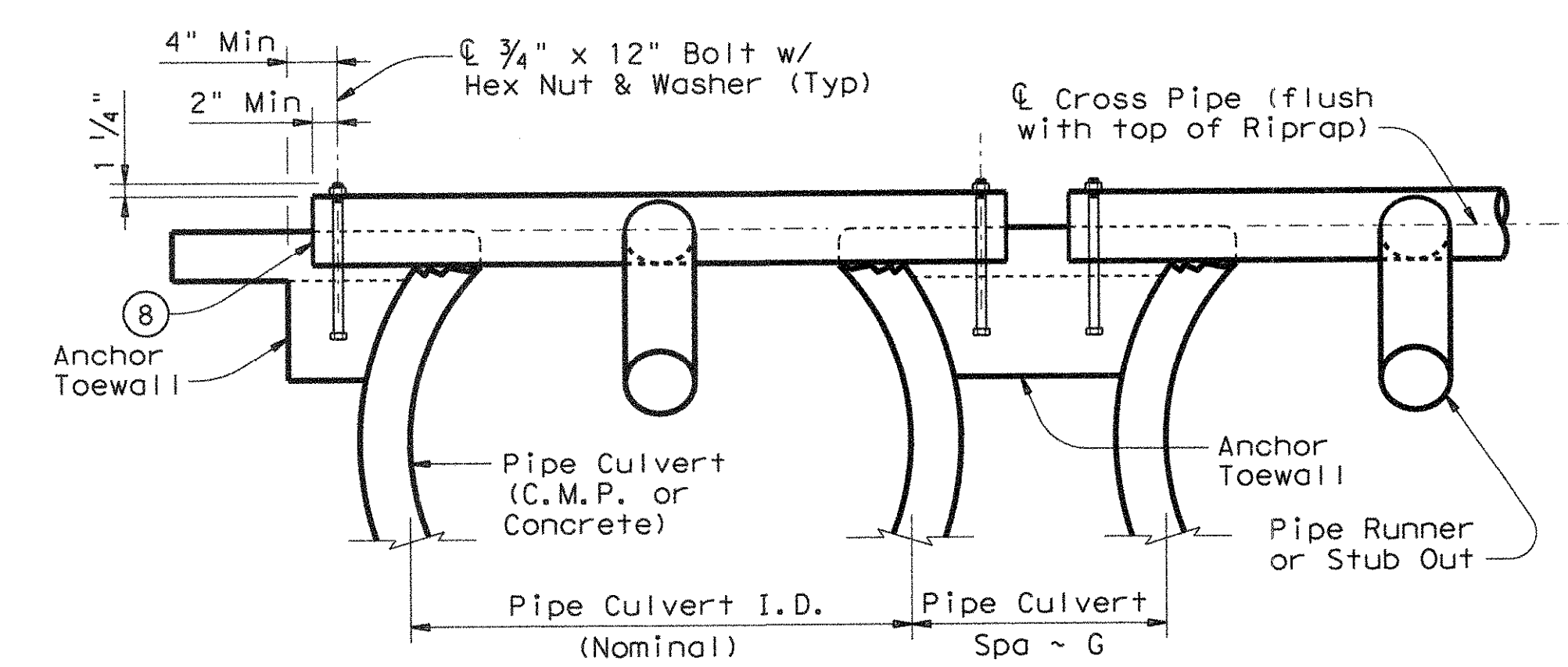


SIDE ELEVATION OF SAFETY END TREATMENT INSTALLATION

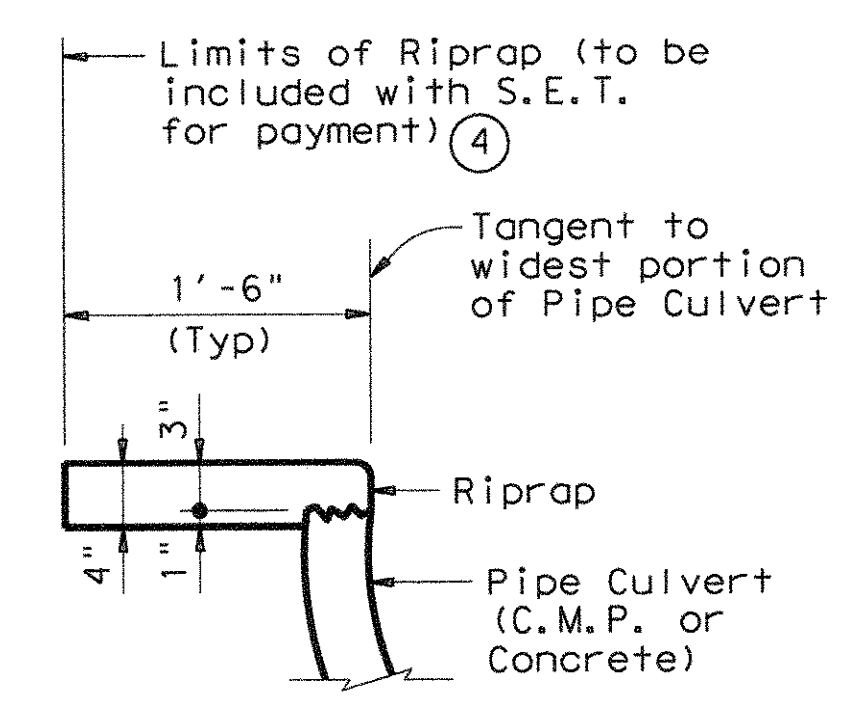
(Showing Pipe Runner with Cross Pipe Connection option A1 and Anchor Pipe option B2 on Corrugated Metal Pipe Culvert. Concrete Pipe Culvert details are similar. Riprap not shown for clarity)



PLAN OF SKEWED INSTALLATION



SHOWING CROSS PIPE & ANCHOR TOEWALL



SHOWING TYPICAL PIPE CULVERT & RIPRAP

SECTION A-A

- ④ Riprap placed beyond the limits shown will be paid as Concrete Riprap in accordance with Item 432, "Riprap".
- ⑥ Recommended values of side slope are 3:1, 4:1, & 6:1. All quantities, calculations, and dimensions shown herein are based on these recommended values. Slope of 3:1 or flatter is required for vehicle safety.
- ⑦ Note that actual slope of Pipe Runner may vary slightly from Side Slope of Riprap and trimmed Culvert Pipe edge.
- ⑧ Care shall be taken to ensure that Riprap concrete does not flow into the Cross Pipe so as to permit disassembly of the bolted connection to allow cleanout access.
- ⑨ After installation, the 1/2 inch hole shall be inspected to ensure that the lap of the Pipe Runner with the Bottom Anchor Pipe is adequate.
- ⑩ At fabricator's option, a heat bend to a smooth 5" radius or a manufactured elbow (of the same material as the Runner) may be substituted for the mitered and welded joint in the Bottom Anchor Pipe.

GENERAL NOTES:

Pipe Runners are designed for a traversing load of 1,800 pounds at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981. The Safety End Treatments shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the Pipe Runners. Riprap and all necessary inverts shall be Concrete Riprap conforming to the requirements of Item 432, "Riprap". Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise. Payment for riprap and toewall is included in the Price Bid for each Safety End Treatment. Pipe Runners, Cross Pipes, and Anchor Pipes shall conform to the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52. Bolts and nuts shall conform to ASTM A307. All steel components, except concrete reinforcing, shall be galvanized after fabrication. Galvanizing damaged during transport or construction shall be repaired in accordance with the specifications.

		Bridge Division Standard	
SAFETY END TREATMENT FOR 12" DIA TO 60" DIA PIPE CULVERTS TYPE II ~ CROSS DRAINAGE			
SETP-CD			
FILE: setpcdse.dgn	DN: GAF	CK: CAT	DW: JRP
©TxDOT February 2010	CONT	SECT	JOB
REVISIONS			
11-10: Add note for synthetic fibers.	DIST	COUNTY	SHEET NO.