

5

4

3

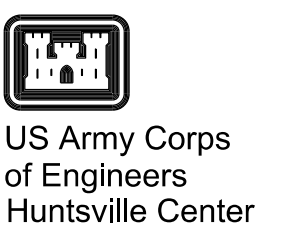
2

1

US ARMY CORPS  
OF ENGINEERS,  
ENGINEERING AND  
SUPPORT CENTER,  
HUNTSVILLE

## DEFINITIVE DRAWINGS

# BARRICADES



No.	Description	Revisions	Date	Appr.
2	GENERAL REVISIONS AND UPDATES		6/17/2021	
1	GENERAL REVISIONS AND UPDATES		5/6/2011	
	ORIGINAL DOCUMENT		12/2/1988	

Designed by:	ARB	Date:	17 JUNE 2021
Drawn by:	MM/CS/DH	Scale:	N.T.S.
Checked by:	CHAD HOUSE, PE	Drawing code:	DEF 149-30-01
Submitted by:		Date:	30 JUNE 2021

U. S. ARMY CORPS OF ENGINEERS  
ENGINEERING AND  
SUPPORT CENTER,  
HUNTSVILLE, ALABAMA

BARRICADES  
STANDARD DESIGN  
COVER SHEET

Sheet reference  
number:  
**G-1**

U. S. ARMY CORPS OF ENGINEERS  
ENGINEERING AND SUPPORT CENTER, HUNTSVILLE

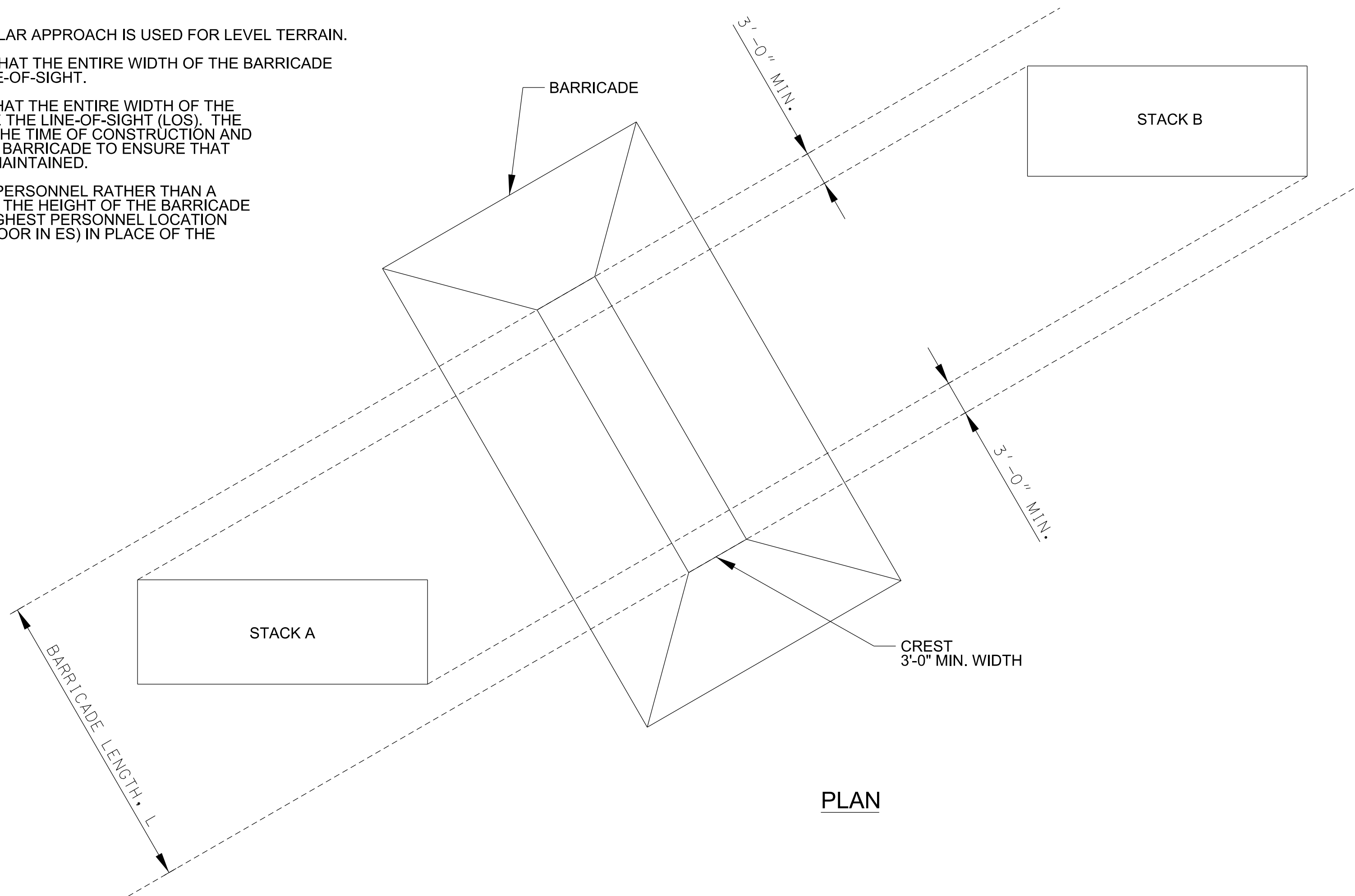
DISCIPLINES	DESIGNERS	REVIEWERS	SUPERVISORS
FACILITIES, SYSTEMS & SUSTAINMENT	AMANDA BAKER	MICHELLE CRULL, PE SUSAN HAMILTON, PE	CHAD HOUSE, PE
ARCHITECTURAL			
MECHANICAL PLUMBING FIRE PROTECTION			
ELECTRICAL TELECOMMUNICATIONS SECURITY			

APPROVALS	SIGNATURE
BCOE BY	
REVIEWED BY (DIVISION CHIEF - MECH/ELEC)	
REVIEWED BY (DIVISION CHIEF - CIVIL/STRUC)	
RECOMMENDED BY (DIR OF ENGINEERING)	
APPROVED BY (COMMANDER)	

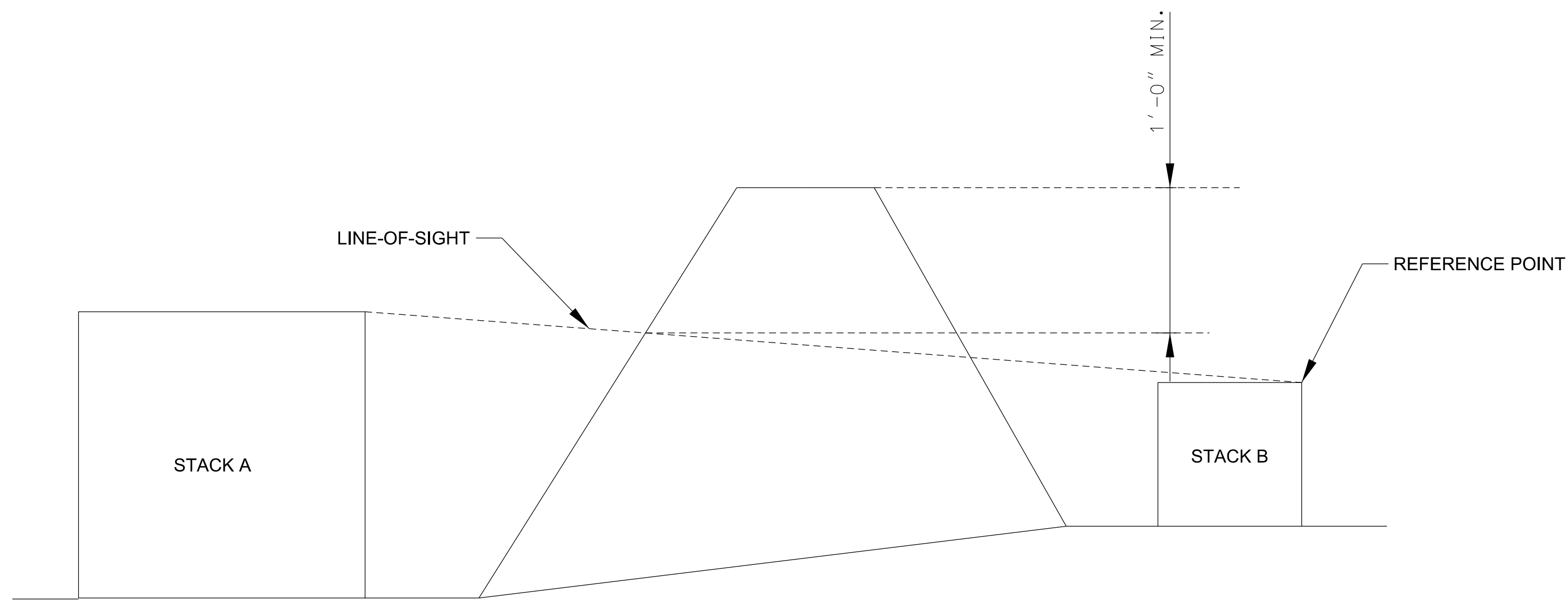
THIS DEFINITIVE DRAWING WAS DESIGNED BY THE U.S. ARMY ENGINEERING AND SUPPORT CENTER, HUNTSVILLE, OF THE U.S. ARMY CORPS OF ENGINEERS. THE INITIALS OR SIGNATURE'S AND REGISTRATIONS OF INDIVIDUALS APPEAR ON THESE PROJECT DOCUMENTS WITHIN THE SCOPE OF THEIR EMPLOYMENT AS REQUIRED BY ER 1110-1-8152 AND CEHNC 1110-1-1.

NOTES:

1. SECTIONS SHOW SLOPING TERRAIN. A SIMILAR APPROACH IS USED FOR LEVEL TERRAIN.
2. THE BARRICADE'S HEIGHT MUST BE SUCH THAT THE ENTIRE WIDTH OF THE BARRICADE CREST IS AT LEAST ONE (1) FT ABOVE THE LINE-OF-SIGHT.
3. THE BARRICADE'S HEIGHT MUST BE SUCH THAT THE ENTIRE WIDTH OF THE BARRICADE CREST IS AT LEAST ONE FT ABOVE THE LINE-OF-SIGHT (LOS). THE BARRICADE HEIGHT MUST BE MEASURED AT THE TIME OF CONSTRUCTION AND AT INTERVALS THROUGHOUT THE LIFE OF THE BARRICADE TO ENSURE THAT THE SPECIFIED THICKNESS AND HEIGHT ARE MAINTAINED.
4. WHERE THE EXPOSED SITE (ES) INCLUDES PERSONNEL RATHER THAN A STACK OF AMMUNITION AND EXPLOSIVES (AE), THE HEIGHT OF THE BARRICADE IS DETERMINED USING THE HEIGHT OF THE HIGHEST PERSONNEL LOCATION (E.G., 6 FT FROM THE HIGHEST PERSONNEL FLOOR IN ES) IN PLACE OF THE HEIGHT OF THE ACCEPTOR STACK.



PLAN



SECTION: BARRICADE

GENERIC BARRICADE

N.T.S.

REFERENCES	
DESR 6055.09	DoD AMMUNITION AND EXPLOSIVES SAFETY STANDARDS
DA PAM 385-64	AMMUNITION AND EXPLOSIVES SAFETY STANDARDS
AMC-R 385-100	SAFETY MANUAL (FOR AMC FACILITIES ONLY)
UFC 3-340-01	FUNDAMENTALS OF PROTECTIVE DESIGN FOR CONVENTIONAL WEAPONS
UFC 3-340-02	STRUCTURES TO RESIST THE EFFECTS OF ACCIDENTAL EXPLOSIONS
DDESB TP-15	APPROVED PROTECTIVE CONSTRUCTION
CEHNC-CS-11-01	ROCKET OR MISSILE BARRICADE OPTION (RAMBO) PHASE 1 TEST REPORT

OVERALL OBJECTIVES	
-	THE OBJECTIVE OF THIS DEFINITIVE DRAWING IS TO PROVIDE THE DESIGNER A SHOPPING LIST OF BARRICADES CONSIDERED EFFECTIVE IN PROTECTING BUILDINGS, INSTALLATION ACCESS POINTS, EXPLOSIVE-HANDLING FACILITIES, AND HIGH-VALUE EQUIPMENT STORAGE AREAS.
-	THIS DEFINITIVE DRAWING AFFORDS DESIGNERS THE MEANS TO SELECT AND DESIGN COST EFFECTIVE BARRICADES TO SATISFY FUNCTIONAL REQUIREMENTS TO INCLUDE AESTHETIC CONSIDERATIONS.

GENERAL NOTES	
-	BARRICADES - BARRICADES ARE INTERVENING BARRIERS OF SUCH TYPE, SIZE & CONSTRUCTION THAT LIMIT THE EFFECT OF AN EXPLOSION ON AN EXPOSED SITE (ES) IN A PRESCRIBED MANNER. PROPERLY CONSTRUCTED & SITED BARRICADES HAVE SAFETY APPLICATIONS FOR PROTECTING AGAINST LOW-ANGLE FRAGMENTS. IF THE BARRICADE IS DESTROYED IN THE PROCESS OF PROVIDING PROTECTION, THEN SECONDARY FRAGMENTS FROM THE DESTROYED BARRICADE MUST ALSO BE CONSIDERED AS PART OF THE HAZARD ANALYSIS. BARRICADES PROVIDE NO PROTECTION AGAINST LOBBED AE. FRAGMENTS MOVE ALONG BALLISTIC TRAJECTORIES RATHER THAN STRAIGHT LINES. BARRICADES MUST BE HIGH ENOUGH TO INTERCEPT THE BALLISTIC TRAJECTORIES OF THE FRAGMENTS OF CONCERN. (SEE GENERIC BARRICADE THIS SHEET.)
-	LIMITATIONS - A BARRICADE INTERRUPTS THE DIRECT LINE-OF-SIGHT MOTION OF THE OF THE SHOCK WAVE. IF THE BARRICADE HAS SUFFICIENT DIMENSIONS, & IS LOCATED CLOSE ENOUGH TO THE ES, THERE MAY BE SOME REDUCTION IN SHOCK LOADING TO SELECTED AREAS OF THE ES. THE AMOUNT OF PROTECTION PROVIDED BY A BARRICADE IS GOVERNED BY THE BARRICADE'S HEIGHT & LENGTH & THE DISTANCE THE EXPOSURE IS FROM THE REAR OF THE BARRICADE. PROTECTION INCREASES AS SEPARATION DECREASES. A BARRICADE IS INEFFECTIVE AT REDUCING BLAST OVER-PRESSURE AT FAR-FIELD DISTANCES, SUCH AS THOSE ASSOCIATED WITH IBD OR PTRD.
-	BARRICADE TYPES - MANY TYPES OF BARRICADES ARE DEPICTED ON THIS DRAWING. SELECTION WILL BE INFLUENCED BY FUNCTIONAL REQUIREMENTS, COST, AESTHETICS, SITE CONSTRAINTS, AND MATERIAL AVAILABILITY.
-	MINIMUM REQUIREMENTS PER DESR 6055.09:
-	THE SLOPE OF AN UNREINFORCED EARTHEN BARRICADE MUST BE 2 HORIZONTAL TO 1 VERTICAL, UNLESS EROSION CONTROLS ARE USED. EARTHEN BARRICADES WITH SLOPES NO GREATER THAN 1.5 HORIZONTAL TO 1 VERTICAL THAT WERE APPROVED BEFORE 1976 MAY CONTINUE TO BE USED. HOWEVER, RENOVATIONS TO THESE BARRICADES MUST MEET THE 2 HORIZONTAL TO 1 VERTICAL SLOPE CRITERIA WHEN FEASIBLE.
-	MATERIALS FOR EARTHEN BARRICADES & FILL MUST BE REASONABLY COHESIVE & FREE FROM HARMFUL OR TOXIC MATTER, TRASH, DEBRIS, & STONES HEAVIER THAN 10 LBS OR LARGER THAN 6 INCHES IN DIAMETER. THE LARGER OF ACCEPTABLE STONES MUST BE LIMITED TO THE LOWER CENTER OF FILLS. EARTHEN MATERIAL MUST BE COMPACTED & PREPARED, AS NECESSARY, FOR STRUCTURAL INTEGRITY & EROSION CONTROL. SOLID OR WET CLAY OR SIMILAR TYPES OF SOIL MUST NOT BE USED AS THEY ARE TOO COHESIVE. IF IT IS IMPOSSIBLE TO USE A COHESIVE MATERIAL (E.G., IN SANDY SOIL), THE BARRICADE MUST BE FINISHED WITH A SUITABLE MATERIAL (E.G., GEOTEXTILES, GUNNITE) THAT DOES NOT PRODUCE HAZARDOUS DEBRIS BUT ENSURES STRUCTURAL INTEGRITY.
-	MANUFACTURERS - MANY OF THESE BARRICADE SYSTEMS ARE PROPRIETARY, REGISTERED, ETC. THE MANUFACTURERS IDENTIFIED ARE FOR GENERAL INFORMATION ONLY. THEIR INCLUSION DOES NOT IMPLY PRODUCT ENDORSEMENT. UNDOUBTLY THERE ARE MANY OTHERS. THOSE IDENTIFIED ARE TO PROVIDE POTENTIAL USERS WITH SOURCES OF INFORMATION.
-	SITE SPECIFIC DESIGN MAY BE NEEDED FOR TYPE OF SOIL



US Army Corps of Engineers  
Huntsville Center

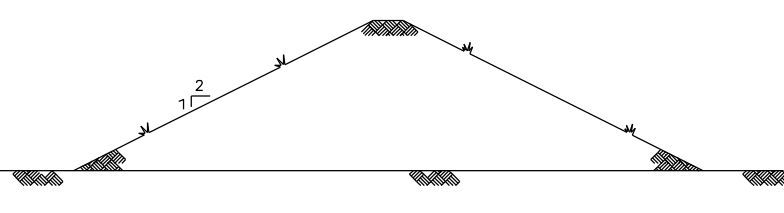
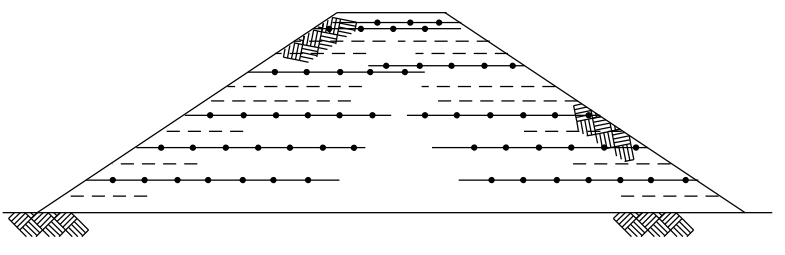
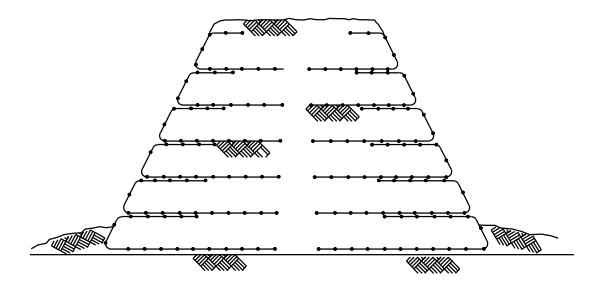
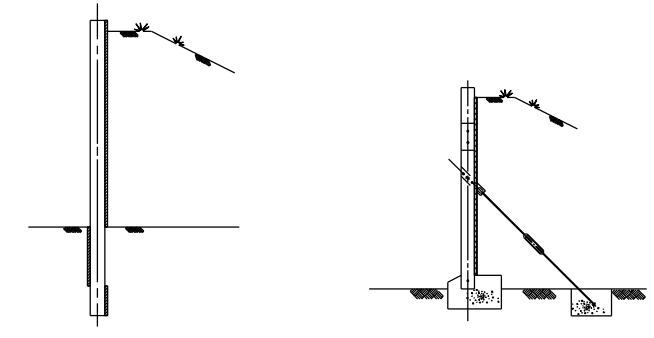
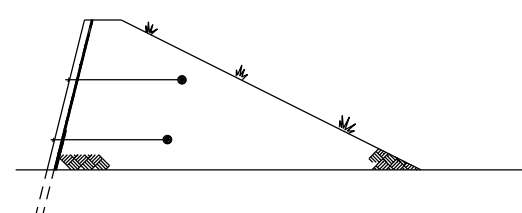
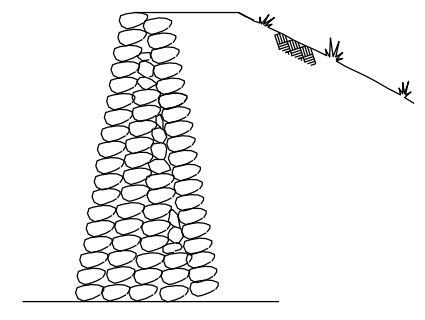
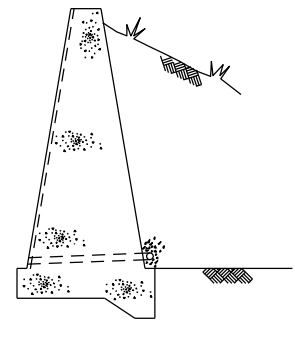
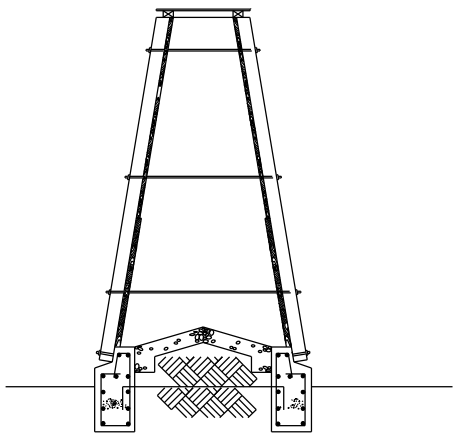
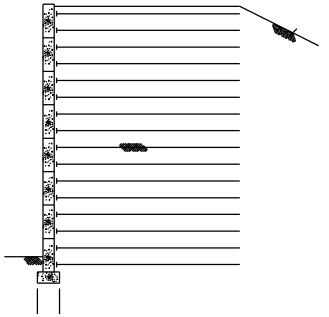
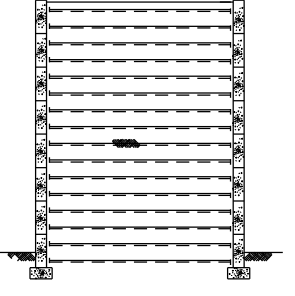
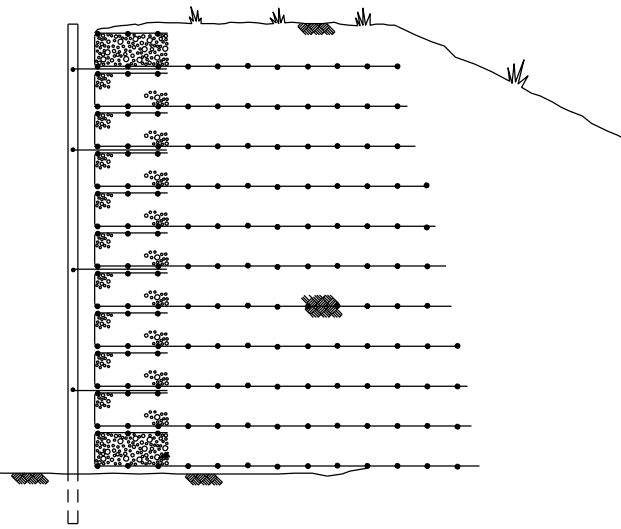
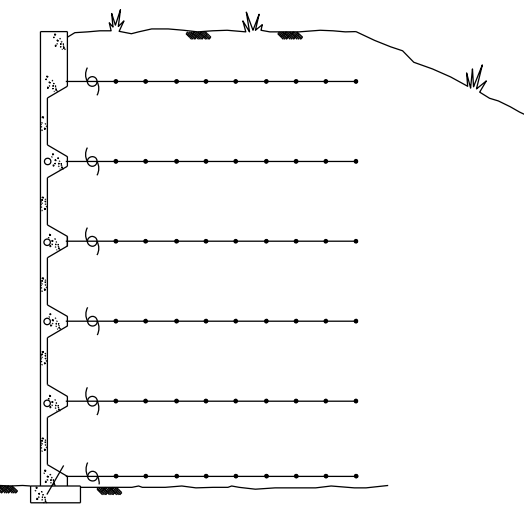
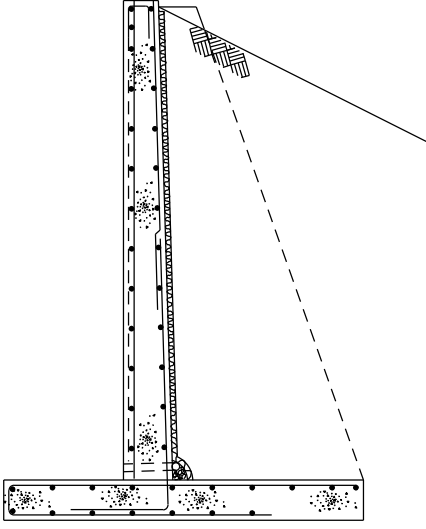
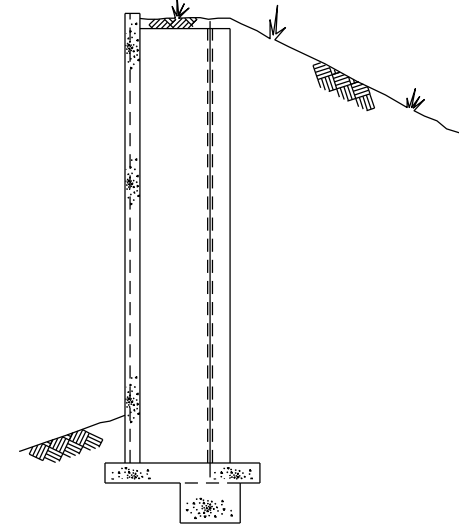
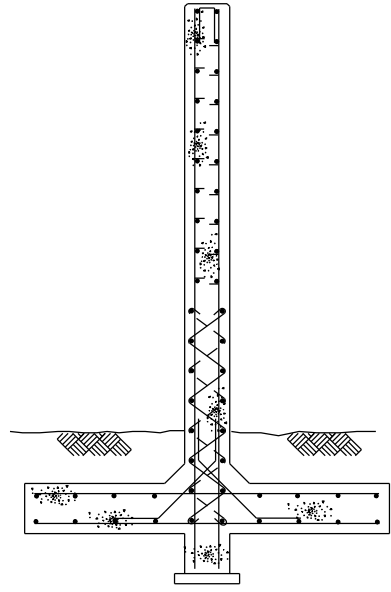
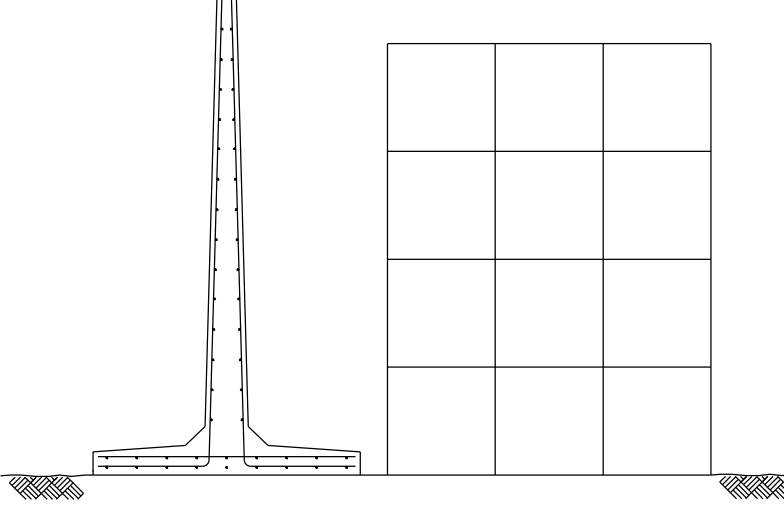
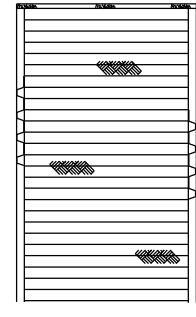
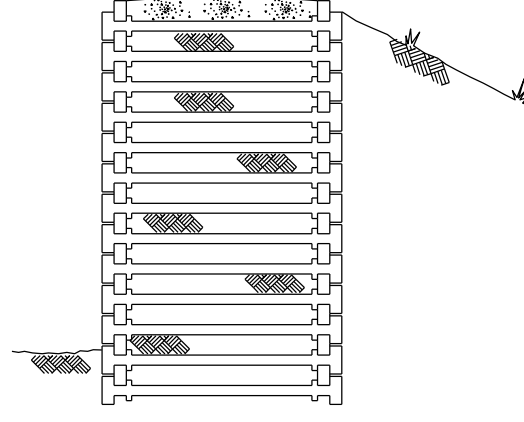
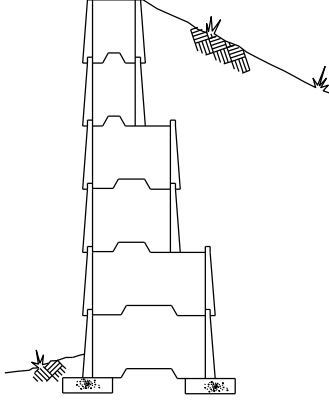
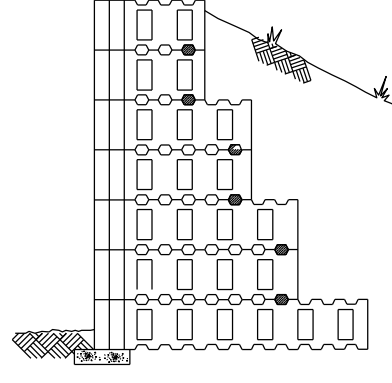
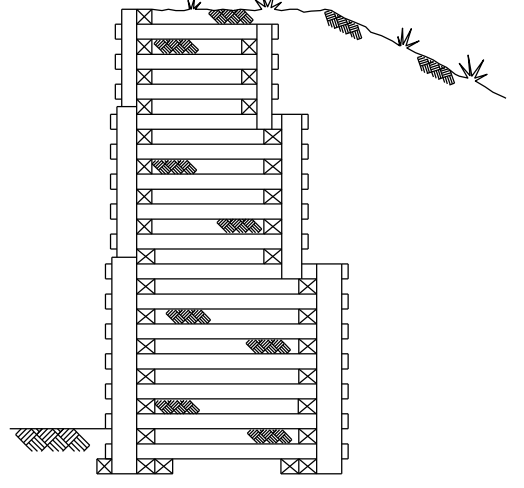
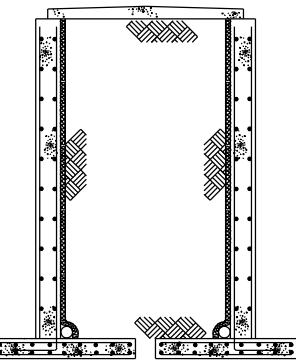
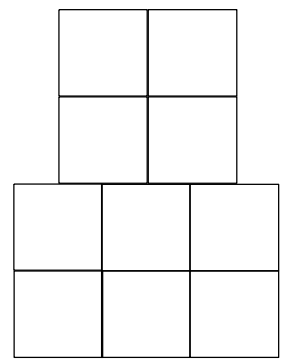
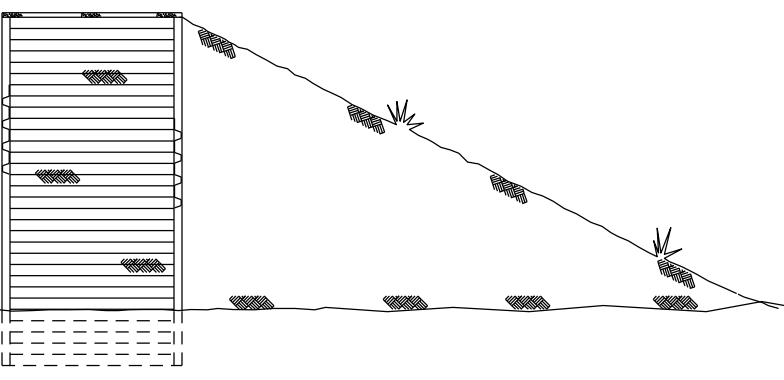
No.	Description	Date	Appr.
3	GENERAL REVISIONS AND UPDATES	6/17/2021	
2	GENERAL REVISIONS AND UPDATES	5/6/2021	
1	GENERAL REVISIONS	11/22/1991	
	ORIGINAL DOCUMENT	12/21/1988	

Designed by:	ARB	Date:	17 JUNE 2021
Drawn by:	ARB	Scale:	N.T.S.
Checked by:	MMC/SDH	Drawing code:	DEF 145-30-01
Submitted by:	CHAD HOUSE, PE	Date:	30 JUNE 2021

U. S. ARMY CORPS OF ENGINEERS  
ENGINEERING AND SUPPORT CENTER  
HUNTSVILLE, ALABAMA

BARRICADES STANDARD DESIGN  
GENERIC BARRICADES

Sheet reference number:  
**1**  
Sheet 1 of 13

<p>5</p>  <p>B1 - EARTH MOUND</p>	<p>4</p>  <p>B2 - REINFORCED EARTH MOUND</p>	<p>3</p>  <p>B3 - WRAP-AROUND EARTH MOUND</p>	<p>2</p>  <p>TYPE A      TYPE B</p> <p>B4 - TIMBER - SINGLE REVETTED</p>	<p>1</p>  <p>B5 - TIMBER - SINGLE REVETTED</p>	<p>1</p>  <p>B6 - SAND BAG - SINGLE REVETTED</p>
<p>C</p>  <p>B7 - CONCRETE GRAVITY WALL - SINGLE REVETTED</p>	 <p>B8 - TIMBER - DOUBLE REVETTED</p>	 <p>B9 - REINFORCED SOIL - SINGLE REVETTED</p>	 <p>B10 - REINFORCED SOIL - DOUBLE REVETTED</p>	 <p>B11 - WRAP-AROUND RETAINING WALL</p>	 <p>B12 - WAFFLE CRETE RETAINING WALL</p>
<p>B</p>  <p>B13 - CANTILEVER RETAINING WALL</p>	 <p>B14 - PRECAST DOUBLE TEES</p>	 <p>B15 - CONCRETE BLAST WALL</p>	 <p>B16 - 2.75' ROCKET BARRICADE</p>	 <p>B17 - STEEL BIN DOUBLE-REVETTED BARRICADE</p>	 <p>B18 - CONCRETE CRIBBING</p>
<p>A</p>  <p>B19 - PRECAST CONCRETE BIN</p>	 <p>B20 - PRECAST T-WALL</p>	 <p>B21 - TIMBER CRIB</p>	 <p>B22 - EARTH-FILLED CONCRETE WALL</p>	 <p>B23 - EARTH-FILLED STEEL MESH DEFENSIVE BARRICADE (HESCO)</p>	 <p>B24 - STEEL BIN SINGLE-REVETTED RETAINING WALL</p>



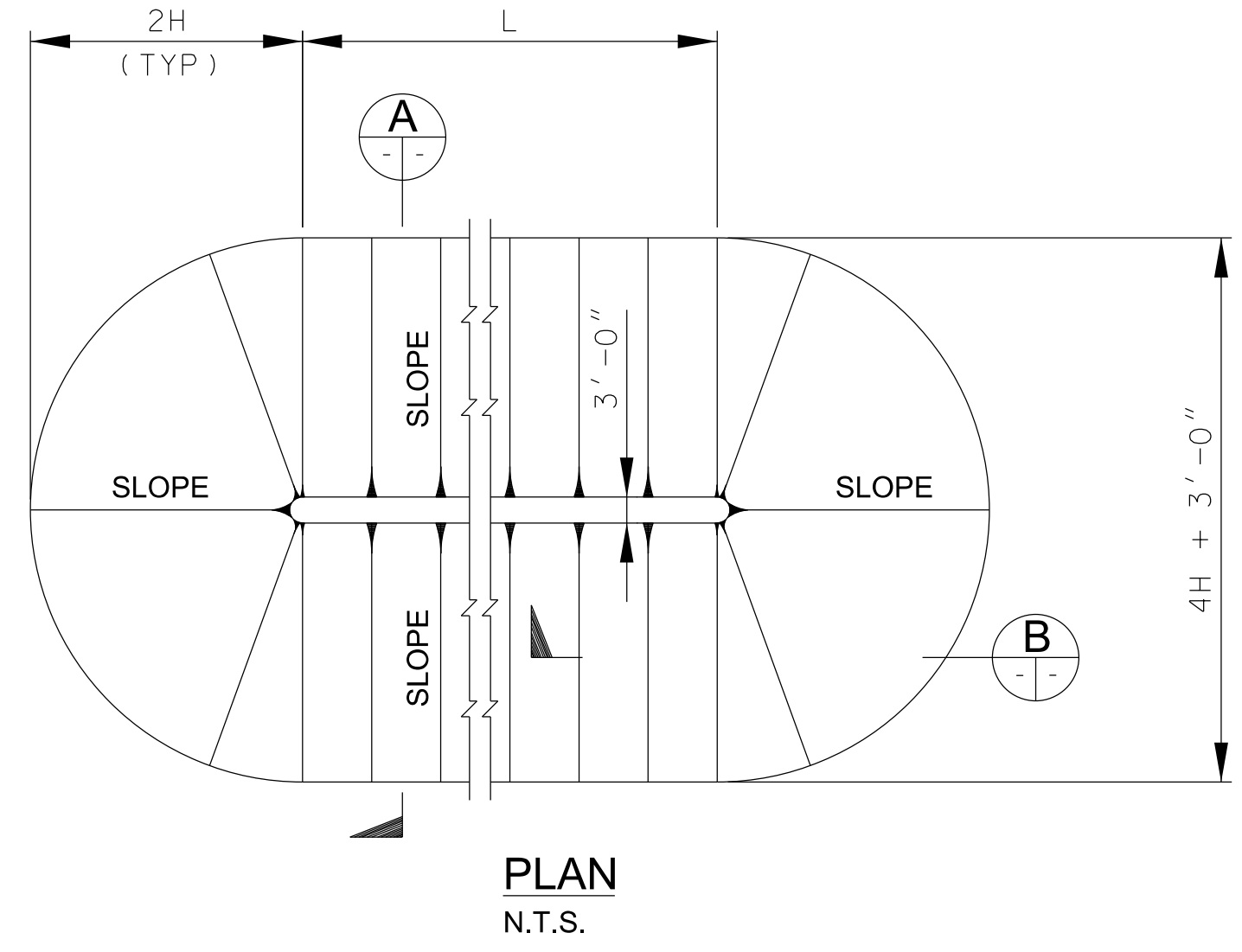
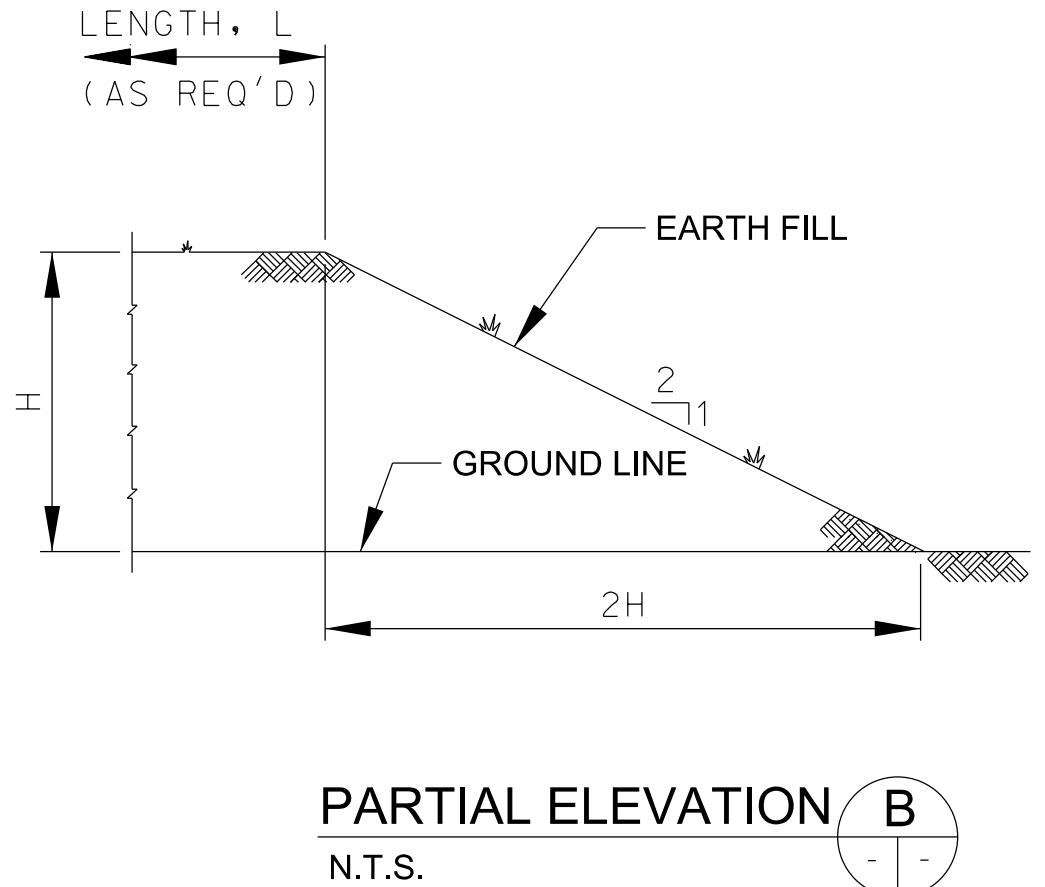
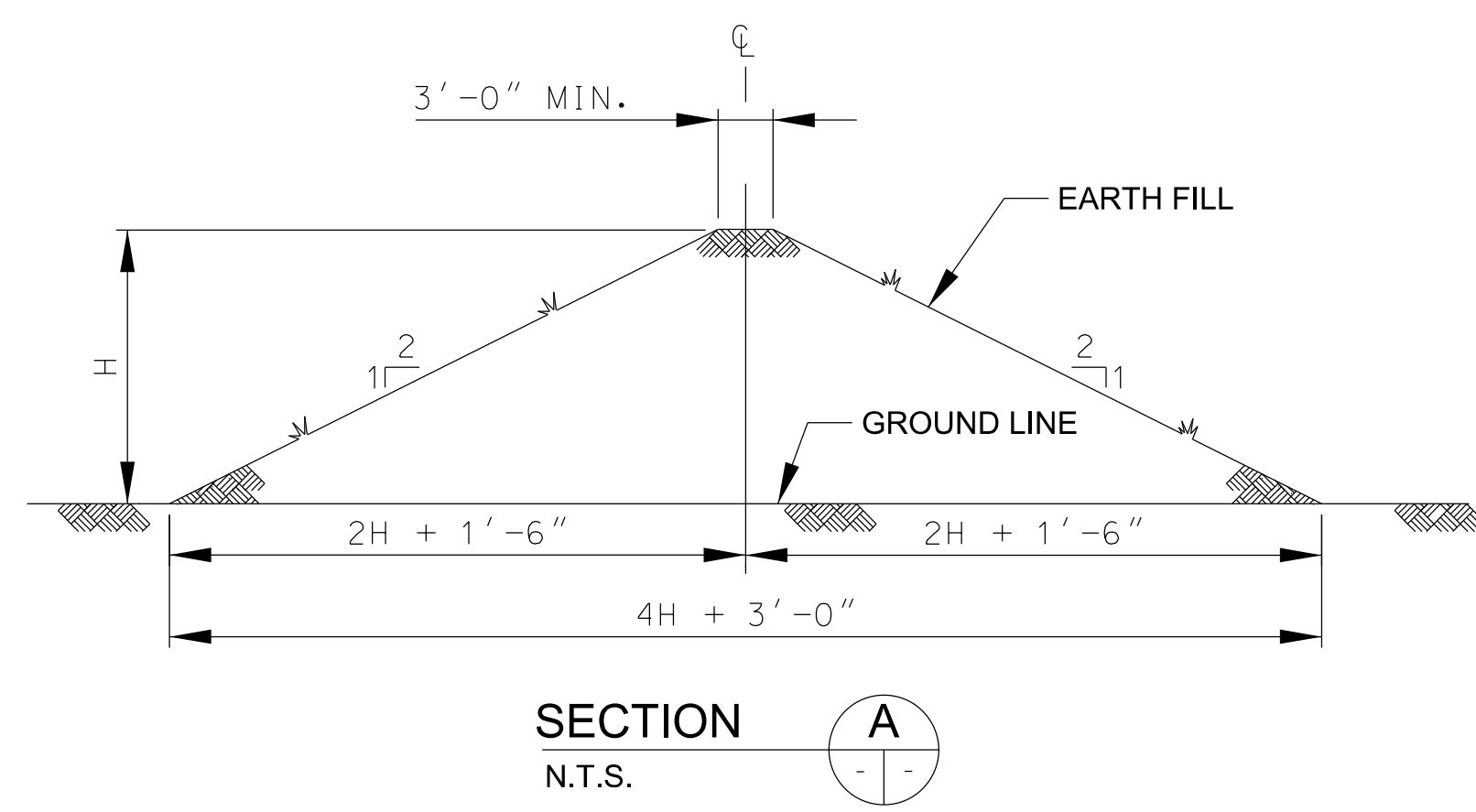
No.	Description	Revisions	Date	Appr.
3	ADDED B23 & B24, REVISED B17		6/17/2021	
2	REMOVED B23/REPLACED B16		5/6/2011	
1	B23 ADDED/SHEET TOTAL CHANGED ORIGINAL DOCUMENT		11/22/1991	
			12/2/1988	

Date:	17 JUNE 2021
Scale:	N.T.S.
Drawing code:	DEF 149-30-01
Date:	30 JUNE 2021

Designed by:  
 Drawn by: ARB  
 Checked by: MMC/SDH  
 U. S. ARMY CORPS OF ENGINEERS  
 ENGINEERING AND SUPPORT CENTER  
 HUNTSVILLE, ALABAMA  
 Submitted by: CHAD HOUSE, PE

BARRICADES  
 STANDARD DESIGN  
 GENERIC BARRICADES

Sheet reference number:  
**2**  
 Sheet 2 of 13



ESTIMATED ERECTION TIME MANHOURS	
100 LIN. FT. OF CROSS SECTION, 15 FT HIGH	BARRICADE END
920	90

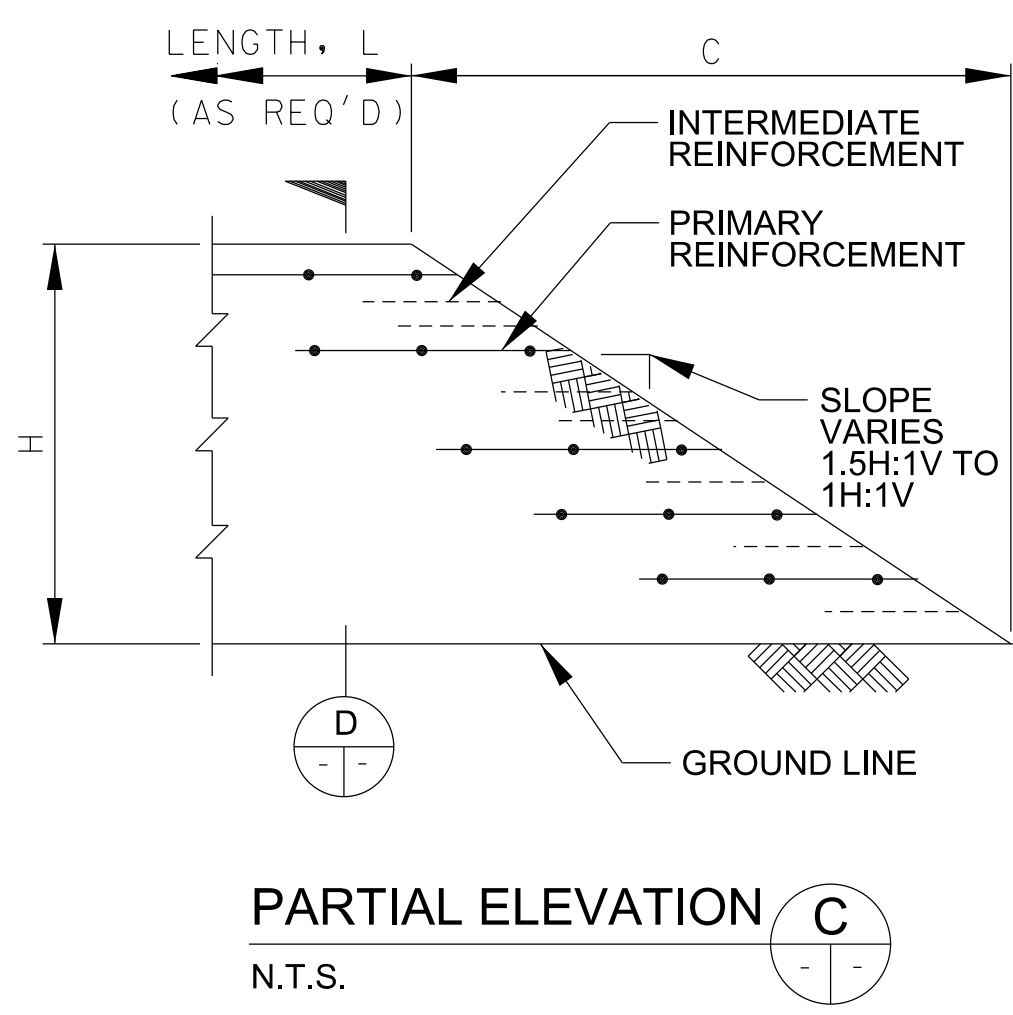
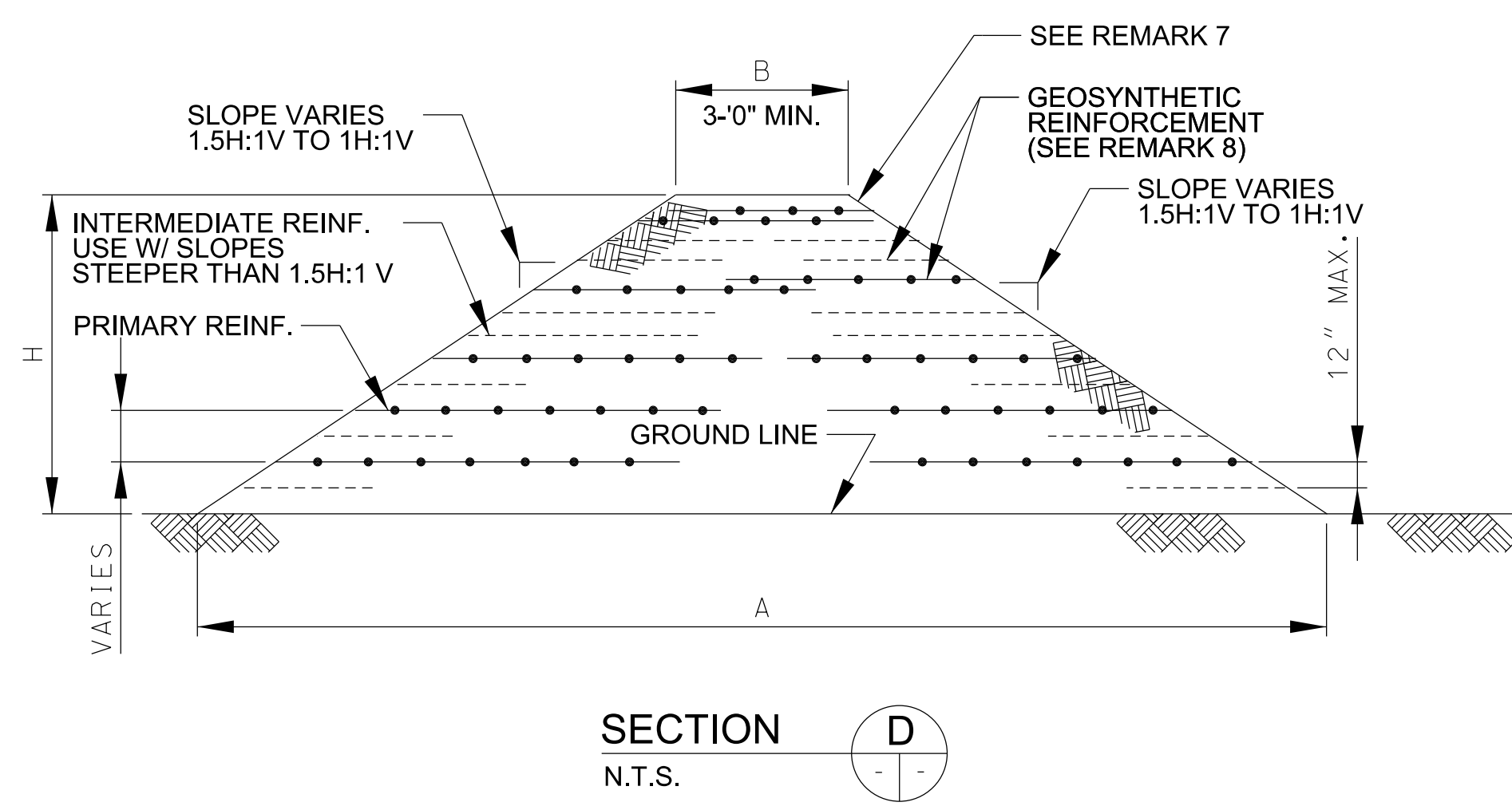
- REMARKS:
- CAN BE RAPIDLY CONSTRUCTED WITH UNSKILLED LABOR.
  - NO HEIGHT OR LENGTH LIMITATIONS.
  - UNSUITABLE WHERE SPACE IS LIMITED.
  - REQUIRES SOIL STABILIZATION (SEEDING, ETC.)
  - REQUIRES REPEATED MAINTENANCE.



No.	Description	Revisions	Date	Appr.
3	GENERAL UPDATES AND REVISIONS		6/17/2021	
2	GENERAL UPDATES AND REVISIONS		5/6/2011	
1	SHEET TOTAL CHANGED		11/22/1991	
			12/2/1988	
				ORIGINAL DOCUMENT

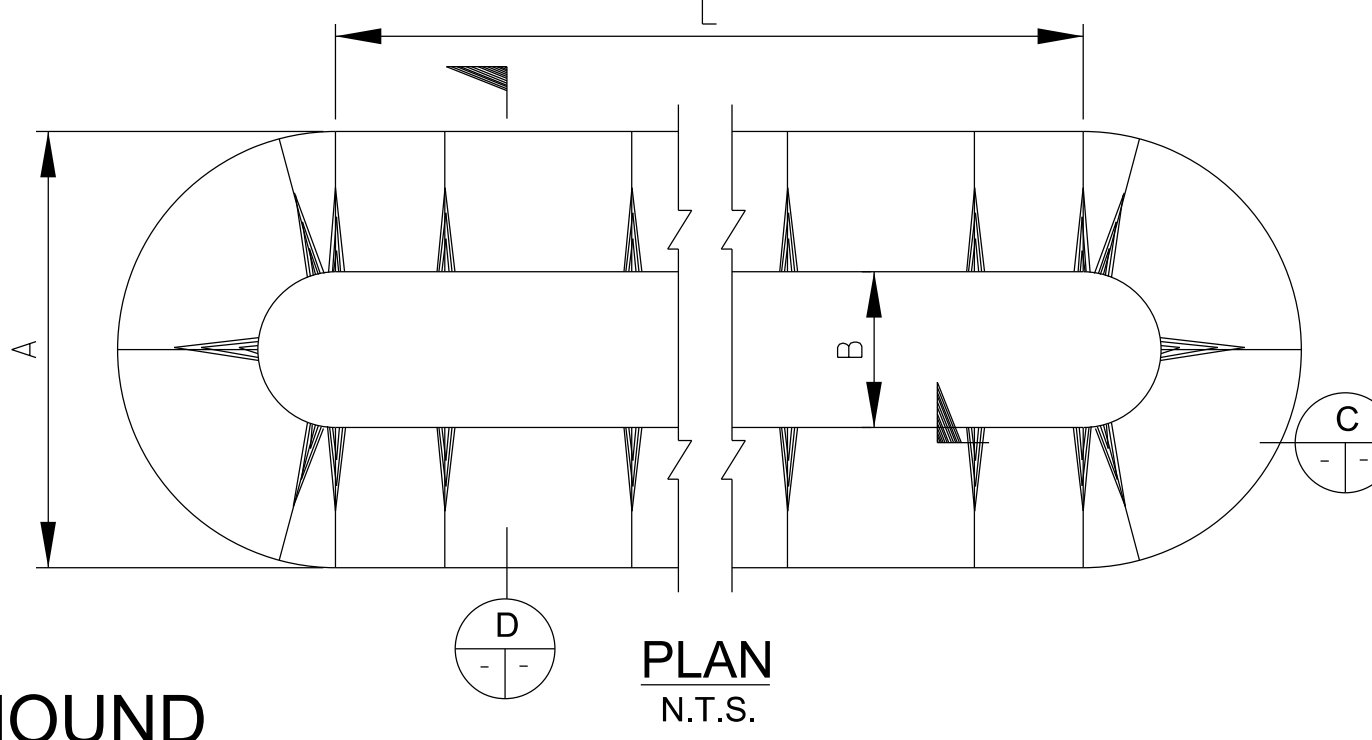
NOTE: SEE SHEET 1 FOR L AND H DIMENSION DETERMINATION

**B1 - EARTH MOUND**



HEIGHT OF MOUND "H"	WIDTH OF BASE "A"	WIDTH AT TOP "B"	WIDTH OF END "C"
	SLOPE	SLOPE	SLOPE
10'	1.5H:1V TO 1H:1V	1.5H:1V TO 1H:1V	SLOPE X "H"
15'	3.6H TO 2.8H	0.60H TO 0.74H	SLOPE X "H"
22'	3.6H TO 2.8H	0.55H TO 0.73H	SLOPE X "H"
30'	3.6H TO 2.7H	0.54H TO 0.70H	SLOPE X "H"
40'	3.6H TO 2.7H	0.53H TO 0.70H	SLOPE X "H"

- NOTES:
- DATA SHOWN IS APPROXIMATE.
  - FOR SLOPES STEEPER THAN 1H:1V USE TYPE B3



ESTIMATED ERECTION TIME MANHOURS	
100 LIN. FT. OF CROSS SECTION, 15 FT HIGH	BARRICADE END
1,278	140

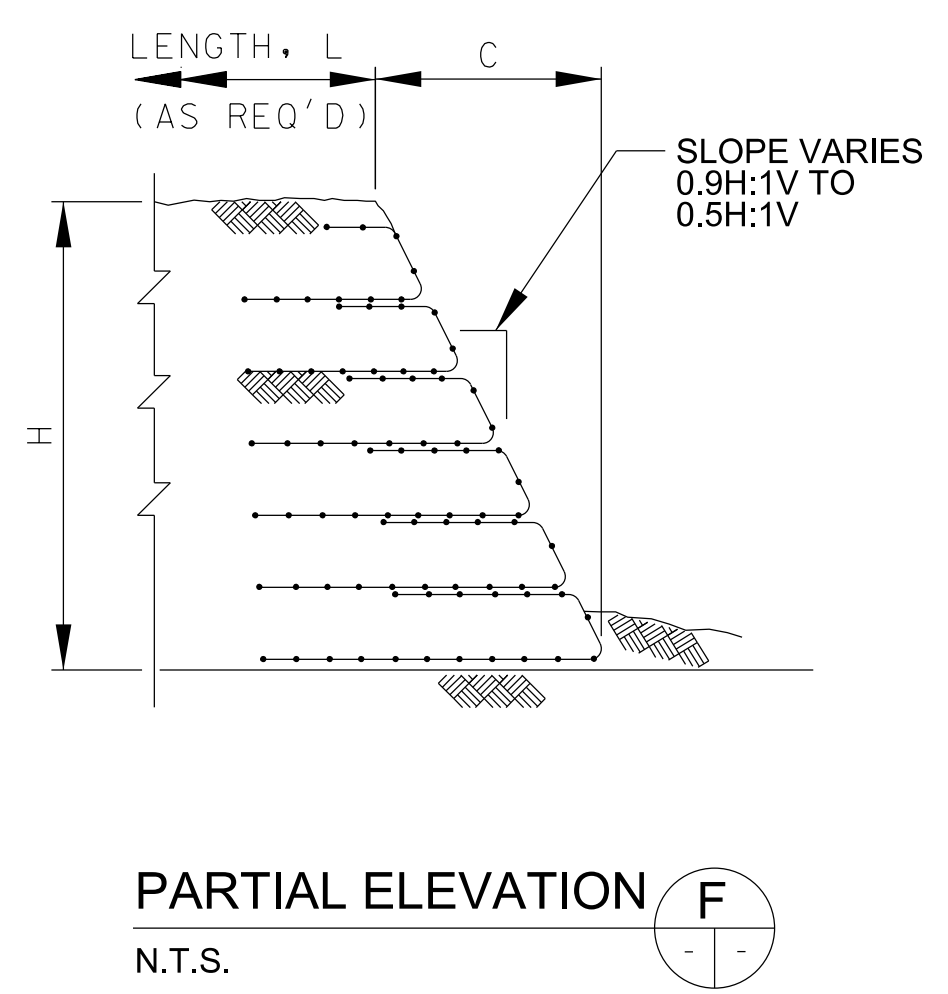
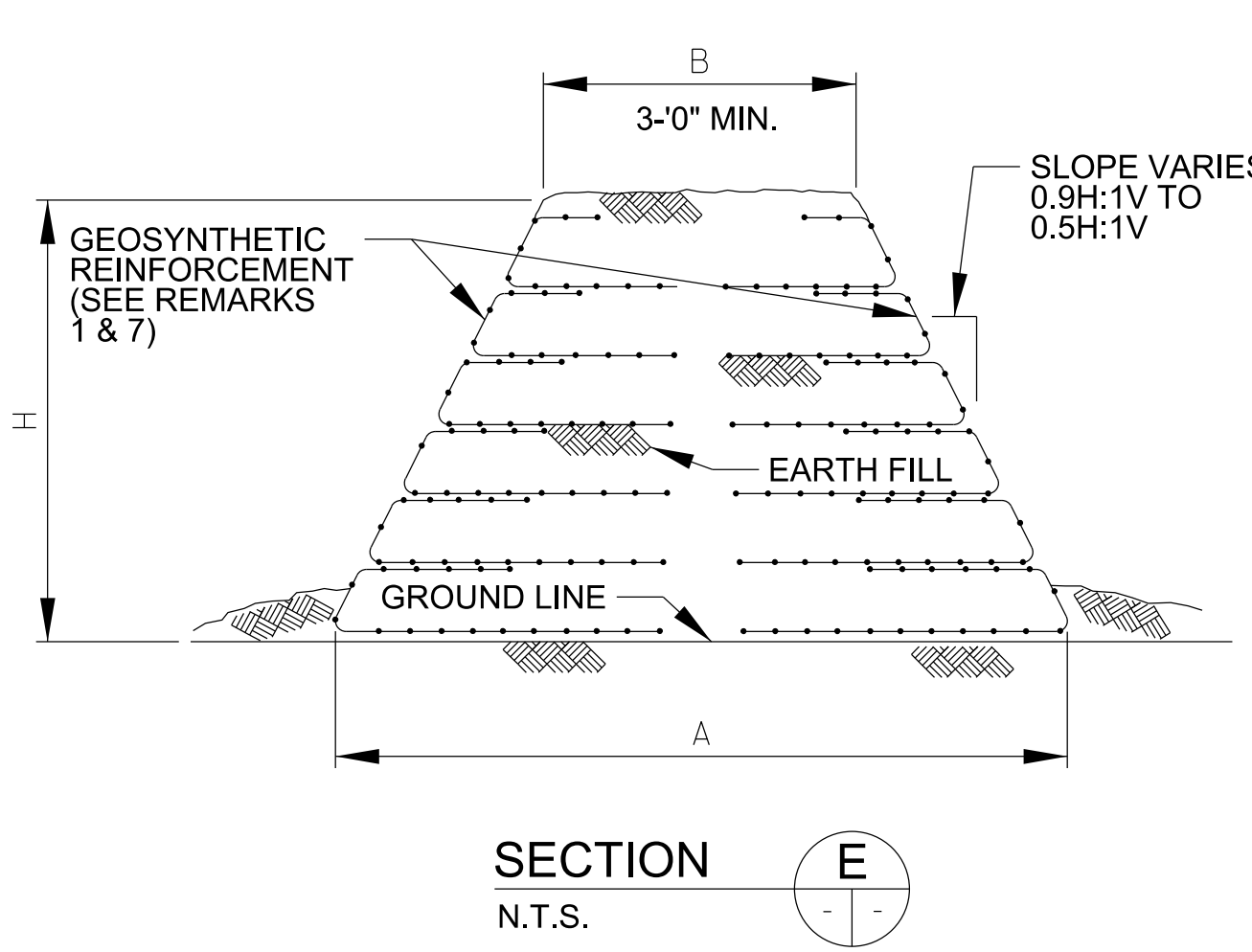
- REMARKS:
- REDUCED FILL REQUIREMENT OVER UNREINFORCED EARTH MOUND.
  - EFFICIENT CONSTRUCTION AND USE OF LAND.
  - CAN BE RAPIDLY CONSTRUCTED WITH UNSKILLED LABOR.
  - ALLOWS CONSTRUCTION OF STEEPER SLOPES THAN THE SOILS NATURAL ANGLE OF REPOSE.
  - NO HEIGHT OR LENGTH LIMITATIONS.
  - REINFORCEMENT IS LIGHTWEIGHT AND EASILY CUT ON SITE.
  - REQUIRES SOIL STABILIZATION. GRASS COVER, IF USED, IS DIFFICULT TO MAINTAIN.
  - GEOSYNTHETIC REINFORCEMENT IS PLASTIC MESH MADE OF HIGH-DENSITY POLYMERS.
  - SUGGESTED SOURCE (MAY BE AVAILABLE FROM OTHER VENDORS)  
THE TENSAR CORP.  
P.O. BOX 986  
MORROW, GA 80260  
(404) 968-3255

Date	Scale	Drawn by	Checked by	Date
17 JUNE 2021	N.T.S.	ARB	MHC/SDH	30 JUNE 2021

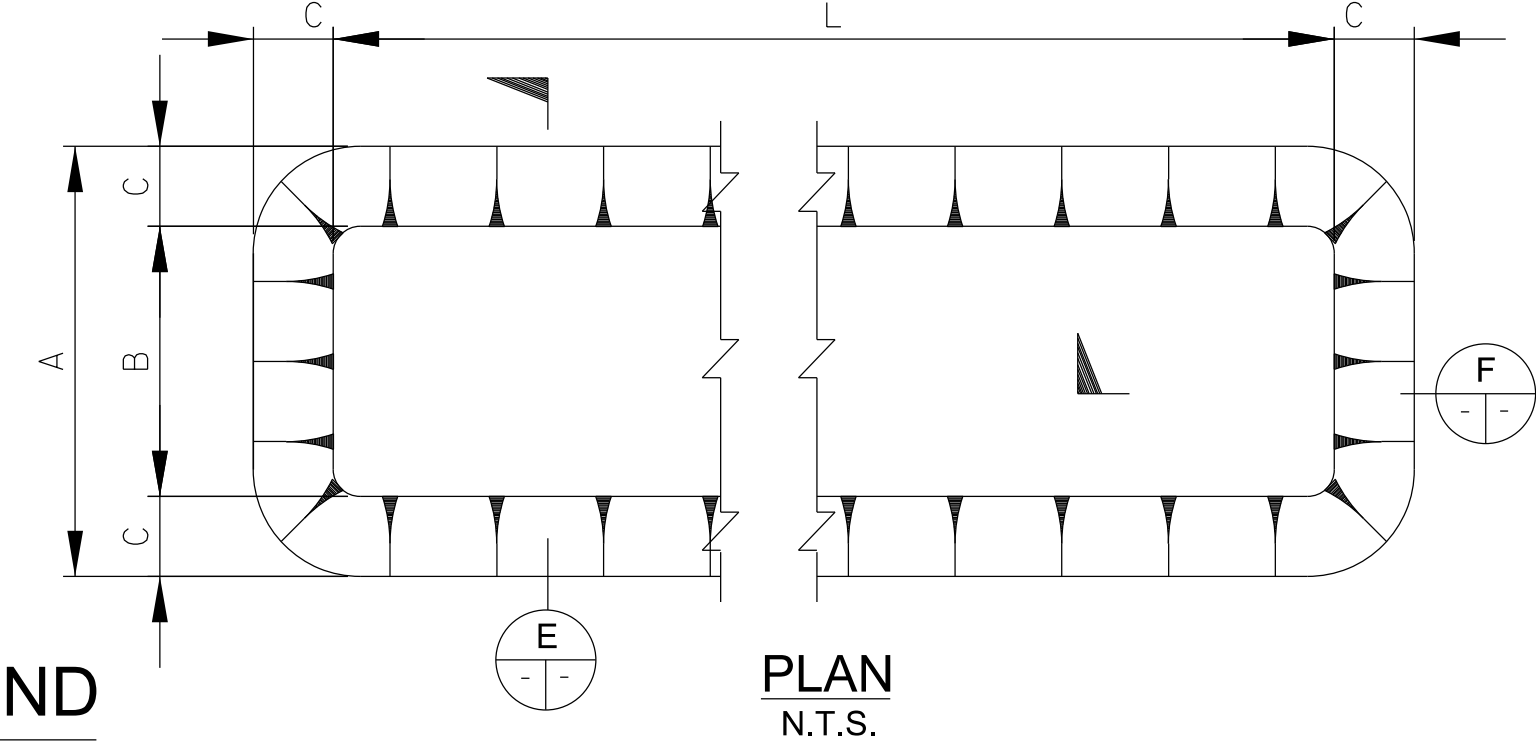
DESIGNED BY: U.S. ARMY CORPS OF ENGINEERS  
DRAWN BY: ENGINEERING AND SUPPORT CENTER  
CHECKED BY: HUNTSVILLE, ALABAMA  
SUBMITTED BY: CHAD HOUSE, PE

NOTE: SEE SHEET 1 FOR L AND H DIMENSION DETERMINATION

**B2 - REINFORCED EARTH MOUND**



HEIGHT OF MOUND "H"	WIDTH OF BASE "A"			WIDTH AT TOP "B"			WIDTH OF END "C"		
	SLOPE			SLOPE			SLOPE		
	0.5H:1 V	0.75H:1 V	0.90H:1 V	0.5H:1 V	0.75H:1 V	0.90H:1 V	0.5H:1 V	0.75H:1 V	0.90H:1 V
10'	1.80 H	2.25 H	2.50 H	0.80 H	0.75 H	0.70 H	0.50 H	0.75 H	0.90 H
15'									
22'									
30'									
40'									



ESTIMATED ERECTION TIME MANHOURS	
100 LIN. FT. OF CROSS SECTION, 15 FT HIGH	BARRICADE END
1,100	270

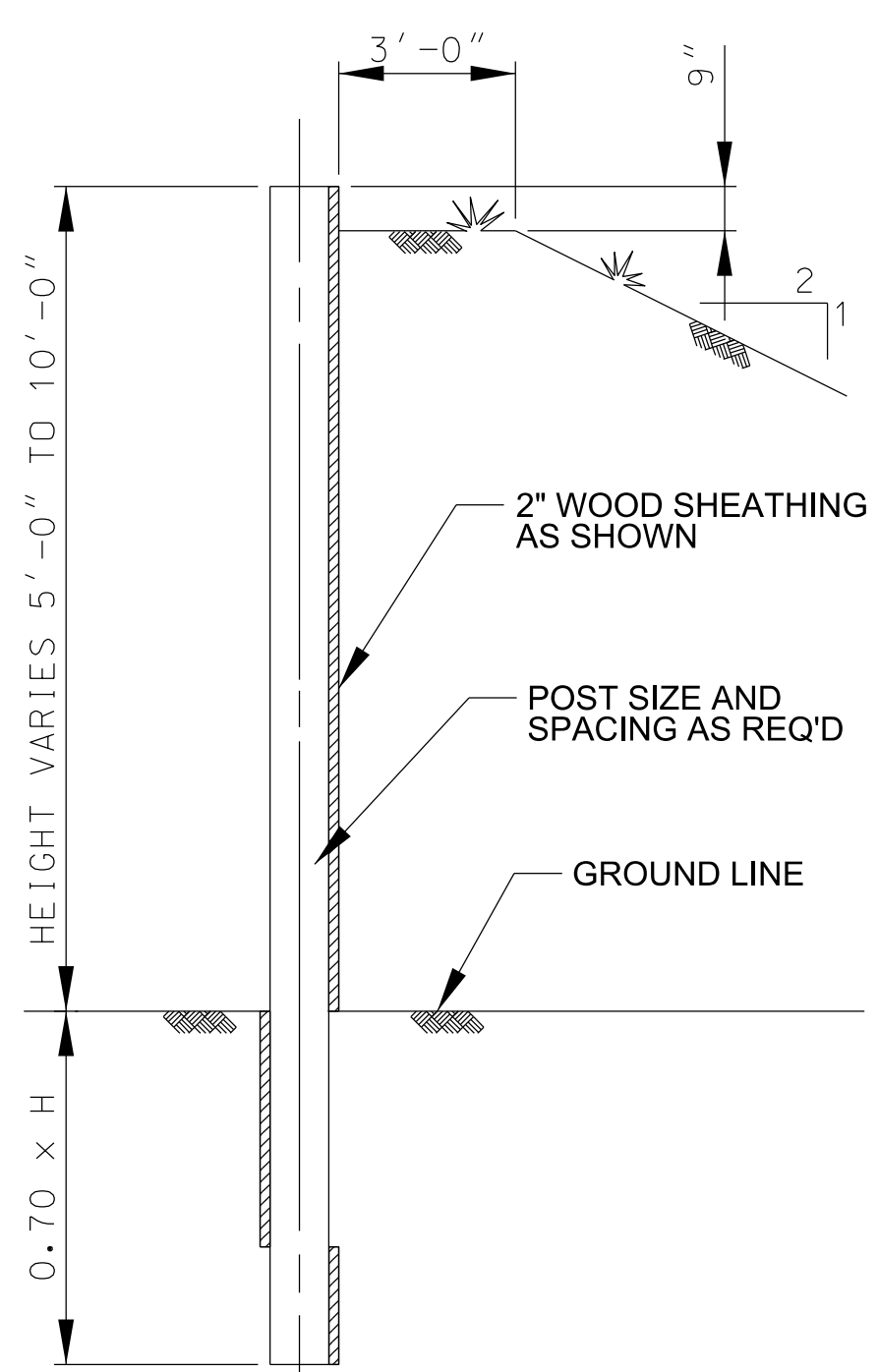
- REMARKS:
- A FINE MESH POLYMER NET REQUIRED FOR EROSION CONTROL.
  - REQUIRES LESS FILL THAN B1 OR B2.
  - CAN BE LOCATED CLOSE TO SITE BOUNDARIES OR OBSTRUCTIONS.
  - CAN BE RAPIDLY CONSTRUCTED WITH UNSKILLED LABOR.
  - REINFORCEMENT IS LIGHTWEIGHT AND EASILY CUT ON SITE.
  - TEMPORARY SUPPORTS REQUIRED AT FACES DURING CONSTRUCTION.
  - GEOSYNTHETIC REINFORCEMENT IS PLASTIC MESH MADE OF HIGH-DENSITY POLYMERS.
  - SUGGESTED SOURCE (MAY BE AVAILABLE FROM OTHER VENDORS)  
THE TENSAR CORP.  
P.O. BOX 986  
MORROW, GA 80260  
(404) 968-3255

BARRICADES STANDARD DESIGN  
EARTH MOUND  
REINFORCED EARTH MOUND  
WRAP-AROUND EARTH MOUND

Sheet reference number:  
**3**  
Sheet 3 of 13

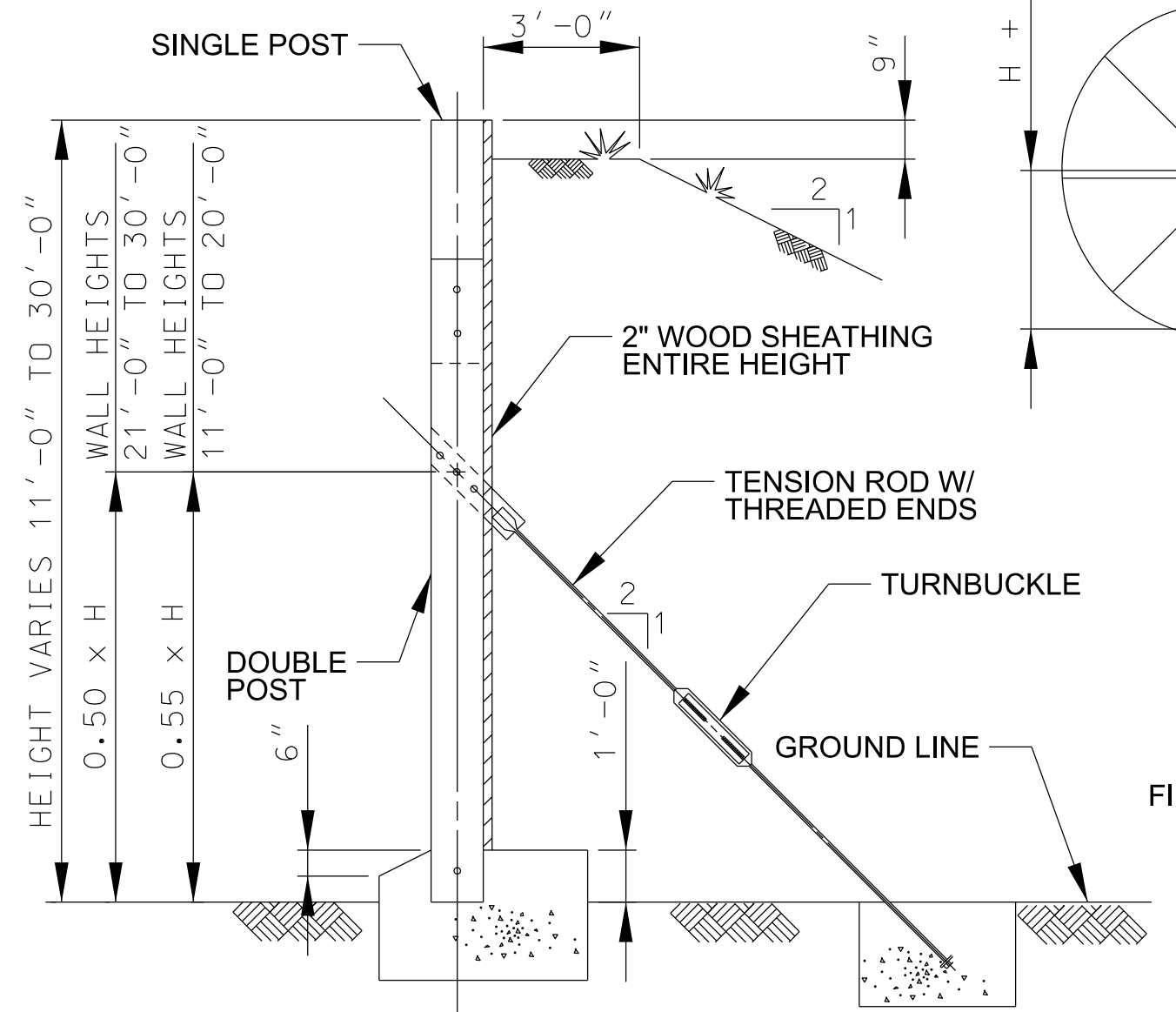
NOTE: SEE SHEET 1 FOR L AND H DIMENSION DETERMINATION

**B3 - WRAP-AROUND REINFORCED EARTH MOUND**



SECTION A  
N.T.S.

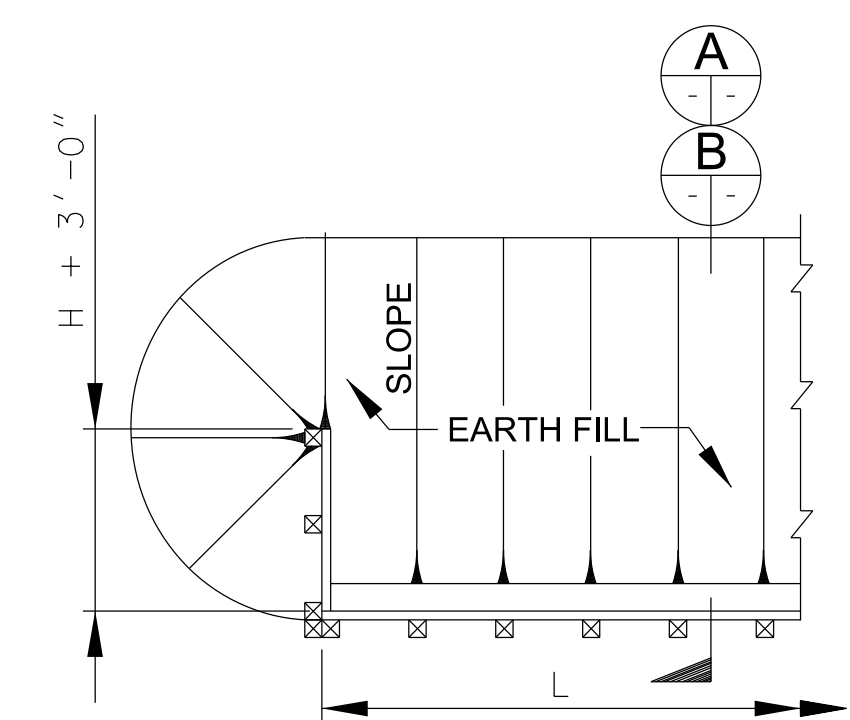
TYPE A - WALL HEIGHT 10 FT OR LESS



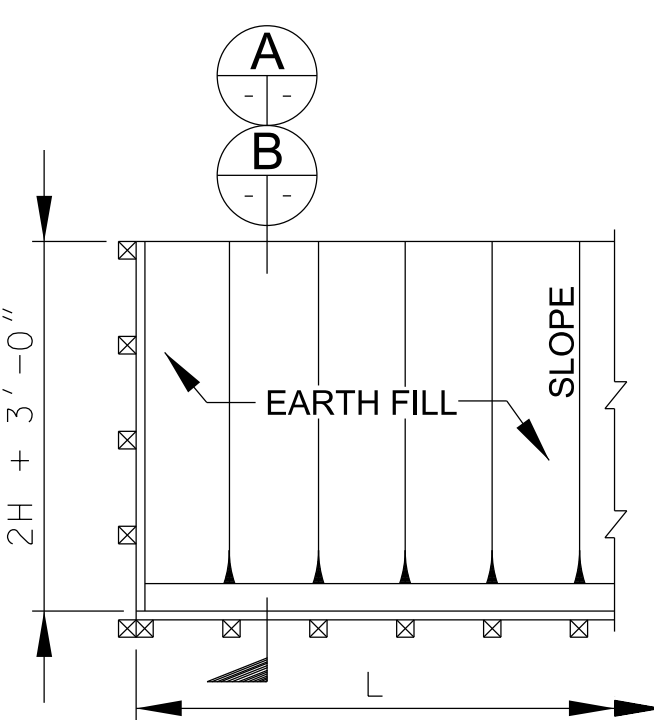
SECTION B  
N.T.S.

TYPE B - WALL HEIGHT GREATER THAN 10 FT

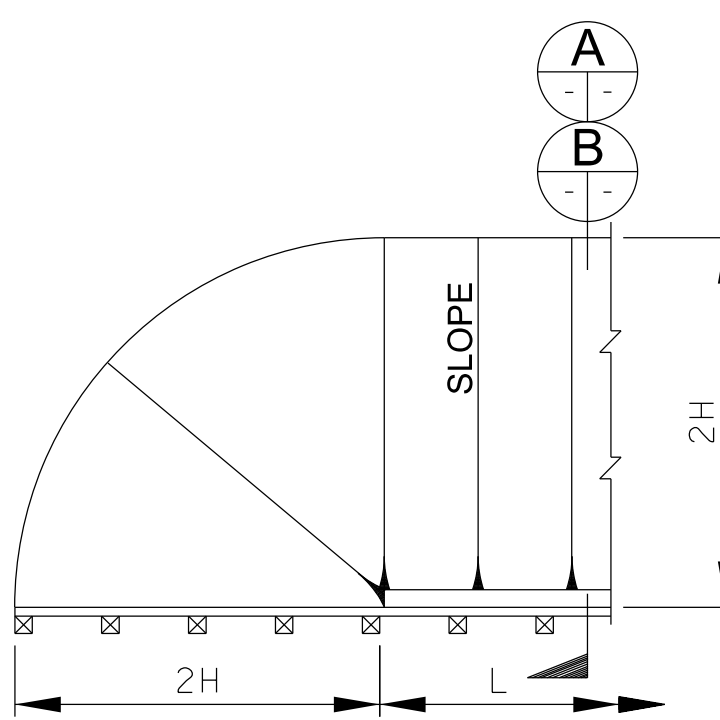
NOTE: SEE SHEET 1 FOR L AND H DIMENSION DETERMINATION



TYPE 1

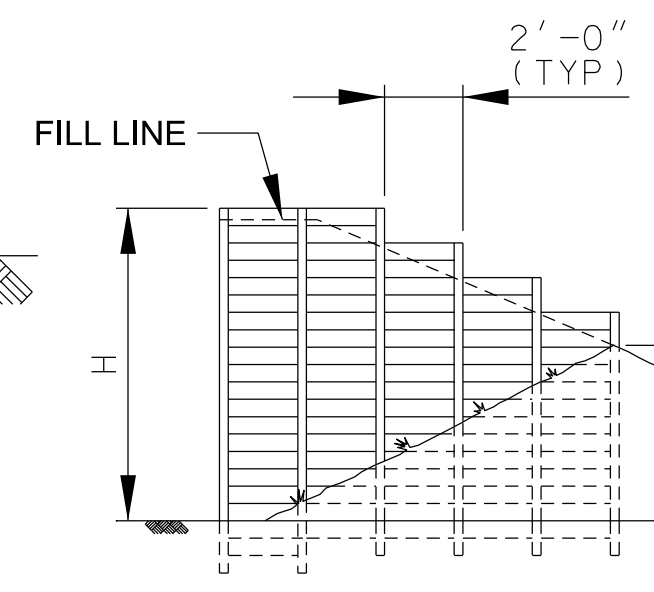


TYPE 2

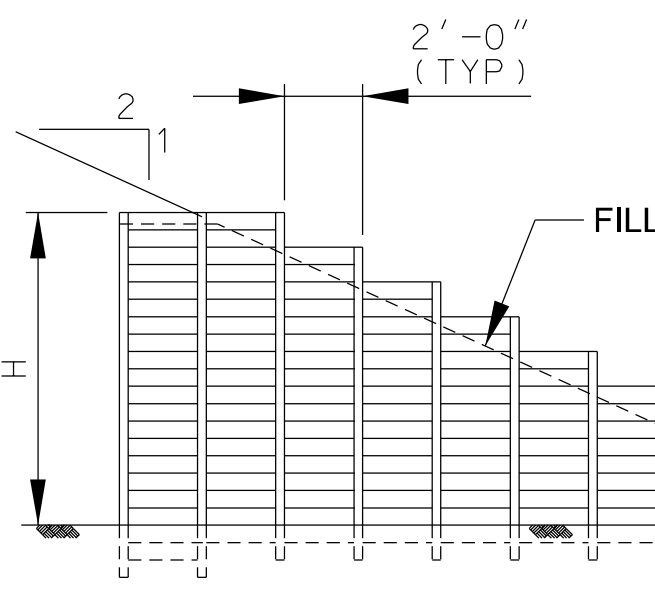


TYPE 3

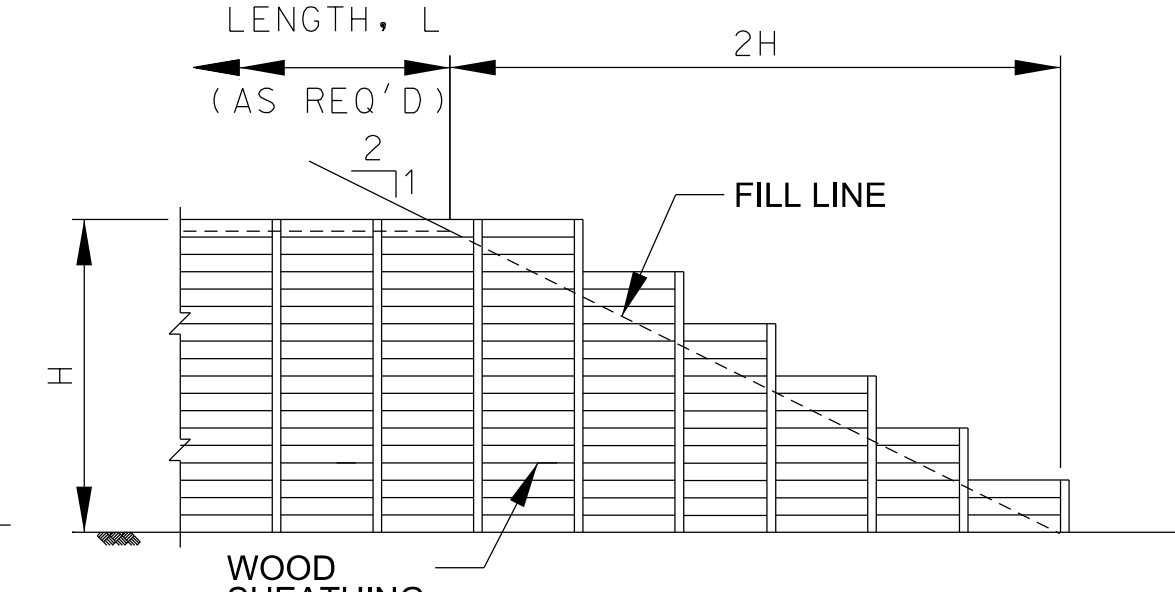
END PLAN  
N.T.S.



TYPE 1



TYPE 2



TYPE 3

END ELEVATION  
N.T.S.

B4 - TIMBER - SINGLE REVETTED

ESTIMATED ERECTION TIME MANHOURS			
100 LIN. FT. OF CROSS SECTION, 15 FT HIGH	END TYPE 1	END TYPE 2	END TYPE 3
390	71	60	119

- REMARKS:
1. ALL LUMBER SHALL BE PRESSURE TREATED WITH PRESERVATIVES.
  2. CAN BE RAPIDLY CONSTRUCTED WITH UNSKILLED LABOR.
  3. REQUIRES SOIL STABILIZATION (SEEDING, ETC.)
  4. AESTHETICALLY NOT PLEASING.
  5. REQUIRES REPEATED MAINTENANCE.



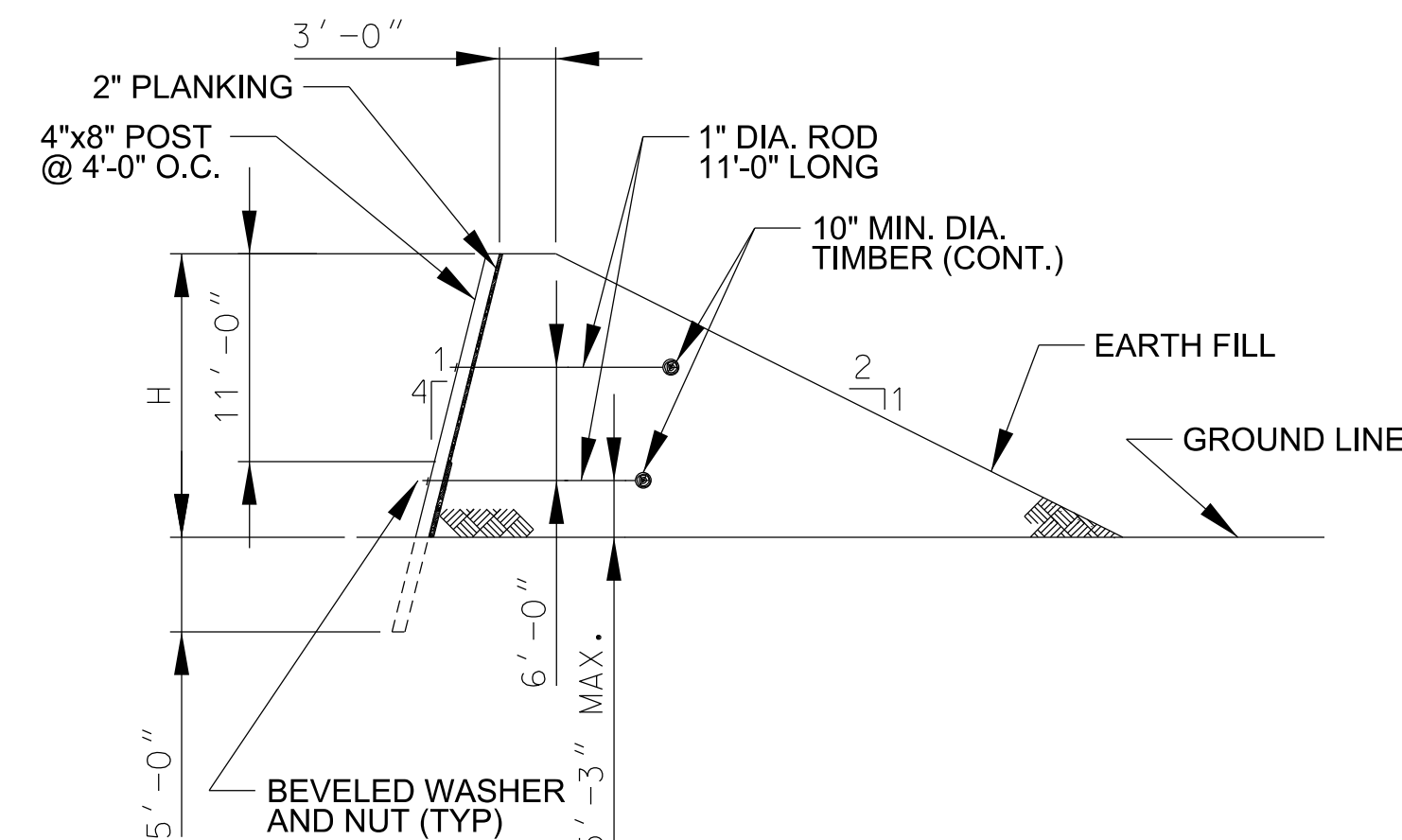
No.	Description	Date	Appr.
3	GENERAL UPDATES AND REVISIONS	6/17/2021	
2	GENERAL UPDATES AND REVISIONS	5/6/2011	
1	SHEET TOTAL CHANGED ORIGINAL DOCUMENT	11/22/1991	
		12/2/1988	

Date:	17 JUNE 2021	Date	30 JUNE 2021
Scale:	N.T.S.	Drawing code:	DEF 149-30-01
Designed by:	ARB	Submitted by:	CHAD HOUSE, PE
Drawn by:	ARB		
Checked by:	MMC/SDH		

U. S. ARMY CORPS OF ENGINEERS  
ENGINEERING AND SUPPORT CENTER  
HUNTSVILLE, ALABAMA

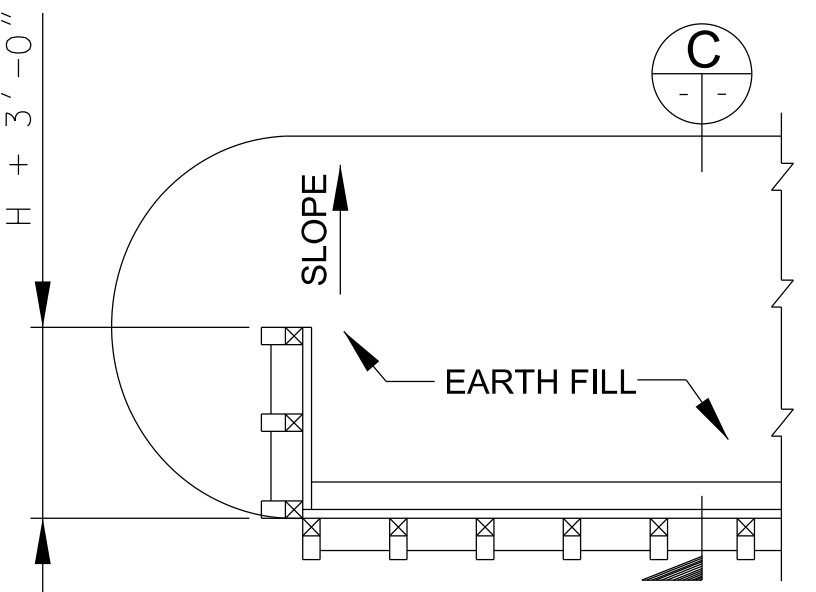
BARRICADES STANDARD DESIGN  
TIMBER - SINGLE REVETTED

Sheet reference number:  
**4**  
Sheet 4 of 13

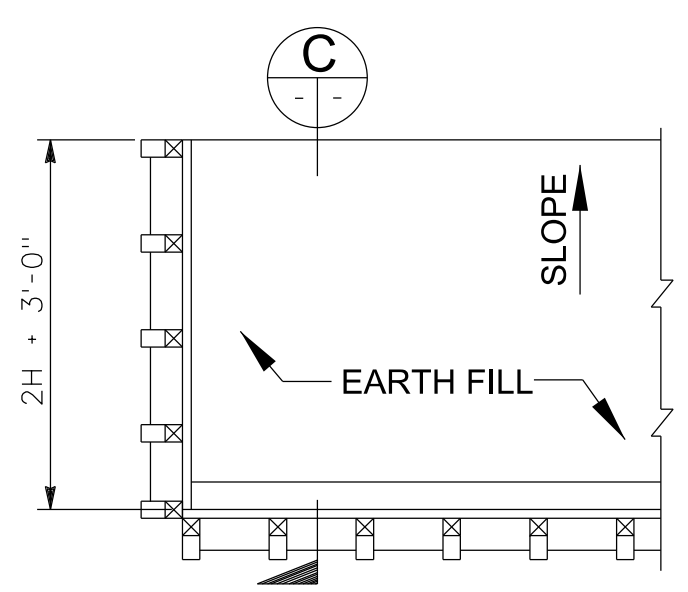


SECTION C  
N.T.S.

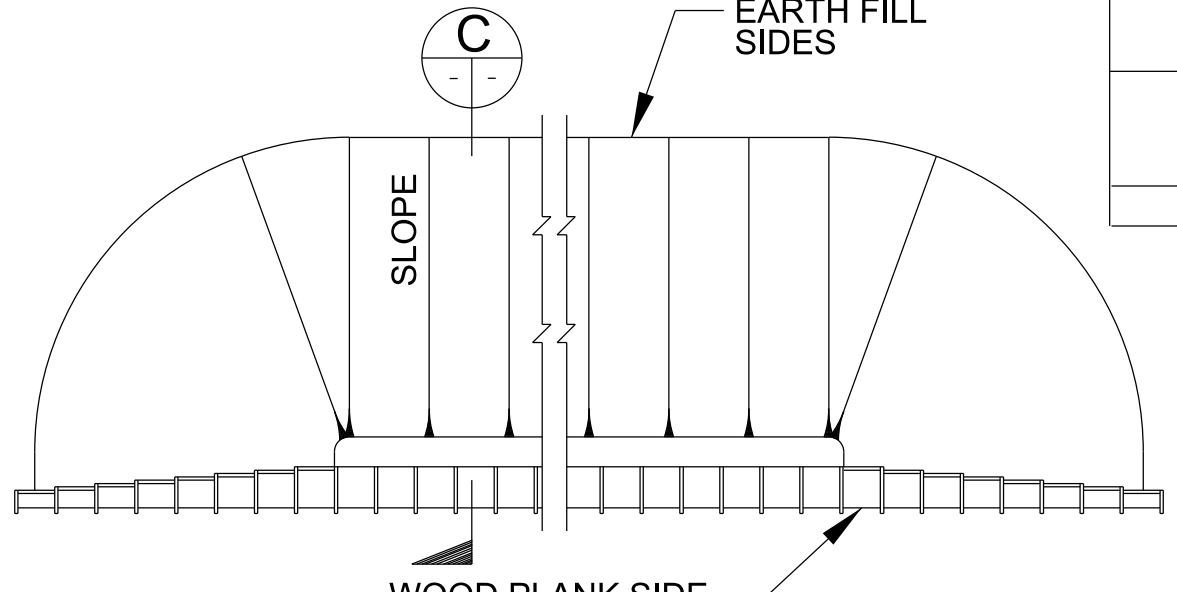
NOTE: SEE SHEET 1 FOR L AND H DIMENSION DETERMINATION



TYPE 1

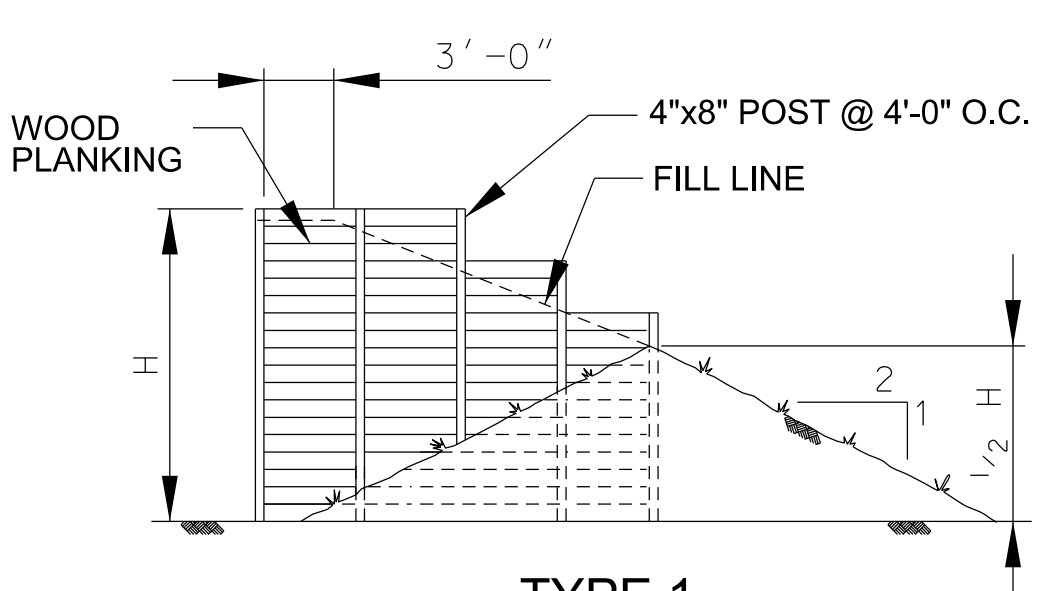


TYPE 2

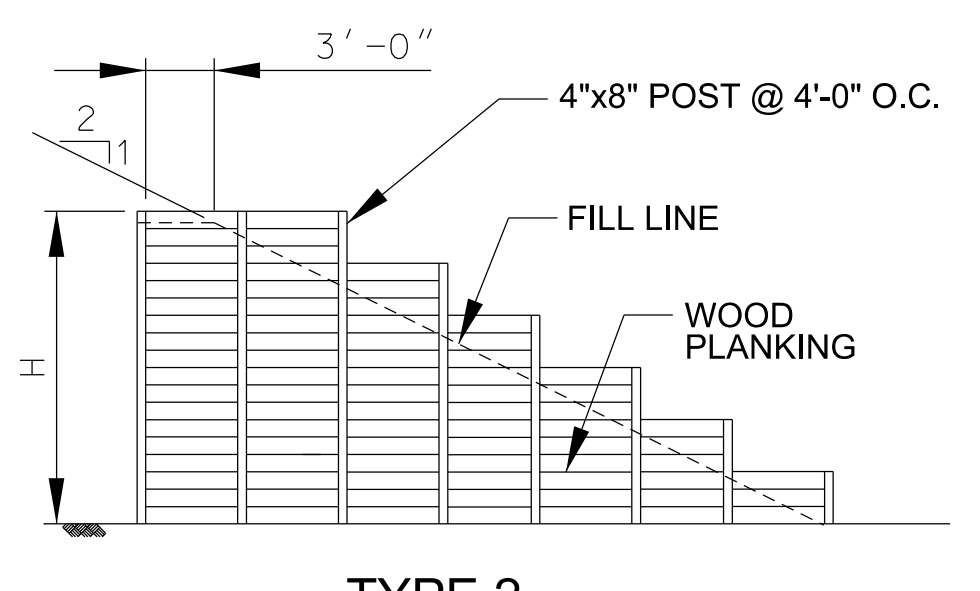


TYPE 3

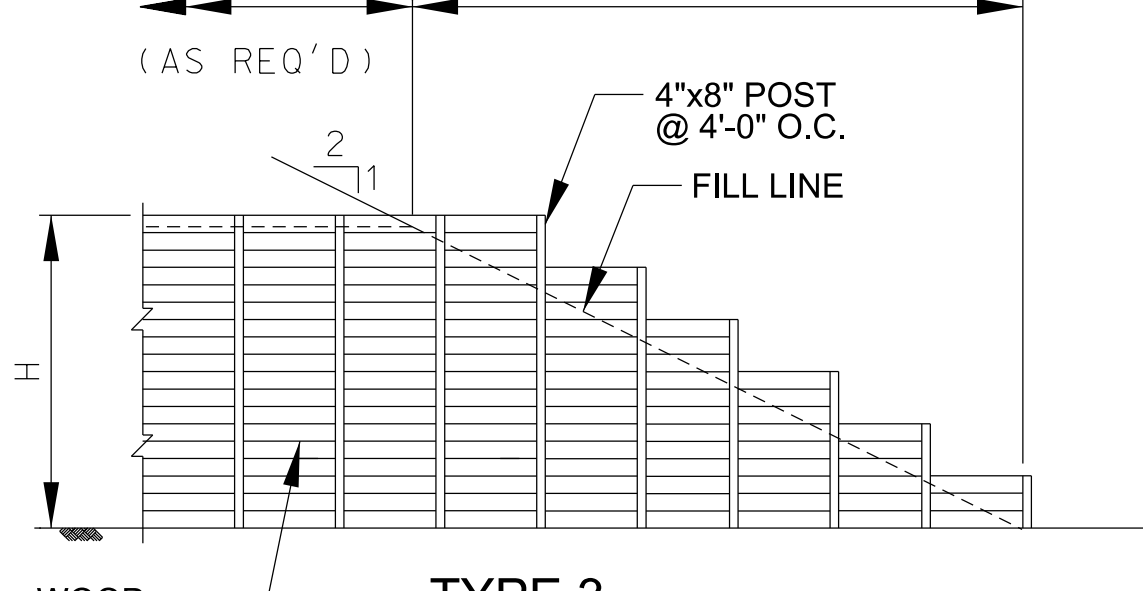
END PLAN  
N.T.S.



TYPE 1



TYPE 2



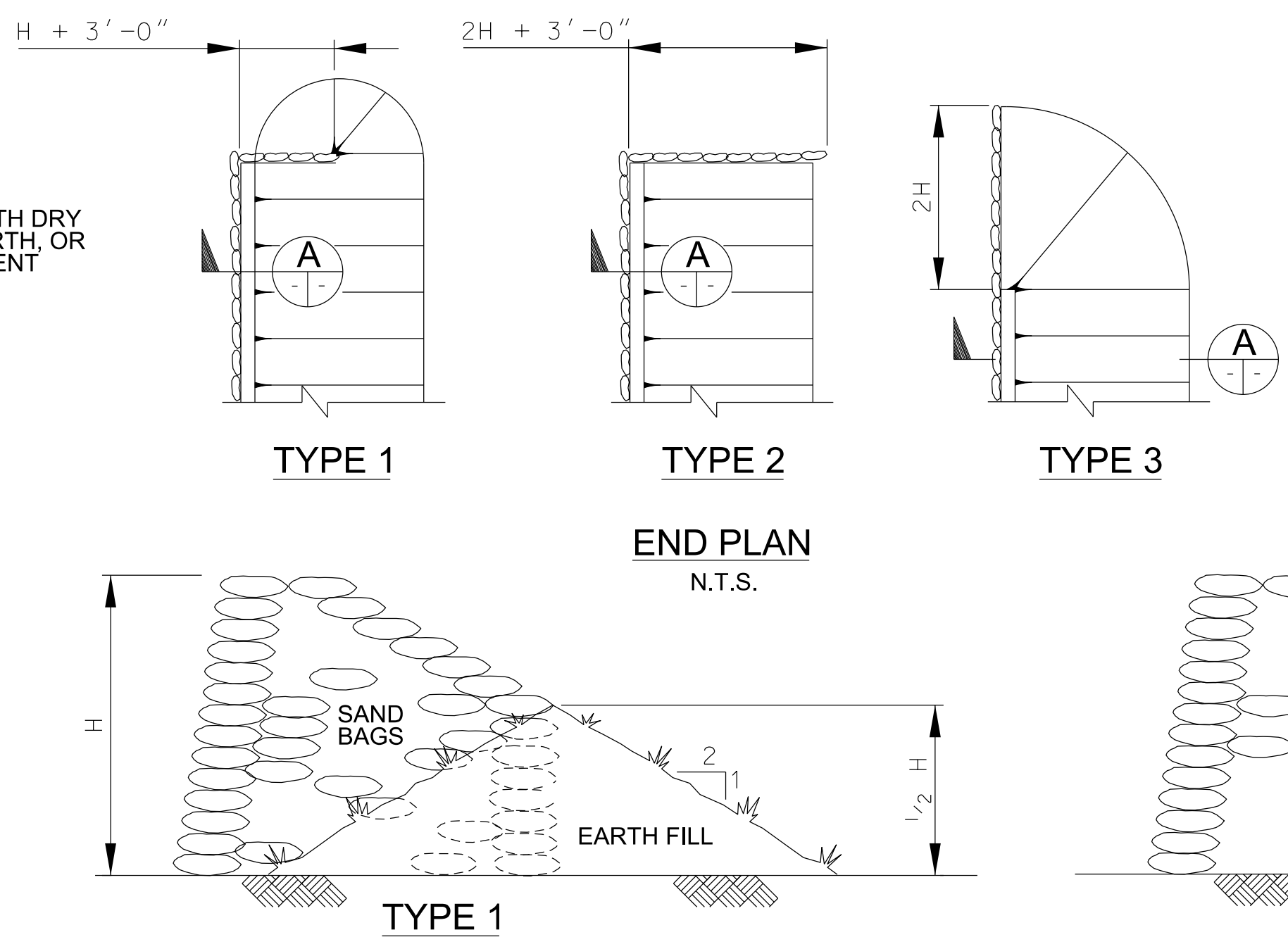
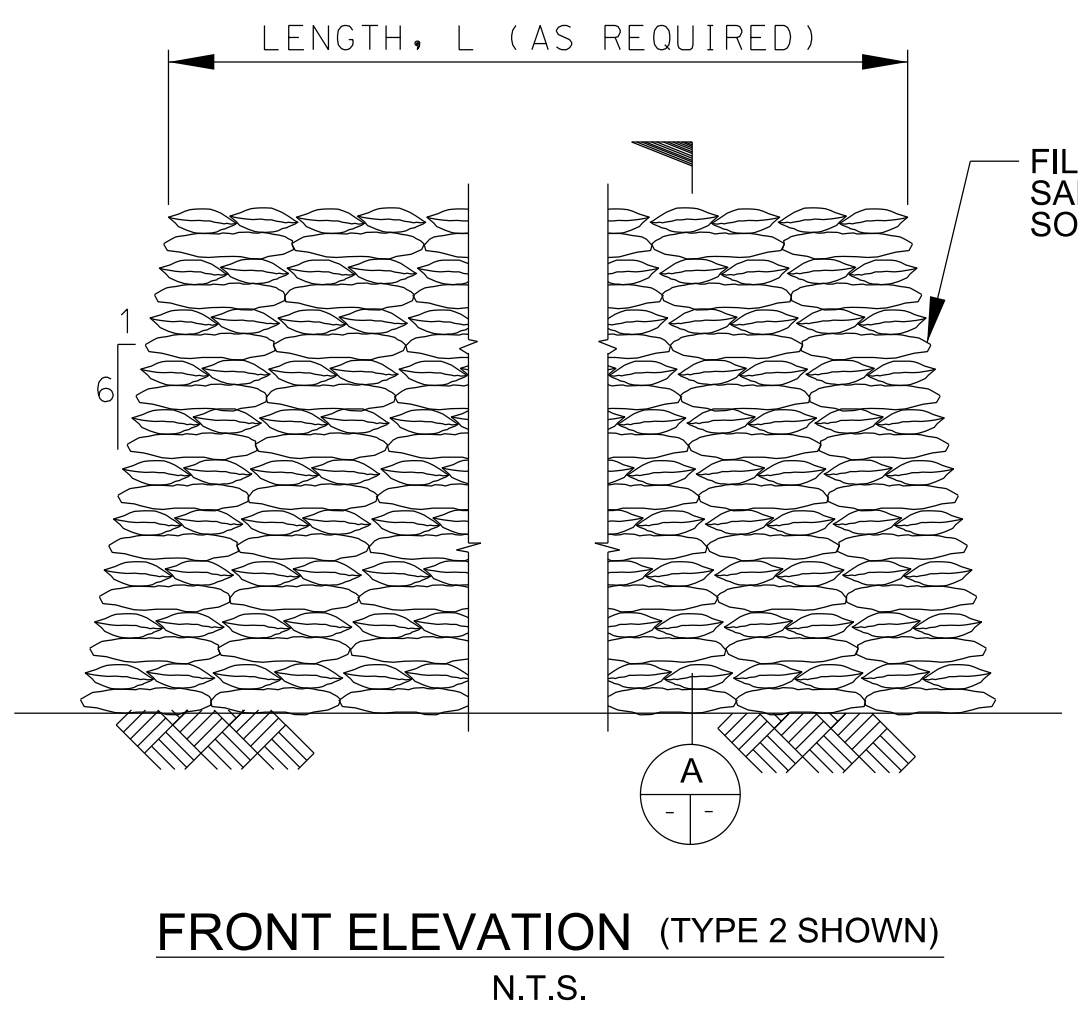
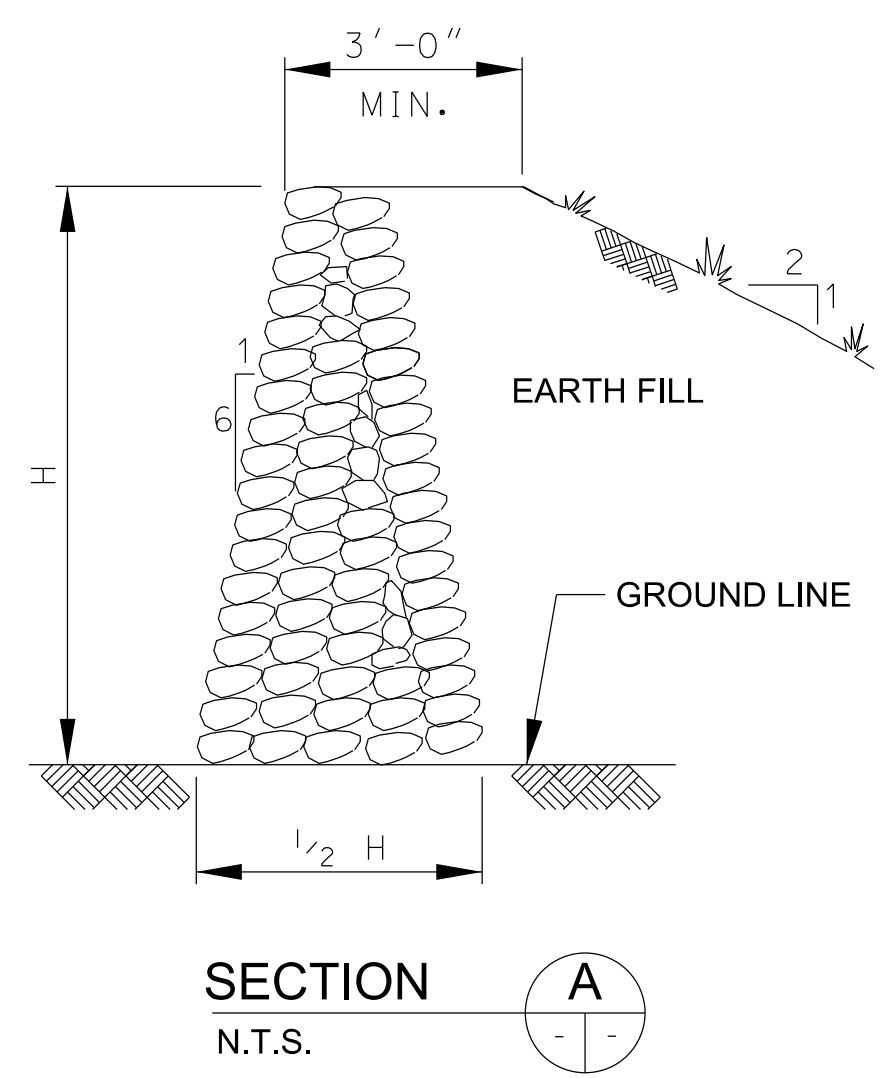
TYPE 3

END ELEVATION  
N.T.S.

B5 - TIMBER - SINGLE REVETTED

ESTIMATED ERECTION TIME MANHOURS			
100 LIN. FT. OF CROSS SECTION, 15 FT HIGH	END TYPE 1	END TYPE 2	END TYPE 3
410	92	80	110

- REMARKS:
1. ALL LUMBER SHALL BE PRESSURE TREATED WITH PRESERVATIVES.
  2. CAN BE RAPIDLY CONSTRUCTED WITH UNSKILLED LABOR.
  3. REQUIRES SOIL STABILIZATION (SEEDING, ETC.)
  4. AESTHETICALLY NOT PLEASING.
  5. REQUIRES REPEATED MAINTENANCE.



ESTIMATED ERECTION TIME			
MANHOURS			
100 LIN. FT. OF CROSS SECTION, 15 FT HIGH	END TYPE 1	END TYPE 2	END TYPE 3
1,970	200	290	310

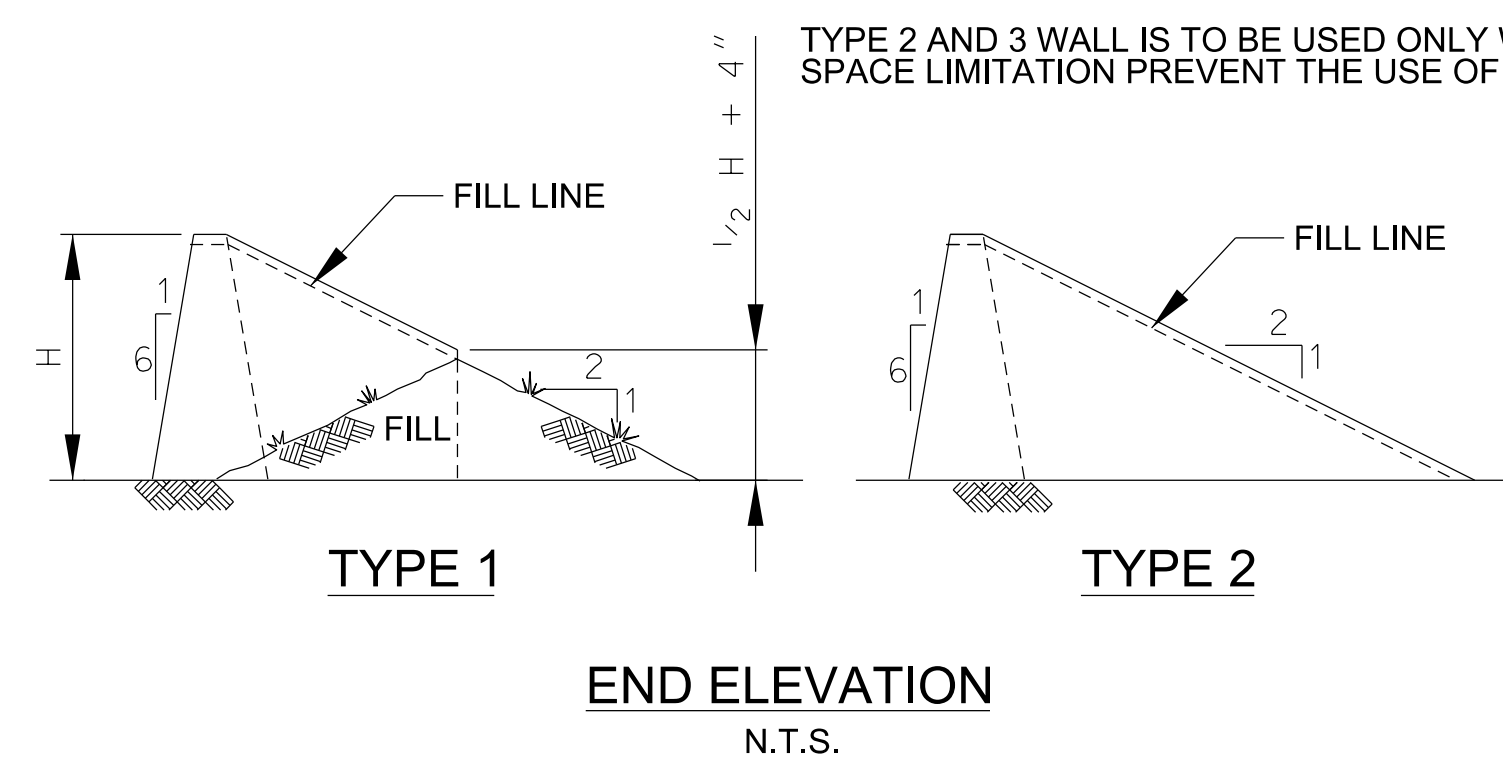
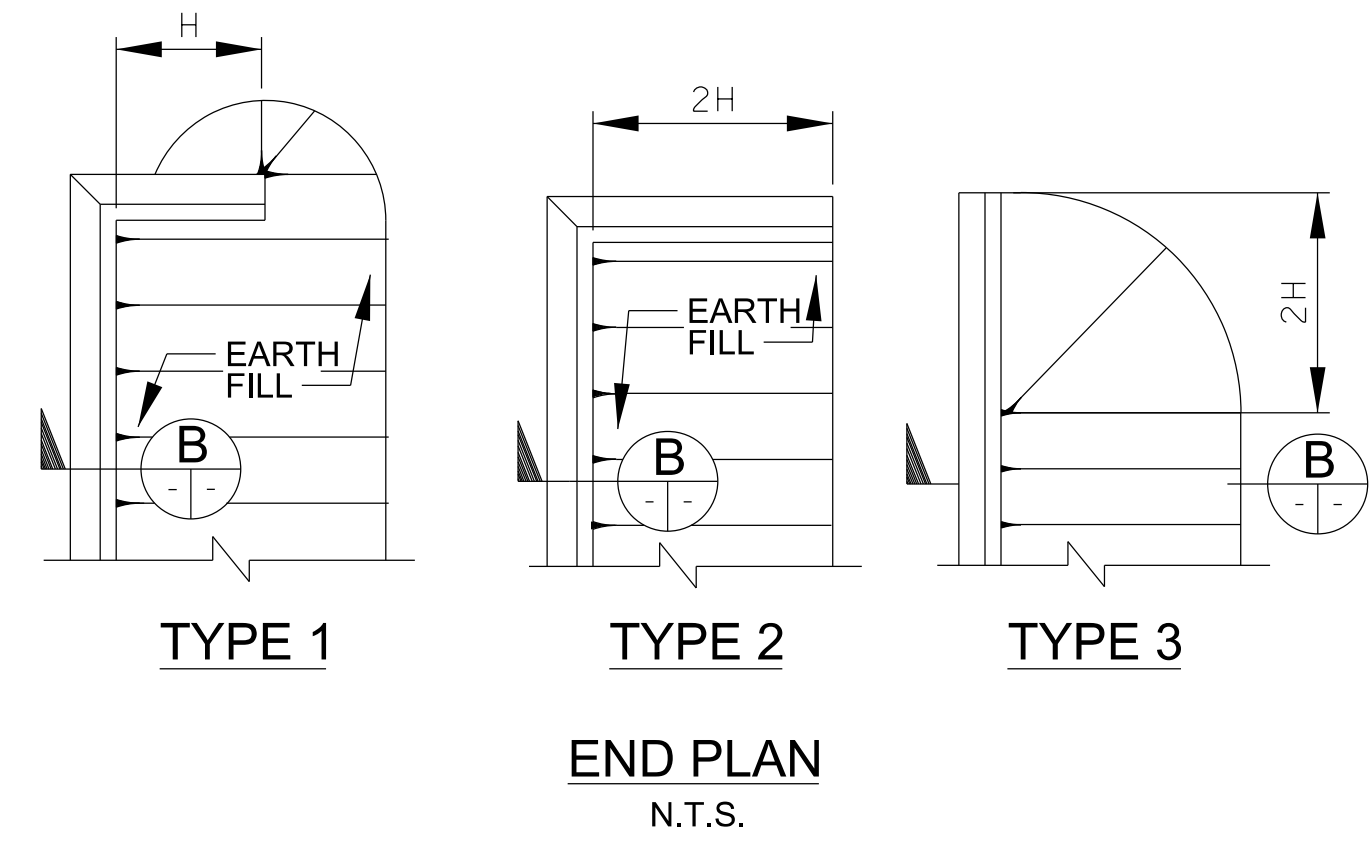
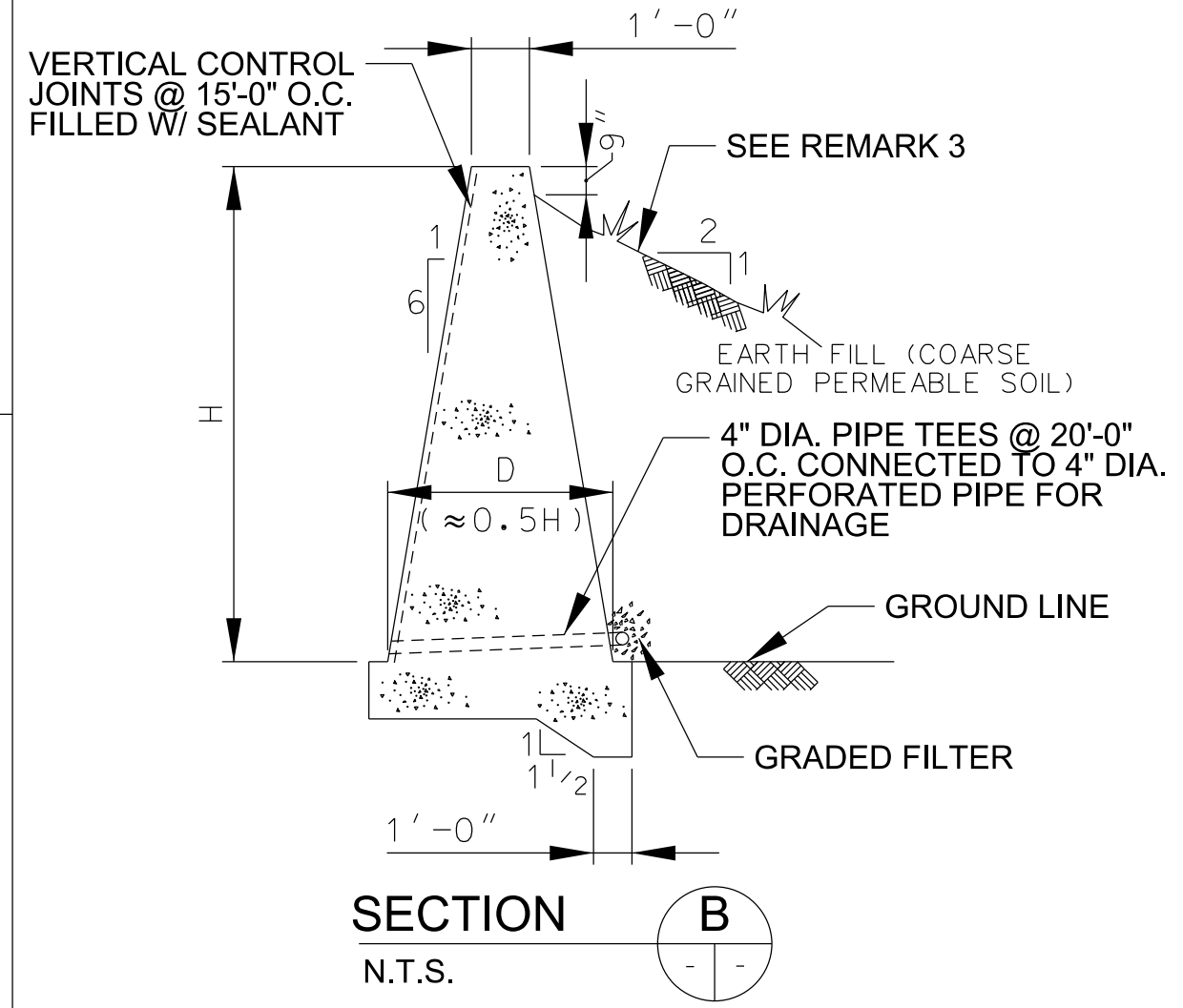
- REMARKS:
- SANDBAGS MAY BECOME SECONDARY FRAGMENTS AS A RESULT OF HIGH OVERPRESSURES.
  - AESTHETICALLY NOT PLEASING.
  - SIMPLE TO CONSTRUCT WITH UNSKILLED LABOR.
  - SUITABLE FOR REMOTE LOCATIONS.
  - SANDBAGS WILL DETERIORATE WITH TIME.
  - REQUIRES SLOPE STABILIZATION IF CONSTRUCTED FOR OTHER THAN TEMPORARY USE.



No.	Description	Revisions	Date	Appr.
3	GENERAL UPDATES AND REVISIONS		6/17/2021	
2	GENERAL UPDATES AND REVISIONS		5/6/2011	
1	SHEET TOTAL CHANGED		11/22/1991	
	ORIGINAL DOCUMENT		12/2/1988	

NOTE: SEE SHEET 1 FOR L AND H DIMENSION DETERMINATION

**B6 - SAND BAG - SINGLE REVETTED**



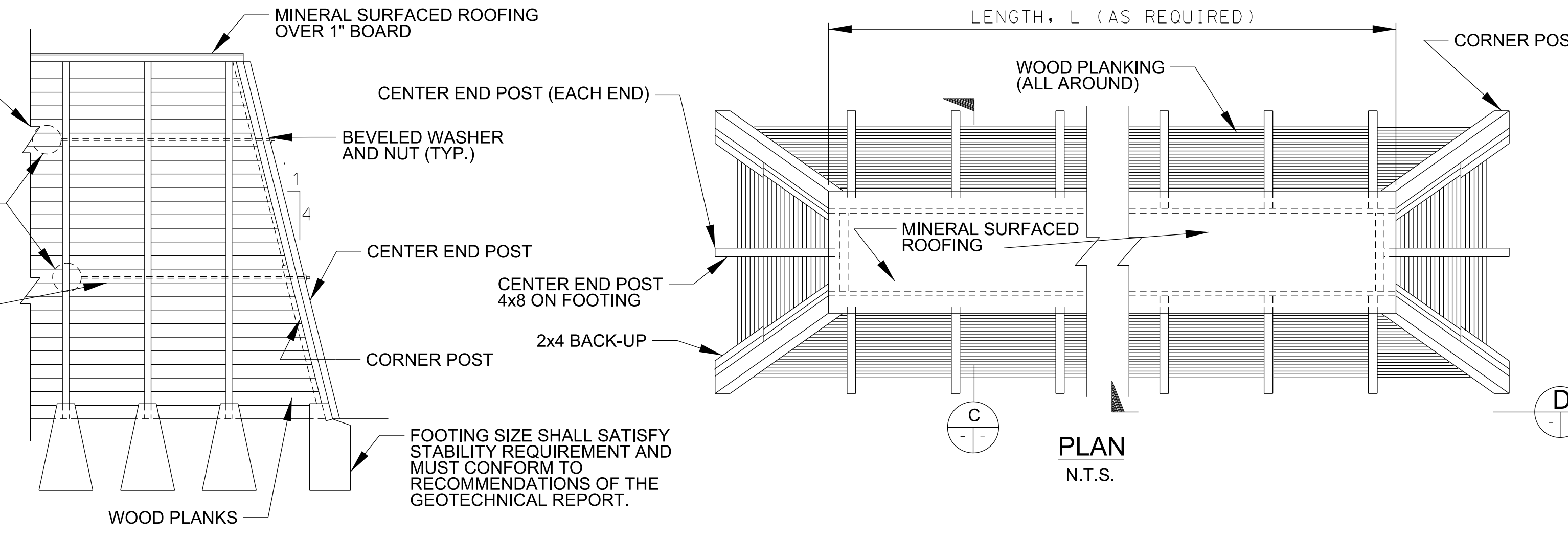
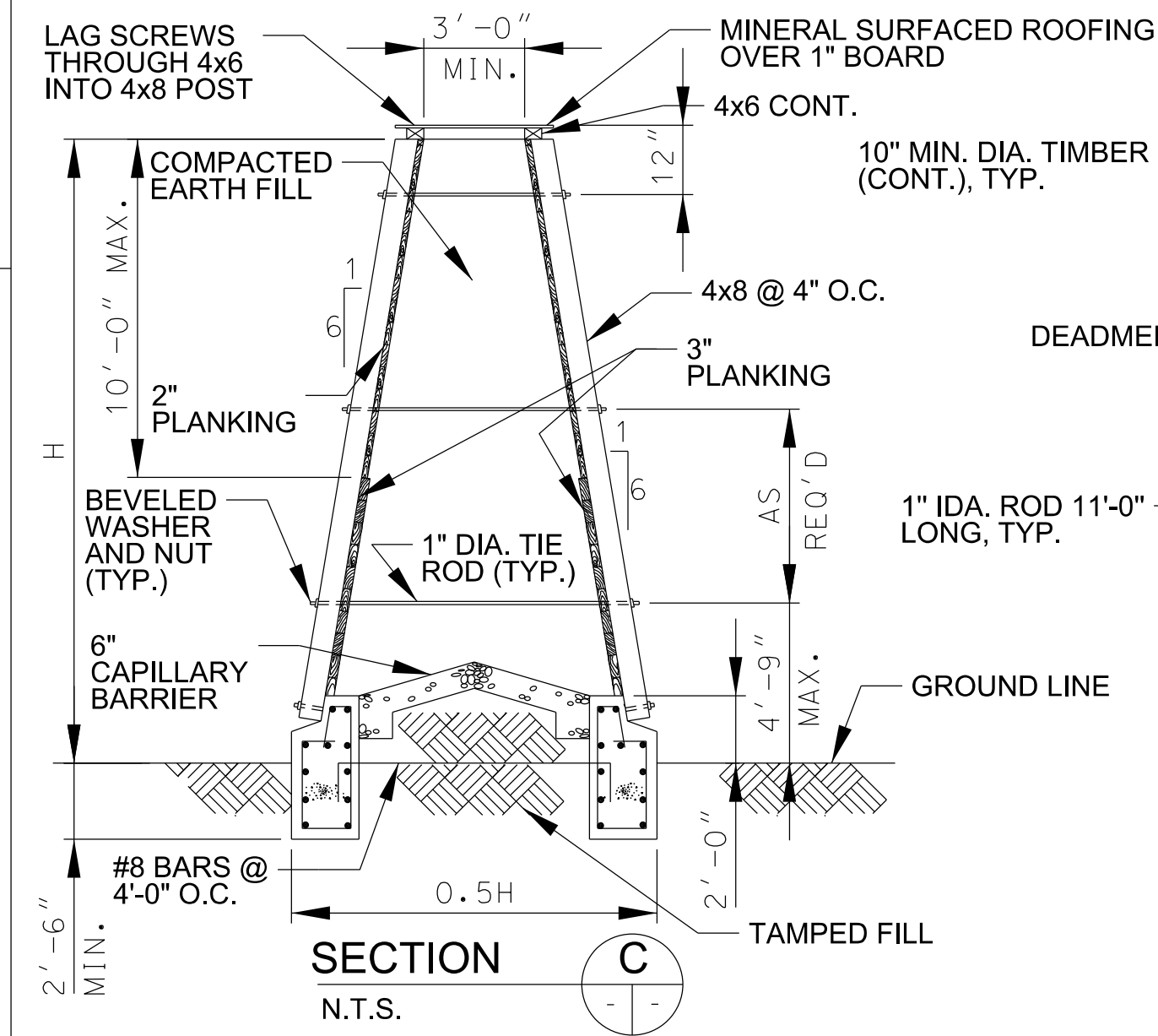
ESTIMATED ERECTION TIME			
MANHOURS			
100 LIN. FT. OF CROSS SECTION, 15 FT HIGH	END TYPE 1	END TYPE 2	END TYPE 3
1,670	320	560	600

- REMARKS:
- CAN BE BUILT WITH UNSKILLED LABOR AND LOCALLY AVAILABLE MATERIALS.
  - EXPOSED AGGREGATE FINISH POSSIBLE.
  - IF EARTH FILL IS PLACED BEHIND A WALL, STABILITY OF WALL MUST BE CHECKED ON A CASE-BY-CASE BASIS.

Date:	17 JUNE 2021
Scale:	N.T.S.
Drawing code:	DEF 149-30-01
Date:	30 JUNE 2021

Designed by: U.S. ARMY CORPS OF ENGINEERS  
 Drawn by: ARB  
 Checked by: MMC/SDH  
 Submitted by: CHAD HOUSE, PE

U.S. ARMY CORPS OF ENGINEERS  
 ENGINEERING AND SUPPORT CENTER  
 HUNTSVILLE, ALABAMA



ESTIMATED ERECTION TIME	
MANHOURS	
100 LIN. FT. OF CROSS SECTION, 15 FT HIGH	BARRICADE END
850	170

- REMARKS:
- ALL LUMBER SHALL BE PRESSURE TREATED WITH PRESERVATIVES.
  - CAN BE RAPIDLY CONSTRUCTED WITH UNSKILLED LABOR.
  - CAN BE LOCATED CLOSE TO SITE BOUNDARIES OR RESTRICTIONS.
  - CAN TOLERATE SIGNIFICANT AMOUNT OF SETTLEMENT
  - AESTHETICALLY NOT PLEASING
  - REQUIRES REPEATED MAINTENANCE.

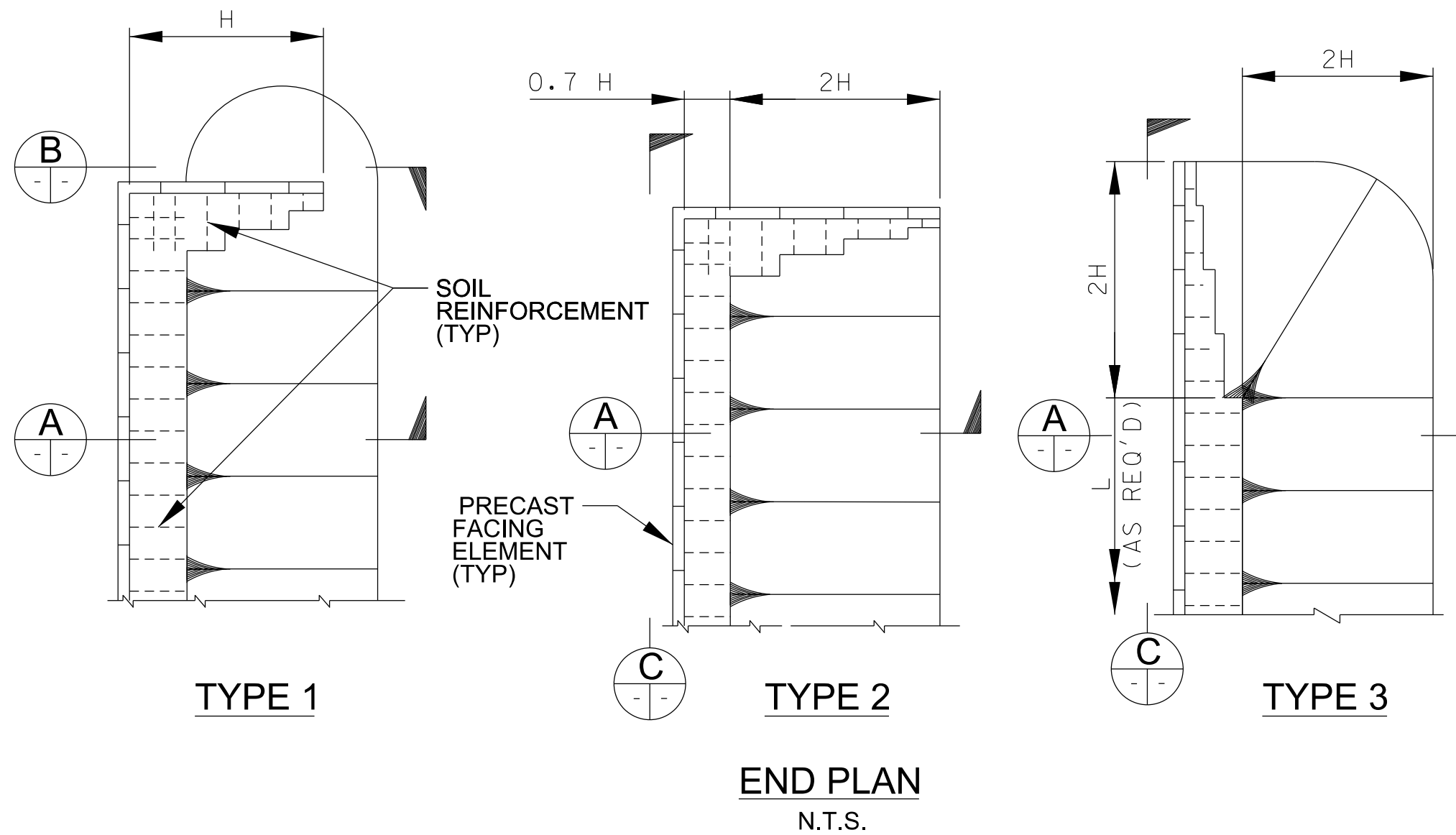
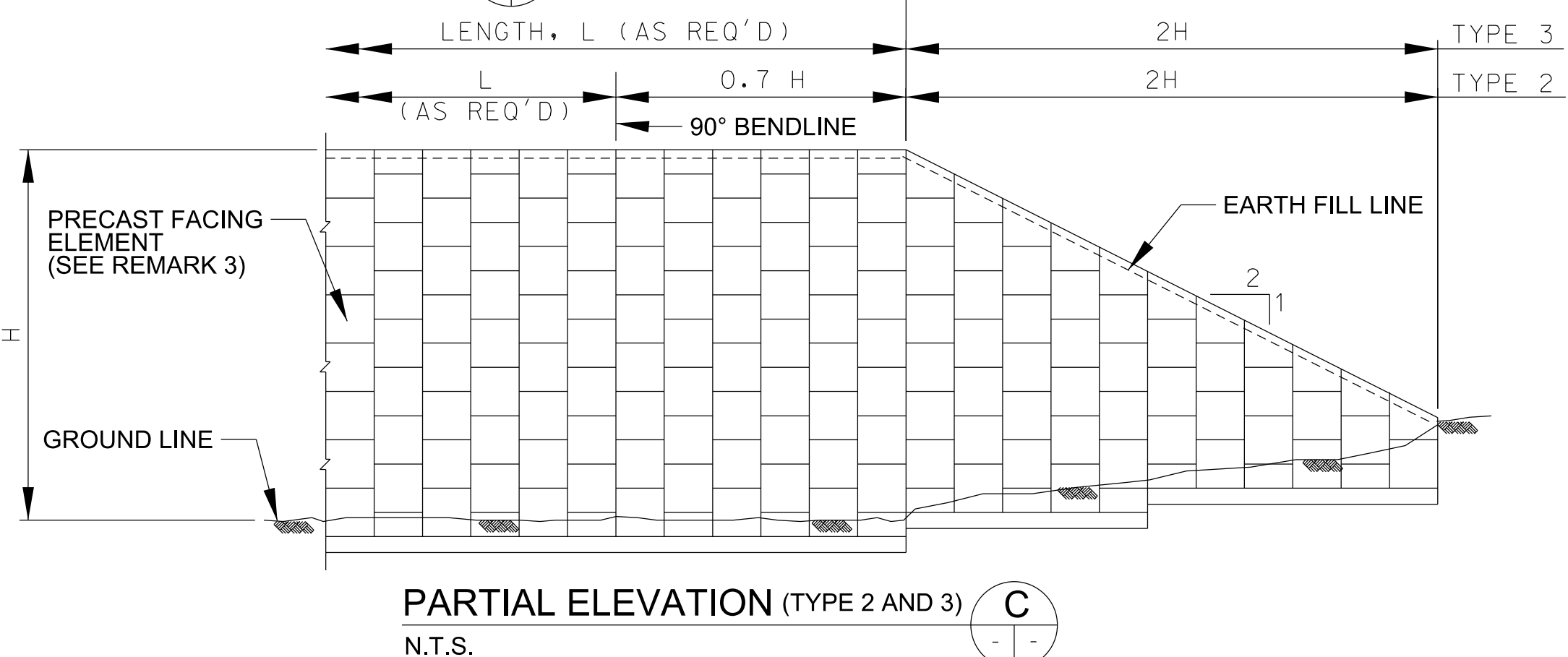
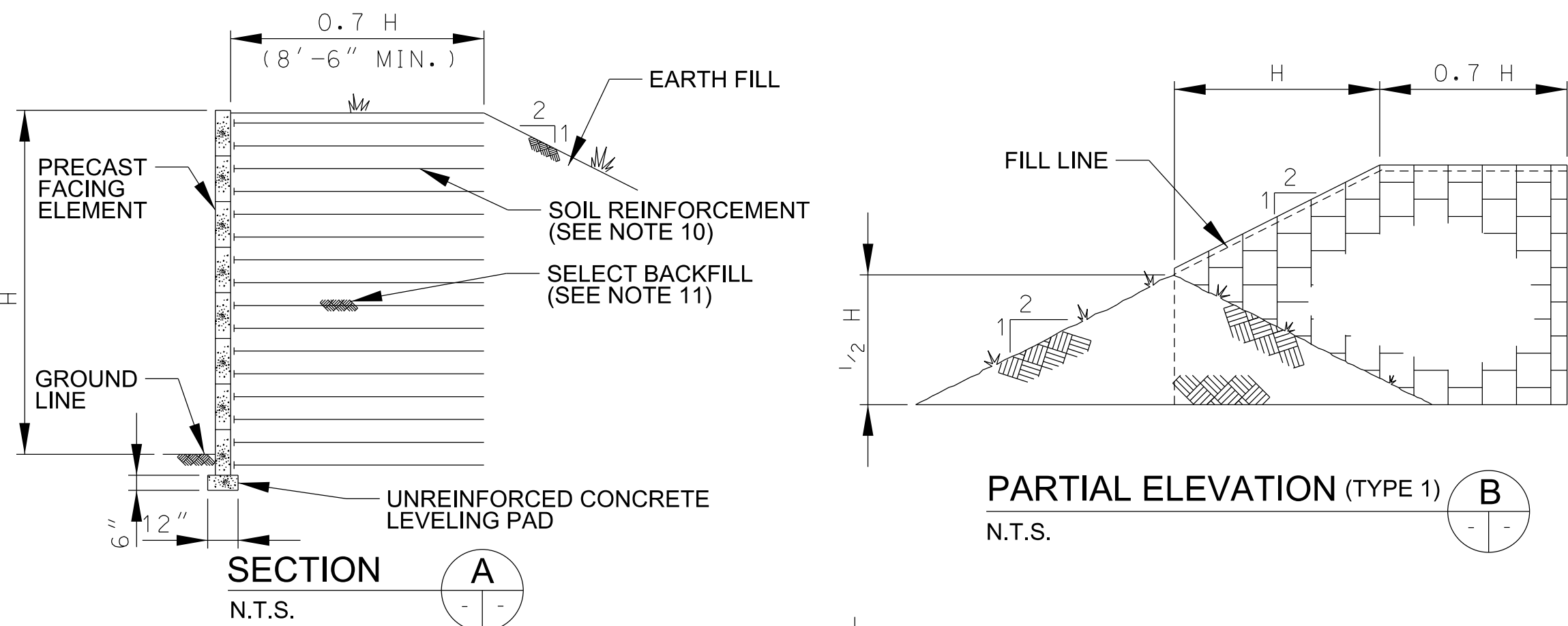
BARRICADES STANDARD DESIGN  
 SAND BAG  
 CONCRETE GRAVITY WALL  
 TIMBER - DOUBLE REVETTED

Sheet reference number:  
**5**  
 Sheet 5 of 13

NOTE: SEE SHEET 1 FOR L AND H DIMENSION DETERMINATION

**B8 - TIMBER - DOUBLE REVETTED**

NOTE: SEE SHEET 1 FOR L AND H DIMENSION DETERMINATION



NOTE: SEE SHEET 1 FOR L AND H DIMENSION DETERMINATION

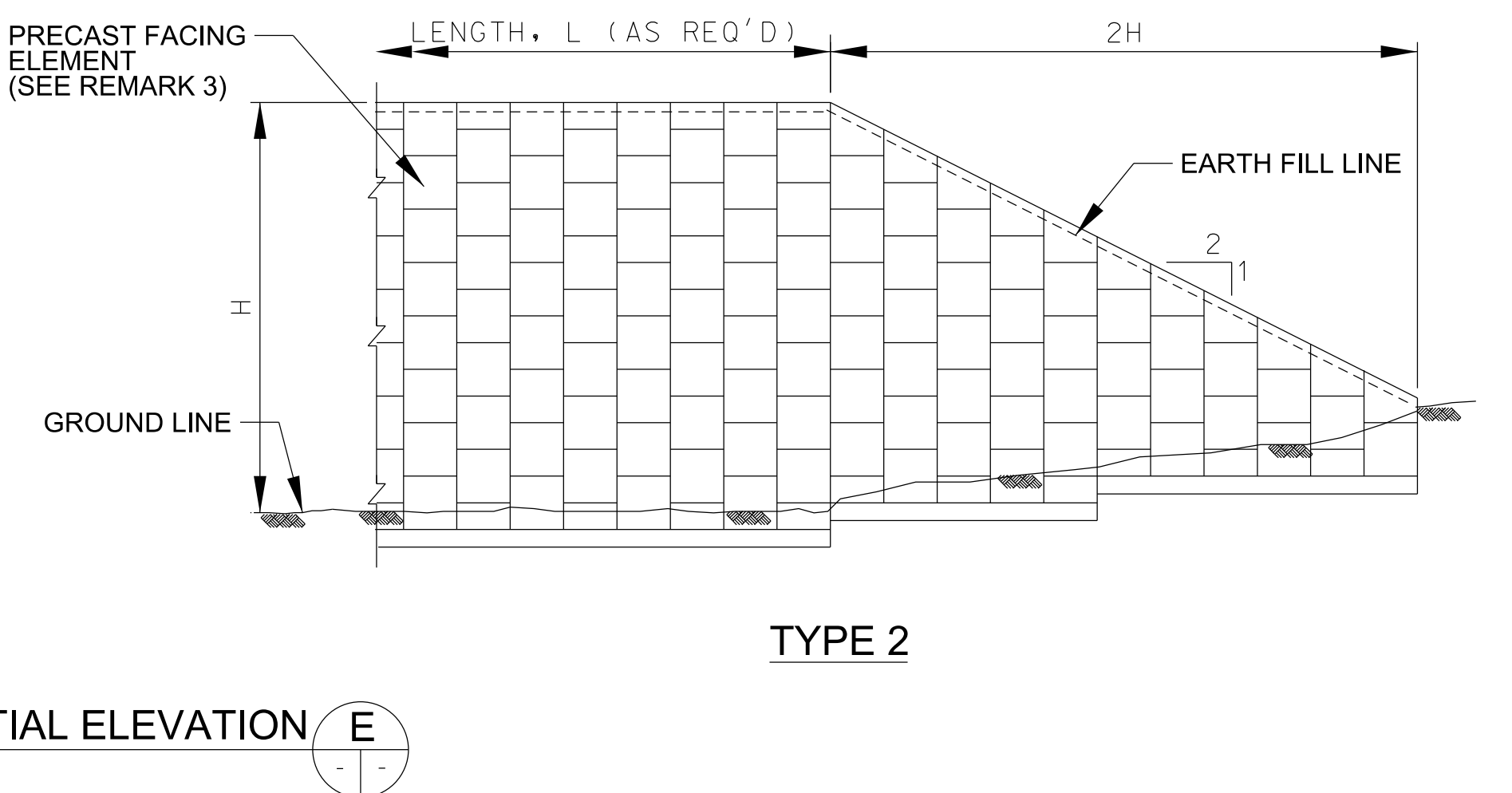
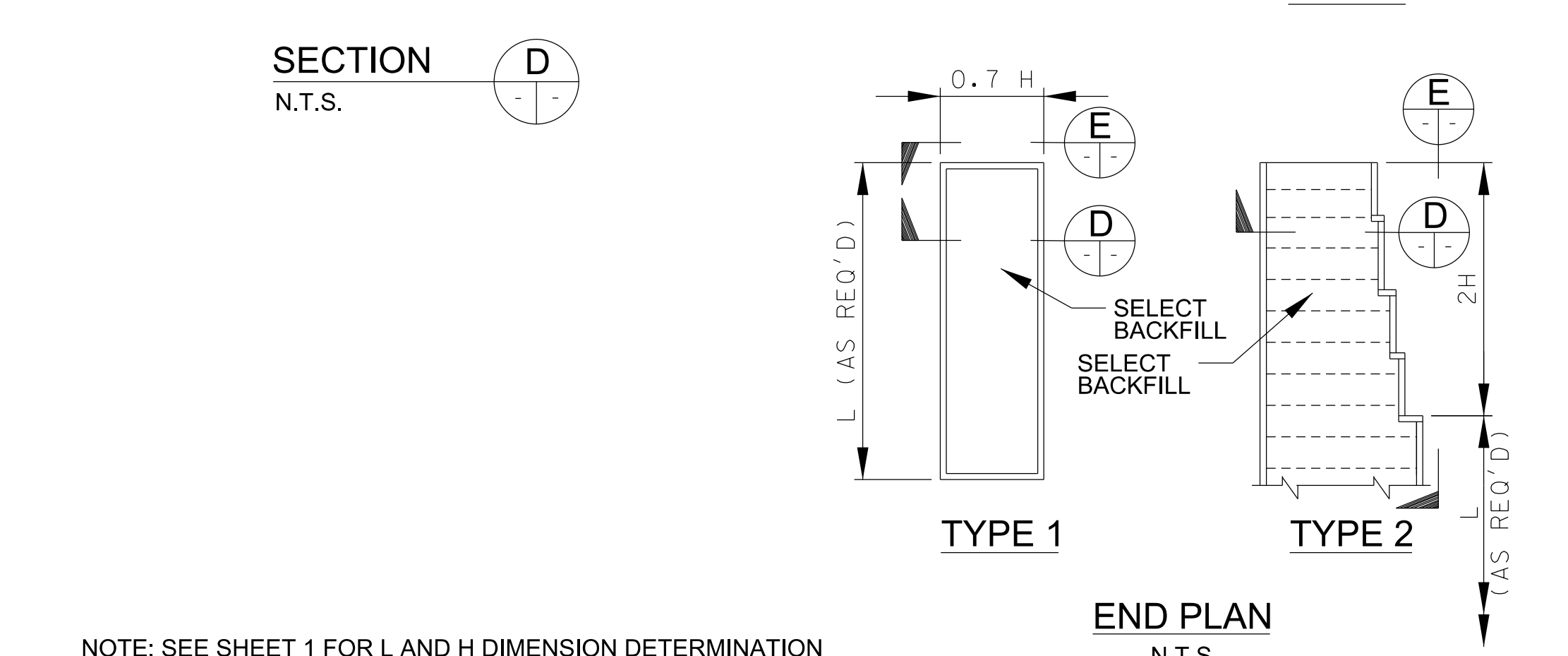
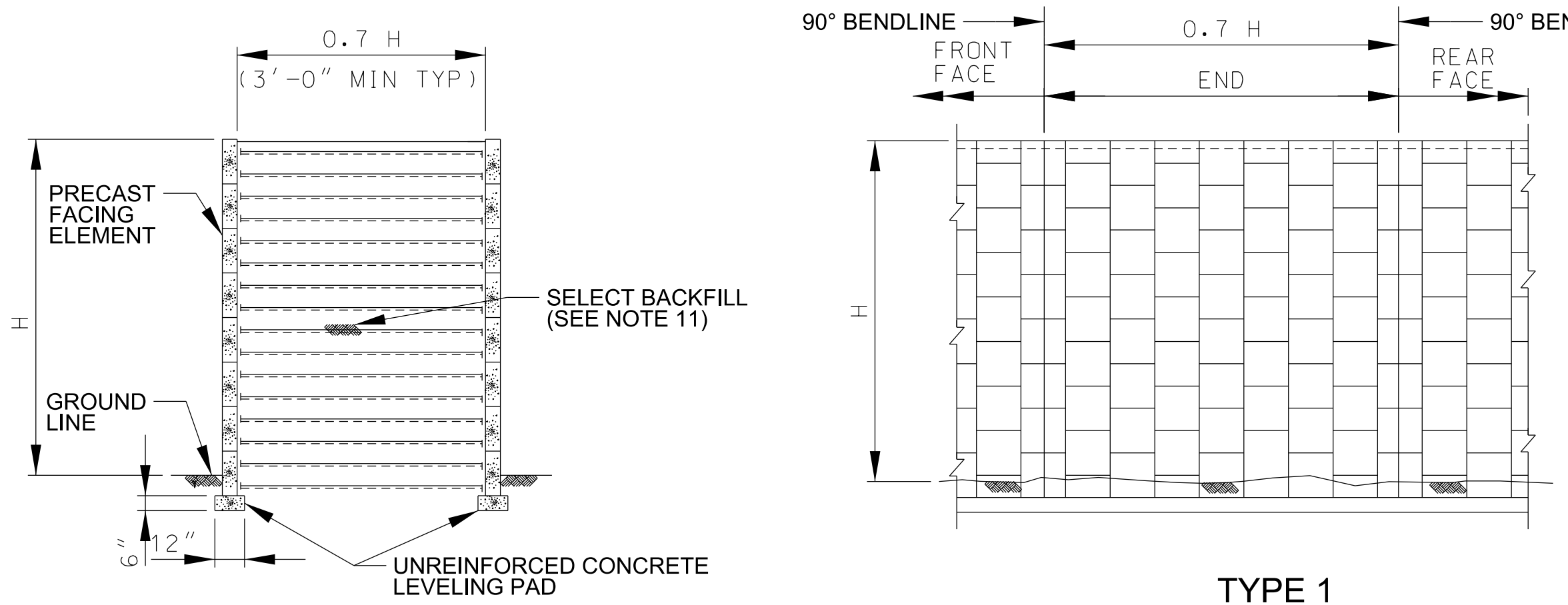
ESTIMATED ERECTION TIME MANHOURS			
100 LIN. FT. OF CROSS SECTION, 15 FT HIGH	END TYPE 1	END TYPE 2	END TYPE 3
1,070	95	160	150

- REMARKS:
- CAN BE ECONOMICALLY AND RAPIDLY CONSTRUCTED
  - REQUIRES SHALLOW FOUNDATION.
  - VARIETY OF ARCHITECTURAL FACING ELEMENTS AND FINISHES AVAILABLE (CRUCIFORM, HEXAGONAL, RIBBED, ETC.)
  - NO HEIGHT OR LENGTH LIMITATIONS
  - FACING ELEMENTS ARE REUSABLE.
  - WALLS CAN BE LOCATED CLOSE TO SITE BOUNDARIES OR OBSTRUCTIONS.
  - SYSTEM ADAPTABLE TO SLOPING WALL CONFIGURATIONS AND TO TIERS.
  - SYSTEM CAN TOLERATE SIGNIFICANT AMOUNT OF SETTLEMENT.
  - REPAIR CAN BE ACCOMPLISHED ON INDIVIDUAL FACING ELEMENTS.
  - GALVANIZED STRIPS, STEEL WIRE MESH, GEOSYNTHETIC, ETC. ARE USE FOR SOIL REINFORCEMENT.
  - GRANULAR MATERIALS ARE GENERALLY USED TO PROVIDE PROPER DRAINAGE. SELECTION OF BACKFILL SHALL BE RECOMMENDED BY THE SYSTEM MANUFACTURER.
  - REQUIRES SLOPE STABILIZATION (SEEDING, ETC.)
  - SUGGESTED SOURCES (MAY BE AVAILABLE FROM OTHER VENDORS)
    - REINFORCED EARTH CO.  
8614 WESTWOOD CENTER DRIVE  
SUITE 1100  
VIENNA, VA 22182  
(703) 821-1175
    - VSL CORPORATION  
15600 TRINITY BLVD, SUITE 118  
FORT WORTH, TX 76155  
(817) 545-4807
    - HILFIKER WALLS  
1902 HILFIKER LANE  
EUREKA, CA 95502  
(707) 443-5093



No.	Description	Revisions	Date	Appr.
3	GENERAL UPDATES AND REVISIONS		6/17/2021	
2	GENERAL UPDATES AND REVISIONS		5/6/2011	
1	SHEET TOTAL CHANGED		11/22/1991	
	ORIGINAL DOCUMENT		12/2/1988	

Designed by:	ARB	Date:	17 JUNE 2021
Drawn by:	ARB	Scale:	N.T.S.
Checked by:	MMC/SDH	Drawing code:	DEF 149-30-01
Submitted by:	CHAD HOUSE, PE	Date:	30 JUNE 2021



NOTE: SEE SHEET 1 FOR L AND H DIMENSION DETERMINATION

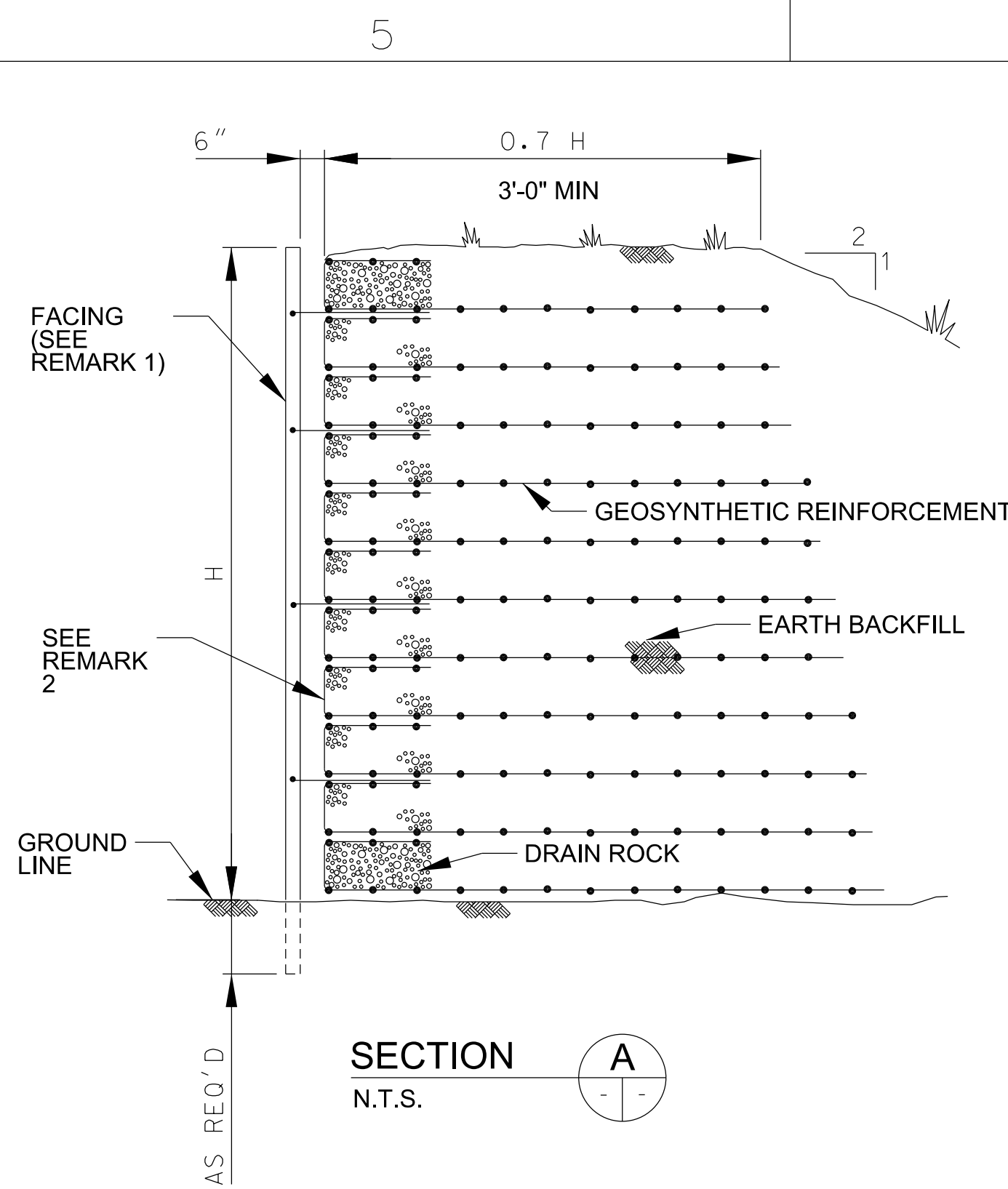
ESTIMATED ERECTION TIME MANHOURS		
100 LIN. FT. OF CROSS SECTION, 15 FT HIGH	END TYPE 1	END TYPE 2
1,510	60	290

- REMARKS:
- CAN BE ECONOMICALLY AND RAPIDLY CONSTRUCTED
  - REQUIRES SHALLOW FOUNDATION.
  - VARIETY OF ARCHITECTURAL FACING ELEMENTS AND FINISHES AVAILABLE (CRUCIFORM, HEXAGONAL, RIBBED, ETC.)
  - NO HEIGHT OR LENGTH LIMITATIONS
  - FACING ELEMENTS ARE REUSABLE.
  - WALLS CAN BE LOCATED CLOSE TO SITE BOUNDARIES OR OBSTRUCTIONS.
  - SYSTEM ADAPTABLE TO SLOPING WALL CONFIGURATIONS AND TO TIERS.
  - SYSTEM CAN TOLERATE SIGNIFICANT AMOUNT OF SETTLEMENT.
  - REPAIR CAN BE ACCOMPLISHED ON INDIVIDUAL FACING ELEMENTS.
  - GALVANIZED STRIPS, STEEL WIRE MESH, GEOSYNTHETIC, ETC. ARE USE FOR SOIL REINFORCEMENT.
  - GRANULAR MATERIALS ARE GENERALLY USED TO PROVIDE PROPER DRAINAGE. SELECTION OF BACKFILL SHALL BE RECOMMENDED BY THE SYSTEM MANUFACTURER.
  - REQUIRES SLOPE STABILIZATION (SEEDING, ETC.)
  - SUGGESTED SOURCES (MAY BE AVAILABLE FROM OTHER VENDORS)
    - REINFORCED EARTH CO.  
8614 WESTWOOD CENTER DRIVE  
SUITE 1100  
VIENNA, VA 22182  
(703) 821-1175
    - VSL CORPORATION  
15600 TRINITY BLVD, SUITE 118  
FORT WORTH, TX 76155  
(817) 545-4807
    - HILFIKER WALLS  
1902 HILFIKER LANE  
EUREKA, CA 95502  
(707) 443-5093

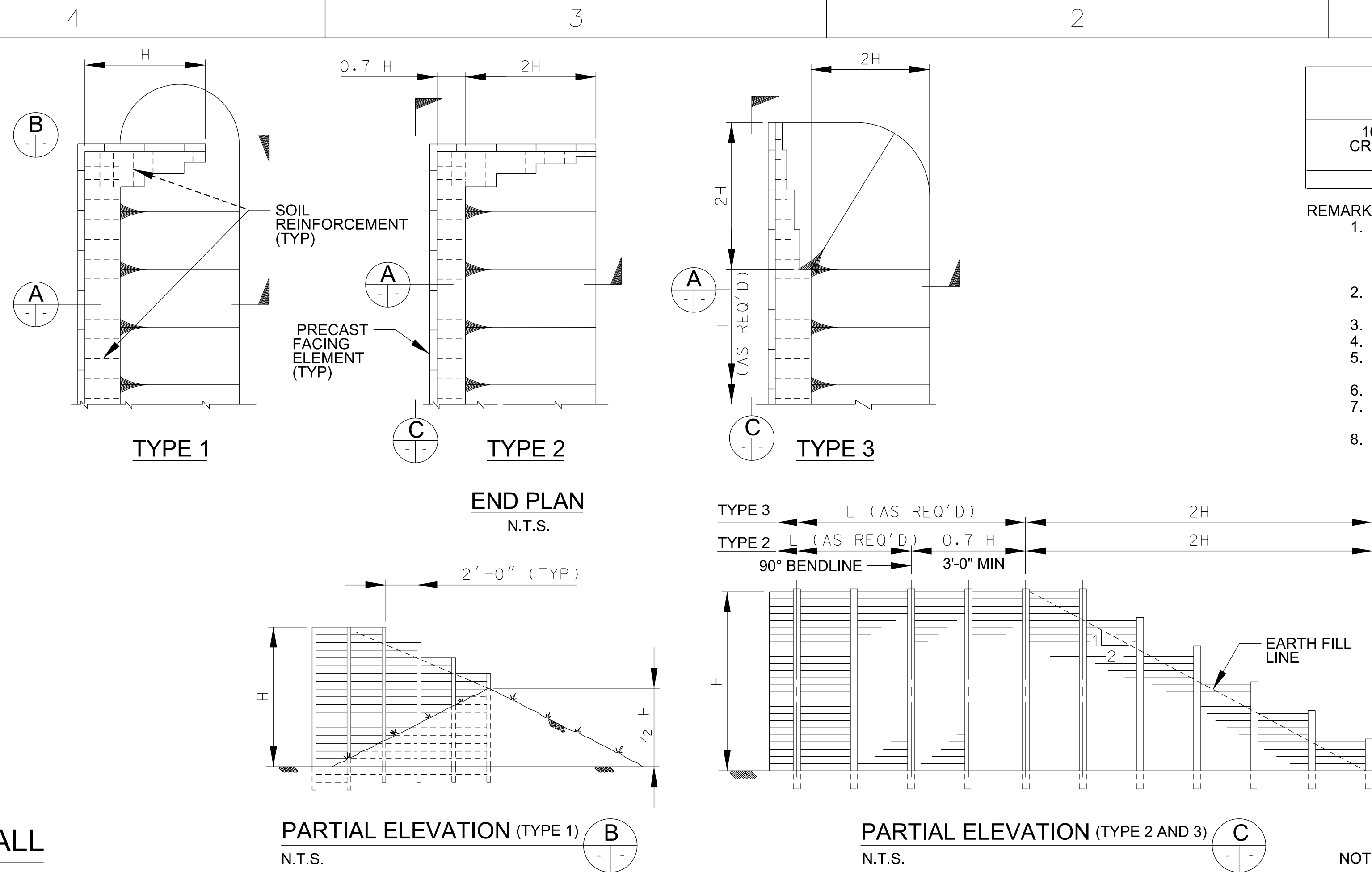
U. S. ARMY CORPS OF ENGINEERS  
ENGINEERING AND SUPPORT CENTER  
HUNTSVILLE, ALABAMA

BARRICADES STANDARD DESIGN  
REINFORCED SOIL SINGLE & DOUBLE REVETTED

Sheet reference number:  
**6**  
Sheet 6 of 13



**B11 - WRAP AROUND RETAINING WALL**



ESTIMATED ERECTION TIME MANHOURS			
100 LIN. FT. OF CROSS SECTION, 15 FT HIGH	END TYPE 1	END TYPE 2	END TYPE 3
1,040	160	160	190

REMARKS:

- FACING CAN BE SELECTED TO ACHIEVE DESIRED ARCHITECTURAL FINISH, EXAMPLE: SOLDIER PILE AND LAGGING FACING, PRECAST CONCRETE, ETC.
- GEOSYNTHETIC FINE MESH IS USED TO CONTAIN SOIL OR SAND FILL.
- CAN BE ECONOMICALLY AND RAPIDLY CONSTRUCTED
- REQUIRES SHALLOW FOUNDATION.
- SYSTEM CAN TOLERATE SIGNIFICANT AMOUNT OF SETTLEMENT.
- REQUIRES SLOPE STABILIZATION (SEEDING, ETC.)
- GEOSYNTHETIC REINFORCEMENT IS PLASTIC MESH MADE OF HIGH DENSITY POLYMER.
- SUGGESTED SOURCE (MAY BE AVAILABLE FROM OTHER VENDORS)  
THE TENSAR CORP.  
P.O. BOX 986  
MORROW, GA 80260  
(404) 968-3255



No.	Description	Date	Appr.
3	GENERAL UPDATES AND REVISIONS	6/17/2021	
2	GENERAL UPDATES AND REVISIONS	5/6/2021	
1	SHEET TOTAL CHANGED ORIGINAL DOCUMENT	11/22/1991	
		12/22/1988	

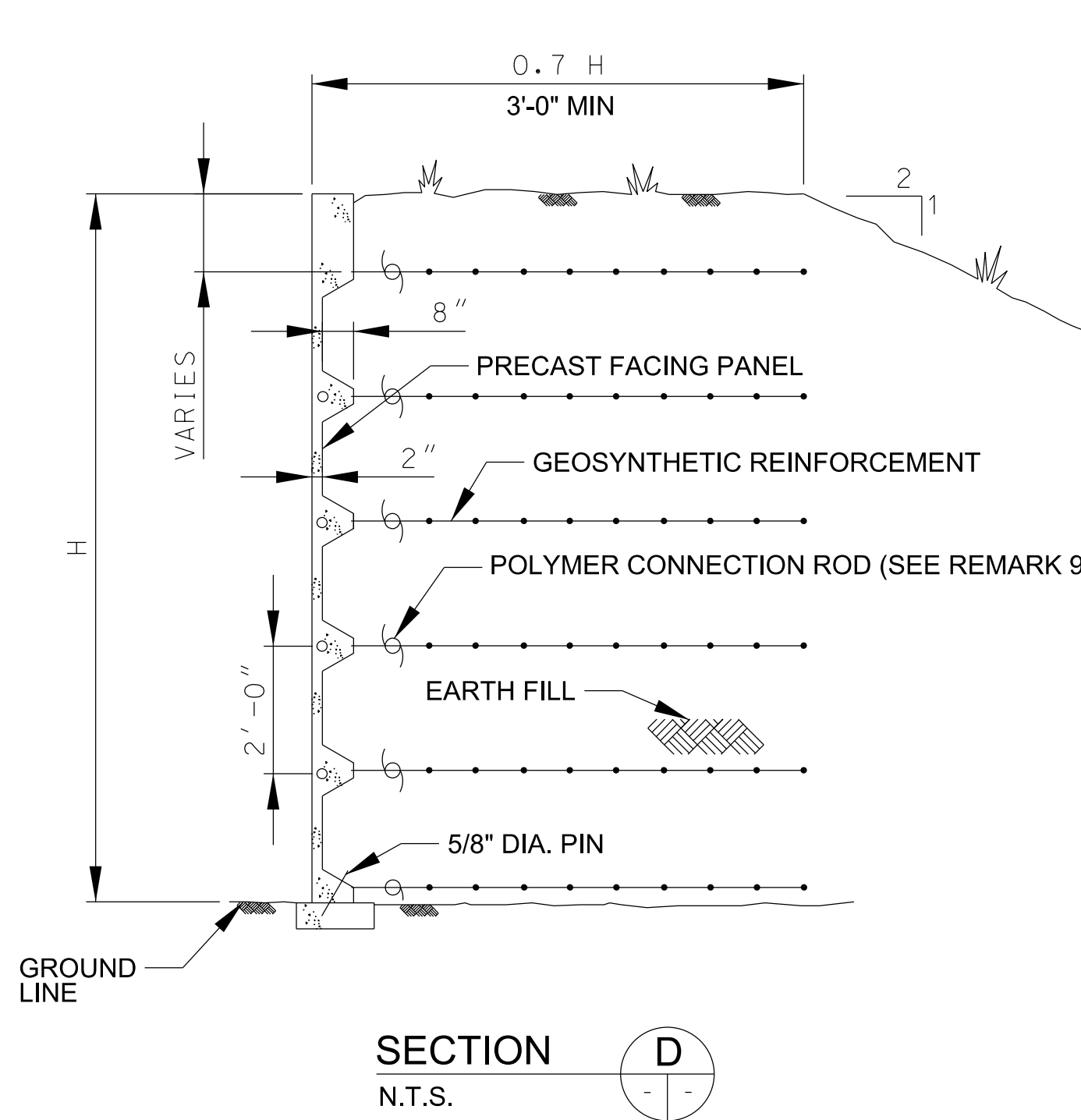
Date:	17 JUNE 2021
Scale:	N.T.S.
Drawing code:	DEF 149-30-01
Date:	30 JUNE 2021

Designed by:	ARB
Drawn by:	ARB
Checked by:	M/MC/SDH
Submitted by:	CHAD HOUSE PE

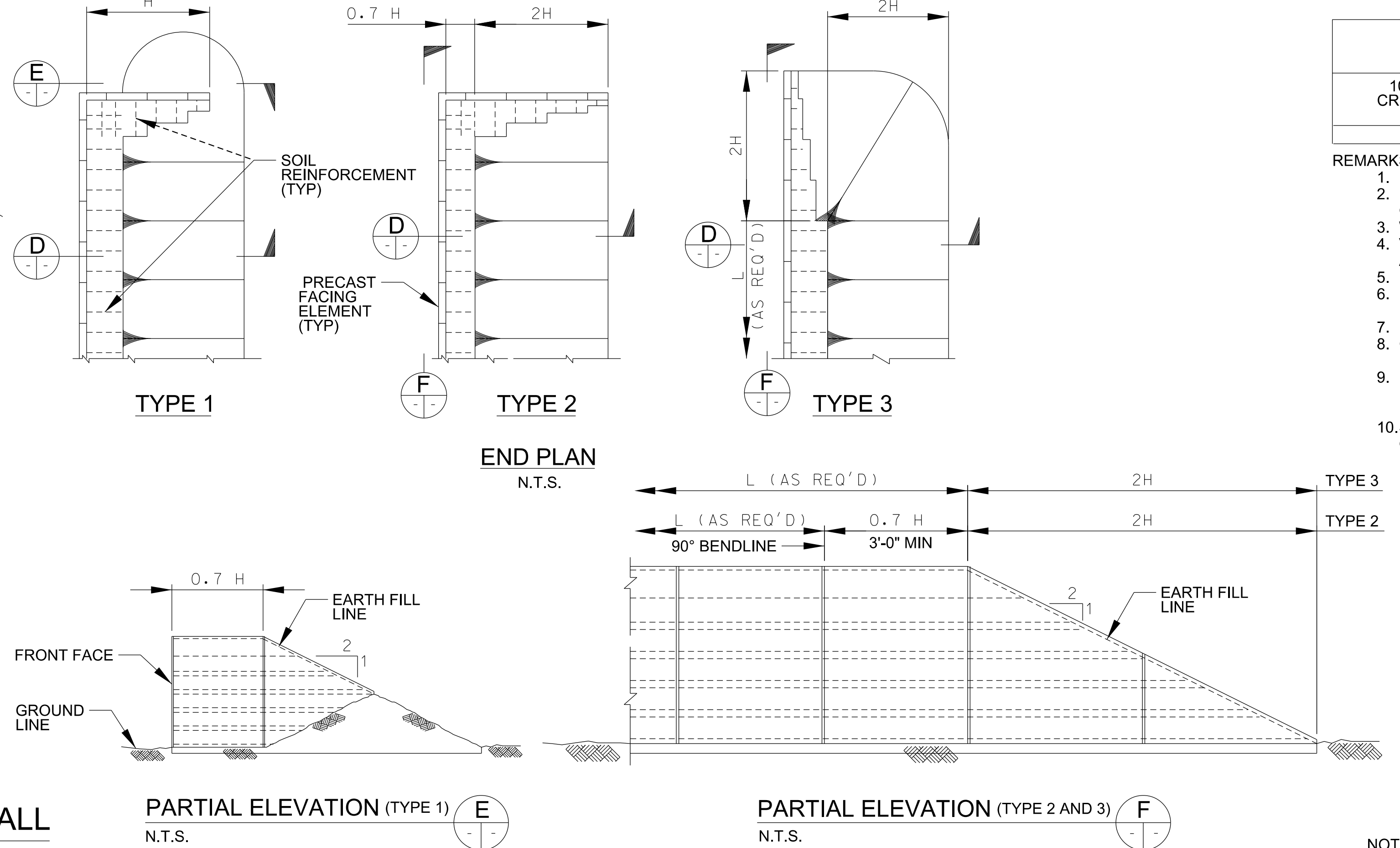
U. S. ARMY CORPS OF ENGINEERS  
SUPPORT CENTER  
HUNTSVILLE, ALABAMA

BARRICADES  
STANDARD DESIGN  
WRAPAROUND RETAINING  
WALL & WAFFLE-CRETE  
RETAINING WALL

Sheet reference number:  
**7**  
Sheet 7 of 13



**B12 - WAFFLE-CRETE RETAINING WALL**

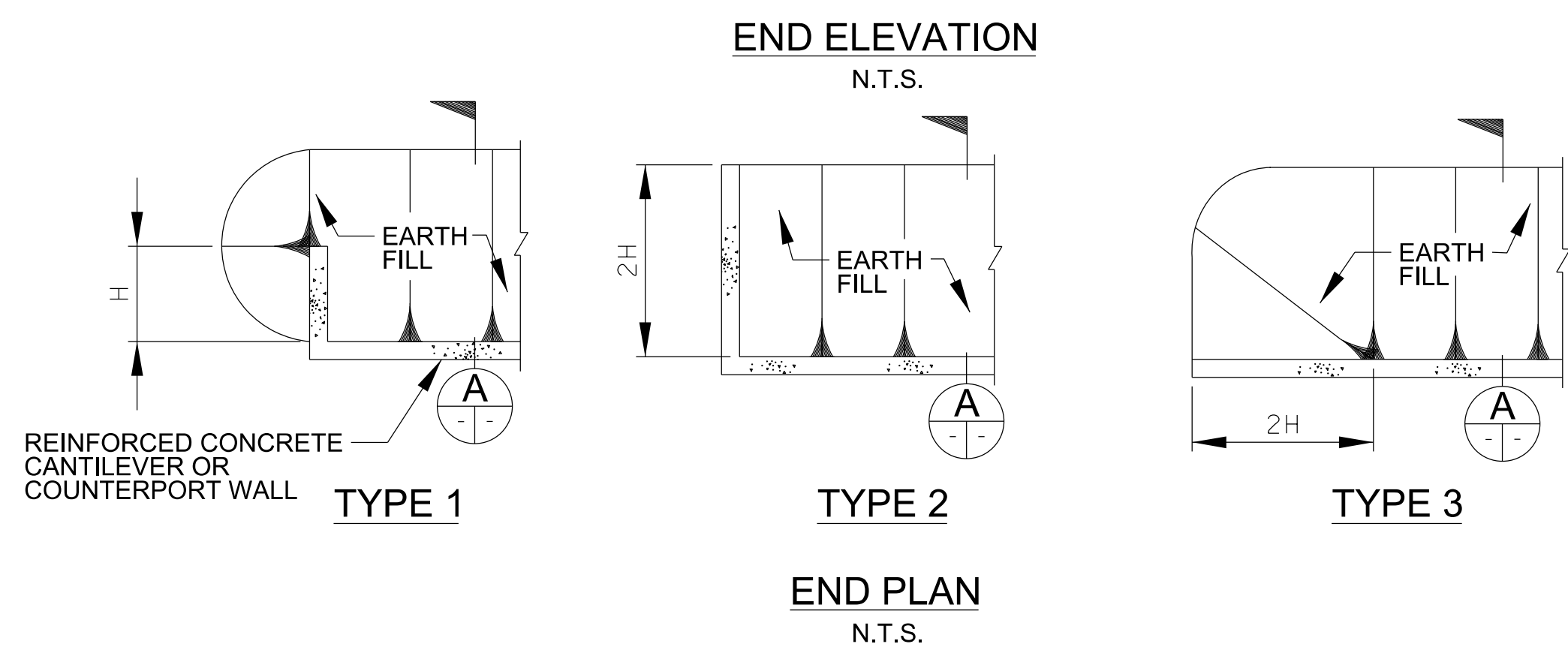
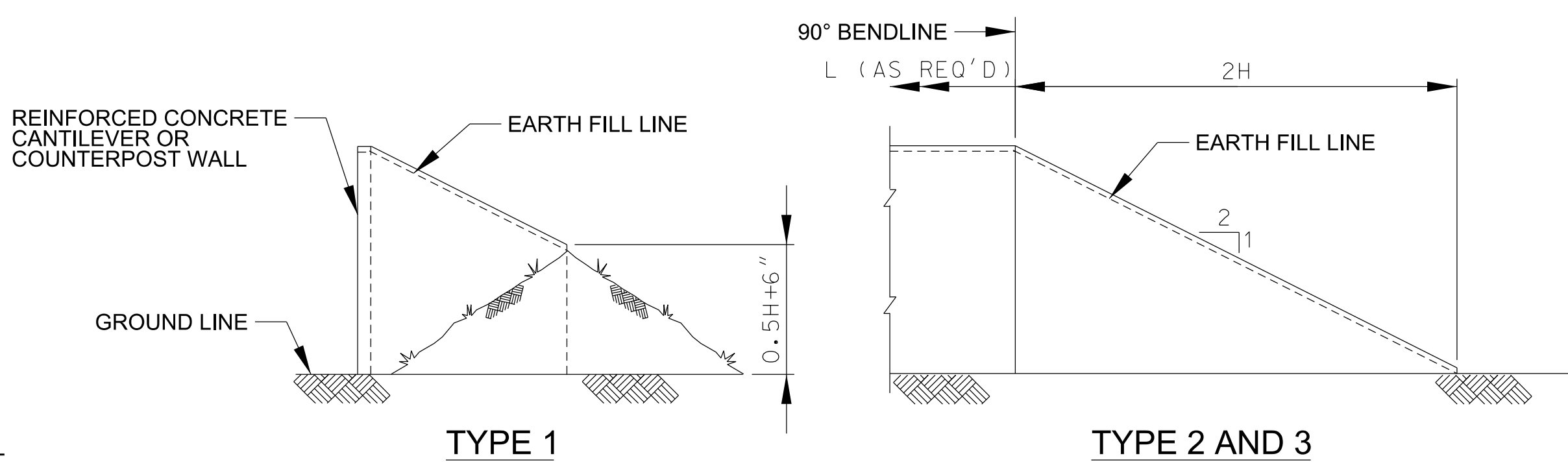
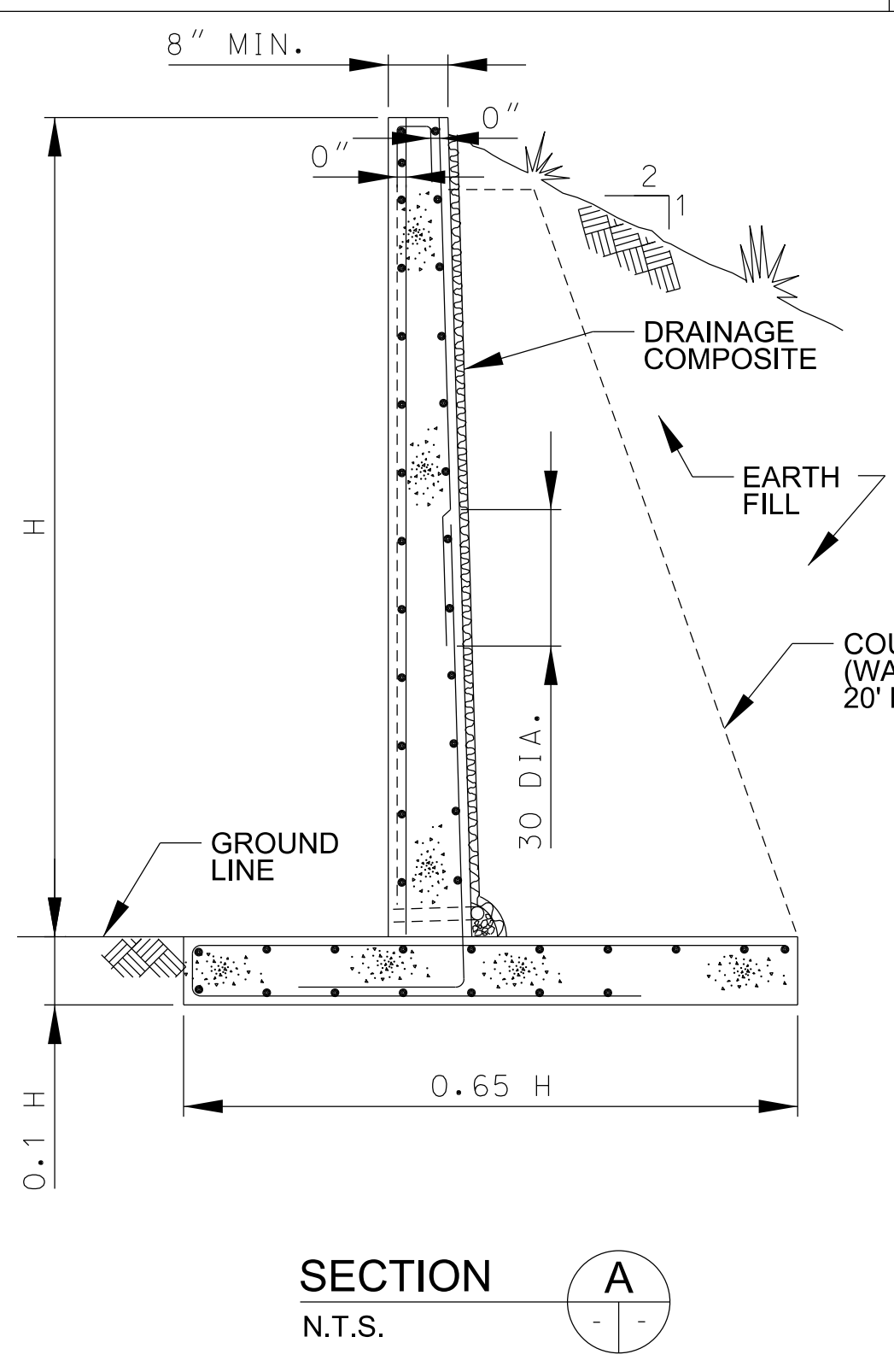


ESTIMATED ERECTION TIME MANHOURS			
100 LIN. FT. OF CROSS SECTION, 15 FT HIGH	END TYPE 1	END TYPE 2	END TYPE 3
1,220	100	230	160

REMARKS:

- PRECAST FACING PANELS ARE LIGHTWEIGHT.
- PANELS MUST BE EXTERNALLY BRACED DURING CONSTRUCTION.
- WALL REQUIRES BATTER OF 1/8" PER FOOT.
- VARIETY OF DIFFERENT PRECAST FACING PANELS ARE AVAILABLE WITH WIDE VARIETY OF FINISHES.
- LIMITED TO 20 FT IN HEIGHT.
- PROPRIETARY WAFFLE-CRETE PANELS SHOWN. OTHER FACING SYSTEMS MAY BE SUBSTITUTED.
- REQUIRES SLOPE STABILIZATION (SEEDING, ETC.)
- GEOSYNTHETIC REINFORCEMENT IS PLASTIC MESH MADE OF HIGH DENSITY POLYMER.
- POLYMER CONNECTION ROD IS USED TO CONNECT THE PRECAST FACING PANEL TABS TO THE GEOSYNTHETIC REINFORCEMENTS.
- SUGGESTED SOURCE (MAY BE AVAILABLE FROM OTHER VENDORS)  
WAFFLE-CRETE INTERNATIONAL  
2500 E. 9TH STREET  
HAYS, KS 67601  
(785) 625-3486





**B13 - CANTILEVER RETAINING WALL**

NOTE: SEE SHEET 1 FOR L AND H DIMENSION DETERMINATION

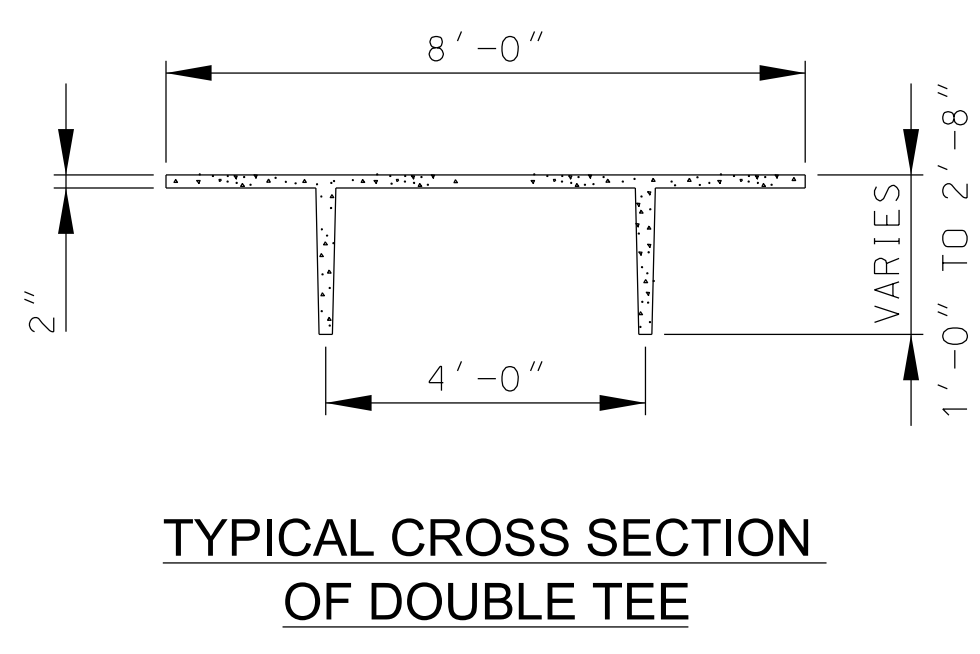
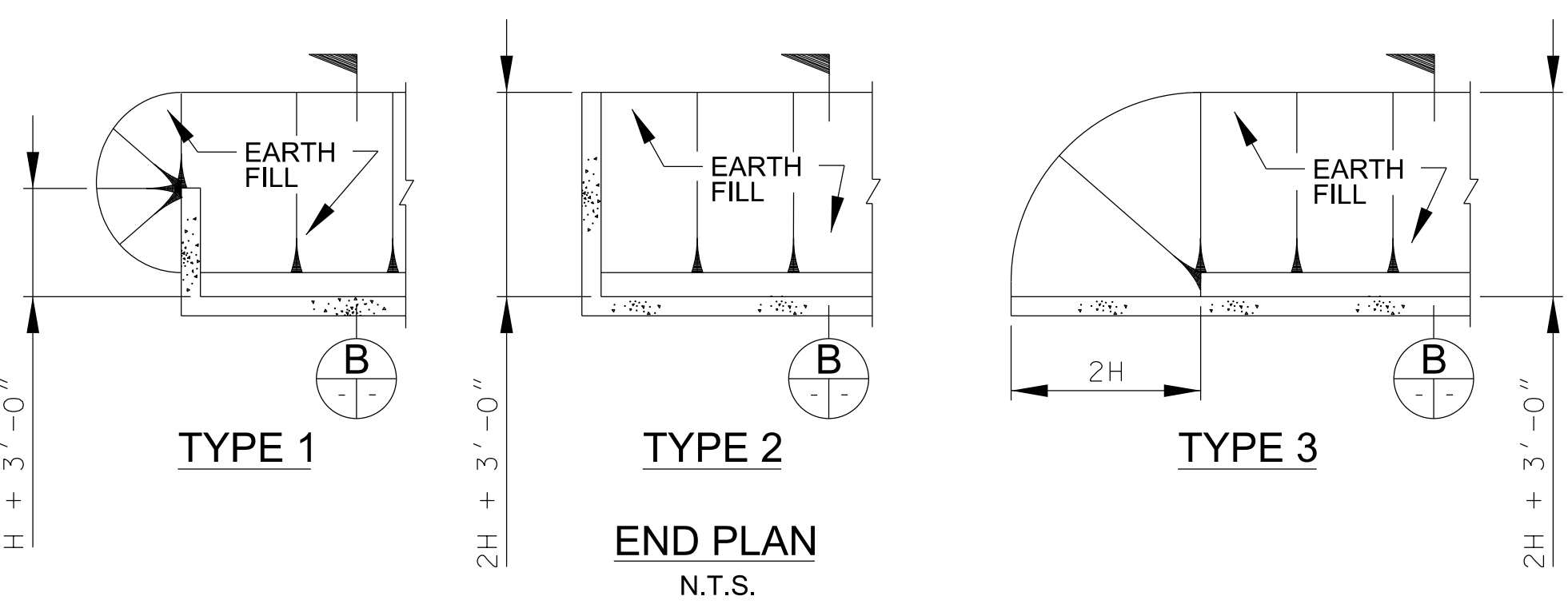
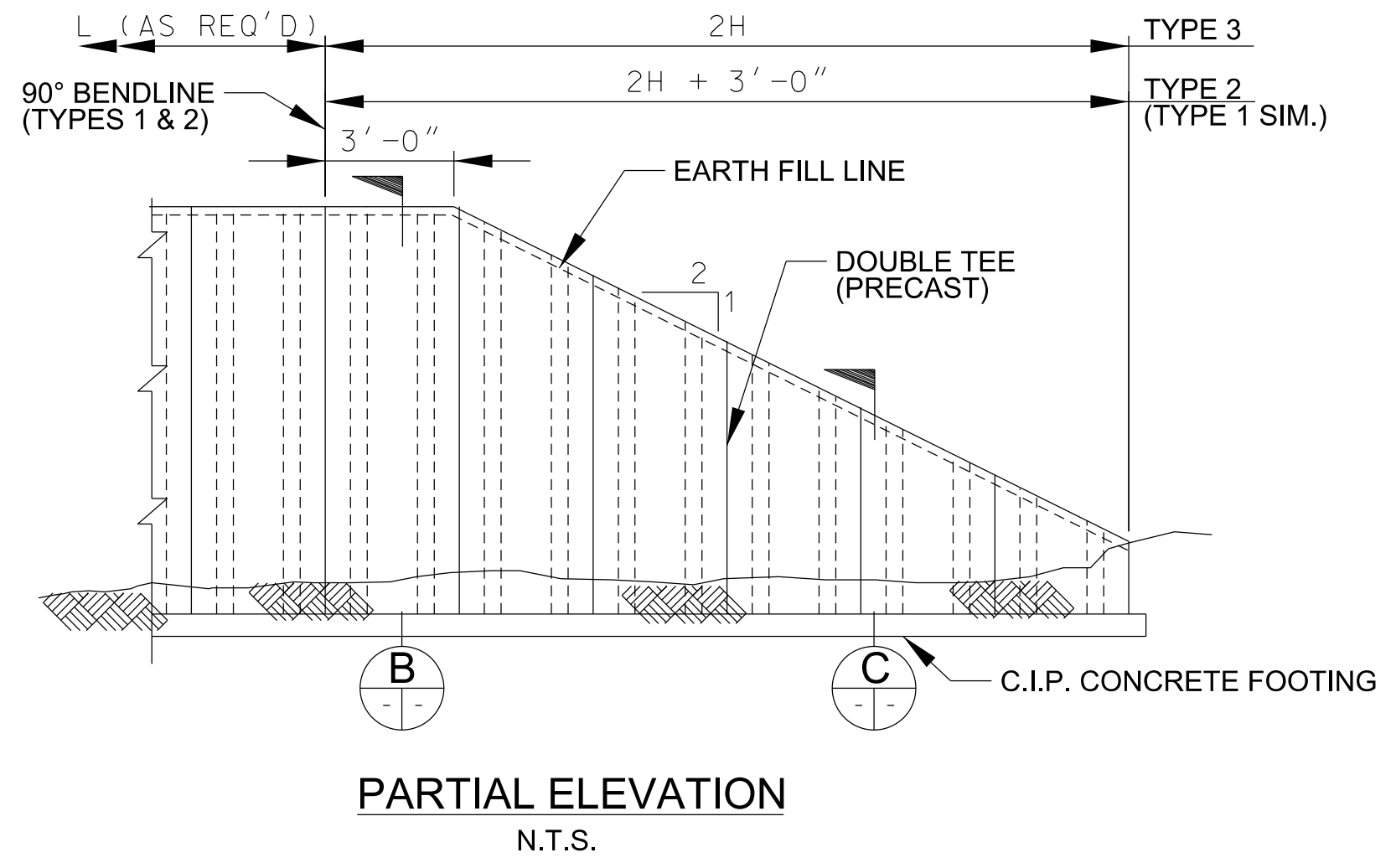
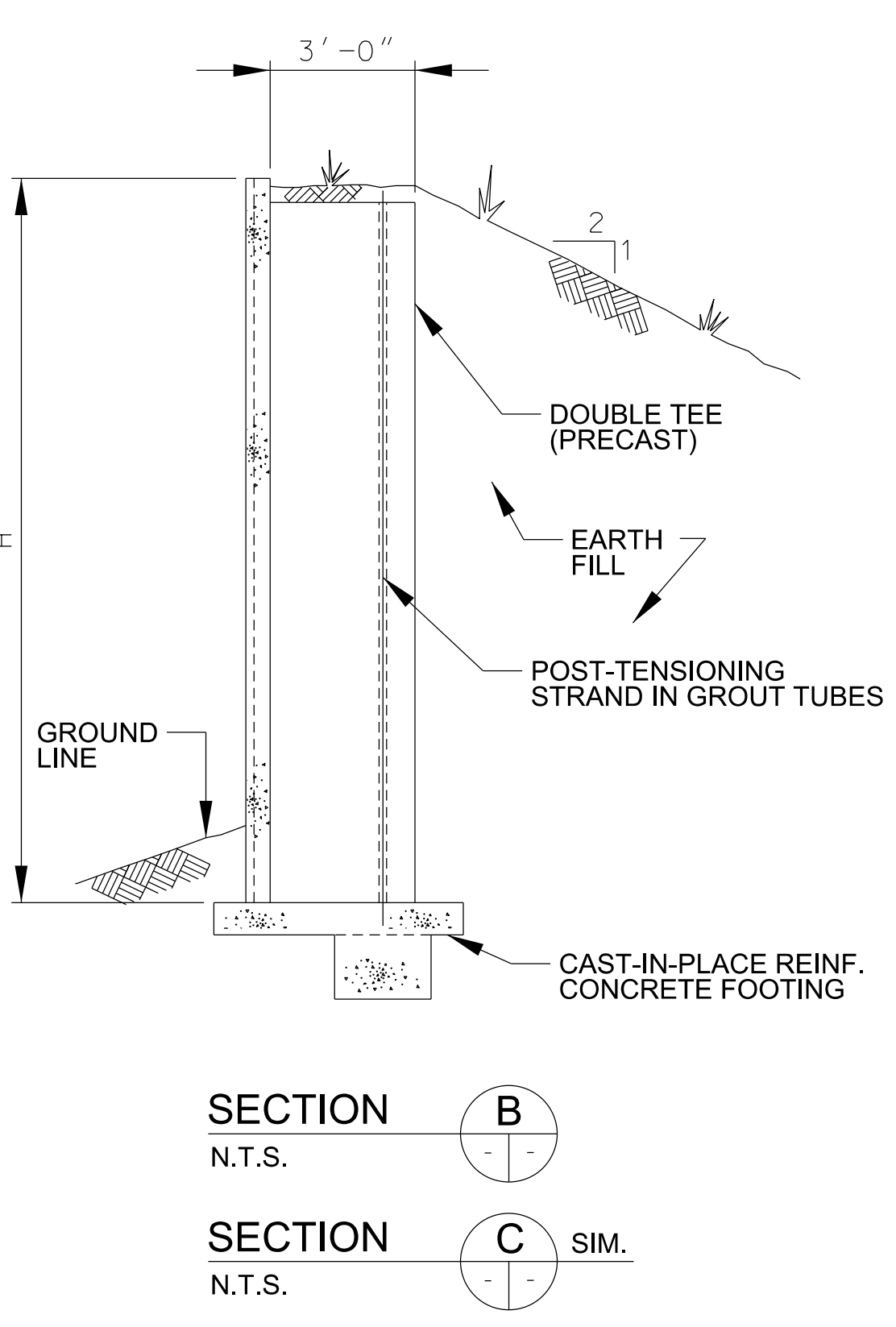
ESTIMATED ERECTION TIME MANHOURS			
100 LIN. FT. OF CROSS SECTION, 15 FT HIGH	END TYPE 1	END TYPE 2	END TYPE 3
1,400	150	180	220

REMARKS:  
 1. REQUIRES EXTENSIVE FORMING AND CONSTRUCTION TIME.  
 2. NOT COST EFFECTIVE FOR HIGH WALLS.  
 3. CONCRETE THICKNESS, REINFORCING STEEL, AND TOE LENGTH MUST BE DESIGNED ON A CASE-BY-CASE BASIS.



No.	Description	Revisions	Date	Appr.
3	GENERAL UPDATES AND REVISIONS		6/17/2021	
2	GENERAL UPDATES AND REVISIONS		3/6/2011	
1	SHEET TOTAL CHANGED		11/22/1991	
	ORIGINAL DOCUMENT		12/2/1988	

Date:	17 JUNE 2021
Scale:	N.T.S.
Drawing code:	DEF 149-30-01
Submitted by:	CHAD HOUSE, PE
Date:	30 JUNE 2021



ESTIMATED ERECTION TIME MANHOURS			
100 LIN. FT. OF CROSS SECTION, 15 FT HIGH	END TYPE 1	END TYPE 2	END TYPE 3
940	90	90	140

REMARKS:  
 1. REQUIRES NO COSTLY FORMWORK  
 2. VARIETY OF ARCHITECTURAL FINISHES POSSIBLE.  
 3. WITHOUT PRESTRESSING, THICK STEMS AND MORE THAN NORMAL REINFORCEMENTS REQUIRED.  
 4. CRANE EQUIPMENT REQUIRED FOR HANDLING AND ERECTION.  
 5. SHIMS FOR LEVELING AND NON-SHRINK, NON-METALLIC GROUT REQUIRED PRIOR TO POST-TENSIONING.  
 6. FOOTINGS REQUIRE ANCHORS FOR POST-TENSIONING.

Designed by:	ARB
Drawn by:	ARB
Checked by:	MMC/SDH
Submitted by:	CHAD HOUSE, PE

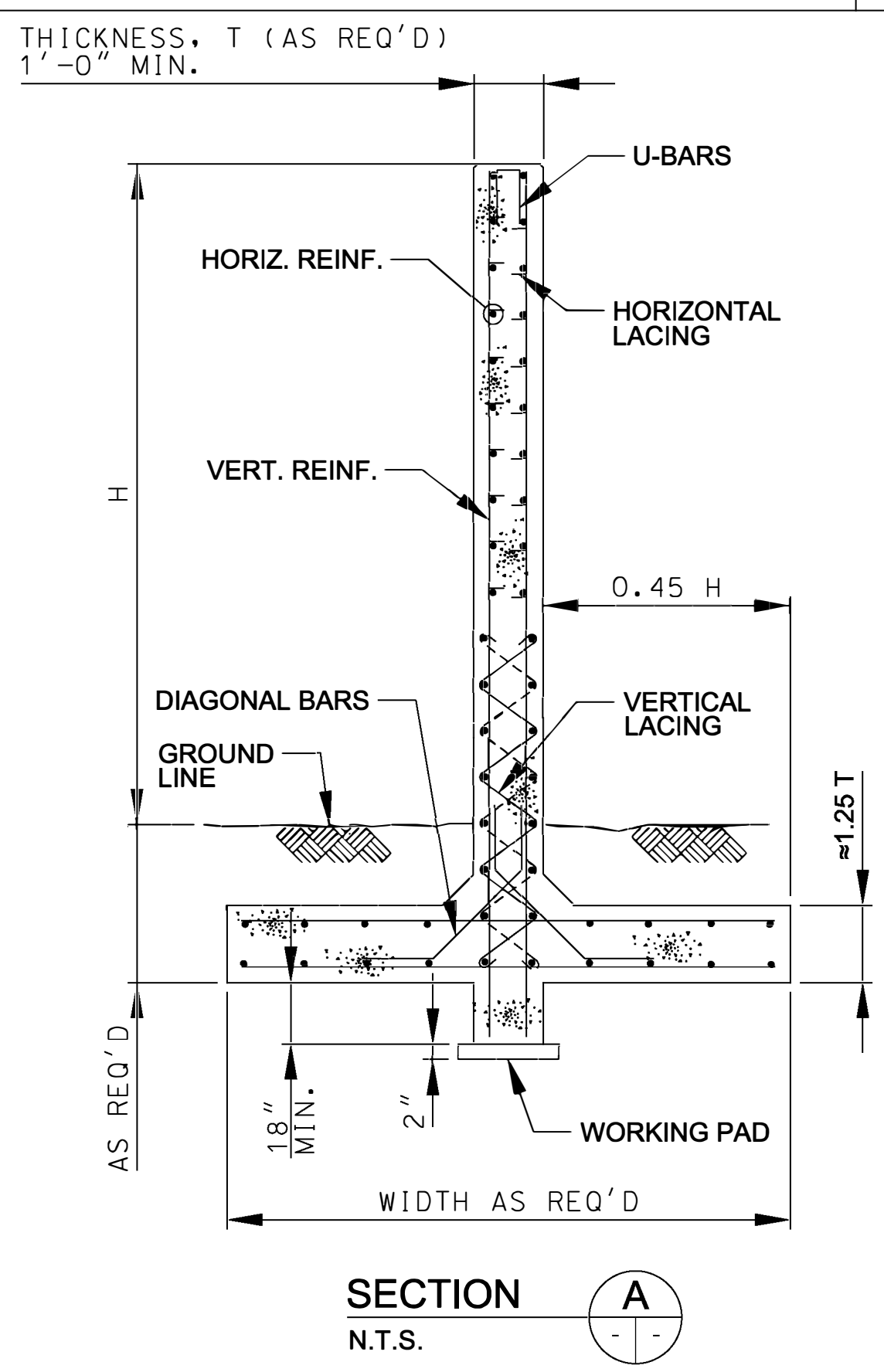
U. S. ARMY CORPS OF ENGINEERS  
 ENGINEERING AND SUPPORT CENTER  
 HUNTSVILLE, ALABAMA

BARRICADES STANDARD DESIGN  
 CANTILEVER WALL  
 PRECAST DOUBLE TEES

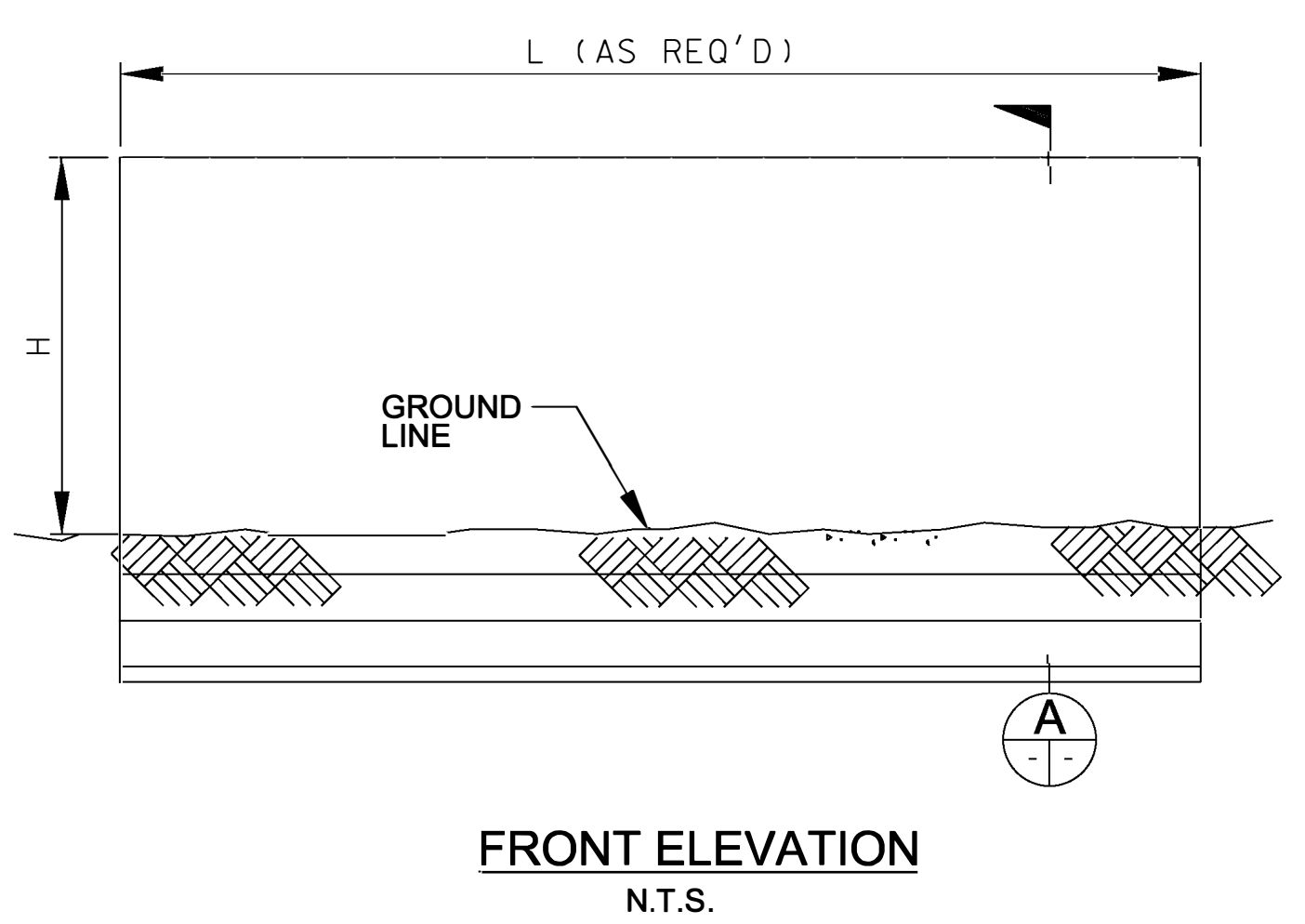
Sheet reference number:  
**8**  
 Sheet 8 of 13

**B14 - PRECAST DOUBLE TEES**

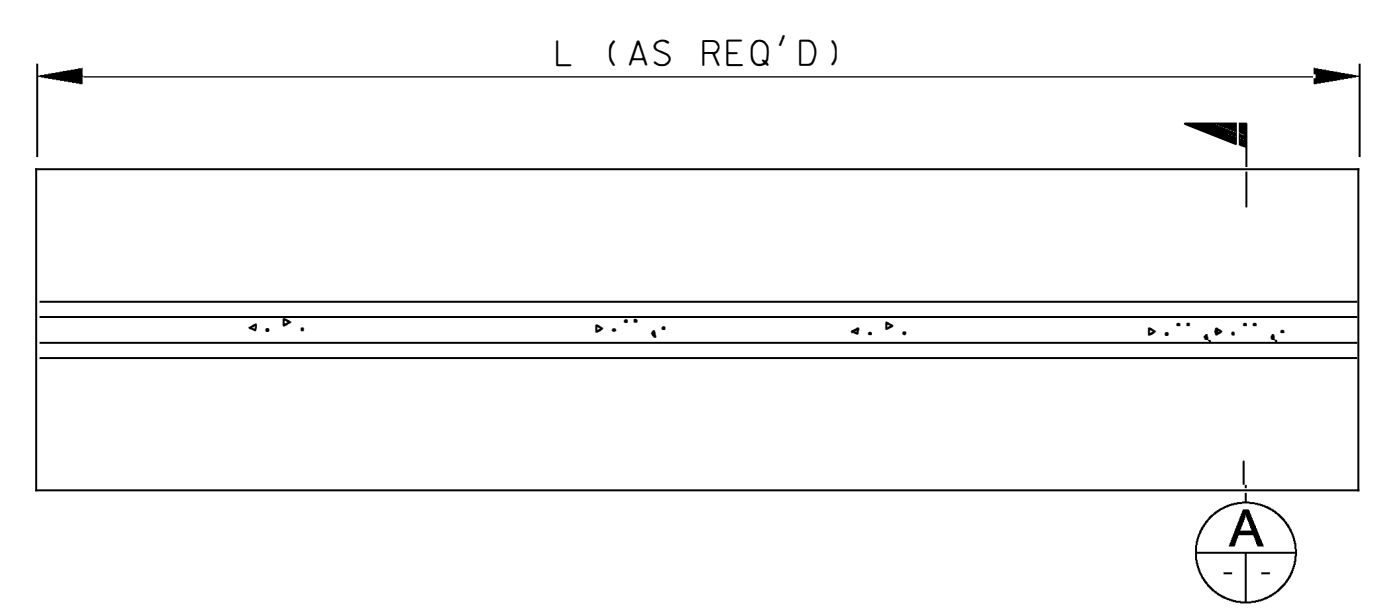
NOTE: SEE SHEET 1 FOR L AND H DIMENSION DETERMINATION



SECTION A  
N.T.S.



FRONT ELEVATION  
N.T.S.



PLAN  
N.T.S.

ESTIMATED ERECTION TIME	
MANHOURS	
100 LIN FT. OF CROSS SECTION, 15 FT HIGH	1,400

- REMARKS:
1. WALL MUST BE DESIGNED IN ACCORDANCE WITH THE REQUIREMENTS OF UFC 3-340-02 (SEE REFERENCES, SHEET 1) TO PREVENT COMMUNICATION OF DETONATION BY BLAST OR FRAGMENTS.
  2. REINFORCEMENT DETAILING IN SECTION A IS SHOWN ONLY AS AN EXAMPLE. ALTERNATE DETAILING IS PERMITTED PER UFC 3-340-02.
  3. USUALLY USED TO RESIST THE EXPLOSIVE OUTPUT OF CLOSE-IN-DETONATIONS (HIGH INTENSITY PRESSURE WITH SHORT DURATIONS)
  4. REQUIRES SPECIAL FABRICATION AND CONSTRUCTION PROCEDURES.
  5. DESCRIPTIONS OF OTHER BLAST WALL CONFIGURATIONS CAN BE FOUND IN UFC 3-340-02.
  6. FOR PROPERLY DESIGNED WALL, EARTH FILL BEHIND WALL IS NOT REQUIRED.



No.	Description	Revisions	Date	Appr.
3	GEN UPDATES/REVISED NOTE 8 ON B16		6/17/2021	
2	GEN UPDATES/REVISIONS & REPLACED B16		5/6/2021	
1	SHEET TOTAL CHANGED		11/22/1991	
	ORIGINAL DOCUMENT		12/2/1988	

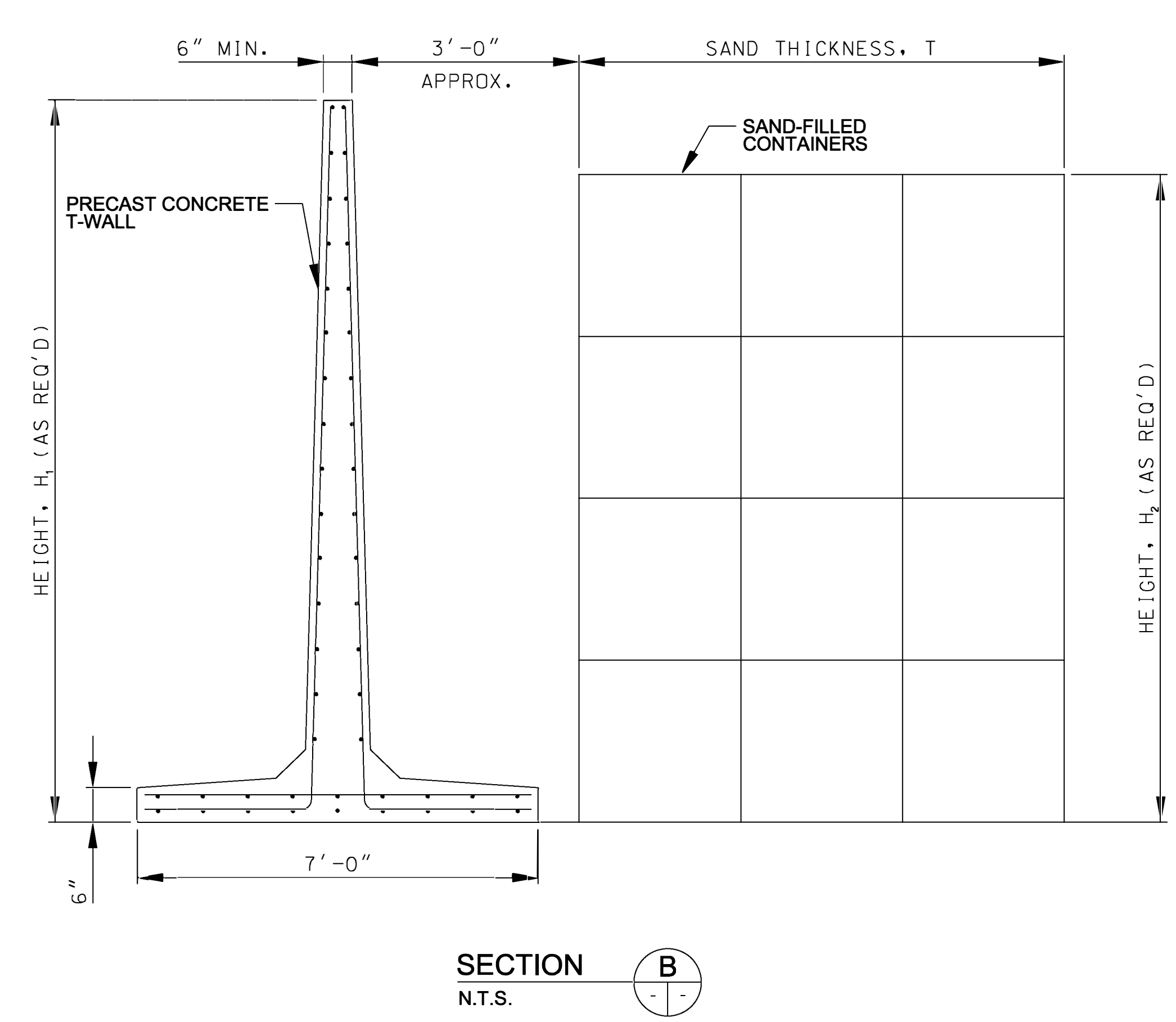
Date:	17 JUNE 2021
Scale:	N.T.S.
Drawing code:	DEF 148-30-01
Date:	30 JUNE 2021

Designed by:	ARB
Drawn by:	MM/CS/DH
Checked by:	CHAD HOUSE, PE
Submitted by:	

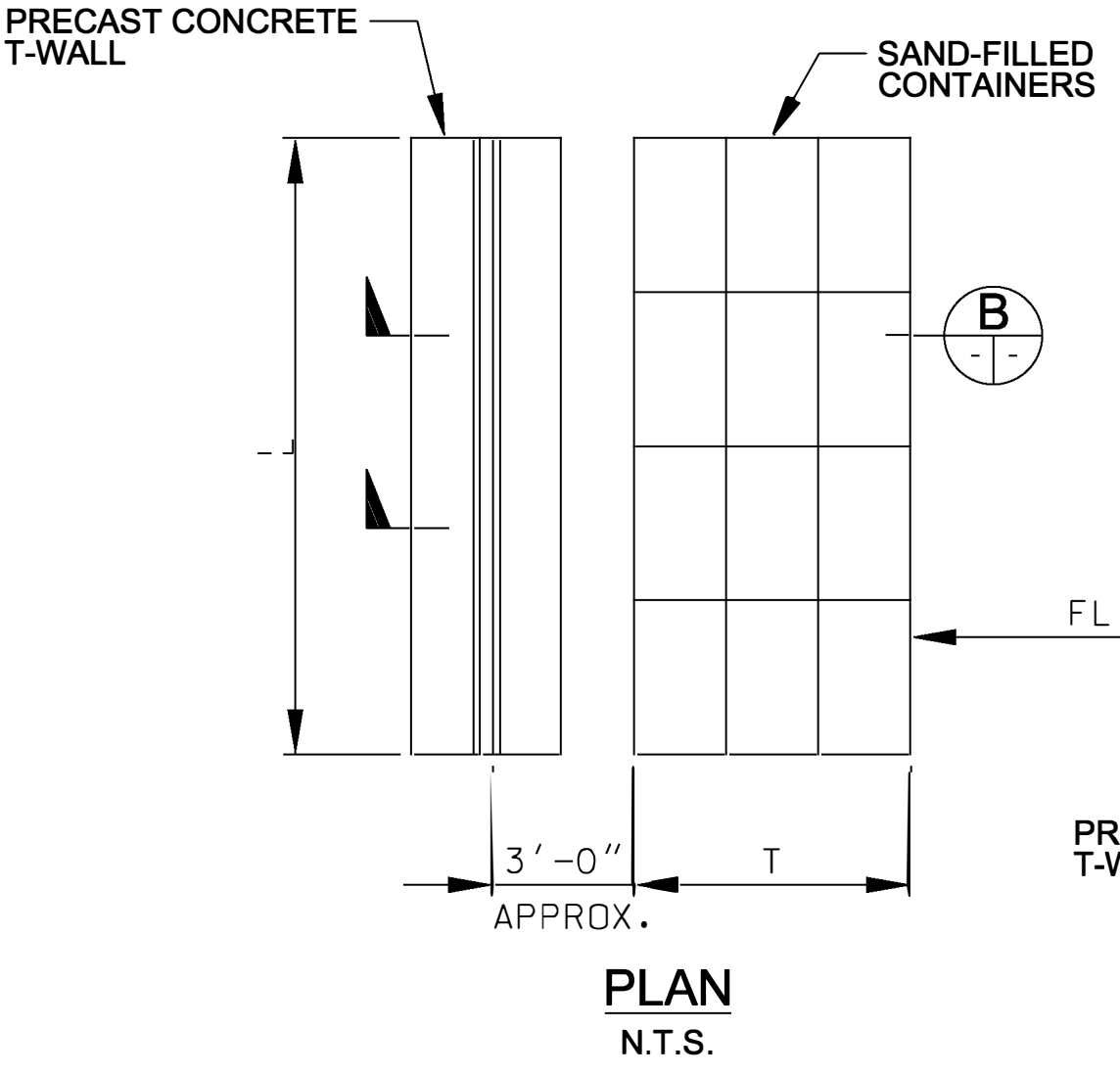
U. S. ARMY CORPS OF ENGINEERS  
ENGINEERING AND SUPPORT CENTER  
HUNTSVILLE, ALABAMA

B15 - CONCRETE BLAST WALL

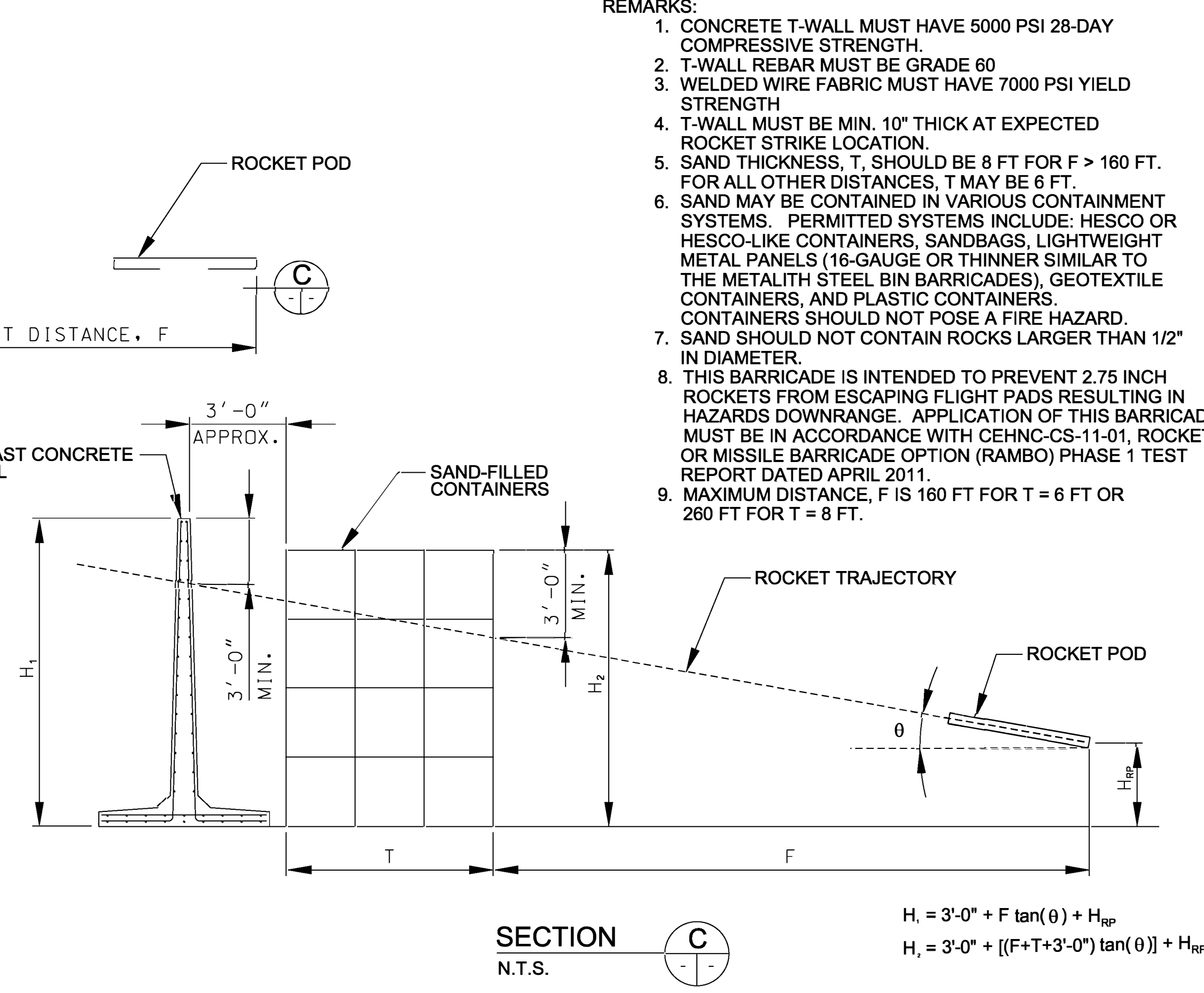
NOTE: SEE SHEET 1 FOR L AND H DIMENSION DETERMINATION



SECTION B  
N.T.S.



PLAN  
N.T.S.



SECTION C  
N.T.S.

$$H_1 = 3'-0" + F \tan(\theta) + H_{RP}$$

$$H_2 = 3'-0" + [(F+T+3'-0") \tan(\theta)] + H_{RP}$$

- REMARKS:
1. CONCRETE T-WALL MUST HAVE 5000 PSI 28-DAY COMPRESSIVE STRENGTH.
  2. T-WALL REBAR MUST BE GRADE 60
  3. WELDED WIRE FABRIC MUST HAVE 7000 PSI YIELD STRENGTH
  4. T-WALL MUST BE MIN. 10" THICK AT EXPECTED ROCKET STRIKE LOCATION.
  5. SAND THICKNESS, T, SHOULD BE 8 FT FOR F > 160 FT. FOR ALL OTHER DISTANCES, T MAY BE 6 FT.
  6. SAND MAY BE CONTAINED IN VARIOUS CONTAINMENT SYSTEMS. PERMITTED SYSTEMS INCLUDE: HESCO OR HESCO-LIKE CONTAINERS, SANDBAGS, LIGHTWEIGHT METAL PANELS (16-GAUGE OR THINNER SIMILAR TO THE METALITH STEEL BIN BARRICADES), GEOTEXTILE CONTAINERS, AND PLASTIC CONTAINERS. CONTAINERS SHOULD NOT POSE A FIRE HAZARD.
  7. SAND SHOULD NOT CONTAIN ROCKS LARGER THAN 1/2" IN DIAMETER.
  8. THIS BARRICADE IS INTENDED TO PREVENT 2.75 INCH ROCKETS FROM ESCAPING FLIGHT PADS RESULTING IN HAZARDS DOWNRANGE. APPLICATION OF THIS BARRICADE MUST BE IN ACCORDANCE WITH CEHNC-CS-11-01, ROCKET OR MISSILE BARRICADE OPTION (RAMBO) PHASE 1 TEST REPORT DATED APRIL 2011.
  9. MAXIMUM DISTANCE, F IS 160 FT FOR T = 6 FT OR 260 FT FOR T = 8 FT.

BARRICADES STANDARD DESIGN  
CONCRETE BLAST WALL  
2.75" ROCKET BARRICADE

Sheet reference number:  
**9**  
Sheet 9 of 13

B16 - 2.75" ROCKET BARRICADE

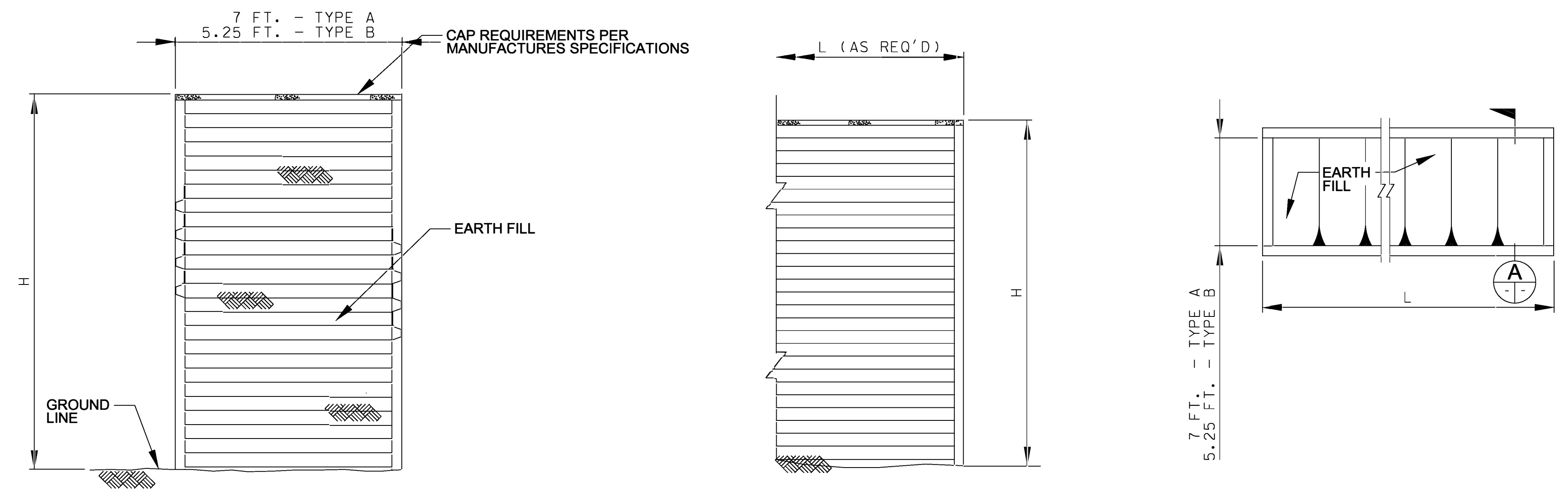
NOTE: SEE SHEET 1 FOR L AND H DIMENSION DETERMINATION

ESTIMATED ERECTION TIME MANHOURS			
100 LIN FT. OF CROSS SECTION, 15 FT HIGH	END TYPE 1	END TYPE 2	END TYPE 3
1,730	200	370	400



No.	Description	Revisions	Date	Appr.
3	GENERAL UPDATES/ ADDED TYPE 4 TO B17		6/17/2021	
2	GENERAL UPDATES AND REVISIONS		3/6/2011	
1	SHEET TOTAL CHANGED		11/22/1991	
	ORIGINAL DOCUMENT		12/27/1988	

- REMARKS:
- EARTH FILLED, STEEL BIN-TYPE DOUBLE-REVETTED BARRICADES ARE PRE-ENGINEERED STRUCTURES EASILY TRANSPORTED TO REMOTE AREAS.
  - MINIMUM SITE PREPARATION REQUIRED.
  - EASILY ASSEMBLED WITH LIGHT WEIGHT EQUIPMENT.
  - AVAILABLE IN WALL HEIGHTS TO 40 FEET.
  - CAN BE DISASSEMBLED AND REINSTALLED WHEN NECESSARY.
  - BARRICADE CAN BE USED IN REDUCED QUANTITY DISTANCE APPLICATIONS PER DESR 6055.09 PARAGRAPH V2.E5.4.5. SEE REFERENCE FOR MORE INFORMATION ON PROTECTIVE CONSTRUCTION TYPE A AND TYPE B REVETMENTS.
  - EQUIVALENT TO TRADE NAMED ARMCO REVETMENTS



SECTION  
N.T.S. A

PARTIAL ELEVATION  
N.T.S.

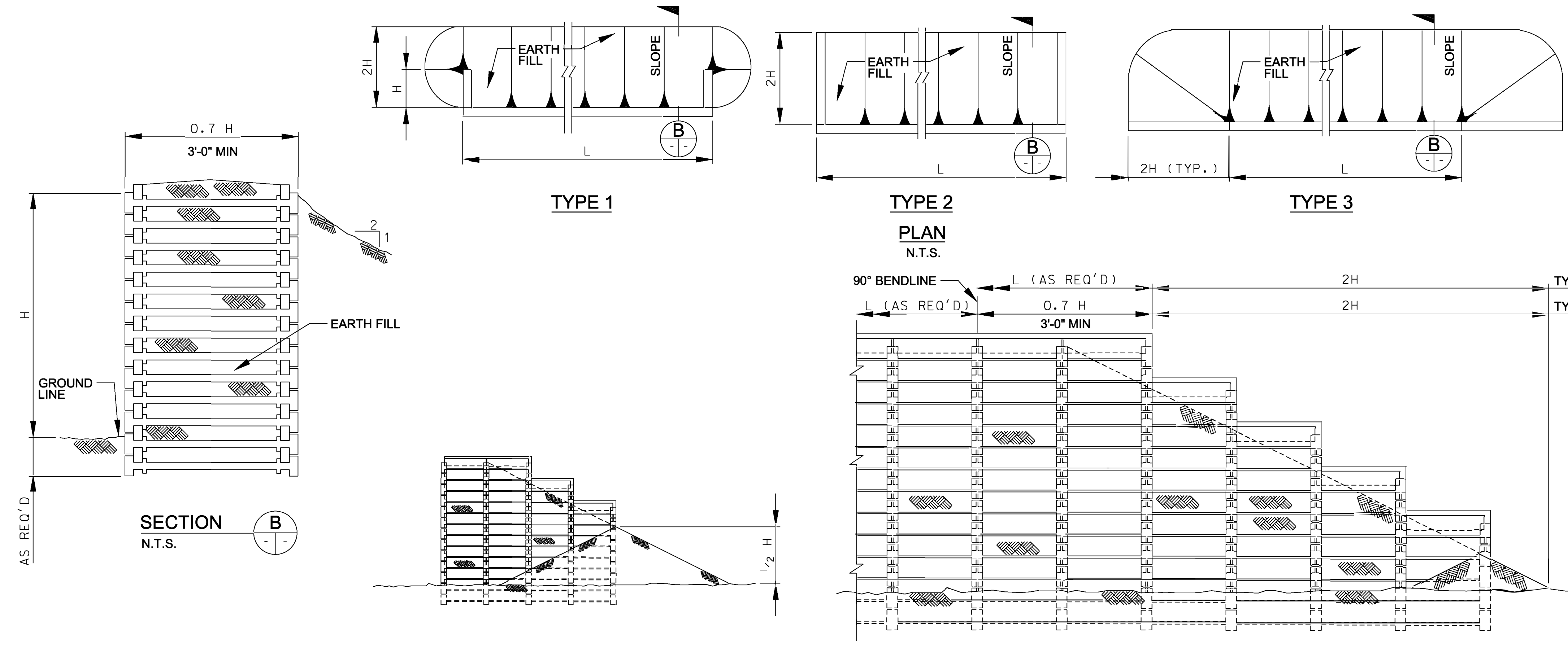
PLAN  
N.T.S.

B17 - STEEL BIN DOUBLE-REVETTED BARRICADE

NOTE: SEE SHEET 1 FOR L AND H DIMENSION DETERMINATION

ESTIMATED ERECTION TIME MANHOURS			
100 LIN FT. OF CROSS SECTION, 15 FT HIGH	END TYPE 1	END TYPE 2	END TYPE 3
1,120	110	170	140

- REMARKS:
- CRIB PRECAST STRUCTURAL MEMBERS (HEADERS AND STRETCHERS) EASILY TRANSPORTED AND ERECTED.
  - MINIMUM SITE PREPARATION REQUIRED.
  - IMPROVED STABILITY CAN BE ACHIEVED WITH 1:6 WALL BATTER (NOT SHOWN).
  - CRIB WALLS CAN BE CONSTRUCTED TO HEIGHTS OVER 45 FEET. HEIGHTS OVER 15 FEET NORMALLY REQUIRE TWIN-CELL CONSTRUCTION AT BASE OF WALL.
  - CAN BE DISASSEMBLED AND REINSTALLED WHEN NECESSARY.
  - SUGGESTED SOURCES (MAY BE AVAILABLE FROM OTHER VENDORS)  
RETAINING WALLS NW  
1299 156th AVE  
SUITE 150  
BELLVUE, WA 98007  
(425) 747-0956  
CONCRIB - HILFIKER RETAINING WALLS  
1902 HILFIKER LANE  
EUREKA, CA 95501



SECTION  
N.T.S. B

END ELEVATION  
N.T.S.

PLAN  
N.T.S.

PARTIAL ELEVATION  
N.T.S.

B18 - CONCRETE CRIBBING

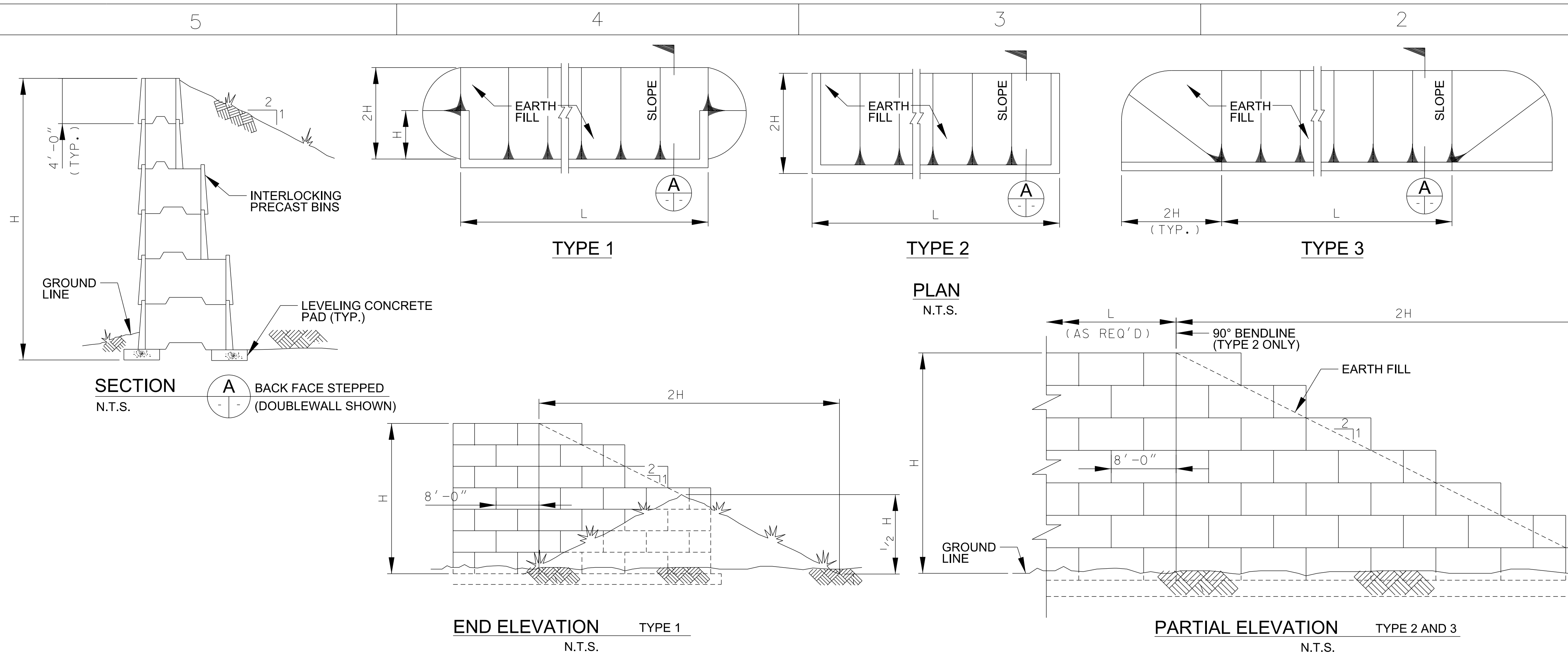
NOTE: SEE SHEET 1 FOR L AND H DIMENSION DETERMINATION

Date:	17 JUNE 2021
Scale:	N.T.S.
Designed by:	ARB
Drawn by:	ARB
Checked by:	MM/CS/DH
Drawing code:	DEF 149-30-01
Submitted by:	CHAD HOUSE, PE
Date:	30 JUNE 2021

U. S. ARMY CORPS OF ENGINEERS  
ENGINEERING AND  
SUPPORT CENTER,  
HUNTSVILLE, ALABAMA

BARRICADES  
STANDARD DESIGN  
STEEL BIN  
CONCRETE CRIBBING

Sheet reference  
number:  
**10**  
Sheet 10 of 13



ESTIMATED ERECTION TIME MANHOURS			
100 LIN. FT. OF CROSS SECTION, 15 FT HIGH	END TYPE 1	END TYPE 2	END TYPE 3
1,600	285	390	390

- REMARKS:
1. CAN BE ECONOMICALLY AND RAPIDLY CONSTRUCTED
  2. ERECTION UNAFFECTED BY CLIMATIC CONDITIONS.
  3. ON-SITE LABOR AND FORM COSTS ARE SMALL.
  4. AESTHETICALLY PLEASING. SELECTED SURFACE FINISHES POSSIBLE.
  5. CAN TOLERATE DIFFERENTIAL SETTLEMENT.
  6. CAN BE DISMANTLED AND RELOCATED.
  7. TRADEMARK:  
UNITED CONCRETE PRODUCTS  
173 CHURCH ST.  
YATESVILLE, CT 06492

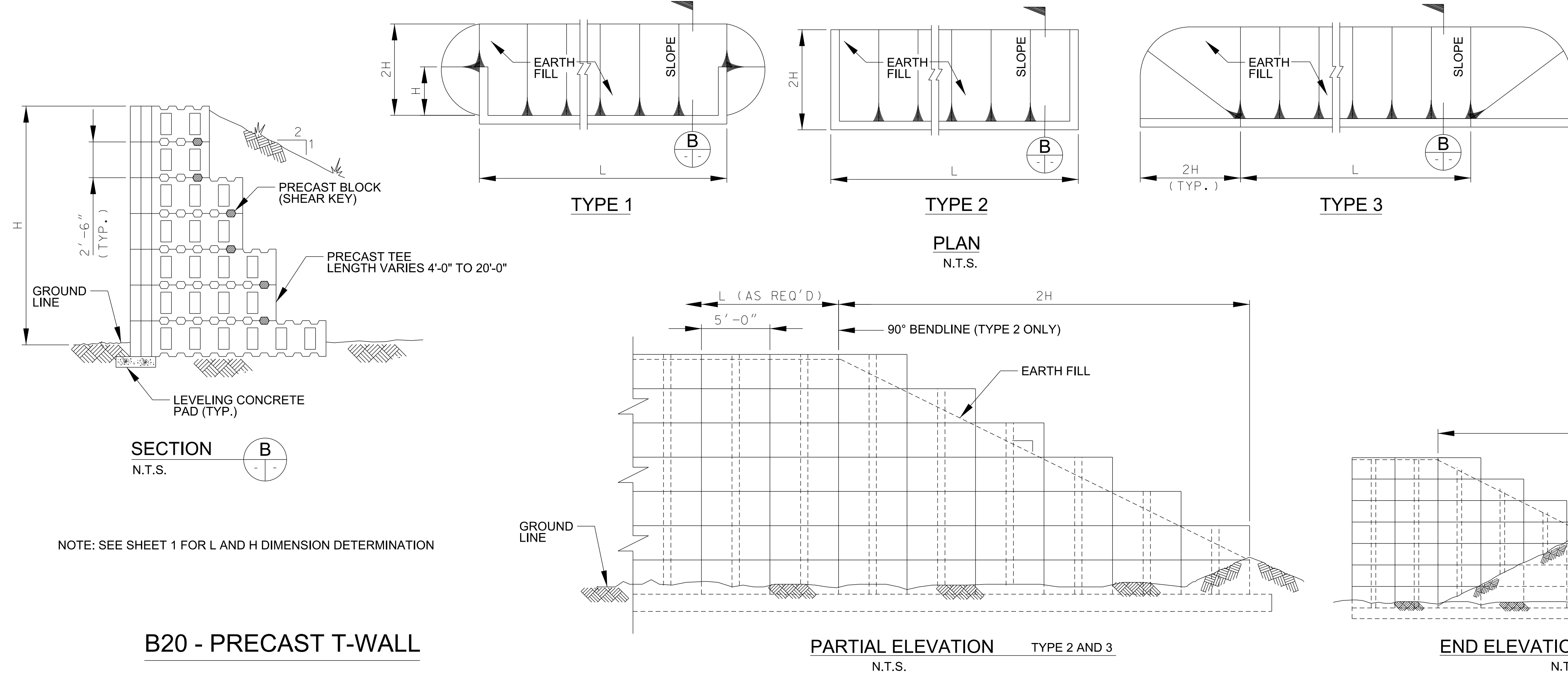


No.	Description	Revisions	Date	Appr.
3	GENERAL UPDATES AND REVISIONS		6/17/2021	
2	GENERAL UPDATES AND REVISIONS		5/6/2011	
1	SHEET TOTAL CHANGED		11/22/1991	
	ORIGINAL DOCUMENT		12/22/1988	

Date:	17 JUNE 2021	Scale:	N.T.S.
Designed by:	ARB	Drawing code:	DEF 149-30-01
Drawn by:	ARB	Checked by:	MMC/SDH
Submitted by:	CHAD HOUSE, PE	Date:	30 JUNE 2021

NOTE: SEE SHEET 1 FOR L AND H DIMENSION DETERMINATION

**B19 - PRECAST CONCRETE BIN**



ESTIMATED ERECTION TIME MANHOURS			
100 LIN. FT. OF CROSS SECTION, 15 FT HIGH	END TYPE 1	END TYPE 2	END TYPE 3
1,130	140	100	180

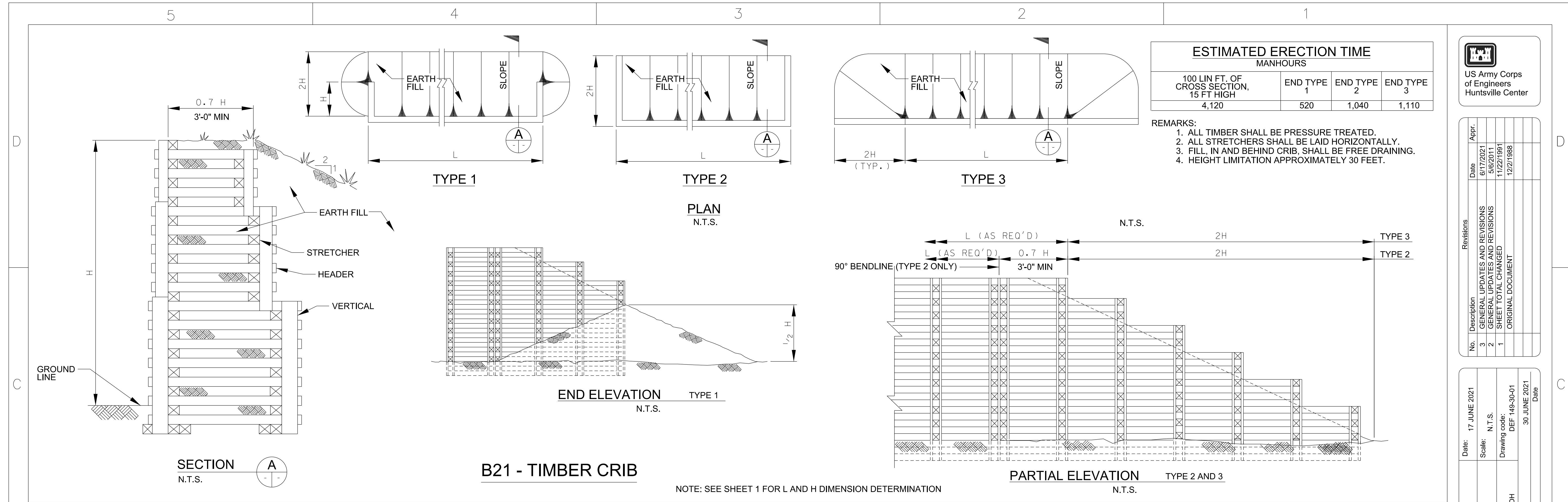
- REMARKS:
1. CAN BE ECONOMICALLY AND RAPIDLY CONSTRUCTED
  2. HEIGHT LIMITATION 27'-0"
  3. STORAGE AND ERECTION SIMPLIFIED DUE TO RIB SYMMETRY.
  4. PRECAST ELEMENTS ARE MANUFACTURED BY LOCAL PRECASTERS.
  5. WALL MAY BE BATTERED.
  6. SUGGESTED SOURCE (MAY BE AVAILABLE FROM OTHER VENDORS)  
THE NEEL COMPANY  
8328-D TRAFORD LANE  
SPRINGFIELD, VA 22152  
(703) 913-7858
  7. TRADEMARK:  
TINDALL CONCRETE PRODUCTS  
3076 N. BLACKSFOCK ROAD  
SPARTANBURG, SC 29301  
(864) 576-3230

U. S. ARMY CORPS OF ENGINEERS  
ENGINEERING AND SUPPORT CENTER  
HUNTSVILLE, ALABAMA

BARRICADES STANDARD DESIGN  
PRECAST CONCRETE BIN  
PRECAST T-WALL

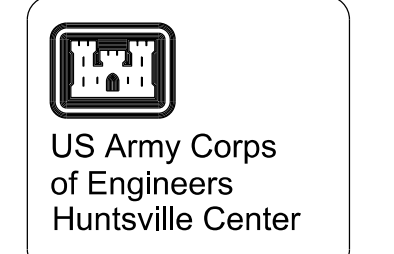
Sheet reference number:  
**11**  
Sheet 11 of 13

NOTE: SEE SHEET 1 FOR L AND H DIMENSION DETERMINATION



ESTIMATED ERECTION TIME MANHOURS			
100 LIN FT. OF CROSS SECTION, 15 FT HIGH	END TYPE 1	END TYPE 2	END TYPE 3
4,120	520	1,040	1,110

- REMARKS:
1. ALL TIMBER SHALL BE PRESSURE TREATED.
  2. ALL STRETCHERS SHALL BE LAID HORIZONTALLY.
  3. FILL, IN AND BEHIND CRIB, SHALL BE FREE DRAINING.
  4. HEIGHT LIMITATION APPROXIMATELY 30 FEET.



No.	Description	Revisions	Date	Appr.
3	GENERAL UPDATES AND REVISIONS		6/17/2021	
2	GENERAL UPDATES AND REVISIONS		5/6/2021	
1	SHEET TOTAL CHANGED		11/22/1991	
	ORIGINAL DOCUMENT		12/2/1988	

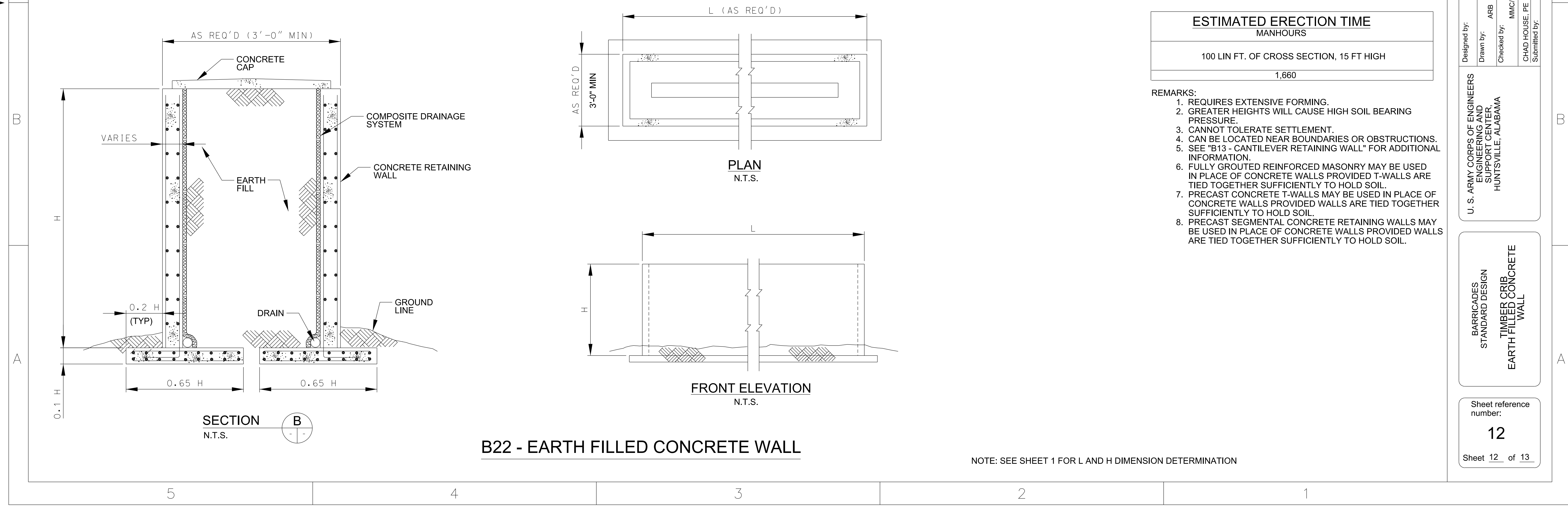
Date:	17 JUNE 2021
Scale:	N.T.S.
Drawing code:	DEF 149-30-01
Submitted by:	CHAD HOUSE, PE
Date:	30 JUNE 2021

Designed by:	ARB
Drawn by:	ARB
Checked by:	M/MC/SDH

U. S. ARMY CORPS OF ENGINEERS  
ENGINEERING AND SUPPORT CENTER  
HUNTSVILLE, ALABAMA

BARRICADES STANDARD DESIGN  
TIMBER CRIB EARTH FILLED CONCRETE WALL

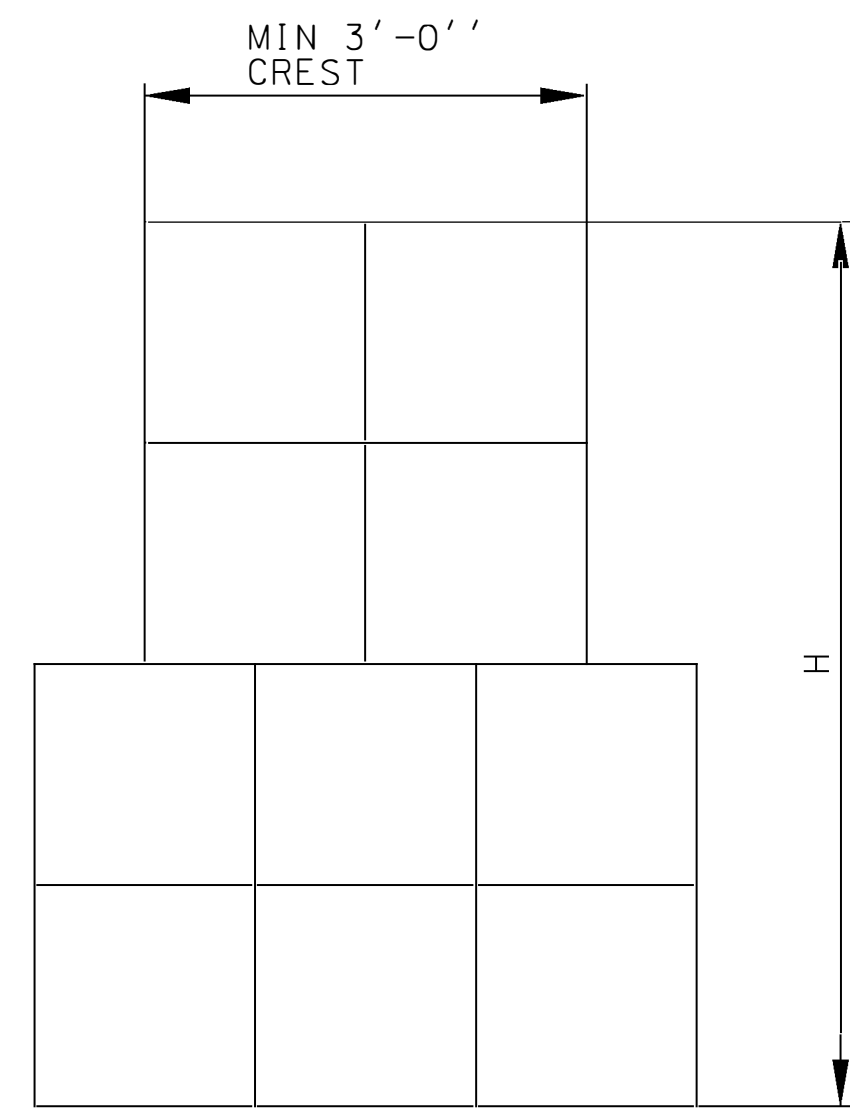
Sheet reference number:  
**12**  
Sheet 12 of 13



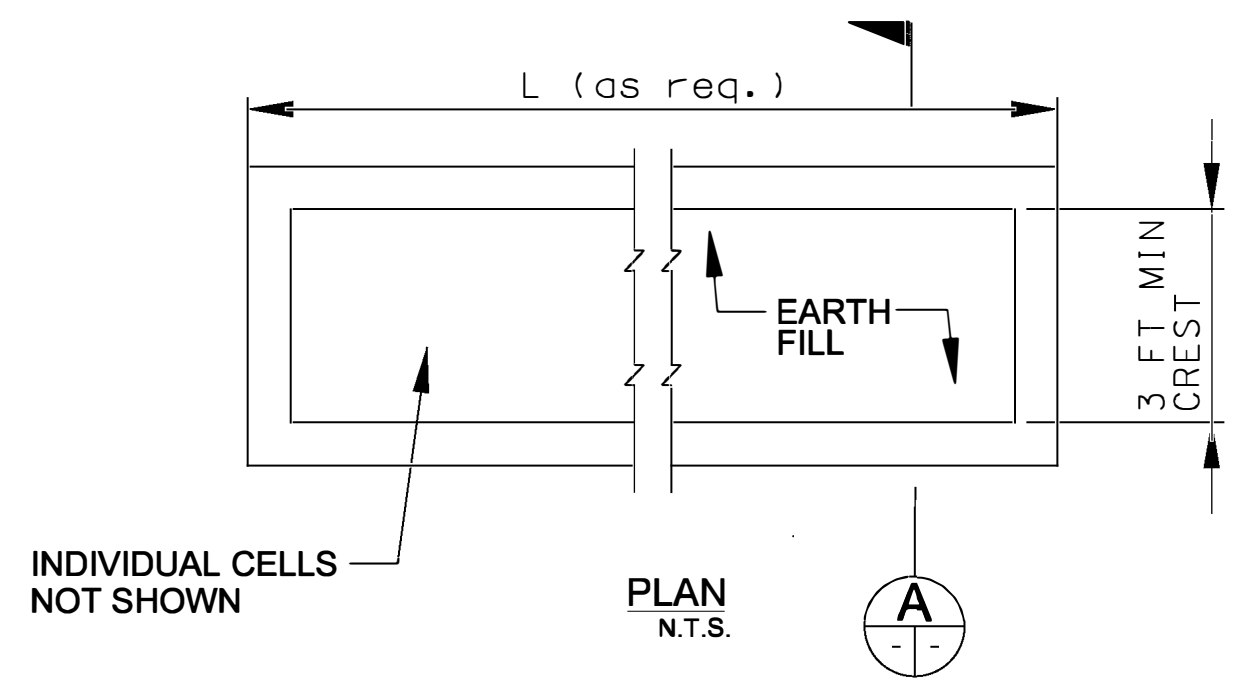
ESTIMATED ERECTION TIME MANHOURS	
100 LIN FT. OF CROSS SECTION, 15 FT HIGH	1,660

- REMARKS:
1. REQUIRES EXTENSIVE FORMING.
  2. GREATER HEIGHTS WILL CAUSE HIGH SOIL BEARING PRESSURE.
  3. CANNOT TOLERATE SETTLEMENT.
  4. CAN BE LOCATED NEAR BOUNDARIES OR OBSTRUCTIONS.
  5. SEE "B13 - CANTILEVER RETAINING WALL" FOR ADDITIONAL INFORMATION.
  6. FULLY GROUTED REINFORCED MASONRY MAY BE USED IN PLACE OF CONCRETE WALLS PROVIDED T-WALLS ARE TIED TOGETHER SUFFICIENTLY TO HOLD SOIL.
  7. PRECAST CONCRETE T-WALLS MAY BE USED IN PLACE OF CONCRETE WALLS PROVIDED WALLS ARE TIED TOGETHER SUFFICIENTLY TO HOLD SOIL.
  8. PRECAST SEGMENTAL CONCRETE RETAINING WALLS MAY BE USED IN PLACE OF CONCRETE WALLS PROVIDED WALLS ARE TIED TOGETHER SUFFICIENTLY TO HOLD SOIL.

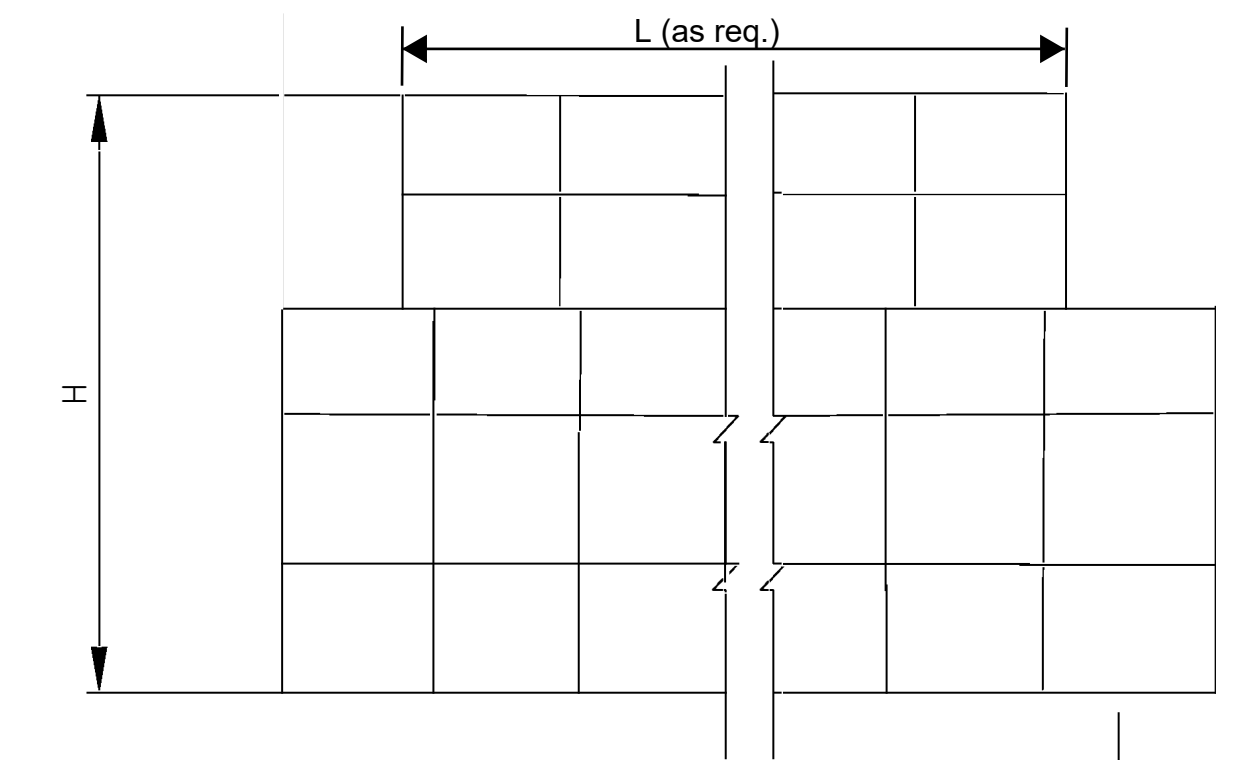
5 4 3 2 1



SECTION A  
N.T.S.



PLAN  
N.T.S.

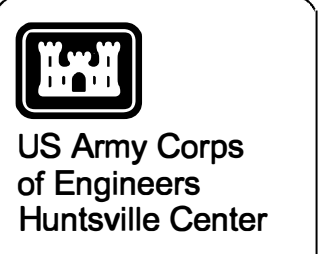


FRONT ELEVATION  
N.T.S.

**B23 - EARTH-FILLED STEEL MESH DEFENSIVE BARRIER (HESCO)**

REMARKS:

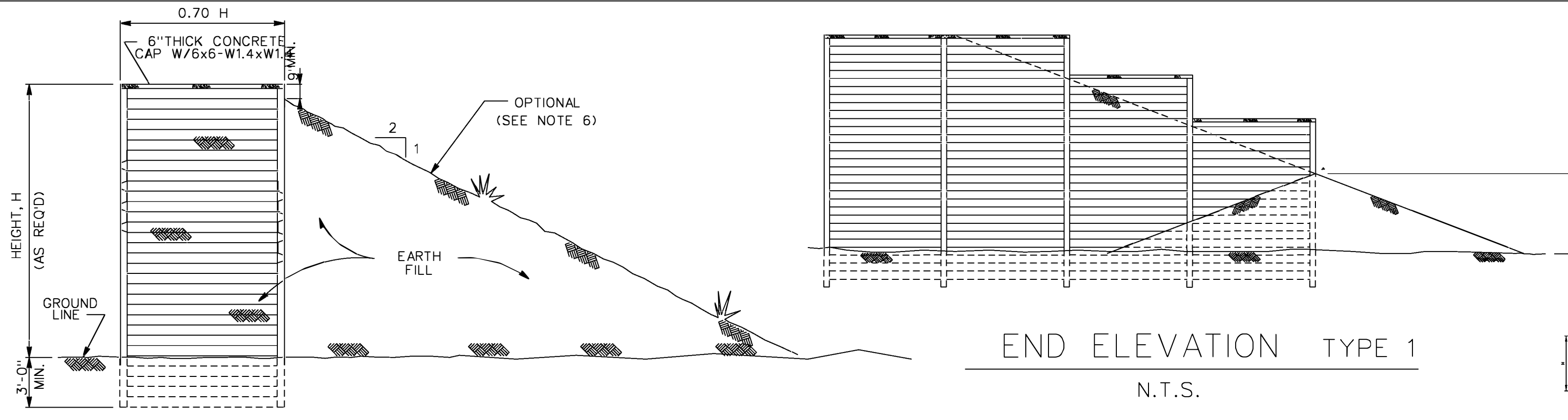
1. UNITS ARE LIGHTWEIGHT, DEPLOYABLE CELLS THAT ARE CONSTRUCTED FROM WELDED STEEL MESH AND A GEOTEXTILE LINER AND FILLED WITH SOIL.
2. CAN BE ECONOMICALLY AND RAPIDLY CONSTRUCTED
3. MINIMUM SITE PREPARATION REQUIRED
4. SOIL FILL PER MANUFACTURER SPECIFICATIONS BUT NOT LARGER THAN REQUIREMENTS ON SHEET 1
5. BARRICADE CAN BE USED AS A REDUCED QUANTITY OPTION IN OPERATIONAL STORAGE SCENARIOS PER DDESB TP-15, SEE REFERENCES
6. TYPICAL HESCO SIZES USED: MIL 7 (BOTTOM, 7.25' H x 7.0' W), MIL 4 (TOP, 3.25' H x 5.0' W), OTHERS OF EQUIVALENT SIZE CAN BE USED.
7. SUGGESTED SOURCES (MAY BE AVAILABLE FROM OTHER VENDORS)  
HESCO  
3450-C BUFFALO AVENUE  
NORTH CHARLESTON, SC 29418  
(985)-345-7332



No.	Description	Date	Appr.
	SHEET 13 ADDED	6/17/2021	

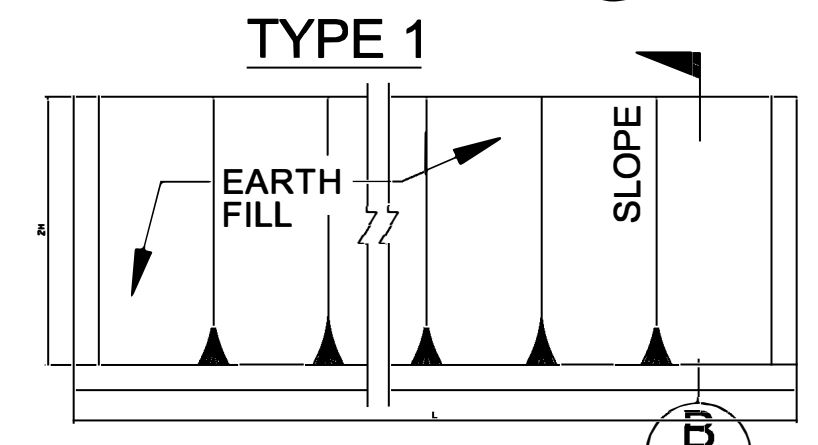
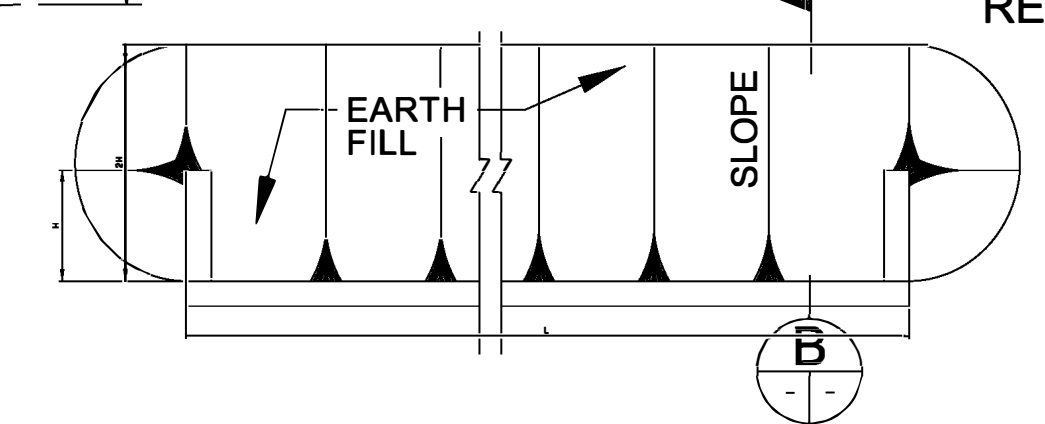
Date:	17 JUNE 2021
Scale:	N.T.S.
Designed by:	ARB
Drawn by:	MM/CS/DH
Checked by:	CHAD HOUSE, PE
Drawing code:	DEF 145-30-01
Submitted by:	
Date:	30 JUNE 2021

NOTE: SEE SHEET 1 FOR L AND H DIMENSION DETERMINATION

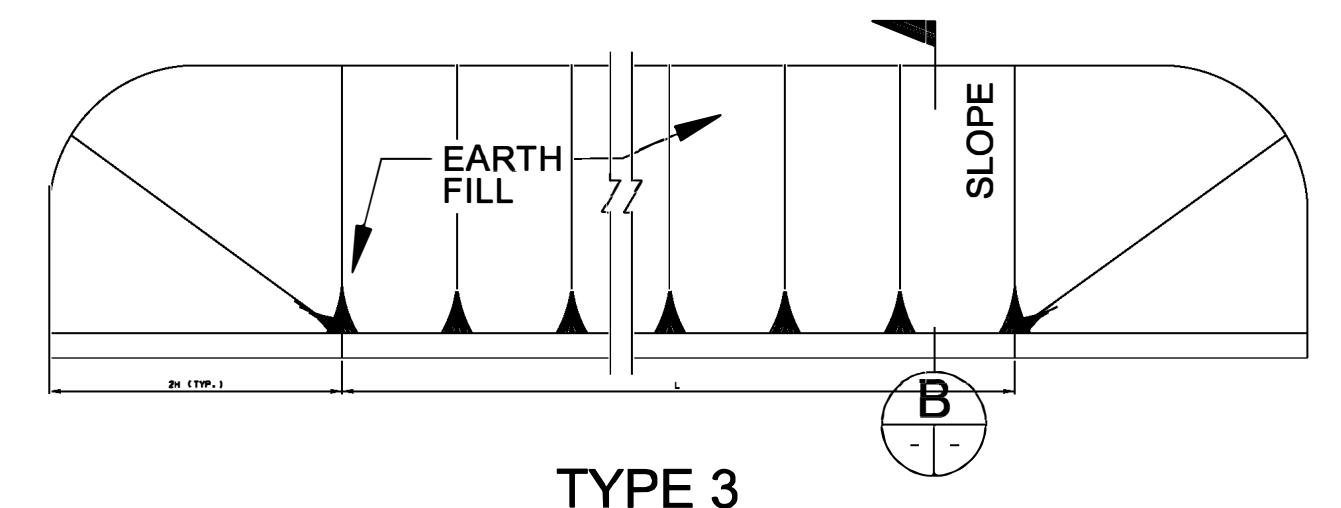


SECTION B  
N.T.S.

END ELEVATION TYPE 1  
N.T.S.



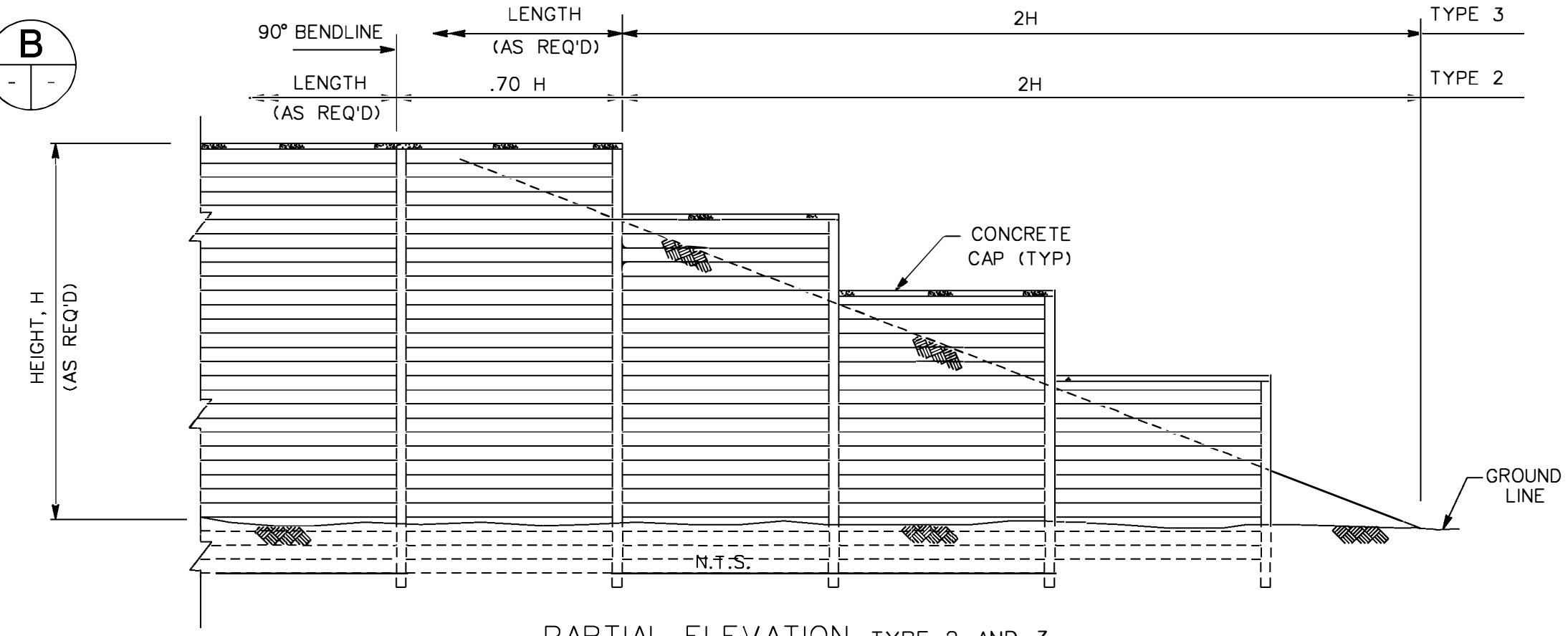
TYPE 2



TYPE 3

REMARKS:

1. STEEL BIN SINGLE-RETTED RETAINING WALLS ARE PRE-ENGINEERED STRUCTURES EASILY TRANSPORTED TO REMOTE AREAS.
2. MINIMUM SITE PREPARATION REQUIRED.
3. EASILY ASSEMBLED WITH LIGHT WEIGHT EQUIPMENT.
4. CAN BE DISASSEMBLED AND REINSTALLED WHEN NECESSARY.



PARTIAL ELEVATION TYPE 2 AND 3  
N.T.S.

**B24 - STEEL BIN SINGLE- REVETTED RETAINING WALL**

NOTE: SEE SHEET 1 FOR L AND H DIMENSION DETERMINATION

ESTIMATED ERECTION TIME			
MANHOURS			
100 LIN FT. OF CROSS SECTION, 15 FT HIGH	END TYPE 1	END TYPE 2	END TYPE 3
1,730	200	370	400

Designed by: U. S. ARMY CORPS OF ENGINEERS  
Drawn by: ARB  
Checked by: MM/CS/DH  
Submitted by: CHAD HOUSE, PE

BARRICADES STANDARD DESIGN  
HESCO

Sheet reference number:  
**13**  
Sheet 13 of 13

5 4 3 2 1