CORPS OF ENGINEERS | 4 | 3 | 2 | 1 | U.S. ARMY

US ARMY CORPS
OF ENGINEERS
HUNTSVILLE DIVISION

DEFINITIVE DRAWINGS

BARRICADES

APPROVED FUNCTIONAL ADEQUACY	
TITLE:	DATE :
PREPARED BY	
PRINCIPAL, A/E FIRM	DATE :
CONSTRUCTIBILITY REVIEW	
CHIEF,CONSTRUCTION DIV.	DATE :
REVIEWED BY :	
CHIEF,CS BRANCH	DATE :
REVIEWED BY :	
CHIEF,ME BRANCH	DATE :
RECOMMENDED BY :	
CHIEF,ENGINEER DIVISION	DATE :
APPROVED BY :	
DIVISION ENGINEER	DATE :

SYMBOL	DESCRIPTION	DATE	APPROVED
	REVISIONS		

US ARMY ENGINEER DIVISION,
HUNTSVILLE
CORPS OF ENGINEERS
HUNTSVILLE, ALABAMA

SITE ADAPT A/E :

US ARMY CORPS OF ENGINEERS

BARRICADES

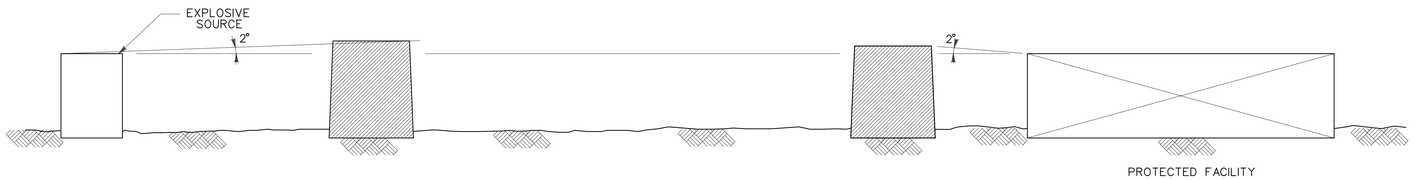
DWN. BY : RDP
CKD. BY : AF

COVER SHEET

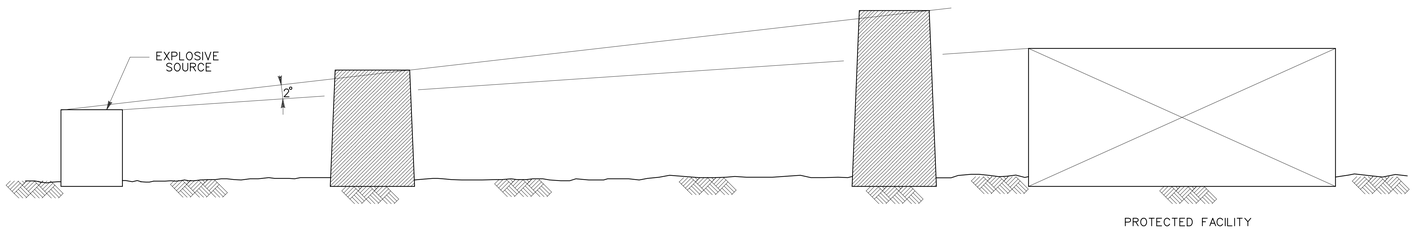
REVIEWED BY :
DATE : 2 DEC 88
SHEET REFERENCE NUMBER : **G-1**
DESIGN FILE NO. :
REV
APPROVED BY :
DRAWING CODE : DEF 149-30-01
SHEET OF

5 | 4 | 3 | 2 | 1

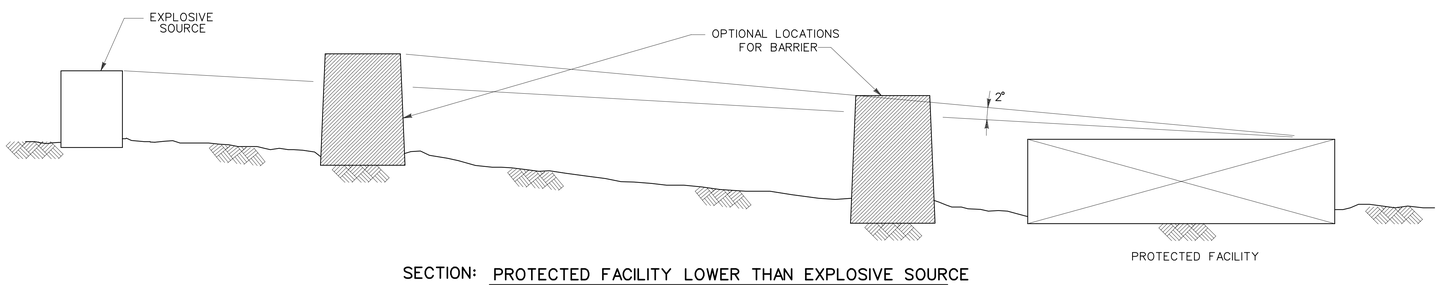
BARRCS.DGN



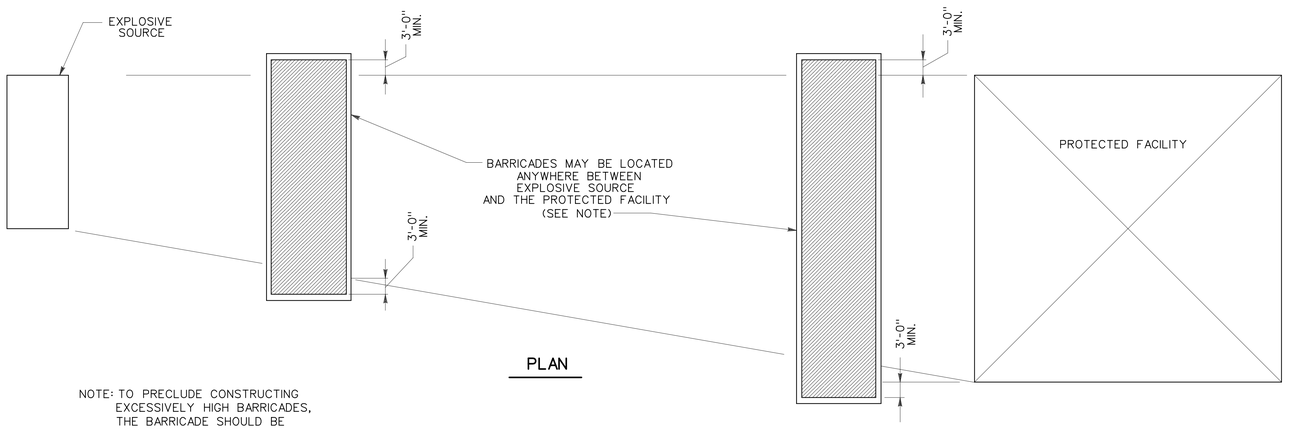
SECTION: PROTECTED FACILITY LEVEL WITH EXPLOSIVE SOURCE



SECTION: PROTECTED FACILITY HIGHER THAN EXPLOSIVE SOURCE



SECTION: PROTECTED FACILITY LOWER THAN EXPLOSIVE SOURCE



PLAN

NOTE: TO PRECLUDE CONSTRUCTING EXCESSIVELY HIGH BARRICADES, THE BARRICADE SHOULD BE LOCATED AS CLOSE AS POSSIBLE TO THE EXPLOSIVE SOURCE/STACK ON WHICH THE REFERENCE POINT IS ESTABLISHED.

GENERIC BARRICADE

N.T.S.

REFERENCES

DOD 6055.9-STD	AMMUNITION AND EXPLOSIVES SAFETY STANDARDS.
AR 385-64	AMMUNITION AND EXPLOSIVES SAFETY STANDARDS
AMC-R 385-100	SAFETY MANUAL.(FOR AMC FACILITIES ONLY)
TM 5-855-1	FUNDAMENTAL OF PROTECTIVE DESIGN FOR CONVENTIONAL WEAPONS.
TM 5-1300	STRUCTURES TO RESIST THE EFFECTS OF ACCIDENTAL EXPLOSIONS
TM 9-1300-206	AMMUNITION AND EXPLOSIVES STANDARD

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 PROTECTIVE STRUCTURES WHICH ACT AS A BARRIER BETWEEN AN EXPLOSIVE SOURCE AND A PROTECTED FACILITY. WHEN PROPERLY CONSTRUCTED, THEY ARE EFFECTIVE AGAINST HIGH VELOCITY, LOW ANGLE FRAGMENTS, EVEN THOUGH THE BARRICADE MAY BE DESTROYED IN THE PROCESS. FRAGMENTS MOVE ALONG BALLISTIC TRAJECTORIES RATHER THAN STRAIGHT LINES, THEREFORE REASONABLE MARGINS IN BARRICADE HEIGHT AND LENGTH MUST BE PROVIDED BEYOND THE MINIMUM DIMENSIONS WHICH BLOCK LINE OF SIGHT.(SEE "GENERIC BARRICADE", THIS SHEET.)
- LIMITATIONS - BARRICADES PROVIDE LIMITED PROTECTION AGAINST BLAST OVERPRESSURES IN THE NEAR RANGE (AT A DISTANCE OF 2 TO 10 TIMES BARRICADE HEIGHT). THEY ARE NOT EFFECTIVE IN REDUCING BLAST OVERPRESSURES IN THE FAR RANGE. FOR THIS REASON, EVEN WHEN BARRICADES ARE USED, FACILITIES MAY STILL REQUIRE PROTECTION FROM OVERPRESSURES.
- 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:
  - THE SLOPE OF ANY FREE-STANDING EARTH FILL (UNREINFORCED) SHALL NOT BE STEEPER THAN 2 UNITS HORIZONTALLY TO 1 UNIT VERTICALLY.
  - EARTH FILL MATERIAL SHALL BE REASONABLY COHESIVE (SOLID OR WET CLAY OR SIMILAR TYPES OF SOILS MAY NOT BE USED AS THEY ARE TOO COHESIVE), FREE FROM DELETERIOUS ORGANIC MATTER, TRASH, DEBRIS, AND STONES HEAVIER THAN TEN POUNDS OR LARGER THAN SIX INCHES IN DIAMETER.
- 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 SOURCE OF INFORMATION.
- COSTS - COST DATA IS BASED ON CONSTRUCTION IN WASHINGTON, D.C., WITH MIDPOINT OF CONSTRUCTION JANUARY 1989.
  - COST IS BASED ON BARRICADE HEIGHT OF 15 FEET.
  - LIFE CYCLE ANALYSIS SHOULD BE USED TO DETERMINE LEAST COST FOR BARRICADES WITH A SIGNIFICANT DESIGN LIFE.
  - ESTIMATES ARE ROUGH ORDER OF MAGNITUDE (ROM) AND SHOULD BE USED FOR COMPARISON PURPOSES ONLY. THESE ESTIMATES SHOULD NOT BE USED AS GOVERNMENT ESTIMATES. ESTIMATES MAY VARY WIDELY DEPENDING ON AVAILABILITY OF LOCAL MATERIALS AND SITE SPECIFIC CONDITIONS.
  - MAN-HOUR ESTIMATES DO NOT INCLUDE OVERHEAD MAN-HOURS OR MOVE IN/MOVE-OUT TIME.

Symbol	Description	Date	Approved
1	GENERAL REVISIONS	22NOV91	

Revisions

U.S. ARMY ENGINEER DIVISION, HUNTSVILLE
CORPS OF ENGINEERS
HUNTSVILLE, ALABAMA

Site adapt A/E :

US Army Corps of Engineers

Dwn. by : RDP
Ckd. by : AF

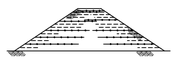
BARRICADES

Reviewed by :
Approved by :
Date : 2 DEC 88
Drawing code : DEF 149-30-01
Sheet reference number : 1
Design file no. : 51722
Rev.
Sheet 1 of 13

barr1.dgn

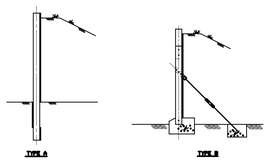
CORPS OF ENGINEERS — U.S. ARMY

S1 - EARTH MOUND

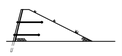


S2 - REINFORCED EARTH MOUND

S3 - WRAP-AROUND EARTH MOUND



S4 - TIMBER-SINGLE REVETTED



S5 - TIMBER-SINGLE REVETTED

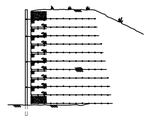
S6 - SAND BAG-SINGLE REVETTED

S7 - CONCRETE GRAVITY WALL-SINGLE REVETTED

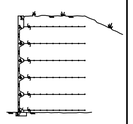
S8 - TIMBER-DOUBLE REVETTED

S9 - REINFORCED SOIL-SINGLE REVETTED

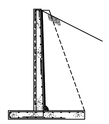
S10 - REINFORCED SOIL-DOUBLE REVETTED



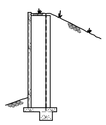
S11 - WRAPAROUND RETAINING WALL



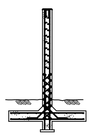
S12 - WAFFLE CRETE RETAINING WALL



S13 - CANTILEVER RETAINING WALL



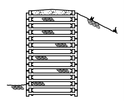
S14 - PRECAST DOUBLE TEES



S15 - CONCRETE BLAST WALL

S16 - COMPOSITE WALL SYSTEM

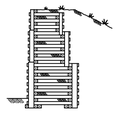
S17 - STEEL BIN



S18 - CONCRETE CRIBBING

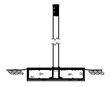
S19 - PRECAST CONCRETE BIN

S20 - PRECAST T-WALL



S21 - TIMBER CRIB

S22 - EARTH FILLED CONCRETE WALL



S23 - VENTED SUPPRESSIVE SHIELD WALL SYSTEM

SYMBOL	DESCRIPTION	DATE	APPROVED
1	B23 TYPE BARRICADE ADDED/SHEET TOTAL CHANGED 2(NOW 1)		

REVISIONS

U.S. ARMY ENGINEER DIVISION, HUNTSVILLE
CORPS OF ENGINEERS
HUNTSVILLE, ALABAMA

US ARMY CORPS OF ENGINEERS

SITE ADAPT A/E :

DWN. BY RDP | CKD. BY AF

REVIEWED BY :

APPROVED BY :

DATE : 2 DEC 88

DRAWING CODE : DEF 149-30-01

SHEET REFERENCE NUMBER : 2

DESIGN FILE NO.: 91123

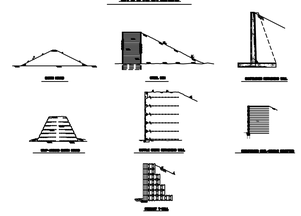
REV

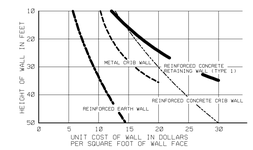
SHEET 2 OF 13

BARRICADES

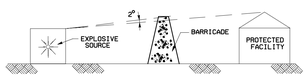
BARR2.DGN

BARRICADES

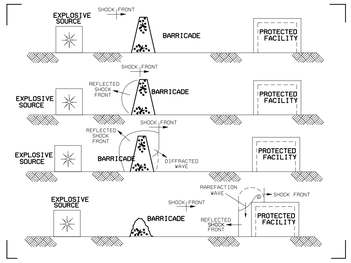


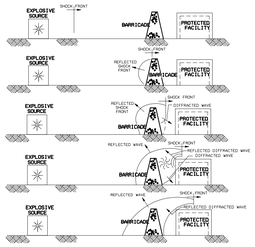


(EXTRACTED FROM "THE REINFORCED EARTH CO. LITERATURE)



- BARRICADES
- FUNCTION AND LIMITATION
- BARRICADE REQUIREMENTS
- LOCATION OF BARRICADES
- BARRICADE TYPES

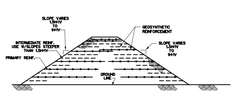




B1 - EARTH MOUND

REMARKS:

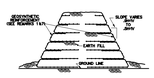
1. CAN BE RAPIDLY CONSTRUCTED WITH UNSKILLED LABOR.
2. NO HEIGHT OR LENGTH LIMITATIONS.
3. UNSUITABLE WHERE SPACE IS LIMITED.
4. REQUIRES SOIL STABILIZATION (SEEDING, ETC.)
5. REQUIRES REPEATED MAINTENANCE.



B2 - REINFORCED EARTH MOUND

REMARKS:

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

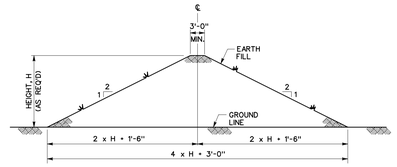


B3 - WRAP-AROUND REINFORCED EARTH MOUND

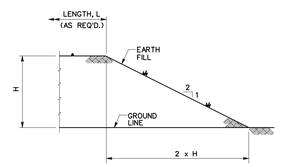
REMARKS:

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

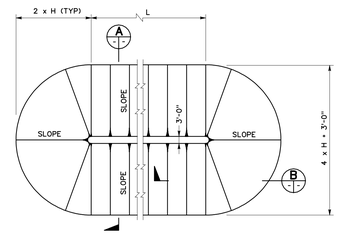
CORPS OF ENGINEERS | 4 | 3 | 2 | 1 | U.S. ARMY



SECTION (A)
N.T.S.



PARTIAL ELEVATION (B)
N.T.S.



PLAN
N.T.S.

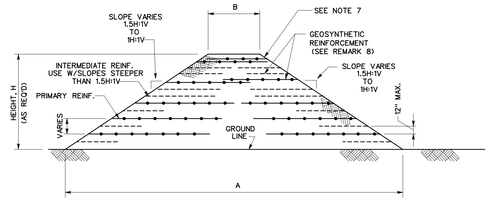
B1 - EARTH MOUND

ESTIMATED COST, $	
PER LIN. FT. OF CROSS-SECTION, 15 FT. HIGH	LUMP SUM BARRICADE END
230	2,600

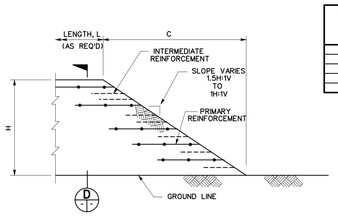
ESTIMATED ERECTION TIME MANHOURS	
100 LIN. FT. OF CROSS-SECTION, 15 FT. HIGH	BARRICADE END
920	90

REMARKS:

1. CAN BE RAPIDLY CONSTRUCTED WITH UNSKILLED LABOR.
2. NO HEIGHT OR LENGTH LIMITATIONS.
3. UNSUITABLE WHERE SPACE IS LIMITED.
4. REQUIRES SOIL STABILIZATION (SEEDING, ETC.)
5. REQUIRES REPEATED MAINTENANCE.



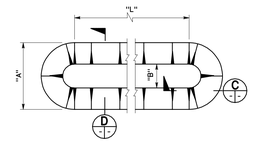
SECTION (D)
N.T.S.



PARTIAL ELEVATION (C)
N.T.S.

HEIGHT OF MOUND "H"	WIDTH OF BASE "A"	WIDTH AT TOP "B"	WIDTH OF END "C"
	1.5H:1V TO 1H:1V	1.5H:1V TO 1H:1V	
10'	3.60H TO 2.8H	0.60H TO 0.80H	SLOPE x "H"
15'	3.60H TO 2.8H	0.60H TO 0.74H	"
22'	3.60H TO 2.8H	0.55H TO 0.73H	"
30'	3.60H TO 2.7H	0.54H TO 0.70H	"
40'	3.60H TO 2.7H	0.53H TO 0.70H	"

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



PLAN
N.T.S.

B2 - REINFORCED EARTH MOUND

ESTIMATED COST, $	
PER LIN. FT. OF CROSS-SECTION, 15 FT. HIGH	LUMP SUM BARRICADE END
500	4,800

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

REMARKS:

1. REDUCED FILL REQUIREMENT OVER UNREINFORCED EARTH MOUND.
2. EFFICIENT CONSTRUCTION AND USE OF LAND.
3. CAN BE RAPIDLY CONSTRUCTED WITH UNSKILLED LABOR.
4. ALLOWS CONSTRUCTION OF STEEPER SLOPES THAN THE SOIL'S NATURAL ANGLE OF REPOSE.
5. NO HEIGHT OR LENGTH LIMITATIONS.
6. REINFORCEMENT IS LIGHTWEIGHT AND EASILY CUT ON SITE.
7. REQUIRES SOIL STABILIZATION. GRASS COVER, IF USED, IS DIFFICULT TO MAINTAIN.
8. GEOSYNTHETIC REINFORCEMENT IS PLASTIC MESH MADE OF HIGH-DENSITY POLYMERS.
   SOURCE: THE TENSAR CORP.
   P.O.BOX 986
   MORROW, GA. 80260
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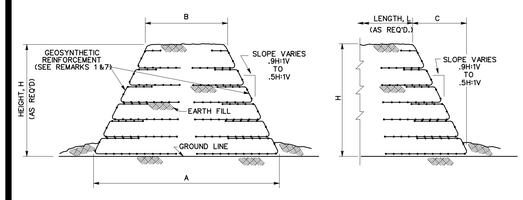
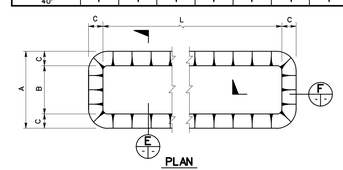


SECTION (E)
N.T.S.

PARTIAL ELEVATION (F)
N.T.S.

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	.80 H	.75 H	.70 H	.50 H	.75 H	.90 H
15'	↓	↓	↓	↓	↓	↓	↓	↓	↓
22'	↓	↓	↓	↓	↓	↓	↓	↓	↓
30'	↓	↓	↓	↓	↓	↓	↓	↓	↓
40'	↓	↓	↓	↓	↓	↓	↓	↓	↓



PLAN
N.T.S.

B3 - WRAP-AROUND REINFORCED EARTH MOUND

ESTIMATED COST, $	
PER LIN. FT. OF CROSS-SECTION, 15 FT. HIGH	LUMP SUM BARRICADE END
380	8,700

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

REMARKS:

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

Symbol	Description	Date	Approved
A	SHEET TOTAL CHANGED	23NOV	

Revisions

U.S. ARMY ENGINEER DIVISION, HUNTSVILLE
CORPS OF ENGINEERS
HUNTSVILLE, ALABAMA

Site adapt A/E :

US Army Corps of Engineers

Dwn. by : RDP | Ckd. by : AF

BARRICADES

Reviewed by :
Approved by :
Date : 2 DEC 88
Sheet reference number : 3
Drawing code : DEF 149-30-01
Design file no. : 51724
Rev
Sheet 3 of 13

5 | 4 | 3 | 2 | 1

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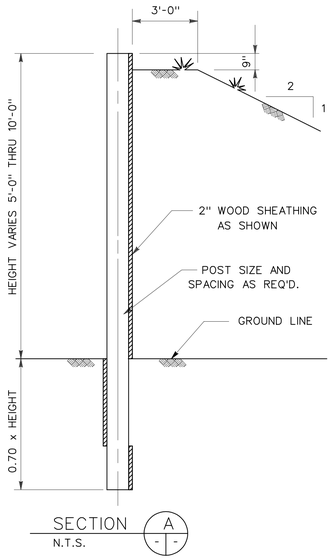
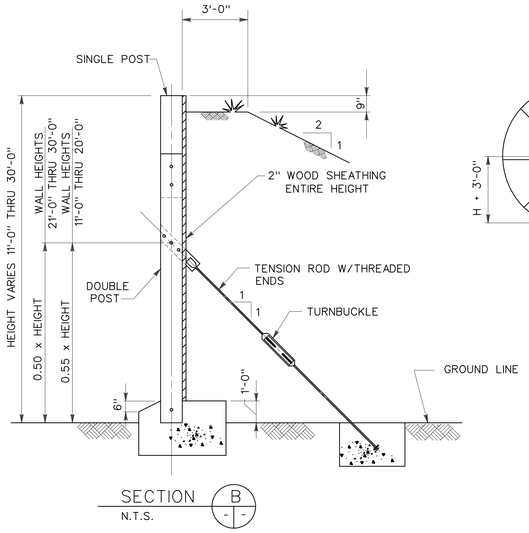


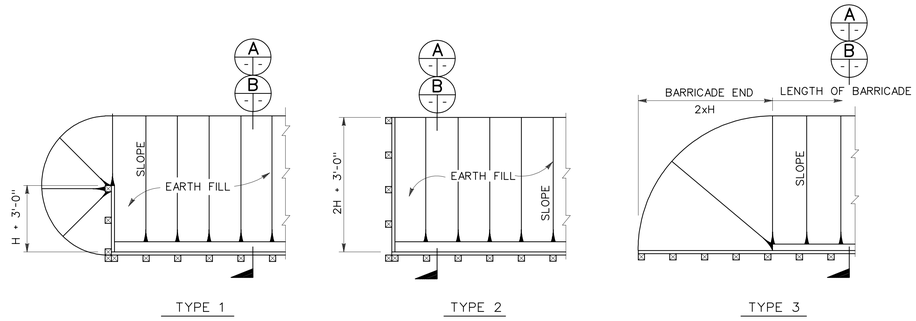
SECTION A
N.T.S.

TYPE A - WALL HEIGHT 10 FEET OR LESS



SECTION B
N.T.S.

TYPE B - WALL HEIGHT GREATER THAN 10 FEET



TYPE 1 TYPE 2 TYPE 3

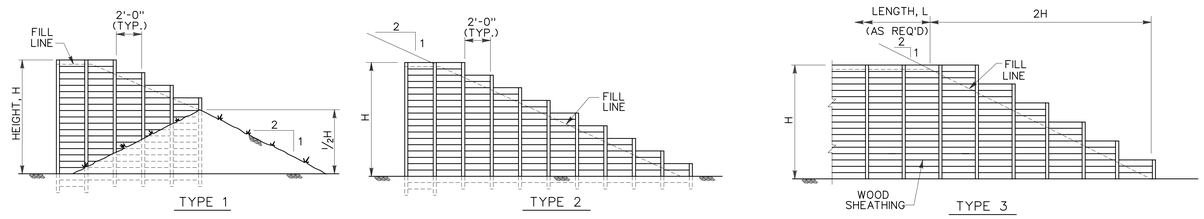
END PLAN
N.T.S.

ESTIMATED COST, $			
PER LIN. FT. OF CROSS SECTION 15 FT. HIGH	LUMP SUM END		
130	TYPE 1	TYPE 2	TYPE 3
	2,100	2,100	2,150

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

REMARKS:

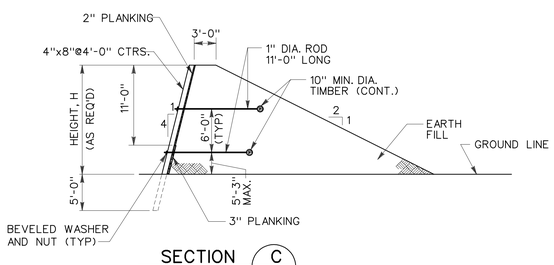
1. ALL LUMBER SHALL BE PRESSURE TREATED WITH PRESERVATIVES.
2. CAN BE RAPIDLY CONSTRUCTED WITH UNSKILLED LABOR.
3. REQUIRES SOIL STABILIZATION (SEEDING, ETC.)
4. AESTHETICALLY NOT PLEASING.
5. REQUIRES REPEATED MAINTENANCE.



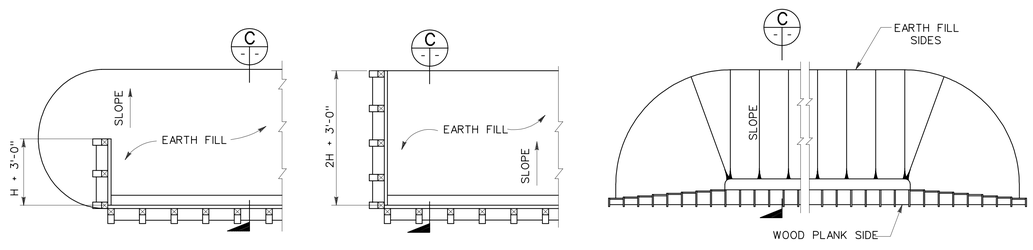
TYPE 1 TYPE 2 TYPE 3

END ELEVATION
N.T.S.

B4 - TIMBER - SINGLE REVETTED



SECTION C
N.T.S.



TYPE 1 TYPE 2 TYPE 3

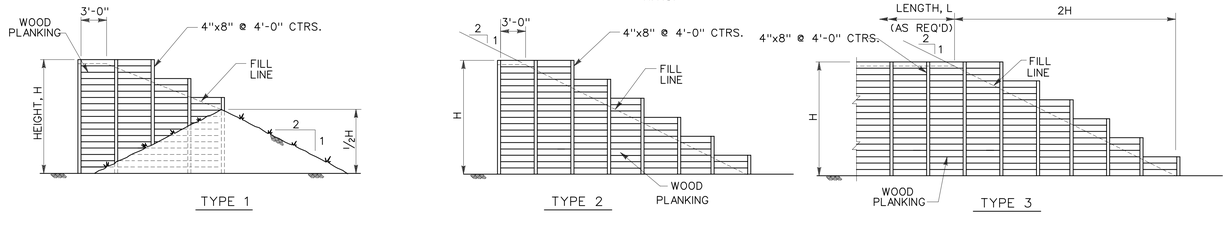
END PLAN
N.T.S.

ESTIMATED COST, $			
PER LIN. FT. OF CROSS SECTION 15 FT. HIGH	LUMP SUM END		
150	TYPE 1	TYPE 2	TYPE 3
	2,600	3,600	3,700

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

REMARKS:

SEE ABOVE (B4)



TYPE 1 TYPE 2 TYPE 3

END ELEVATION
N.T.S.

B5 - TIMBER - SINGLE REVETTED

Symbol	Description	Date	Approved
1	SHEET TOTAL CHANGED	22NOV91	

Revisions

U.S. ARMY ENGINEER DIVISION, HUNTSVILLE
CORPS OF ENGINEERS
HUNTSVILLE, ALABAMA

Site adapt A/E :

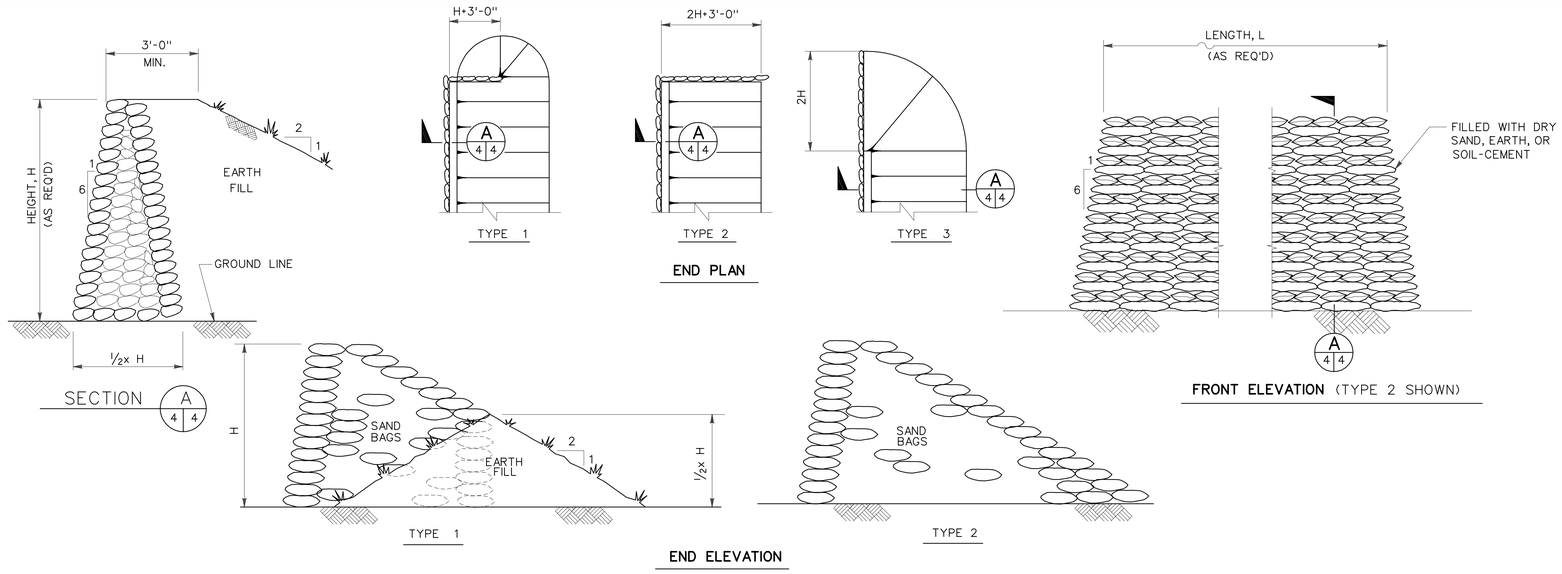
US Army Corps of Engineers

Dwn. by : RDP | Ckd. by : AF

BARRICADES

Reviewed by :
Date : 2 DEC 88
Sheet reference number : 4
Design file no. : 51725
Rev.
Approved by :
Drawing code : DEF 149-30-01
Sheet 4 of 13

barr4.dgn



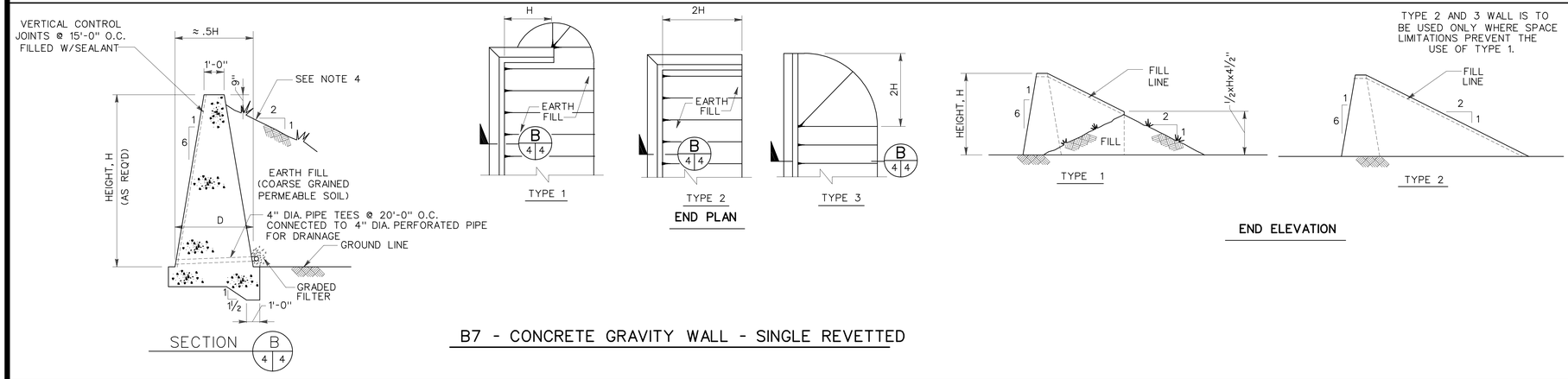
B6 - SAND BAG - SINGLE REVETTED

ESTIMATED COST,$			
PER LIN. FT. OF CROSS SECTION 15 FT. HIGH	LUMP SUM END		
	TYPE 1	TYPE 2	TYPE 3
430	4,300	6,100	6,600

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:

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



B7 - CONCRETE GRAVITY WALL - SINGLE REVETTED

ESTIMATED COST, $ (W/O EARTH FILL)			
PER LIN. FT. OF CROSS SECTION 15 FT. HIGH	LUMP SUM END		
	TYPE 1	TYPE 2	TYPE 3
610	8,600	15,400	16,500

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:

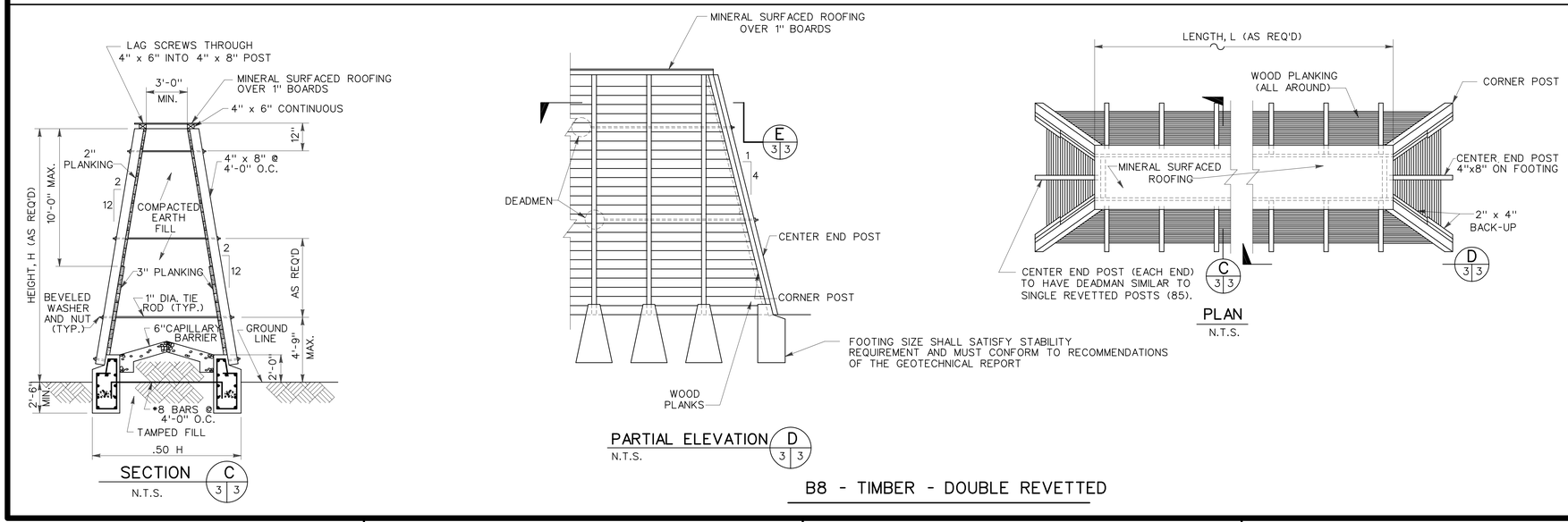
1. CAN BE BUILT WITH UNSKILLED LABOR AND LOCALLY AVAILABLE MATERIALS.
2. EXPOSED AGGREGATE FINISH POSSIBLE.
3. DELETE IF ONLY FRAGMENT RESISTANT REQUIRED.
4. IF EARTH FILL IS PLACED BEHIND WALL, STABILITY OF WALL MUST BE CHECKED ON A CASE-BY-CASE BASIS.

ESTIMATED COST, $	
PER LIN. FT. OF CROSS SECTION 15 FT. HIGH	LUMP SUM BARRICADE END
280	6,900

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

REMARKS:

1. ALL LUMBER SHALL BE PRESSURE TREATED WITH PRESERVATIVES.
2. CAN BE RAPIDLY CONSTRUCTED WITH UNSKILLED LABOR.
3. CAN BE LOCATED CLOSE TO SITE BOUNDARIES OR RESTRICTIONS.
4. CAN TOLERATE SIGNIFICANT AMOUNT OF SETTLEMENT.
5. AESTHETICALLY NOT PLEASING.
6. REQUIRES REPEATED MAINTENANCE.



B8 - TIMBER - DOUBLE REVETTED

Symbol	Description	Date	Approved
	SHEET TOTAL CHANGED	22NOV99	

Revisions

U.S. ARMY ENGINEER DIVISION, HUNTSVILLE
CORPS OF ENGINEERS
HUNTSVILLE, ALABAMA

Site adapt A/E :

US Army Corps of Engineers

Dwn. by : RDP | Ckd. by : AF

BARRICADES

Reviewed by :

Date : 2 DEC 88

Sheet reference number : 5

Design file no. : 51726

Rev.

Approved by :

Drawing code : DEF 149-30-01

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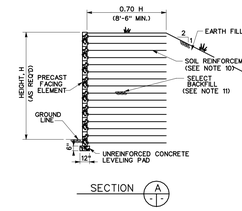
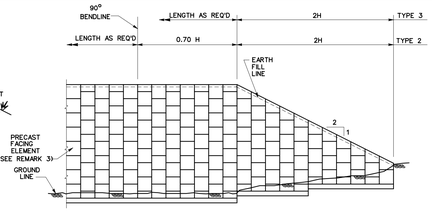
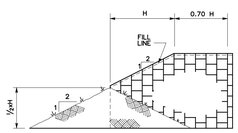


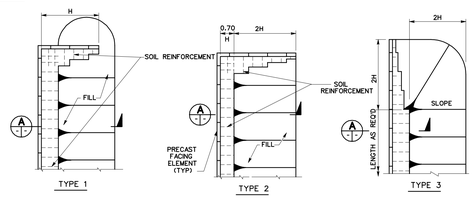
SECTION A



PARTIAL ELEVATION -TYPE 2 AND 3



ELEVATION - TYPE 1



END PLAN

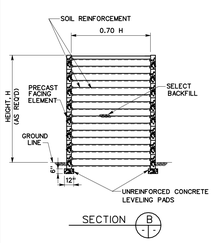
B9 - REINFORCED SOIL - SINGLE REVETTED

ESTIMATED COST, $				
PER LIN. FT. OF CROSS SECTION 15 FT. HIGH	PER SQ. FT. OF OF WALL FACE 15 FT. HIGH	LUMP SUM END		
		TYPE 1	TYPE 2	TYPE 3
480	32	4,200	5,500	6,300

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

REMARKS:

1. CAN BE ECONOMICALLY AND RAPIDLY CONSTRUCTED.
2. REQUIRES SHALLOW FOUNDATION.
3. VARIETY OF ARCHITECTURAL FACING ELEMENTS AND FINISHES AVAILABLE (CRUCIFORM, HEXAGONAL, RIBBED, ETC.)
4. NO HEIGHT OR LENGTH LIMITATIONS.
5. FACING ELEMENTS ARE REUSABLE.
6. WALLS CAN BE LOCATED CLOSE TO SITE BOUNDARIES OR OBSTRUCTIONS.
7. SYSTEM ADAPTABLE TO SLOPING WALL CONFIGURATIONS AND TO TIERS.
8. SYSTEM CAN TOLERATE SIGNIFICANT AMOUNT OF SETTLEMENT.
9. REPAIR CAN BE ACCOMPLISHED ON INDIVIDUAL FACING ELEMENTS.
10. GALVANIZED STRIPS, STEEL WIRE MESH, GEOSYNTHETIC, ETC. ARE USED FOR SOIL REINFORCEMENT.
11. GRANULAR MATERIALS ARE GENERALLY USED TO PROVIDE PROPER DRAINAGE. SELECTION OF BACKFILL SHALL BE AS RECOMMENDED BY THE SYSTEMS MANUFACTURER.
12. REQUIRES SLOPE STABILIZATION (SEEDING, ETC.).
13. PATENTED SYSTEMS:
    a. REINFORCED EARTH CO.
       1414 TWENTY SECOND ST. N.W.
       WASH., D.C. 20037
       (202) 223-3434
    b. VSL CORPORATION
       101 ALBRIGHT WAY
       LOS GATOS, CA 95030
       (408) 866-5000
    c. HILFIKER WALLS
       P.O. BOX 2012
       EUREKA, CA 95502
       (707) 443-5093



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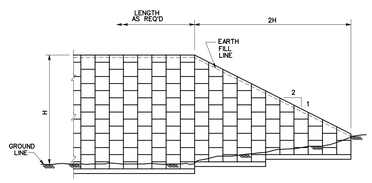
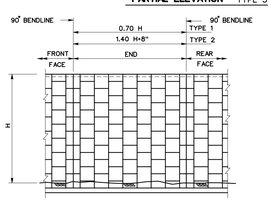
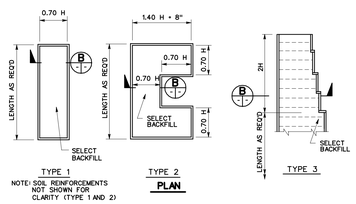


PARTIAL ELEVATION - TYPE 3



PARTIAL ELEVATION - FRONT FACE TYPE 1 AND 2



NOTE: SOIL REINFORCEMENTS NOT SHOWN FOR CLARITY (TYPE 1 AND 2)

PLAN

B10 - REINFORCED SOIL - DOUBLE REVETTED

ESTIMATED COST, $				
PER LIN. FT. OF CROSS SECTION 15 FT. HIGH	PER SQ. FT. OF OF WALL FACE 15 FT. HIGH	LUMP SUM END		
		TYPE 1	TYPE 2	TYPE 3
820	55	4,000	16,500	15,400

ESTIMATED ERECTION TIME MANHOURS			
100 LIN. FT. OF CROSS SECTION 15 FT. HIGH	END TYPE	END TYPE	END TYPE
1,510	60	280	290

REMARKS:

SEE "REINFORCED SOIL - SINGLE REVETTED"

Symbol	Description	Date	Approved
A	SHEET TOTAL CHANGED	5/NOV/	

Revisions

U.S. ARMY ENGINEER DIVISION, HUNTSVILLE
CORPS OF ENGINEERS
HUNTSVILLE, ALABAMA

Site adapt A/E :

US Army Corps of Engineers

Dwn. by : RDP | Ckd. by : AF

BARRICADES

Reviewed by :

Date : 2 DEC 88

Sheet reference number : 6

Design file no. : 51727

Rev

Approved by :

Drawing code : DEF 149-30-01

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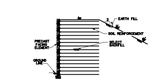
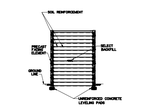


B9 - REINFORCED SOIL - SINGLE REVETTED

REMARKS:

1. CAN BE ECONOMICALLY AND RAPIDLY CONSTRUCTED.
2. REQUIRES SHALLOW FOUNDATION.
3. VARIETY OF ARCHITECTURAL FACING ELEMENTS AND FINISHES AVAILABLE (CRUCIFORM, HEXAGONAL, RIBBED, ETC.)
4. NO HEIGHT OR LENGTH LIMITATIONS.
5. FACING ELEMENTS ARE REUSABLE.
6. WALLS CAN BE LOCATED CLOSE TO SITE BOUNDARIES OR OBSTRUCTIONS.
7. SYSTEM ADAPTABLE TO SLOPING WALL CONFIGURATIONS AND TO TIERS.
8. SYSTEM CAN TOLERATE SIGNIFICANT AMOUNT OF SETTLEMENT.
9. REPAIR CAN BE ACCOMPLISHED ON INDIVIDUAL FACING ELEMENTS.
10. GALVANIZED STRIPS, STEEL WIRE MESH, GEOSYNTHETIC, ETC. ARE USED FOR SOIL REINFORCEMENT.
11. GRANULAR MATERIALS ARE GENERALLY USED TO PROVIDE PROPER DRAINAGE. SELECTION OF BACKFILL SHALL BE AS RECOMMENDED BY THE SYSTEMS MANUFACTURER.
12. REQUIRES SLOPE STABILIZATION (SEEDING, ETC.).
13. PATENTED SYSTEMS:
    a. REINFORCED EARTH CO.
       1414 TWENTY SECOND ST. N.W.
       WASH., D.C. 20037
       (202) 223-3434
    b. VSL CORPORATION
       101 ALBRIGHT WAY
       LOS GATOS, CA 95030
       (408) 866-5000
    c. HILFIKER WALLS
       P.O. BOX 2012
       EUREKA, CA 95502
       (707) 443-5093



B10 - REINFORCED SOIL - DOUBLE REVETTED

REMARKS:

1. CAN BE ECONOMICALLY AND RAPIDLY CONSTRUCTED.
2. REQUIRES SHALLOW FOUNDATION.
3. VARIETY OF ARCHITECTURAL FACING ELEMENTS AND FINISHES AVAILABLE (CRUCIFORM, HEXAGONAL, RIBBED, ETC.)
4. NO HEIGHT OR LENGTH LIMITATIONS.
5. FACING ELEMENTS ARE REUSABLE.
6. WALLS CAN BE LOCATED CLOSE TO SITE BOUNDARIES OR OBSTRUCTIONS.
7. SYSTEM ADAPTABLE TO SLOPING WALL CONFIGURATIONS AND TO TIERS.
8. SYSTEM CAN TOLERATE SIGNIFICANT AMOUNT OF SETTLEMENT.
9. REPAIR CAN BE ACCOMPLISHED ON INDIVIDUAL FACING ELEMENTS.
10. GALVANIZED STRIPS, STEEL WIRE MESH, GEOSYNTHETIC, ETC. ARE USED FOR SOIL REINFORCEMENT.
11. GRANULAR MATERIALS ARE GENERALLY USED TO PROVIDE PROPER DRAINAGE. SELECTION OF BACKFILL SHALL BE AS RECOMMENDED BY THE SYSTEMS MANUFACTURER.
12. REQUIRES SLOPE STABILIZATION (SEEDING, ETC.).
13. PATENTED SYSTEMS:
    a. REINFORCED EARTH CO.
       1414 TWENTY SECOND ST. N.W.
       WASH., D.C. 20037
       (202) 223-3434
    b. VSL CORPORATION
       101 ALBRIGHT WAY
       LOS GATOS, CA 95030
       (408) 866-5000
    c. HILFIKER WALLS
       P.O. BOX 2012
       EUREKA, CA 95502
       (707) 443-5093

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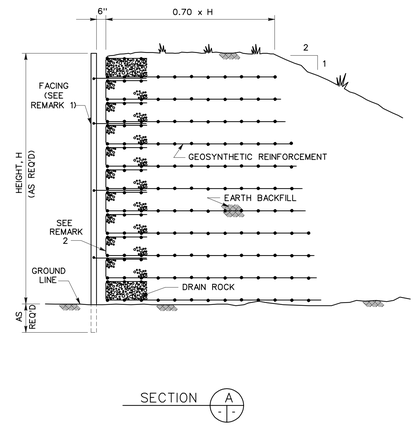
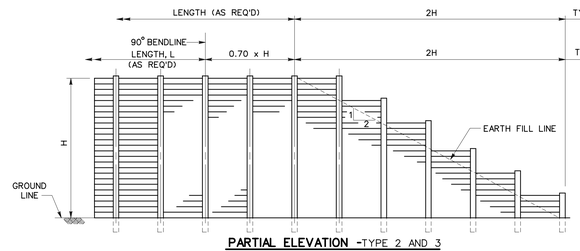
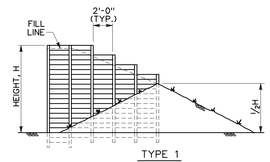


SECTION A



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



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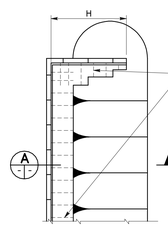

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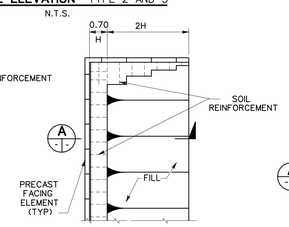
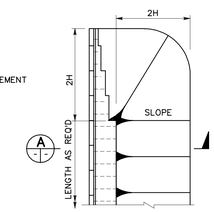


TYPE 2

END PLAN



TYPE 3

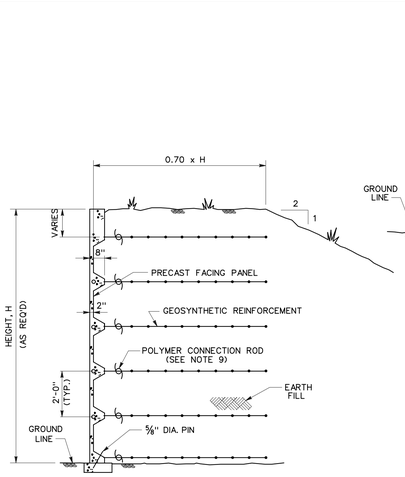
B11 - WRAPAROUND RETAINING WALL

ESTIMATED COST, $				
PER LIN. FT. OF CROSS SECTION 15 FT. HIGH	PER SQ. FT. OF OF WALL FACE 15 FT. HIGH	LUMP SUM END		
		TYPE 1	TYPE 2	TYPE 3
330	22	6,300	6,900	7,500

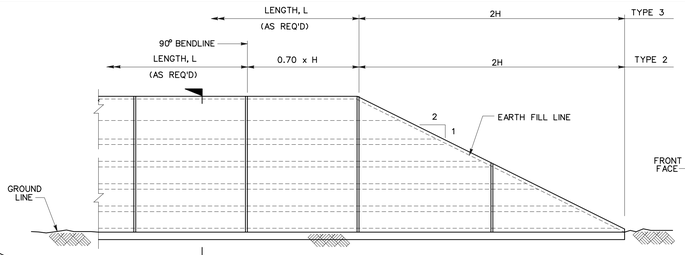
ESTIMATED ERECTION TIME MANHOURS			
100 LIN. FT. OF CROSS SECTION 15 FT. HIGH	END TYPE	END TYPE 2	END TYPE
1,040	160	160	190

REMARKS:

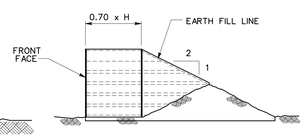
1. FACING CAN BE SELECTED TO ACHIEVE DESIRED ARCHITECTURAL FINISH. EXAMPLE: SOLDIER PILE AND LAGGING FACING, PRECAST CONCRETE, ETC.
2. GEOSYNTHETIC FINE MESH IS USED TO CONTAIN SOIL OR SAND FILL.
3. CAN BE ECONOMICALLY AND RAPIDLY CONSTRUCTED.
4. REQUIRES SHALLOW FOUNDATION.
5. SYSTEM CAN TOLERATE SIGNIFICANT AMOUNT OF SETTLEMENT.
6. REQUIRES SLOPE STABILIZATION (SEEDING, ETC.).
7. GEOSYNTHETIC REINFORCEMENT IS PLASTIC MESH MADE OF HIGH DENSITY POLYMER.
8. SUPPLIER:
   TENSAR CORPORATION
   P.O. BOX 49526
   ATLANTA, GA. 30359
   (404) 325-0814



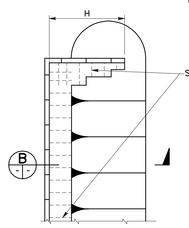
SECTION B



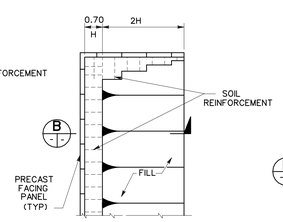
PARTIAL ELEVATION-TYPES 2 AND 3
N.T.S.



TYPE 1

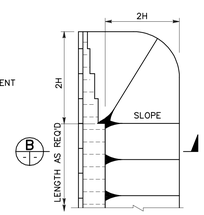


TYPE 1



TYPE 2

END PLAN
N.T.S.



TYPE 3

B12 - WAFFLE-CRETE RETAINING WALL

ESTIMATED COST, $				
PER LIN. FT. OF CROSS SECTION 15 FT. HIGH	PER SQ. FT. OF OF WALL FACE 15 FT. HIGH	LUMP SUM END		
		TYPE 1	TYPE 2	TYPE 3
540	36	4,120	11,800	7,420

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

REMARKS:

1. PRECAST FACING PANELS ARE LIGHTWEIGHT.
2. PANELS MUST BE EXTERNALLY BRACED DURING CONSTRUCTION.
3. WALL REQUIRES BATTER OF 1/4" PER FOOT.
4. VARIETY OF DIFFERENT PRECAST FACING PANELS ARE AVAILABLE, WITH WIDE VARIETY OF FINISHES.
5. LIMITED TO 20 FEET IN HEIGHT.
6. PROPRIETARY WAFFLE-CRETE PANELS SHOWN. OTHER FACING SYSTEMS MAY BE SUBSTITUTED.
7. REQUIRES SLOPE STABILIZATION (SEEDING, ETC.).
8. GEOSYNTHETIC REINFORCEMENT IS PLASTIC MESH MADE OF HIGH DENSITY POLYMER.
9. POLYMER CONNECTION ROD IS USED TO CONNECT THE PRECAST FACING PANEL TABS TO THE GEOSYNTHETIC REINFORCEMENTS.
7. SUPPLIER:
   TENSAR CORPORATION
   P.O. BOX 49526
   ATLANTA, GA. 30359
   (404) 325-0814

Symbol	Description	Date	Approved
1	SHEET TOTAL CHANGED	22NOV8	

Revisions

U.S. ARMY ENGINEER DIVISION, HUNTSVILLE
CORPS OF ENGINEERS
HUNTSVILLE, ALABAMA

Site adapt A/E :

US Army Corps of Engineers

Dwn. by : RDP | Ckd. by : AF

BARRICADES

Reviewed by :

Approved by :

Date : 2 DEC 88

Drawing code : DEF 149-30-01

Sheet reference number : 7

Design file no. : 51728

Rev

Sheet 7 of 13

5 | 4 | 3 | 2 | 1

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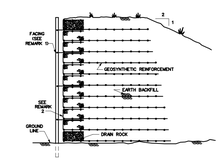
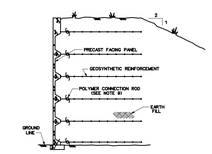


B11 - WRAPAROUND RETAINING WALL

REMARKS:

1. FACING CAN BE SELECTED TO ACHIEVE DESIRED ARCHITECTURAL FINISH. EXAMPLE: SOLDIER PILE AND LAGGING FACING, PRECAST CONCRETE, ETC.
2. GEOSYNTHETIC FINE MESH IS USED TO CONTAIN SOIL OR SAND FILL.
3. CAN BE ECONOMICALLY AND RAPIDLY CONSTRUCTED.
4. REQUIRES SHALLOW FOUNDATION.
5. SYSTEM CAN TOLERATE SIGNIFICANT AMOUNT OF SETTLEMENT.
6. REQUIRES SLOPE STABILIZATION (SEEDING, ETC.).
7. GEOSYNTHETIC REINFORCEMENT IS PLASTIC MESH MADE OF HIGH DENSITY POLYMER.
8. SUPPLIER:
   TENSAR CORPORATION
   P.O. BOX 49526
   ATLANTA, GA. 30359
   (404) 325-0814

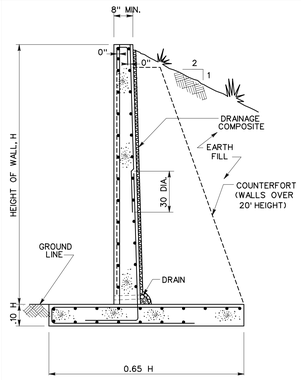


B12 - WAFFLE-CRETE RETAINING WALL

REMARKS:

1. PRECAST FACING PANELS ARE LIGHTWEIGHT.
2. PANELS MUST BE EXTERNALLY BRACED DURING CONSTRUCTION.
3. WALL REQUIRES BATTER OF 1/4" PER FOOT.
4. VARIETY OF DIFFERENT PRECAST FACING PANELS ARE AVAILABLE, WITH WIDE VARIETY OF FINISHES.
5. LIMITED TO 20 FEET IN HEIGHT.
6. PROPRIETARY WAFFLE-CRETE PANELS SHOWN. OTHER FACING SYSTEMS MAY BE SUBSTITUTED.
7. REQUIRES SLOPE STABILIZATION (SEEDING, ETC.).
8. GEOSYNTHETIC REINFORCEMENT IS PLASTIC MESH MADE OF HIGH DENSITY POLYMER.
9. POLYMER CONNECTION ROD IS USED TO CONNECT THE PRECAST FACING PANEL TABS TO THE GEOSYNTHETIC REINFORCEMENTS.
7. SUPPLIER:
   TENSAR CORPORATION
   P.O. BOX 49526
   ATLANTA, GA. 30359
   (404) 325-0814

CORPS OF ENGINEERS | 4 | 3 | 2 | 1 | U.S. ARMY



SECTION A
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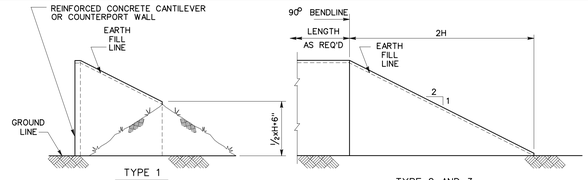
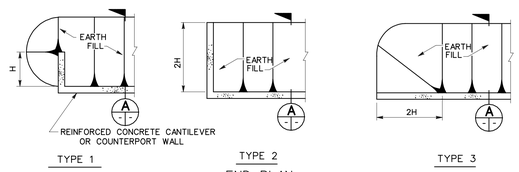


TYPE 1 — END ELEVATION — TYPE 2 AND 3

N.T.S.



TYPE 1 — TYPE 2 — TYPE 3

END PLAN

N.T.S.

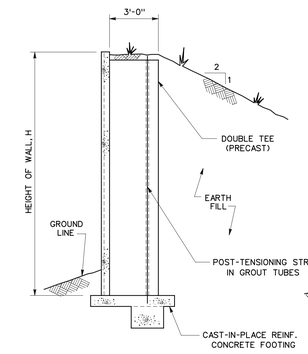
B13 - CANTILEVER RETAINING WALL

ESTIMATED COST, $			
PER LIN. FT. OF CROSS SECTION 15 FT. HIGH	LUMP SUM END		
	TYPE 1	TYPE 2	TYPE 3
355	5,600	6,300	7,400

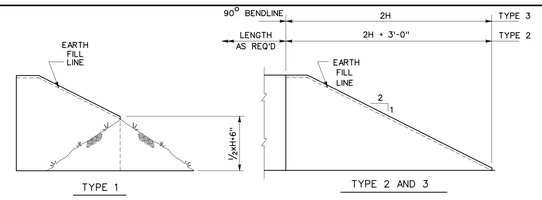
ESTIMATED ERECTION TIME MANHOURS			
100 LIN. FT. OF CROSS SECTION 15 FT. HIGH	END TYPE 1	END TYPE 2	END TYPE 3
1,400	150	180	220

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.

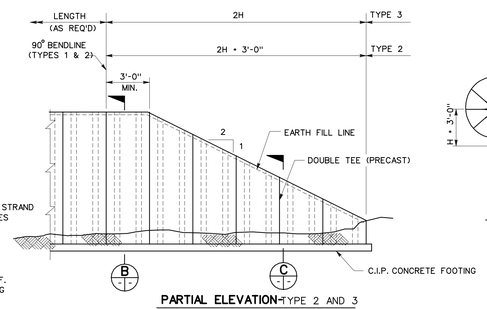


SECTION B
SECTION C SIM.
N.T.S.



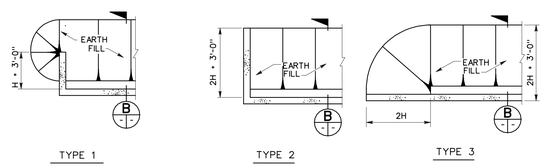
TYPE 1 — END ELEVATION — TYPE 2 AND 3

N.T.S.



PARTIAL ELEVATION-TYPE 2 AND 3

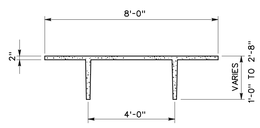
N.T.S.



TYPE 1 — TYPE 2 — TYPE 3

END PLAN

N.T.S.



TYPICAL CROSS SECTION OF DOUBLE TEE

B14 - PRECAST DOUBLE TEES

ESTIMATED COST, $			
PER LIN. FT. OF CROSS SECTION 15 FT. HIGH	LUMP SUM END		
	TYPE 1	TYPE 2	TYPE 3
430	4,300	6,600	7,700

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.
7. AN INNOVATIVE RETAINING SYSTEM USED BY COLORADO DIVISION OF HIGHWAYS.

Symbol	Description	Date	Approved
1	SHEET TOTAL CHANGED	22NOV91	

Revisions

U.S. ARMY ENGINEER DIVISION, HUNTSVILLE
CORPS OF ENGINEERS
HUNTSVILLE, ALABAMA

Site adapt A/E :

US Army Corps of Engineers

Dwn. by : RDP | Ckd. by : AF

BARRICADES

Reviewed by :
Approved by :
Date : 2 DEC 88
Drawing code : DEF 149-30-01
Sheet reference number : 8
Design file no. : 51729
Rev.
Sheet 8 of 13

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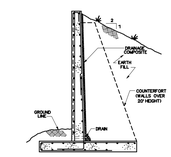
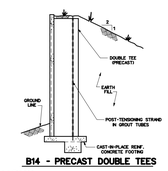


B13 - CANTILEVER RETAINING WALL

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.

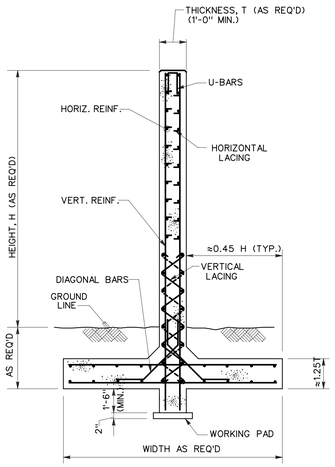


B14 - PRECAST DOUBLE TEES

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.
7. AN INNOVATIVE RETAINING SYSTEM USED BY COLORADO DIVISION OF HIGHWAYS.

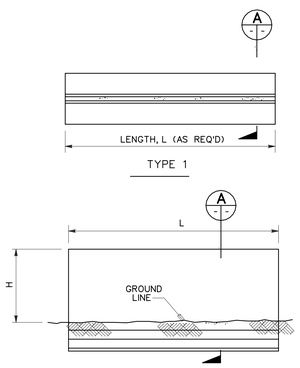
CORPS OF ENGINEERS | 4 | 3 | 2 | 1 | U.S. ARMY



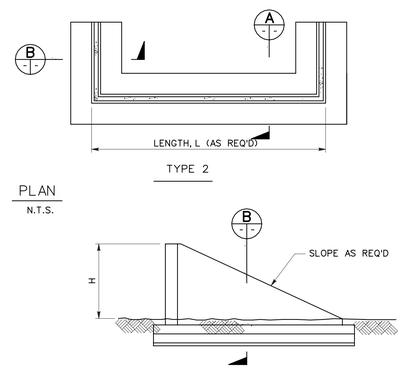
SECTION A

SECTION B SIM.

N.T.S.



FRONT ELEVATION-TYPE 1



PLAN

N.T.S.

END ELEVATION-TYPE 2

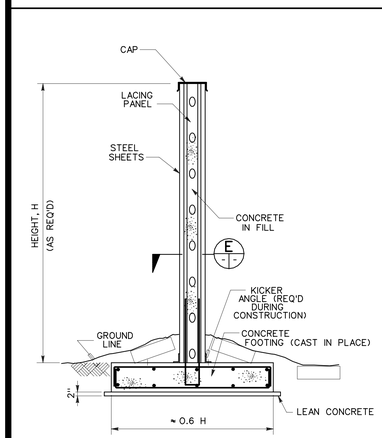
B15 - CONCRETE BLAST WALL

ESTIMATED COST, $		
PER LIN. FT. OF CROSS SECTION 15 FT. HIGH	LUMP SUM END	
	TYPE 1	TYPE 2
290	-	8,800

ESTIMATED ERECTION TIME MANHOURS		
100 LIN. FT. OF CROSS SECTION 15 FT. HIGH	END TYPE 1	END TYPE 2
1,090	-	290

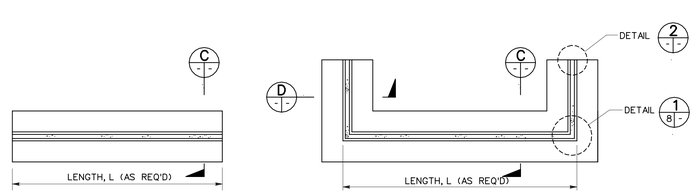
REMARKS:

1. WALL MUST BE DESIGNED IN ACCORDANCE WITH THE REQUIREMENTS OF TM 5-1300 (SEE REFERENCES, SHEET 1).
2. USUALLY USED TO RESIST THE EXPLOSIVE OUTPUT OF CLOSE-IN-DETONATIONS (HIGH INTENSITY PRESSURE WITH SHORT DURATIONS)
3. REQUIRES SPECIAL FABRICATION AND CONSTRUCTION PROCEDURES.
4. DESCRIPTIONS OF OTHER BLAST WALL CONFIGURATIONS CAN BE FOUND IN TM 5-1300.
5. FOR PROPERLY DESIGNED WALL, EARTH FILL BEHIND WALL IS NOT REQUIRED.



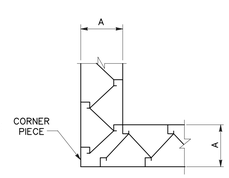
SECTION C D SIM.

N.T.S.



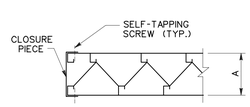
PLAN

N.T.S.



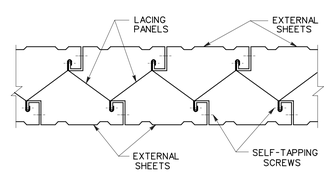
CORNER DETAIL 1

N.T.S.



DETAIL 2

N.T.S.



SECTION E

N.T.S.

B16 - COMPOSITE WALL SYSTEM

ESTIMATED COST, $		
PER LIN. FT. OF CROSS SECTION 15 FT. HIGH	LUMP SUM END	
	TYPE 1	TYPE 2
210	-	11,400

ESTIMATED ERECTION TIME MANHOURS		
100 LIN. FT. OF CROSS SECTION 15 FT. HIGH	END TYPE 1	END TYPE 2
480	-	250

REMARKS:

1. AESTHETICALLY PLEASING.
2. CAN BE ECONOMICALLY AND RAPIDLY CONSTRUCTED WITH UNSKILLED LABOR.
3. AVAILABLE IN DIFFERENT THICKNESSES.
4. PROVIDES HIGH RESISTANCE TO FRAGMENT PENETRATION.
5. FOR PROPERLY DESIGNED WALL, EARTH FILL BEHIND WALL IS NOT REQUIRED.
6. PATENTED:
   TAFI, INC.
   301 MAPLE AVENUE WEST, SUITE 100
   VIENNA, VA. 22180
   (703) 938-9651

Symbol	Description	Date	Approved
	B16 ADDRESS CORRECTED/SHEET TOTAL CHANGED	22NOV89	

Revisions

U.S. ARMY ENGINEER DIVISION, HUNTSVILLE
CORPS OF ENGINEERS
HUNTSVILLE, ALABAMA

Site adapt A/E :

US Army Corps of Engineers

Dwn. by : RDP | Ckd. by : AF

BARRICADES

Reviewed by :

Approved by :

Date : 2 DEC 88

Drawing code : DEF 149-30-01

Sheet reference number : 9

Design file no. : 51730

Rev.

Sheet 9 of 13

5 | 4 | 3 | 2 | 1

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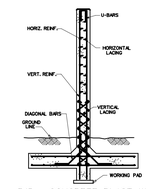
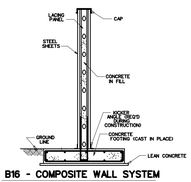


B15 - CONCRETE BLAST WALL

REMARKS:

1. WALL MUST BE DESIGNED IN ACCORDANCE WITH THE REQUIREMENTS OF TM 5-1300 (SEE REFERENCES, SHEET 1).
2. USUALLY USED TO RESIST THE EXPLOSIVE OUTPUT OF CLOSE-IN-DETONATIONS (HIGH INTENSITY PRESSURE WITH SHORT DURATIONS)
3. REQUIRES SPECIAL FABRICATION AND CONSTRUCTION PROCEDURES.
4. DESCRIPTIONS OF OTHER BLAST WALL CONFIGURATIONS CAN BE FOUND IN TM 5-1300.
5. FOR PROPERLY DESIGNED WALL, EARTH FILL BEHIND IS NOT REQUIRED.

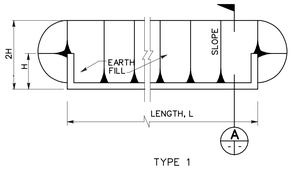


B16 - COMPOSITE WALL SYSTEM

REMARKS:

1. AESTHETICALLY PLEASING.
2. CAN BE ECONOMICALLY AND RAPIDLY CONSTRUCTED WITH UNSKILLED LABOR.
3. AVAILABLE IN DIFFERENT THICKNESSES.
4. PROVIDES HIGH RESISTANCE TO FRAGMENT PENETRATION.
5. FOR PROPERLY DESIGNED WALL, EARTH FILL BEHIND WALL IS NOT REQUIRED.
6. PATENTED:
   INNOVATIVE MILITARY TECHNOLOGY
   60 EAST 42ND ST. SUITE 2580
   NEW YORK, N.Y. 10165
   (212) 599-2030

CORPS OF ENGINEERS | 4 | 3 | 2 | 1 | U.S. ARMY



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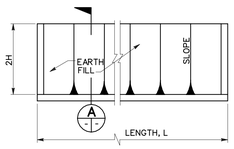
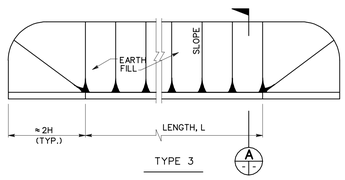


TYPE 2

PLAN

N.T.S.



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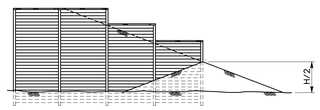


END ELEVATION TYPE 1

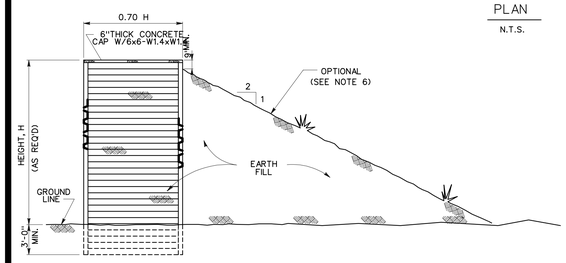
N.T.S.

ESTIMATED COST, $				
PER LIN. FT. OF CROSS SECTION 15 FT. HIGH	PER SQ. FT. OF OF WALL FACE 15 FT. HIGH	LUMP SUM END		
		TYPE 1	TYPE 2	TYPE 3
810	54	9,000	16,000	16,700

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

REMARKS:

1. STEEL BINS ARE PRE-ENGINEERED STRUCTURES EASILY TRANSPORTED TO REMOTE AREAS.
2. MINIMUM SITE PREPARATION REQUIRED.
3. EASILY ASSEMBLED WITH LIGHT WEIGHT EQUIPMENT.
4. AVAILABLE IN WALL HEIGHTS TO 40 FEET.
5. CAN BE DISASSEMBLED AND REINSTALLED WHEN NECESSARY.
6. DELETE IF ONLY FRAGMENT RESISTANCE REQUIRED.
7. SUPPLIERS:
   a. ARMCO CONSTRUCTION PRODUCTS
      DEPT. LCP-2584
      BOX 800
      MIDDLETON, OHIO 45042
   b. REPUBLIC STEEL, TERRA-WALL
      4416 LOUISVILLE RD. N.E.
      CANTON, OHIO 44705
      (216)438-5984



SECTION A

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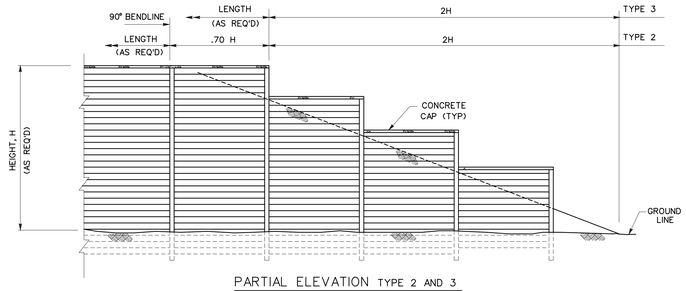
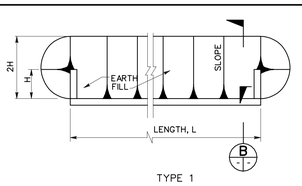


PARTIAL ELEVATION TYPE 2 AND 3

N.T.S.

B17 - STEEL BIN



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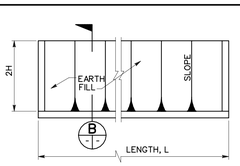

TYPE 2

PLAN

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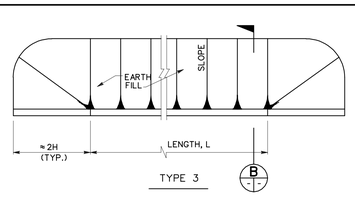


TYPE 3

ESTIMATED COST, $				
PER LIN. FT. OF CROSS SECTION 15 FT. HIGH	PER SQ. FT. OF OF WALL FACE 15 FT. HIGH	LUMP SUM END		
		TYPE 1	TYPE 2	TYPE 3
620	42	4,200	11,000	2,600

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

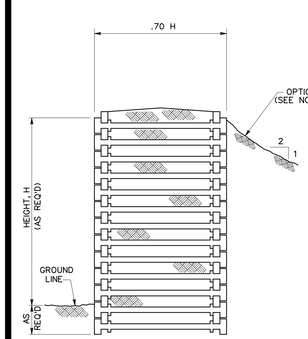
REMARKS:

1. CRIB PRECAST STRUCTURAL MEMBERS (HEADERS AND STRETCHERS) EASILY TRANSPORTED AND ERECTED.
2. MINIMUM SITE PREPARATION REQUIRED.
3. IMPROVED STABILITY CAN BE ACHIEVED WITH 1:6 WALL BATTER (NOT SHOWN)
4. CRIB WALLS CAN BE CONSTRUCTED TO HEIGHTS OVER 45 FEET. HEIGHTS OVER 15 FEET NORMALLY REQUIRE TWIN-CELL CONSTRUCTION AT BASE OF WALL.
5. CAN BE DISASSEMBLED AND REINSTALLED WHEN NECESSARY.
6. DELETE IF ONLY FRAGMENT RESISTANCE REQUIRED.
7. SUPPLIERS:
   CRIBLOCK RETAINING WALLS OF AMERICA, INC.
   6760 JIMMY CARTER BLVD.
   SUITE 140
   NORCROSS, GA. 30071
   (404) 242-1918

   EVERGREEN SYSTEMS, INC.
   KINGS PARK, N.Y.
   (213) 762-7967

   CONCRIB - HILFIKER RETAINING WALLS
   3900 BROADWAY
   EUREKA, CA. 95501

   DEPENDABLE CONCRETE PRODUCTS CO.
   P.O. BOX 296
   GARY, ILL. 60013
   (312) 639-2303



SECTION B

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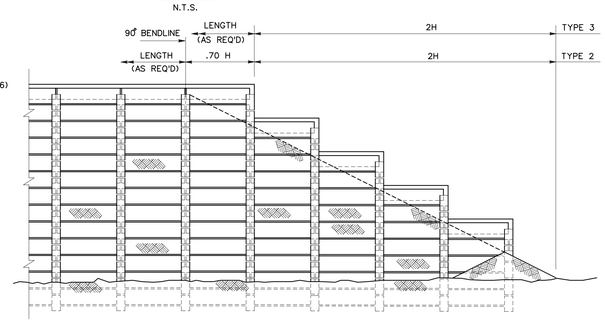
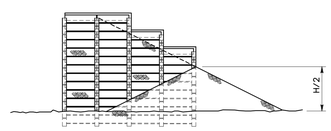


PARTIAL ELEVATION TYPE 2 AND 3

N.T.S.



END ELEVATION TYPE 2 AND 3

N.T.S.

B18 - CONCRETE CRIBBING

Symbol	Description	Date	Approved
1	SHEET TOTAL CHANGED	22NOV99	

Revisions

U.S. ARMY ENGINEER DIVISION, HUNTSVILLE
CORPS OF ENGINEERS
HUNTSVILLE, ALABAMA

Site adapt A/E :

U.S. Army Corps of Engineers

Dwn. by : RDP | Ckd. by : AF

BARRICADES

Reviewed by :

Date : 2 DEC 88

Sheet reference number : 10

Design file no. : 51731

Rev

Approved by :

Drawing code : DEF 149-30-01

Sheet 10 of 13

5 | 4 | 3 | 2 | 1

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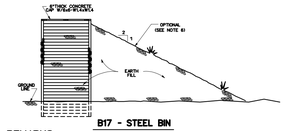
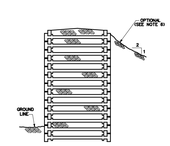


B17 - STEEL BIN

REMARKS:

1. STEEL BINS ARE PRE-ENGINEERED STRUCTURES EASILY TRANSPORTED TO REMOTE AREAS.
2. MINIMUM SITE PREPARATION REQUIRED.
3. EASILY ASSEMBLED WITH LIGHT WEIGHT EQUIPMENT.
4. AVAILABLE IN WALL HEIGHTS TO 40 FEET.
5. CAN BE DISASSEMBLED AND REINSTALLED WHEN NECESSARY.
6. DELETE IF ONLY FRAGMENT RESISTANCE REQUIRED.
7. SUPPLIERS:
   a. ARMCO CONSTRUCTION PRODUCTS
      DEPT. LCP-2584
      BOX 800
      MIDDLETON, OHIO 45042
   b. REPUBLIC STEEL, TERRA-WALL
      4416 LOUISVILLE RD. N.E.
      CANTON, OHIO 44705
      (216)438-5984



B18 - CONCRETE CRIBBING

REMARKS:

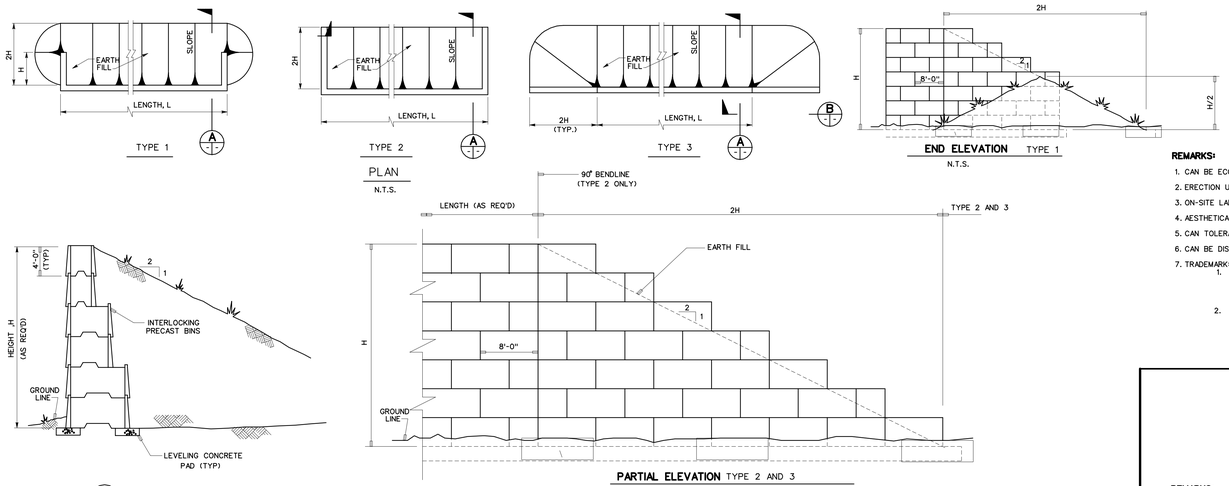
1. CRIB PRECAST STRUCTURAL MEMBERS (HEADERS AND STRETCHERS) EASILY TRANSPORTED AND ERECTED.
2. MINIMUM SITE PREPARATION REQUIRED.
3. IMPROVED STABILITY CAN BE ACHIEVED WITH 1:6 WALL BATTER (NOT SHOWN)
4. CRIB WALLS CAN BE CONSTRUCTED TO HEIGHTS OVER 45 FEET. HEIGHTS OVER 15 FEET NORMALLY REQUIRE TWIN-CELL CONSTRUCTION AT BASE OF WALL.
5. CAN BE DISASSEMBLED AND REINSTALLED WHEN NECESSARY.
6. DELETE IF ONLY FRAGMENT RESISTANCE REQUIRED.
7. SUPPLIERS:
   CRIBLOCK RETAINING WALLS OF AMERICA, INC.
   6760 JIMMY CARTER BLVD.
   SUITE 140
   NORCROSS, GA. 30071
   (404) 242-1918

   EVERGREEN SYSTEMS, INC.
   KINGS PARK, N.Y.
   (213) 762-7967

   CONCRIB - HILFIKER RETAINING WALLS
   3900 BROADWAY
   EUREKA, CA. 95501

   DEPENDABLE CONCRETE PRODUCTS CO.
   P.O. BOX 296
   GARY, ILL. 60013
   (312) 639-2303

CORPS OF ENGINEERS | U.S. ARMY

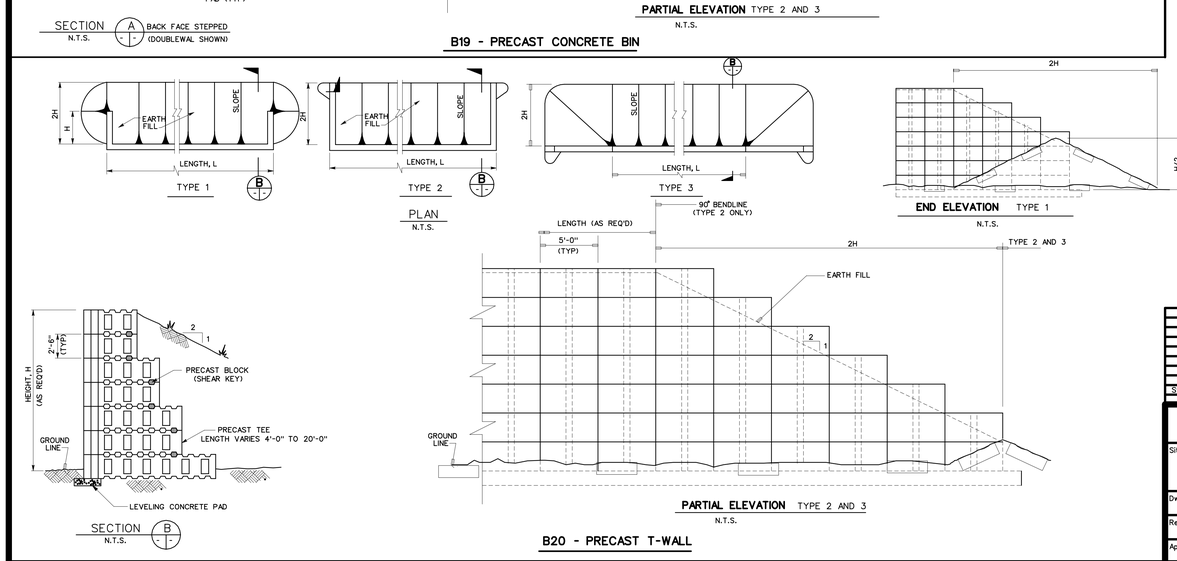


B19 - PRECAST CONCRETE BIN

550	37	9,900	13,400	13,850
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:
   1. DOUBLEWAL CORPORATION
      59 EAST MAIN STREET
      PLAINVILLE,CT. 06062
      TEL: (203)793-0295
   2. MODUWALL PRECAST CONCRETE
      ADDRESS: NOT AVAILABLE



B20 - PRECAST T-WALL

480	32	4,500	5,300	6,200
1,130		140	100	180

REMARKS:

1. CAN BE RAPIDLY ERECTED BY A SMALL CREW.
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. PATENTED:
   THE NEEL COMPANY
   6520 DEEPFORD STREET
   SPRINGFIELD, VA. 22150
   TEL: (703)922-6778
7. PRECASTER:
   TINDALL CONCRETE PRODUCTS
   P.O. BOX 1778
   SPARTANBURG, S.C. 29304
   TEL: (803)576-3230

Symbol	Description	Date	Approved
	SHEET TOTAL CHANGED	22NOV8	

Revisions

U.S. ARMY ENGINEER DIVISION, HUNTSVILLE
CORPS OF ENGINEERS
HUNTSVILLE, ALABAMA

Site adapt A/E :

U.S. Army Corps of Engineers

Dwn. by : RDP | Ckd. by : AF

BARRICADES

Reviewed by :

Date : 2 DEC 88

Sheet reference number : 11

Design file no. : 51732 | Rev

Approved by :

Drawing code : DEF 149-30-01

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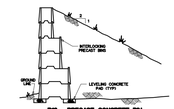
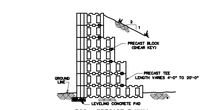


B19 - PRECAST CONCRETE BIN

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:
   1. DOUBLEWAL CORPORATION
      59 EAST MAIN STREET
      PLAINVILLE,CT. 06062
      TEL: (203)793-0295
   2. MODUWALL PRECAST CONCRETE
      ADDRESS: NOT AVAILABLE
   3. TINDALL CONCRETE PRODUCTS
      P.O. BOX 1778
      SPARTANBURG, S.C. 29304
      TEL: (803)576-3230

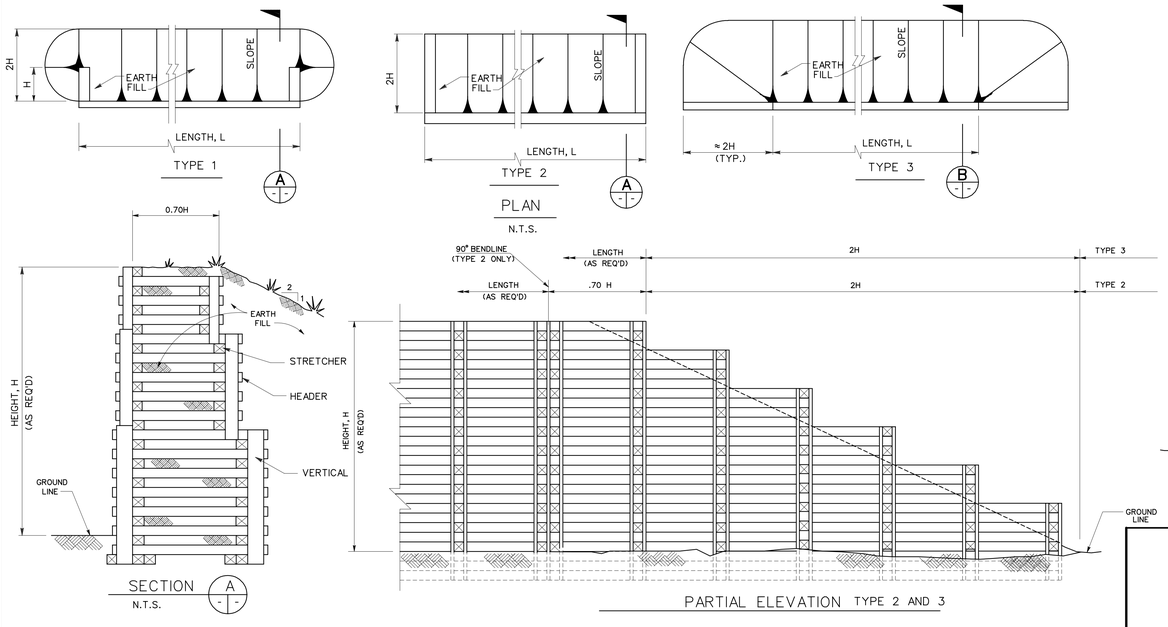


B20 - PRECAST T-WALL

REMARKS:

1. CAN BE RAPIDLY ERECTED BY A SMALL CREW.
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. PATENTED:
   THE NEEL COMPANY
   6520 DEEPFORD STREET
   SPRINGFIELD, VA. 22150
   TEL: (703)922-6778
7. PRECASTER:
   TINDALL CONCRETE PRODUCTS
   P.O. BOX 1778
   SPARTANBURG, S.C. 29304
   TEL: (803)576-3230

CORPS OF ENGINEERS | 4 | 3 | 2 | 1 | U.S. ARMY



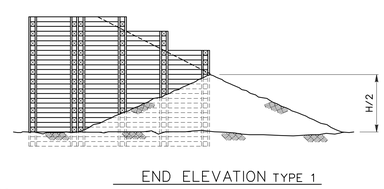
B21 - TIMBER CRIB

ESTIMATED COST, $			
PER LIN. FT. OF CROSS SECTION 15 FT. HIGH	LUMP SUM END		
	TYPE 1	TYPE 2	TYPE 3
1,440	17,600	36,500	37,300

ESTIMATED ERECTION TIME MANHOURS			
100 LIN. FT. OF CROSS SECTION 15 FT. HIGH	END TYPE	END TYPE 2	END TYPE
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.



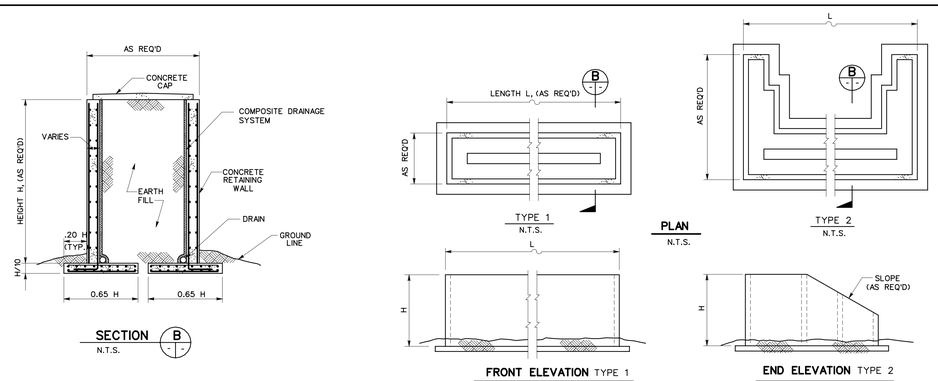
END ELEVATION TYPE 1

ESTIMATED COST, $		
PER LIN. FT. OF CROSS SECTION 15 FT. HIGH	LUMP SUM END	
	TYPE 1	TYPE 2
560	3,200	29,500

ESTIMATED ERECTION TIME MANHOURS		
100 LIN. FT. OF CROSS SECTION 15 FT. HIGH	END TYPE 1	END TYPE 2
1,660	90	860

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.



B22 - EARTH FILLED CONCRETE WALL

Symbol	Description	Date	Approved
1	SHEET TOTAL CHANGED	22NOV0	

Revisions

US ARMY ENGINEER DIVISION HUNTSVILLE
CORPS OF ENGINEERS
HUNTSVILLE, ALABAMA

Site adapt A/E :

US Army Corps of Engineers

Dwn. by : RDP | Ckd. by : AF

BARRICADES

Reviewed by :

Approved by :

Date : 2 DEC 88

Sheet reference number : 12

Design file no. : 51733

Rev

Drawing code : DEF 149-30-01

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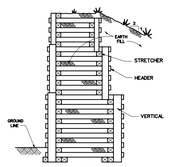
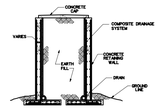


B21 - TIMBER CRIB

REMARKS:

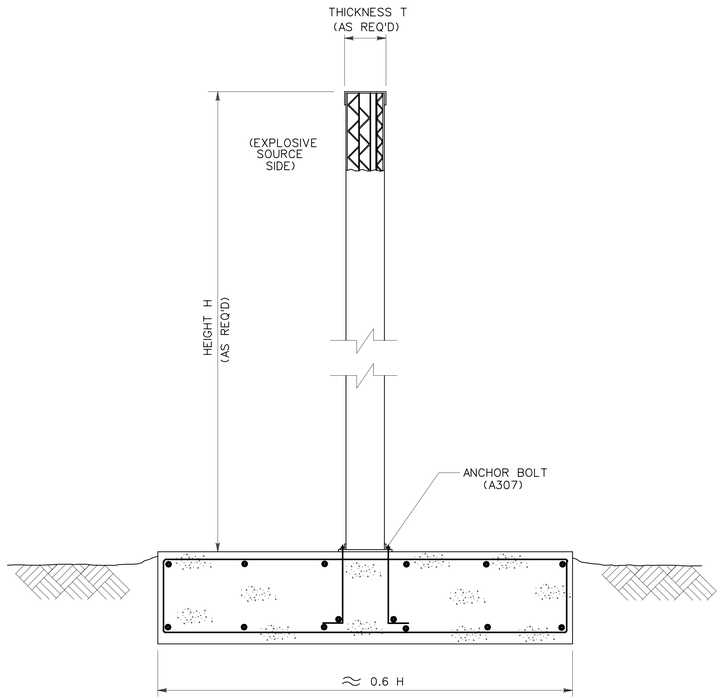
1. ALL TIMBER SHALL BE PRESSURE TREATED.
2. ALL STRETCHERS SHALL BE LAID HORIZONTALLY.
3. FILL, IN AND BEHIND CRIB, SHALL BE FREE DRAINING.
4. HEIGHT LIMITATION APPROXIMATELY 30 FEET.



B22 - EARTH FILLED CONCRETE WALL

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.



SECTION C D SIM.
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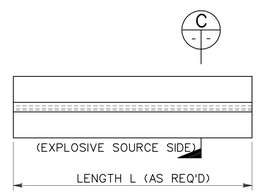
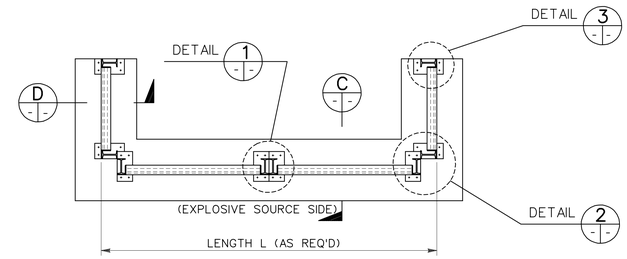


TYPE 1



TYPE 2

PLAN
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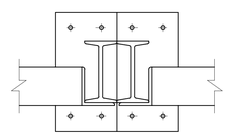

CONNECTION DETAIL 1
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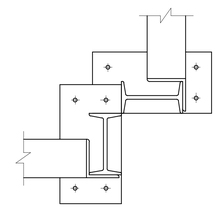

CORNER DETAIL 2
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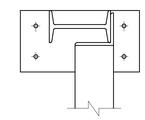

END DETAIL 3
N.T.S.

B23 - VENTED SUPPRESSIVE SHIELD WALL SYSTEM

ESTIMATED COST, $		
PER LIN. FT. OF CROSS SECTION 15 FT. HIGH	LUMP SUM END	
	TYPE 1	TYPE 2
2,150	-	7,850

ESTIMATED ERECTION TIME MANHOURS		
100 LIN. FT. OF CROSS SECTION 15 FT. HIGH	END TYPE 1	END TYPE 2
100	-	15

REMARKS:

1. AESTHETICALLY PLEASING.
2. CAN BE ECONOMICALLY INSTALLED WITH UNSKILLED LABOR.
3. AVAILABLE IN DIFFERENT CONFIGURATIONS FOR VARIOUS APPLICATIONS.
4. PROVIDES BLAST AND FLAME SUPPRESSION.
5. PROVIDES HIGH RESISTANCE TO FRAGMENT PENETRATION.
6. EARTH FILL IS NOT ALLOWED FOR VENTED SUPPRESSIVE SHIELD WALLS.
7. BARRICADE MUST BE CONSTRUCTED IN ACCORDANCE WITH THE REQUIREMENTS OF TM 5-1300 (SEE REFERENCES, SHEET 1).
8. PATENTED:
   SHIELDING TECHNOLOGIES INC.
   1003 OLD PHILADELPHIA RD.
   ABERDEEN, MD. 21001
   (301)272-1138

Symbol	Description	Date	Approved
1	NEW SHEET	22NOV91	

Revisions

U.S. ARMY ENGINEER DIVISION,
HUNTSVILLE
CORPS OF ENGINEERS
HUNTSVILLE, ALABAMA

Site adapt A/E :

US Army Corps of Engineers

Dwn. by: RDP
Ckd. by: CB

BARRICADES

Reviewed by :
Approved by :
Date : 22 NOV 9
Drawing code : DEF 149-30-01
Sheet reference number : 13
Design file no.: 51734
Rev.
Sheet 13 of 13

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