DEFINITIVE DRAWINGS

BARRICADES

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

DEFINITIVE DRAWINGS

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BARRICADES
4. Where the exposed site (ES) includes personnel rather than a structure, the height of the acceptor stack 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.

3. 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.

2. The barricade’s height 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.

1. General notes:

- Barricades - Barriers are intervening barriers of such type, size & configuration that limit the effect of a threat (e.g., explosion, fire, etc.) to a prescribed manner. Properly constructed & used, barricades may be used in conjunction with earth materials to extend & enhance the ballistic trajectories of the fragments of concern. (See generic barricade sheet.)

- Limitations: A barricade interrupts the direct line-of-sight motion of the shock wave if the barricade has sufficient dimensions & is located close enough to the threat source. Barricades may be used to extend or enhance the protective benefits of earth materials (e.g., geotextiles, gunnites) that do not produce hazardous debris but may be too cohesive. If it is impossible to use a cohesive material, stones must be limited to the lower center of fills. Earthen materials must be free from harmful or toxic material, trash, debris, & stones heavier than 6 in diameter. The larger of acceptable & available materials is used.

- Minimum requirements per DESR 6055.09:

  - The slope of an un-reinforced earth barricade must be horizontal to the vehicle unless damage consists of a single, external barricade located close to the vehicle. Barricades located in a trench or pit may be oriented to the vehicle, provided the barricades are fully embedded in the earth. Barricades located in a trench or pit may be oriented to the vehicle, provided the barricades are fully embedded in the earth. Barricades located in a trench or pit may be oriented to the vehicle, provided the barricades are fully embedded in the earth. Barricades located in a trench or pit may be oriented to the vehicle, provided the barricades are fully embedded in the earth.

  - Materials for earth barricades (e.g., sand, soil, etc.) must be reasonably cohesive & extend the protective benefits of earth materials. Materials that do not have cohesive behavior must not be used in earth barricades. Materials that do not have cohesive behavior must not be used in earth barricades.

  - Minimum width & height of barricades must be 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.

  - Earth barricades must be reinforced with a suitable material that does not produce hazardous debris but may be too cohesive. If it is impossible to use a cohesive material, stones must be limited to the lower center of fills. Earthen materials must be free from harmful or toxic material, trash, debris, & stones heavier than 6 in diameter. The larger of acceptable materials is used.

- Manufacturers - Many of these barricade systems are proprietary & must be obtained from the manufacturer. They are not available for general information only. Their inclusion does not imply product endorsement. If the barricade is not furnished as a standard product, it can be provided to potential users with sources of information.

- Site-specific design may be needed for type of soil.
1. **Earth Mound**
2. **Reinforced Earth Mound**
3. **Wrap-Around Earth Mound**
4. **Timber - Single Revetted**
5. **Sand Bag - Single Revetted**
6. **Concrete Gravity Wall - Single Revetted**
7. **Timber - Double Revetted**
8. **Reinforced Soil - Single Revetted**
9. **Wrap-Around Retaining Wall**
10. **Reinforced Soil - Double Revetted**
11. **Waffle Crete Retaining Wall**
12. **Precast Double Tees**
13. **Concrete Blast Wall**
14. **Concrete Cribbing**
15. **EARTH-FILLED CONCRETE WALL**
16. **2,75" ROCKET BARRICADE**
17. **CANTILEVER RETAINING WALL**
18. **PRECAST CONCRETE BIN**
19. **STEEL SINGLE-REVETTED RETAINING WALL**
20. **STEEL BIN SINGLE-REVETTED RETAINING WALL**
21. **TIMBER CRIB**
22. **EARTH-FILLED STEEL MESH DEFENSIVE BARRICADE (HESCO)**
23. **STEEL BIN DOUBLE-REVETTED RETAINING WALL**
B9 - REINFORCED SOIL - SINGLE REVETTED

- End Type 1
- End Type 2

B10 - REINFORCED SOIL - DOUBLE REVETTED

- End Type 1
- End Type 2
- End Type 3

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**REMARKS:**

1. CAN BE ECONOMICALLY AND RAPIDLY CONSTRUCTED
2. REQUIRES SHEAR LUG FOUNDATION
3. VARIETY OF ARCHITECTURAL FACING ELEMENTS AND FINISHES AVAILABLE (STAIN, HORIZONTAL, RIBBED, ETC.)
4. NO HEIGHT OR LENGTH LIMITATIONS
5. FACING ELEMENTS ARE REUSABLE
6. NO SECTIONS ARE REQUIRED
7. WALLS CAN BE LOCATED CLOSE TO SITE BOUNDARIES OR OBSTRUCTIONS
8. SYSTEM ADAPTABLE TO SLOPING WALL CONFIGURATIONS AND TO TIERS
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 SETTLEMENT. PROPER DRAINAGE. SELECTION OF BACKFILL SHALL BE RECOMMENDED BY THE SYSTEM MANUFACTURER.
12. WALLS CAN BE LOCATED CLOSE TO SITE BOUNDARIES OR OBSTRUCTIONS
13. REQUIRES SLOPE STABILIZATION (SEEDING, ETC.)
14. OTHER VENDORS (MAY BE AVAILABLE FROM OTHER VENDORS)
   - Reinforced Earth Co.
   - VSL Corporation
   - Hunt Refe Eart Co.

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**ESTIMATED ERECTION TIME**

- End Type 1
- End Type 2
- End Type 3

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**SAFETY FIRST**

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**DEVELOPMENT OF DESIGN**

- Designed by:
- Drawn by:
- Checked by:

---

**DESIGN AND CONSTRUCTION**

- Original Document
- Submittal by:
- Date:

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**SUPPORT VALUE ENGINEERING - IT PAYS**
B11 - WRAP AROUND RETAINING WALL

B12 - WAFFLE-CRETE RETAINING WALL

NOTE: SEE SHEET 1 FOR L AND H DIMENSION DETERMINATION

REMARKS:
1. PRECAST FACING PANELS ARE LIGHTWEIGHT.
2. PANELS MUST BE EXTREMELY BRACED DURING CONSTRUCTION.
3. WALL REQUIREMENTS BATTERY OF VARIOUS FOOT.
4. PRECAST FACING PANELS ARE AVAILABLE WITH WIDE VARIETY OF FINISHES.
5. LIMIT TO 10 FT IN HEAT.
6. PROPRIETARY WAFFLE-CRETE PANELS SHOWN. OTHER FACING SYSTEMS MAY BE SUBSTITUTED.
7. POLYMER CONNECTION ROD IS USED TO CONNECT THE PRECAST FACINGS PANELS TO THE GEOSYNTHETIC REINFORCEMENTS.
8. GEOSYNTHETIC REINFORCEMENT IS MANUFACTURED FROM HIGH DENSITY POLYMER.
9. POLYMER CONNECTION ROD IS USED TO CONNECT THE PRECAST FACINGS PANELS TO THE GEOSYNTHETIC REINFORCEMENTS.
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ESTIMATED ERECTION TIME

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30 June 2021

Chad House, PE

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Date:

Design by:

Drawn by:

Drawing code:

SUPPORT CENTER, ARMY ENGINEERING AND SUPPORT COMMAND

SUPPORT VALUE ENGINEERING - IT PAYS

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B15 - CONCRETE BLAST WALL

NOTE: SEE SHEET 1 FOR L AND H DIMENSION DETERMINATION

REMARKS:
1. CONCRETE T-WALL MUST HAVE 5000 PSI 28-DAY COMpressive STRENGTH.
2. TOTAL BASE MATERIAL MUST BE IDENTIFIED.
3. T-WALL MUST HAVE 7000 PSI YIELD STRENGTH.
4. T-WALL MUST BE MIN. 1" THICK AT EXPECTED ROCKET STRIKE LOCATION.
5. SANd THICKNESS, T, SHOULD BE 8 FT FOR F > 160 FT.
6. SAND MAY BE CONTAINED IN VARIOUS CONTAINER SYSTEMS. PERMITTED CONTAINERS INCLUDE HESCO-LIKE CONTAINERS, SANDBAGS, LIGHTWEIGHT METAL PANELS (16-GAUGE OR THINNER SIMILAR TO 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 ROCKET STRIKE LOCATION.
9. ROCKET POD TRAJECTORY COULD IMPACT WALL WITH SHORT DURATIONS.

B16 - 2.75" ROCKET BARRICADE

NOTE: SEE SHEET 1 FOR L AND H DIMENSION DETERMINATION

REMARKS:
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2. TOTAL BASE MATERIAL MUST BE IDENTIFIED.
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H = 2 x (T + F) sin(e) + H_{RP}
H_{RP} = F_{RP} / F

100 LIN FT. OF CROSS SECTION, 15 FT HIGH

FLIGHT DISTANCE, F

ROCKET POD

ROCKET TRAJECTORY

1,400 MANHOURS

SAND THICKNESS, T

SANd Filled CONTAINERS

SANdbags

.lightweight METAL PANELS (16-GAUGE OR THINNER SIMILAR TO GEOTEXTILE CONTAINERS), AND PLASTIC CONTAINERS.

SANd BAGS

LIGHTWEIGHT METAL PANELS (16-GAUGE OR THINNER SIMILAR TO GEOTEXTILE CONTAINERS), AND PLASTIC CONTAINERS.

SANd SHOULD NOT CONTAIN ROCKS LARGER THAN 1/2" IN DIAMETER.

THIS BARRICADE IS INTENDED TO PREVENT 2.75 INCH ROCKET STRIKE LOCATION.
ESTIMATED ERECTION TIME

B21 - TIMBER CRIB

NOTE: SEE SHEET 1 FOR L AND H DIMENSION DETERMINATION

ESTIMATED ERECTION TIME

B22 - EARTH FILLED CONCRETE WALL

NOTE: SEE SHEET 1 FOR L AND H DIMENSION DETERMINATION

REMARKS:
1. ALL TIMBER SHALL BE PRESSURE TREATED.
2. ALL STRETCHERS SHALL BE LAID HORIZONTALLY.
3. FILL AND BEHIND CRIB SHALL BE FREE DRAINING.
4. HEIGHT LIMITATION APPROXIMATELY 30 FEET.
5. CONCRETE WALLS PROVIDED WALLS ARE TIED TOGETHER SUFICIENTLY TO HOLD SOIL.
6. FULLY GROUTED REINFORCED MASONRY MAY BE USED IN PLACE OF CONCRETE WALLS PROVIDED WALLS ARE TIED TOGETHER SUFICIENTLY TO HOLD SOIL.
7. PRECAST CONCRETE T-WALLS MAY BE USED IN PLACE OF CONCRETE WALLS PROVIDED WALLS ARE TIED TOGETHER SUFICIENTLY TO HOLD SOIL.
8. PRECAST SEGMENTAL CONCRETE RETAINING WALLS MAY BE USED IN PLACE OF CONCRETE WALLS PROVIDED WALLS ARE TIED TOGETHER SUFICIENTLY TO HOLD SOIL.

REMARKS:
1. REQUIRES EXTENSIVE FORMING.
2. DIFFICULT UPHOLDS WOODEN HULLS WITH ACH HULLS BEARING PRESSURE.
3. CANNOT TOLERATE SETTLEMENT.
4. CAN BE LOCATED IN SITU ON OTHERS OR OBSTRUCTIONS.
5. CAN BE LOCATED IN SITU ON OTHERS OR OBSTRUCTIONS.
6. CAN BE LOCATED IN SITU ON OTHERS OR OBSTRUCTIONS.
7. PRECAST CONCRETE T-WALLS MAY BE USED IN PLACE OF CONCRETE WALLS PROVIDED WALLS ARE TIED TOGETHER SUFICIENTLY TO HOLD SOIL.
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REMARKS:
1. TIMBER Retaining WALLS CAN BE LOCATED NEAR PROPERTIES OR OBSTRUCTIONS.
2. GREATER HEIGHTS WILL CAUSE HIGH SOIL BEARING PRESSURE.
3. PRESSURE.
4. CAN BE LOCATED IN SITU ON OTHERS OR OBSTRUCTIONS.
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B23 - EARTH-FILLED STEEL MESH DEFENSIVE BARRIER (HESCO)

B24 - STEEL BIN SINGLE-REVETTED RETAINING WALL

REMARKS:
1. STEEL BIN SINGLE-REVETTED 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.

ESTIMATED ERECTION TIME

<table>
<thead>
<tr>
<th>MANHOURS</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 LIN. FT. OF CROSS SECTION, 15 FT. HIGH</td>
</tr>
<tr>
<td>1.750</td>
</tr>
</tbody>
</table>

REMARKS:
1. UNITS ARE LIGHTWEIGHT, DEPLOYABLE CELLS THAT ARE CONSTRUCTED FROM REUSED STEEL MESH AND A GEOTEXTILE LINER AND FILLED WITH SOIL.
2. CAN BE ECONOMICALLY AND RAPIDLY CONSTRUCTED.
3. MINIMUM SITE PREPARATION REQUIRED.
4. SOIL FILLED PER MANUFACTURER SPECIFICATIONS BUT MEET MINIMUM SITE PREPARATION REQUIREMENTS.
5. BARRIERS CAN BE USED AS A REDUCED QUANTITY OPTION IN OPERATIONAL STORAGE SCENARIOS PER DECEMBER 19-15 SEE REFERENCES.
6. TYPICAL HESCO SIZES USED: ML, 7 BOTTOM, TYPE 1 CROSS SECTION, 20" 7. 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
(866) 345-7332

NOTE: SEE SHEET 1 FOR LAND H DIMENSION DETERMINATION

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