EARTH-COVERED MAGAZINE, 
CONCRETE OVAL-ARCH 421-80-09 
WITH 8'-0" OR 10'-0" DOOR
1.0 DESIGN CRITERIA

A. BUILDING CODES AND SPECIFICATIONS:

1. INTERNATIONAL BUILDING CODE 2006 (IBC) AS MODIFIED BY UFC 1-200-31
2. NAVAL ARCHITECTS AND ENGINEERS COUNCIL (NAECE) CODES
3. AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)
4. UNITED STATES NAVY WELDING SOCIETY, A, W 5

B. LIVE LOADS

1. ROOF.......................... 150 PSI
2. STOREY......................... 100 PSI

C. SNOW LOAD

1. BACKGROUND................ 120 PSI
2. BASIS FOR DESIGN........... 100 PSI

D. WIND LOAD

1. BASIC WIND PRESSURE........ 60 PSI
2. WIND ORIENTED FACTOR...... 0.8

E. EARTHQUAKE

1. OCCUPANCY CATEGORY=H
2. S1......................... 0.4
3. SITE S3.67

F. SOILS

1. CLASSIFIED SOIL............ C
2. MINIMUM Rheometric factor...... 120

2.0 GENERAL

1. CONTRACTOR SHALL VENTILATE ALL DIMENSIONS AND SITE CONDITIONS PRIOR TO CONSTRUCTION.
2. THE CONTRACTOR SHALL NOTIFY THE CONTRACTING OFFICER OF ANY DISPARITIES PRIOR TO CONSTRUCTION.
3. THE CONTRACTOR SHALL NOT SUBSTITUTE ANY MATERIALS.
4. ALL TERMS AND CONDITIONS SHALL CONFORM TO THE FOLLOWING DOCUMENTS:
   a. NAVAL ARCHITECTS AND ENGINEERS COUNCIL (NAECE) CODES
   b. AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)
   c. UNITED STATES NAVY WELDING SOCIETY, A, W 5

3.0 FOUNDATIONS

1. ALL FOUNDATIONS ARE TO BE BUILT IN ACCORDANCE WITH THE SITE CONDITIONS AS SHOWN ON THE DRAWINGS.
2. FOUNDATION DETAILS ARE SUBJECT TO CHANGE BASED ON MUTUAL AGREEMENT.
3. FOUNDATIONS SHALL BE BASED ON REFERENCE DRAWINGS AND SPECIFICATIONS.

4.0 CONCRETE

1. ALL CONCRETE SHALL BE PRODUCED IN ACCORDANCE WITH THE REQUIREMENTS OF REFERENCE DRAWINGS AND SPECIFICATIONS.
2. CONCRETE SHALL BE PLACED AND COMPACTED IN ACCORDANCE WITH THE REQUIREMENTS OF REFERENCE DRAWINGS AND SPECIFICATIONS.
3. CONCRETE SHALL BE CURED IN ACCORDANCE WITH THE REQUIREMENTS OF REFERENCE DRAWINGS AND SPECIFICATIONS.

5.0 STRUCTURAL STEEL

1. ALL Structural steel components shall conform to the following ASTM designations:
   a. A36
   b. A572
   c. A516
   d. A992

6.0 SPECIAL REQUIREMENTS

1. ALL SPECIAL REQUIREMENTS SHALL BE MET IN ACCORDANCE WITH REFERENCE DRAWINGS AND SPECIFICATIONS.
2. ALL SPECIAL REQUIREMENTS SHALL BE APPROVED BY THE CONTRACTING OFFICER.
3. ALL SPECIAL REQUIREMENTS SHALL BE NOTED ON THE DRAWINGS.

7.0 WELDING

1. ALL WELDS SHALL BE CONFORM TO THE FOLLOWING ASTM DESIGNATIONS:
   a. A302
   b. A307
   c. A527

8.0 SUPPORT VALUE ENGINEERING - IT PAYS

1. THE MAGAZINE HAS BEEN ANALYZED FOR THE LOADS LISTED ON THIS SHEET AND DETERMINED TO MEET THE REQUIREMENTS OF REFERENCE DRAWINGS AND SPECIFICATIONS.
2. THE CONTRACTOR SHALL PROVIDE A SUPPORT SYSTEM TO MEET THE REQUIREMENTS OF REFERENCE DRAWINGS AND SPECIFICATIONS.
3. THE CONTRACTOR SHALL PROVIDE A SUPPORT SYSTEM TO MEET THE REQUIREMENTS OF REFERENCE DRAWINGS AND SPECIFICATIONS.

9.0 ELECTRICAL

1. ALL ELECTRICAL SYSTEMS SHALL BE DESIGNED IN ACCORDANCE WITH THE REQUIREMENTS OF REFERENCE DRAWINGS AND SPECIFICATIONS.
2. ALL ELECTRICAL SYSTEMS SHALL BE TESTED IN ACCORDANCE WITH THE REQUIREMENTS OF REFERENCE DRAWINGS AND SPECIFICATIONS.
3. ALL ELECTRICAL SYSTEMS SHALL BE INSPECTED IN ACCORDANCE WITH THE REQUIREMENTS OF REFERENCE DRAWINGS AND SPECIFICATIONS.

10.0 OTHER

1. ALL OTHER REQUIREMENTS SHALL BE MET IN ACCORDANCE WITH REFERENCE DRAWINGS AND SPECIFICATIONS.
2. ALL OTHER REQUIREMENTS SHALL BE APPROVED BY THE CONTRACTING OFFICER.
3. ALL OTHER REQUIREMENTS SHALL BE NOTED ON THE DRAWINGS.

11.0 SUPPORT CENTER, HUNTSVILLE (STRUCTURAL BRANCH).

1. STRUCTURE HAS BEEN DETERMINED TO BE ADEQUATE FOR THE DESIGN CRITERIA LISTED ON THIS SHEET.
2. STRUCTURE MEETS THE REQUIREMENTS OF REFERENCE DRAWINGS AND SPECIFICATIONS.
3. STRUCTURE MEETS THE REQUIREMENTS OF REFERENCE DRAWINGS AND SPECIFICATIONS.
### Special Inspection Schedule Certification

<table>
<thead>
<tr>
<th>Item</th>
<th>Special Inspection Items</th>
<th>Reference</th>
</tr>
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<tbody>
<tr>
<td>1. CONCRETE CONSTRUCTION</td>
<td></td>
<td>ACI318: 3.5.7, 7.7.7</td>
</tr>
<tr>
<td>2. REINFORCING STEEL PLACEMENT</td>
<td></td>
<td>AWS D1.1, A318: 3.5.3.2</td>
</tr>
<tr>
<td>3. WELDING OF REINFORCEMENT</td>
<td></td>
<td>ASTM D100, AWS D1.1, A318: 3.5.3.10</td>
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<tr>
<td>4. CONCRETE PLACEMENT</td>
<td></td>
<td>ACI 318: 5.9.9, 5.12.1</td>
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<tr>
<td>5. SAMPLING AND TESTING OF CONCRETE</td>
<td></td>
<td>ASTM C 31, ACI 318: 5.5.4, 5.5.8, ACI 318: 5.11.2.8, ACI 318: 5.11.6.1.1</td>
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**Door Construction**
- Fabricator Certification/Quality Control Procedures
- Fabricator Inspection

**Special Items Related to the Bluff Structural Strength Designation**
- Fabricator Certification/Quality Control Procedures
- Fabricator Inspection

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<td>1. SPECIAL INSPECTION SCHEDULE SHALL BE REVISED TO REFLECT SPECIFIC PROJECT REQUIREMENTS IN ACCORDANCE WITH CHAPTER 17 OF THE INTERNATIONAL BUILDING CODE; HOWEVER, AT A MINIMUM THE SPECIAL ITEMS RELATED TO THE &quot;OTHER EXPLOSIVES SAFETY RELATED ITEMS&quot; SHALL BE INSPECTED AS SHOWN ON THIS SCHEDULE.</td>
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1. SPECIAL INSPECTION SCHEDULES SHALL BE REVISED TO REFLECT SPECIFIC PROJECT REQUIREMENTS IN ACCORDANCE WITH CHAPTER 17 OF THE INTERNATIONAL BUILDING CODE; HOWEVER, AT A MINIMUM THE SPECIAL ITEMS RELATED TO THE "OTHER EXPLOSIVES SAFETY RELATED ITEMS" SHALL BE INSPECTED AS SHOWN ON THIS SCHEDULE.

**Special Inspection Notes:**
- 1. Inspection intervals are as follows:
  - C- Continuous: The full-time observation of work requiring special inspection by an approved special inspector who is present in the area where work is being performed
  - P- Periodic: The part-time or intermittent observation of work requiring special inspection by an approved special inspector who is present in the area where work has been or is being performed at the completion of the area.
  - S- Submittal
- 2. Structural test and special inspections are based on Chapter 17 of the IBC 2008 Edition.
- 3. Contractor shall hire a qualified inspection and testing agency to perform special inspections and testing in accordance with the IBC. Submit inspection reports to the contracting officer for each day's special inspections and testing is performed.

**Additional Information:**
- US Army Corps of Engineers
- Huntsville Center
- Sheet: 1 of 22
- Date: Sep 2013
- Size: 1/8" = 1'-0"
- Scale: AS SHOWN

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**Design Notes:** To be removed when preparing construction drawings.
1. Normally constructed in 87'-0" or 87'-0" lengths. Maximum length with floor slope: 90'-0".
2. Door opening may be constructed for interior sizes if 10'-0" x 10'-0" or 12'-0" x 12'-0".
3. Slab-on-grade: 6' concrete on 6" capillary water barrier and vapor barrier, reinforced with #1/2 12" O.C. each way supported 1 1/2" from top of slab. Slab, reinforced with #4 at 12" O.C. each way, supported 1 1/2" from top of slab.
4. Place control joints in slab-on-grade at 18'-0" O.C. Control joints shall be completed as shown as possible.
5. Drains to be site adapted to drain either to the front or rear of the magazine.
6. All metal parts, including reinforcement, louvers, vent, door frame, etc., shall be made electrically continuous by means of approved bonding material and methods intersecting floor isolation joint and arch reinforcement at linear feet intervals. See electrical drawings for additional information regarding LPS.
7. In frost areas provide frost resistant susceptible material under headwall footing to pull depth of frost penetration, or lower bottom of footing to frost penetration depth.
8. Louvers are optional. Their necessity and size shall be determined during the site-adaptation process based on materials to be stored and geographical locations. The louver width of 8 inches shall be maintained. The height may be varied as necessary.
9. Waterproof all surfaces of the shelter which will be in contact with earth fill after shelter is erected.

*** SAFETY FIRST ***

FOUNDATION PLAN
SCALE: 1/24" = 1'-0"

<table>
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<tr>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>DRAWN BY:</td>
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<tr>
<td>DESIGNED BY:</td>
</tr>
<tr>
<td>CHECKED BY:</td>
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</table>

US Army Corps of Engineers
Huntsville Center
Sheet Reference
Date:

SCALE: 1/24" = 1'-0"
*** SAFETY FIRST ***

CONTRACTORS OPTION: EXTERIOR FACE AT TOP OF WALL MAY BE CONSTRUCTED AS SHOWN

NOTE:
- EARTH FILL OVER ARCH SHALL CONTAIN NO STONES HEAVIER THAN 10 POUNDS OR LARGER THAN 6" IN ANY DIMENSION.
- NO STONES HEAVIER THAN 10 POUNDS OR EARTH FILL OVER ARCH SHALL BE USED.

*** SUPPORT VALUE ENGINEERING - IT PAYS ***

*** SAFETY FIRST ***
*** SAFETY FIRST ***

**A SECTION**

- **MATERIAL**
  - SAND FILTER

- **EACH FACE**
  - #4 AT 12" O.C.

- **2"**

- **MAX.**

**B SECTION**

- **MATERIAL**
  - SAND FILTER

- **EACH FACE**
  - #4 AT 12" O.C.

- **2"**

- **MAX.**

- **S201**

- **S101**

- **MAX.**

- **#5 CONT. AT 12" O.C.**

- **1½ DEEP KEY CONT.**

- **3/4" CHAMFER, TYP.**

**C SECTION**

- **MATERIAL**
  - SAND FILTER

- **EACH FACE**
  - #4 AT 12" O.C.

- **2"**

- **MAX.**

- **S201**

- **S101**

- **MAX.**

- **#5 CONT. AT 12" O.C.**

- **1½ DEEP KEY CONT.**

- **3/4" CHAMFER, TYP.**

**D SECTION**

- **MATERIAL**
  - SAND FILTER

- **EACH FACE**
  - #4 AT 12" O.C.

- **2"**

- **MAX.**

- **S201**

- **S101**

- **MAX.**

- **#5 CONT. AT 12" O.C.**

- **1½ DEEP KEY CONT.**

- **3/4" CHAMFER, TYP.**

**NOTE:**

As an option, depending on site-specific conditions, the embankment may be replaced with a filter consisting of two layers of materials, with the upper layer consisting of a smaller-diameter embankment material with a minimum thickness of 1.5 feet, placed on top of the larger-diameter embankment material. The embankment material shall be designed to meet the requirements of the applicable codes and standards.
For support value engineering - it pays.

S-305

1. **DESCRIPTION**

   a. **REINFORCING**
      - Stop all reinforcement
      - #4 ties at 12" O.C. each face
      - #4 at 12" O.C. each face
      - #4 at 1'-8" each face
      - #4 at 1'-0" each face
      - #4 at 1'-0" each face

   b. **SECTION**
      - 34" CHAMFER, TYP.
      - 1'-8" MIN.
      - Extent of plaster
      - Horizontal wall reinforcement
      - Vertical wall reinforcement

   c. **NOTE:**
      - Stairs embedded at 0'11" and 0'35" not shown for clarity
      - Angles embedded at each face
      - Angle of each face

   d. **FOR FRONT WALL REINF.**
      - See sheet S-303

   e. **FOR BACKWALL REINF.**
      - See sheet S-302

   f. **FOR AFFIRM WALL REINF.**
      - See sheet S-303

   g. **FOR ARCH WALL REINF.**
      - See sheet S-303

2. **NOTES:**

   a. #10 bars in header are not shown to avoid interference of plasters to avoid interference of rebar

   b. Extents of pilaster

   c. Pilaster and beam edges

3. **FOR ARCH WALL REINF.**

   a. See sheet S-303

   b. Front wall reinf.

   c. Back wall reinf.

4. **FOR SUPPORT VALUE ENGINEERING - IT PAYS.**

   a. 34" CHAMFER, TYP.
CONTRACT DOCUMENTS FOR THE DOOR SIZE NOT USED. REDUNDANT SHEETS FROM THE CONSTRUCTION

CORRECT DOOR SIZE REQUIRED AND REMOVE THE SHEET.

SHALL VERIFY WITH THE CONTRACTING OFFICER THE DIFFERENT DOOR OPENING SIZES. THE DESIGNER
S701(A) - S702(A) (8'-0" x 8'-0" DOOR) IDENTIFY TWO SHEETS S701 - S702 (10'-0" x 10'-0" DOOR) AND CONSTRUCTION DRAWINGS FOR SITE ADAPTION DESIGN

DESIGNER NOTE: TO BE REMOVED WHEN PREPARING A

B

C

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Z

*** SAFETY FIRST ***

*** SUPPORT VALUE ENGINEERING - IT PAYS ***
HIGH SECURITY HASP

STYLE 2, MK 2 MOD 9

HIGH SECURITY HASP NOTES

1. HIGH SECURITY HASPS SHALL CONFORM TO MILITARY SPECIFICATION MIL-DTL-29181C, STYLE 2. HARDWARE INSTALLATION FOR LEFT HAND SWINGING DOORS. HIGH SECURITY PADLOCKS.

2. NO MODIFICATIONS AND/OR DEVIATIONS TO THE DOOR CONSTRUCTION SHOWN IN THE STANDARDS DRAWINGS IS PERMITTED TO ACCOMMODATE THE HIGH SECURITY HASP UNLESS APPROVED BY THE USA ENGINEERING AND SUPPORT CENTER, HUNTSVILLE (STRUCTURAL BRANCH).

3. HIGH SECURITY HASPS SHOULD CONFORM TO MILITARY SPECIFICATION MIL-DTL-43607J.

4. DOOR MANUFACTURER WILL COORDINATE WITH THE GOVERNMENT ON INSTALLATION AND ATTACHMENT DETAILS OF THE HASPS AND PROVIDE THE NECESSARY SUPPORT DETAILS AND ADDITIONAL FRAMING IF REQUIRED TO ACCOMMODATE THE HIGH SECURITY HASPS.

5. HIGH SECURITY HASP DETAIL

ELEVATION VIEW

PLAN VIEW

HASPS DETAIL

1. SEE DOOR FRAME AND DOOR DETAILS ON SHEETS S701 - S703.

2. ADDITIONAL FRAMING (IF REQUIRED) TO ACCOMMODATE THE HIGH SECURITY HASPS.

3. ATTACHMENT DETAILS OF THE HASPS AND PROVIDE THE NECESSARY STIFFENERS AND WIDTHS.

4. HIGH SECURITY HASPS, SEE NOTES ON THIS SHEET.
1. INTERNAL LOCKING DEVICE (ILD) NOTES:

1. INTERNAL LOCKING DEVICE (ILD) is a U.S. Government designed and patented locking system. The ILD system shall be purchased from a Government approved ILD manufacturer with the predesigned and patented ILD. For ordering information, contact the U.S. Army Corps of Engineers, Huntsville Support Center, Engineering and Support Center, Huntsville (Structural Branch). (805-982-1212) or their website:


2. No modifications and/or deviations to the door construction shown in the standard drawings are permitted to accommodate the ILD unless approved by the U.S. Army Corps of Engineers, Huntsville Support Center, Engineering and Support Center, Huntsville (Structural Branch).

3. Door manufacturer will coordinate with the government on installation and additional framing (if required) to accommodate the ILD.

4. See ILD manufacturer's installation drawings for additional information not shown in these drawings.

5. See door frame and door details on sheets S701-S703.

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