Texas Transportation Institute
Proving Ground

Texas Transportation Institute
The Texas A&M University System
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College Station, TX 77843-3135

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http://tti.tamu.edu

SUMMARY TEST REPORT

Contract No.: **P2011375**
Summary Test Report No.: **STR-400001-SWS1**
Project Name: **ASTM F2656-07 M50 Testing of 9 ft Wedge, 20 ft Post & Cable, and 170 ft Post & Cable Barriers**
Sponsor Name: **Smith & Wesson Security Solutions**

DATE: **July 21, 2011**

TO: **Mark R. Morgan**
Smith & Wesson Security Solutions

FROM: **D. Lance, Bullard, Jr.**, P.E., Research Engineer, TTI Roadside Safety & Physical Security Division

PREPARED BY: **Wanda L. Menges**, Research Specialist, TTI Proving Ground
Richard A. Zimmer, Senior Research Specialist, TTI Proving Ground

FOR MORE INFORMATION:

Name: D. L. Bullard, Jr.
Phone: 979-845-6153
E-mail: l-bullard@tamu.edu

SUMMARY TEST REPORT:

Disclaimer:

This report does not constitute a standard, specification, or regulation. Texas A&M University and Texas Transportation Institute assume no liability for its contents or use thereof. The names of specific products or manufacturers listed herein do not imply endorsement of those products or manufacturers. The results reported herein apply only to the security device being crash tested. The crash test was performed according to *ASTM F2656-07* standard specifications and TTI Proving Ground quality procedures.

Test Article Design and Construction

Drawings for the Smith & Wesson 9 ft wedge barrier are provided in Attachment A.

Assessment and Conclusions

On the morning of July 18, 2011, TTI Proving Ground performed *ASTM F2656-07* M50 test on 9 ft wedge barrier designed and manufactured by Smith & Wesson Security Solutions. A 2000 International 4700 single-unit flatbed truck impacted the 9 ft wedge barrier at 90.1 degrees,

with the centerline of the vehicle aligned with the centerline of the 9 ft wedge barrier. The acceptable range for impact speed for this M50 test was 47.0 mi/h or above, and the actual impact speed was 50.2 mi/h. The 9 ft wedge brought the vehicle to a stop. The cargo remained onboard the vehicle; however, the hood of the vehicle was thrown beyond the inside edge of the 9 ft wedge. The vehicle was disabled. The leading edge of the cargo bed did not penetrate beyond the inside edge of the 9 ft wedge barrier.

ASTM F2656-07 provides a range of vehicle test designations and penetration levels that allow agencies to select perimeter security devices that satisfy their specific facility needs. The amount of vehicle penetration of the security device at the required impact velocity determines the dynamic penetration rating for each condition designation.

The leading edge of the cargo bed did not penetrate beyond the inside edge of the 9 ft wedge barrier. According to *ASTM F2656-07*, the Smith & Wesson 9 ft wedge barrier meets Condition Designation/Penetration Rating M50/P1, which allows penetration of ≤3.3 ft when impacted by the medium duty truck at 50 mi/h.


0.000 s


0.048 s


0.096 s


0.144 s


Device before test


Device and Truck before test


Device after test


Truck after test

General Information
- Test Agency ..... Texas Transportation Institute (TTI)
- Test Standard Test No..... ASTM F2656-07 M50
- Test No. ..... TTI 400001-SWS1
- Date ..... July 18, 2011

Test Article
- Type..... Security Barrier
- Name ..... Smith & Wesson 9 ft wedge
- Installation Dimensions..... 109 inches x 86 inches
- Material or Key Elements ... Lid assembly and base assembly of plate steel in concrete foundation

Soil/Foundation Type ..... Concrete foundation in crushed limestone

Test Vehicle
- Type.....Medium Duty Truck
- Designation.....M50
- Model.....2000 International 4700
- Mass
  - Curb.....12,090 LB
  - Test Inertial .....15,050 LB

Impact Conditions
- Speed .....50.2 mi/h
- Angle .....90.1 degrees

Exit Conditions
- Speed .....Stopped
- Angle .....N/A

Occupant Risk Values
- Impact Velocity
  - Longitudinal..... 39.7 ft/s
  - Lateral ..... 10.5 ft/s
- Ridedown Accelerations
  - Longitudinal..... 29.6 G
  - Lateral ..... 20.6 G
- Max. 0.050-s Average
  - Longitudinal..... -18.6 G
  - Lateral ..... 10.3 G

Penetration of Cargo Bed
- Distance Beyond Inside Edge of Security Device ..... Did not penetrate
- Truck Disabled? ..... Yes

Summary of results for *ASTM F2656-07* M50 test on the Smith & Wesson 9 ft wedge barrier.

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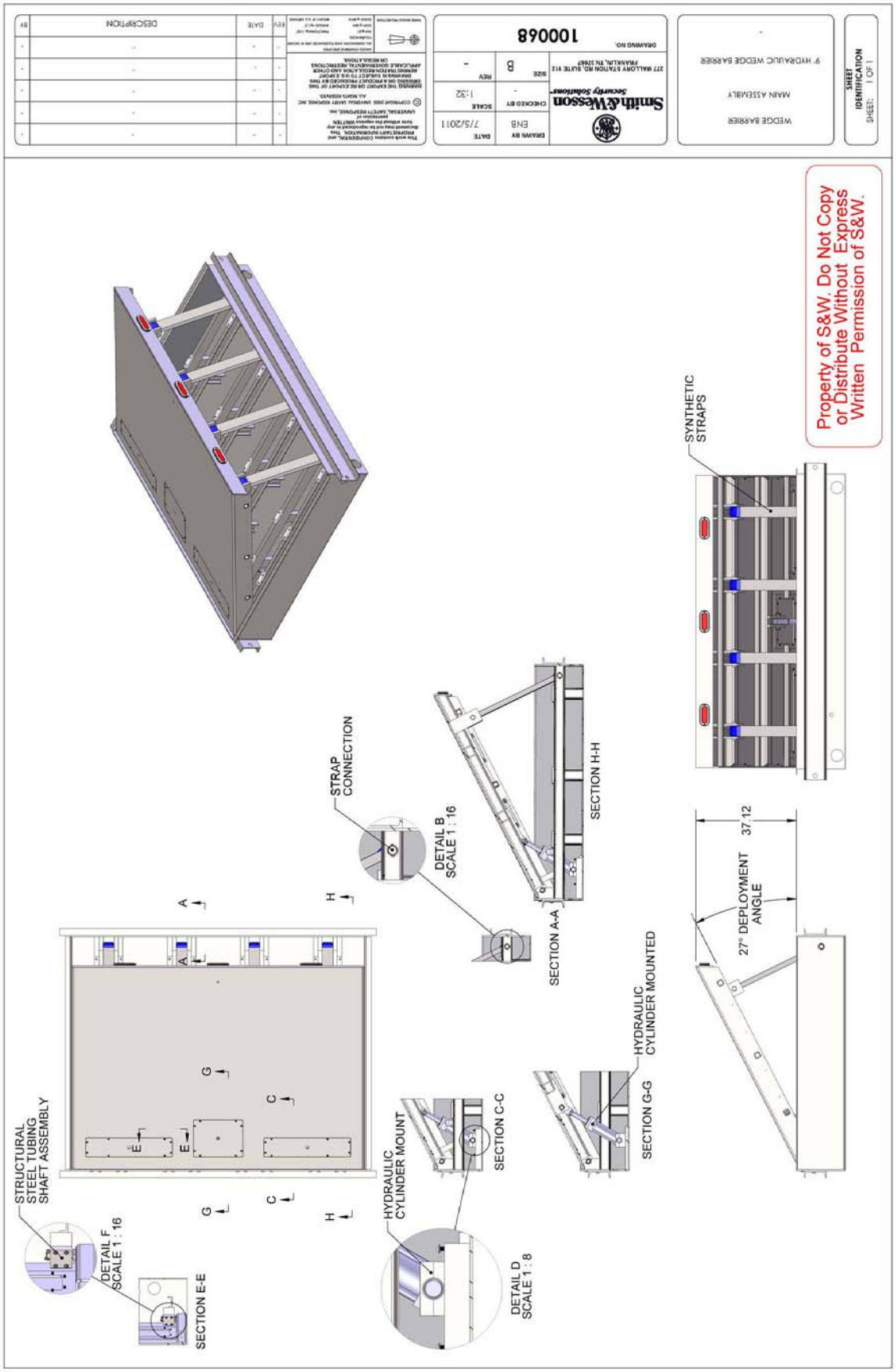
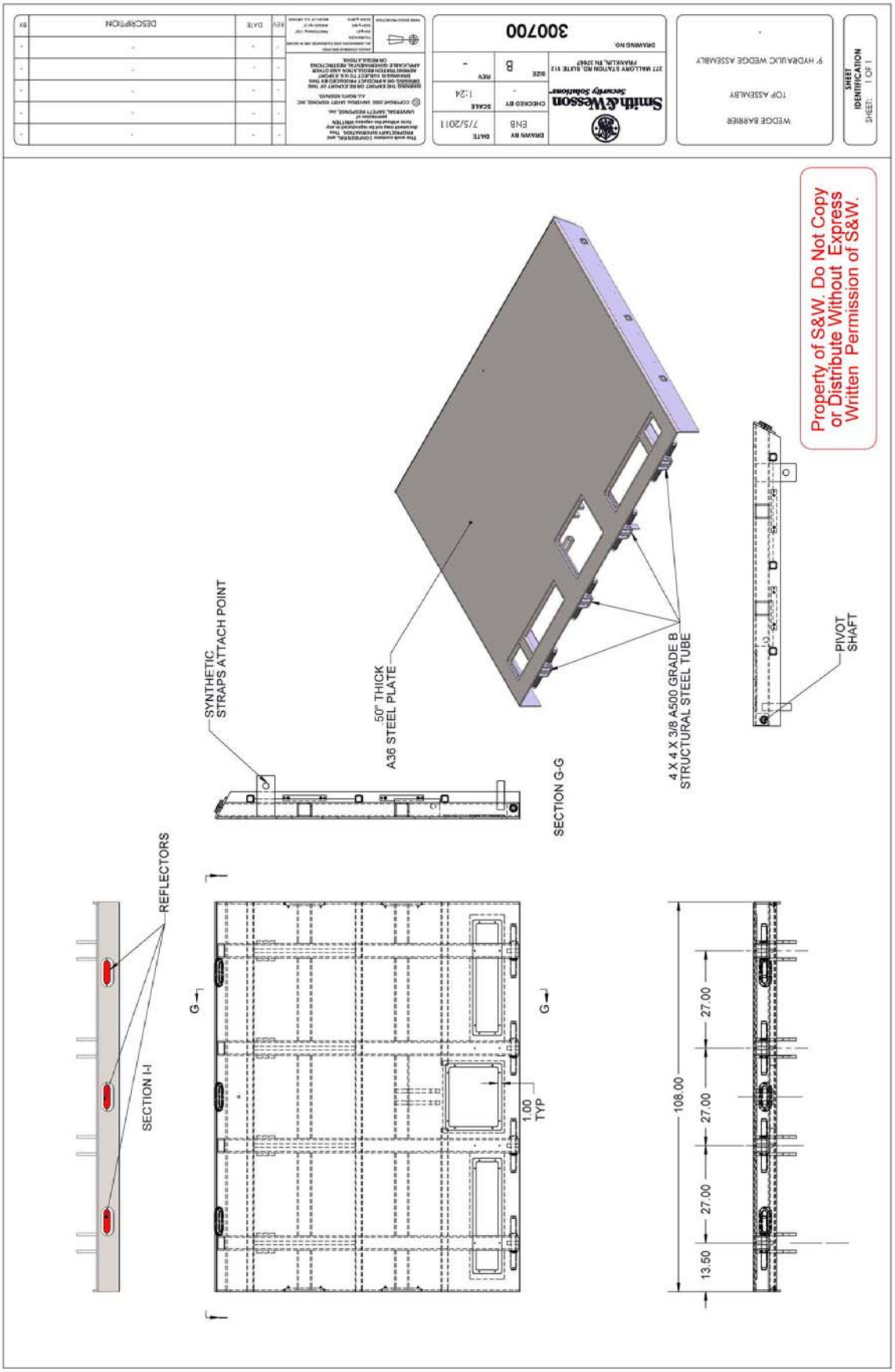
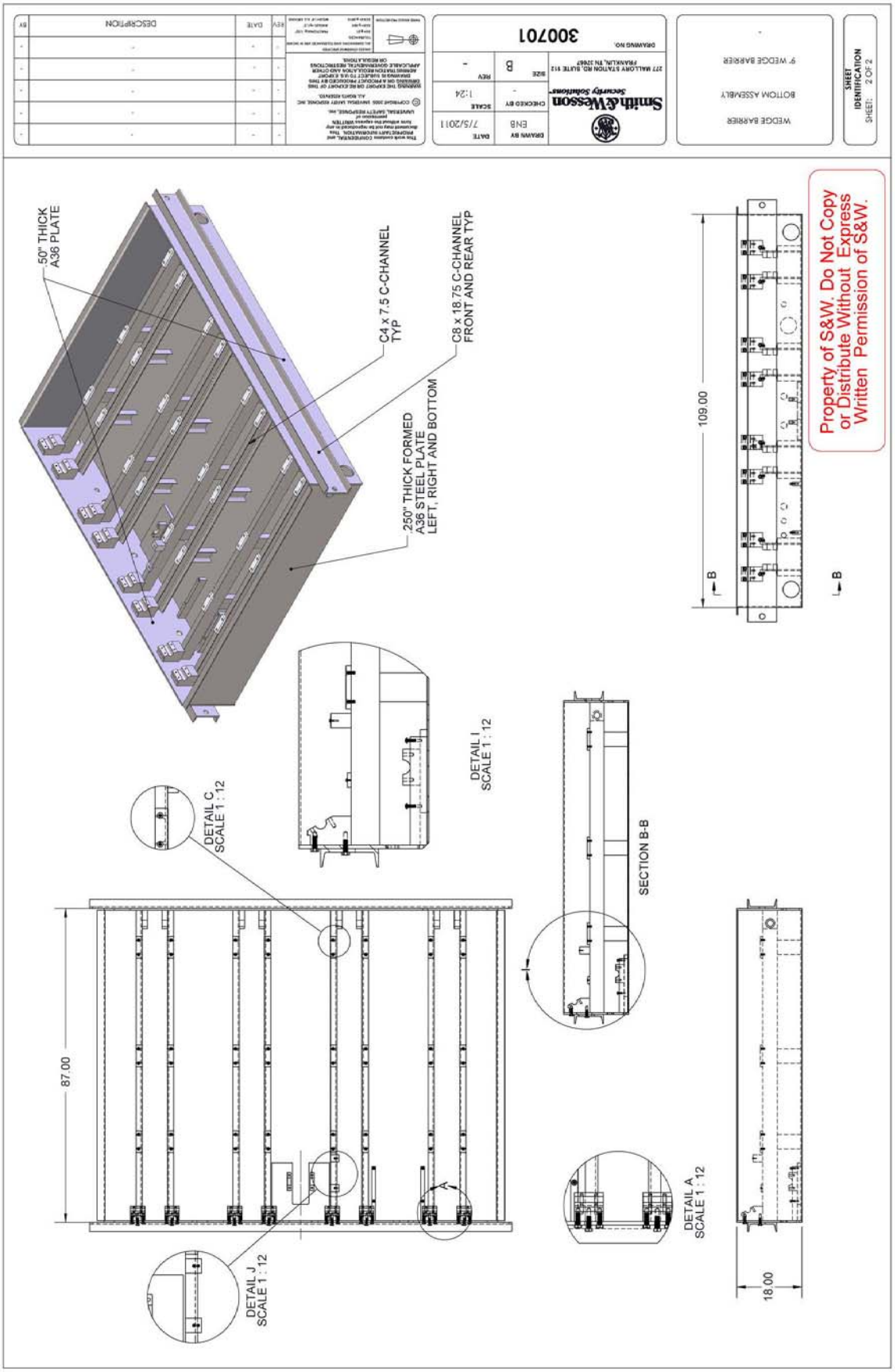
ATTACHMENT A: DETAILS OF THE SMITH & WESSON 9 FT WEDGE BARRIER


SHEET IDENTIFICATION
SHEET: 1 OF 1
WEDGE BARRIER
MAIN ASSEMBLY
9' HYDRAULIC WEDGE BARRIER
Smith & Wesson Security Solutions
277 MALLORY STATION RD. SUITE 913
FRANKLIN, TN 37067
DRAWING NO. 100068
SIZE B
REV -
CHECKED BY -
DRAWN BY ENB
DATE 7/5/2011
SCALE 1:32
DESCRIPTION
DATE
REV
BY
Property of S&W. Do Not Copy or Distribute Without Express Written Permission of S&W.
SYNTHETIC STRAPS
37.12
27° DEPLOYMENT ANGLE
STRAP CONNECTION
DETAIL B SCALE 1 : 16
SECTION H-H
SECTION A-A
HYDRAULIC CYLINDER MOUNTED
SECTION G-G
STRUCTURAL STEEL TUBING SHAFT ASSEMBLY
DETAIL F SCALE 1 : 16
SECTION E-E
HYDRAULIC CYLINDER MOUNT
SECTION C-C
DETAIL D SCALE 1 : 8


WEDGE BARRIER
TOP ASSEMBLY
9' HYDRAULIC WEDGE ASSEMBLY
SHEET IDENTIFICATION
SHEET: 1 OF 1
Smith & Wesson
Security Solutions
277 MALLORY STATION RD. SUITE 913
FRANKLIN, TN 37067
DRAWN BY
ENB
DATE
7/5/2011
CHECKED BY
-
SCALE
1:24
SIZE
B
REV
-
DRAWING NO.
300700
DESCRIPTION
DATE
REV
BY
Property of S&W. Do Not Copy or Distribute Without Express Written Permission of S&W.
SYNTHETIC STRAPS ATTACH POINT
50" THICK A36 STEEL PLATE
4 X 4 X 3/8 A500 GRADE B STRUCTURAL STEEL TUBE
PIVOT SHAFT
SECTION G-G
REFLECTORS
SECTION I-I
G
G
1.00 TYP
108.00
27.00
27.00
27.00
13.50


WEDGE BARRIER
BOTTOM ASSEMBLY
9' WEDGE BARRIER
SHEET
IDENTIFICATION
SHEET: 2 OF 2
Smith&Wesson
Security Solutions
277 MALLORY STATION RD, SUITE 913
FRANKLIN, TN 37067
DRAWN BY
ENB
DATE
7/5/2011
CHECKED BY
-
SCALE
1:24
SIZE
B
REV
-
DRAWING NO.
300701
DESCRIPTION
DATE
REV
BY
50" THICK
A36 PLATE
C4 x 7.5 C-CHANNEL
TYP
C8 x 18.75 C-CHANNEL
FRONT AND REAR TYP
250" THICK FORMED
A36 STEEL PLATE
LEFT, RIGHT AND BOTTOM
109.00
B
B
DETAIL I
SCALE 1 : 12
DETAIL C
SCALE 1 : 12
SECTION B-B
87.00
DETAIL A
SCALE 1 : 12
DETAIL J
SCALE 1 : 12
18.00
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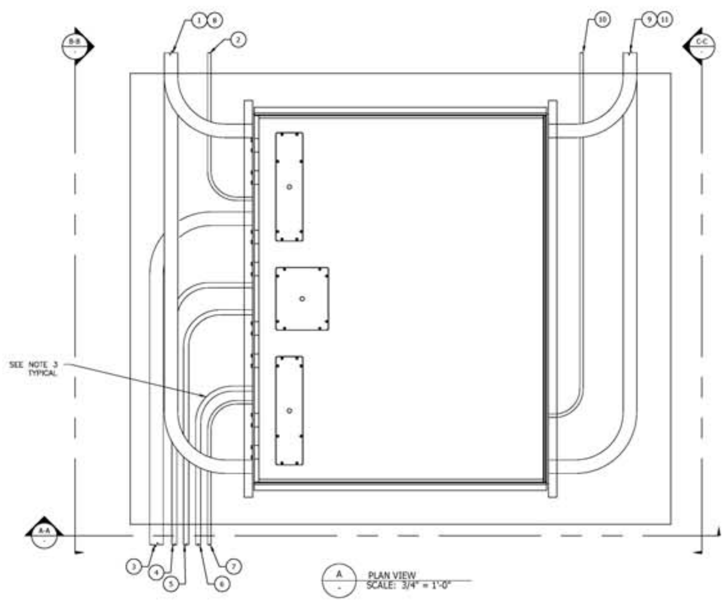
2011-07-21

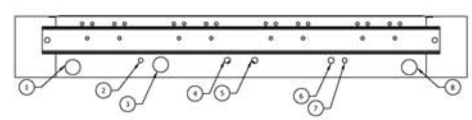
UTILITY OUTLET INDEX				
OUTLET	OUTLET DIAMETER	DESCRIPTION	MODEL	REQUIREMENT
1	4.5"	GRAVITY DRAIN	HYDRAULIC/ELECTRIC	OPTIONAL
2	1.38"	WATER PUMP – OPTION 1	HYDRAULIC/ELECTRIC	OPTIONAL
3	4.5"	HYDRAULIC HOSES	HYDRAULIC ONLY	REQUIRED FOR THIS MODEL
4	1.73"	ACTUATOR – COMMUNICATIONS	ELECTRIC ONLY	REQUIRED FOR THIS MODEL
5	1.73"	ACTUATOR – HIGH VOLT.	ELECTRIC ONLY	REQUIRED FOR THIS MODEL
6	1.73"	HIGH VOLTAGE IN	HYDRAULIC/ELECTRIC	REQUIRED ALL MODELS
7	1.38"	LOW VOLTAGE IN	HYDRAULIC/ELECTRIC	REQUIRED ALL MODELS
8	4.5"	GRAVITY DRAIN	HYDRAULIC/ELECTRIC	OPTIONAL
9	4.5"	GRAVITY DRAIN	HYDRAULIC/ELECTRIC	OPTIONAL
10	1.38"	SUMP PUMP – FRONT OPTION	HYDRAULIC/ELECTRIC	OPTIONAL
11	4.5"	GRAVITY DRAIN	HYDRAULIC/ELECTRIC	OPTIONAL
NOTE: EACH OPTIONAL ITEM IS DETERMINED IF REQUIRED BY SITE SPECIFIC CONDITIONS.				

NOTES

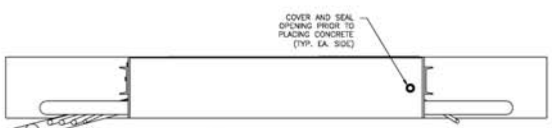
1	CONDUIT SHALL BE SUPPLIED BY INSTALLER.
2	CONDUIT SHALL BE INSTALLED PER PROJECT SPECS & NEC, LATEST EDITION.
3	ALL ELECTRICAL/CONTROLS CONDUITS WITH BENDS MUST BE SWEEPING 90 DEGREES TO ALLOW FOR PULLING/FEEDING WIRES.
4	THIS DRAWING IS REPRESENTATIVE OF ALL UTILITY OUTLETS. SITE SPECIFIC CONDITIONS AND MODEL TYPE WILL DETERMINE WHICH OUTLETS ARE ACTUALLY USED. REFERENCE SHEET WB-102 FOR A TYPICAL HYDRAULIC MODEL AND ELECTRIC MODEL CONDUIT LAYOUT.
5	ANY UNUSED OUTLETS MUST BE SEALED OFF PRIOR TO PLACING CONCRETE.



A PLAN VIEW
SCALE: 3/4" = 1'-0"



B-B REAR ELEVATION VIEW
SCALE: 3/4" = 1'-0"



A-A SIDE ELEVATION VIEW
SCALE: 3/4" = 1'-0"

C-C FRONT ELEVATION VIEW
SCALE: 3/4" = 1'-0"

CONCEPTUAL DRAWING

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Smith & Wesson Security Solutions

DRAWN BY: JOE
DATE: 06/27/2011
CHECKED BY:
SCALE:
SIZE: ANSI D
REV:
DRAWING NUMBER: WB-101

9' WIDE ACTIVE VEHICLE WEDGE BARRIER
UTILITY LAYOUT

SHEET ID
WB-101

REV | DATE | DESCRIPTION | BY

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