



AFRL-RX-TY-TM-2010-0024

**“BUMPER BUDDY” HUMVEE TRANSPORTER
DATA PACKAGE
INSTALLATION GUIDE AND DRAWINGS**

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Contract No. FA4819-09-C-0045

FEBRUARY 2010

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**AIR FORCE RESEARCH LABORATORY
MATERIALS AND MANUFACTURING DIRECTORATE**

■ Air Force Materiel Command ■ United States Air Force ■ Tyndall Air Force Base, FL 32403-5323

REPORT DOCUMENTATION PAGE

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	5c. PROGRAM ELEMENT NUMBER 99999F

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	11. SPONSOR/MONITOR'S REPORT NUMBER(S) AFRL-RX-TY-TM-2010-0024

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Distribution Statement A: Approved for public release; distribution unlimited.

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Ref AFRL/RXQ Public Affairs Case # 10-058. Document contains color images.

14. ABSTRACT
The intent of this document is to provide the reader with instructions on installation of the "Bumper Buddy" Humvee Transporter and drawings as a collective data package.

15. SUBJECT TERMS
Bumper Buddy, Humvee, ANDROS MARK VI, ramp, HHV, up armored, UA-HHV, HMMWV, robot transporter

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT UU	18. NUMBER OF PAGES 20	19a. NAME OF RESPONSIBLE PERSON Walter M. Waltz
a. REPORT U	b. ABSTRACT U	c. THIS PAGE U			19b. TELEPHONE NUMBER (Include area code) (850) 283-3725

Reset

BUMPER BUDDY

The Bumper Buddy robot transporter was accomplished by the Air Force Research Laboratory (AFRL) at the urgent request of Central Air Forces and Headquarters Air Combat Command for Explosives Ordnance Disposal (EOD) personnel to transport and haul robots instead of using a trailer. The bumper mount and ramp allow deployed forces to carry small robots such as the Andros Mark VI Robot on the rear of armored Humvees. The Bumper Buddy was transitioned to Operation Iraqi Freedom troops for field use.

BUMPER BUDDY

Robotic Transporter Installation Guide

For the Up-Armored HHV (Heavy Hummer Variant) Vehicle with a 2-in x 8-in Bumper



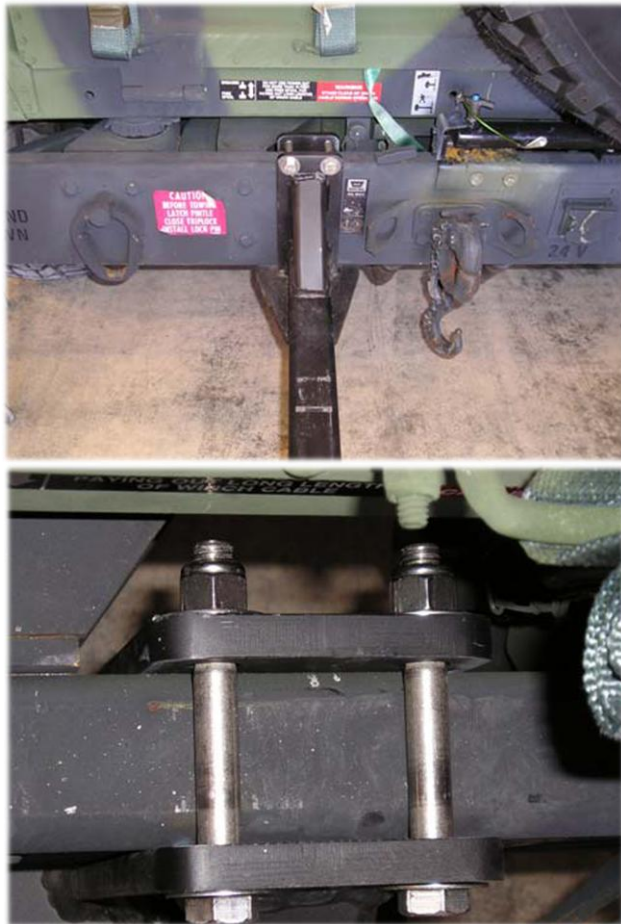
Tools required for first assembly and installation: Two 3/4-in wrenches, one 9/16-in wrench

Tools required for reinstallation: Two 3/4-in wrenches

Note: Two 3/4-in and One 9/16-in wrenches are supplied with each transporter.

NOTE: An ANDROS MARK VI with wheels was used for this guide, however, the transporter can be used for any robot under 500 lb that fits securely.

Installation



STEP 1: Bolt platform tube to bumper. Make sure the winch umbilical connector is functional.
REQUIRED: Two 3/4-in wrenches



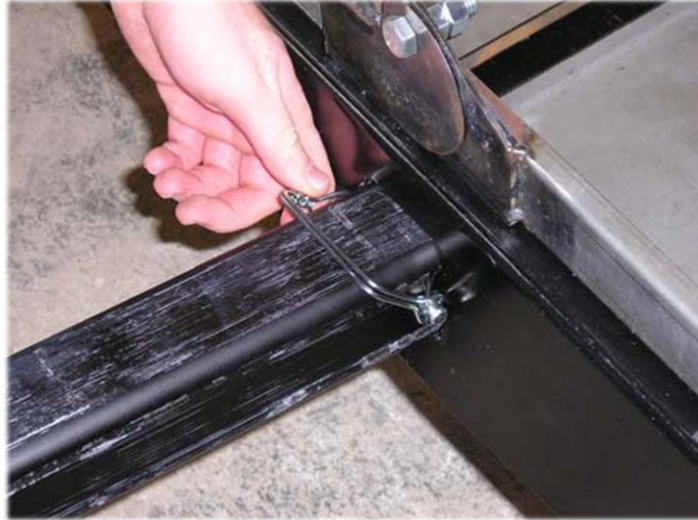
STEP 2: Remove safety retainer pins. This will be from a total of three places.



STEP 3: Making sure the ramp is on the passenger side, slide the first platform all the way on the tube. Insert the safety retainer pin in the hole nearest the bumper. Slide the platform back so it just hits the safety retainer pin. Tighten the four bolts under the platform that secure the platform to the tube

REQUIRED: 9/16-in wrench

NOTE: The safety retainer pin is used for both location and keeping the ramp from sliding off the tube should the bolts become loose.

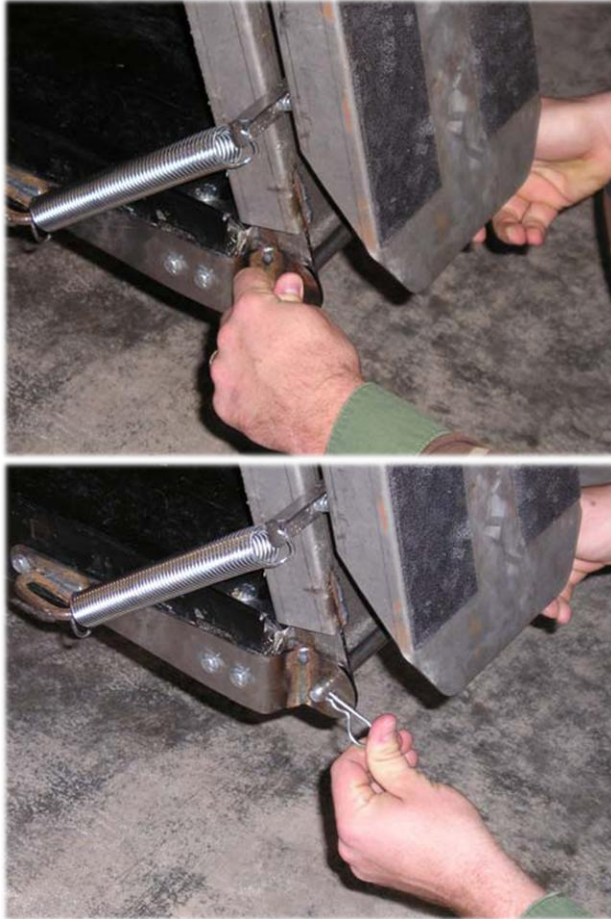


STEP 4: Slide the second platform all the way to the first platform. If you are transporting an ANDROS MARK VI with wheels, insert a safety retainer pin in the second hole from the bumper and slide the platform back so it just hits the safety retainer pin. Otherwise, adjust the spacing between the platforms for the specific vehicle. Tighten the four bolts under the platform that secure the platform to the tube.

REQUIRED: 9/16-in wrench



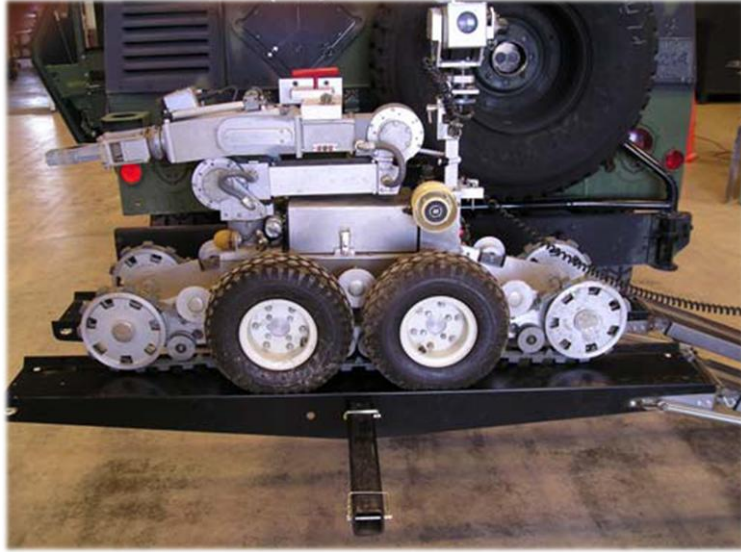
STEP 5: Insert safety retainer pin in hole at the end of the tube. This will keep the platform from sliding off if the bolts should become loose.



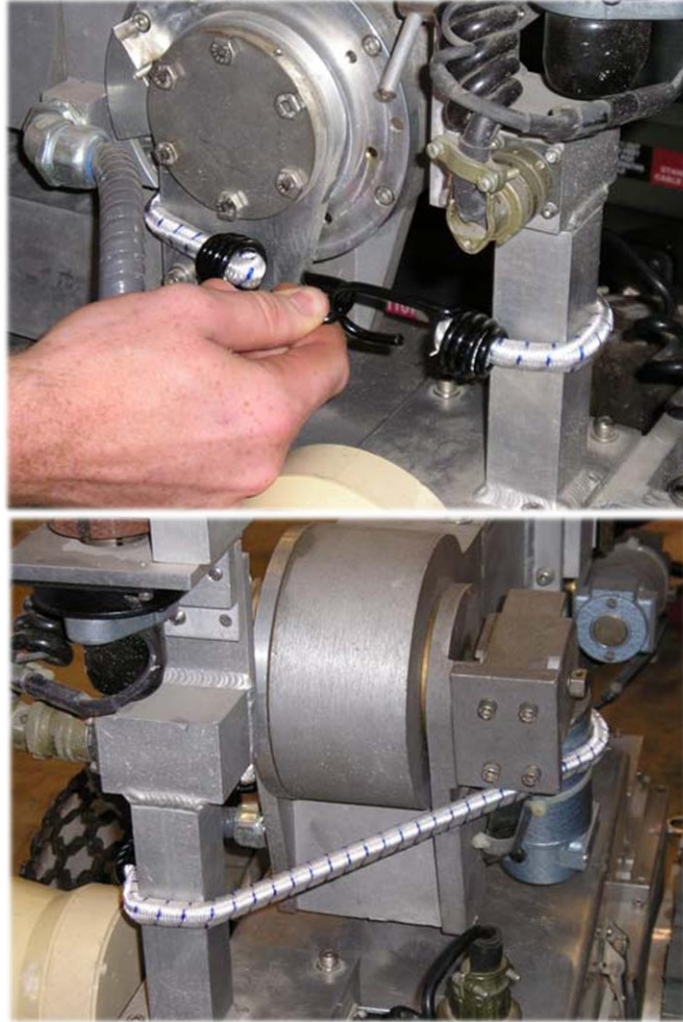
STEP 6: Remove the hinge pin from the platform and insert between the platform and ramp. Secure with a retainer clip.



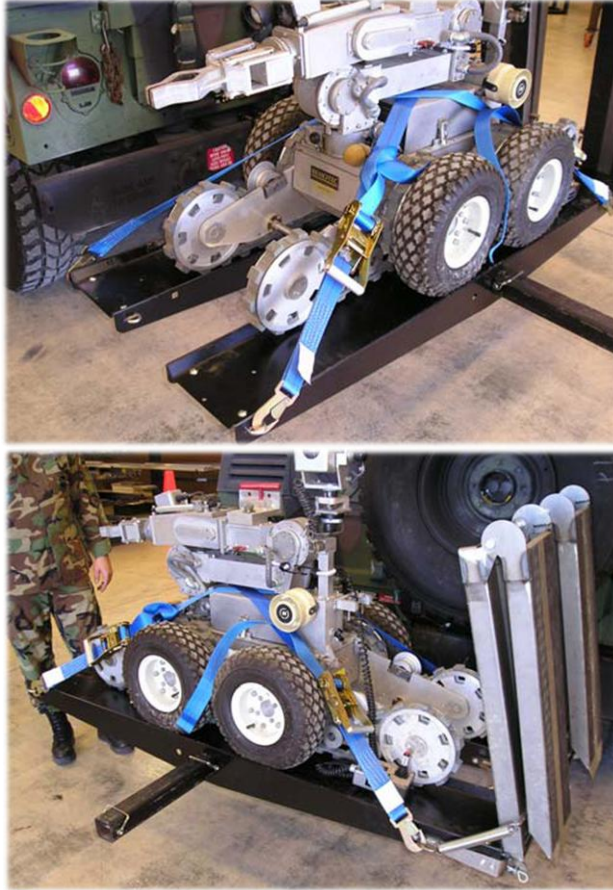
STEP 7: Lower the ramps and load the vehicle.



STEP 8: Center the MARK VI on the tube and fold the ramps to travel position.

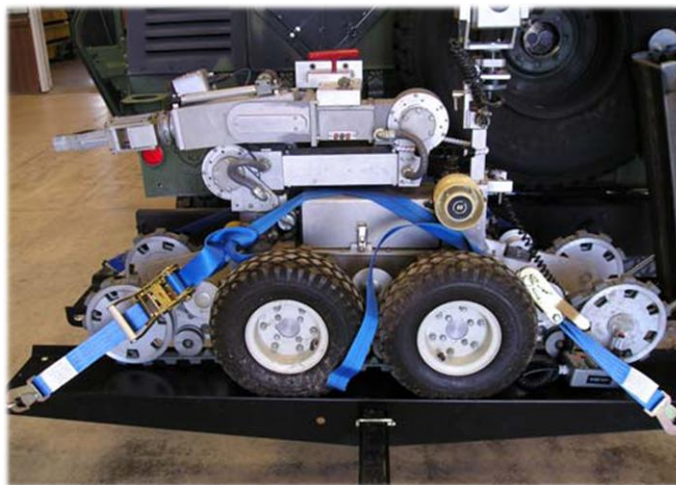


STEP 9: Secure the arm with a bungee cord. This helps reduce damage to arm when transporting.



STEP 10: Strap the robot to the platform as shown.

NOTE: Follow this method explicitly as testing indicated this is the most secure and least damaging method.



STEP 11: Make sure the straps do not go over the arm. The arm may be damaged by excessive loads.



STEP 12: Place cover over the robot and secure with bungee cords.

Removal



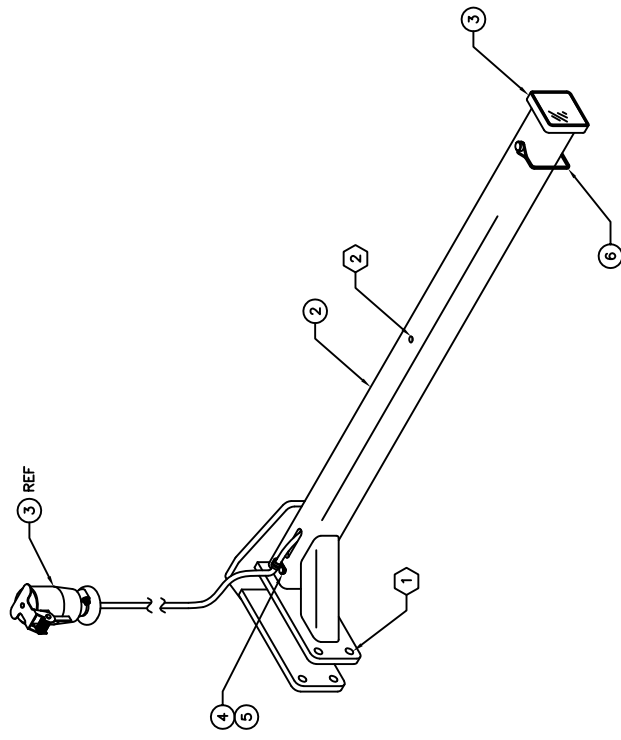
STEP 1: Remove the transporter by removing the tube bolts and sliding off bumper.



STEP 2: Reinstall tube bolts to prevent them from being lost.

NOTES:

- ① BOLTS USED TO ATTACH TRANSPORTER TUBE TO HAMMY VEHICLE:
BOLT : 1/2-13 NC-2A x 4.00" LONG, GRADE 8 (2 REQUIRED)
WASHER : 1/2" DIAMETER (4 REQUIRED)
NUT, SELF LOCKING : 1/2-13 UNC-2B (2 REQUIRED)
- ② PINS USED FOR LOCATION AND SAFETY:
ZINC-PLATED SAFETY SNAP PIN SQUARE RETAINER
WITHOUT TAB LOCK, 3/8" DIA., 3" USABLE LENGTH.
PART NUMBER : 984166S31
CAGE CODE : 39428
SUPPLIER : MCMASTER-CARR



① 030219-001 TRANSPORTER TUBE BRAKE LIGHT ASSEMBLY

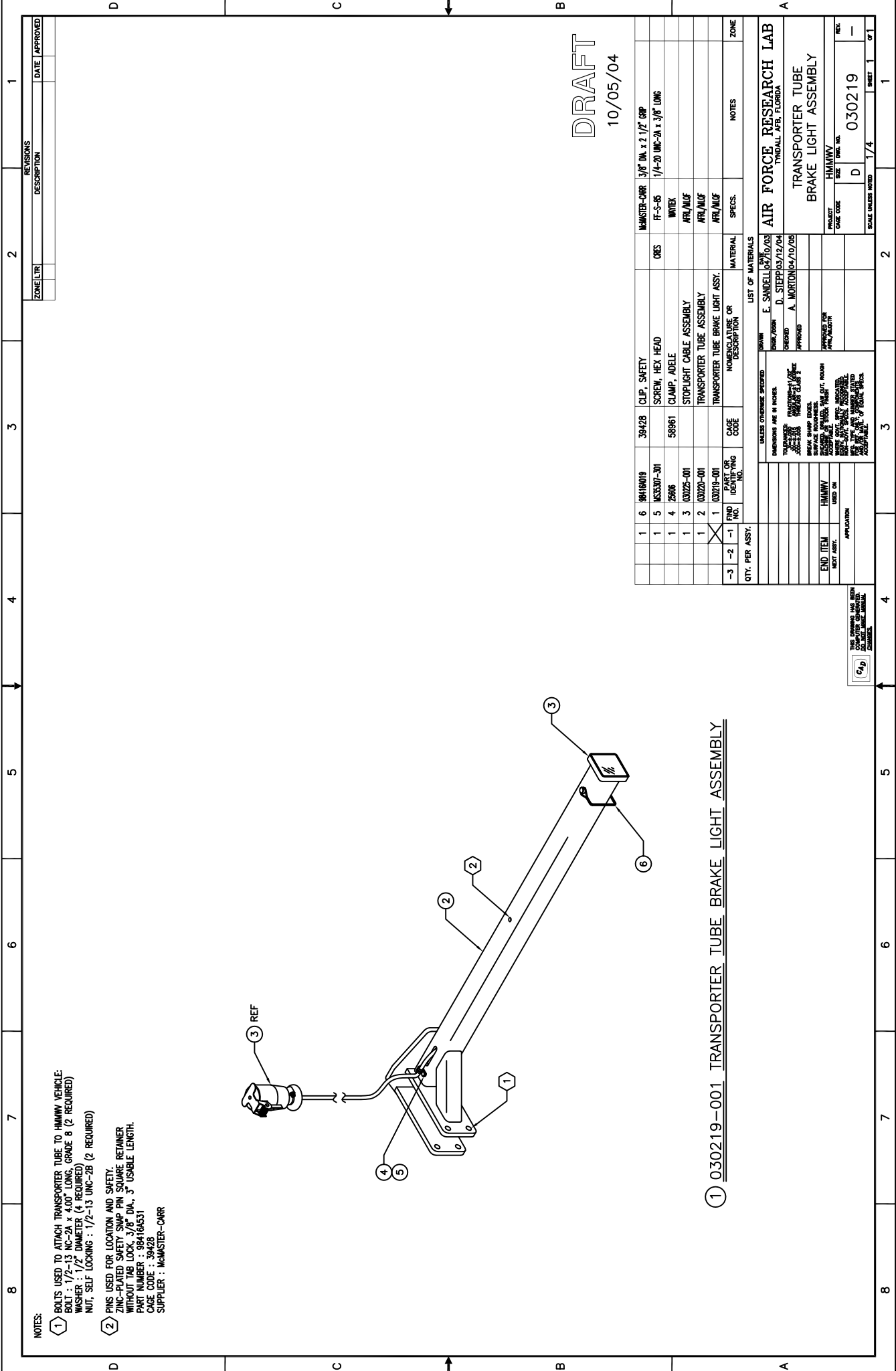
DRAFT
10/05/04

QTY.	PER ASSY:	NO. IDENTIFYING NO.	DESCRIPTION OR NOMENCLATURE	CAGE CODE	UNIT OF MEASURE	MATERIAL	ZONE
1	6	984166D19	39428 CLIP, SAFETY				
1	5	M33307-301	SCREW, HEX HEAD				
1	4	25006	58961 CLAMP, ANGLE				
1	3	00025-001	STOPLIGHT CABLE ASSEMBLY				
1	2	00020-001	TRANSPORTER TUBE ASSEMBLY				
1	2	00018-001	TRANSPORTER TUBE BRAKE LIGHT ASSY.				
-3	-2	-1	IDENTIFYING NO.				

LIST OF MATERIALS	
DESIGNED BY	E. SANDELL 02/10/03
CHECKED BY	D. STEPP 03/12/04
APPROVED BY	A. MORTON 04/10/05
DESIGNED BY	
APPROVED BY	
PRODUCT CODE	HMMWV
SIZE	D
SCALE UNLESS NOTED	1/4

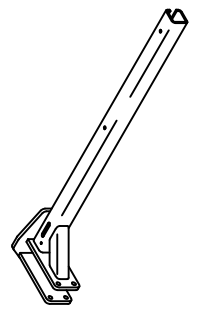
AIR FORCE RESEARCH LAB	
TINDALL AFB, FLORIDA	
TRANSPORTER TUBE	
BRAKE LIGHT ASSEMBLY	
PRODUCT CODE	HMMWV
SIZE	D
SCALE UNLESS NOTED	1/4
SHEET	1
OF 1	

THIS DRAWING HAS BEEN CHECKED FOR CONFORMANCE WITH THE DRAWING STANDARDS.

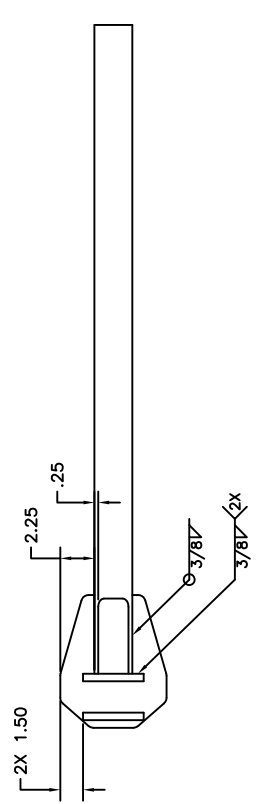
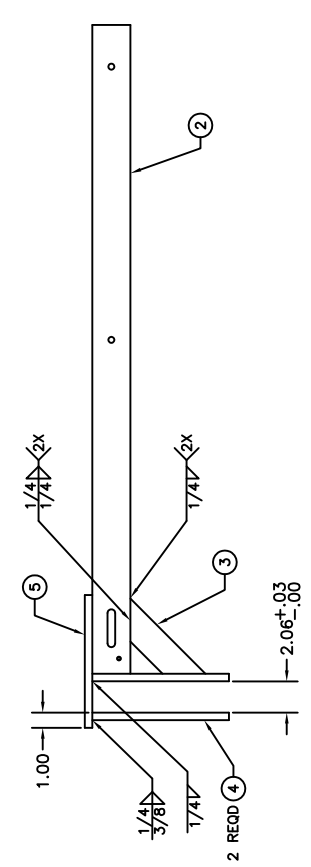
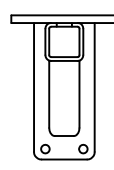


1	2	3	4	5	6	7	8
REVISIONS		ZONE LTR		DATE		APPROVED	
DESCRIPTION							

D C B A



ISOMETRIC VIEW
SCALE = 1/8



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10/05/04

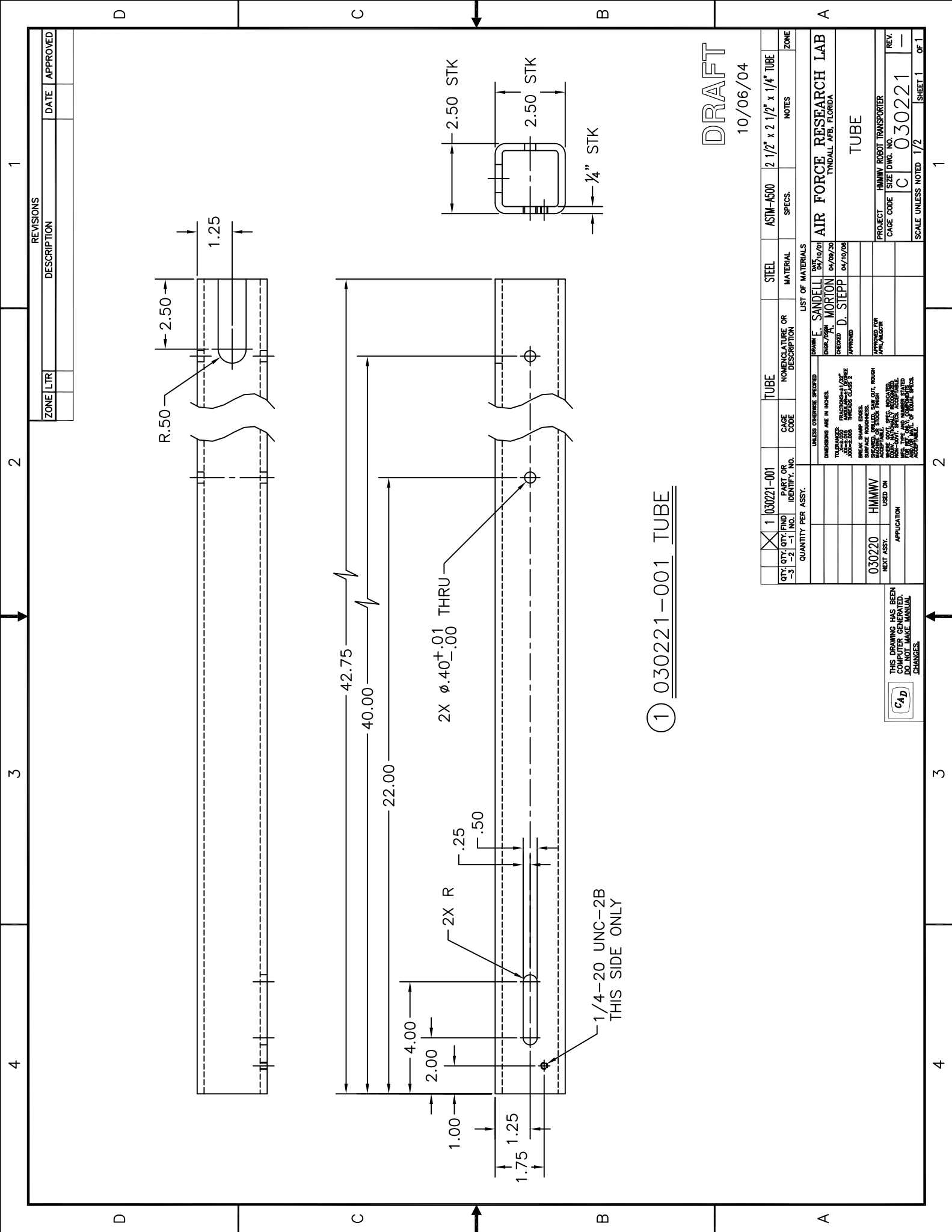
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1	5	00024-001			PLATE				
2	4	00023-001			PRESSURE PLATE				
1	3	00022-001			TUBE				
1	2	00021-001			TUBE				
1	1	00020-001			TRANSPORTER TUBE ASSEMBLY				
-3	-2	-1							

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES.		DRAWN BY E. SANDELL 03/12/04	
TOLERANCES UNLESS OTHERWISE SPECIFIED:		CHECKED BY D. STEPP 03/11/21	
FRACTIONS DECIMALS ANGLES		APPROVED BY A. MORTON 04/10/05	
.125 .005 .010 .015 .020 .030 .040 .050 .060 .070 .080 .090 .100 .125 .150 .175 .200 .250 .300 .375 .400 .500 .625 .750 .875 1.000 1.250 1.500 2.000 2.500 3.000 4.000 5.000 6.000 8.000 10.000		SCALE UNLESS NOTED 1/4	
BREAK SHARP EDGES		AIR FORCE RESEARCH LAB	
SURFACE FINISHES		TUNNALL AFB, FLORIDA	
ASSEMBLY AND TEST INSTRUCTIONS		TRANSPORTER TUBE ASSEMBLY	
ALL DIMENSIONS ARE TO CENTER UNLESS OTHERWISE SPECIFIED		ASSEMBLY	
HOLE DIMENSIONS ARE TO CENTER UNLESS OTHERWISE SPECIFIED		HAMMIV ROBOT TRANSPORTER	
HOLE DIMENSIONS ARE TO CENTER UNLESS OTHERWISE SPECIFIED		PRODUCT CODE D	
HOLE DIMENSIONS ARE TO CENTER UNLESS OTHERWISE SPECIFIED		SIZE D	
HOLE DIMENSIONS ARE TO CENTER UNLESS OTHERWISE SPECIFIED		REV. 030220	
HOLE DIMENSIONS ARE TO CENTER UNLESS OTHERWISE SPECIFIED		SHEET 1	
HOLE DIMENSIONS ARE TO CENTER UNLESS OTHERWISE SPECIFIED		OF 1	

① 030220-001 TRANSPORTER TUBE ASSEMBLY



THIS DRAWING HAS BEEN CHECKED FOR CONFORMANCE WITH THE DRAWING STANDARDS.



① 030221-001 TUBE

DRAFT
10/06/04

REVISIONS		DATE	APPROVED
ZONE	LTR	DESCRIPTION	

QTY	QTY	END	PART OR	TUBE	STEEL	ASTM-A500	2 1/2" x 2 1/2" x 1/4" TUBE	ZONE
-3	-1	NO.	IDENTIF. NO.	DESCRIPTION	MATERIAL	SPECS.	NOTES	
1	030221-001							

LIST OF MATERIALS	
DRW. / APPR. / DATE	04/10/04
DESIGNED BY	MORTON
CHECKED BY	D. STEPP
APPROVED BY	
APPROVED FOR	
APPROVED FOR	

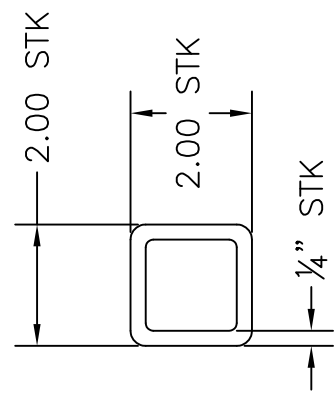
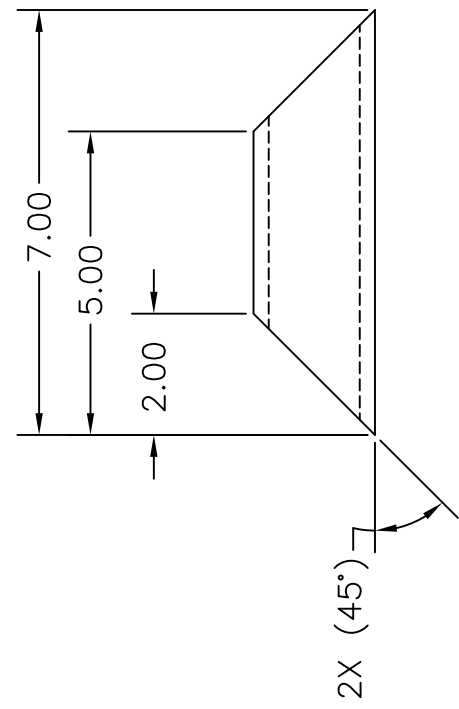
PROJECT	SIZE	DWG. NO.	REV.
HMMWV ROBOT TRANSPORTER	C	030221	-

SCALE	UNLESS NOTED	1/2	SHEET 1	OF 1
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(CAD)

REVISIONS		
ZONE	DESCRIPTION	DATE
LTR		



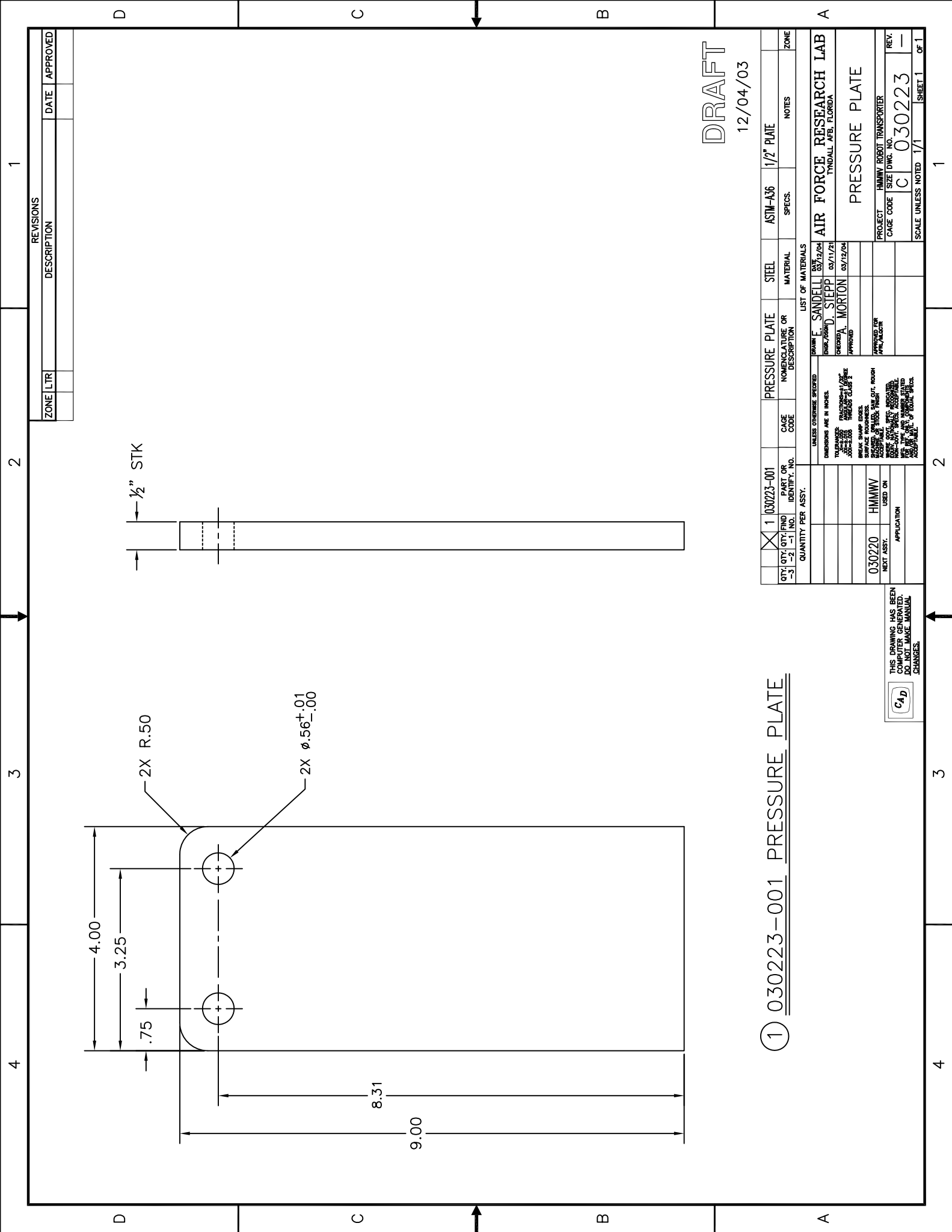
① 030222-001 TUBE

DRAFT
12/04/03

QTY	QTY	FIND	PART	NO.	IDENTIFY	NO.	TUBE	STEEL	ASTM-A500	2.00" X 2.00" X 1/4" TUBE	ZONE
	1										
<p>UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES: FRACTIONS = ±1/32" DECIMALS = ±0.005 ANGLES = ±1.5 DEGREE HOLE POS = ±0.008 HOLE DIA = ±0.008</p> <p>BREAK SHARP EDGES. SURFACE FINISH: MILL CUT, ROUGH FINISH OR STOCK FINISH ACCEPTABLE. EQUIV. NATIONAL SPEC. INDICATED. NON-GOV'T. SPECS. ACCEPTABLE. FOR REF. ONLY. DIMENSIONS TO BE ACCEPTABLE OF EQUAL SPECS.</p>											
030220			HMMWV								
<p>APPLICATION USED ON</p>											
<p>THIS DRAWING HAS BEEN COMPUTER GENERATED DO NOT MAKE MANUAL CHANGES.</p>											
<p>LIST OF MATERIALS</p>											
<p>DRANN E. SANDELL DATE 03/12/04 ENGR./ASST D. STEPP 03/11/21 CHECKED A. MORTON 03/12/04 APPROVED</p>											
<p>APPROVED FOR APRIL/MG/01R</p>											
<p>PROJECT HMMWV ROBOT TRANSPORTER CAGE CODE SIZE DWG. NO. B 030222 SCALE UNLESS NOTED 1/2 SHEET 1 OF 1</p>											

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TYNDALL AFB, FLORIDA

TUBE



ZONE	L	T	R	REVISIONS	DATE	APPROVED
				DESCRIPTION		

DRAFT
12/04/03

① 030223-001 PRESSURE PLATE

QTY	QTY	END	NO.	IDENTY.	NO.	CAGE	CODE	PRESSURE	PLATE	STEEL	ASTM-A36	1/2" PLATE	NOTES	ZONE
1	1	030223-001												
<p>UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES: FRACTIONS ±.005 DECIMALS ±.010 ANGLES ±.5° SURFACE FINISH: UNLESS OTHERWISE SPECIFIED, RA 32 BREAK SHARP EDGES. FINISH: UNLESS OTHERWISE SPECIFIED, 16.00 MATERIAL: UNLESS OTHERWISE SPECIFIED, A36 APPROVED FOR: [Signature] DATE: 03/11/24</p>														
<p>LIST OF MATERIALS DRAWN: E. SANDELL 03/12/04 CHECKED: S. STEPP 03/11/24 APPROVED: A. MORTON 03/12/04</p>														
<p>PROJECT: HMMWV ROBOT TRANSPORTER CAGE CODE: C 030223 REV: - SCALE: UNLESS NOTED 1/1</p>														

THIS DRAWING HAS BEEN
REVIEWED AND APPROVED.
DO NOT MAKE MANUAL
CHANGES.

(CAJ)

ZONE/LTR	REVISIONS	DATE	APPROVED

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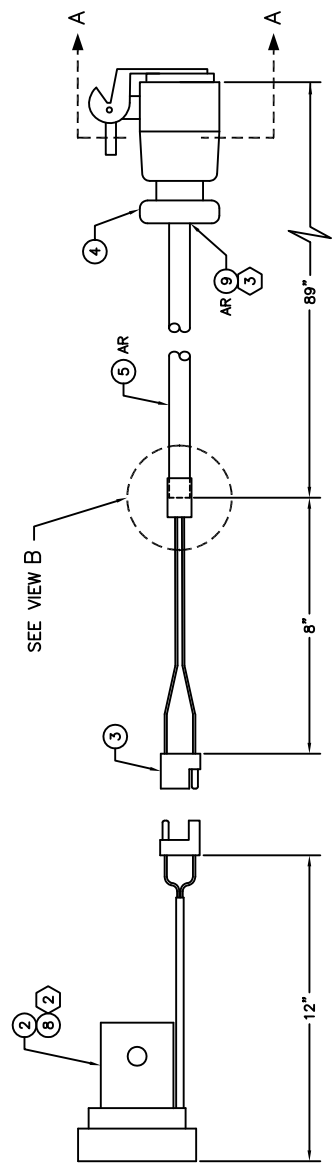
NOTES:

1 CABLE PREPARATION:

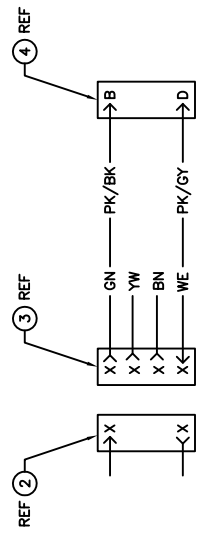
CUT SO CABLE (F/N 5), TO 88" AND STRIP OUTER JACKET BACK 2.1/4". CUT OFF UNUSED WIRE EVEN WITH "JACKET". SOLDER SPLICE REMAINING LEADS AND COVER EACH WITH 2" LONG, 1/4" HEAT SHRINK (F/N 7). USE 4" LONG, 3/8" HEAT SHRINK (F/N 6), TO COVER CABLE END AND SPLICE.

2 REPLACE EXISTING 12 VOLT BULB WITH 28 VOLT BULB (F/N 8).

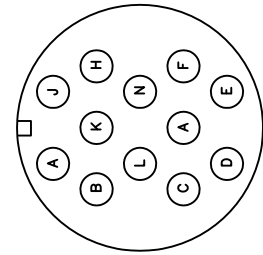
3 FILL IN VOID AROUND CABLE (F/N 5), WITH RTV (F/N 9).



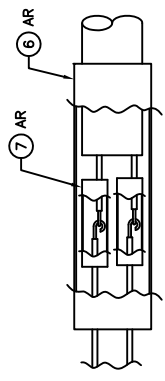
SEE VIEW B



WIRING DIAGRAM



VIEW A-A



VIEW B

1 030225-001 STOPLIGHT CABLE ASSEMBLY

DRAFT
10/05/04

QTY.	PER ASSY:	NO IDENTIFYING NO.	CASE NO.	DESCRIPTION OR NOMENCLATURE	MATERIAL	NOTES	ZONE
AR 9	7545661	39428	RTV, GE			MANUFACT-ORR BLACK	
1	8	746-9707	DKC13	LAMP, INCANDESCENT		ALUD 28 VOLT	
AR 7	617-830	DKC13	HEAT SHRINK, ADHESIVE LINED			ALUD 1/4" DIA. ESP-300, BLACK	
AR 6	617-883	DKC13	HEAT SHRINK, ADHESIVE LINED			ALUD 3/8" DIA. ESP-300, BLACK	
AR 5	1W26	2X427	SLOOW CORD			GRANBER	
1	4	5035-00-059-2841	CONNECTOR, VEHICULAR			NRK	
1	3	37112	CABLE, MOLDED			NRK	
1	2	CR-007	LAMP, HITCH BRAKE			WYTEK 48" WIRE, FLAT, FEMALE END	
1	1	030225-001	STOPLIGHT CABLE ASSEMBLY			AUTOZONE	
-3	-2	-1				APR/ALUD	

LIST OF MATERIALS	
DRAWN	J. EVANS 10/07/04
CHECKED	C. GREEN 04/07/07
APPROVED	C. GREEN 04/10/05
DESIGNED BY	
APPROVED BY	
DATE	
SCALE	UNLESS NOTED NONE
SHEET	1 OF 1

AIR FORCE RESEARCH LAB
TUNNALL AFB, FLORIDA

STOPLIGHT CABLE ASSEMBLY

PRODUCT HAMMAY ROBOT TRANSPORTER

FORM NO. 030225



1	2	3	4	5	6	7	8
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