



AFRL-RX-TY-TM-2010-0024

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

---

Marshall G. Dutton

Applied Research Associates  
P.O. Box 40128  
Tyndall Air Force Base, FL 32403

Contract No. FA4819-09-C-0045

FEBRUARY 2010

**DISTRIBUTION A:** Approved for public release; distribution unlimited.

**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**

*Form Approved  
OMB No. 0704-0188*

The public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

**PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.**

|   |   |  |
|---|---|--|
| <b>1. REPORT DATE (DD-MM-YYYY)</b><br>19-FEB-2010 | <b>2. REPORT TYPE</b><br>Technical Memo | <b>3. DATES COVERED (From - To)</b><br>01-OCT-2003 - 31-MAR-2004 |
|---|---|--|

|  |  |
|--|--|
| <b>4. TITLE AND SUBTITLE</b><br>"Bumper Buddy" Humvee Transporter Data Package | <b>5a. CONTRACT NUMBER</b><br>F08637-03-C-6006 |
|  | <b>5b. GRANT NUMBER</b>                        |
|  | <b>5c. PROGRAM ELEMENT NUMBER</b><br>99999F    |

|  |   |
|--|---|
| <b>6. AUTHOR(S)</b><br>Dutton, Marshall G. | <b>5d. PROJECT NUMBER</b><br>GOVT       |
|  | <b>5e. TASK NUMBER</b><br>F0            |
|  | <b>5f. WORK UNIT NUMBER</b><br>QF503021 |

|  |   |
|--|---|
| <b>7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)</b><br>Applied Research Associates<br>P.O. Box 40128<br>Tyndall Air Force Base, FL 32403 | <b>8. PERFORMING ORGANIZATION REPORT NUMBER</b> |
|--|---|

|   |  |
|---|--|
| <b>9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)</b><br>Air Force Research Laboratory<br>Materials and Manufacturing Directorate<br>Airbase Technologies Division<br>139 Barnes Drive, Suite 2<br>Tyndall Air Force Base, FL 32403-5323 | <b>10. SPONSOR/MONITOR'S ACRONYM(S)</b><br>AFRL/RXQES, AFRL/RXQF         |
|   | <b>11. SPONSOR/MONITOR'S REPORT NUMBER(S)</b><br>AFRL-RX-TY-TM-2010-0024 |

**12. DISTRIBUTION/AVAILABILITY STATEMENT**  
Distribution Statement A: Approved for public release; distribution unlimited.

**13. SUPPLEMENTARY NOTES**  
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

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

## **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



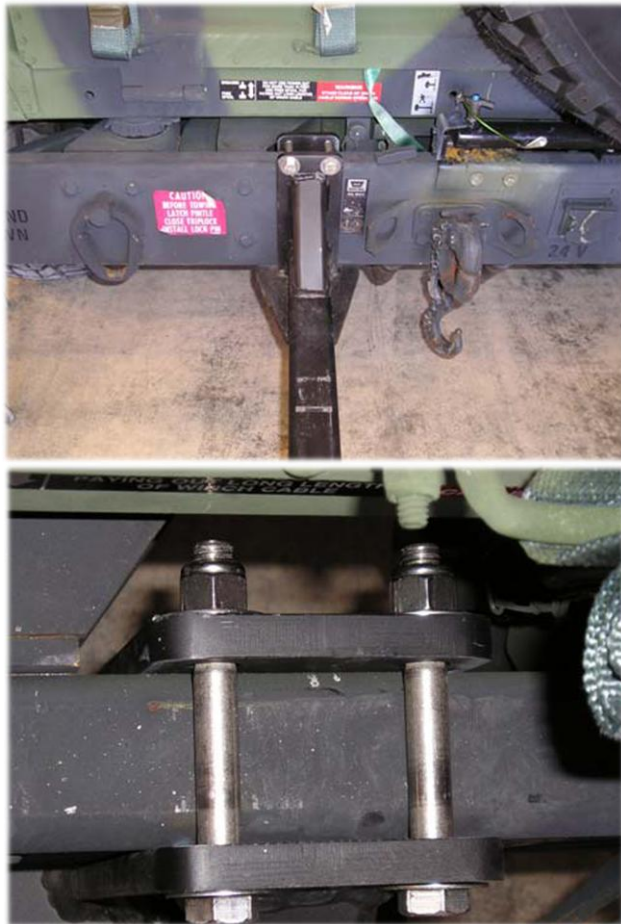
Tools required for first assembly and installation: Two 3/4-in wrenches, one 9/16-in wrench

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.

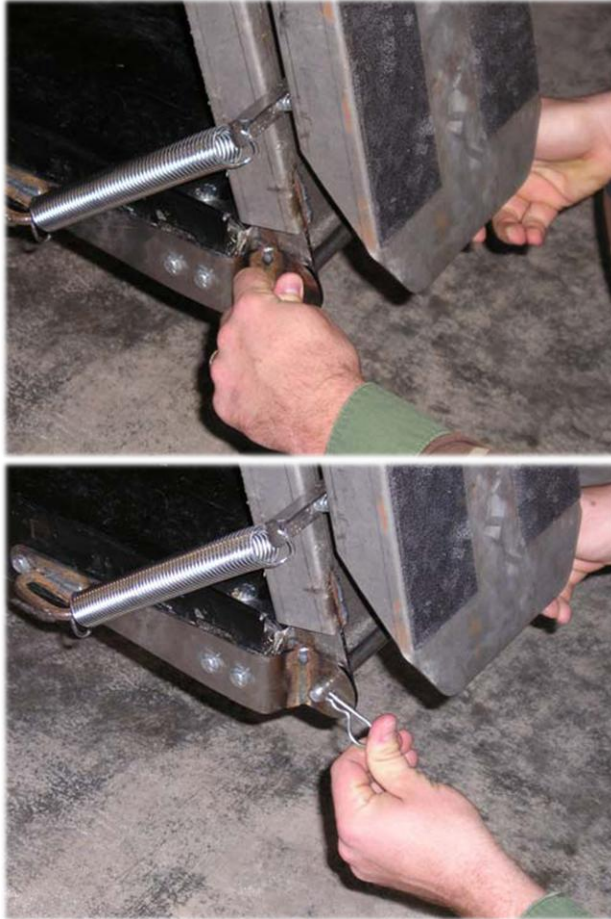


**STEP 4:** Slide the second platform all the way to the first platform. If you are transporting an ANDROS MARK VI with wheels, insert a safety retainer pin in the second hole from the bumper and slide the platform back so it just hits the safety retainer pin. Otherwise, adjust the spacing between the 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.

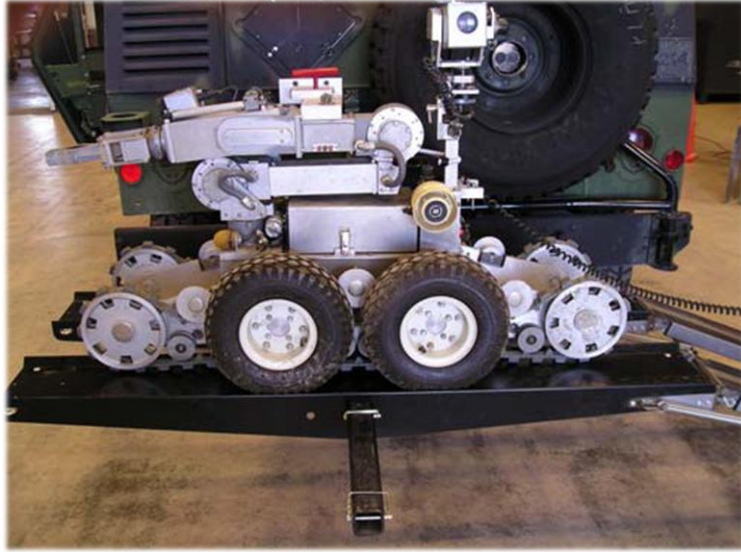


STEP 6: Remove the hinge pin from the platform and insert between the platform and ramp. Secure with a retainer clip.

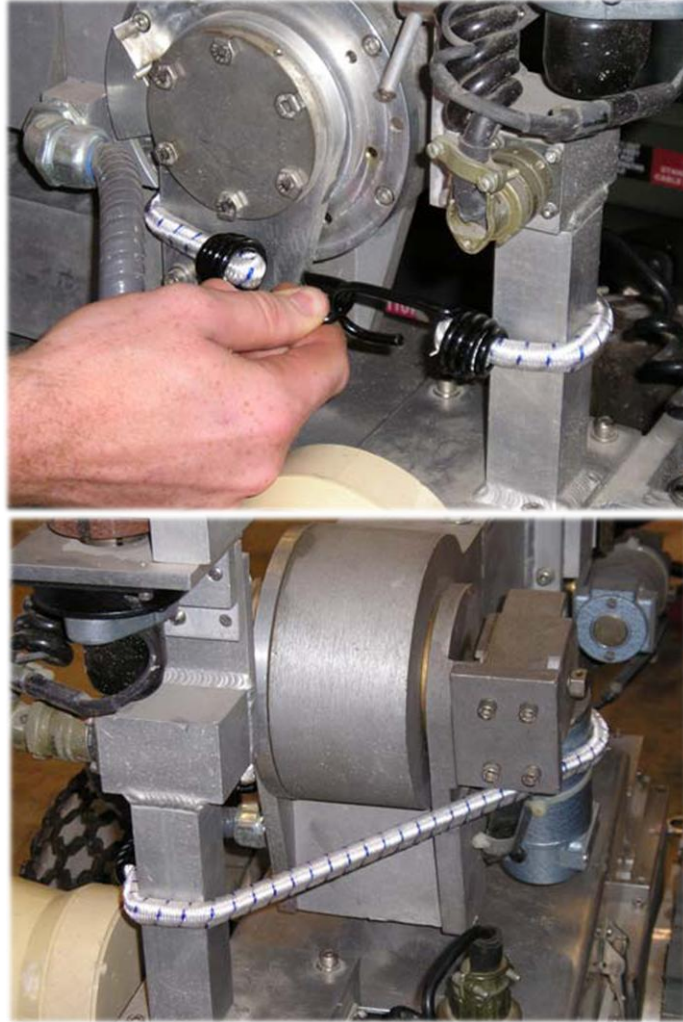


STEP 7: Lower the ramps and load the vehicle.

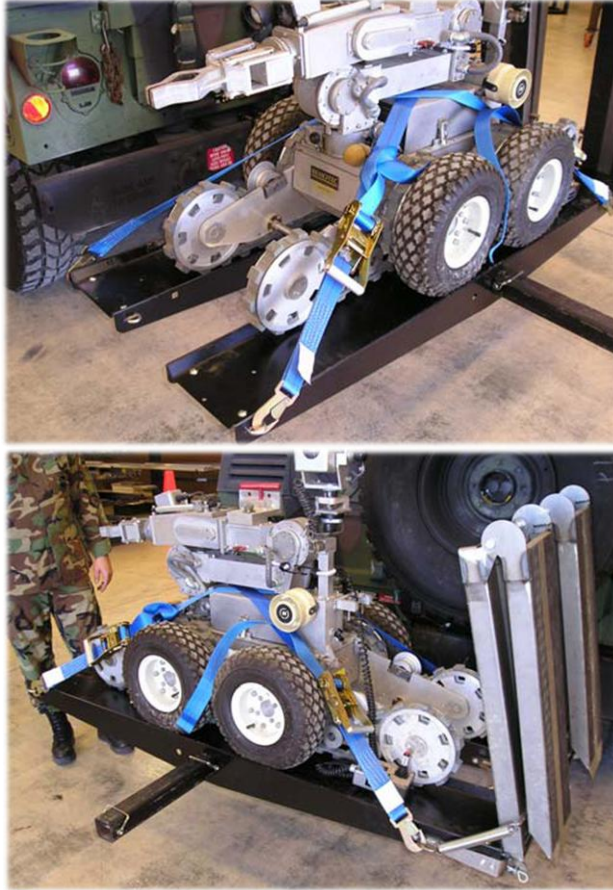




STEP 8: Center the MARK VI on the tube and fold the ramps to travel position.

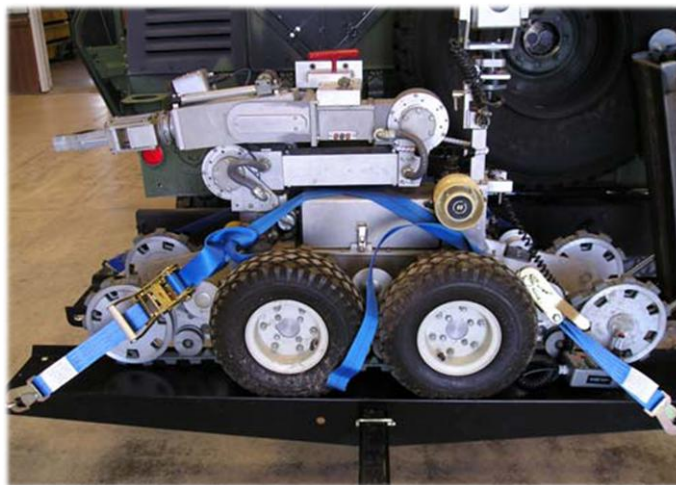


STEP 9: Secure the arm with a bungee cord. This helps reduce damage to arm when transporting.



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



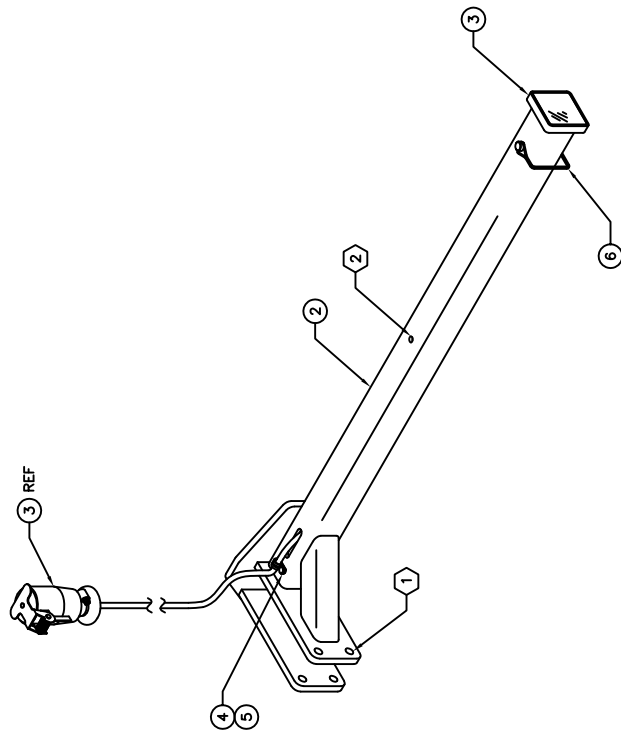
STEP 1: Remove the transporter by removing the tube bolts and sliding off bumper.



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



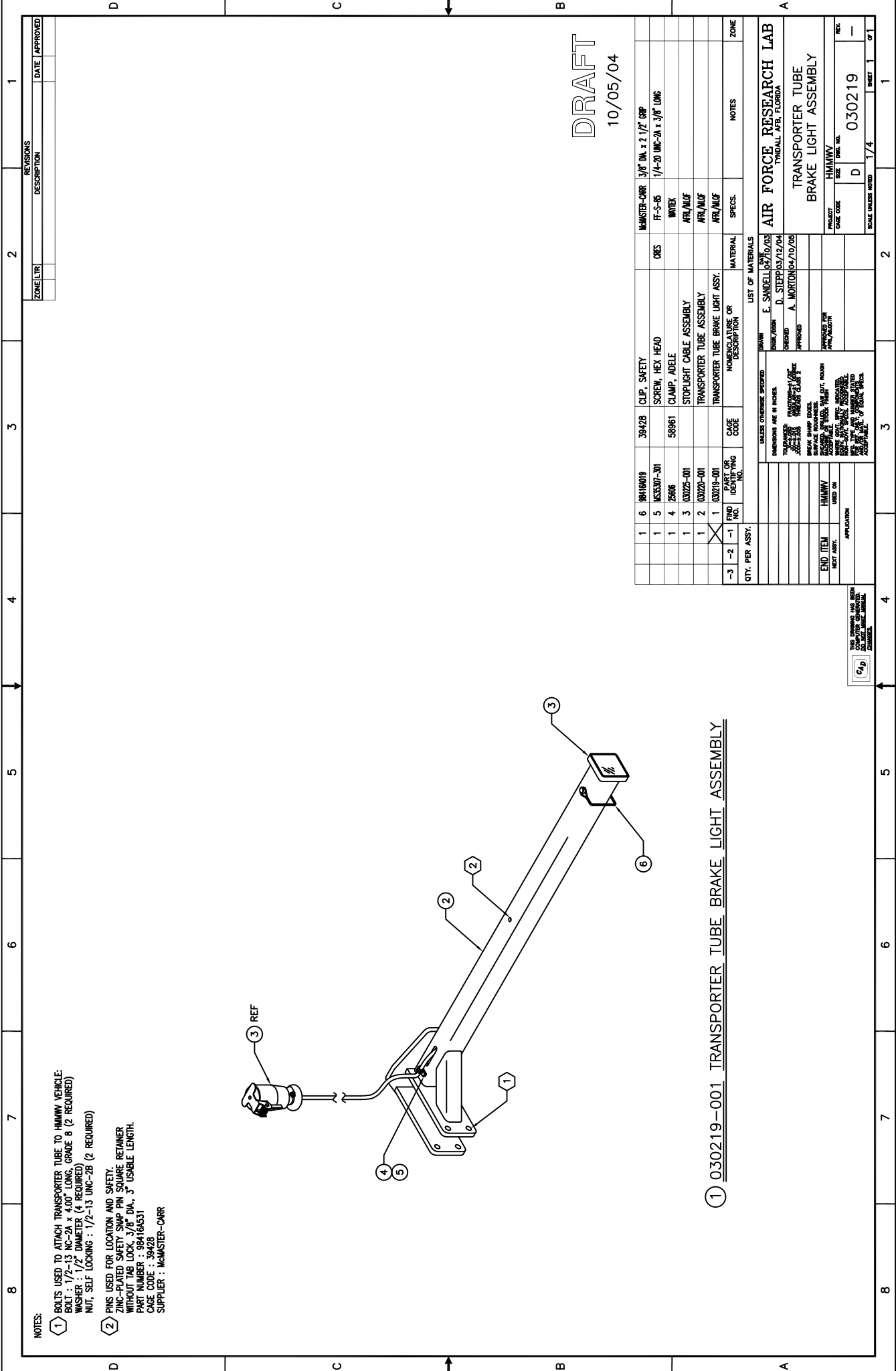
① 030219-001 TRANSPORTER TUBE BRAKE LIGHT ASSEMBLY

DRAFT  
10/05/04

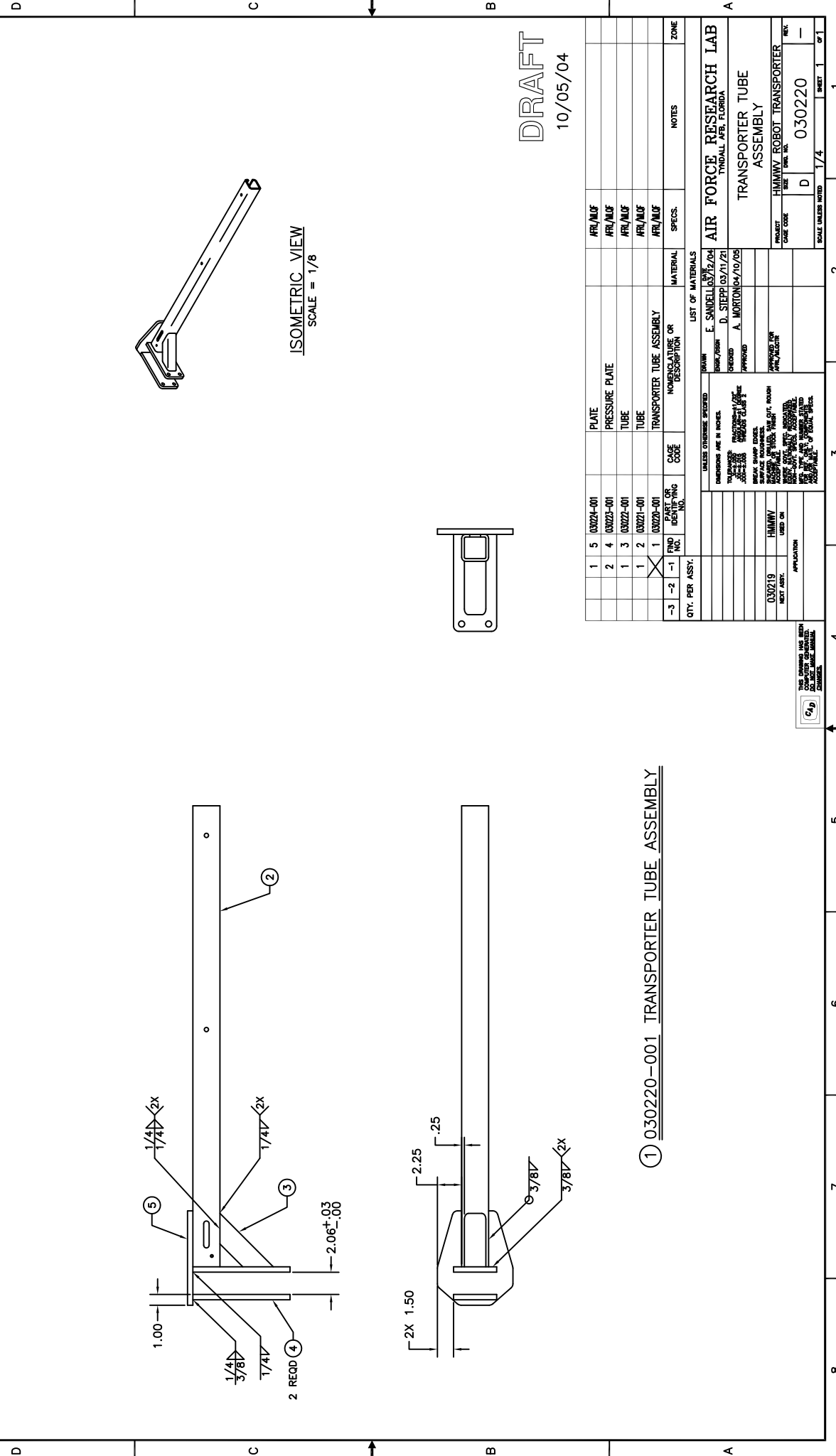
| QTY. | PER ASSY: | NO. IDENTIFYING NO. | DESCRIPTION OR NOMENCLATURE        | CAGE CODE | UNIT OF MEASURE | MATERIAL | ZONE |
|------|-----------|---------------------|------------------------------------|-----------|-----------------|----------|------|
| 1    | 6         | 984166D19           | 39428 CLIP, SAFETY                 |           |                 |          |      |
| 1    | 5         | MS3307-301          | SCREW, HEX HEAD                    |           |                 |          |      |
| 1    | 4         | 25006               | 58861 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                  | NO IDENTIFYING NO.                 |           |                 |          |      |

| LIST OF MATERIALS                             |                     |
|---|---------------------|
| DRWN  | E. SANDELL 02/10/03 |
| CHKD  | D. STEPP 03/12/04   |
| CHKD  | A. MORTON 04/10/05  |
| APPROVD                                       |                     |
| DESIGNED BY                                   |                     |
| APPROVED BY                                   |                     |
| DATE  |                     |
| SCALE   | UNLESS NOTED 1/4    |
| AIR FORCE RESEARCH LAB<br>TNDALL AFB, FLORIDA |                     |
| TRANSPORTER TUBE<br>BRAKE LIGHT ASSEMBLY      |                     |
| PRODUCT                                       | HMMWV               |
| CAGE CODE                                     | D                   |
| SIZE  | 030219              |
| REV.  | -                   |
| 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 |   |          |   |      |   |          |   |



DRAFT  
10/05/04

| QTY. | PER ASSY: | NO IDENTIFYING NO. | CASE NO. | NOMENCLATURE OR DESCRIPTION | MATERIAL | SPECS. | NOTES | ZONE |
|------|-----------|--------------------|----------|-----------------------------|----------|--------|-------|------|
| 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                 |          |                             |          |        |       |      |

| LIST OF MATERIALS |                         |
|-------------------|-------------------------|
| DRAWN             | E. SANDELL 03/22/04     |
| CHECKED           | D. STEPP 03/11/21       |
| APPROVED          | A. MORTON 04/10/25      |
| DESIGNED BY       |                         |
| APPROVED BY       |                         |
| PROJECT CODE      | HMMWV ROBOT TRANSPORTER |
| SIZE              | D                       |
| REV.              | 030220                  |
| SCALE             | UNLESS NOTED 1/4        |

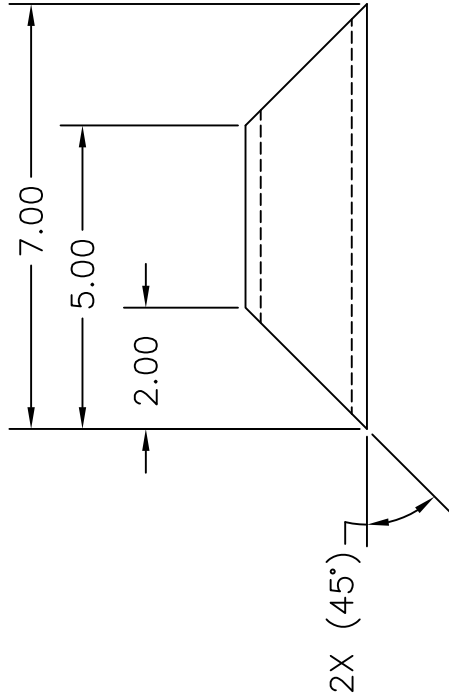
① 030220-001 TRANSPORTER TUBE ASSEMBLY

THIS DRAWING HAS BEEN CHECKED FOR DIMENSIONAL COMPLIANCE





| REVISIONS |             |      |
|-----------|-------------|------|
| ZONE      | DESCRIPTION | DATE |
| LTR       |             |      |
|           |             |      |



① 030222-001 TUBE

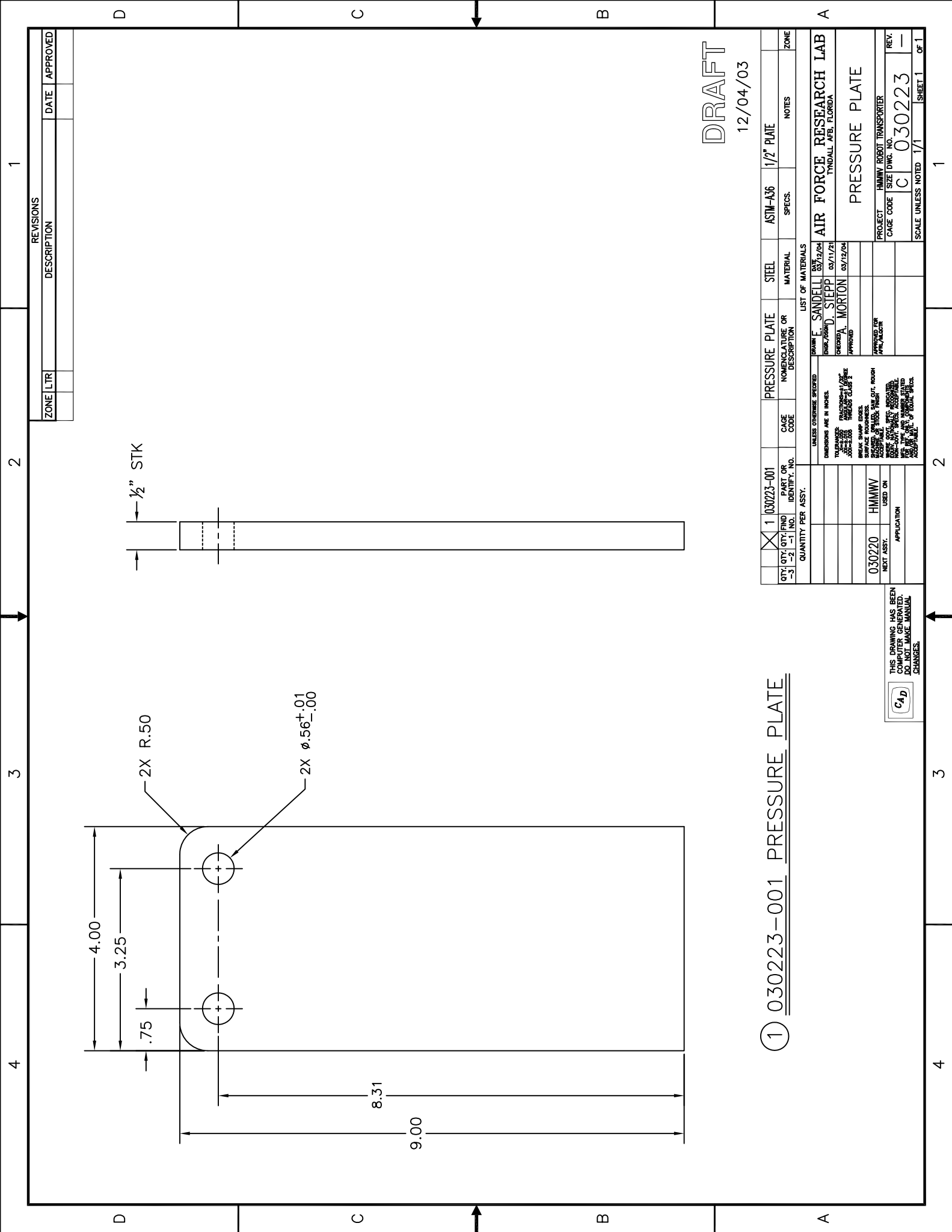
DRAFT  
12/04/03

| QTY   | QTY | FIND | PART | NO. | IDENTIFY | NO. | TUBE | STEEL | ASTM   | 2.00" X 2.00" X 1/4" TUBE | ZONE |
|---|-----|------|------|-----|----------|-----|------|-------|--------|---------------------------|------|
| -3  | -2  | -1   | -1   |     |          |     |      |       | SPECS. | NOTES                     |      |
|   |     |      |      |     |          |     |      |       |        |                           |      |
| <p>UNLESS OTHERWISE SPECIFIED:<br/>DIMENSIONS ARE IN INCHES.<br/>TOLERANCES:<br/>FRACTIONS = ±1/32"<br/>DECIMALS = ±0.005<br/>ANGLES = ±1.0 DEGREE<br/>HOLE POS. CLASS 2<br/>BREAK SHARP EDGES.<br/>SURFACE ROUGHNESS:<br/>MACHINE OR STOCK FINISH<br/>ACCEPTABLE.<br/>EQUIV. NATIONAL SPEC. INDICATED.<br/>NON-GOV'T. SPECS. ACCEPTABLE.<br/>FOR REF. ONLY. DIMENSIONS SHOWN<br/>ACCEPTABLE.</p> |     |      |      |     |          |     |      |       |        |                           |      |
| <p>030220 HMMWV USED ON APPLICATION</p>   |     |      |      |     |          |     |      |       |        |                           |      |
| <p>1 030222-001</p>   |     |      |      |     |          |     |      |       |        |                           |      |
| <p>LIST OF MATERIALS</p>  |     |      |      |     |          |     |      |       |        |                           |      |
| <p>DRANN E. SANDELL DATE 03/12/04<br/>ENGR./ASST. D. STEPP 03/11/21<br/>CHECKED A. MORTON 03/12/04<br/>APPROVED</p>   |     |      |      |     |          |     |      |       |        |                           |      |
| <p>APPROVED FOR APRIL/MG/01R</p>  |     |      |      |     |          |     |      |       |        |                           |      |
| <p>PROJECT HMMWV ROBOT TRANSPORTER</p>  |     |      |      |     |          |     |      |       |        |                           |      |
| <p>CAGE CODE SIZE DWG. NO. B 030222</p>   |     |      |      |     |          |     |      |       |        |                           |      |
| <p>SCALE UNLESS NOTED 1/2 SHEET 1 OF 1</p>  |     |      |      |     |          |     |      |       |        |                           |      |

| AIR FORCE RESEARCH LAB |  |
|------------------------|--|
| TYNDALL AFB, FLORIDA   |  |
| TUBE                   |  |

THIS DRAWING HAS BEEN  
COMPUTER GENERATED  
DO NOT MAKE MANUAL  
CHANGES.

CAD



| ZONE | L | T | R | REVISIONS | DATE | APPROVED |
|------|---|---|---|-----------|------|----------|
|      |   |   |   |           |      |          |

DRAFT  
12/04/03

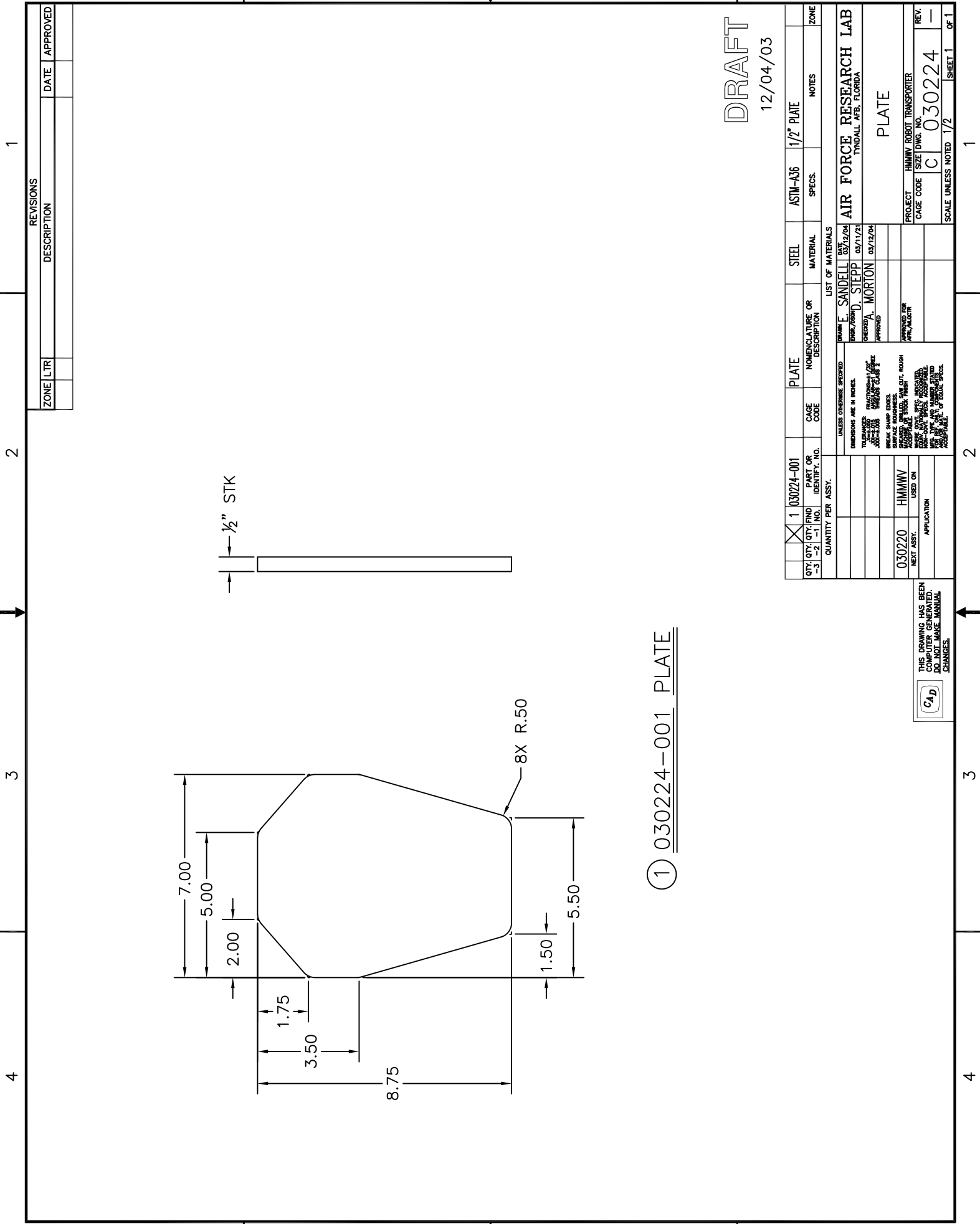
① 030223-001 PRESSURE PLATE

| QTY   | QTY | END        | NO. | IDENTY.    | NO. | CAGE       | CODE | PRESSURE | PLATE | STEEL | ASTM-A36 | 1/2" PLATE | NOTES | ZONE |
|---|-----|------------|-----|------------|-----|------------|------|----------|-------|-------|----------|------------|-------|------|
| 1   | 1   | 030223-001 | 1   | 030223-001 | 1   | 030223-001 | 001  | STEEL    | STEEL | STEEL | ASTM-A36 | 1/2" PLATE | NOTES | ZONE |
| <p>UNLESS OTHERWISE SPECIFIED<br/>DIMENSIONS ARE IN INCHES.<br/>TOLERANCES: FRACTIONS ±.005<br/>DECIMALS ±.010<br/>ANGLES ±.5°<br/>SURFACE FINISH: UNLESS OTHERWISE SPECIFIED, SURFACE FINISH SHALL BE AS SHOWN.<br/>BREAK SHARP EDGES.<br/>ALL DIMENSIONS UNLESS OTHERWISE SPECIFIED ARE TO CENTER UNLESS INDICATED OTHERWISE.<br/>ALL DIMENSIONS UNLESS OTHERWISE SPECIFIED ARE TO CENTER UNLESS INDICATED OTHERWISE.</p> |     |            |     |            |     |            |      |          |       |       |          |            |       |      |
| <p>APPROVED FOR: [Signature]<br/>DATE: 03/11/24</p>   |     |            |     |            |     |            |      |          |       |       |          |            |       |      |
| <p>PROJECT: HMMWV ROBOT TRANSPORTER<br/>CAGE CODE: C 030223<br/>REV: -</p>  |     |            |     |            |     |            |      |          |       |       |          |            |       |      |
| <p>SCALE: UNLESS NOTED 1/1 SHEET 1 OF 1</p>   |     |            |     |            |     |            |      |          |       |       |          |            |       |      |

THIS DRAWING HAS BEEN  
REVIEWED FOR  
COMPLETION.  
DO NOT MAKE MANUAL  
CHANGES.

(C4D)

4 3 2 1



① 030224-001 PLATE

DRAFT  
12/04/03

| ZONE | L | T | R | REVISIONS   | DATE | APPROVED |
|------|---|---|---|-------------|------|----------|
|      |   |   |   | DESCRIPTION |      |          |

| QTY   | QTY        | END | PART OR          | PLATE                       | STEEL    | ASTM-A36 | 1/2" PLATE | NOTES | ZONE |
|---|------------|-----|------------------|-----------------------------|----------|----------|------------|-------|------|
| -3  | -2         | -1  | NO. IDENTIF. NO. | NOMENCLATURE OR DESCRIPTION | MATERIAL | SPECS.   |            |       |      |
| 1   | 030224-001 |     |                  | PLATE                       | STEEL    | ASTM-A36 | 1/2" PLATE |       |      |
| LIST OF MATERIALS<br>DRAWN: E. SANDELL 03/12/04<br>CHECKED: A. MORTON 03/11/04<br>APPROVED: [Signature] 03/12/04<br>DIMENSIONS ARE IN INCHES.<br>TOLERANCES: FRACTIONS ± 1/32"<br>DECIMALS ± 0.005"<br>UNLESS OTHERWISE SPECIFIED<br>SURFACE FINISH: UNLESS OTHERWISE SPECIFIED<br>BREAK: SHARP EDGES<br>FINISH: UNLESS OTHERWISE SPECIFIED<br>HMMWV USED ON APPLICATION<br>THIS DRAWING HAS BEEN REVISIONED. DO NOT MAKE MANUAL CHANGES. |            |     |                  |                             |          |          |            |       |      |
| PROJECT: HMMWV ROBOT TRANSPORTER<br>CAGE CODE: C 030224<br>SCALE: UNLESS NOTED 1/2"   |            |     |                  |                             |          |          |            |       |      |

THIS DRAWING HAS BEEN REVISIONED. DO NOT MAKE MANUAL CHANGES.

(C4D)

AIR FORCE RESEARCH LAB  
TYNDALL AFB, FLORIDA  
PLATE

REV. 030224  
SHEET 1 OF 1

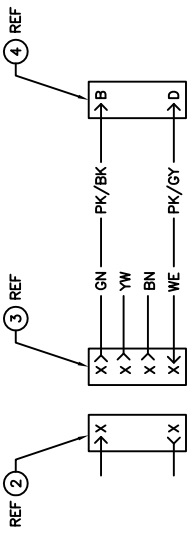
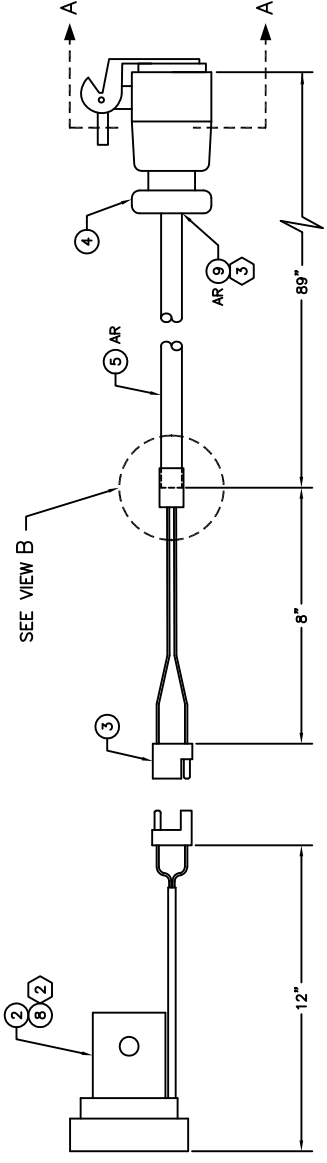
D C B A

1 2 3 4

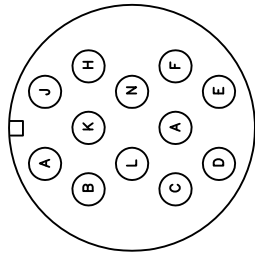
| ZONE/LTR | REVISIONS | DATE | APPROVED |
|----------|-----------|------|----------|
|          |           |      |          |

**NOTES:**

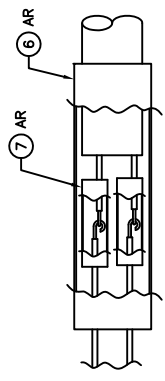
- 1 CABLE PREPARATION:  
CUT SO CABLE (F/N 5), TO 88" AND STRIP OUTER JACKET BACK 2.1/4". CUT OFF UNUSED WIRE EVEN WITH "JACKET". SOLDER SPLICE REMAINING LEADS AND COVER EACH WITH 2" LONG, 1/4" HEAT SHRINK (F/N 7). USE 4" LONG, 3/8" HEAT SHRINK (F/N 6), TO COVER CABLE END AND SPLICE.
- 2 REPLACE EXISTING 12 VOLT BULB WITH 28 VOLT BULB (F/N 8).
- 3 FILL IN VOID AROUND CABLE (F/N 5), WITH RTV (F/N 9).



WIRING DIAGRAM



VIEW A-A



VIEW B

1 030225-001 STOPLIGHT CABLE ASSEMBLY

DRAFT  
10/05/04

| QTY. | PER ASSY: | NO IDENTIFYING NO. | DESCRIPTION OR NOMENCLATURE | CASE NO. | UNIT OF MATERIALS | MATERIAL | SPECS. | NOTES | ZONE |
|------|-----------|--------------------|-----------------------------|----------|-------------------|----------|--------|-------|------|
| AR 9 | 7545661   | 39428              | RTV, GE                     |          |                   |          |        |       |      |
| 1    | 8         | 746-9707           | DKC13 LAMP, INCANDESCENT    |          |                   |          |        |       |      |
| AR 7 | 617-830   | DKC13              | HEAT SHRINK, ADHESIVE LINED |          |                   |          |        |       |      |
| AR 6 | 617-883   | DKC13              | HEAT SHRINK, ADHESIVE LINED |          |                   |          |        |       |      |
| AR 5 | 1W26      | 2X427              | SLOOW CORD                  |          |                   |          |        |       |      |
| 1    | 4         | 5035-00-559-2841   | CONNECTOR, VEHICULAR        |          |                   |          |        |       |      |
| 1    | 3         | 37112              | CABLE, MOLDED               |          |                   |          |        |       |      |
| 1    | 2         | CR-007             | LAMP, HITCH BRAKE           |          |                   |          |        |       |      |
| 1    | 1         | 030225-001         | STOPLIGHT CABLE ASSEMBLY    |          |                   |          |        |       |      |
| -3   | -2        | -1                 | NON-IDENTIFYING             |          |                   |          |        |       |      |

| DRAWN    |          | CHECKED  |          | APPROVED |          | DATE |  |
|----------|----------|----------|----------|----------|----------|------|--|
| J. EVANS | 10/07/07 | C. GREEN | 04/07/07 | C. GREEN | 04/10/05 |      |  |

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES.  
TOLERANCES UNLESS OTHERWISE SPECIFIED:  
FRACTIONS ±0.005  
DECIMALS ±0.005  
DIMENSIONS IN PARENTHESES ARE HOLE SIZE  
DIMENSIONS IN PARENTHESES ARE HOLE POSITION  
DIMENSIONS IN PARENTHESES ARE HOLE POSITION  
DIMENSIONS IN PARENTHESES ARE HOLE POSITION

030219  
NEXT ASSY: HAMMIV  
USED ON: HAMMIV  
APPLICATION: HAMMIV

SCALE UNLESS NOTED: NONE

SHEET 1 OF 1