

**BELOW-THE-HOOK LIFTING DEVICE**  
**Engineering Note Cover Page**

Lifting Device Numbers:

FNAL Site No.: \_\_\_\_\_ Div. Specific No.: 134 Asset No. \_\_\_\_\_  
if applicable if applicable if applicable

ASME B30.20 Group: (check one)  
Group I Structural and Mechanical Lifting Devices  
Group II Vacuum Lifting Devices  
Group III Magnets, Close Proximity Operated  
Group IV Magnets, Remote Operated

Device Name or Description: MINUS NEAR DETECTOR POSITIONING FIXTURE

Device was: Purchased from a Commercial Lifting Device Manufacturer  
mfg. name: \_\_\_\_\_

(check all applicable) Designed and Built at Fermilab  
Designed by Fermilab and Built by a Vendor

Assy drawing number: Q213.300-ME-397226

Provided by a User or Other Laboratory

Other. Describe: \_\_\_\_\_

Engineering Note Prepared by: INGRID FIONG Date: April 4, 2001

Engineering Note Reviewed by: Bob Woods Date: 4/4/01

Lifting Device Data:

Capacity: 8000 lb

Fixture Weight: 3800 lb

Service: normal heavy severe (refer to B30.20 for definitions)

Duty Cycle: \_\_\_\_\_ 8, 16 or 24 hour rating (applicable to groups III, and IV)

Inspections Frequency: Normal Service

Rated Load Test by FNAL (if applicable): Date: \_\_\_\_\_ Load: \_\_\_\_\_

Check if Load Test was by Vendor and attach the certificate.

Satisfactory Load Test Witnessed by: T. J. SARINA

Signature (of Load Test Witness): T. J. Sarina

Notes or Special Information:



## *MINOS NEAR DETECTOR POSITIONING FIXTURE LOAD TEST*

*Prepared by Ingrid Fang  
Revision 3.0  
January 22, 2002*

### *Introduction*

The near detector positioning fixture is designed to lift an 8000 pound load with a single pick up point. The fixture weight is 3500 pounds. The load test plate is made of the scrapped near detector steel plate and 10 additional triangular or rectangular steel plates to obtain 125% lifted load. The load test plate weighs 10000 pounds.

The purpose of this load test is to verify that the positioning fixture is able to lift the steel and scintillator plane from the near strongback in a vertical orientation.

The positioning fixture connects to the transport cart at four places. In its intended use, the scintillator side of the plane assembly connects to the positioning fixture while the steel side of the plane assembly connects to the strongback. For the load test, the test plate will replace the plane assembly.

First, the test plate that is attached to the strongback will be lifted over the two upper ear supports of the positioning fixture. Then, this assembly will be lowered to couple with the two bottom lips on the positioning fixture. After initial engagement, two bolts at the back of the ear support will be tightened to pull the plane and strongback assembly from its 2.2-degree backward tilt angle to a true vertical position. At this point, the strongback will be removed from the plane assembly.

Two clamping devices and two support lips are designed to securely hold the plane to the positioning fixture. Further, Two safety belts will be routed through the coil hole and around the positioning fixture to prevent the steel and scintillator plane from sliding off the positioning fixture.

The following personnel will be required to perform this load test. They are:

1. Responsible Engineer/ Provides technical guidance during the load test.
2. Lift Coordinator/ Stationed on the floor. Coordinates efforts and provides instructions during the lift to other personnel. This person supervises the lift.
3. Crane Operator/ Stationed on the floor. Operates the crane under the direction of the Lift Coordinator.
4. Guideline Operators/ stationed on both sides of the positioning fixture the floor. They keep both the strongback and the positioning fixture straight while lifting the load.

### *Load Test*

#### *(1). Prerequisites*

##### *A. The transport cart and positioning fixture assembly preparation procedures*

1. Park the transport cart and make sure that all brakes on the casters are locked.
2. Check the torque on the hoist ring of the positioning fixture and make sure that it is 800 ft-lbs.
3. Install a safety rope on each side of the positioning fixture.
4. Attach the building crane with scale to the hoist ring of the positioning fixture.
5. Lift the positioning fixture from horizontal to vertical position.

6. Place the positioning fixture onto the transport cart by resting the alignment angles on the top rail of the transport cart.
7. Install a total of four 1-1/8" bolts with washers in the connection plates between the positioning fixture and the transport cart.
8. Torque all the 1-1/8" bolts to 200 ft-lbs.
9. Inspect the positioning fixture and make sure that it is secured to the transport cart. The scale should read zero pounds.
10. Remove the building crane with scale from the positioning fixture.
11. Extend the two top ear support brackets on the positioning fixture to 6 inches by turning the bolts in the back of the ear support counterclockwise.

*B. The load test plate and strongback assembly preparation procedures*

1. Set the Near Strongback Fixture on the floor.
2. Check torque at all bolted connections on the strongback.
3. Check the lifting plate location on the strongback and make sure that this plate is in the extreme highest vertical position.
4. Check the torque at swivel hoist ring and make sure that it is 800 ft-lbs.
5. Set the load test plate on the top of the strongback. Slide the bottom of the load test plate to fit under the two supporting lips until the lower edge of the test plate touches the two roller pivot brackets and two supporting lips. Use shim plates as required.
6. Install two clamping devices on top of the load test plate. Torque attached bolts to 150 ft-lbs.
7. Install safety rope on both sides of the lifting lugs of the strongback.
8. Install two Hilman roller attachments. Torque attached bolts to 70 ft-Lbs.
9. Attach the crane with crane scale to the swivel hoist ring to the strongback.

## *(2). Lifting Procedure*

1. Sweep the floor to remove any debris in the path of the Hilman rollers.
2. Lift the load test plate and strongback assembly with the building crane and the scale.
3. Control the load test plate and strongback assembly rotation with two safety ropes if necessary.
4. Continue to raise the load test plate and strongback assembly until the load test plate and strongback assembly passes over the top two ear supports of the positioning fixture.
5. Adjust the position of the load test plate and strongback assembly and make sure the load test plate and strongback assembly is aligned with the bottom lips on the positioning fixture.
6. Lower the crane vertically until the load test plate and strongback assembly slides over the top two ear supports of the positioning fixture. Continue to lower the crane until the load test plate couples with the positioning fixture at the bottom two lips. Please make sure the load test plate and strongback assembly never rest on the front plates of the bottom two lips.
7. After initial engagement, tighten the two bolts at the back of the ear supports on the positioning fixture to pull the load test plate and strongback assembly from its 2.2-degree backward tilt angle to a true vertical position. Torque these bolts to 100 ft-lbs.
8. Inspect the load test plate and make sure that it is secured to the positioning fixture. The scale should read just about 5400lbs, which is the weight of the strongback.
9. Loosen the 1-1/8" bolts of the clamping devices on both sides of the strongback while the crane holds the weight of the strongback. The short helical compression spring will release the clamping plate to clear the load test plate. Please keep hands and feet clear of the clamping plate while loosening the bolts.
10. Lower the strongback fixture about 2 inches to disengage the plane assembly off the two bottom supporting lips on the strongback.
11. Inspect the strongback and make sure that it is no longer coupled to the plane assembly.

12. Move the strongback away from the load test plate.
13. Place the top and bottom support wedges inside of the coil hole of the load test plate.
14. Install two safety straps between the plane assembly and the positioning fixture as shown in the drawing 9213.300-ME-397468. These straps will be routed through the coil hole and around the positioning fixture to prevent the plane assembly from sliding off the positioning fixture.
15. Inspect the ratchet assembly on the safety straps and make sure that the 3-inch wide polyester webbing is tightened.
16. Connect the crane with the scale to the hoist ring on the top plate of the positioning fixture.
17. Remove a total of four 1-1/8 inch bolts and washers from the connections between the transport cart and the positioning fixture.
18. Inspect the positioning fixture to make sure that it is no longer coupled to the transport cart. The scale should read about 13800 pounds, which is the weight of the load test plate and positioning fixture.
19. Lift the positioning fixture with the load test plate attached off the transport cart.
20. Control the load test plate and the positioning fixture rotation with the two ropes if necessary.
21. Carefully hold the positioning fixture with the load test plate in this position for 15 minutes. Check the positioning fixture for any unusual deflections or component failure during this time period.
22. After the time is up, get the responsible engineer's permission to begin lowering the positioning fixture with the load test plate.
23. Place the positioning fixture with the load test plate in front of the transport cart.
24. Align the connection plates of the positioning fixture to the connection plates of the transport cart by resting the alignment angles of the positioning fixture on the top rail of the transport cart.

25. Install a total of four 1-1/8" bolts with washers in the connections. Torque these bolts to 200 ft-lbs.
26. Inspect the positioning fixture and make sure that it is secured to the transport cart. The scale should read about 10000 pounds, which is the weight of the load test plate.
27. Remove the two safety straps between the load test plate and the positioning fixture.
28. Remove the top and bottom support wedges inside of the coil hole of the load test plate.
29. Bring the strongback up near to the load test plane using previous procedure.
30. Slowly move the strongback into contact with the plane. Do not bang into the plane.
31. After the bottom of the strongback contacts the plane. Slowly move the trolley until the strongback is flat on the load test plate surface.
32. Slowly lower the strongback vertically until the two supporting lips pass the bottom of the plane.
33. Slowly raise the strongback vertically until the load test plate fits under the two supporting lips. Do not bang into the lips of the positioning fixture.
34. Continue to raise the strongback with the crane until the plane touches the two roller pivot brackets and two supporting lips.
35. Install two clamping devices on top of the plane and torque attached bolts to 150 ft-lbs.
36. Inspect the strongback and make sure all clamps are engaged.
37. Loosen the two bolts at the back of the ear supports on the positioning fixture.
38. Slowly lift the strongback with the load test plate until it is clear to the two bottom lips on the positioning fixture. The scale should read about 15400 pounds, which is the weight of the strongback and the load test plate.
39. Continue to move the strongback with the load test plate away from the positioning fixture.

40. Lower the strongback with the load test plate until the Hilman rollers touch the floor. After the Hilman rollers have contacted the ground, lower the strongback until it rests on the floor.

### *Reference Drawings*

1. *9213.300-ME-397468, MINOS Near Detector Transport Cart, Positioning Fixture, Scintillator/Steel Plane and Strongback Fixture Assembly*
2. *9213.300-ME-397467, MINOS Near Detector Transport Cart and Positioning Fixture Assembly*
3. *9213.300-ME-397430, MINOS Near Detector Transport Cart Weldment*
4. *9213.300-ME-397226, MINOS Near Detector Positioning Fixture Weldment*
5. *9213.300-ME-384040, MINOS Near Detector Steel Plane*
6. *9213.300-ME-384185, MINOS Near Detector Strongback Fixture*
7. *9213.300-ME-384996, MINOS Near Detector Perpendicular Manifold Assembly, Straight Out Snout, 16 Strips*
8. *9213.300-ME-384896, MINOS Near Detector Bypass Manifold*
9. *University of Minnesota, Manifold Assembly, Perpendicular Manifold, Straight Out Snout, 20 Strips*
10. *University of Minnesota, Manifold Assembly, 45 degree Manifold, 28 Strips*

The following signatures on this sheet indicate that everyone has read and understands the near detector strongback load test procedure.

1. John Voirin, Lift Coordinator

Signature: John Voirin  
Date: 2/5/02

2. John Cornele, Co. Lift Coordinator

Signature: John Cornele  
Date: 2-5-02

3. xxxxx, Guide Line Operator

Signature: Jamie E. Dradt  
Date: 2/5/02

4. xxxxx, Guide Line Operator

MARK SHOWN

Signature: Mark Shown  
Date: 2-5-02

4. <sup>Tom Rathbun</sup> xxxxx, Crane Operator

Signature: Tom Rathbun  
Date: 2-5-02

5. Ingrid Fang, Responsible Engineer

Signature: Ingrid Fang  
Date: 2-5-02

# PPD Work Plan/Hazard Analysis

**JOB NAME:** Near Detector Positioning Fixture Load Test

**LOCATION:** New Muon Lab

**ESTIMATED START DATE:** February 5, 2002

**ESTIMATED JOB DURATION OR END DATE:** February 5, 2002

**WORK TO BE PERFORMED BY:** MINOS Personnel

**RESPONSIBLE ENGINEER:** Ingrid Fang x 8725

**TASK MANAGER:** John Voirin

## DESCRIPTION OF WORK:

This job is to verify that the positioning fixture is able to lift the load test plate with 125% lifted load from the near strongback in a vertical orientation.

The positioning fixture connects to the transport cart at four places. In its intended use, the scintillator side of the plane assembly connects to the positioning fixture while the steel side of the plane assembly connects to the strongback. For the load test, the test plate will replace the plane assembly.

First, the test plate that is attached to the strongback will be lifted over the two upper ear supports of the positioning fixture. Then, this assembly will be lowered to couple with the two bottom lips on the positioning fixture. After initial engagement, two bolts at the back of the ear support will be tightened to pull the plane and strongback assembly from its 2.2 degree backward tilt angle to a true vertical positioning. At this point, the strongback will be removed from the plane assembly. Two clamping devices and two support lips are designed to securely hold the

plane to the positioning fixture. Further, two safety belts will be routed through the coil hole and around the positioning fixture to prevent the test plate from sliding off the positioning fixture.

The details of this job are outlined under Minos Near Detector Positioning Fixture Load Procedure. An experienced crew of Minos personnel will conduct the lifting operation.

#### ASSOCIATED HAZARDS:

1. Mechanical Hazards: Lifting heavy objects as described under Minos Near Detector Positioning Fixture Load Test Procedure.
2. Work at Elevations: Personnel will be working from ladders.

#### PLANNED MITIGATION OF HAZARDS:

1. Experienced personnel will be conducting the operation as follows:

The task manager, John Voirin, as crew foreman and will act as lifting coordinator to the operation. He will assure that the Minos Near Detector Positioning Fixture Load Test Procedure is followed. John has previously participated in Minos Near Detector Plane Lifting and Hanging operation and is well versed in this task. In the absence of the task manager, the work will cease.

The responsible engineer, Ingrid Fang, will be present to supply technical guidance during the operation and to insure all prerequisites have been completed.

Xxxx and xxxx will function as the guideline operators responsible for performing all prerequisites outlined under 1A and 1B of the Minos Near Detector Positioning Fixture Load Test Procedure. The guideline operators are also responsible for the following:

- a. Control the load test plate and strongback assembly rotation with two safety ropes if necessary. While the load test plate and strongback assembly is being lowered, each guideline operator watches his side of the plane, correcting the movement of the strongback assembly as directed by the lifting coordinator.
- b. Adjust the position of the load test plate and strongback assembly until the load test plate and strongback assembly passes over the top two ear supports of the positioning fixture.
- c. Adjust the position of the load test plate and strongback assembly and make sure the load test plate and strongback assembly is aligned with the bottom lips on the positioning fixture.
- d. Watching the location of the two bottom lips on the positioning fixture with respect to the two bottom lips on the strongback during the load transfer from

the strongback to the positioning fixture. Also, to insure that the assembly will not bang into the bottom lips during the operation.

- e. After initial engagement, tighten the two bolts at the back of the ear supports on the positioning fixture to pull the load test plate and strongback assembly from its 2.2 degree backward tilt angle to a true vertical position. Torque these bolts to 100 ft-lbs.
- f. Inspect the load test plate and make sure that it is secured to the positioning fixture.
- g. Releasing the clamping device on both sides of the strongback after the load test plate has been securely set on the positioning fixture. Please keep hands and feet clear of the clamping plate while loosening the bolts on the clamping device.
- h. Inspect the strongback and make sure that it is no longer coupled to the plane assembly before moving the strongback away from the load test plate.
- i. Place the top and bottom support wedges inside of the coil hole of the load test plate.
- j. Install two safety straps between the plane assembly and the positioning fixture. These straps will be routed through the coil hole and around the positioning fixture to prevent the plane assembly from sliding off the positioning fixture.
- k. Inspect the ratchet assembly on the safety straps and make sure that the 3 inch wide polyester webbing is tightened.
- l. Align the connection plates of the positioning fixture to the connection plates of the transport cart by resting the alignment angles of the positioning fixture on the top rail of the transport cart after the load test.
- m. Install a total of four 1-1/8" bolts and washers in the connections. Torque these bolts to 200 ft-lbs.
- n. Inspect the positioning fixture and make sure that it is secured to the transport cart.
- o. Remove the two safety straps between the load test plate and the positioning fixture. Remove the top and bottom support wedges inside of the coil hole of the load test plate.

- p. Bring the strongback up near to the load test plate and make sure the two support lips of the strongback fit the bottom of the load test plate. Do not bang the bottom lips of the positioning fixture.
  - q. Inspect the load test plate and make sure that it is resting on the two roller pivot brackets and two supporting lips of the strongback.
  - r. Install two clamping devices on top of the load test plate. Torque attached bolts to 150 ft-lbs.
  - s. Inspect the strongback and make sure all clamps are engaged.
  - t. Inspect the load test plate and make sure it is secured to the strongback.
  - u. Loosen the two bolts at the back of the ear supports on the positioning fixture.
  - v. Inspect the load test plate and make sure it is disengaged from the positioning fixture.
2. Personnel will wear hand protection and sturdy work boots for foot protection.
  3. Personnel utilizing platform and man lifts will have lift training.
  4. Personnel working at elevations above six feet will wear properly anchored safety harnesses.
  5. Personnel are required to wear hard hats in the area of operations.
  6. A pre-operational meeting will be held with the crewmembers to discuss the work to be performed.

***WORK PARTY (NAMES, TITLES IN THIS TASK):***

1. Jon Voirin, Task Manager/ Lifting Coordinator
2. John Cornell, Co Task Manager
3. Ingrid Fang, Responsible Engineer
4. xxxx, Crane Operator
5. xxxx, Guideline Operator
6. xxxx, Guideline Operator

**PREPARED BY:** Ingrid Fang      **DATE:** February 4, 2002

APPROVED BY: R. J. [Signature] DATE: 2/5/02

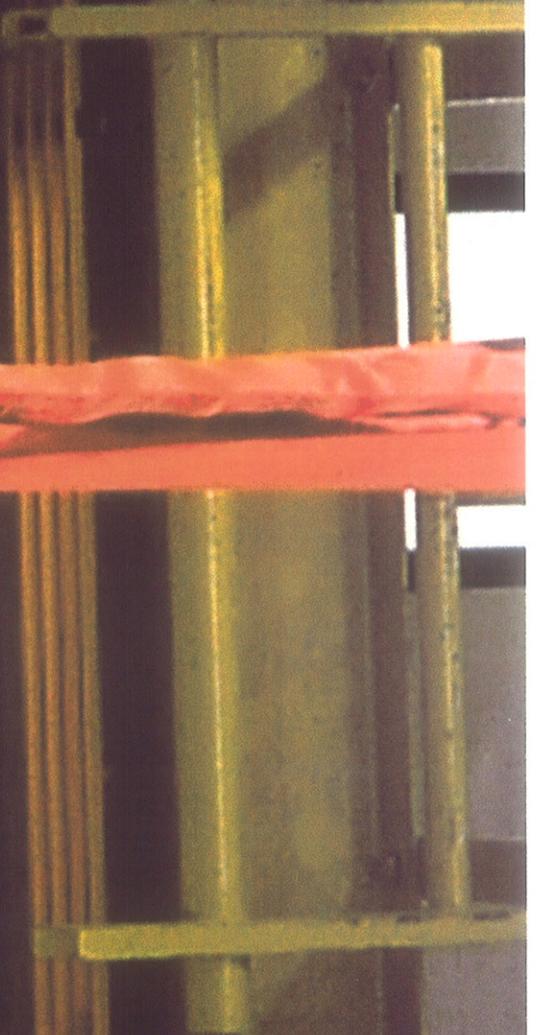
**DETAILS ON NOTIFICATION / APPROVAL BY OTHER DIVISIONS**

**SIGNATURE LIST OF WORKERS INVOLVED IN THIS TASK**

My supervisor has reviewed this Work Plan & Hazard Analysis with me and I understand the hazards and required precautionary actions. I will follow the requirements of this plan or notify my supervisor if I am unable to do so.

<u>Name (print)</u>	<u>ID#</u>	<u>Signature</u>	<u>Date</u>
<u>John Voire</u>	<u>4940</u>	<u>[Signature]</u>	<u>2/5/02</u>
<u>John Cornele</u>	<u>6208</u>	<u>[Signature]</u>	<u>2/5/02</u>
<u>Tom Rathbun</u>	<u>751</u>	<u>[Signature]</u>	<u>2-5-02</u>
<u>MARK SHOWN</u>	<u>4959</u>	<u>Mark Shown</u>	<u>2-5-02</u>
<u>Jamie Grado</u>	<u>6576</u>	<u>Jamie Grado</u>	<u>2/5/02</u>
<u>Ingrid Fay</u>	<u>12281</u>	<u>[Signature]</u>	<u>2/5/02</u>
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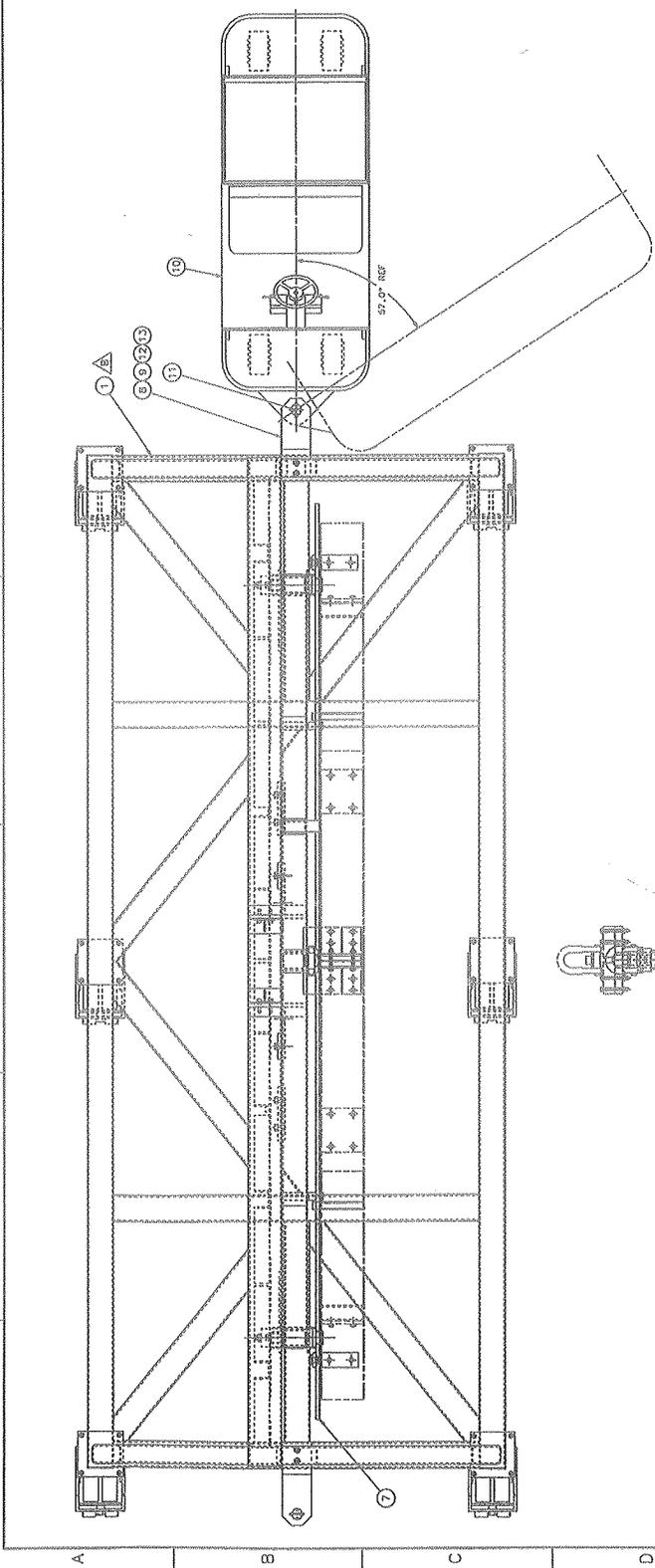






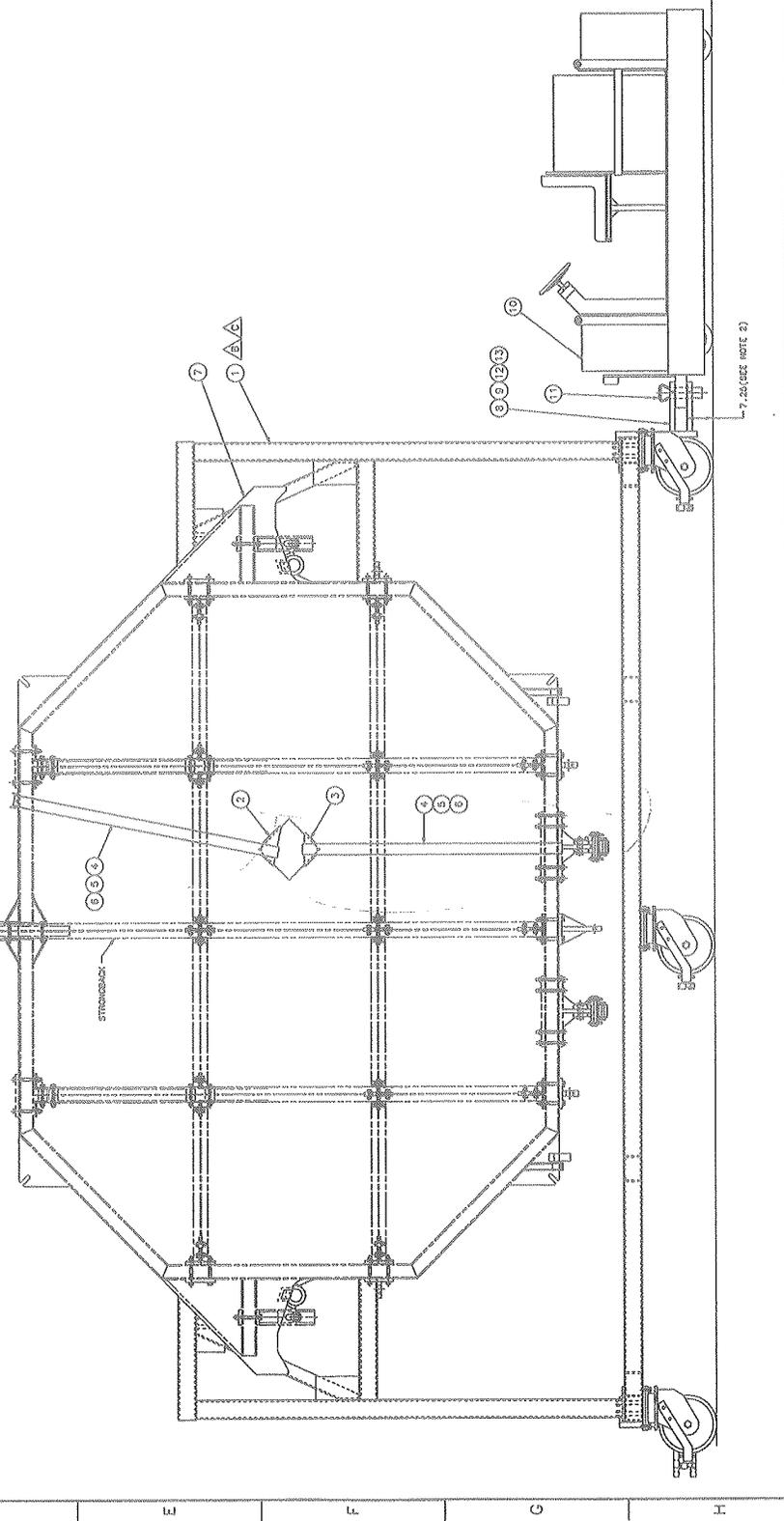


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C	REVISED DRAWING		
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NOTES:

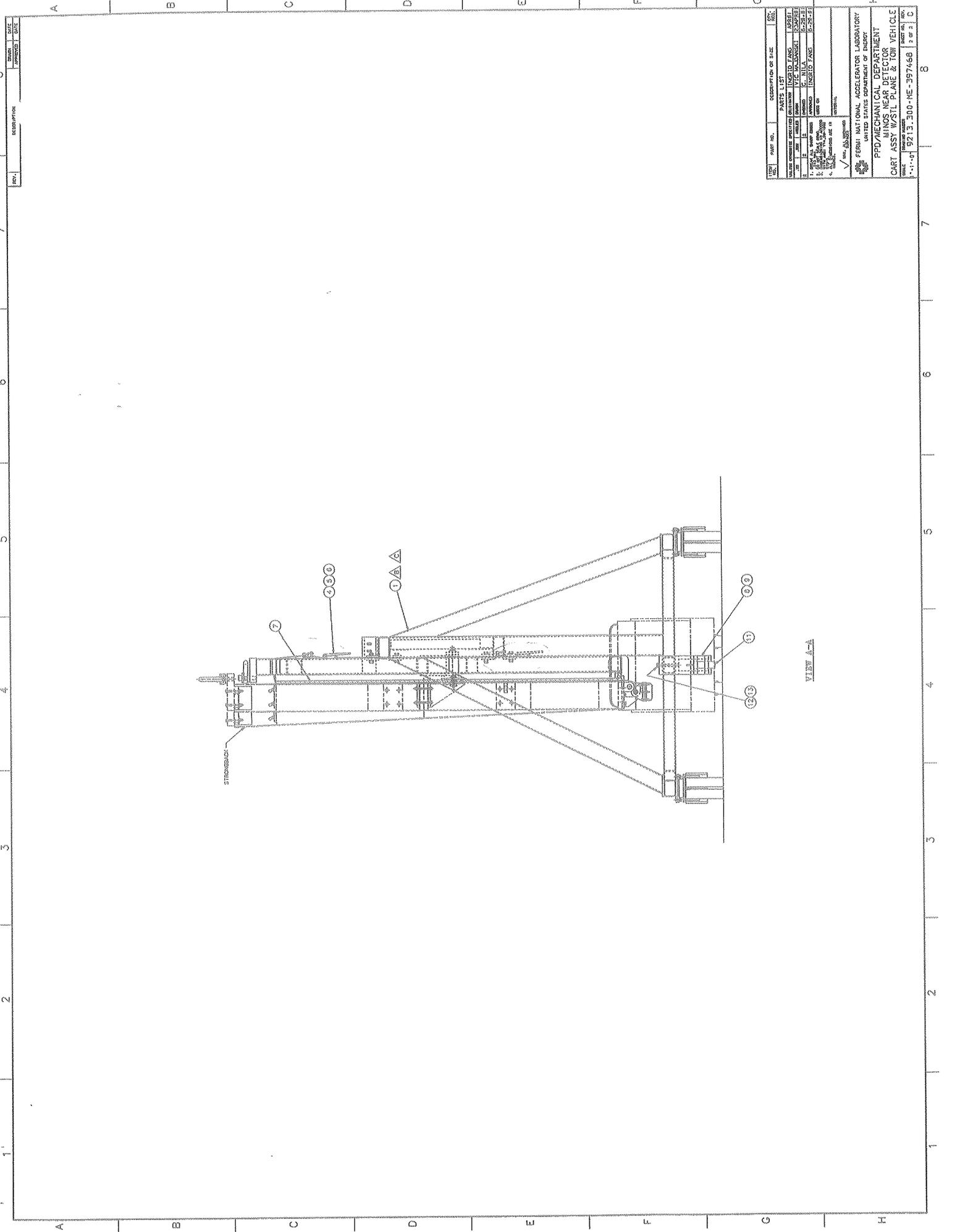
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5. DIMENSIONS SHALL BE IN FEET AND INCHES UNLESS OTHERWISE SPECIFIED.
6. DIMENSIONS SHALL BE IN METERS UNLESS OTHERWISE SPECIFIED.
7. DIMENSIONS SHALL BE IN KILOMETERS UNLESS OTHERWISE SPECIFIED.
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9. DIMENSIONS SHALL BE IN KILOMETERS PER HOUR SQUARED UNLESS OTHERWISE SPECIFIED.
10. DIMENSIONS SHALL BE IN KILOMETERS PER HOUR CUBED UNLESS OTHERWISE SPECIFIED.
11. DIMENSIONS SHALL BE IN KILOMETERS PER HOUR TO THE FOURTH POWER UNLESS OTHERWISE SPECIFIED.



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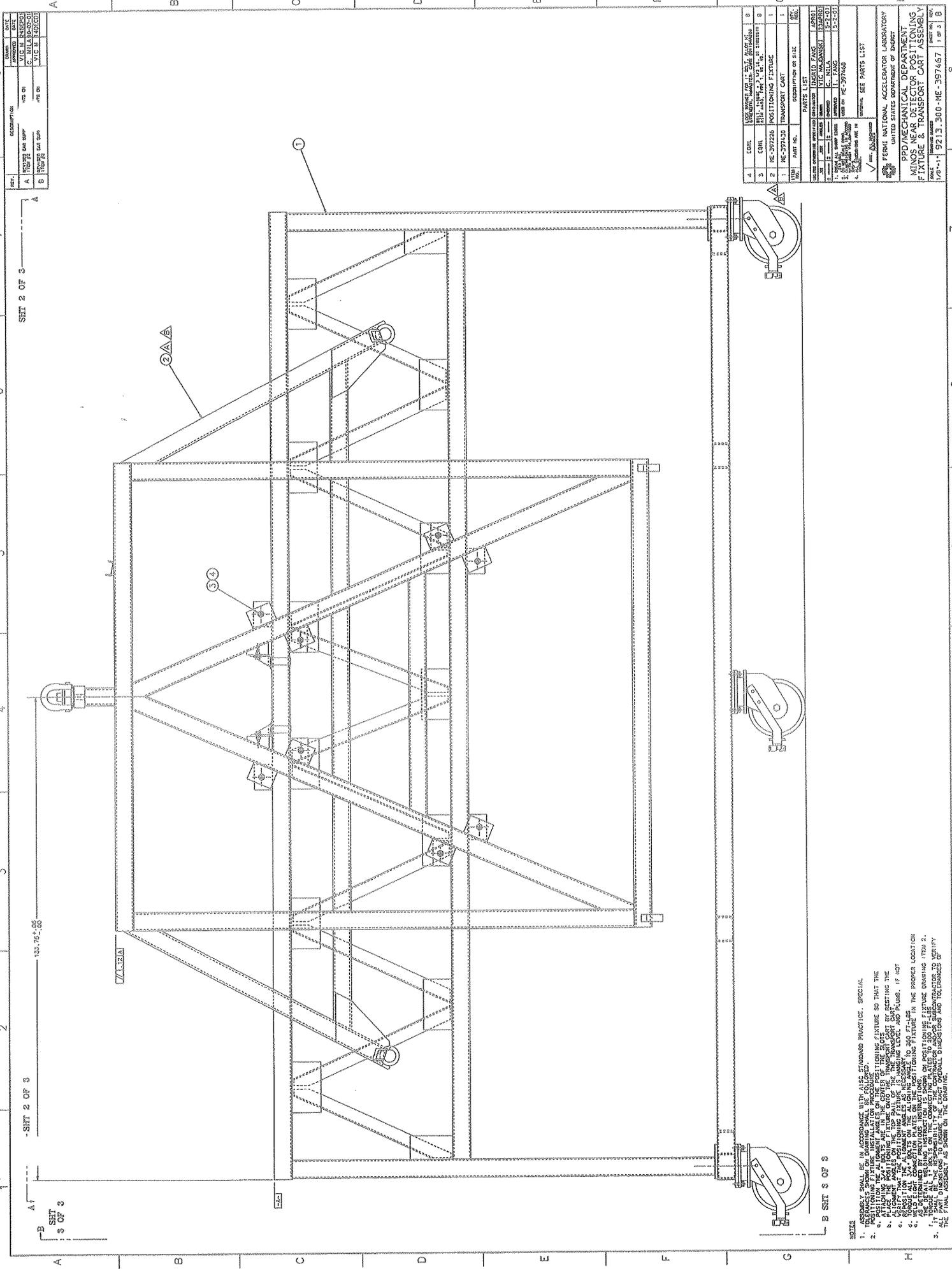
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 UNITED STATES DEPARTMENT OF ENERGY  
 FERMILAB NATIONAL ACCELERATOR LABORATORY  
 CART ASSEMBLY IN THE VECTOR VEHICLE  
 DRAWING NO. 9213-300-ME-397468  
 SHEET NO. 1 OF 1



VIEW A-A

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FEDERAL BUREAU OF INVESTIGATION  
 UNITED STATES DEPARTMENT OF JUSTICE  
 LABORATORY  
 PPD/MECHANICAL DEPARTMENT  
 MINOS NEAR DETECTOR  
 CART ASSY W/STL PLANE & TOW VEHICLE  
 11-01 92131-300-NE-357468 2 OF 2 C



REV. DESCRIPTION

REV. A	DESIGNED BY	DATE
REV. B	CONTRACTOR	DATE

133.76±.06

SHIT 2 OF 3

SHIT 3 OF 3

CDL#	DESCRIPTION	QUANTITY	UNIT
1	POSITIONING FIXTURE	1	PC
2	TRANSPORT CART	1	PC

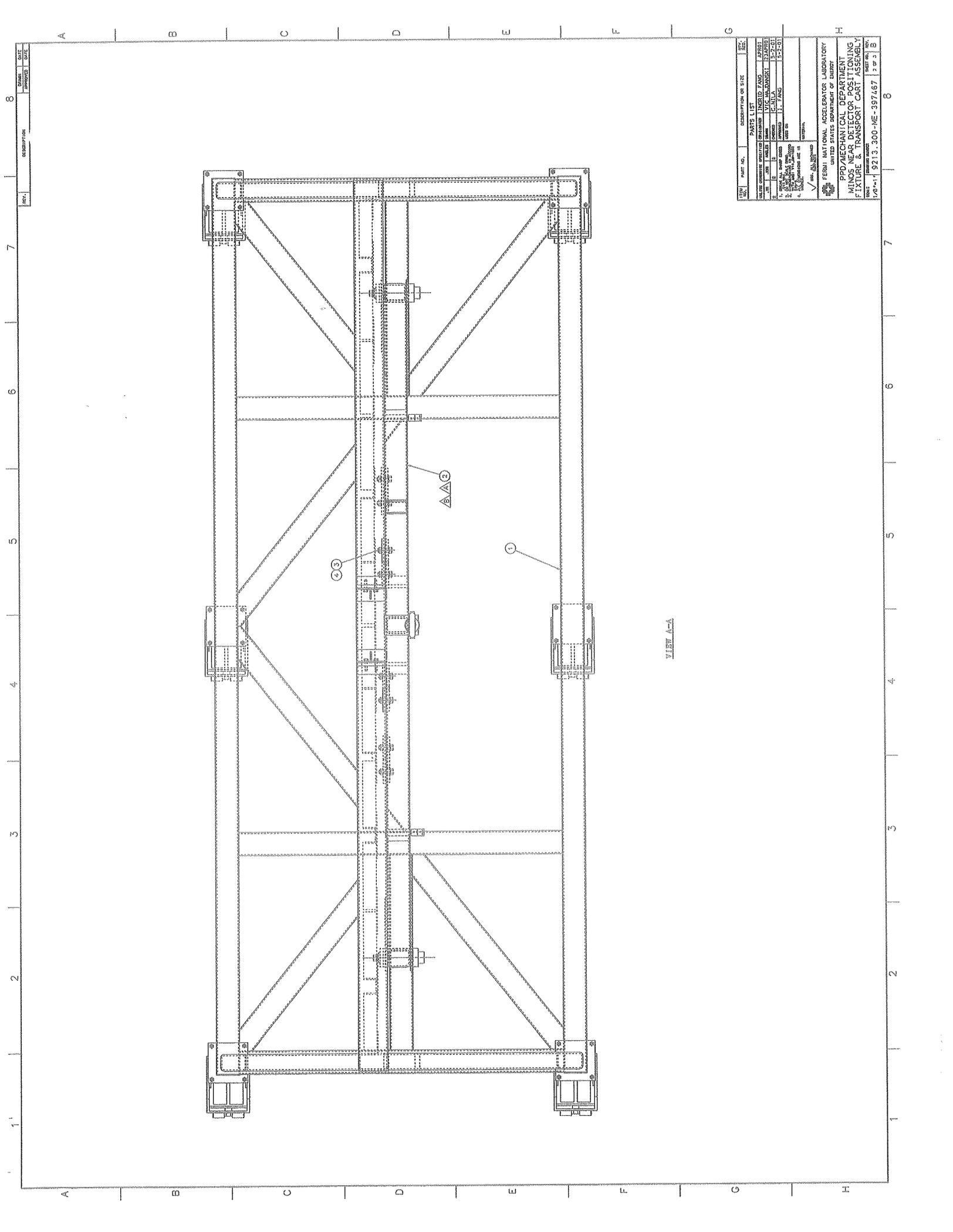
CDL#	DESCRIPTION	QUANTITY	UNIT
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2	TRANSPORT CART	1	PC

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1	POSITIONING FIXTURE	1	PC
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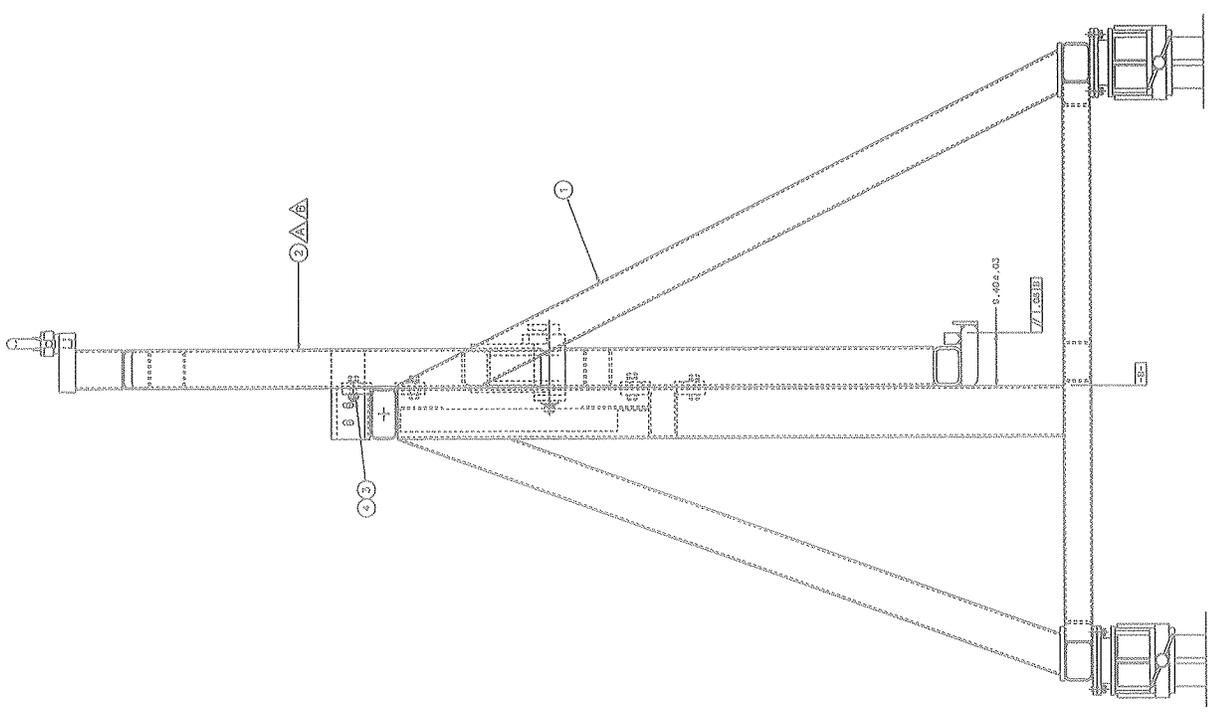
ASSEMBLY SHALL BE IN ACCORDANCE WITH AISC STANDARD PRACTICE. SPECIAL  
 1. POSITIONING FIXTURE INSTALLATION PROCEDURE SHALL BE PROVIDED TO THE CONTRACTOR.  
 2. ATTACHING PLATES SHALL BE IN THE CENTER OF THE BEAMS.  
 3. ALLOWANCE SHALL BE MADE FOR THE CENTER OF THE BEAMS.  
 4. ALLOWANCE SHALL BE MADE FOR THE CENTER OF THE BEAMS.  
 5. ALLOWANCE SHALL BE MADE FOR THE CENTER OF THE BEAMS.  
 6. ALLOWANCE SHALL BE MADE FOR THE CENTER OF THE BEAMS.  
 7. ALLOWANCE SHALL BE MADE FOR THE CENTER OF THE BEAMS.  
 8. ALLOWANCE SHALL BE MADE FOR THE CENTER OF THE BEAMS.  
 9. ALLOWANCE SHALL BE MADE FOR THE CENTER OF THE BEAMS.  
 10. ALLOWANCE SHALL BE MADE FOR THE CENTER OF THE BEAMS.

SHIT 3 OF 3



VIEW A-A

ITEM	PART NO.	DESCRIPTION OR SIZE	QTY.
<b>PARTS LIST</b>			
1	INSERIT FANS	APPROX.	
2	INSERIT FANS	APPROX.	
3	INSERIT FANS	APPROX.	
4	INSERIT FANS	APPROX.	
5	INSERIT FANS	APPROX.	
6	INSERIT FANS	APPROX.	
7	INSERIT FANS	APPROX.	
8	INSERIT FANS	APPROX.	
<input checked="" type="checkbox"/> ALL DIMENSIONS IN INCHES <input type="checkbox"/> ALL DIMENSIONS IN METERS			
FERM NATIONAL ACCELERATOR LABORATORY UNITED STATES DEPARTMENT OF ENERGY PP/MECHANICAL DEPARTMENT MOUNTAIN VIEW, MISSOURI FIGURE 13. TRANSPORT CAR ASSEMBLY DRAWING NO. 9213.300-ME-397467 SHEET NO. 2 OF 2			



VIEW B-2

ITEM NO.	QTY	DESCRIPTION OR SIZE	UNIT	REMARKS
PARTS LIST				
1	1	INSERD FANS	APR01	
2	1	INSERD FANS	APR01	
3	1	INSERD FANS	APR01	
4	1	INSERD FANS	APR01	
5	1	INSERD FANS	APR01	
6	1	INSERD FANS	APR01	
7	1	INSERD FANS	APR01	
8	1	INSERD FANS	APR01	
<input checked="" type="checkbox"/> SEE DRAWING FOR MATERIAL <input type="checkbox"/> SEE DRAWING FOR MATERIAL				
FEDERAL BUREAU OF INVESTIGATION UNITED STATES DEPARTMENT OF JUSTICE FBI LABORATORY FEDERAL BUREAU OF INVESTIGATION UNITED STATES DEPARTMENT OF JUSTICE FBI LABORATORY MINOS NEAR DETECTOR POSITIONING FIXTURE & TRANSPORT CART ASSEMBLY DRAWING NO. 213.300-NE-397467 DATE 10/1/83 SHEET 1 OF 1				