

# Job Hazard Analysis for CM1 Transport

**Job Name:** Transport of 1.3 GHz Cryomodule (CM1)

**Estimated Start Date:** 5 Aug 08

**Estimated Job Duration:** 1 Day

**Work to be performed by:** TD and AD personnel

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## Description of work:

This step-by-step procedure describes in detail the preparation, loading onto air-ride trailer, transport (from ICB to NML) and unloading of the 1.3 GHz Cryomodule (CM1).

## Pre-Transport Preparation

- Spread aggregate crushed limestone in large depressions along route
- Cover cryomodule ends and (3) support post openings with plastic
- Using 30-ton crane, attach yellow strong-back lifting fixture (TD lifting fixture TLF 1155, rated load 10 tons, tare weight of 3.52 tons) to CM1 (weighing 8-tons), becoming "CM1 assembly" (total weight of 11.52 tons)
- Adjust yellow strong-back fixture's C.G. (from red line (CM1 off) to black line (CM1 attached)) through wheel mechanism
- Attach geophones and GP1 (DAQ) devices
- Reset GP1 devices

## Loading of CM1 at ICB

- Sling and lift red base frame (weighing 1.42 tons) using 30-ton crane
- Load red base frame onto air-ride trailer centered transversely per Figure 1

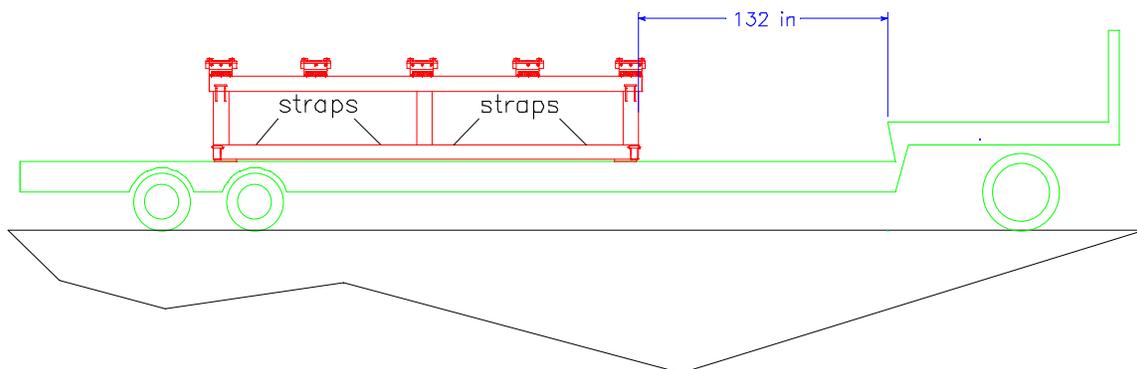


Figure 1. Position of red base frame air-ride trailer.

- Secure red base frame using straps
- Start DAQ process for geophones
- Move crane to CM1 assembly, attach hook and carefully lift
- Move CM1 assembly to air-ride trailer
- Load CM1 assembly onto air-ride trailer within red base as shown in Figure 2

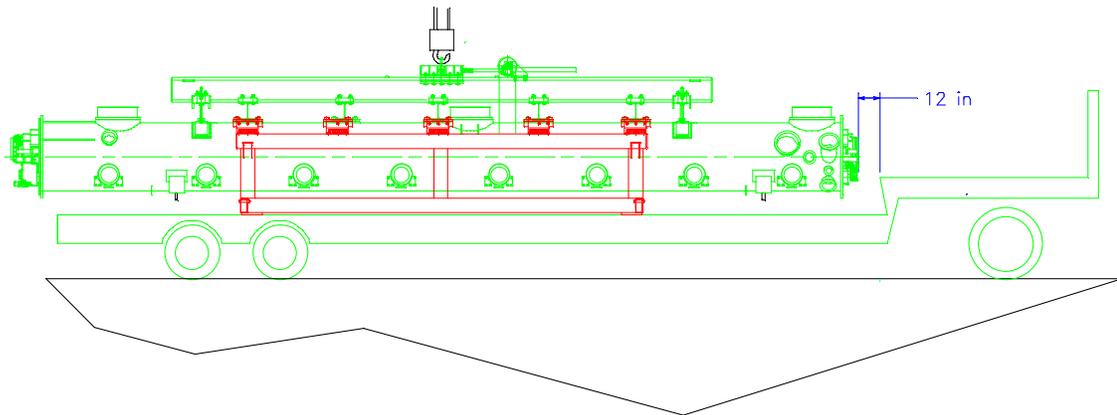


Figure 2. Loading CM1 assembly onto trailer.

- Keep load suspended using crane
- Connect red base frame to CM1 assembly by attaching cross-members to isolators
- Lower CM1 assembly onto isolators (total weight of ~13 tons) using crane, trailer rated for 40 tons (tare weight of truck with trailer is 25 tons)
- Remove crane connection from CM1 assembly
- Secure instrumentation and electronics for transport

## Transport

- Restart DAQ process for geophones
- Confirm Security escort is ready and announce to all involved “ready to move”
- A Security car will lead with another to follow the transport truck
- Other Security personnel will stop traffic at points ahead when necessary
- Carefully pullout from ICB east highbay
- Travel in first gear 2.1 miles, roughly 3 mph, while not changing the accelerator (therefore preventing surge effect)
- Follow route outlined in Figure 3 (Security will provide constant support to prevent unnecessary stops)

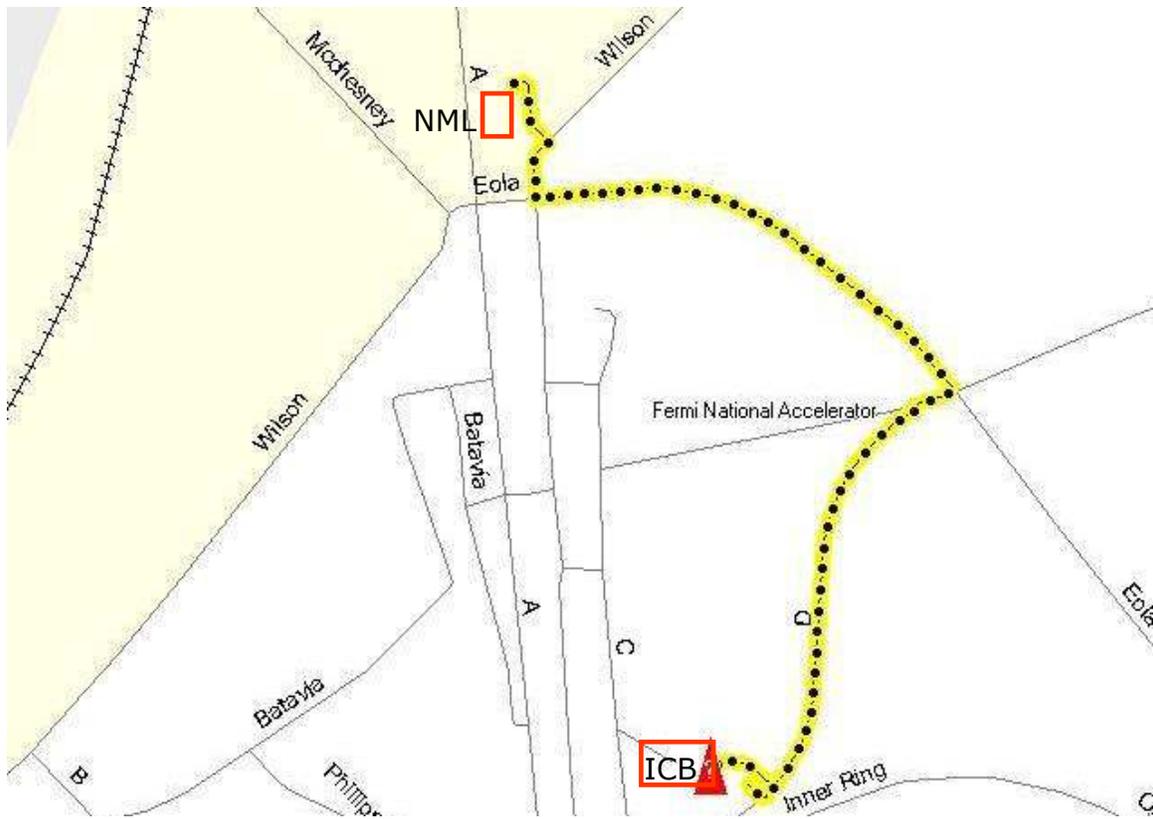


Figure 3. Fermilab route for transport.

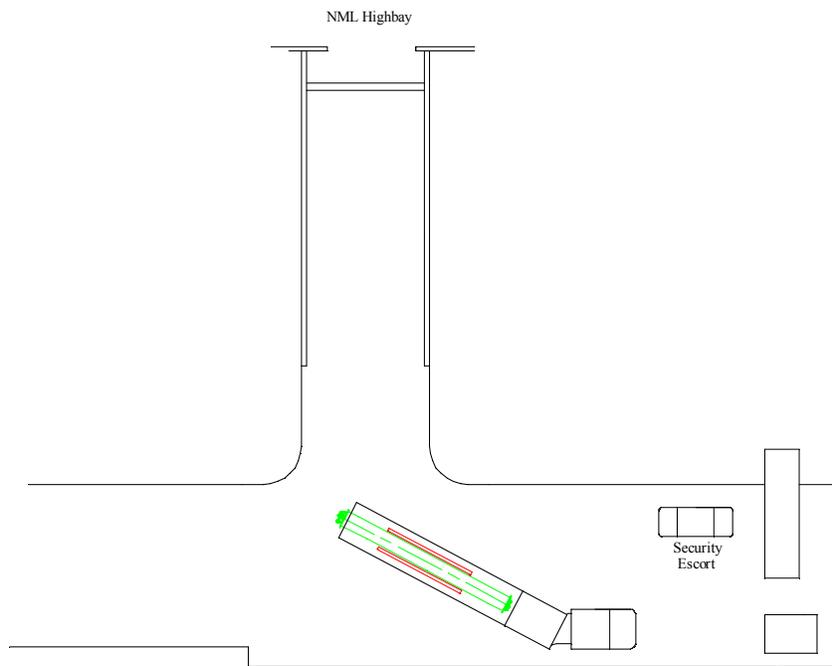


Figure 4. Diagram for backing at NML.

- Minimize maneuvers by pulling past the highbay entrance
- Raise tail flap and carefully back into NML highbay as shown in Figure 4
- Carefully back-down the 7% grade with assistance from spotter
- Carefully back into NML highbay and stop per Figure 5 (a bulkhead exists to prevent the trailer from moving too far)

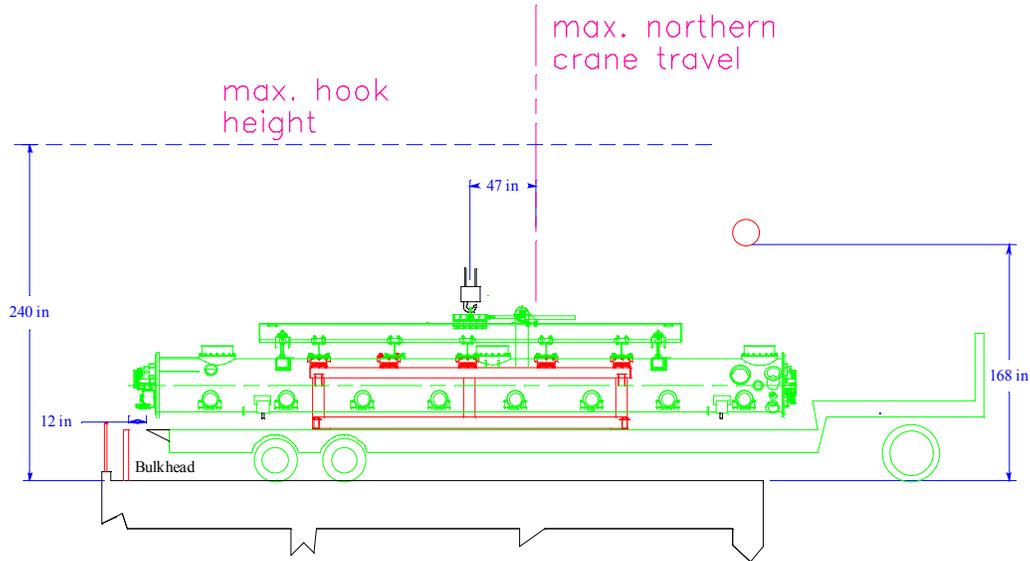


Figure 5. Final position within NML highbay.

### Unloading of CM1 at NML

- Lower 25-ton crane into position to lift CM1 assembly (insert hook)
- Maximum hook height from highbay deck is 20'
- Note that strong-back fixture is **not** designed to lift the entire transport assembly, CM1 assembly and red base frame
- Lift CM1 assembly slightly enough to disconnect isolators
- Remove cross-member connections between CM1 strong-back assembly and base frame at isolators
- Attach tag-line(s) to control horizontal rotation of CM1 assembly while transporting with crane
- Carefully lift CM1 assembly and raise to a safe clearance height which avoids red frame on trailer and other obstructions as shown in Figure 6

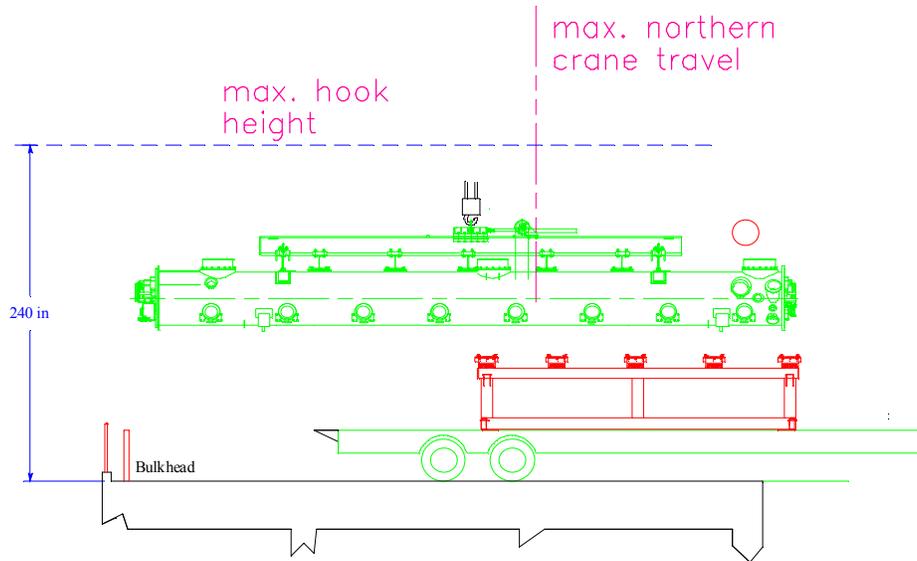


Figure 6. Remove CM1 assembly from transport frame.

- Carefully pull truck and trailer out of highbay completely
- Carefully move assembly south towards NML pit and SCRF cave area
- Lower CM1 assembly into pit towards support stands using tag-line(s)
- Carefully position CM1 above and lower onto stands
- Secure CM1 to stands
- Adjust yellow strong-back fixture's C.G. (from black line (CM1 attached) to red line (CM1 off)) through wheel mechanism
- Lift yellow strong-back lifting fixture out of cave into NML holding area
- Lower yellow strong-back onto cribbing
- Disconnect crane

### Post-Transport

- Download GP1 devices and backup geophone data
- Return red base frame to ICB

### Associated Hazards

- Standard hazards involved in rigging with crane operations, which can result in injuries to personnel or equipment
- Dropping load
- Pinched or smashed fingers, toes or other injuries
- Coming into contact with crane or truck, or being crushed by crane or moving equipment
- Working at heights

## Hazard Mitigation

- The entire operation is pre-planned (as stated above)
- All personnel involved will be briefed regarding their functions and responsibilities
- Only experienced personnel will be conducting the operation
- Only trained qualified personnel will be operating the cranes
- Use a trained spotter during crane and vehicle operation
- Inspect cranes prior to use
- Ensure that cranes are properly rated for the considered loads
- Maintain safety rail position during work
- All personnel involved in the operation will have the following Personal Protection Equipment (PPE): safety shoes, safety glasses and gloves
- Keep non-essential personnel clear of work area

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