



Fermi National Accelerator Laboratory  
Mechanical Department  
P. O. Box 500, MS 219  
Batavia, IL 60510

**JOB NAME:** E-907 JHA/Work Permit/Assembly Procedure for Jolly Green Giant Magnet

**LOCATION:** Meson Experimental Area – MC7 Building

**E-907 SPOKESMAN:** Rajendran Raja

**E-907 INSTALLATION PROJECT MANAGERS:** Peter Barnes, Leon Beverly

**E-907 MAGNET INSTALLATION TASK MANAGERS:** Mike Mascione, Jim Ellermeier

**PERSONNEL PERFORMING WORK:** Mike Mascione and a Contract Rigging Crew

**Description of Work:** One of the experimental apparatuses required for running E-907 in the Meson center line at MC-7 will be the analysis magnet known as the Jolly Green Giant. (Hereafter referred to as JGG) Since being disassembled and removed from the Neutrino experimental area several years ago, this magnet has been stored in the outdoors just to the west of the M west line and just south of the MAB. In its disassembled state, the magnet consist of the following components:

- 1.) One top and one bottom steel piece, each weighing 32.9 tons. Each is rigged with 4 each 1-1/2”-6 drilled and tapped holes for lifting/rigging.
- 2.) One top and one bottom coil-retaining steel pieces, each weighing 31 tons. Each is rigged with 4 each 1-1/2”-6 d/t holes for lifting /rigging.
- 3.) Four side pole steel pieces, each weighing 16.6 tons. Each is rigged with 2 each d/t 3”-4 holes for lifting/rigging.
- 4.) 24 corner steel pieces, each weighing 4.25 tons. Each has one 3/4”-10 d/t hole for lifting/rigging.
- 5.) Four corner/side steel pieces, each weighing 500 lbs. Each has one 3/4”-10 d/t hole for lifting/rigging.
- 6.) Four magnet coils, each weighing 4.5 tons. Each will be rigged with a crane and slings.

- 7.) Four 4” bolts approximately 12’ long, each about 500 lbs. Each will be rigged with slings.

Each of these magnet components will be staged from their present storage area to the hard-stand area just east of the MC-7 area where the JGG will be assembled. Staging will be done by Fermi personnel and contract rigging crews. Rigging equipment will consist of properly rated cranes, forklifts and flat bed trucks. The magnet components will be staged and assembled in the order given by the assembly procedure described later in this document.

**Setup:** All magnet components for magnet assembly will be rigged into MC-7 with a 90 ton crane operated by a contract rigging crew and will be task managed by Mike Mascione. Backup task manager will be Jim Ellermeier

**Safety:** The following safety issues will be addresses and will be mitigated:

*Familiarity with the project:* All personnel involved with any phase of the magnet assembly will have been briefed on the scope of the task and the possible safety issues involved. All personnel involved with the task will have read and signed this document prior to the start of work.

*Possible injuries from pinching/crushing:* Because of the nature of this task with its very large pieces of steel, special care will be taken to prevent injuries from pinching and crushing. All personnel involved with rigging and assemble will wear work boots and hard hats. Gloves will be worn when necessary.

*Eye protection:* Safety eyewear will be worn when operating hand tools.

*Two-man rule:* Whenever a piece of the magnet is being moved, at least 2 people, in addition to the crane operator, will be monitoring and helping with this move.

*Working at heights:* Personnel will be working at heights up to 13 feet and in an open roof situation. Appropriate caution will be taken when working at these heights, and tie-offs with safety harnesses will be used when possible. The appropriate and safe use of ladders will be exercised.

*Securing work area:* All areas within 100 feet of the rigging /assembly area will be roped off and marked as a “stay clear” area in order to avoid unauthorized personnel from entering the work area.

**Procedure For Assembly of JGG:** An exploded view diagram with the 8 major steel pieces of the magnet labeled #1- #8, as well as a diagram that shows the 4 stacked corner/side assemblies will be furnished to the task manager for assembly.

The four coils will be labeled upper-upper, upper-lower, lower-upper, and lower-lower.

- 1.) Build a dam for the epoxy grout of 1” or 1 1/2” aluminum angle. The dam should be 2”-3” wider on all sides than the footprint of the steel. Caulk all seams.
- 2.) The assembly of the magnet starts by rigging into position the bottom steel piece (#1) onto the concrete pad. The pad will be pre-marked by the alignment group for the proper location of this piece in the x and z directions. The height of beam center will determine the height of the top of this piece. The top should be straight

and level in all directions. At present, beam center is set at 80.5" above the floor elevation, thus the height of the top of this piece of steel is to be 14" above the top elevation of the 12" concrete slab.. The down stream face of this piece should be perpendicular to the beam. This piece will be shimmed to its proper position by use of a transit that will be supplied and operated by experienced PPD personnel. Once this is done, the alignment group will verify the correct position to 1/8". The correct position of this first piece of magnet steel is very crucial, as the rest of the magnet will stack off of this piece and result in magnet center being on beam center.

- 3.) After this bottom steel piece has been set, pour the epoxy grout. Depending on the temperature of the concrete at the time that the grout is poured, either Unisorb standard V-100 epoxy grout or Unisorb low-temp V-100 epoxy grout will be used to grout the bottom piece to steel in place. Low-temp grout should be used for temperatures between 25 F and 60 F. Magnet assemble can continue the following morning after the epoxy has been poured, as the compressive strength of the epoxy will be 9,000 psi six hours after the pour. The floor loading for the fully assembled JGG will be 30 psi.
- 4.) As the assembly proceeds, buff all steel mating surfaces with a wire wheel to remove rust and other debris.
- 5.) Stack the lower coil-retaining steel piece (#2) on top of the bottom piece. These two pieces have 2" diameter alignment pins that will position #2 in the proper x and z position.
- 6.) Before the coils are set, clean the area on the steel where the coils will rest on both the bottom (#2) and top (#7) pieces of steel. Stack the 4 coils, in the proper orientation, on top of the #2 piece of steel. Make sure that the coils are oriented correctly, i.e. right side up and the correct rotation with the power/water connections pointed in the upstream direction. Walt Jaskierny should be present whenever the coils are handled. Walt will inspect all surfaces that come in contact with the coils, clean if necessary and hi-pot coils to steel. After coils are inspected, cleaned and hi-potted, cover them with a tarp while the balance of steel is stacked.
- 7.) Stack the two side pole pieces on the sides of piece #2 and on top of piece #1. Looking upstream, piece #3 will be located on the left side and piece #4 will be located on the right side. Once again 2" diameter alignment pins will position these two side pieces in the proper x and z positions relative to the base plate.
- 8.) Stack the four 6-piece stacks, labeled A,B,C, and D, on top of pieces #3 and #4. The footprint left from painting the magnet in conjunction with the through holes for the 4" bolt will indicate the correct position and orientation of these four stacks. The diagram shows the position for the four stacks. All 24 pieces have been marked for identification. Make sure that the rotation and stacking sequence of these 24 pieces is correct so that the 6"x6"x49" piece of steel can be bolted in place.

Attach the four 6"x6"x49" steel pieces to the above four stacks of steel. These four pieces of steel are identical. Each of the four 6-piece stacks needs to be at the same elevation. Full size shims should be used to make their respective elevations to be within 0.050" of the tallest stack.

- 9.) Stack the two upper side pole pieces on top of the 6-piece stacks. Piece #5 should be stacked on the left side and piece #6 should be on the right side. The opening between these two pieces should be just wide enough to accommodate the 111" top coil-retainer piece of steel, which is marked #7. Using a plumb bob, pieces #5 and #6 should be positioned so that they are within 1/8" of the same x and z positions as the two side pole pieces (marked #3 and #4) directly below them.
- 10.) Stack the top coil-retaining piece (#7) between the two upper side pole pieces. The front edge, at the corners, should plumb bob to within 1/8" of the position of the bottom coil retaining piece, which is marked #2.
- 11.) Stack the top piece (#8) of the magnet on top of piece #7. 2" alignment pins will align this top piece relative to the rest of the stacked assembly
- 12.) Raise the two upper coils, upper-upper and upper-lower, as a unit into their correct position on the upper coil-retaining piece of steel. Using 1/16" and 1/8" thick rubber, shim the coils until they fit tight and snug into the three retaining brackets. Secure the retaining brackets in place. Using 1/16" and 1/8" thick rubber, shim the two bottom coils, upper-lower and lower-lower, until they fit tight and snug into the three retaining brackets. Secure the retaining brackets in place.
- 13.) When magnet is fully assembled, install and tighten the 4" bolts. After magnet is energized, re-tighten bolts.

**Prepared by:** Jim Ellermeier 3/27/02

**Approved by:** John Cooper (PPD Division Office) \_\_\_\_\_

**Approved by:** Martha Heflin (PPD Sr. Safety Officer) \_\_\_\_\_

**Approved by:** Rajandrn Raja (E-907 Spokesman) \_\_\_\_\_

**Approved by:** Peter Barnes/Leon Beverly  
(Installation Project Managers) \_\_\_\_\_  
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**Approved by:** Mike Mascione/Jim Ellermeier  
(Installation Task Managers) \_\_\_\_\_  
\_\_\_\_\_

**Approved by:** \_\_\_\_\_

**Approved by:** \_\_\_\_\_

**Signature List of Workers Involved With This Task:**

My supervisor has reviewed this JHA and Work Permit with me. I understand the hazards and safety issues involved with this task. I will follow the requirements and instructions of this plan and will notify my supervisor if I an unable to do so.

<u>Name (print)</u>	<u>ID#</u>	<u>Signature</u>	<u>Date</u>
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