



# Assembly Status

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Level 2 Manager for Assembly



# Detector Assembly

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- Activities within the last year
  - Full Height Engineering Prototype constructed and filled.
  - Far Detector layout was finalized.
  - South bookend has been installed.
  - Block Pivoter construction has progressed
    - Table top and towers are installed
  - The major tools are coming together
    - 2/3 Lifting fixtures complete and in use
    - Adhesive dispenser commissioned.
    - Leak Tester constructed and tested



# Full Height Engineering Prototype



FHEP

Table top

- FHEP was assembled at ANL in Aug-Oct. 2011
- Built and shipped on the pivoter tabletop



# FHEP Installed at FNAL

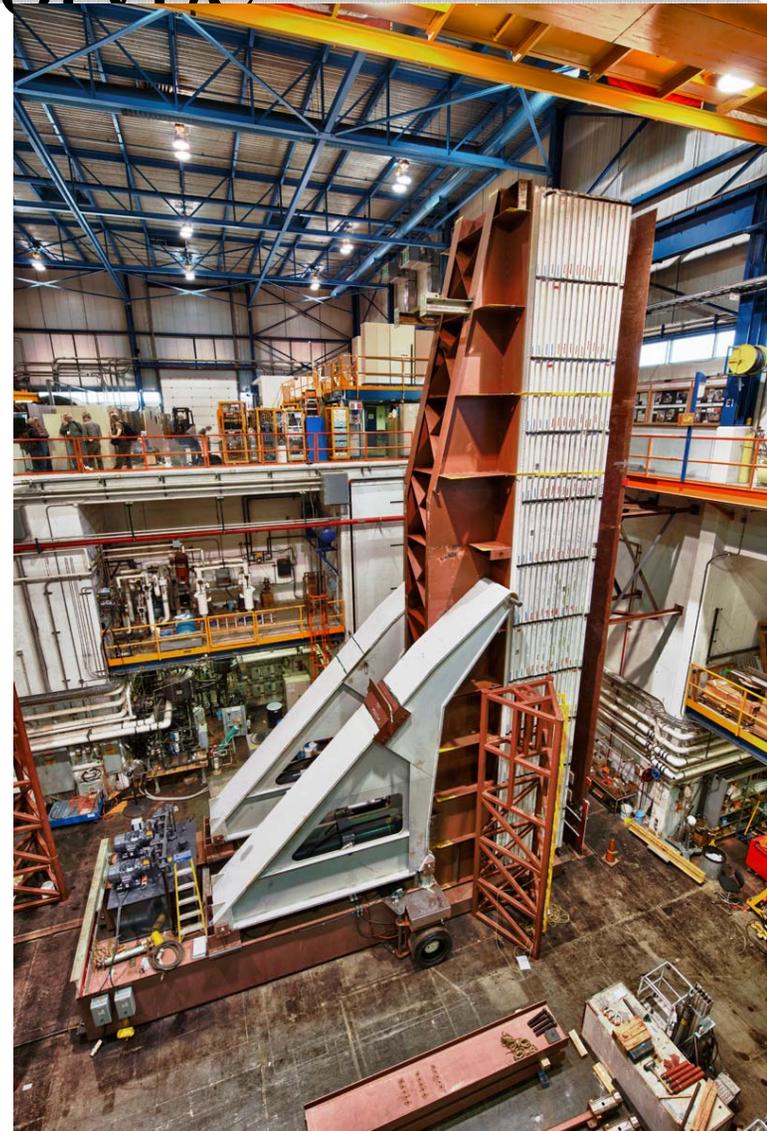
- The FHEP was also a pivoter prototype exercise.
- Pivoter worked well
  - Prototype has many parts now considered to be spares for the production machine.
- Operation can be viewed
  - <http://www.youtube.com/watch?v=YtuMqjCiymQ>





# Far Detector Engineering Prototype

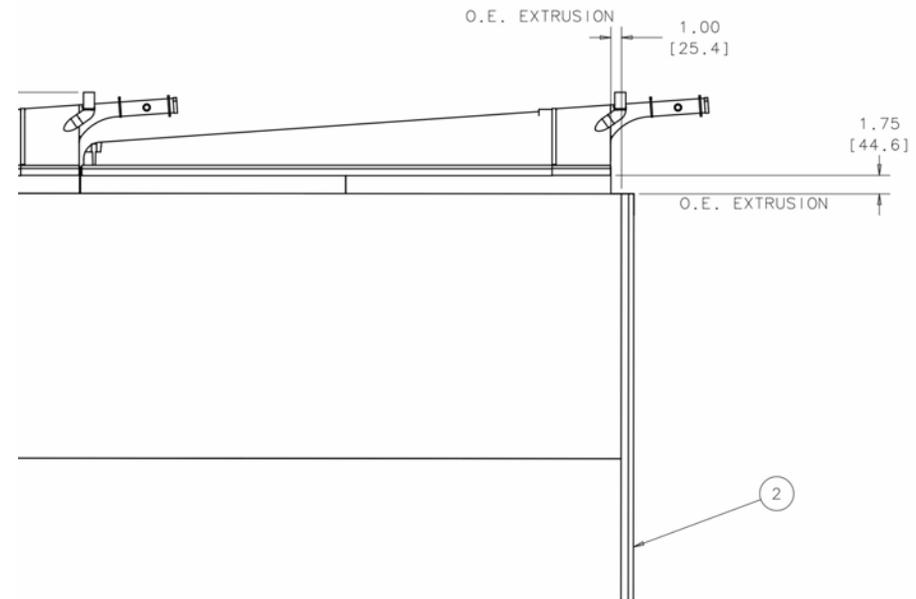
- FHEP was filled with water
  - Completed 12 Mar.
- The floor beneath it is bone dry
- Subtler details
  - Deformations
  - Strain measurements
- These will be studied when the pivoter is operational





# Horizontals Pushed Up, West

- Recent module straightness measurements motivate a refinement of the block layout.
- Assembly space is maximized by pushing the horizontals up and to the west.
- Also, the tilt angle of horizontal modules is reduced – now 1.25 mr.

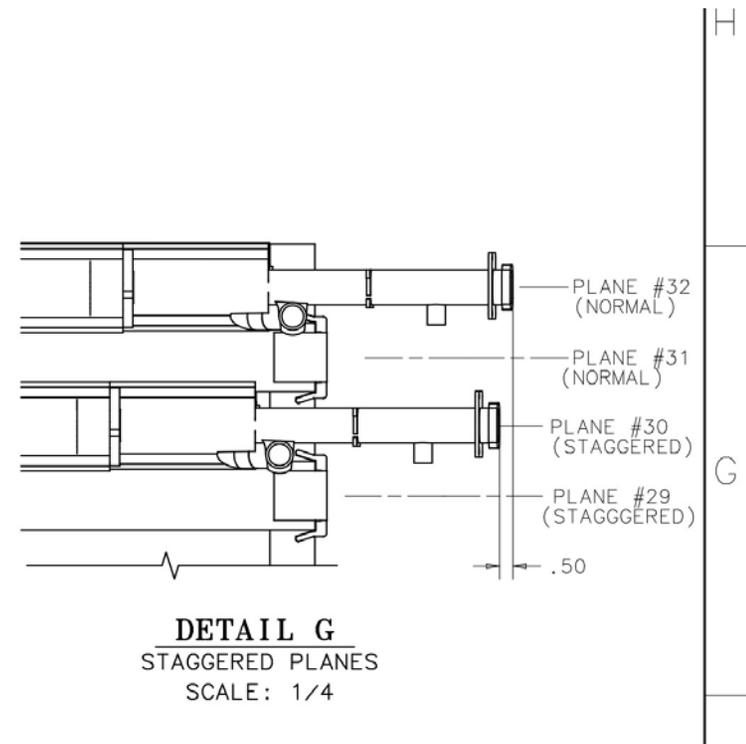


- From 5813, drawing 489028



# Layer Staggering

- As requested, the layers will be staggered.
- A 0.5 inch offset will be applied to alternate layers
  - This cuts into our assembly space, so experience may force a reevaluation.
- Given what we know today, this is the layout plan we will use to assemble the detector.



- From 5813, drawing 489028



# Safety Approvals Needed

Item	Status
Module Lifting Fixture	1/3 done. Process understood
Adhesive Dispenser	With the Safety Committee
Detector Structure	With the Safety Committee
Scintillator Distribution	With the Safety Committee
Pivoter	With the Safety Committee
Leak Tester	With the Safety Committee

- Safety Committee visits Ash River 24-26 April
- We've hit them with a lot. Expect Adhesive Dispenser and Pivoter reviews complete first.



# Block Pivoter Events

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- The table top delivery, expected in Nov. stretched out until mid Feb.
- Assembly of the parts in hand proceeded as well as possible.
- However, on Feb. 1, a design flaw turned up in the pivoting sections
  - Parts had to be modified
  - Sent to a local machine shop, and they were ruined.



# Block Pivoter Developments

- Table sections were shipped back to FNAL
- Parts were replaced and installed
- Back at Ash River 8 days later.
  - We lost the month of February for this.





# Block Pivoter Developments

- Pivoter assembly resumed immediately
  - 6 March



Repaired "A" sections



# Block Pivoter Developments

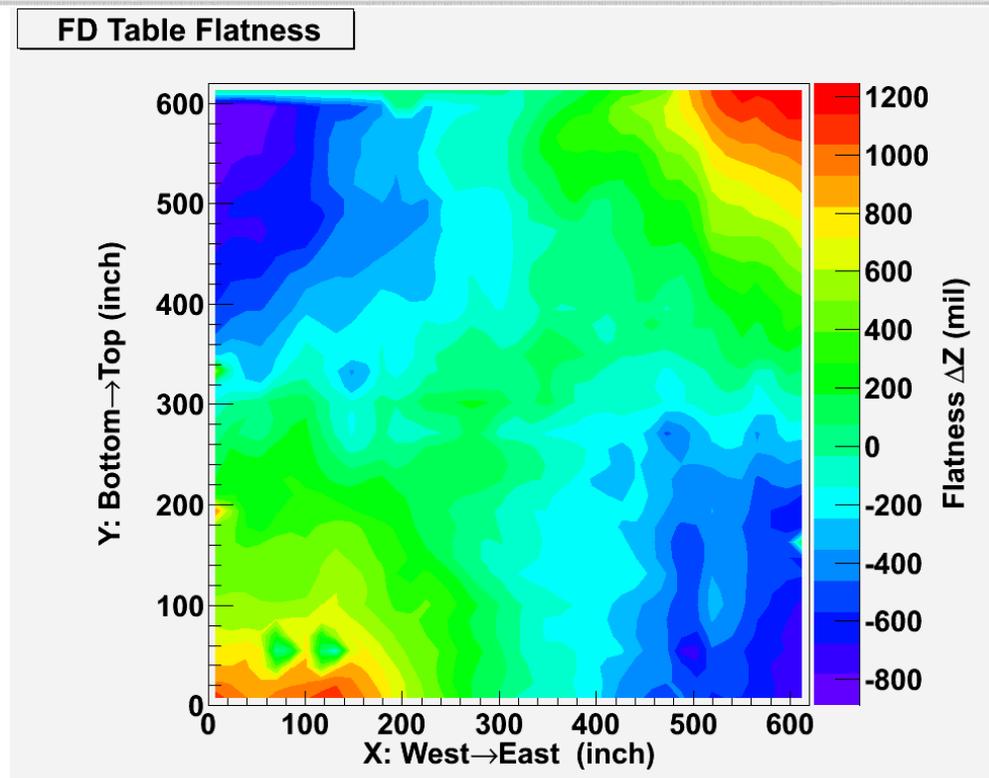
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- By 23 March, all sections had been installed
- All 3300 bolts are torqued to specification.



# Pivoter Survey



- A first survey of the pivoter was performed 26 Mar.
- It indicates a saddle shape,  $\pm 1$  inch



# Current Activity

Pallets



Towers

- Towers have been installed
  - These take the table load when horizontal, hydraulics deenergized.



# Current Activity

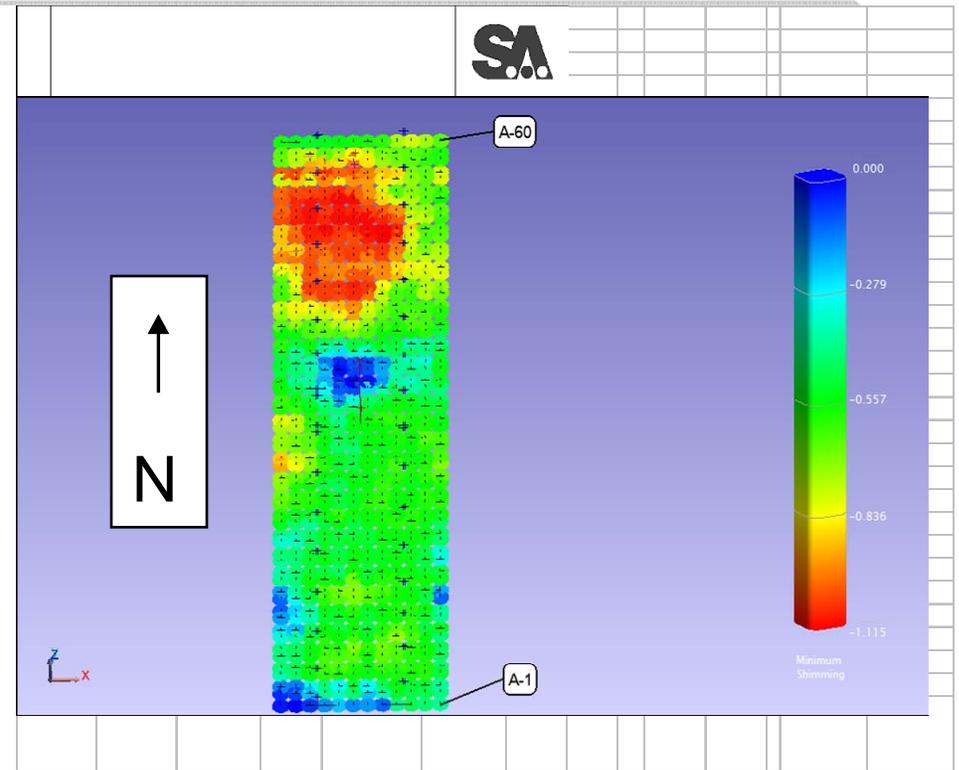


- Survey in the horizontal position this week.
  - Decisions about shimming the surface will follow.



# Floor Survey

- The floor flatness was surveyed 26 Mar.
- Important, to ensure uniform loading on the 24 pallet feet.
- Shims will be placed under each foot to compensate for unevenness.



- Blue = 0
- Red = 1 inch low



# Remaining Block Pivoter Work

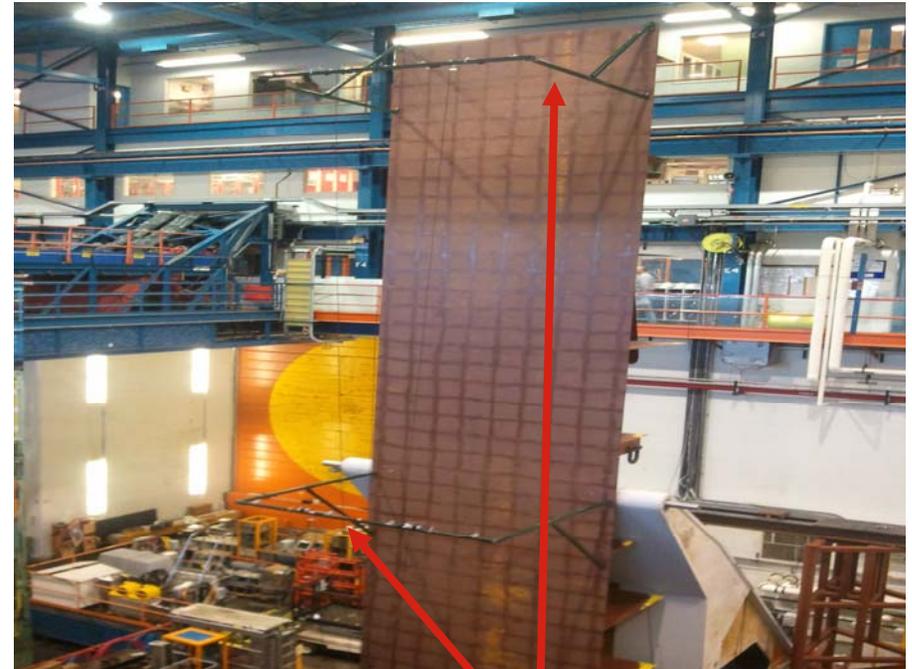
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- Safety review work
- Mechanical work remaining
  - Alignment fixture installation
  - Fall protection barriers on the north and west edges.
  - Reinforcement plates added to the uprights
    - These parts have not been fabricated
  - Test drive with a space frame that occupies the block
    - Check clearances, ability to steer and place precisely.
- These will be completed in May.



# Pivoter Commissioning Plans

- We plan a “Pseudo-block” exercise as soon as the pivoter is fully operational
  - Similar one was done on the prototype
  - Define block volume with something simple.
  - Test clearances and positioning against the south wall.

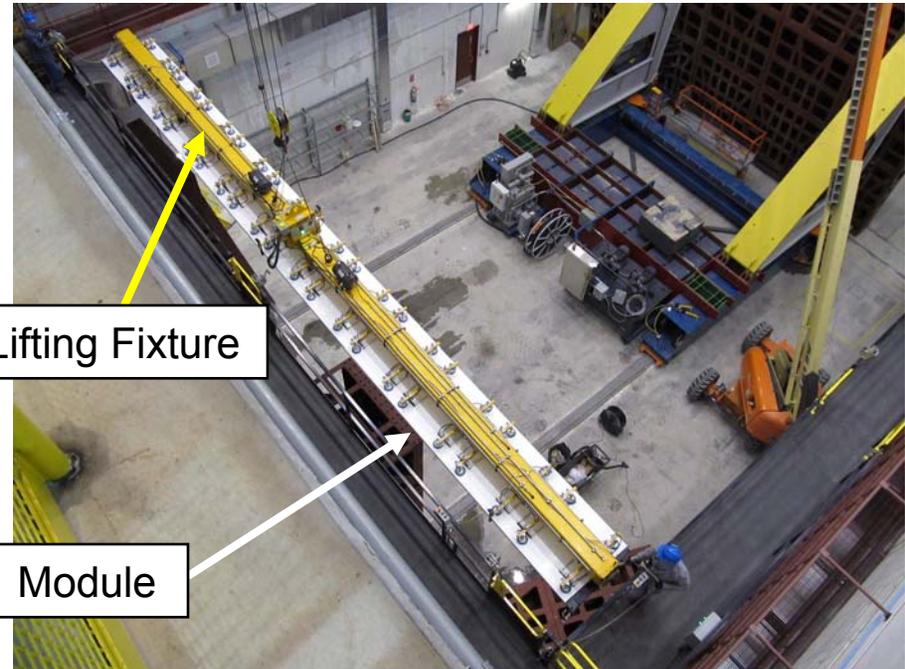


Unistrut mockups on the prototype table



# Other Assembly Equipment

- Three lifting fixtures are being assembled.
- Two are at Ash river and is ready for assembly
  - Sufficient for assembly to begin
- The third is a spare, still at ANL



Lowering a module



# Adhesive Dispenser

- The adhesive dispenser has been in place for a couple of months
- Pumps and drive motors have been commissioned
- Module rotation working
- Prototype assembly can be viewed:
  - <http://www.youtube.com/watch?v=4bNwHizbWkM>

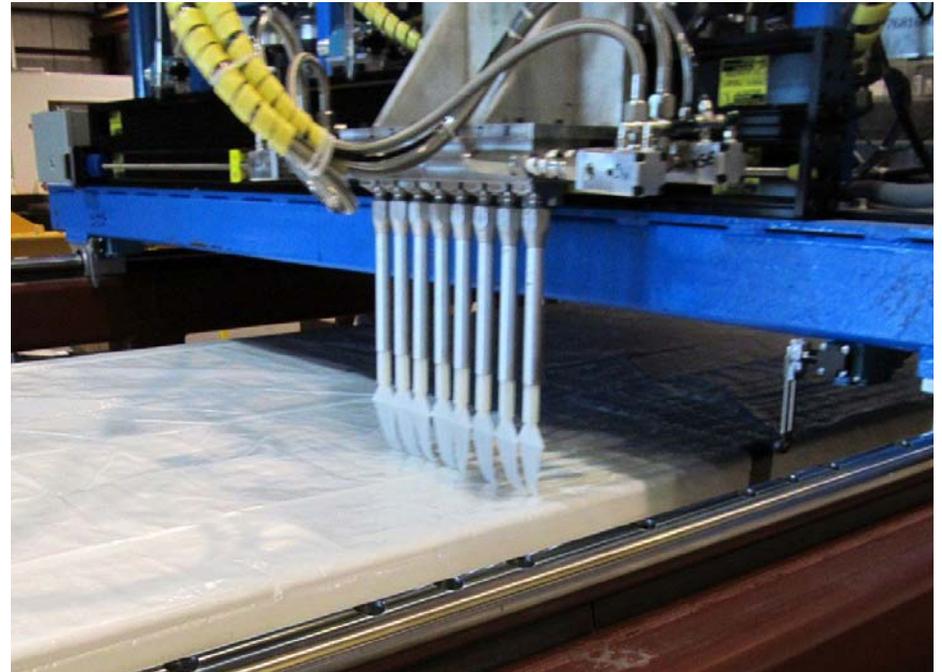


- Module being rotated within the dispenser



# Adhesive Dispenser

- Vapor level tests were performed week of 26 Mar.
  - UM Ind. Hygiene in attendance
  - MMA and %LEL measurements were taken
- Results were same as tests at ANL
  - %LEL barely measureable
    - No special fire response is needed.
  - MMA levels at 1-2 ppm
    - 50 is our threshold
- Adhesive dispensing
  - 8 simultaneous beads
  - 4 passes per module





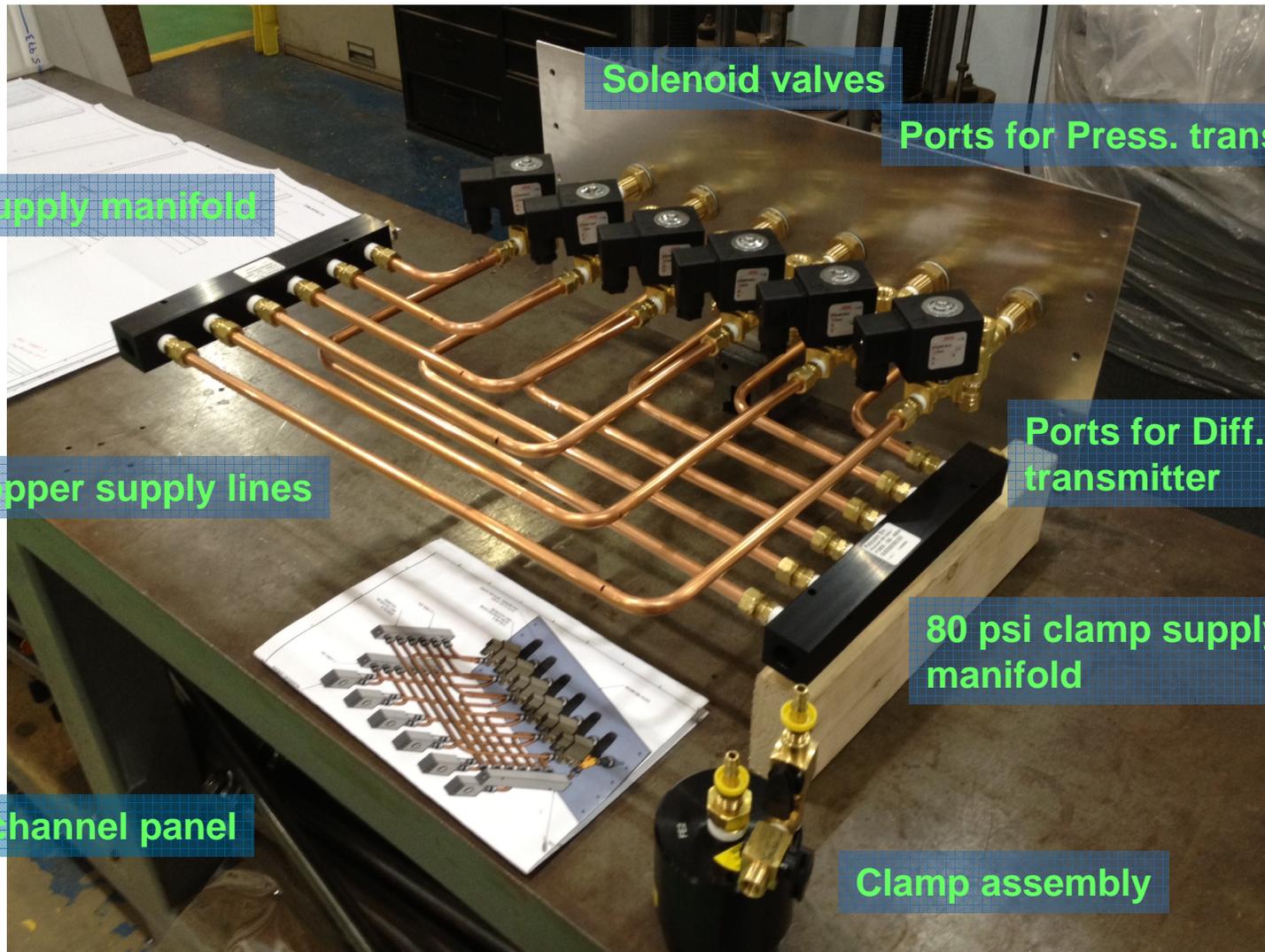
# Leak Tester

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- Modules will be tested for leaks when they arrive
  - Looking for shipping damage
- Compressed air will be used
  - Plan for low pressure, 1.5 psi
- Tester is being designed and built at ANL
  - Commercial parts, gauges, software.
- Last parts arrived last week
  - Delivery to Ash River is planned for 19 April.



# Leak Tester 6 Channel Subassembly



Solenoid valves

Ports for Press. transmitter

Module supply manifold

Copper supply lines

Ports for Diff. Press. transmitter

80 psi clamp supply manifold

6-channel panel

Clamp assembly



# 30 Channel Leak Tester



- Operator end



- Business end



# Assembly Readiness Review

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- Procedures – we have many drafts, all need to exist.
- Safety approval of all equipment
- Performance approval of all equipment
  - Tests of the pivoter – driving, steering, placing pallets, touching the wall, etc.
- Experience
  - Planning a four layer “moist” stack assembly
    - Week of 14 May
    - Full assembly procedure except adhesive. Timing measured.
- Review anticipated the week of 21 May.



# Assembly and the Schedule

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- Assembly sets the critical path for completion.
- Many tasks are in series at Ash River
  - Assemble block, install, fill, outfit, commission...
- Assembly times are estimates based on experience
  - Full size assembly prototype, summer 2009
  - Near Detector, summer 2010
  - Full Height Engineering Prototype, summer 2011
- Module laying sequence is well practiced

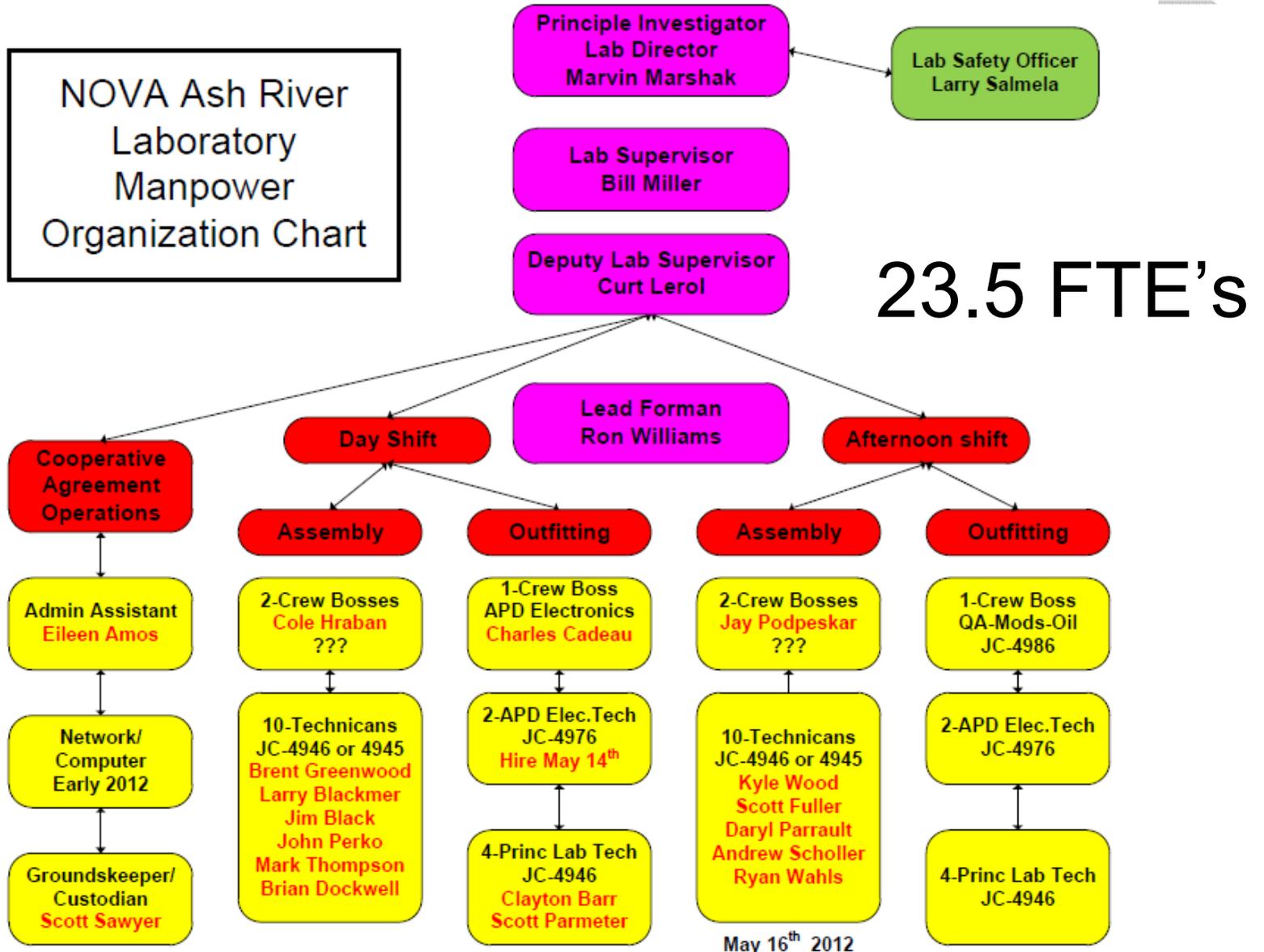


# Assembly Schedule

- New elements of the Far Detector assembly
  - Pivoter operations and block installation
  - Module QA on a large scale
  - Shipping, receiving, material handling
- Contingency is held to increase the labor if needed
  - A four-day, 10 hour work week was planned.
  - Additional work shifts are possible.



# Staff at Ash River-May 16<sup>th</sup>





# Hiring process-Staff Ramp Up

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- ~23 positions to fill many for Outfitting positions
- Total applications for the 6 posted job positions-203 (79 local)
- We have completed a total of 51 interviews so far
  - We have hired 19 applicants (3 have quit the job)
  - 7 applicants we have interviewed that we said we would hire
  - 5 more that we have interviewed and told we to wait till more interviews were completed
  - We have ~28 more interviews of “local” people to do
- Assuming that we start building block 1 by the end of May and we continue to hire 2 new employees per week
- ~32 people required to split into two shifts ~June 18<sup>th</sup>



# Assembly Conclusions

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- Last year has been enormously productive
- Major equipment completed and delivered
  - Two lifting fixtures
  - Adhesive dispenser
  - Leak Tester
  - South Bookend
- Pivoter is assembled – lacking some reinforcement plates, possible surface shimming
- Assembly of the first block should begin in June.