



Assembly Report

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Fermilab

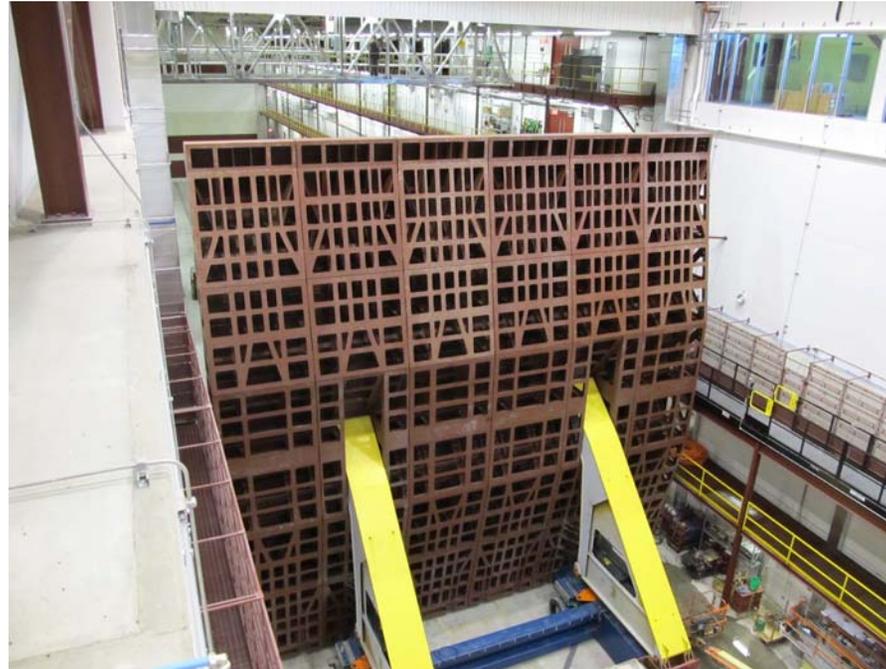


Detector Assembly

- Assembly of the Nova Far Detector is very close
 - Block Pivoter has been completed
 - The major tools are ready
 - Pivoter has been commissioned
 - 2/3 Lifting fixtures complete and in use
 - Adhesive dispenser commissioned.
 - “Dry stack” assemblies have occurred.
- Startup has been delayed by adhesive concerns
 - Solutions have been identified



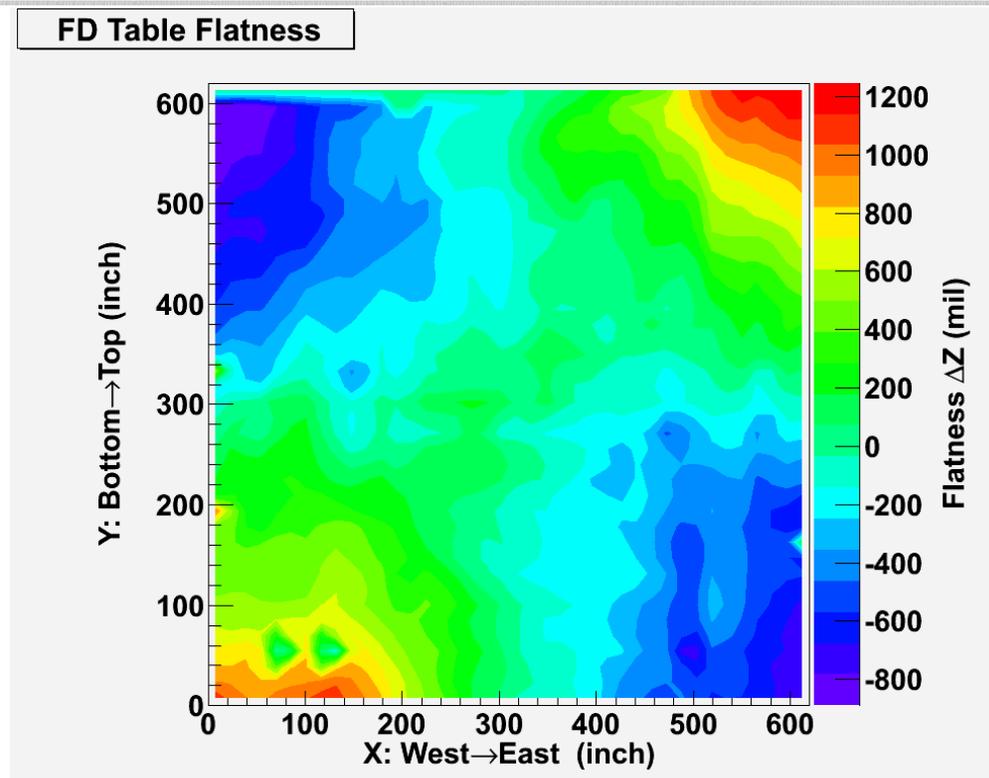
Block Pivoter Developments



- Block pivoter was assembled by 1 April.
 - Small, additional issues were resolved in May- June
 - Fall protection, pivot reinforcement, alignment structure



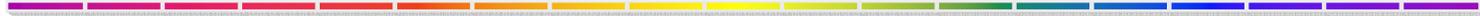
Pivoter Survey



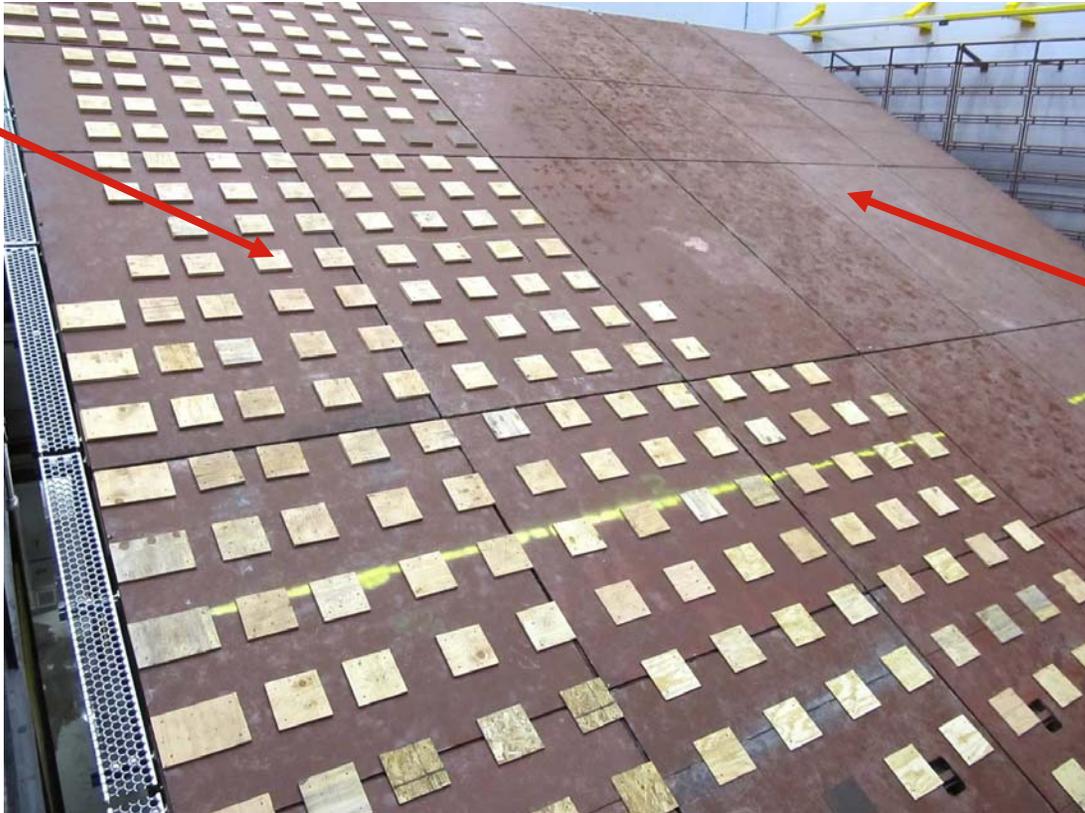
- A first survey of the pivoter was performed 26 Mar.
- It indicates a saddle shape, ± 1 inch



Table Top Leveling



Wooden
Shims



Steel
Surface

- The table surface was shimmed, based on the flatness survey



Working surface

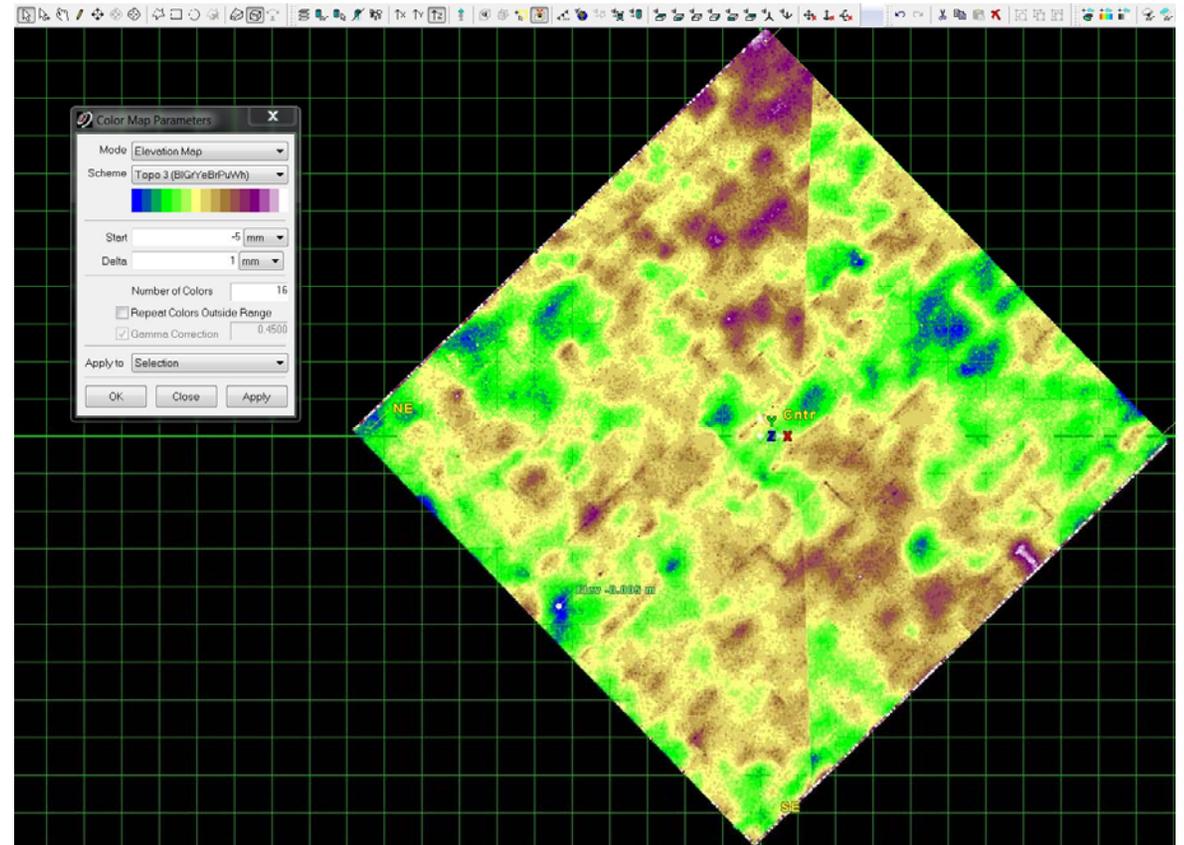


- The shims were then covered with plywood and the surface painted.
 - Shimming of the pallet positions was then needed as well.



Table Top Survey after Shims

- Full range is now ± 8 mm (spec. is ± 1 cm)
- Measurement taken with the ceiling-mounted laser scanner
 - Part of our QA

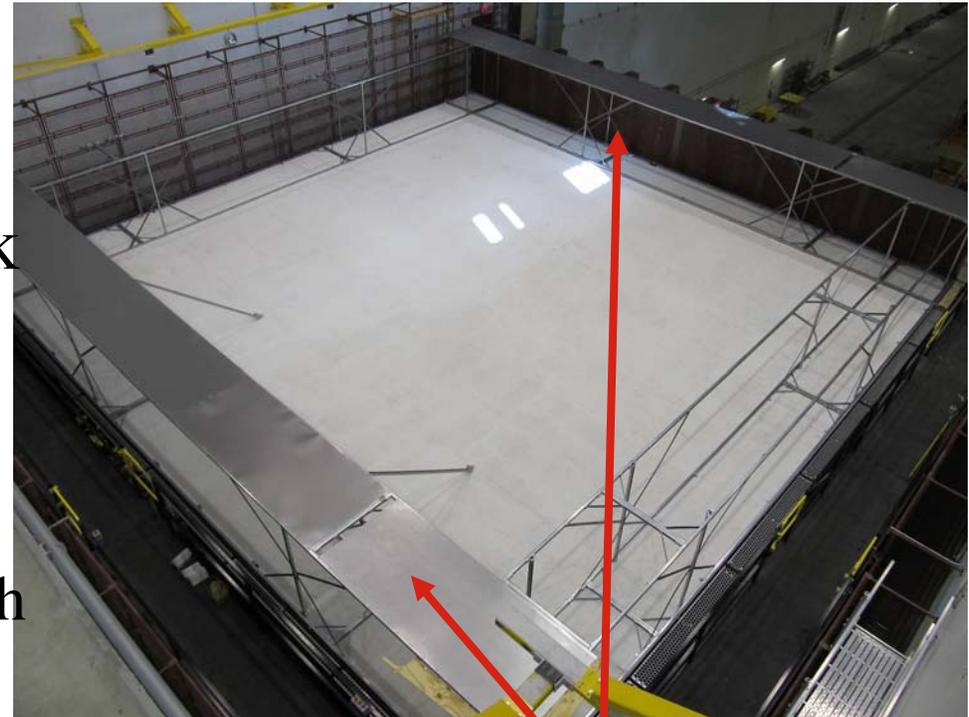


- ~ 2 mm discontinuity due to survey artifact



Pivoter Commissioning

- We held a “Pseudo-block” exercise the week of 4 June
 - 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 table



Block Pivoter Test Drive

- The table top, with “mock block” was rotated to vertical
- Then traveled to the south end of the hall
- Clearances checked to catwalks
 - West – 6”
 - East assembly area – 2”
 - Judged to be fine.





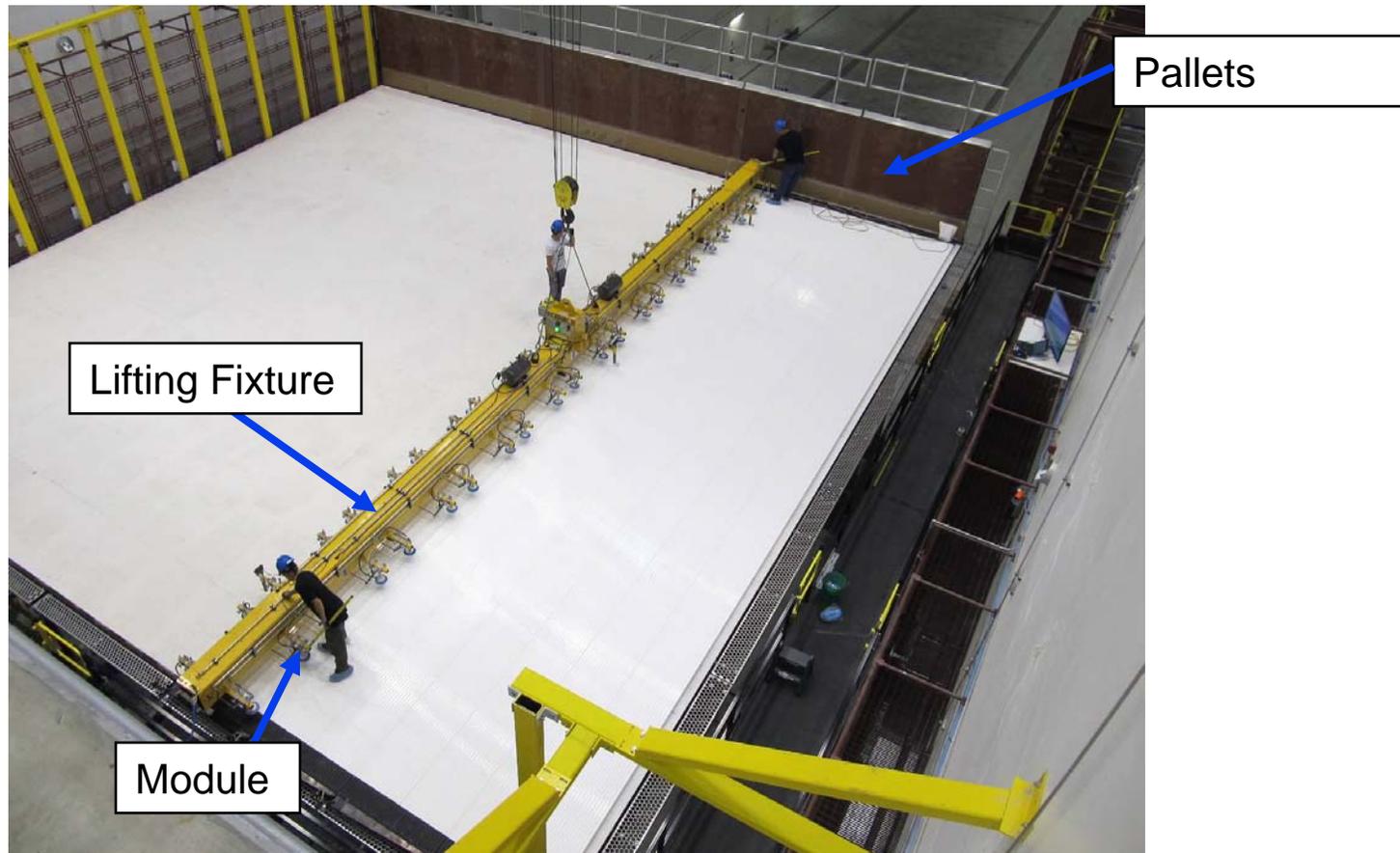
Block Pivoter Test Drive



- The plywood optical connectors did their job on the south wall
 - Interferences with piping, cable trays is now fixed



Other Assembly Equipment



- Two lifting fixtures are at Ash river
 - The third is a spare



Assembly Area

Lifting
Fixture

Modules



Adhesive
Dispenser

Alignment
Poles

- Assembly area, viewed from the south



Adhesive Dispenser

- The adhesive dispenser has been in place since Oct. 2011
- Pumps and drive motors have been commissioned
- Module rotation working

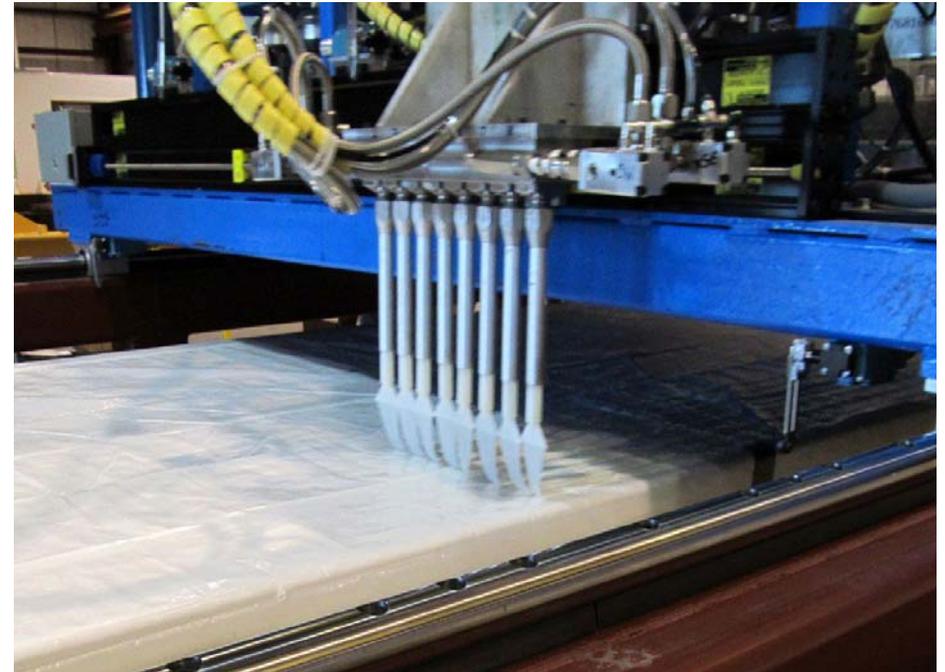


- Module being rotated within the dispenser



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

- Modules will be tested for leaks when they arrive
 - Looking for shipping damage
- Compressed air will be used
 - Low pressure, 1.5 psi



- 30 channel module leak tester



Bringing it all Together

- The pivoter is ready for assembly to begin
 - Surface flattened to specifications (± 1 cm)
 - Fall protection in place, pallets and alignment posts set
 - Installation operation has been practiced
- Adhesive dispenser has been commissioned
- Lifting fixtures commissioned
- Dry stack assembly has occurred
 - Trained the crew, found some issues and fixed them
- Six layers of tested, good modules are at Ash River

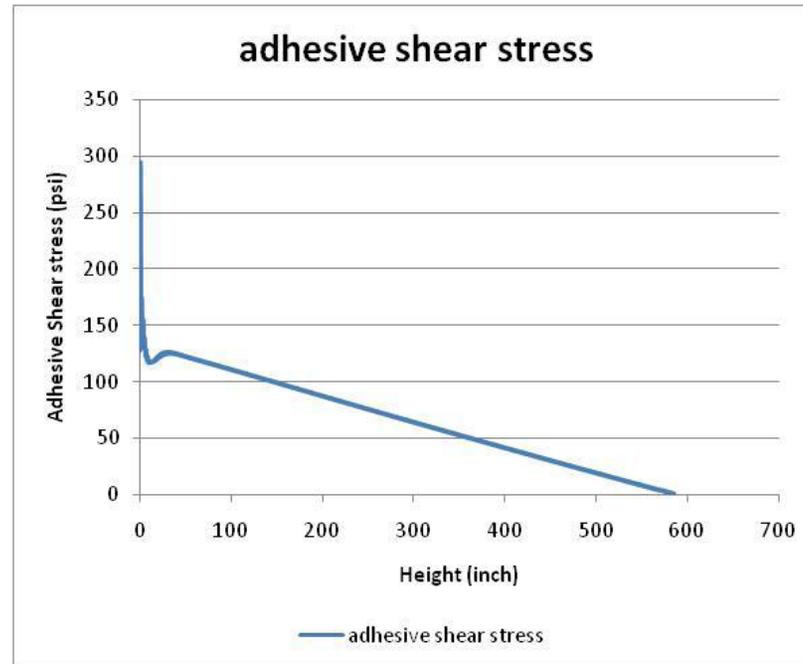


Adhesive Issues

- We have been stalled for the last ~6 weeks with an adhesive problem
- Strength tests with PVC extruded in 2012 showed problems
 - Joints failed below our 500 psi shear strength specification
 - Joints with Type 1 PVC or older Nova PVC are stronger
- Assembly is on hold until we can be assured of sufficient strength in the adhesive bonds.



Adhesive Strength Requirement



From Nova #5726

- Predicted maximum stress in the adhesive is 125 psi
 - Declines with height
 - Based on conservative assumptions about the PVC strength
- Our 500 psi standard is based on desiring a safety factor of 4 in this stress.
 - A standard that varies with position could give the same safety factor.



Adhesive R&D

- The adhesive problem is being attacked on two fronts
- The adhesive formula has been modified.
 - Strength tests by the vendor (Devcon) confirm the problem.
 - They have offered a slightly modified formula (ZH52-6)
 - Contains an acid that give more “bite”.
- PVC surface modifications are being studied
 - Abrasion has been tested – scuff the surface
 - Isopropyl alcohol wash has been tested (Devcon suggestion)



Adhesive R&D

Shear strength measured in PSI.			
Surface Preparation		Batch	
Abrasion	Rinsing	PW60 - Dec. 2011	ZH6-52-6
None	None	204	358
None	6% Iso.		
None	99% Iso.	287	591, 967
Scotch Brite	None	397	618, 1064
Scotch Brite	6% Iso.		
Scotch Brite	99% Iso.	466	638
Sandpaper	None		
Sandpaper	6% Iso.	221	965
Sandpaper	99% Iso.	305	1124

- Our current state of knowledge is summed here.
 - Compares our original adhesive to the new formulation
 - Multiple entries reflect different techniques



Adhesive R&D

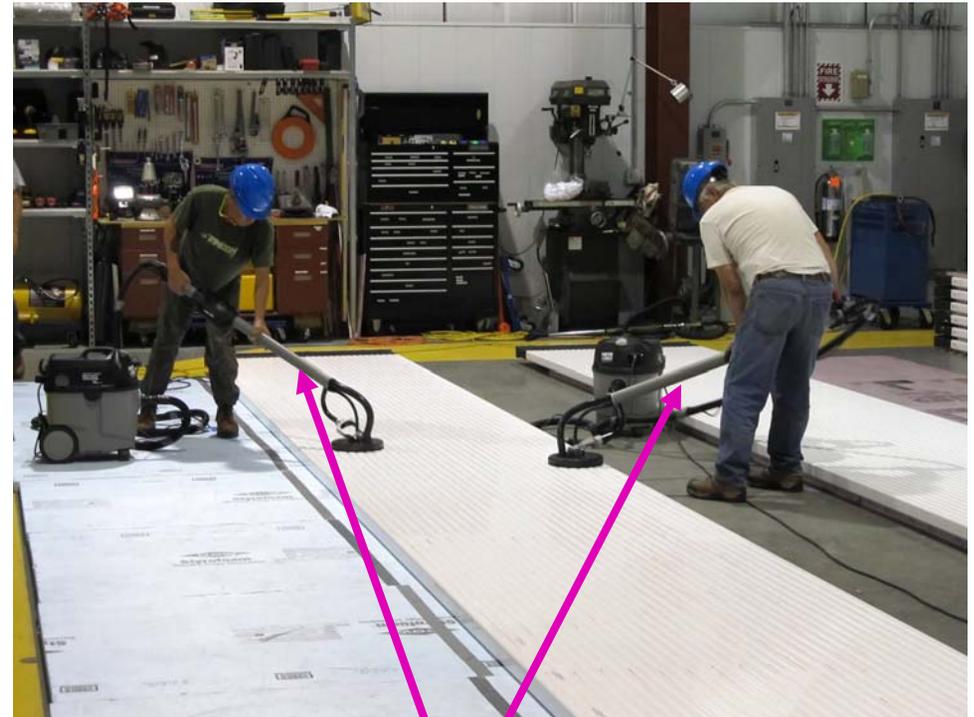
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- Our short term plan is treat all glued surfaces the same
 - Scuff with Scotch Brite, avoid alcohol entirely
 - Replace our adhesive with ZH52-6



Module Surface Treatment

- Longer term, tests and technique development will continue.
 - Plan to avoid alcohol
- At the least, we will limit the areas of surface treatment.
 - Currently, about 1.5 hours/module for prep.



Drywall Sanders with Scotch Brite Pads



Immediate Plans

- The first layer will be placed today.
- A shipment of new adhesive (ZH52-6) is due 30 July.
 - The adhesive dispenser will be purged with new material.
 - Strength test samples will be made immediately.
- Assembly of the second layer will begin as soon as possible
 - All modules prepared with Scotch Brite scuffing and dry wiping.



Assembly Conclusions

- Assembly of the Far Detector should begin very soon.
- The equipment is ready, the crew has practiced the procedure.
- We will soon have an adhesive and surface preparation that will meet our requirements.
- Second layer should go down next week.