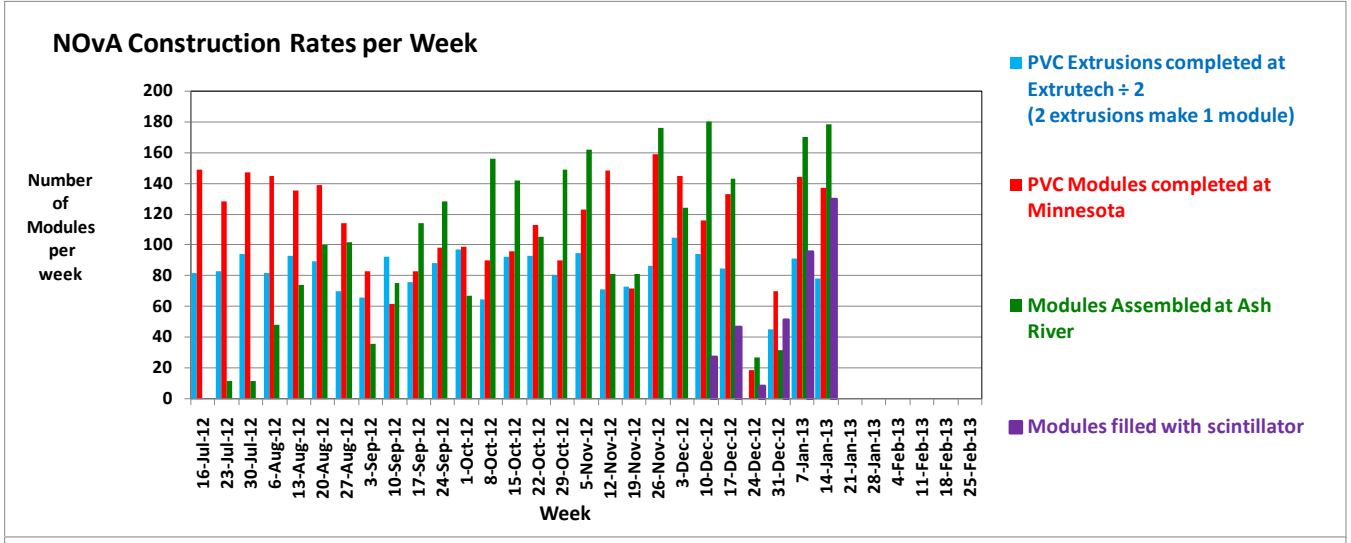
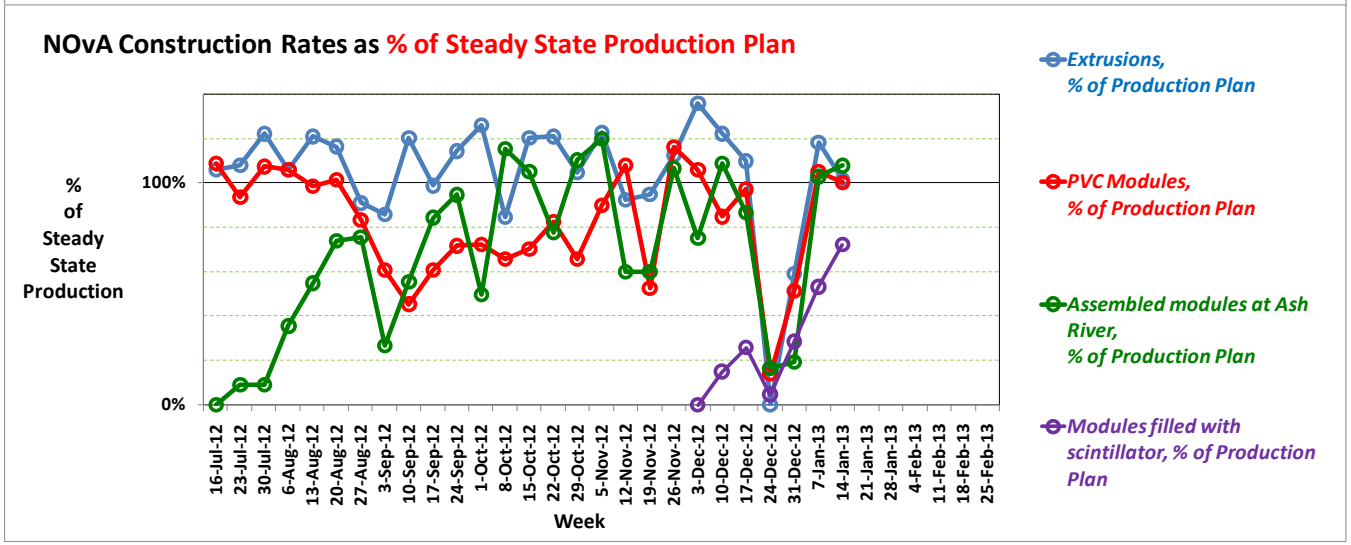
# Project Technical Status

John Cooper

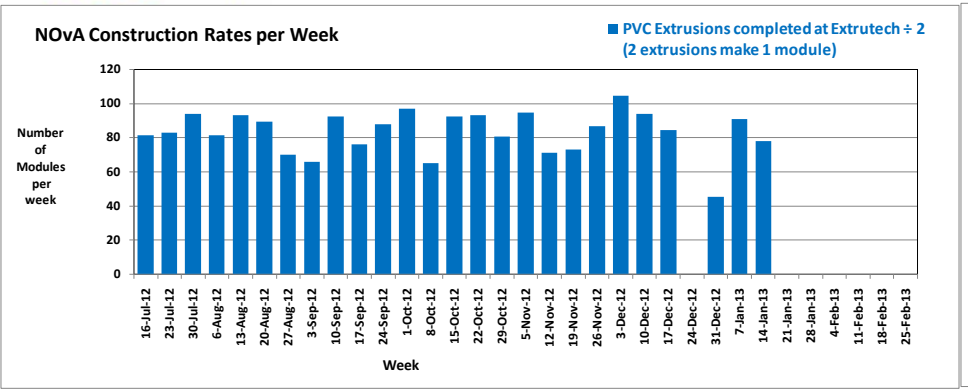
# NOvA Weekly Progress

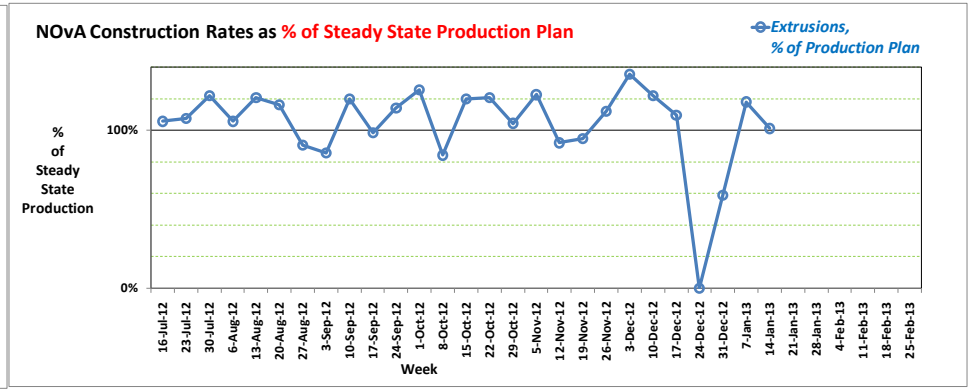



- PVC extrusions: **156** (101% of planned rate)
- PVC modules: **137** (100% )
- Ash River modules: **178** (108%)
- Ash River scintillator: **130** ( 72%), still ramping up

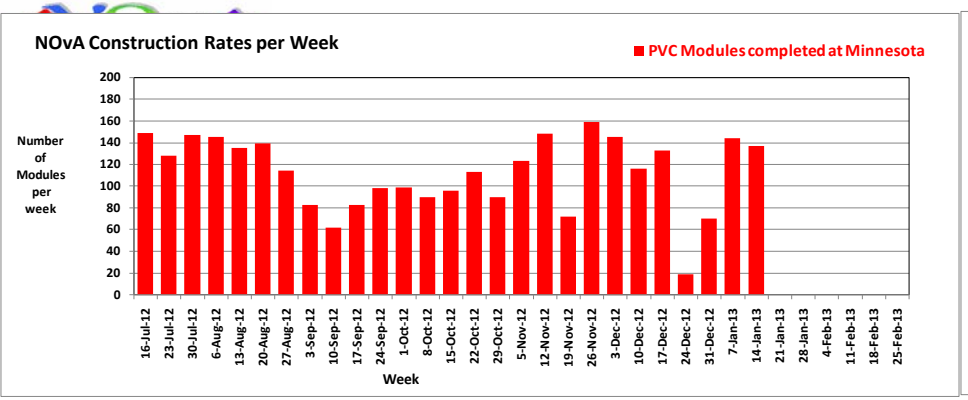
# NOvA Weekly Progress: Extrusions

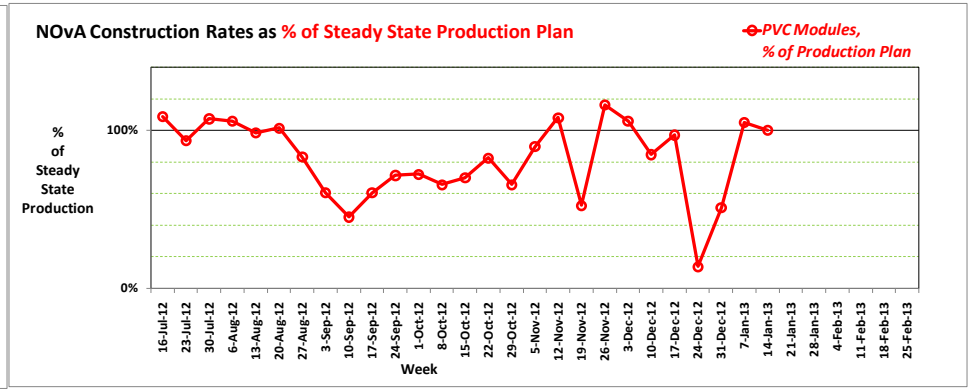



- Overall: Extrusions generally > the planned rate
  - 156 extrusions last week, 101% of planned rate
- Gap in production in graphs above is a shutdown over holidays to clean the NOvA die & extrusion machine,
  - done at this detailed level about every 6 months
  - Up and running as of Jan 2 at 4 PM, running 5 days/wk, 24 hrs/day again.
- Switched to 6 days x 24 hours on Jan 19
  - Recovery Act requires all items costed by September 30, 2013, and running at 5 days / week looked to cut this a little close (~ Sept 1)
    - 6 day operations should gain us about 1+ months.
  - Downside is that we have to rent space in Manitowoc and in Minneapolis for about 6 additional months to hold all the extrusions @ a cost of ~ 20 K$ per month

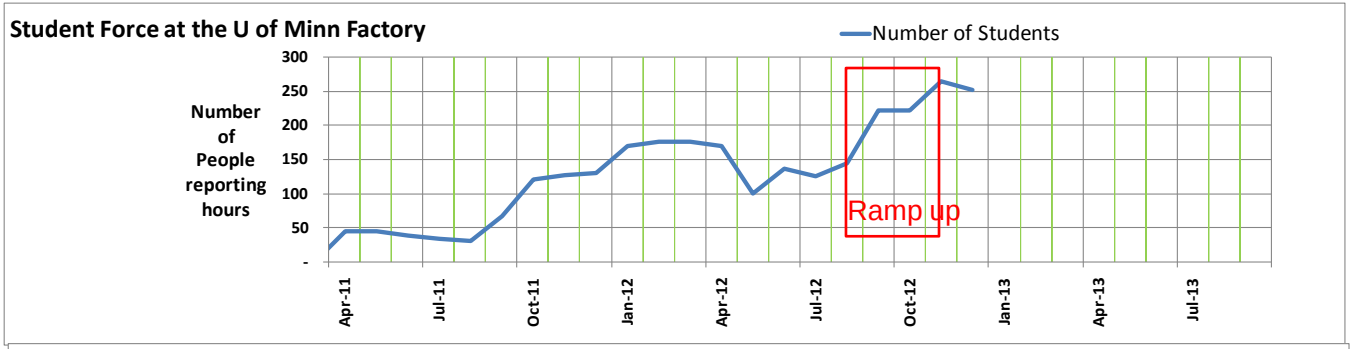
# NOvA Weekly Progress: Modules

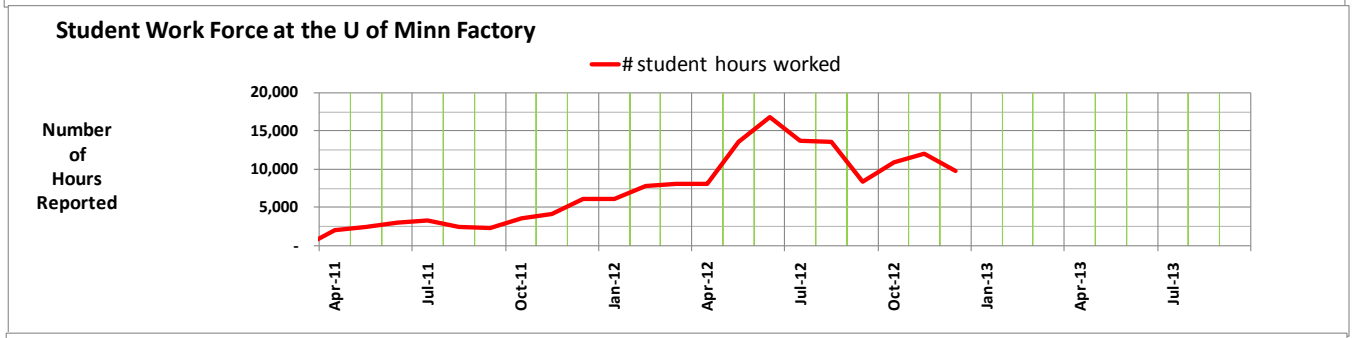


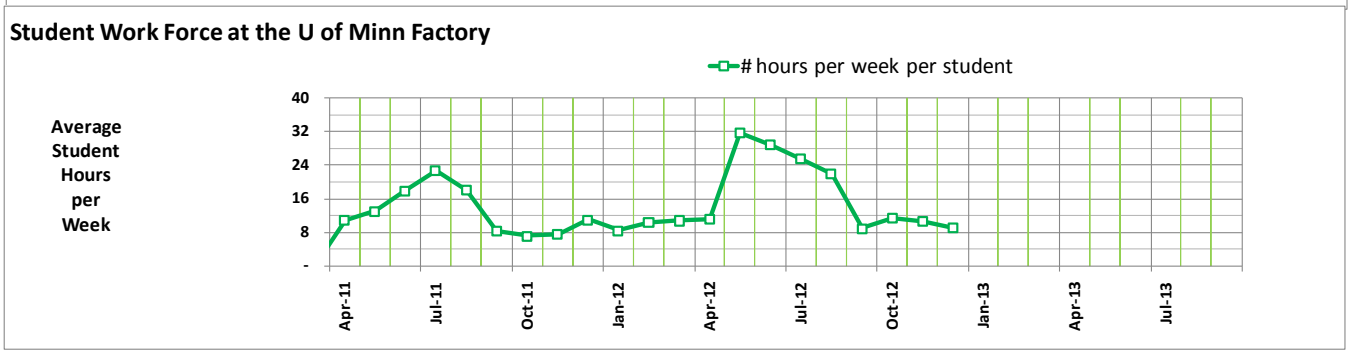




- Overall: Module production now back to about the planned rate after Fall Semester startup with part-time vs. summer full-time students
  - 137 modules produced last week, 100% of planned rate
  - Not much work between Christmas and New Year's, but no classes now until Jan 22
- 251 students reported time in December
- Module production failure rate is 1.7% integrated over production since October 15. (goal is < 2%)

# Minnesota Students and hours

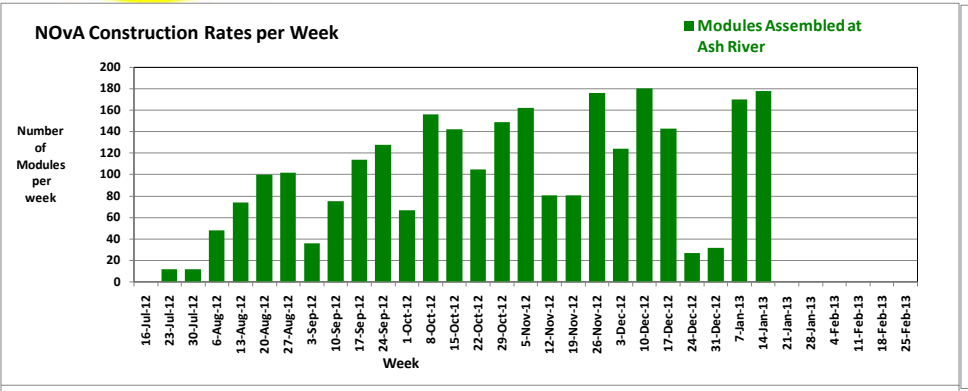


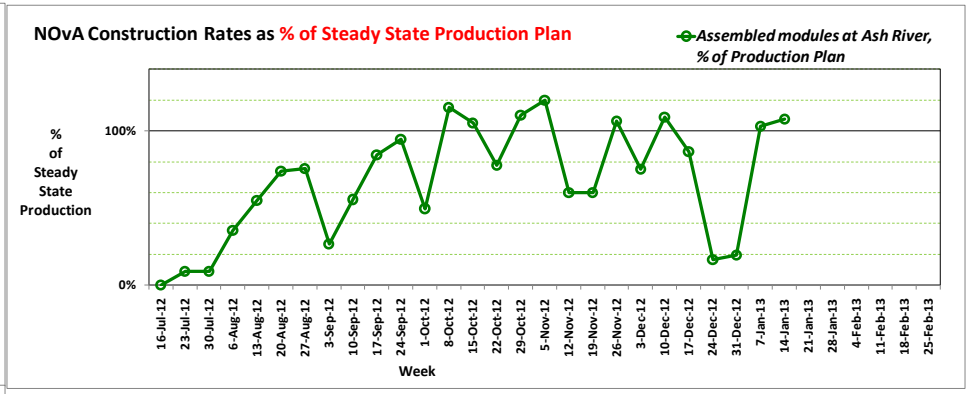



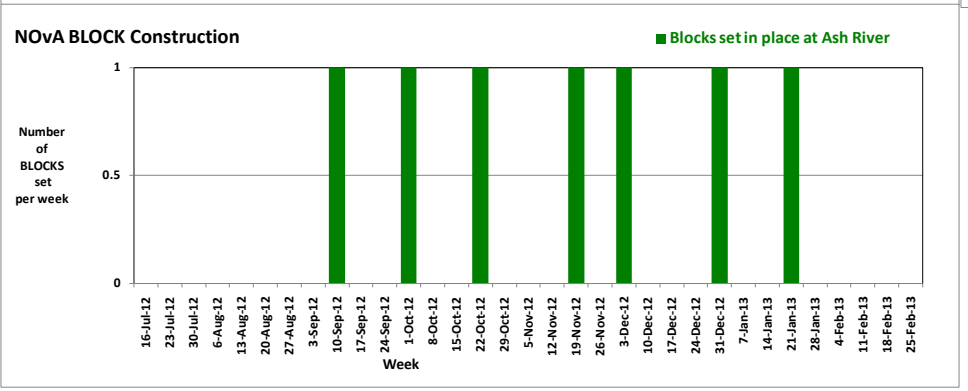




- During ramp, initial rates were low, bad modules were high
- Now all fixed, rate back > 137 modules per week, only 1.7 % failures
- **In fact, now building at max rate with LESS labor** (red curve above)

# Weekly Progress: Modules at Ash River



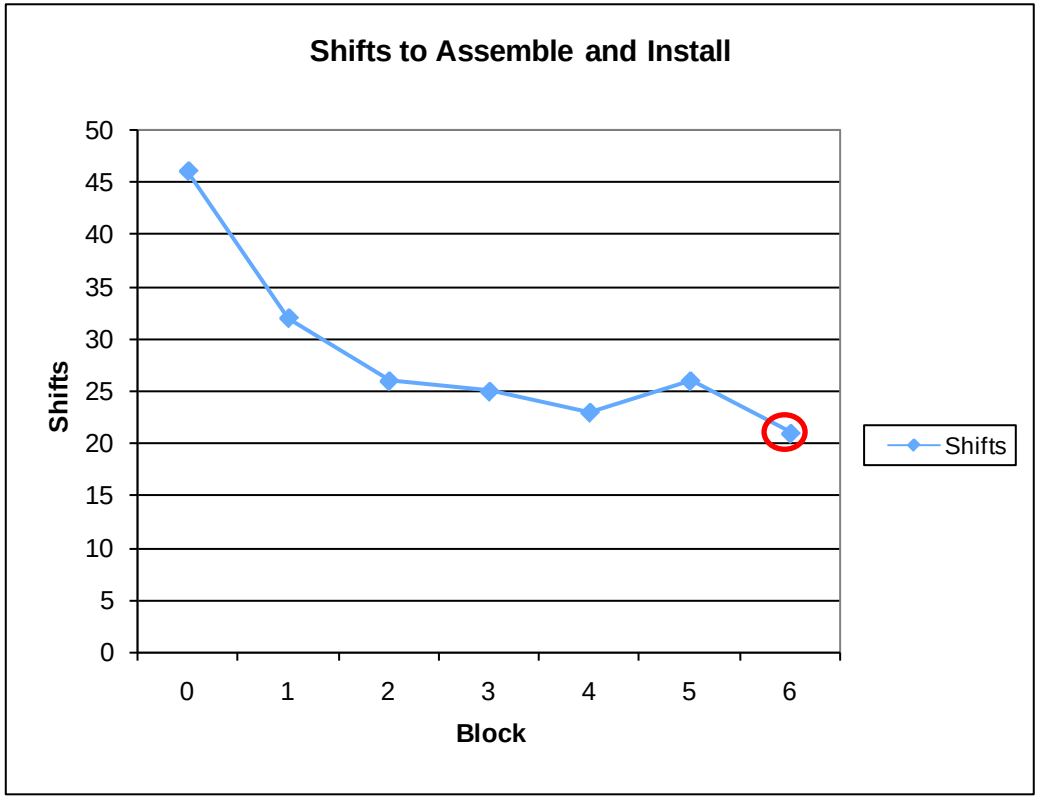



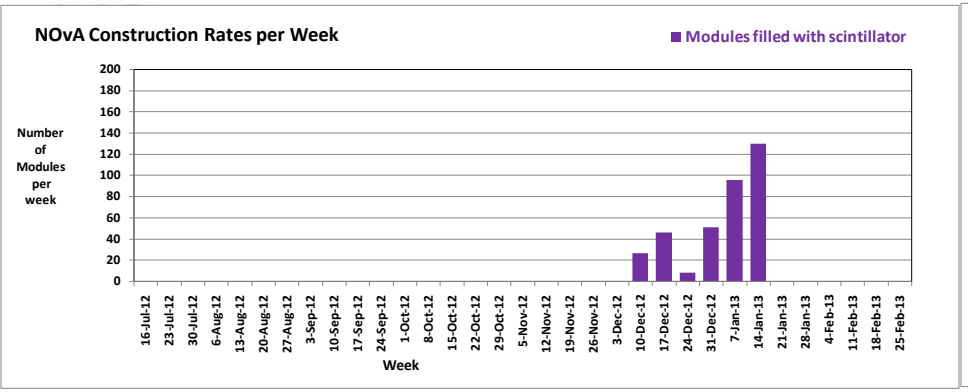

- Overall: Block assembly is at the planned rate, see next page
  - Slowed down over holidays to avoid standing army while pivoter winch design was re-worked, dropped 6-7 shifts in addition to holidays
- Set 6th block on Jan 3
- 5 of 47 workers sick last week
- **6 -14 modules to go on 7th block today, then move it down the hall**
- **7 blocks = 25% complete !**

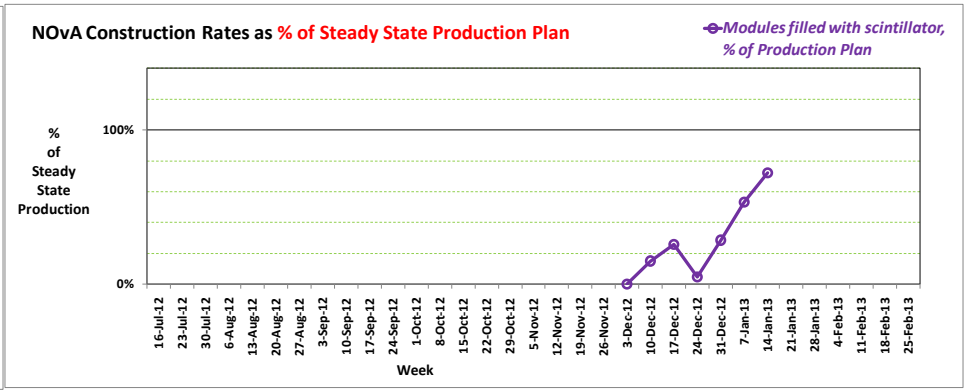
# Block Assembly Rate history

- Shifts to assemble and install vs. Block #
  - **Baseline is 21 shifts per block**, including time to take it down the hall and set it.
  - Block #5 slow due to winch cable re-design
    - would have been faster since it was the first block where we did not laser scan every layer.
  - **Data for Block #6 assumes it gets set in one shift on January 22 = Baseline**



# Weekly Progress: Scintillator Filling




- Overall: Filling started the week of Dec 10, still working up to the steady state plan
  - Problem with tanker heater during week of 12/24 cancelled filling between holidays
  - Second shift of filling started Jan 7, so rate is still increasing
- **NO LEAKS !**
  - and people are checking

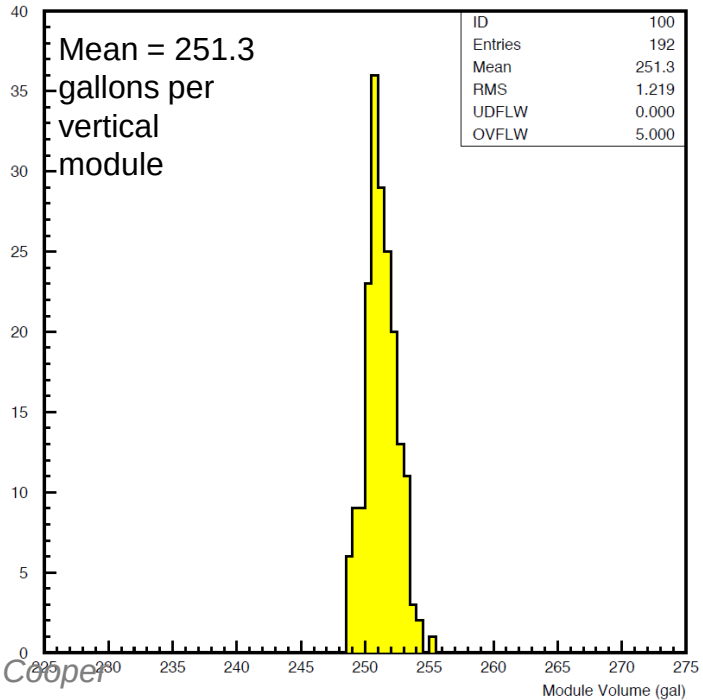
# Scintillator Filling

- Filling scheme
  - We fill all horizontals not quite full (orange),
  - then all verticals really full (green),
  - then go back to topping off horizontals
    - that is the task this week, which will slow us down in rate
      - One day so far at 10% of vertical rate
- The reason for topping off is to let air bubbles percolate through the horizontals before filling right to the top.
  - First try seems to be about 10-15 gallons short on average. Still learning

2013/01/19

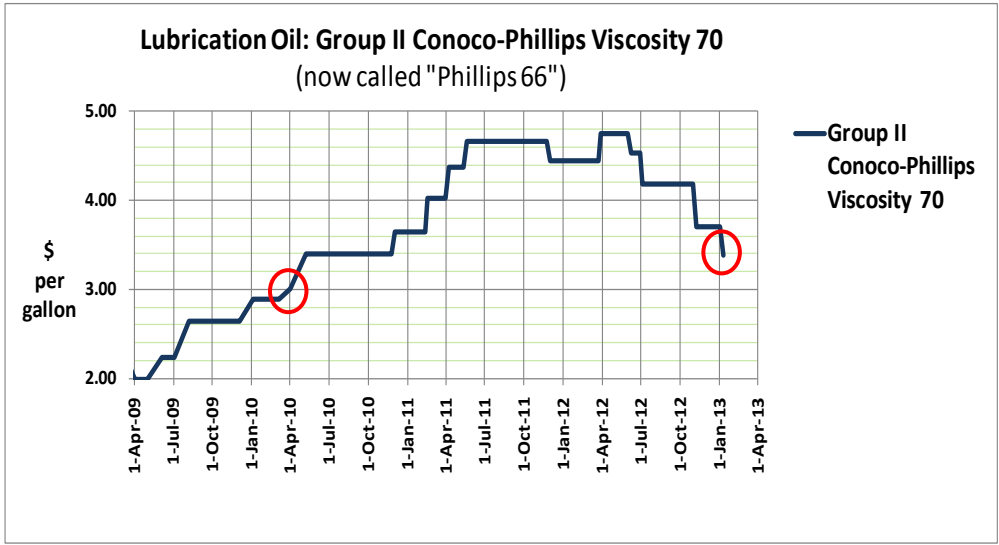
| Vertical Modules | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Position | 1 | 3 | 5 | 7 | 9 | 11 | 13 | 15 | 17 | 19 | 21 | 23 | 25 | 27 | 29 | 31 |
| 0 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 |
| 1 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 |
| 2 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 |
| 3 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 255 | 252 | 252 | 252 | 252 | 252 | 252 |
| 4 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 |
| 5 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 |
| 6 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 |
| 7 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 |
| 8 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 |
| 9 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 |
| 10 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 |
| 11 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 | 252 |

| Horizontal Modules | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Position | 0 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 |
| 11 | 243 | 245 | 244 | 238 | 233 | 243 | 235 | 229 | 240 | 247 | 230 | 228 | 235 | 248 | 244 | 249 |
| 10 | 248 | 249 | 231 | 215 | 243 | 215 | 231 | 215 | 250 | 243 | 241 | 215 | 236 | 240 | 248 | 215 |
| 9 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 |
| 8 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 |
| 7 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 |
| 6 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 |
| 5 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 |
| 4 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 208 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 |
| 3 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 |
| 2 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 |
| 1 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 | 215 |
| 0 | 215 | 215 | 215 | 232 | 215 | 215 | 219 | 236 | 215 | 215 | 230 | 239 | 215 | 215 | 215 | 235 |



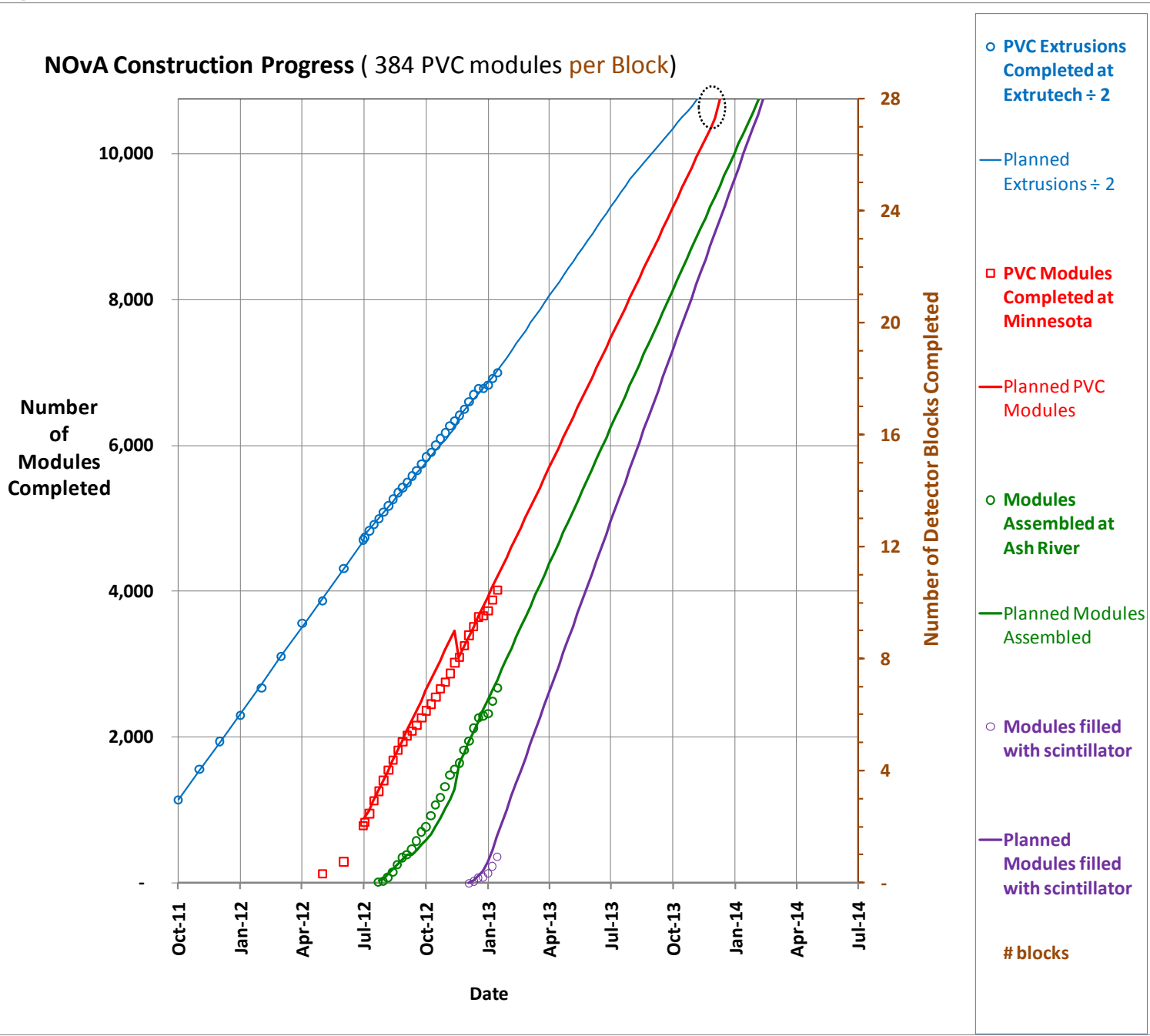
# Scintillator price and mixing plans

- 90,000 gallons in the Far Detector so far + 25,000 gallons in tankers
- We have emptied the first (of 2) blend tanks at Ash River
- Next blend starts today
  - Have Fluor mix ready
  - Filling with mineral oil
- STRATEGY:
  - Keep our 600 K gallon mineral oil buffer tank as full as possible
    - Mitigates against price increases
  - Initiated shipping of mineral oil directly to blend tank in railcars (25,000 gal)
- WHY?: the index price of our mineral oil is now at its lowest price since the bid date in April 2010.
  - Price to us ($3.80) is now **LOWER** than in the Project's base estimate ($3.92) for the first time !!!!



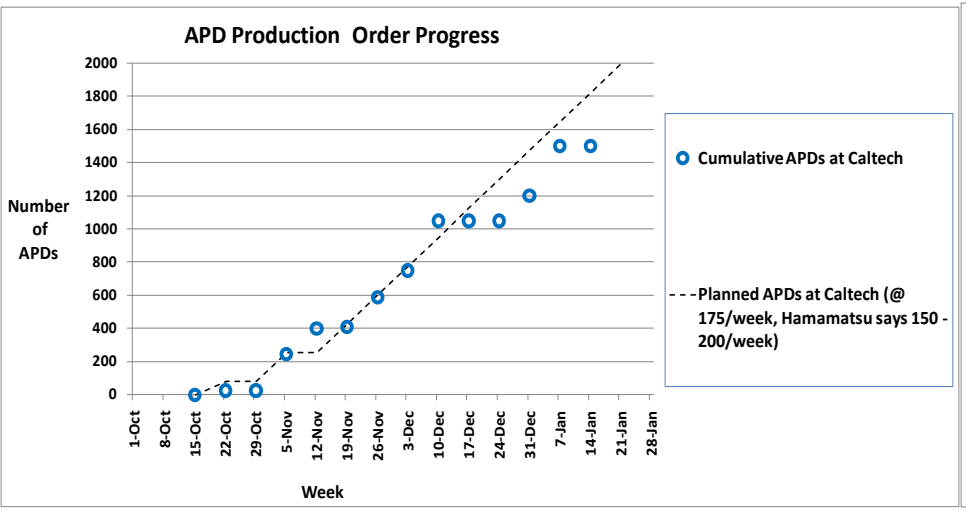
# Longer Cumulative View:

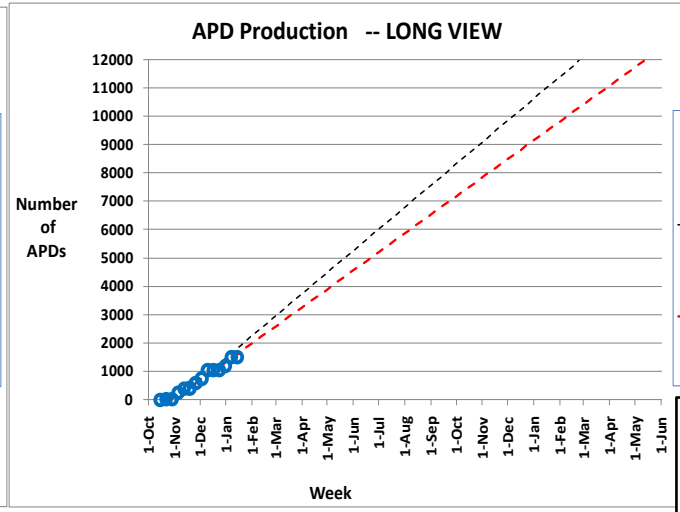
- Projections for all four assuming planned rate is sustained after Nov 26, 2012
- PVC modules does not include 0.68 blocks of modules with 1 cell not passing the fiber test(s)
  - Since we want to use those at the END of the detector
- Watching slopes & end points of the various parts
  - PVC modules will slow down as we build 660 Near Detector modules (= 1.7 blocks) this spring & summer
  - ~ 1.5 blocks



# Other notable events

- Production APDs continue to arrive at Caltech
  - A total of **1,500** received to date. (**12.5 %** of the order). Rate close to 175 / month expected
  - **111** now coated, **96** of those now assembled & tested at Caltech, **60** shipped to Ash River
  - **411** shipped to coater, beginning production, expect 300 back from the coater on Jan 23.




End points are Different by ~ 2 months

- Status of Installation test at Fermilab:
  - 85 production Parylene coated APDs installed in 3 groups on Nov 23, Dec 12, and Dec 19 on a set of 30 production optical connectors. All were cooled to -15C.
  - Of the 85, one in the 1st set was noisy and one in the 2nd set was noisy.
    - Viewing "noisy" an installation failure, **the failure rate is 2/85 = 2.4%.**
    - THIS IS MUCH BETTER THAN THE 15% FAILURE RATE REPORTED AT THE NOV 20 MINI-REVIEW.
  - In fact the 1st noisy one was traced to one of the 32 pixels on the device.
    - **Counting working pixels as success, the failure rate is then only 33 / 2720 = 1.2 % failures**
  - The last 30 will be left operating on the installation test stand for a longer time.

# Status of Outfitting electronics

- Infrastructure status:

| Item | Di-block 01 | Di-block 02 | Di-block 03 | Di-block 04 |
|---|---|---|---|---|
| Unistrut / cable trays | X | X | X | X |
| Power DB installed | X | X | X | - |
| PDB tested | - | X | X | - |
| DCM installed | X | X | X | - |
| DCM tested | - | X | X | - |
| Water manifolds installed | X | X | - | - |

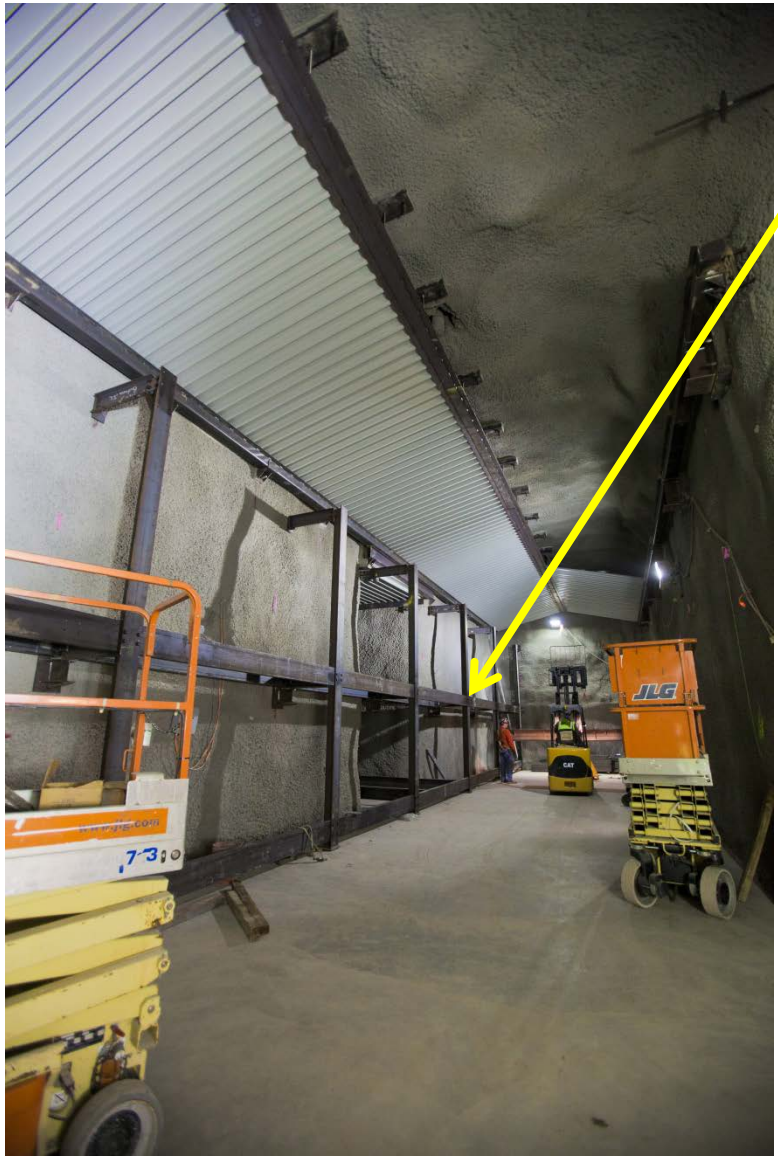
# Status of Outfitting electronics, Key Dates

- Scintillator Filling:
  - Block 00 filled _____ 1/24/13
  - Block 01 filled _____ 2/18/13
- Electronics Installation:
  - First FEBs installed on Block 00 _____ 1/22/13
  - FEB Communication Cables Installed (Parts?)_____ 2/12/13
  - FEB Installation/Checkout Starts (Parts?) _____ 2/18/13
  - APD Installation Starts (Parts?) _____ 2/25/13 (2/19/13)
- Dry Gas System:
  - Detector air tube routing complete _____ 1/22/13
  - Field wiring of instruments to PLC complete _____ 1/28/13
  - Dry Gas System commissioning complete (installation?) _____ 2/7/13
- Detector Commissioning:
  - Start far detector commissioning _____ 3/7/13
  - 1st di-block 99% live (DAQ, analysis/monitoring tools?) _____ 4/2/13
  - 2nd di-block 99% live (DAQ, analysis/monitoring tools?) _____ 4/24/13

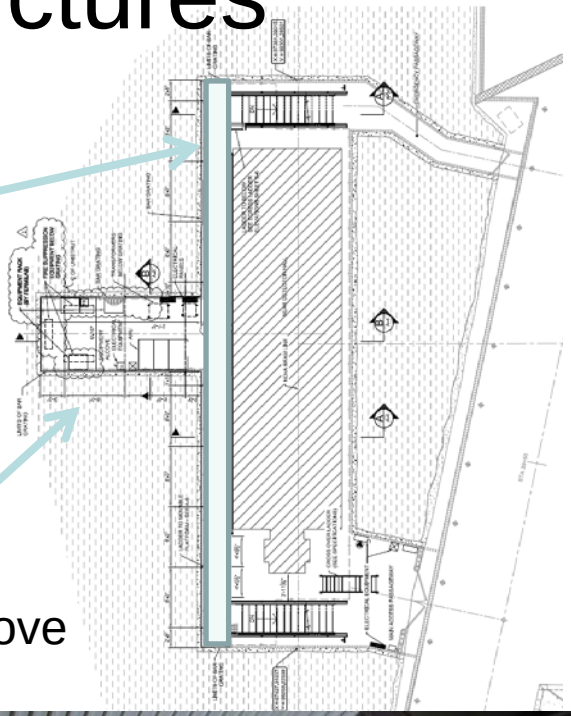
# Other notable events

- Near Detector Cavern status:
  - Dismantled dust walls
  - Installed drip ceiling brackets, gutter & roof panels
  - Starting to install catwalk structural steel (next slide)


# More Near Cavern pictures



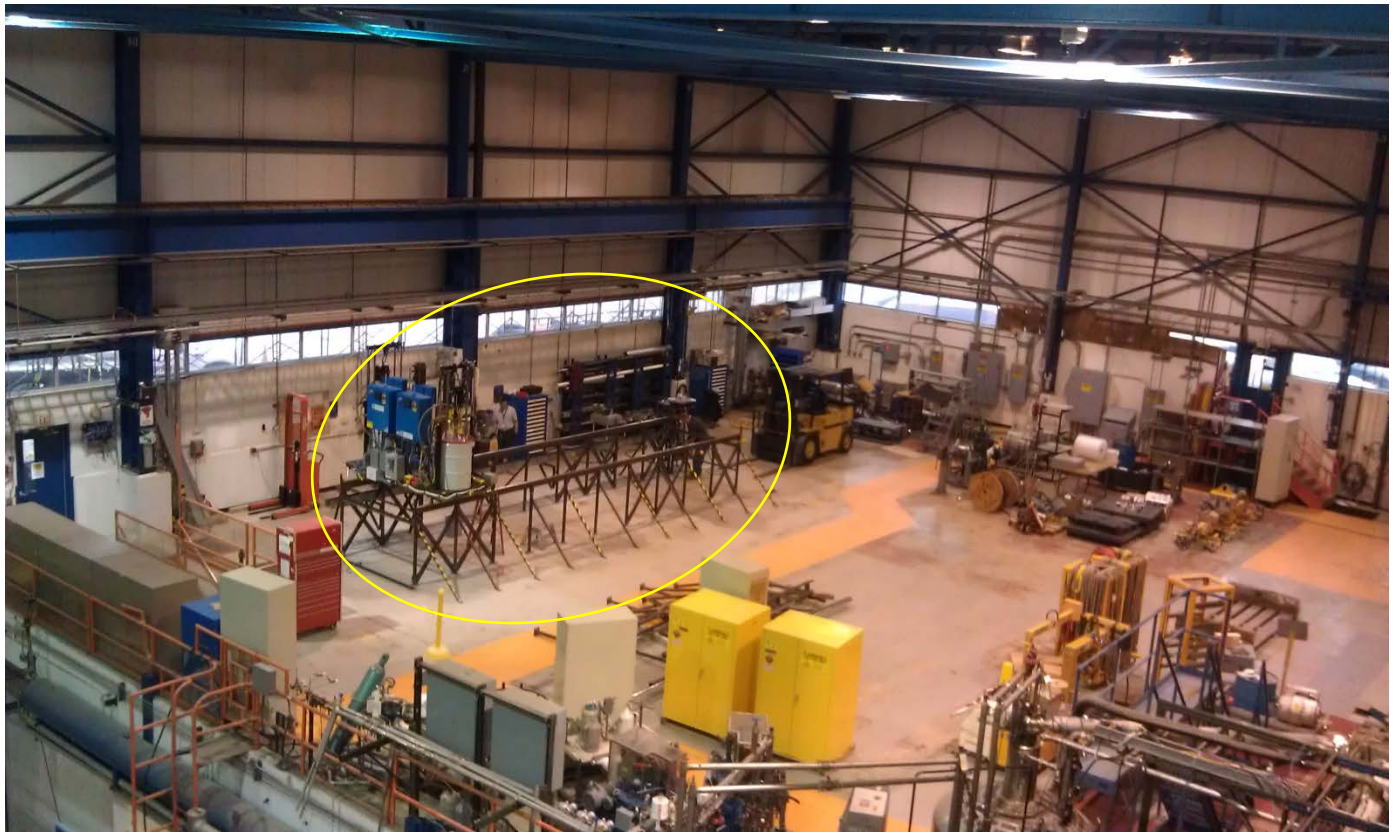

catwalk



Equipment alcove

# Other notable events

- Near Detector construction status:
  - Setting up ANL prototype adhesive machine in the CDF Assembly Building
  - Recall we will build the Near Detector blocks at Fermilab (24 layers) so that transportation after construction is a short as possible to the MINOS Service Building, minimizing risk.



# ES&H Summary

- At Ash River: Nothing new
  - Work days without a lost time accident or recordable incident = **56** days as of 18 Jan 2013
    - First lost time accident on 01 Nov 2012. Worker hit his knee, lost one day after being prescribed a topical medication .
    - Prior record was 391 days and accumulated employee hours of 61,669 since beneficial occupancy of the Ash River building in April 2011.
    - Winch cable snap, no one hurt, reported 11 Dec 2012
      - Re-designed & approved, Stop Work order lifted on Jan 3, 6th block set with Pushka & McHugh on the scene on Jan 2-4.
- Transportation of Materials to Ash River: Nothing new
  - A truck with PVC modules from Minneapolis was involved in a low speed accident on 27Nov2012. No damage to the modules, but Ash River lost 6 hours of construction time.
- At the U of Minnesota Factory: Nothing new
  - No reportable accidents since module assembly started in April 2011.
  - About **159,000** student hours worked during this time
- At Fermilab during the Accelerator Shutdown for NOvA: Nothing new
  - Of order 70 - 120 FTEs working per month on shutdown items.
  - Accelerator tunnel incident on Nov 19. Employee did mandated stretch exercise after installing a shim on a permanent magnet end in the tunnel, hit his hand on something nearby, needed a butterfly closure.
- At Fermilab by Kiewit, construction of the Near Detector Cavern: Nothing new
  - **24,403** hours of work so far, no accidents.