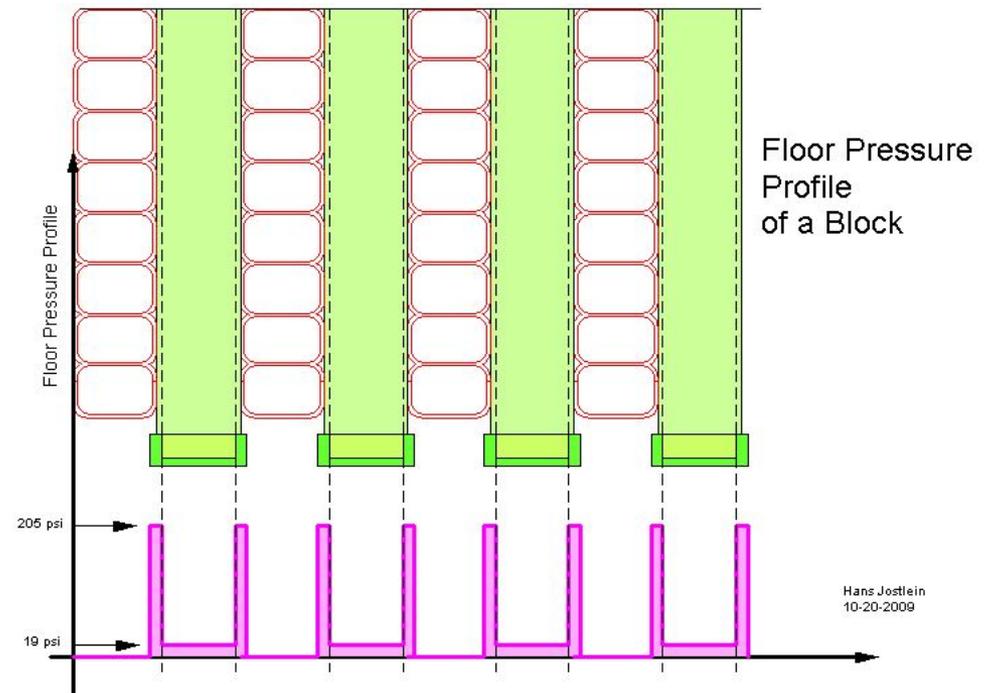


Grouts and Grout tests for NOVA

- The NOVA extrusions, when filled, will exert an average pressure of 19 psi (2736 psf) on the floor.
- The pressure is not uniform:



Floor pressure

- It is actually more complicated; there is partial force transmission through the webs,
- Except for the middle channel in the end cap.

Two locations for grout:

- Between the block and the pallet
(applies to IPND as well)
- Between the pallet and the hall floor
(Applies to far detector only)

Why do we need grout ?

- The PVC block is stiff
- We always assumed a full support area
- There are several sources of imperfect alignment of the block components versus the pallet- or floor shape:

Geometrical Imperfections

- Non-square module bottoms (X and Y)
- Module bottoms misaligned (X and Y)
- Pallet construction tolerances
- Concrete floor not a perfect plane

Cumulative error:

Somewhere between $1/16''$ and $1/8''$ (my own wild guess)

Grout Requirements

- Long Life (no deterioration with time or oil soaking)
- No Creep (to avoid stresses during partial oil filling)
- Stiff (same reason)
- Easy to install
- Must flow easily
- Reasonably fast setup

Liquid grouts

- Commonly used for machinery
- Require leak-tight form
- Not easily used on far detector floor
- Costly

Cement based grouts

- See DocDB # 581 (January 2006) for measurements
- Last for decades (centuries ?)
- Do not require leak tight forms
- Have the marvelous property of being

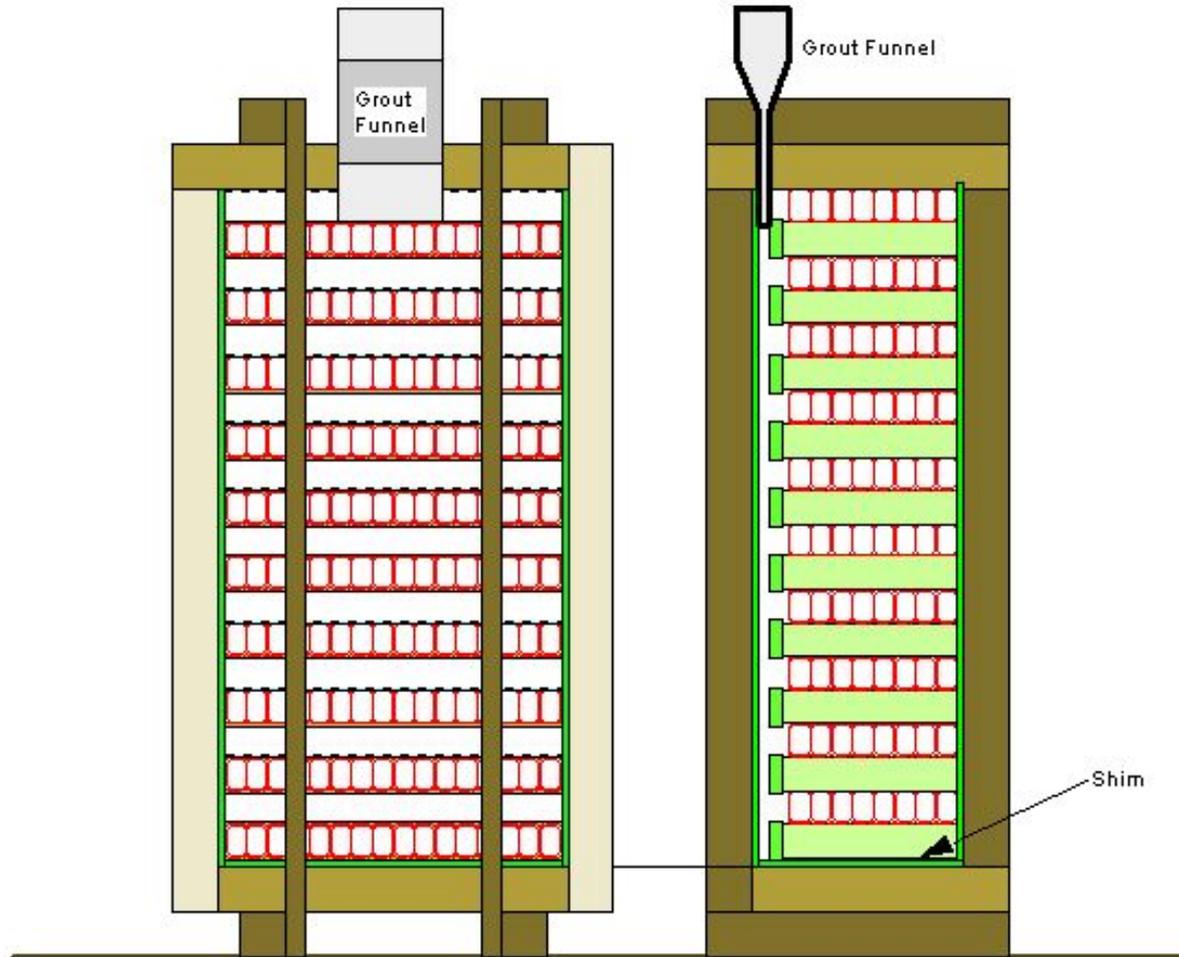
Tixotropic:

- Behave like liquids when shaken or stirred
(Sorry, James B.-007)
- Behave like solids when at rest

Typical mix

- Use “play-sand” as filler
- Add cement and water and mix
- Fill into the gap
- “vibrate” with a long board until settled
- Let set (setting can be as short as 30 minutes, and can be tuned with additive to be as long as 3 days)

Test assembly



Grout Test

Proposed size of test

- One extrusion wide (26 " or so)
- 1 foot deep
- 5 double-layers tall (52 inches)
- Install fake bottom seals (PVC, 3" x 26" x ½")
- Glue stack together using existing Magnolia epoxy
- Install plywood wall (¾" thick ?) with gap spacer (¾" to start)

Main purpose of test

- Find out how hard or easy it is to fill the mortar in a tall gap with realistic block shape
- Check on resulting completeness and distribution of fill
- (We'll cover the extrusions with foil to separate the mortar from the extrusions after cure)

Effort

- Cut extrusions – 4 hours
- Epoxy end plates – 8 hours
- Epoxy stack together – 8 hours
- Make wooden cage –8 hours
- Make a funnel– 2 hours
- Mix mortar and install – 4 hours

Materials

- (Bad) Extrusions from Meson – free
- Mortar mixing drum \$ 50.-
- Sand, cement \$ 35.-
- Form assembly bolts etc \$ 25.-

Time scale

- Depends on my time and some tech help (move extrusions; saw cuts)
- Would aim for less than a month

Test Program

- Everything may work right away—great
- If not , tinker some more
- In any case, try different grout gaps

Floor Grouting (Far Detector only)

- Place mortar on floor over the whole contact area
- Use a rake-type tool to groove it deeply
- Set the block down with the block raiser
- During block alignment there is enough motion to re-liquefy the grout
- If not, just make a very small motion with the block raiser and set the block down
- Grout will set to full load bearing strength as soon as the motion stops

Floor Grout test

- We can test this by grouting a concrete block to the floor in Lab 6
- Cover floor and top of mortar with a PE sheet for easy clean-up
- This test costs very little time and materials. We should do it.

Future use

- Use on at least one module of INPD
- Use for FHEP (to test floor grouting, mostly)