

Mechanical Tests on Structure

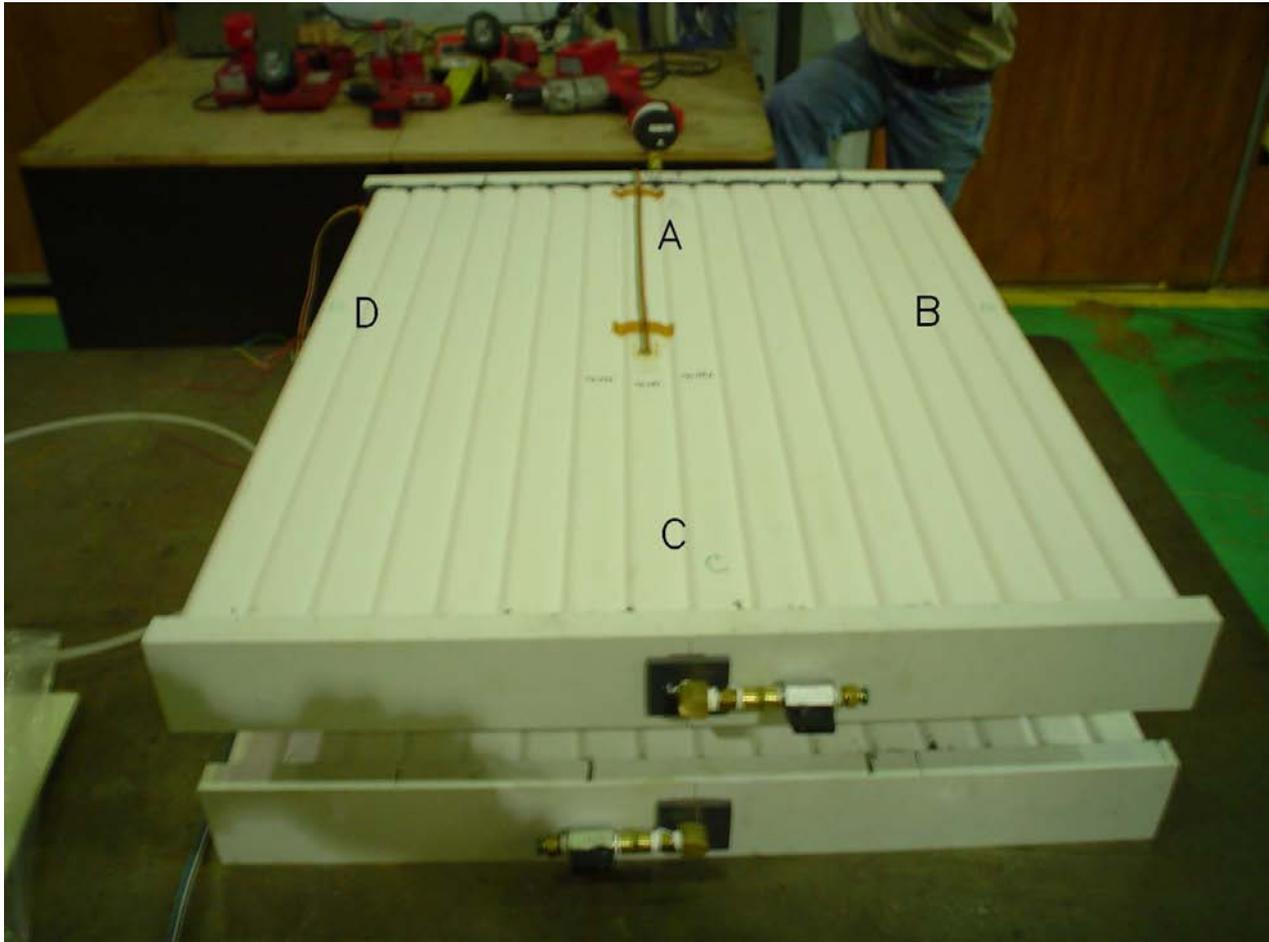
- Mechanical Tests are being started using real extrusions.
- Purpose of the tests are to evaluate the accuracy and validity of FEA model and assumptions.
- See DocDB 704 for test descriptions
- See DocDB 1120 and 1194 for results of current testing.

Results of 3 Extrusion Test

DocDb 1194

- Two extrusions had endseals attached to simulate vertical extrusions.
- These “vertical” extrusions were then used to sandwich a third extrusion that did not have endseals and was used to simulate a horizontal extrusion.
- Extrusion bonding was done using 3M 2216 with the surfaces of the extrusions roughened.
- Extrusions were attached to the extrusions to measure strain/stress.
- Pressure was increased from 19psi, 40psi, 60psi, 80psi.
- Main purpose of this test was to evaluate the strength of the 3M bond

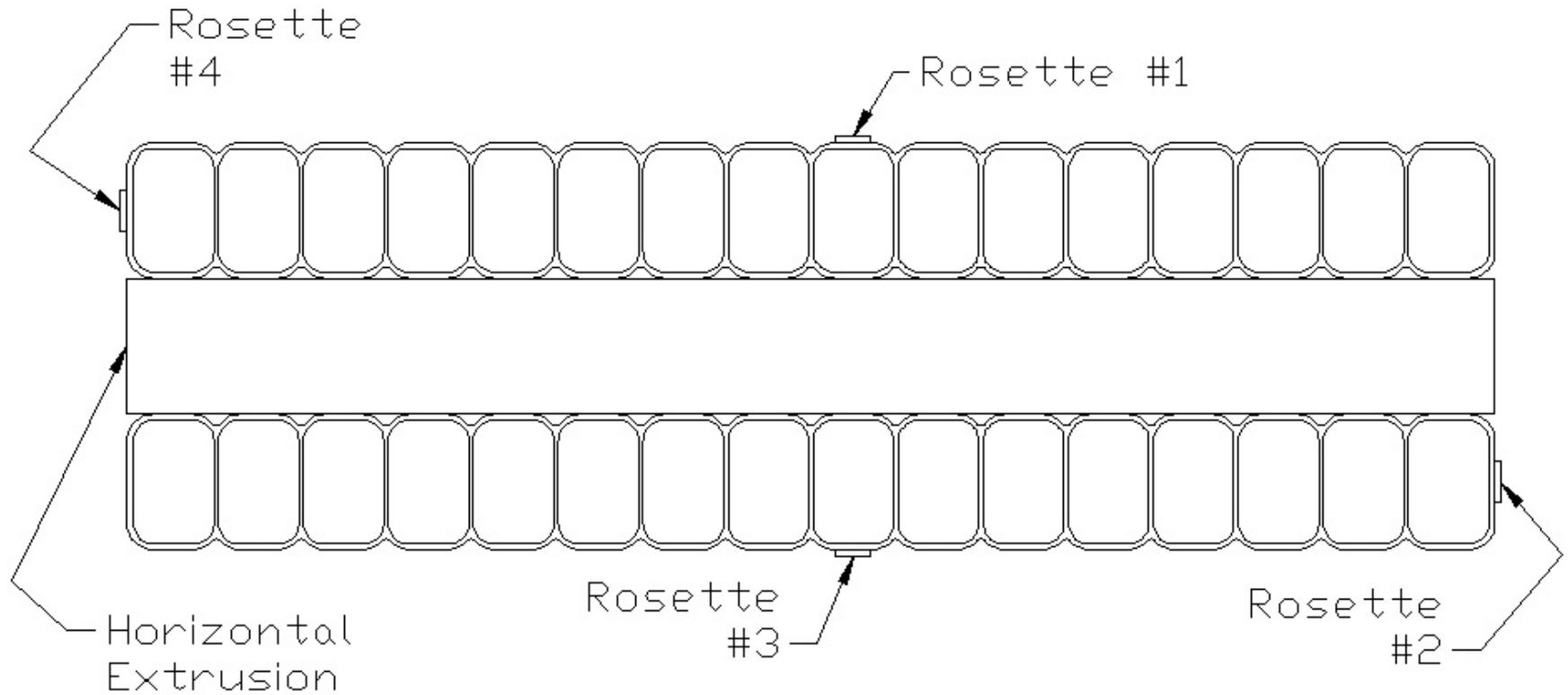
3 Extrusion Test



3 Extrusion Test



3 Extrusion Test



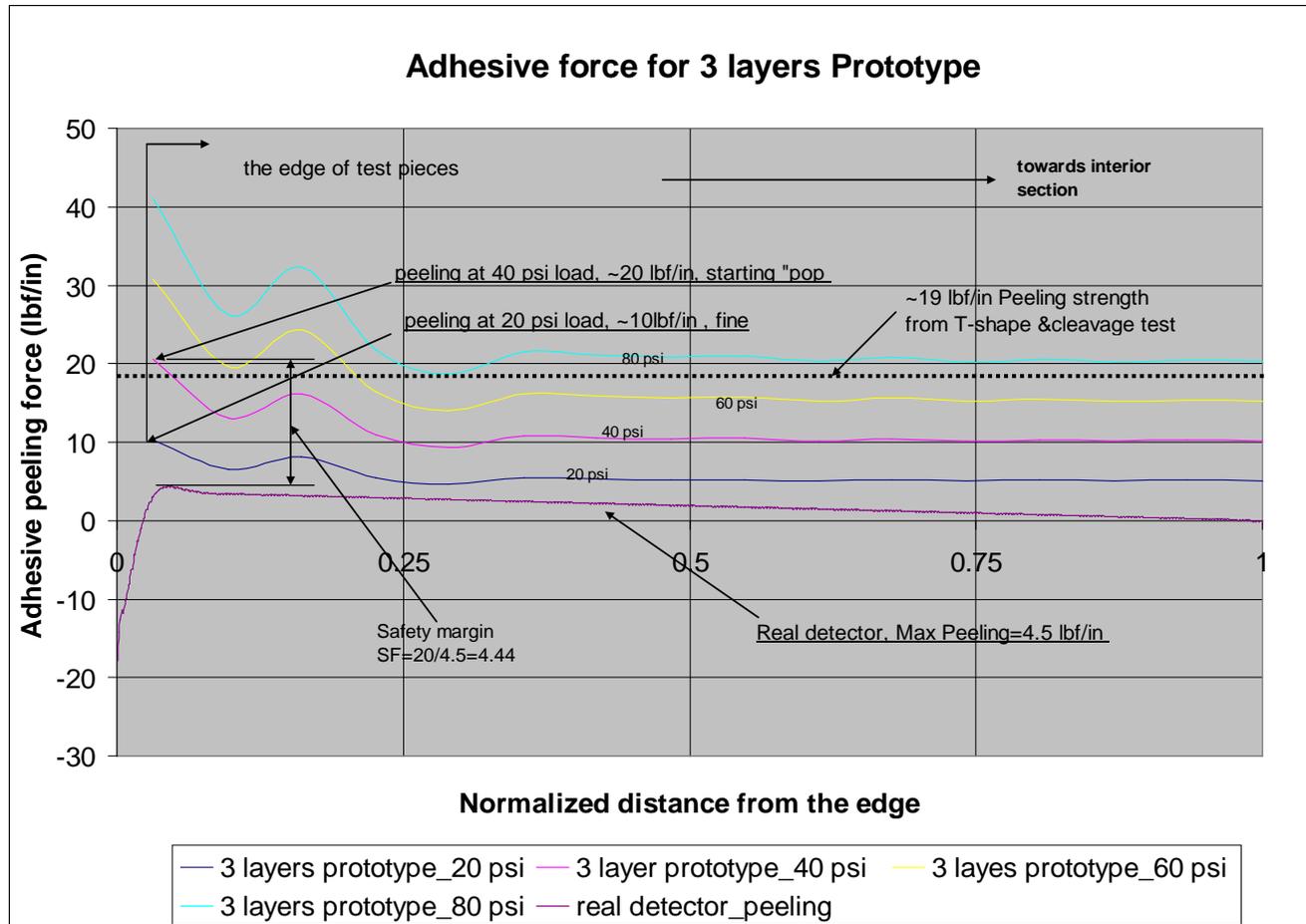
3 Extrusion Test - Results

- The extrusions were pressurized to 19psi and strain gage data recorded.
- As pressure was increased to 40 psi, after 35psi a series of “popping” noises were heard. There were assumed to be bonds breaking.
- At 40psi the strain gage data was recorded and the extrusions inspected.
- Pressure was increased to 60 and then 80psi. “Popping” noises were heard each time as the pressure increased.
- The pressure was held for 1.5hours at 19, 40, 60psi. Once the pressure was stable no additional popping noises were heard.
- Endseal began leaking at 80psi before strain gage data could be recorded.

3 Extrusion Test - Results

- 12” long feeler gages were used to evaluate the number of glue bonds broken. Only the first few perimeter bonds appear to have failed. See DocDb 1194 for details.
- Stresses were calculated from stains and compared reasonable well with FEA model within the accuracy of extrusion wall thickness and assumed modulus. See DocDb 1194 for details.
- FEA model of adhesive peel/shear stresses done. FEA predicts at 35-40psi that peel stress along the perimeter will reach the experimental limit. This corresponds with point where the “popping” noises began to be heard.

3 Extrusion Test - Results



Conclusions – Further Mechanical Tests

- The FEA model was able to predict the pressure at which bond failure by peel would begin. Strains/stresses match reasonably well with model.
- 11 layer 1 extrusion x 1 extrusion test will be performed next week. Will be testing adhesive bond, PVC stresses, and progressive swelling.
- Dave P. performing tests on progressive swelling.
- 8 Layer IPND block will be constructed and tested in the next few weeks. This block will have weights added to the top as well as being pressurized to simulate the stresses in the adhesive of the full height block.
- Extrusions from the latest extrusion run will be used for additional tests that will be developed based on what we learn from upcoming tests.
- Eventually will do a full-height prototype.

