CHANGES IN CONSTRUCTION PROCEDURES

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WRITTEN: OCTOBER 28, 2009→ VERSION 1
UPDATED: NOVEMBER 27, 2009 → VERSION 2
UPDATED: JULY 8, 2010 → VERSION 3 (NEWEST PROCEDURES)

Our experience during the building of the first eight production modules has led us to modify our procedures in this regard, as compared to those in place after the BCAL Readiness Review (Version 2, November 27, 2009).

Several issues remained.

1. Minor difficulties continued in build-height asymmetry between the front and back edge of each module, as being erected up on the press tables.
2. Local height bulges or dips appeared at different positions along the length of each module and at different spots on each press. These features did not seem to be correlated with the order of ram lowering.
3. At the conclusion of each build, a pair of cooked fettuccini noodles would straddle the width of the module at each end. Then, in sequence, a .006 in. thick polyethylene sheet, first a ¼ in.-thick later replaced by a .1/16 in.-thick soft rubber sheet, a .1/8 in.-thick Teflon sheet, a 1-1/4 in. thick, and a ¾ in. thick aluminum press plates would be placed on top of the topmost lead layer, before pressing over night. This covering process was quite time consuming, and on one occasion – during the build of Module 05 – the rubber slipped causing damage, and five layers of fibres and lead had to be discarded.

We believe that the local high/low spots and the front/back height asymmetry were due primarily to the rubber, which either retained memory of its shape from previous pressings, and/or accentuated any inherent press asymmetries.

Procedures were modified.

1. We first degrease and then abrade (using a orbital sander with a 80 grit emery cloth disk) the surfaces on both (top and base) aluminum plates that are bonded to the matrix, in order to provide a better bonding surface. We then degrease them again after abrading.
2. We decided to simplify the end-of-build layering, and kept only a .006 inch thick polyethylene sheet and use a 1-1/4 and ¾ in. thick, 6”-wide aluminum press plates.
3. We stopped using the ‘lunar lander’ feet on the press rams.
4. We implemented the use of wider lead sheets for the top three Mayan steps (12cm, 11cm, and 10cm) from widths of their preceding steps (13cm, 12cm, and 11cm), and of slightly longer length, in order to

overhang the top lead layer on all four sides, and completely prevent epoxy migration from the layers below during the pressing. The only exception was the top builds of the 13cm step, as no wider sheets than those exist. Those layers (two builds only) continue to be constructed in a similar manner and any epoxy migration is physically removed.

5. We stopped using the fettuccini noodles except for the very first lead sheet (on top of the aluminum base plate) and in one other case where an overhang lead sheet was defective.
6. We now bring the press rams down sequentially from the center out, but without any time delay in between. After all the rams have seated, all but the middle two are released and the process is repeated three times. The two center rams take the slack out of the press and hold the build in position. The pressing and releasing of the other rams aid in the epoxy flow. This helps eliminate the possibility of excess epoxy being trapped in areas between where the rams are pressing. Many other sequences were tried and this method produces the best results. This also simplifies operations, as previously at least one person had to bring the rams down manually at 2-3 minute intervals, leading to a 20-30 minute period.
7. We trim the protruding fibre ends off the module before setting up the top plate fastening apparatus. We then apply a flat (chalkboard) paint to protect the ends from light during shipping and machining.

The preparations to press became considerably easier and quicker; and epoxy migration no longer seems to be a major issue. Productivity has increased by 10-20%.