SUBJECT: **POTTING MATERIALS TEMPERATURE CYCLING**

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● Part Description:

Temperature Cycling Test for potting materials/compounds

● Equipment List:

- Potting Box 116-013 (3.0 x 3.0 x .9 approx.)
- Potting Compounds from Hisco (DJ Schilling)
  - Insulcast 116FR Black Epoxy (mix 1:1) [Data Panel P/N 117-100 & 117-101]
  - 3M 5 Clear Amber Epoxy (mix 2:1)
- Potting Compounds from Ellsworth (Erin Stone)
  - Dow Corning Slygard 160 Dark Gray Silicone (mix 1:1)
  - Dow Corning 3-6636 Clear Silicone (mix 1:1)
- Heat Chamber
- Freezer

● Test Setup:

- Fill Potting Box .25” in the bottom with Clear material. Allow material to cure 24 hours.

- Fill Potting Box .50” to top of box with Black/Dark Gray material. Allow material to cure 24 hours.
  - Insulcast 116FR Black goes on 3M 5 Clear [*Hisco recommendation*]
  - Dow Corning Slygard 160 Dark Gray goes on Dow Corning 3-6636 Clear [*Ellsworth recommendation*]

  Mixed and matched vendors materials to see how they would react to each other:
  - Insulcast 116FR Black Epoxy on Dow Corning 3-6636 Clear Silicone
  - Dow Corning Slygard 160 Dark Gray Silicone on 3M 5 Clear Amber Epoxy

- After potting material is fully cured, run thermal cycle testing with lowest and highest temperatures.
  - Freezer [-17C 0F] and Oven [80C 176F].
  - Cycle every two hours.
  - Let units soak in freezer/oven overnight while test is running.
  - The faster the rate of change from high to the low and back, the more severe the test.
  - Cycle units: 25 times freezer, 25 times oven. [parts were on test for two weeks]

- After the temperature cycle, test the unit for its intended use to determine if its performance is affected. If no effect, then the potting compound is suitable.
  - Materials adhering to the housing.
  - No Separation of materials.
  - Color changes/shifts.

- Use the end mill to shave off the side of potting box to reveal the edges of the material to examine and test how LEDs show through the clear material.

● Results:

Observations regarding the potting material/compound:

- Insulcast 116FR Black
  - When cured had bubbles in the appearance. (hand mixed)
  - Hardness was Shore D 80
  - Dielectric strength per spec is 420 volts/mil
  - Health Classifications: skin irritation 2, eye 2, Environment 2

- 3M 5 Clear
  - It has a very strong smell that would give me a headache after a few minutes when mixing it.
  - It did not have bubbles when fully cured. (hand mixed)
  - Color is transparent amber.
  - I poured about .75 fl oz into a small mixing cup and when it was cured it did not adhere to the cup.
  - The color is transparent amber.
  - Dielectric strength per spec is 325 volts/mil
  - Health Classifications: Eye 2B, Skin 1, Carcinogenicity 2

- Dow Corning Slygard 160 Dark Gray
  - Had a nice smooth finish. (mixed by tube)
  - Too soft to measure Shore D [spec is 56 shore A]
  - Dielectric strength per spec is 475 volts/mil
  - Health Classifications: eye contact may cause temporary redness & discomfort, all other no significant effects from short term exposure.

- Dow Corning 3-6636 Clear
  - It did not have bubbles when fully cured. (mixed by tube)
  - Very clear when cured
  - It is a gel when cured so it is very flexible. It is not as boogery as our current 117-031 Quantum Qgel.
  - It did adhere to the small mixing cup.
  - Dielectric strength per spec is 425 volts/mil
  - Health Classifications: Not a hazardous substance or mixture

Observations of materials/compounds after temperature cycle testing:

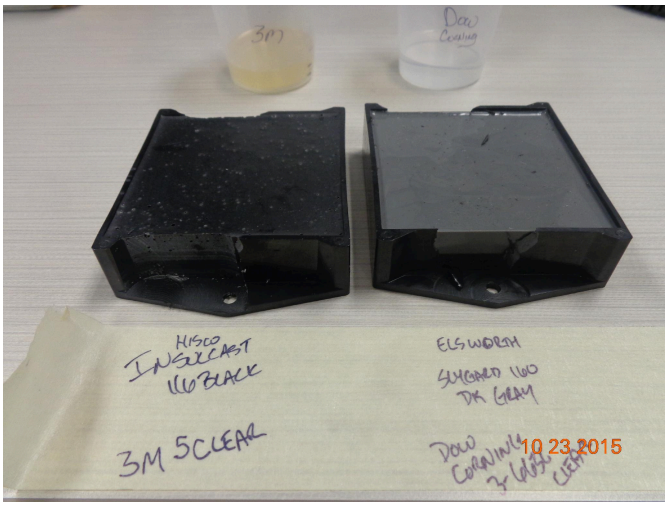
- Insulast 116FR Black goes on 3M 5 Clear
  - Both materials are hard and are adhered together.
  - A green or white LED could be seen though 2.8” of 3M 5 Clear. The light was diffused.

- Dow Corning Slygard 160 Dark Gray goes on Dow Corning 3-6636 Clear
  - Both materials have flexibility and are adhered together.
  - A green or white LED could be seen though 2.8” of Dow Corning 3-6636 Clear.

- Insulcast 116FR Black Epoxy on Dow Corning 3-6636 Clear Silicone
  - The Clear Silicone sticks to the Black Epoxy.

- Dow Corning Slygard 160 Dark Gray Silicone on 3M 5 Clear Amber Epoxy
  - Dark Gray Silicone separated from the 3M 5 Clear with no effort. ***Fail!***

- **Reference Data:**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116 BLACK
3M 5CLEAR
ELSWORTH
SLYGARD 160
DK GRAY
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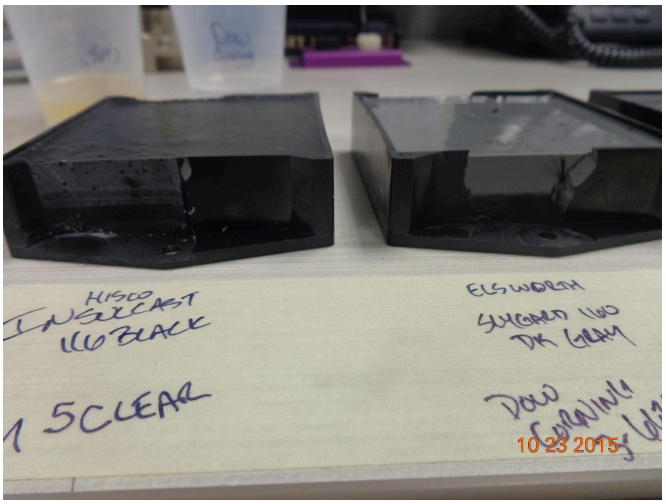
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