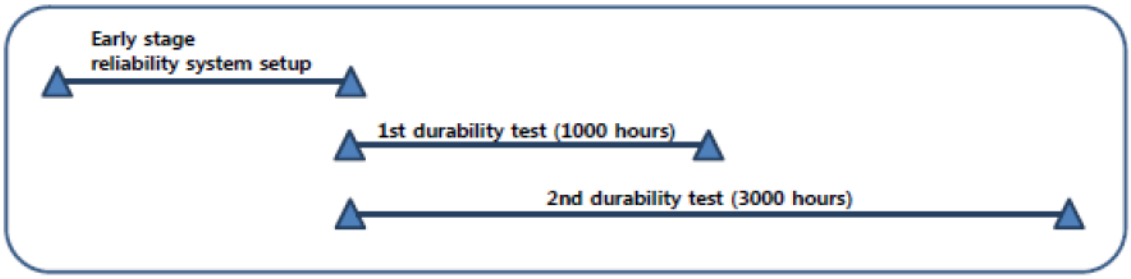
AFTC 5391 vs 3M G23F

Test Methods – Durability

Accelerated Aging Test

- UV exposure, Cycling heat, Humidity
- Test Method – ASTM G 154 Cycle 1
- 1st durability test – 1,000 hours
- 2nd durability test – 3,000 hours



AFTC 5391 vs 3M G23F

Test Methods – Durability

Adhesion Performance (Lab-Scale) - Durability test

- **Test Methods**

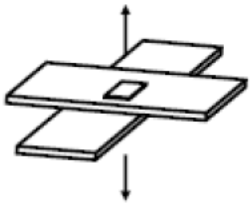
✓ **Peel strength**

- Equipment : Texture Analyzer (TA-ST2i, UK)
- Substrate : Aluminum
- Peeling angle : 180°
- Test Standard : ASTM D3330

180° Peel strength

✓ **Pull-off test**

- Equipment : Universal Test Machine (Zwick,)
- Substrate : Aluminum
- Test Standard: ASTM D897



Tensile strength

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AFTC 5391 and 3M G23F were both bonded at the same time, using the same processing methods. Both materials were allowed to wet out and dwell for the same amount of time. The substrate, Aluminum was prepped by being thoroughly cleaned with a 50/50 mix of IPA / H^2O and then primed with 3M Primer 94.

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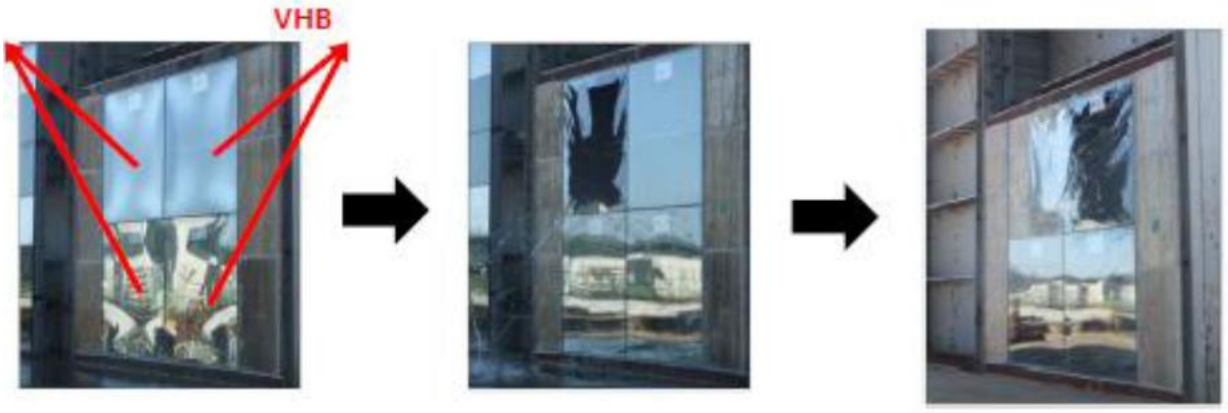
Window being bonded and water penetration test

After the windows were bonded with both AFTC 5391 and 3M G23F, the windows were tested to determine if there was any penetration or leakage. No penetration or leakage of water or moisture was found. As a result, both windows provide an air and water tight seal.

AFTC 5391 vs 3M G23F

Wind Load Structural Test



AFTC 5391 vs 3M G23F

In both cases, the tapes (AFTC 5391 and 3M G23F) did not fail when exposed to Hurricane force winds. The windows (Glass) failed (at 2500 Pa). The net result, both tapes remained bonded when exposed to hurricane force winds. In addition, both tapes provide a stronger bond than the actual failure level of the glass.

WINDSPEED TO PRESSURE CONVERSION CHART			
Metres/Second m/s	Kilometres/Hour km/h	Miles/Hour mph	Pascals Pa
6.38	22.97	14.28	25
9.03	32.50	20.19	50
11.06	39.80	24.73	75
12.77	45.96	28.56	100
15.63	56.27	34.97	150
18.06	65.00	40.39	200
20.18	72.66	45.16	250
22.11	79.60	49.46	300
23.88	85.97	53.43	350
25.53	91.91	57.11	400
27.08	97.47	60.58	450
28.54	102.76	63.85	500
31.27	112.56	69.94	600
33.77	121.57	75.54	700
36.11	130.00	80.78	800
38.30	137.88	85.67	900
40.31	145.13	90.18	1000
42.34	152.42	94.71	1100
44.22	159.19	98.92	1200
46.03	165.72	102.97	1300
47.77	171.96	106.85	1400
49.44	178.00	110.60	1500
51.06	183.83	114.23	1600
54.16	194.97	121.15	1800
57.09	205.53	127.71	2000
59.87	215.60	133.94	2200
62.54	225.10	139.90	2400
65.09	234.30	145.61	2600
67.54	243.20	151.10	2800

Summary:

The AFTC 5391 performed equivalent to the 3M G23F VHB for this window application where the durability, air leakage, water penetration, and thermal cycling was tested. Long term, the AFTC materials, like the 3M VHB line will not breakdown over time. In fact, the bond lines get stronger as time passes as the "wet out" process continues over the life cycle of the product.

Bottom line: **The AFTC 5391 is a suitable replacement to the 3M G23F VHB.**

AFTC 5391 vs 3M G23F

Testing Completed by AFTC Production Korea:

Verified by Mr. Mark Hahn, AFTC Production Korea Engineer and Dr. Chan Ko, PhD and AFTC USA Technical Director

Note: The pictures provided (broken glass, etc…) are from the actual testing session that took place in July of 2019.

Michael DiCandilo

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AFTC USA Inc.