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REPORT OF TEST

ULTRA BOND, INC.

3696 Beatty Drive, #A
Riverside, CA 92506

REPAIRED LAMINATED GLASS

December 27, 1993

Revised January 10, 1994

TEST REPORT NO. 193128-1R

SIGNED FOR THE COMPANY

BY *Michael Beaton*

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Member of the SGS Group (Société Générale de Surveillance)

4. FLEXURAL STRENGTH TEST PER ASTM C158-84

Procedure:

Forty, 10 inch long by 1 1/2 inch wide by 1/4 inch thick specimens were placed individually in an Instron Universal testing machine. Five specimens each identified as "6", "8", and "cracked and unrepaired", were tested with the crack in tension (face-down) and five specimens of each sample were tested with the crack in compression (face-up).

The specimens were supported on two bearing edges 8 inches apart. The load was applied through two loading points 4 inches apart and centrally located between the two bearing edges. The load was applied at a constant crosshead rate of compression of 0.50 inches per minute.

Tests were performed on December 20, 1993.

4. FLEXURAL STRENGTH TEST PER ASTM C158-84

(continued)

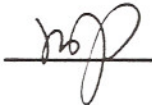
Results:

Sample: Original condition, containing no cracks.

<u>Specimen Number</u>	<u>Maximum Load (lbs.)</u>	<u>Modulus of Rupture (psi)</u>
1	62	4,200
2	69	4,700
3	60	3,900
4	47	3,200
5	58	3,900
6	73	4,800
7	78	5,000
8	71	4,700
9	62	4,100
10	71	4,600
Average:	<u>64</u>	<u>4,200</u>

Observations:

Failures occurred as a result of one or both layers of glass fracturing. All failures occurred at or between the loading points and ran across the width of the specimens.

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4. FLEXURAL STRENGTH TEST PER ASTM C158-84
(continued)

Results: (con't)

Sample: Repaired glass marked "8" - 4,000 cps.

<u>Specimen Number</u>	<u>Maximum Load (lbs.)</u>	<u>Modulus of Rupture (psi)</u>
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Repaired crack in compression (cracked side up)

1	70	4,600
2	67	4,500
3	64	4,300
4	62	4,300
5	72	4,800

Average:	<u>67</u>	<u>4,500</u>
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Repaired crack in tension (cracked side down):

1	67	4,600
2	58	3,700
3	72	4,400
4	70	4,600
5	52	3,400

Average:	<u>65</u>	<u>4,200</u>
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Observations:

Failures occurred as a result of one or both layers of glass fracturing. All failures occurred at or between the loading points, and ran across the width of the specimens. Any failures which occurred at the repaired crack occurred after the maximum load of the specimen was reached. In no case did the failure at the repaired crack occur before the maximum load of the specimen was reached. 80% of the failures occurred away from the repaired crack.

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4. FLEXURAL STRENGTH TEST PER ASTM C158-84

(continued)

Results: (con't)

Sample: Repaired glass marked "6" - 1,800 cps.

<u>Specimen Number</u>	<u>Maximum Load (lbs.)</u>	<u>Modulus of Rupture (psi)</u>
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Repaired crack in compression (cracked side up):

1	62	3,900
2	63	4,300
3	63	4,300
4	72	4,800
5	55	3,900
Average:	$\overline{63}$	$\overline{4,200}$

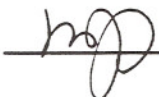
Repaired crack in tension (cracked side down):

1	74	4,900
2	89	5,700
3	79	5,000
4	62	4,000
5	63	4,100
Average:	$\overline{73}$	$\overline{4,700}$

Observations:

Failures occurred as a result of one or both layers of glass fracturing. All failures occurred at or between the loading points, and ran across the width of the specimens. Any failures which occurred at the repaired crack occurred after the maximum load of the specimen was reached. In no case did the failure at the repaired crack occur before the maximum load of the specimen was reached. 70% of failures occurred away from the repaired crack.

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4. FLEXURAL STRENGTH TEST PER ASTM C158-84

(continued)

Results: (con't)

Sample: Cracked and unrepaired glass

<u>Specimen Number</u>	<u>Maximum Load (lbs.)</u>	<u>Modulus of Rupture (psi)</u>
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Crack in compression (cracked side up):

1	70	5,200
2	47	3,500
3	64	4,700
4	56	4,200
5	62	4,600

Average:	<u>60</u>	<u>4,400</u>
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Crack in tension (cracked side down):

1	51	3,800
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3	37	2,800
4	46	3,400
5	67	5,000

Average:	<u>50</u>	<u>3,800</u>
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Note: Specimen No. 2 was defective and the values disregarded.

Observations:

Failures occurred as a result of one or both layers of glass fracturing. 70% of the failures occurred at the crack.

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4. FLEXURAL STRENGTH TEST PER ASTM C158-84

(continued)

Conclusion:

The results of flexural strength tests on the laminated glass sample showed that the glass repaired using the Ultra Bond long crack repair process performed within $\pm 7\%$ of the original condition glass containing no cracks or repairs.

