



SUMMARY OF OFFICIAL TEST REPORTS



2014



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Thermal Performance Tests and Coating Performance Tests:

- **ASTM (American Society for Testing and Materials)**
- **UL (Underwriters Laboratories)**
- **JIS (Japanese Industrial Standards)**



<u>REF. NR.</u>	TEST CRITERIA	STANDARD	LABORATORY	<u>REF. NR.</u>	REPORT
#01	HEAT FLUX (COMPARISON WITH UN-COATED GALVANIZED SHEET STEEL)	ASTM D-177 ASTM C-1045	HAUSER LABORATORIES	E87-0839	THE COATED GALVANIZED SAMPLE HAD 64% LESS HEAT TRANSFER THAN THE UN-COATED SAMPLE. THERMO-SHIELD HEAT TRANSFER = 1.163 BTU/hr/Sq.-Ft²
#02	HEAT FLUX (COMPARISON WITH BLACK ASPHALT COATED FIBRBOARD)	ASTM D-177 ASTM C-1045	HAUSER LABORATORIES	E87-0839	THE COATED SAMPLE HAD 84% LESS HEAT TRANSFER THAN THE FIBREBOARD SAMPLE. THERMO-SHIELD HEAT TRANSFER = 6.1 BTU/hr/Sq.-Ft²
#03	HEAT FLUX (COMPARISON WITH PLANKIAN COATING ON FIBREBOARD)	ASTM D-177 ASTM C-1045	HAUSER LABORATORIES	E87-0839	THE COATED SAMPLE HAD 25% LESS HEAT TRANSFER THAN THE PLANKAIN SAMPLE. THERMO-SHIELD HEAT TRANSFER = 0.871 BTU/hr/Sq.-Ft²
#4	3 YEAR TEST - SOLAR RADIATION CONTROL FOR LOW-SLOPE ROOFS (SOLAR REFLECTION, INFRARED EMITTANCE, SURFACE TEMP. & HEAT FLUX) AND AGEING EFFECT	D.O.E. COOL ROOF CALCULATOR	OAK RIDGE NATIONAL LABORATORY	7.00E+91	REFLECTANCE = 70% EMMITTANCE = 90% OF WEATHERED COATING. ANNUAL HEAT FLUX REDUCED FROM 145,317 BTU PER M² TO 48,439 BTU/M₂

REF. NR.	TEST CRITERIA	STANDARD	LABORATORY	REF. NR.	REPORT
#5	THERMAL RESISTANCE AND STEADY STATE HEAT FLUX AND THERMAL TRANSMISSION PROPERTIES. THIS TEST ENCOMPASSES BOTH SINGLE AND THE DOUBLE SIDED MODE OF MEASUREMENT	ASTM C117 ASTM C1045	CALCOAST ANALYTICAL-ITL	#0426-1A/D91	ROOF COATING: K = 0.0454 / R = 22 EXTERIOR COATING: K = 0.04761 / R = 21 INTERIOR COATING: K = 0.04761 / R = 21
#6	THERMAL CONDUCTIVITY TEST	ASTM E1225	CALIFORNIA INSTITUTE OF ELECTRONICS & MATERIALS SCIENCE	620930322	ROOF COAT 14-15 MILS DFT: W/m.K = 0.0538 ROOF COAT 33-34 MILS DFT: W/m.K = 0.0515 EXTERIOR COAT 8 MILS DFT: W/m.K = 0.0579 INTERIOR COAT 9 MILS DFT: W/m.K = 0.0556
#07	REFLECTANCE AND THERMAL EMITTANCE OF 9 SAMPLES OF ROOF COAT: USING EQUIPMENT MANUFACTURED BY DEVICES AND SERVICES COMPANY MODEL SSR-E		SPECIALIZED TESTING: ACCREDITED BY INTERNATIONAL ACCREDITATION SERVICES, A MEMBER OF THE INTERNATIONAL ACCREDITATION FEDERATION - SANS MEMBERSHIP	STIQA50018/RIO -1073-05	AVERAGE INITIAL REFLECTANCE = 0.882 AVERAGE INITIAL EMISSIVITY = 0.793

<u>REF. NR.</u>	TEST CRITERIA	STANDARD	LABORATORY	<u>REF. NR.</u>	REPORT
#11	TENSILE PROPERTIES	ASTM D-412	COLUMBINE LAB		TENSILE STRENGTH AT 25% ELONGATION = 525 psi. TENSILE STRENGTH AT BREAK = 615 psi. ULTIMATE ELONGATION = 70%. TENSILE SET AT 25% ELONGATION = 10%
#12	BRITTLINESS TEST USING A STRIKING DEVICE THAT CONFORMS TO THE STANDARD	ASTM D-746	COLUMBINE LAB		PASSED: 90° BEND TEST AT -37 Co
#13	DETERIORATION BY HEATING IN AIR. PRECONDITIONING 1 WEEK AT 25 C° 50% RH. HEAT AGING 21 DAYS 150 Co	ASTM D-865	COLUMBINE LAB		TENSILE STRESS AT 25% ELONGATION - INITIAL 515 psi, CHANGING AFTER AGING -15%. TENSILE STRENGTH AT BREAK - 640 psi CHANGE AFTER AGING -20%. ULTIMATE ELONGATION - 85% CHANGE AFTER AGING -15%. TENSILE SET AFTER - 25% ELONGATION - INITIAL 15% CHANGE AFTER AGING -35%
#14	WATER VAPOUR PERMIABILITY USING GARDNER PARK PERMIABILITY CUP	ASTM 1653	COLUMBINE LAB		WATER VAPOUR TRANSMISSION 4.7 GRAINS PER SQ. FT. PER HR. AVERAGE PERMEANCE 310 PERMS. AVERAGE PERMIABILITY 8.8 PERM IN. (AT AVERAGE THICKNESS OF 28.4 MIL).
#15	WATER ABSORPTION - SATURATION OF 5 WEEKS	ASTM D-570	COLUMBINE LAB		INCREASE IN WEIGHT 31%. SOLUBLE MATTER LOST 2.8%. WATER ABSORBED 34%. NO CHANGES IN APPEARANCE OF MATERIAL AFTER RECONDITIONING.

<u>REF. NR.</u>	TEST CRITERIA	STANDARD	LABORATORY	<u>REF. NR.</u>	REPORT
#16	WATER USING GARNER CUP E-96	ASTM E-96	COLUMBINE LAB		AVERAGE PERMEANCE 310 PERMS. AVERAGE PERMEABILITY 8.8 PERM IN.
#17	SURFACE OZONE CRACKING, TOTAL OF 70 DAYS TESTED.	ASTM D-1149	COLUMBINE LAB		NO FAILURE OBSERVED IN DURATION OF TEST.
#18	CHEMICAL RESYSTANCE IN A 16 HOUR SPOT TEST	ASTM D-1380	CALCOAST ANALYTICAL-ITL		RESULTS AVAILABLE ON ORIGINAL REPORT.
#19	TUNNEL TEST OF SURFACE BURNING ON CEMENT BOARD	ASTM E84	JOHNS MANVILLE LABORATORY ACCREDITED BY NATIONAL VOLUNTARY LABORATORY ACCREDITATION PROGRAMME USA	F97-85	QUALIFIES AS A CLASS 1 RATING. FLAMESPREAD = 6.3 SMOKE DEVELOPMENT = 1.9
#20	CLASS A FIRE TESTING (TESTS FOR FIRE RESISTANCE OF ROOF COVERING MATERIALS)	UL 790 ASTM E-108	UNDERWRITERS LABORATORIES INC.	86NK28409	FLYING BRANDS - NONE. DECK EXPOSURE - NONE. LATERAL FLAME SPREAD - NONE.
#21	LOW TEMP. STABILITY TEST: INTERIOR COATING	JIS A 6909 (1984) 5.5	MIYAHARA & CO. LTD.	631532	PASSED: REQUIREMENTS: SHOULD NOT SEPARATE. INGREDIENTS SHOULD NOT SEPARATE, NOT JOINT TOGETHER.
#21	RESISTANCE OF CRACKING AT INITIAL DRYING STAGE TEST: INTERIOR COATING	JIS A 6909 (1984) 5.7	MIYAHARA & CO. LTD.	631532	PASSED: REQUIREMENTS: SHOULD NOT HAVE OCCURRENCE OF CRACKS.

<u>REF. NR.</u>	TEST CRITERIA	STANDARD	LABORATORY	<u>REF. NR.</u>	REPORT
#21	ADHESION STRENGTH (NORMAL CONDITION) TEST: INTERIOR COATING	JIS A 6909 (1984) 5.8	MIYAHARA & CO. LTD.	631532	PASSED: AVERAGE = 158.8 N/cm² MINIMUM STANDARD = 29.4 N/cm²
#21	WASHABILITY TEST: INTERIOR COATING	JIS A 6909 (1984) 5.11	MIYAHARA & CO. LTD.	631532	PASSED: REQUIREMENT: SHOULD NOT PEEL NOR RUB OFF.
#21	IMPACT, SHOCK RESISTANCE TEST: INTERIOR COATING	JIS A 6969 (1984) 5.12	MIYAHARA & CO. LTD.	631532	PASSED: REQUIREMENT: SHOULD NOT CRACK, CHIP, PEEL NOR OBVIOUS CHANGE SHAPE OR FORM.
#21	ALKALINITY TEST: INTERIOR COATING	JIS A 6909 (1984) 5.13.2	MIYAHARA & CO. LTD.	631532	PASSED: REQUIREMENT: SHOULD NOT CRACK, BLISTER, PEEL, NOR GUMMING, SHOULD NOT HAVE NOTICABLE COLOR CHANGE NOR DULLNESS
#21	DISCOLOURATION TEST: INTERIOR COATING	JIS A 6909 (1984) 5.17	MIYAHARA & CO. LTD.	631532	PASSED: (GRAY SCALE # 4-5) REQUIREMENT: SHOULD NOT CRACK, PEEL, SHOULD DISCOLOUR ABOVE GRAY SCALE # 3

<u>REF. NR.</u>	TEST CRITERIA	STANDARD	LABORATORY	<u>REF. NR.</u>	REPORT
#21	HEAT RESISTANCE TEST: INTERIOR COATING	JIS A 6909 (1984) 5.18 / JIS A 1321	MIYAHARA & CO. LTD.	631533	<p>FUSION: PASSED: REQUIREMENT: SHOULD NOT FUSE THE TOTAL THICKNESS OF THE TESTING BODY.</p> <p>FISSION: PASSED: REQUIREMENTS: SHOULD NOT HAVE WIDTH OF CREVICES NO MORE THAN 1/10 OF THICKNESS AT THE REVERSE SIDE.</p> <p>TRANSFORMATION: PASSED: REQUIREMENTS: SHOULD NOT HAVE OBVIOUS HARMFUL SHAPE OR FORM AFTER HEAT IS EXTINGUISHED.</p> <p>FLAME RETENTION: PASSED: REQUIREMENTS: FLAME SHOULD NOT REMAIN OVER 30 SECONDS AFTER HEATING STOPPED.</p> <p>BOW AT COOLED TEMP: PASSED: REQUIREMENTS: THE BOW SHOULD NOT EXCEED THE BOW AT NORMAL TEMP.</p> <p>COMBUSTION COEFFICIENT OF AREA UNIT: PASSED: MEASUREMENTS ARE 8, 9, 8</p>
#22	LOW TEMP. STABILITY TEST: EXTERIOR COATING	JIS A 6909 (1984) 5.5	MIYAHARA & CO. LTD.	631533	<p>PASSED: REQUIREMENTS: SHOULD NOT SEPARATE. INGREDIENTS SHOULD NOT SEPARATE, NOT JOINT TOGETHER.</p>
#22	RESISTANCE OF CRACKING AT INITIAL DRYING STAGE TEST: EXTERIOR COATING	JIS A 6909 (1984) 5.7	MIYAHARA & CO. LTD.	631533	<p>PASSED: REQUIREMENTS: SHOULD NOT HAVE OCCURRENCE OF CRACKS.</p>

<u>REF. NR.</u>	<u>TEST CRITERIA</u>	<u>STANDARD</u>	<u>LABORATORY</u>	<u>REF. NR.</u>	<u>REPORT</u>
#22	ADHESION STRENGTH (NORMAL CONDITION & AFTER SATURATION) TEST: EXTERIOR COATING	JIS A 6909 (1984) 5.8	MIYAHARA & CO. LTD.	631533	NORMAL CONDITIONS: PASSED
					AVERAGE = 138.2 N/cm² MINIMUM STANDARD = 49.0 N/cm²
					AFTER SATURATION: PASSED AVERAGE = 234.2 N/cm² MINIMUM STANDARD = 29.4 N/cm²
#22	RESISTANCE TO REPEATED TEMP. CHANGE TEST: EXTERIOR COATING	JIS A 6909 (1984) 5.9	MIYAHARA & CO. LTD.	631533	PASSED: REQUIREMENT: SHOULD NOT PEEL, CRACK, BLISTER NOR NOTICEABLE DISCOLOURATION, DULLNESS ON THE SURFACE.
#22	WATER PROOF (PENETRATION) TEST: EXTERIOR COATING	JIS A 6909 (1984) 5.10	MIYAHARA & CO. LTD.	631533	PASSED: RESULT = 0.1 cm MINIMUM REQUIREMENT = 1.0 cm
#22	WASHABILITY TEST: EXTERIOR COATING	JIS A 6909 (1984) 5.11	MIYAHARA & CO. LTD.	631533	PASSED: REQUIREMENT: SHOULD NOT PEEL NOR RUB OFF.
#22	IMPACT, SHOCK RESISTANCE TEST: EXTERIOR COATING	JIS A 6969 (1984) 5.12	MIYAHARA & CO. LTD.	631533	PASSED: REQUIREMENT: SHOULD NOT CRACK, PEEL NOR OBVIOUS CHANGE SHAPE OR FORM.
#22	ALKALINITY TEST: EXTERIOR COATING	JIS A 6909 (1984) 5.13.2	MIYAHARA & CO. LTD.	631533	PASSED: REQUIREMENT: SHOULD NOT CRACK, BLISTER, PEEL, NOR GUMMING, SHOULD NOT HAVE NOTICABLE COLOR CHANGE NOR DULLNESS
#22	RESISTANCE TO WEATHER & CLIMATE TEST: EXTERIOR COATING	JIS A 6909 (1984) 5.14	MIYAHARA & CO. LTD.	631533	PASSED: (GRAY SCALE # 4-5) REQUIREMENT: SHOULD NOT CRACK, PEEL, SHOULD DISCOLOUR ABOVE GRAY SCALE # 3