Testing to Avoid Problems

The StoneLite® panels system and its installing components have been thoroughly tested by leading global independent testing laboratories. They are accepted by code officials in North America for unrestricted use as exterior cladding for Type 1 buildings and likewise are accepted throughout the majority of Europe. Summaries of test results are presented below. Copies of the original test reports are available upon request.

Acid Freeze-Thaw

1. Acid Freeze-Thaw Accelerated Aging by Wiss, Janney, Elstner Associates, Inc. Reference WJE Report No. 2005.2577 dated 26 September 2006

   Flexural strength tests in accordance with ASTM C880 procedure and Tensile bond tests in general accordance with ASTM D897 procedure were conducted on both new and 19- year old StoneLite specimens to measure strength, durability and performance characteristics. Tests were conducted on current production of Rosa Porrino granite, Indiana limestone, plus both new Roman Classic Travertine and Roman Classic Travertine that had been installed on the exterior of a building in the Chicago, IL area 19 years ago. The accelerated weathering consisted of exposing specimens to a cyclic temperature from -10 F to +170 F for 100 cycles while partially submerged in a 4-pH sulfuric acid solution to simulate acid rain. After 100 cycles of exposure StoneLite granite lost 2.7% of ultimate load flexural strength, limestone lost 6.3%, new travertine lost 4.7%, and old travertine lost 3.7%. The strength of new travertine and 19-year of travertine was similar in the longitudinal orientation although the old travertine had lower strength in the transverse orientation. Tensile bond strength tests were not conclusive because most of the specimen failure was due to internal fracturing of the stone while the bond to honeycomb did not fail.

2. Test method developed by Wiss Janney Elstner Associates Engineers. Reference SwRi report No. 04-6751-124/141

   White Carrara marble, Indiana limestone, Roman Classic travertine and Black Impala granite StoneLite panels were subjected to an accelerated aging procedure of temperature cycling 100 times from +170 F to -10 F while the stone face, bond line and honeycomb were submerged in a 4-pH sulfuric acid solution. The exposed specimen and corresponding control samples were then subjected to one-quarter-point flexure loading, placing the stone and bond line in tension. There was no bond failure, which would have been considered possible due to the shear stress between the stone and the honeycomb. The StoneLite panel flexure strength loss averaged only 13%, as compared with a loss of flexural strength in solid dimensional stones of 25% to 70% of their original strength. Wiss Janney Elstner Associates Engineers followed this testing with both accelerated aging and flexural tests.

3. Test method developed in Europe, conducted by PARTEK in Finland. Reference FARTEK Report MATLAB 33/96

StoneLite white Carrara marble panels were subjected to 200 cycles of 4 pH acid rain, UV radiation exposure, and temperature variation from -30 C (-22 F) and 25 C (77 F). There was an average of less than 6% reduction in bond strength following the 200 cycles of exposure. As a result of this testing and two (2) years of additional investigation, the technical committee for Finlandia Hall in Helsinki approved the StoneLite panel system for replacement of solid 4 cm dimensional stone slabs that had warped with many having fallen from the exterior walls.

4. Freezing & thawing in water in accordance with ASTM C-67.
   Reference Ramtech Laboratories Report No. 8098A-87

   StoneLite panels were exposed to 100 cycles of freezing at 0 F for 20 hours, followed by thawing in water at a temperature of 75 F for 4 hours, then repeating the freezing and thawing procedure immersed in water. The average flatwise tension bond capacity was 290 psi (41,760-lbs per sq. ft.) following the 100 cycle test.

5. Epoxy-set T-nut insert pullout following accelerated aging in accordance with ASTM D 1183.
   Reference Ramtech Laboratories Report No. 8081-87

   Pull tests were conducted on resin set threaded inserts after exposure to 160 F for 48 hours, followed by water immersion 48 hours, followed by -70 F for 8 hours and finally 100 F for 64 hours. After 50 cycles of exposure, the average pullout capacity was 1,387 lbs. After exposure to oxygen bomb aging 168 hours at 300-psi pressure and temperature of 158 F, the average pullout strength was 1,301 lbs.

6. Shear and flatwise tension bond tests were conducted in accordance with ICC Test Standard AC05 for the purpose of evaluating the bonding adhesive. Reference Columbia Research & Testing Report ESR No. 183.

   Shear and flatwise tension bond tests were conducted after StoneLite panels had been subjected to accelerated aging by submerging in water 48 hours, drying at 145 F for eight hours, followed by three cycles of soaking 16 hours and drying 8 hours. After aging, the average shear capacity increased from 914 psi to 948 psi (136,512 lbs. per sq. ft.), and the average flatwise tension capacity also increased from 309 psi to 337 psi (48,528 lbs. per sq. ft.)

7. Freezing & thawing then flatwise tensile testing in accordance with ASTM C-297 comparing Sandstone (Stanton Moore) to Limestone. Reference Terrapin Testing, Inc Report No. 50427

   Panels were exposed to 25 cycles of freezing at -40 F for 2 hours, followed by 2 hours at a temperature of 70 F then 2 hours at +160 F and finally one hour at 0F. The English Sandstone showed no loss of strength, the typical failure being the stone cohesive failure. The average flatwise tension bond capacity was 333 psi (47,952-lbs./sq. ft.) both before & after 25 cycles.

Air and Water Infiltration

1. Air infiltration in accordance with ASTM £ 283-73 and water penetration in accordance with ASTM E 331-70. Reference Construction Consulting Laboratory Report Jan. 25-Feb.l, 1988

   A steel stud framed assembly measuring 8 ft. x 12 ft. was clad with StoneLite Travertine panels. The panels were attached with Dow Corning 795 structural silicone. Joints between the unfilled travertine (natural voids in the stone) were also sealed (caulked) with Dow Corning 795 structural silicone sealant. The StoneLite assembly successfully passed air infiltration and water penetration tests both before and after thermal cycling temperatures between +180 F and -20 F. After passing the 30-psf-design load and 45-psf overload, the simulated negative wind load was taken to 180 psf (equal to 265 miles per hr.).

2. Air infiltration in accordance with ASTM E 283-73 and water penetration in accordance with ASTM E 331-70. Reference Construction Consulting Laboratory Report September & October 1988

   A steel stud framed assembly measuring 9 ft. - 6 in. wide by 17 ft. high was clad with varying types and sizes of StoneLite marble panels. These panels were attached with T-nut inserts bolted to connection clips and welded to the framing. The assembly successfully passed air infiltration and both static and dynamic water penetration tests before and after thermal cycling temperatures between +210 F and - 10 F. Structural testing was terminated at 88 psf simulated negative wind load when a clip connecting the steels stud framing to the test chamber twisted and failed. There was no panel failure.

Structural and Impact Load Tests

1. Hurricane wind load and missile impact tests in accordance with South Florida Building Code and SBCC1 Impact requirements.
   Reference Hurricane Test Laboratory Report #0053-0403-95

   StoneLite panels, attached 24-in. o.c. to steel stud frames, resisted numerous large missile impacts from 8 ft. long wood 2x4s traveling at over 50 ft. per second. There was an instantaneous deflection of the panel (sometimes exceeding 1 inch), but the Stonelite panels were neither penetrated nor chipped. The StoneLite panel assemblies also successfully withstood 1342 repetitions of positive-negative 90-psf design wind loading, followed by 135 psf (150% of design wind pressure). All test criteria was met and South Florida Code acceptance was obtained.

2. Racking shear tests, simulating seismic loading, conducted in accordance with ASTM E-695.
   Reference Ramtech Laboratories Report No. 8125-87

Racking shear tests were conducted on StoneLite panels attached to steel stud framing with epoxy-set threaded inserts bolt attached to clip angles. The 8-ft. x 8-ft. assemblies were loaded to over 5,000 lbs. producing deflections of 2 1/2 inches. There was no major chipping nor damage, no disengagement, and no bond loss. When loaded to failure, the connection clips distorted and there was connection clip weld failure on the back-up framing.

3. Positive and negative uniform wind load flexural tests.
   Reference Construction Consulting Laboratory Report dated January 10,1986

   Uniform loads were applied to panels, approximately 60-in. x 30-in., in a simulated glazed-in condition. A maximum of 413 lbs. per sq. ft. negative load was resisted without damage or failure.

4. Impact tests conducted in accordance with ASTM E-695.
   Reference Ramtech Laboratory Report No. 8125-87

   Impact tests were conducted on StoneLite panels and also on 3-cm thickness solid granite for the purpose of comparing resistance to impact. All tests were conducted with panels or slabs spanning 42 inches. StoneLite panels resisted 540 ft.-lbs. impact loading with only some fine surface cracking, no change in surface finish nor any other damage. This amount of impact was the maximum possible for the equipment in this laboratory. Unofficial testing on Stone Panels exceeded 3,600 ft.-lbs. impact without failure. By comparison, the 3-cm thick solid granite shattered into pieces as soon as impacted a load of 60 ft.-lbs.

5. Resistance to vibration loading at various frequencies.
   Reference Construction Consulting Laboratory Report dated July 1989,

   A 24-in.x30-in. StoneLite panel was subjected to vibration loading from 13.2 to 65.0 hertz in an attempt to separate the stone facing from the aluminum honeycomb reinforcing. After 50 hours of vibration loading at various frequencies, there was no change in the StoneLite panel. All criteria were met.

6. Flexure testing in accordance with ASTM E-72 and ICC requirements.
   Reference Ramtech Laboratories Report No. 7619-85, dated Feb. 21,1986

   Flexure tests were conducted on StoneLite panels 48 inches wide, and spans of 35.5 inches, 51.5 inches and 92.5 inches. In addition, StoneLite panels were subjected to accelerated aging by rapid cycling of temperature for 2 hours at -40 F, 2 hours at 70 F, 2 hours at 160 F and 1 hour at 0 F, for 25 cycles.

7. Continuation of flexure testing (#6 above) in accordance with ASTM E-72, plus flatwise tension bond testing, to meet ICC requirements.
   Reference Ramtech Laboratories Report No. 7619B-85 dated April 16,1986

After accelerated aging, the average flatwise tension bond, or resistance to delamination, was 385 psi (55,440 lbs./sq. ft). Additional flexural tests were also conducted on StoneLite panels spanning 35.5 inches. The report notes that "Apart from transverse cracking of stone facing in tension, no evidence of definitive failure was observed, even when loads well in exceeds of 300 pounds per square foot were applied." A maximum of 479 lbs. per sq. ft. positive load was resisted on a 35.5-in. span.

Fire Testing

1. A full-scale multi-story fire evaluation was conducted in accordance with UBC Standard No. 17-6.
   Reference Southwest Research Institute Report No. 01-1274

   A two-story structure, approximately 17 ft. by 17 ft., with a floor-to-floor height of 12 ft. was clad with StoneLite panels. The structure had a 4 ft. high by 8 ft. long window on one of elevation of the first floor. A calibrated crib of dried wood weighing 1285 lbs., located near the window opening, was ignited by kerosene poured over the crib in addition to pans of kerosene under the crib. Temperatures inside the building reached 2000 F. StoneLite panels on the exterior surface were exposed to temperatures exceeding 1200 F and the temperature in the aluminum honeycomb core reached 715 F. After 30 minutes of exposure, only small chips of the stone veneer had dislodged. The stone had cracked and was charred up to an elevation of 17 ft. in the area exposed to intense fire. The assembly resisted vertical spread of flame for the duration of the test. There was no flame propagation through the honeycomb core and no flame propagation to adjacent lateral spaces. Temperatures measured 1-inch from the interior surface, within the second story, did not exceed 130 F. The StoneLite wall panel system met all criteria.

2. A modified ASTM E-108 fire test was conducted on a 6 ft. by 10 ft. assembly clad with stone panels. Reference Southwest Research Institute Report No. 01-2602- 218

   StoneLite panels were attached with epoxy-set inserts, bolt attached to angle clips, which in turn were welded to steel stud framing. The assembly was subjected to furnace temperatures exceeding 1500 F, and the exposed stone surface temperature reached 1199 F during the 30 minutes duration. All StoneLite panels remained in place and intact. The assembly met all required criteria.

3. Flame spread and combustion determined by the Standard Method of Test for Surface Burning Characteristics of Building Materials, conducted in accordance with ASTM E 84.

   The results were: Flame Spread Index = 5, Smoke Developed = 5 and Fuel Contributed = 0. As a result, the panels meet Class A or Class I requirements.

4. StoneLite panels were tested according to the new British Standard BS 8414-2 at the Building Research Establishment.

This UK test is the equivalent of the UBC 17-6 test where a two walled structure measuring 8 meters (25 ft.) high is subjected to an intense fire from a crib built in the structure. StoneLite panels met all performance criteria and are one of the first cladding panels to pass this very stringent test.

5. Fire propagation tests were conducted in accordance with BS 476: Part 6: 1989.
   Reference Fulmer Yardley Ltd. Report No. J86257/1 & 2.

   The results qualify StoneLite for a Class 1 flame spread classification. StoneLite was also defined as Class "0" for fuel contribution. Both achieving the highest classification.

6. Tests to measure ignitability, spread of flame, heat evolved and smoke developed were conducted in Melbourne, Australia.
   Reference AW TA Textile Testing Report No. 7-422502-FV

   All indexes were below the range of 0 to 10 qualifying StoneLite panels for the highest rating.

7. Evaluation of the Acute Inhalation Toxicity tests were conducted according to University of Pittsburgh Test Method.
   Reference Southwest Research Institute Report No. 01-8818-705

   It was concluded that StoneLite panels are "no more toxic than wood (Douglas Fir)".

8. Potential heat of combustion tests were conducted in accordance with ASTM D-2015 and UBC Standard No. 17-2.
   Reference United States Testing Company Report No. LA64184

   The potential heat of StoneLite panels is 1150 BTU per pound according to these criteria.

Attachment System Testing & Miscellaneous

1. T-Nut insert wind load tested, Reference Construction Consulting Laboratory Report No. 90-9144.

   Full-scale panel testing with potted inserts subjected to bending, shear and torsion via wind loads up to 256 lbs./sq.ft. with typical in-service spacing.

2. Expansion Coefficients of panels with various stone finish veneers, Reference Dallas Laboratories Report No. 12352.

   Testing was undertaken to establish the coefficient of linear expansion for StoneLite with various stone family types. Results confirmed that the expansion is controlled by the stone, in a range from 4.0 to 5.0 x 10-6 in/in deg F.

3. Interlocking Channels (Narrow) installed over Rigid Insulation Board Load Testing. Reference Construction Consulting Laboratories Report No. CCLI-00-090

   StoneLite panels were installed with Interlocking Channels over 2-inch thick 25-psi compression strength rigid insulation board. The Interlocking Channels were screw attached through the insulation board and through the sheathing to steel stud-framing backup. The panels were gravity loaded to determine whether there might be rotation of the screws and whether the insulation board could resist resultant compression forces. There was no screw rotation and no deformation of the insulation board after applying a gravity load of 61 lbs. per sq. ft. (18 times the StoneLite weight).

4. Kerf and Z-Clip attachment system Full Scale Wind Load Testing. Reference Construction Consulting Laboratories Report No. 92-9256

   Full Scale testing of StoneLite panels Kerf & Z-Clip attachment system for positive and negative wind loading. No failure of any part of the system up to the test chamber limit of 190 lbs./sq.ft.

Building Code Approval & Quality Control Testing

1. The following U.S. Building Code Authorities have approved Stone Panels for Exterior Use on unlimited height construction:
   - International Code Council Report PFC 4397. The ICC-ES was established from the prior four US code bodies (ICC, NER, SBCCI & BOCA). Our prior ICC report has been transferred to the ICC.
   - City of Los Angeles - Research Report RR-24922
   - City of New York - MEA 373-87-M
   - Miami-Dade County NOA 02-1104.11
   - Southern Building Code Congress (SBCCI) Report No. 8799 - Original approval later amalgamated with ICC & ICC.
   - Avis Techniques Nos 2/06-1210 French Code Approval see Volume 6.
2. Quality Control Related Testing & Inspection Reports.

   Various tests by independent Laboratories and by Stone Panels, Inc in-house testing, plus copies of US & French Audit reports, including:

   - ICC Inspection company CI Professional Services Inspection Report.
   - CSTB (Avis Technique) Inspection Report
   - Plascore, Inc. QC testing for Salt Spray resistance of the Honeycomb core.
   - J.D. Lincoln Certified Laboratory for Flatwise Tensile Testing of 1/500 of production panels for Q.C. purposes and the annual ICC tests.
   - Stone Panels Inc QC testing of Flatwise Tension for 1/50 of production panels and pullout values of potted inserts of 1/50 production panels.

French Building Code Approval & CSTB Tests

1. French Building Code Approval, Reference Avis Technique No 2/06-1210 Approval of Granite, Marble and standard Limestone.

   This acceptance is currently awaiting renewal and updating which is expected by summer 2007. Extensive testing listed below undertaken and product approval was achieved in 1998. Due to change in European sales agent from a French company to a UK firm, the renewal has taken additional time.

2. French Building Code Approval, Reference Avis Technique No 2/06-1210.

   This is specifically for the structurally weakest limestone sold by the Rocamat company in France to resolve problems of installation of limestone less than 150mm (6") thick. This is also currently under review for renewal with the above.

3. The following tests carried out by the CSTB (Centre Scientifique et Technique du Batiment) to investigate StoneLite panels for their suitability for the above code approval, both copies of the original test reports in French and the English translations are available upon request:
   - CL98-068 - Thermal Shock testing with cycles of high radiant temperature followed by cold-water spray.
   - CL98-072 - Combination of Fatigue cycles and sudden negative pressure up to the limits of the test apparatus.
   - CL98-074 - Accelerated Aging (Freeze -Thaw) followed by flatwise tensile testing. Virtually all resulted in cohesive failure in the stone itself.
   - CL98-075 - Hydrothermal (humidity cycling) followed by flatwise tensile testing. Virtually all resulted in cohesive failure in the stone itself or the test rig.
   - CL98-076 - Impact testing. Soft bag weights had no effect, a few chips occurred from steel balls being dropped. Note such forces would shatter dimensional stone.
   - CL98-096 - Thermal Cycling on large panels with attachments. Cycling also included simulated rain.

Test of Time

StoneLite® panels were developed and patented more that 37 years ago in Ireland. Production was established in the United States in 1983 and subsequently moved to the current 175,000 sq. ft. manufacturing facility located in Coppell, Texas in 2002. The first notable exterior cladding project in the United States was a five-story office building in Dallas completed in 1980.

Of course, the ultimate test of any product is The Test of Time and StoneLite® has proven performance on building exteriors throughout the world for over 37 years. From Montreal, Quebec to Miami, Anchorage to San Diego, London to Seoul and Moscow to Toronto,

StoneLite® adorns some of the finest commercial buildings in the world. A partial list of completed exterior projects and project profiles may be found in the StoneLite® Specifications Binder and on the Stone Panels, Inc. website at www.stonepanels.com.

The Stone Panels, Inc. quality control program includes cutting samples of epoxy saturated glass cloth from every production run for future evaluation. Those samples have been retained from the date of initial production. In addition, two (2) samples are cut from randomly selected panels out of every 25-panel production run for flatwise bond and epoxy-set insert testing. For additional quality control, there are unannounced inspections and review of records by a Quality Control Inspector for the International Code Council four (4) times each year for the United States. Inspections and audit are also conducted by the CSTB group of building officials for the Avis Technique, the evaluation for French approval and by the BBA for the United Kingdom.

For more information on testing of our StoneLite® panels, please contact our Technical Services Staff.

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