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5360 South Workman Mill Road
Whittier, California 90601

**SOUTHERN BUILDING CODE
CONGRESS INTERNATIONAL, INC.**

900 Montclair Road
Birmingham, Alabama 35213

NATIONAL EVALUATION REPORT

Report No. NER-313

September, 1985

**CYGNUS PANEL
CYGNUS, INC.
1580 LINCOLN STREET
DENVER, COLORADO 80203**

I. Subject: Cygnus Panels.

II. Description: A. General: The panel consists of a nonbearing steel stud wall framing system to which minimum No. 22 gauge, 1 1/2-inch-deep ribbed, hot-dipped galvanized steel decking is screw-attached. The stud framing is limited to a maximum deflection of L/240. Minimum 1/4-inch-thick ceramic facing tile with a maximum unit area of 720 square inches and maximum weight of 3 1/2 pounds per square foot is applied to the deck facing with Dow Corning 795 Silicone Building Sealant at the rate of 7 square inches per square foot of tile by application of symmetrically placed 3/8-inch beads which are compressed to a 3/4-inch width when the tile is properly installed. Tile edges along the panel perimeter must be continuous supported to allow placement of adhesive beads. The tile is set in place with sufficient pressure to set the adhesive and ceramic facing tile. The minimum 3/8-inch gap in horizontal and vertical tile joints are completely filled with the Dow Corning 795 Silicone Adhesive to provide a watertight ceramic tile facing. Tile joints at panel perimeter require backer rods to provide a base for the adhesive.

Stud wall cavities are filled with minimum 2-inch-thick CW40 or 1-inch CW90 Thermafiber insulation and covered on the inside face with minimum 1/2-inch Type X gypsum wallboard attached to studs with 1-inch Type S drywall screws at 8 inches on center along edges and 12 inches on center at intermediate studs.

Where interior and exterior temperature differentials require special precautions to reduce condensation in wall cavities, the interior facing must be backed with a vapor barrier.

The Cygnus Panel is fabricated on the job site under special inspection approved by the building official or in the shop of an approved fabricator specifically recognized by the National Evaluation Service Committee.

B. Fire-resistive Assemblies: One- and two-hour fire-resistive nonbearing exterior wall assemblies deal with steel studs to which the Cygnus panels are attached to the exterior face and multiple layers of 5/8-inch Type X gypsum wallboard to the interior face.

Two-hour: Studs at a maximum 24 inches on center are protected on the inside face with four layers of 5/8-inch Type X gypsum wallboard. The base layer is attached to studs at right angles with 1-inch Type S drywall screws at 12 inches on center. The second layer is attached to studs with 1 5/8-inch Type S drywall screws using only two screws per board. The third layer is attached in the same manner except 2 5/8-inch Type S drywall screws at 23 inches on center. At each stud No. 26 gauge by 1 1/2-inch steel strips are applied vertically over the third layer and attached to the studs with 2 5/8-inch Type S drywall screws at 12 inches on center. The face layer is attached to the steel strips with 1-inch Type S drywall screws at 8 inches on center. Gypsum wallboard joints are staggered between layers.

One-hour: Studs at a maximum 16 inches on center are protected on the inside face with two layers of 5/8-inch Type X gypsum wallboard. Minimum 3-inch-thick, 1 pcf density glass fiber insulation is friction fitted between studs. The wallboard base layer is attached vertically to minimum 0.030-inch-thick steel furring channels placed horizontally at 24 inches on center with 1-inch Type S drywall screws at 16 inches on center. Furring channels are attached to each stud with 1-inch, Type S drywall screws. The face layer is attached vertically to furring channels with 1 7/8-inch Type S drywall screws at 12 inches on center along the top and bottom edges, and laminated to intermediate furring channels with drywall adhesive.

C. Identification: Each panel has a metal tag affixed thereto with the words "Cygnus Patent No. 4506482" and the NER number.

III. Evidence Submitted: 1. Report of tests by Construction Research Laboratories, Inc. on air infiltration by static pressure, water infiltration by static pressure, water infiltration by dynamic pressure, structural performance tests by static pressure and tile structural failure tests.

2. Descriptive data on the panel system.

3. Specification sheet for Dow Corning 395 Construction Adhesive.

4. Report of tests by Dow Corning and observed by Wiss, Janney, Elstner Associates, Inc., on tensile strength tests on Dow Corning 795 Silicone Building Sealants after water immersion, QUV weatherometer exposure and shear strength tests on Dow Corning 795 Silicone Sealant at elevated temperatures.

5. Quality assurance program on fabrication of Cygnus Panels.

6. Fire-resistive assemblies WP-7125 and WP-9060 as noted in tenth edition of Gypsum Association Fire-Resistive Design Manual.

Findings

IV. Findings: The National Evaluation Service Committee finds that the Cygnus Panels comply with the 1984 Basic/National Building Code and 1985 Supplement, the 1985 Standard Building Code and the 1985 Uniform Building Code, subject to the following conditions:

1. Components and installation comply with this report and the manufacturer's instructions.
2. Fabrication is in the shop of an approved fabricator recognized by the National Evaluation Service or done on the job site under special inspection as approved by the building official.
3. Calculations and plans on the steel framing, metal siding and attachments are submitted to the building official for approval prior to panel fabrication.
4. With proper design of the steel framing, siding and connections, the tile adhesive system can be installed in areas with negative and positive wind pressures up to 60 pounds per square foot.

This report is subject to re-examination in one year.

CORRECTED DECEMBER, 1985

This report is limited to the specific product and data and test reports submitted by the applicant in its application requesting this report. No independent tests were performed by the National Evaluation Service Committee and the committee specifically does not make any warranty, either expressed or implied, as to any finding or other matter in this report or as to any product covered by this report. This disclaimer includes, but is not limited to, merchantability. This report is also subject to the limitations listed herein.



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Report No. NER-313

October 1, 1991

THIS REPORT IS SUBJECT TO
RE-EXAMINATION IN TWO YEARS

NATIONAL EVALUATION REPORT

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CYGNUS WALL PANEL

CYGNUS, INC.
1580 LINCOLN STREET
DENVER, COLORADO 80203

I. SUBJECT: Cygnus Wall Panels.

II. PROPERTIES FOR WHICH EVALUATION IS SOUGHT:

- A. Structural Performance
- B. Weatherability

III. DESCRIPTION: A. General: The Cygnus Panel consists of a nonbearing steel stud wall framing system to which minimum No. 22 gauge, 1 $\frac{1}{2}$ -inch-deep ribbed, hot-dipped galvanized steel decking or minimum No. 22 gauge flat steel sheet is screw attached. Ceramic tile veneer units are adhesively applied to the steel decking with Dow Corning 795 silicone building sealant in the Adhered-only System. Dow Corning 795 silicone building sealant and gravity load carrying ledger angles support granite, Class IV travertine marble or Class III limestone veneer units in the Combination Anchored-Adhered System. The granite, Class IV travertine marble and Class III limestone veneer units shall be exterior grade. The units shall meet the ASTM specifications given in Table No. I.

The stone veneer units shall have smooth or standard sawn finishes. The random protrusions and indentations of the finish shall not exceed $\frac{3}{32}$ of an inch.

The Cygnus Panel is fabricated on the jobsite under special inspection as approved by the code official and detailed in Section IV of this report.

B. Adhered-only System: In this system the ceramic tile veneer units are supported entirely by Dow Corning 795 silicone sealant. The maximum thickness of the facing tiles shall not exceed $\frac{3}{8}$ inch and the minimum thickness shall not be less than $\frac{1}{4}$ inch. The weight of the veneer unit shall not exceed 3 $\frac{1}{2}$ psf. The veneer unit area shall not exceed 720 square inches and the maximum dimension shall not exceed 36 inches. The structural silicone shall be applied at a rate of not less than 7.0 square inches per square foot of the tile by application of symmetrically placed $\frac{3}{8}$ -inch beads which are compressed to a $\frac{3}{4}$ inch width when the tile is properly installed. The distribution of adhesive beads on the tile shall be per footnotes 1 to 4 of Table No. II.

C. Combination Anchored-Adhered System: Gravity loads shall be carried by corrosion-resistant ledger angles intermittently placed and mechanically attached to the steel stud wall framing system. All lateral loads shall be carried by structural silicone which shall be applied in accordance with Table No. II. The veneer units shall not exceed 20 square feet in area, or 30 psf. Thicknesses shall be between $\frac{3}{8}$ inch and 2 inches. The maximum dimension of the veneer unit in any one direction shall not exceed 7 feet.

D. Fire-resistive Assemblies: One- and two-hour fire-resistive non-bearing exterior wall assemblies consist of steel studs to which the Cygnus panels are attached on the exterior face and multiple layers of $\frac{5}{8}$ -inch Type X gypsum wallboard on the interior face. The assemblies shall be constructed as described in the Gypsum Association Fire-Resistive Design Manual, fire-resistive assemblies WP-7125 and WP-9060.

IV. INSTALLATION: A. General: Those surfaces on the assembled steel frames to which the structural silicone is to be applied shall be cleaned with toluene solution and primed with Dow Corning 1200 primer before the application of the sealant. The primer shall be applied in a thin film so that when the primer is completely dry no chalking or flaking occurs. If chalking is evident, the excess primer shall be removed with a clean, dry lint free cloth.

The beads of structural sealant shall be applied to the cleaned metal surface. The beads shall be uniform in size and not more than $\frac{1}{16}$ inch smaller in diameter than specified. The pattern of adhesive positioning shall be symmetrical and evenly distributed. The axis of the structural silicone bead shall be placed vertical, slanted or semicircular shaped with the bottom end open.

The panels shall not be moved in any manner that would cause the cladding material to shift until the sealant has cured a minimum of 15 days.

A minimum $\frac{3}{8}$ -inch joint shall be maintained horizontally and vertically between the veneer units. This joint shall be filled with Dow Corning 795 sealant.

The Dow Corning 795 silicone building sealant shall be symmetrically applied in beads not less than $\frac{1}{2}$ inch in diameter, except as noted in Section III B. When compressed, the sealant shall have a nominal thickness of $\frac{1}{4}$ inch and a minimum thickness of $\frac{1}{8}$ inch. The veneer units shall be set in place with sufficient pressure to set the adhesive against both the steel decking and the veneer facing material. A minimum $\frac{3}{8}$ -inch horizontal and vertical joint shall be maintained between the veneer units. Units shall be properly aligned prior to curing of sealant. The joint shall be filled with Dow Corning 795 sealant.

Closed cell-foam plastics backer rods which are compatible with the Dow Corning 795 sealant shall provide a base for the caulking at panel perimeter joints.

B. Special Inspection Items: The code official shall require full-time quality control inspection by an architect or engineer. The quality control inspector's responsibility will be to ensure that the fabrication, erection and installation of the panel components comply with this report. The inspector shall keep daily records in a job log book. The job log book shall be made available upon request to the building official, and to Cygnus. Each entry in the job log book must identify the project, the panel or portion of work involved, the type of test or inspection performed, and the date. Each entry shall be initialed by the project representative.

This report is limited to the specific product and data and test reports submitted by the applicant in its application requesting this report. No independent tests were performed by the National Evaluation Service Committee, and the committee specifically does not make any warranty, either expressed or implied, as to any finding or other matter in this report or as to any product covered by this report. This disclaimer includes, but is not limited to, merchantability. This report is also subject to the limitation listed herein.

A representative from Cygnus shall be present at the start of the project to assist in the instruction of the fabricator's personnel. This instruction shall continue until Cygnus has ascertained that those responsible for the program are fully acquainted with the system, and that the operation is being carried out within the guidelines established by Cygnus and this report.

1. **Cleanliness of Substrates:** a. On every panel the quality control inspector shall check the cleanliness of the steel surface by wiping over the cleaned surface with a clean, white cloth. If any residue is found the surface shall be rejected and re-cleaned. Daily records shall be kept regarding this inspection.

b. On a daily basis the quality control inspector shall inspect and verify the cleanliness of the surface of the veneer units.

2. **Sealant Shelf Life Tests:** Structural silicones have a limited shelf life of six months from date of shipment when stored at temperatures of 80°F. or less. When stored at temperatures which exceed 80°F., the shelf life is shorter. For each shipment the manufacturer, the product name, the lot number, color, date shipped/arrived and the quantity shall be recorded.

The following test shall be conducted each week, or more frequently if there is reason to suspect there is a problem with the sealant. The results shall be recorded in the job log book for each lot number.

Spread a $\frac{1}{16}$ -inch to $\frac{1}{8}$ -inch-thick film of structural silicone on a sheet of polyethylene. Record sample preparation time in job log book at that time. Allow sample to cure for 24 hours at 70°F. and 50-percent relative humidity. After 24 hours, peel the sealant off the polyethylene sheet. Record test time in job log book. Stretch the sealant slowly to see that it is cured and contains the characteristics of an elastomeric rubber. The sealant should stretch and return to its original length. If the sealant does not perform according to these guidelines, all the remaining sealant from that lot shall be rejected and not used in the production of any future panels.

3. **Tests for Minimum Surface Contact Area of Adhesive:** a. At least four times a week, or more often if deemed necessary by the code official or jobsite inspector, at nonpreset times, the quality control inspector shall measure the bead size, bead length and dimension of the gap between the face of the veneer unit and steel deck to verify that all dimensions are correct. The results shall be recorded in the job log book, along with the date and time of the inspection.

b. At least twice a week, at a nonpreset time, the quality control inspector shall remove a veneer unit that has just been set and measure the surface-contact area of adhesive for the veneer unit. This shall be checked against the required contact area and all data entered in the job log book. The removal, contact area measurements and resetting of the veneer piece shall be accomplished within 20 minutes of the original silicone placement. New beads shall be laid over the original beads. If the 20 minute time limit is exceeded, all of the silicone shall be removed and both substrates re-cleaned.

4. **Caulking Joint Adhesion Test:** After the joint caulking has been cured for a period of not less than 14 days, the caulked joint shall be tested for adhesion by using the following method. At least two samples of each day's erected panels shall be randomly selected and tested. The results shall be recorded in the job log book.

- a. Make a knife cut horizontally from one side of the joint to the other.
- b. Make two vertical cuts (from the horizontal cut) approximately 2 inches long, at the sides of the joint.
- c. Grasp the 2-inch piece of sealant firmly and pull at a 90-degree angle or more.
- d. If the sealant tears cohesively before releasing adhesively from the substrate, the adhesion is acceptable.
- e. If the sealant does release adhesively from the substrate before tearing cohesively, five more joints shall be tested.

If one or more of the five additional joints tested also fail, the entire day's production of panels shall be rejected and the sealant lot shall be tested for shelf life.

g. If none of the five joints fail, the entire day's erection of panels can remain in place, with the exception of those panel joints which originally failed. Those joints which originally failed shall be redone.

h. Panels which pass this test shall be repaired in the area of the test by applying more sealant to the joint in the same manner as originally applied. The original sealant surface shall be clean before the new sealant is applied.

5. **Tests for Minimum Size of Caulking Joints:** At least twice a day, or more often if deemed necessary by the code official or the jobsite inspector, at nonpreset times, the quality control inspector shall measure the width of horizontal and vertical joints between veneer units on at least five panels. The results shall be recorded in the job log book, along with the date and time of the inspection.

V. **IDENTIFICATION:** The Cygnus Wall Panels shall be labeled after final inspection in the field. The label shall contain the product name, type of veneer, sealant name, name and address of the fabricator, Cygnus' name and address, the National Evaluation Service report number, the label of the third party inspection agency and the date of final inspection.

VI. **EVIDENCE SUBMITTED:** 1. Test No. 4231, dated July 9, 1984 by Construction Research Laboratories, Inc. Panels with $\frac{5}{16}$ -inch-thick ceramic tile veneer units were tested for air infiltration by static pressure in accordance with ASTM E 283, water infiltration by static pressure in accordance with ASTM E 33, water infiltration by dynamic pressure in accordance with AAMA TH-1-76, structural performance tests by static pressure and structural failure tests for a 60 psf wind load in accordance with ASTM E 330.

2. Tensile Strength Tests on Dow Corning 795 Silicone Building Sealant after Water Immersion, WJE No. 840670, dated August 6, 1984 by Wiss, Janney, Elstner Associates, Inc.

3. WJE No. 840670, Shear Strength Tests on Dow Corning 795 Silicone Building Sealant at Elevated Temperatures, dated September 24, 1984 by Wiss, Janney, Elstner Associates, Inc.

4. WJE No. 840670, Tensile Strength Tests on Dow Corning 795 Silicone Building Sealant after QUV Weatherometer Exposure, dated November 12, 1984 by Wiss, Janney, Elstner Associates.

5. Order No. SFR-1599, Reports Nos. 1 to 5, dated May 18—September 9, 1987 by PTL—Inspectorate, Inc. Test specimens were prepared with granite veneer units. Comparisons were made between the ultimate tensile strength of specimens cured at room temperature, specimens immersed in water for 7 days and specimens exposed to 2,400 hours of QUV weathering.

6. Performance Test Report of Cygnus Granite Panel, dated August 27, 1985 by Construction Consulting Laboratory, Inc.

7. Test Report No. 88-1056, dated March 7, 1989 by Hauser Laboratories. Samples of limestone, slate and granite were tested for shear failure at elevated temperatures at two stress levels.

8. Test Report No. 89-0368, dated June 28, 1989 by Hauser Laboratories. The shear strength of Dow Corning 795 Silicone Building Sealant on ceramic tile, granite, limestone and travertine marble was tested after conditioning.

9. Order No. 71599, Pull Tests Results, dated May 30, 1989 by Construction Materials Testing, Inc.

10. Order No. 71599, dated May 30, 1989 by Construction Materials Testing, Inc. Testing similar to that described in Item No. 9 above was conducted on samples prepared with travertine marble.

11. Gypsum Association Fire-Resistive Design Manual, dated August, 1988, fire-resistive assemblies WP-7125 and WP-9060.

VII. **CONDITIONS OF USE:** The National Evaluation Service Committee finds that the Cygnus Panels described in this report are an alternate method of construction to that specified in the 1990 BOCA National Building Code, with 1991 Supplement, the 1991 Standard Building Code, and the 1988 Uniform Building Code, with the 1990 Accumulative Supplement, subject to the following conditions:

1. The panels shall be fabricated and erected to comply with this report.
2. The physical properties of the veneer units shall comply with this report. Use of veneers other than those discussed in this report are beyond the scope of this report.
3. All permit applications for buildings using Cygnus Panels shall be accompanied by structural calculations and plans which are sealed by a registered architect or professional engineer who is qualified

- to perform such work. The plans shall state the specified stone and its thickness, the bead pattern and the size and length of the structural silicone bead. Plans for mechanically adhered systems shall also show the location of the gravity support device (corrosion-resistant ledger angles), the device size, width and thickness and method of attachment of device to panel frame with type and size of fastener specified.
- The calculations required by Item No. 3 above shall also address the steel framing of the panel, the steel decking and the connection of the panel to the building. If the combination attachment system is used, the calculations should address all mechanical attachments. Design shall be for all applicable dead, wind and seismic loads, per the requirements of the applicable code.
 - Drawings shall indicate the method of installation at all wall open-

- ings, corners and panel terminations and details of penetration of the panel system.
- The Cygnus Panel shall not be used in areas where the design wind load exceeds 60 psf.
- Jobsite inspection shall be provided as noted in Section IV-B.
- Connections and panel joints shall be designed for relative movements between stories due to seismic forces as set forth in Sections 1113.11 of the BOCA National Building Code for those locations which use the BOCA Code, Section 1206.11 of the Standard Building Code for those locations that use the Standard Code, and Section 2312 (h) 2D (iii) of the Uniform Building Code for those locations that use the U.B.C.
- Deflection of the panel framing shall be limited to L/240 when subjected to design wind loading.

TABLE NO. I—SUMMARY OF ASTM REQUIREMENTS FOR PHYSICAL PROPERTIES OF SELECTED STONE VENEERS

PHYSICAL PROPERTY	TEST REQUIREMENTS	ASTM TEST METHOD
GRANITE ASTM C 615-80		
Absorption by weight, maximum percent	0.4	C 97
Density, minimum lb./ft. ³ (kg/m ³)	160 (2560)	C 97
Compressive strength, minimum psi (MPa)	19,000 (131)	C 170
Modulus of rupture, minimum psi (MPa)	1,500 (10.34)	C 99
LIMESTONE ASTM C 568-79		
Class III—High density only		
Absorption by weight, maximum percent	3	C 97
Density, minimum lb./ft. ³ (kg/m ³)	160 (2560)	C 97
Compressive strength, minimum psi (MPa)	8,000 (55)	C 170
Modulus of rupture, minimum psi (MPa)	1,000 (6.9)	C 99
MARBLE ASTM C 503-79		
Class IV—Travertine only		
Absorption by weight, maximum percent	0.75	C 97
Density, minimum lb./ft. ³ (kg/m ³)	144 (2305)	C 97
Compressive strength, minimum psi (MPa)	7,500 (52)	C 170
Modulus of rupture, minimum psi (MPa)	1,000 (7)	C 99

TABLE NO. II—MINIMUM AREA AND PATTERN OF STRUCTURAL SILICONE FOR COMBINATION ANCHORED-ADHERED SYSTEM

WIND LOAD (psf)	REQUIRED AREA OF ADHESIVE ^{2,3} PER SQ. FT. OF VENEER UNIT (in. ² /sq. ft. of unit)
30	4.8
40	6.4
50	8.0
60	9.6

¹Adhesive beads shall be uniformly distributed over the width and height of each tile or veneer unit with beads located near the corners and around the edge perimeter. The maximum interior spacing between beads shall not exceed:

$$l = 13.856t \left[\frac{f_r}{W(F.S.)} \right]^{1/2}$$

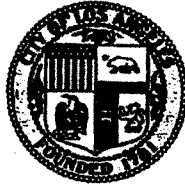
where:

- l* = adhesive spacing (inches)
- t* = thickness of the tile or stone (inches)
- f_r* = modulus of rupture (psi)
- W* = wind load (psf)
- F.S.* = Factor of Safety. *F.S.* shall be that specified by the engineer of record for the project under construction, but not less than 8 for granite, travertine marble or Class III limestone, or 4.0 for ceramic tile.

The maximum edge spacing of beads (cantilever-type span) shall not exceed one-half of the maximum interior spacing.

- ²When the *h/t* ratio (height of unit/thickness) is between 24 and 6, one-half of the adhesive shall be centered not more than one fifth of the veneer unit height from the top and bottom of the veneer unit.
- ³When *h/t* is between 6 and 3, the area of adhesive provided shall be increased by 25 percent.
- ⁴Ratios of *h/t* less than 3 shall not be used.

CITY OF LOS ANGELES
CALIFORNIA



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DEPARTMENT OF
BUILDING AND SAFETY
407, CITY HALL
LOS ANGELES, CA 90012-4869

WARREN V. O'BRIEN
GENERAL MANAGER

TIMOTHY TAYLOR
EXECUTIVE OFFICER

Cygnus, Incorporated
1580 Lincoln Street, #1200
Denver, CO 80203

RESEARCH REPORT: RR 25062

BASED UPON ICBOES EVALUATION
REPORT NO. NER-313

Attn: Joanne Fanganello
(303) 832-7367

REEVALUATION DUE DATE:
September 1, 1993

GENERAL APPROVAL - Reevaluation - Cygnus Non Bearing Wall Panels.

DETAILS

The above assemblies and/or products are approved when in compliance with the description, use, identification and findings of Report No. NER-313, dated October, 1990, of the (CABO) Council of American Building Officials. The report, in its entirety, is attached and made part of this general approval.

Conditions of Approval:

1. These panels may be installed in lieu of nonbearing noncombustible exterior walls as allowed in the Los Angeles Building Code Section 1803(a), Exception 1; 1903(a); Exception 1; 2003(a), Exception 1; and 2103(a), Exception 1; and may be used on Type V Buildings as allowed in the 1990 Los Angeles City Building Code Section 1606(b), Exception 1, provided:
 - a) The building is sprinklered throughout.
 - b) The interior of the building is separated from the panel by two layers of 5/8-inch-thick Type X gypsum wallboard installed in accordance with the 1990 Los Angeles City Building Code.

RR 25062

Page 1 of 3

Cygnus, Incorporated
RE: Cygnus Wall Panels

2. Panels shall be fabricated by a Los Angeles City approved fabricator.
3. Exposed edges of the panel shall be covered.
4. Complete engineering design and calculations for panel connections to framing shall be designed by a California registered engineer or architect and submitted to the Plan Check Division.
5. Dow Corning No. 795, applied between the panel back and the extrusion as a structural silicone sealant, shall be designed by an engineer as per City of Los Angeles Research Report No. 24637.
6. Design of connections of the panel to the building framing system shall be designed to meet Deformation Compatibility requirements of 91.2312(h)2D of the 1990 Los Angeles City Building Code.
7. The panel is non-structural and cannot transfer loads, however it can support it's own weight and wind load.

DISCUSSION

The parts of Report No. NER-313 which are excluded on the attached copy have been removed by the Los Angeles Building Department as not being included in this approval.

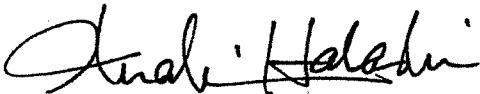
This wall system was tested in accordance with UBC Standards 43-1, and UBC Standards 17-2, dated 1988.

This general approval of an equivalent alternate to the Code is only valid where an engineer and/or inspector of this Department has determined that all conditions of this approval have been met in the project in which it is to be used.

This general approval will remain effective provided the Evaluation Report is maintained valid and unrevised with the issuing organization. Any revisions to the report must be submitted to this Department, with appropriate fee, for review in order to continue the approval of the revised report.

Cygnus, Incorporated
RE: Cygnus Wall Panels

Addressee to whom this Research Report is issued is responsible for providing copies of it, complete with any attachments indicated, to architects, engineers and builders using items approved herein in design or construction which must be approved by Department of Building and Safety Engineers and Inspectors.



IBRAHIM HABASHI, Chief
Research and Development Division

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GG:sav
RRR25062
R7.28.92
1C/1C1/1C2/4D1/1712B4B

Attachments: CABO Evaluation Report No. NER-313 (5 Pages).
Structural Details (3 Pages).

TESTED QUALITY

Approved Laboratory Tests

- *Construction Research Laboratory, Inc.*, Miami, Florida
September 20, 1982 Nissan Office and Training Facility, Portland, Oregon
December 10, 1985 TRW, Fairfax, Virginia
February 12, 1987 COBO Hall, Detroit, Michigan
October 19, 1987 Jamboree Center, Phase 2A, Irvine, California
November 30, 1987 AT&T Irvine Centre, Irvine, CA
- *Construction Consulting Laboratory, Inc.*, Carrollton, Texas
July 16, 1984 Uranga Towers, San Antonio, Texas
August 27, 1985 Cygnus Granite Test Panel
- *Smith-Emery Company*, Los Angeles, California
March 12, 1987 Shear and Tensile Strength Tests Cygnus Granite Panels
March 26, 1987 Tensile Tests Cygnus Granite Panels
- *Construction Consulting Laboratory*, Ontario, California
September 21, 1987 160 West Santa Clara, San Jose, California
- *Building Research Association of New Zealand*, Wellington, New Zealand
April 14, 1988 Cygnus Ceramic Test Panel
- *National Building Technology Centre*, Sydney, New South Wales, Australia
December 23, 1987 Cygnus Panel System

Tests Performed

- Air Infiltration by Static Pressure (ASTM E283)
- Water Infiltration by Static Pressure (ASTM E331)
- Water Infiltration by Dynamic Pressure (NAAMM TM-1-68T; AAMA TM-1-76)
- Structural Performance by Static Pressure (ASTM E330)
- Structural Safety Factor Performance by Static Pressure (ASTM E330)
- Thermal Cycling Test
- Seismic Performance at 200% Design Displacement (1.42")
- Fire Resistance Tests of Elements of Building Construction AS 1530.4-1985

Structural Silicone Tests

- Dow Corning U.S.A. and Tremco tests witnessed by Wiss, Janney, Elstner Associates, Inc., Consulting and Research Engineers, Chicago, San Francisco, Princeton, Honolulu, Denver, Dallas
 - * Tensile Strength After 7-day Water Immersion
 - * Tensile Strength after QUV Weatherometer, 2400 hour exposure
 - * Shear Strength at Elevated Temperatures
- Dow Corning 795 Silicone Fire Resistant Joint Treatment System, Design No. U900D per UL263, ASTM E119

Code Approvals

- NER 313
 - * Building Officials and Code Administrators International, Inc.
 - * International Conference of Building Officials
 - * Southern Building Code Congress International, Inc.
- National Building Technology Centre, Sydney, NSW, Australia No. 88/002

Performance

- The Cygnus Panel has passed all of the above tests.
- Results of the tests are available through Cygnus, Inc.

CYGNUS PANEL SYSTEM - SEISMIC CHARACTERISTICS

The Cygnus Panel was reviewed for seismic performance by KKBNA Inc. Structural Engineers. The engineer doing the report was:

Charles D. Keyes, Principal,
KKBNA
Structural Authority
California Registration #1775

He reported:

"In our opinion, the lightweight Cygnus Panel incorporates the desirable characteristics for use in seismic activity areas:

1. It is lightweight (about 6 lbs. per sq. ft.), which minimizes the effective seismic force as compared to a heavy panel such as 6" precast concrete (75 lbs. per sq. ft.). These seismic forces are, of course, directly related to the weight of the material.
2. The panel is flexible, being constructed entirely of lightweight steel studs and channels (16 gauge), and ribbed metal decking.
3. The panel has toughness as a result of the material used and the configuration of the ribbed paneling, which provides a yielding-type diaphragm action.
4. The connection of the tile panels to the structural frame work is by a relatively thick bead of silicone adhesive, which has an inherent elasticity which allows the structural panel to absorb significant deformation without adversely affecting the individual tiles.
5. The test results that have been provided to us by the testing laboratory indicate the panel can carry forces greatly in excess of design forces without damage to the tile or permanent deformation of the structural frame. (The tiles fractured at 180 lbs. psf suction force. The adhesive connecton remained intact and the structural frame was undamaged at 180 lbs. psf.)"



DOW CORNING U.S.A.

MIDLAND, MICHIGAN 48640-0994
Telephone: (517) 496-4000

To: _____

Date: _____

Warranty No: _____

Project Reference: _____

To assure you and your clients that the DOW CORNING® silicone construction sealants you have selected will perform to your satisfaction, Dow Corning provides compatibility and adhesion testing and print/specification review services. For the project referenced above, you have submitted the material samples and prints/specifications listed on the attached schedule. Based on testing of these materials and review of the prints/specifications, Dow Corning makes the following warranty.

Dow Corning Corporation warrants that the DOW CORNING® silicone construction sealant(s) indicated on the attached Testing/Review Summary Sheet will not fail adhesively or cohesively for a period of 20 years from the date of purchase, if:

- a) The sealant is applied in strict compliance with Dow Corning's published application procedures and with any requirements indicated on the Testing/Review Summary Sheet, and
- b) The sealant is used with the materials listed on the attached Schedule which have been approved for compatibility and adhesion, and
- c) The samples which have been submitted for testing are representative of the materials actually used on the project, and
- d) The application of the sealant and the joint configurations are completed in accordance with the project prints/specifications which are listed on the attached Schedule, and
- e) The sealant is applied within its stated shelf life, and
- f) Field adhesion tests are made and documented to confirm adhesion under site conditions.

This warranty shall become null and void if materials are substituted for those listed on the Schedule without Dow Corning's prior written approval of the substitute materials for compatibility and adhesion.

DOW CORNING

July 13, 1988

Cygnus, Inc.
1580 Lincoln St.
Suite 1200
Denver, CO 80203

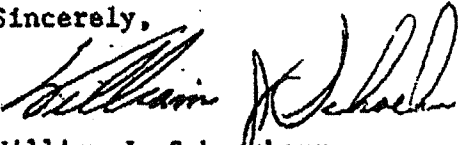
Attention: Mr. William Loper

Reference: SEALANT DESIGN STRENGTH FOR SHEAR STRESSES

This letter is to confirm our conversation regarding the allowable instantaneous lateral shear movement for DOW CORNING® 795 Silicone Building Sealant. The sealant design strength for this application is 20 psi.

I hope this information is helpful to you. If you have any further questions or comments, please feel free to call me.

Sincerely,



William J. Schacherr
Building Products Industry
Technical Service and Development
Phone: (517) 496-5498

cc: L. Carbary - Dow Corning Corporation, 069

D9/147/pb

PRINT/SPECIFICATION REVIEW

DOW CORNING'S PRINT/SPECIFICATION REVIEW IS UNDERTAKEN FOR THE SOLE PURPOSE OF DETERMINING THE SUFFICIENCY OF THE JOINT DESIGNS TO PROVIDE PROPER ADHESION IN ACCORDANCE WITH THE SPECIFIED TYPES AND SIZES OF MATERIALS AND THE WINDLOAD SPECIFICATIONS. DOW CORNING ASSUMES NO RESPONSIBILITY FOR THE PROPRIETY OR ADEQUACY OF THE SPECIFIED MATERIALS OR FOR ANY STRUCTURAL DESIGN ELEMENTS IN THE PRINTS AND/OR SPECIFICATIONS FOR THE PROJECT, AND DOW CORNING EXPRESSLY DISCLAIMS ANY WARRANTY OR RESPONSIBILITY WHATSOEVER FOR SUCH MATERIALS OR STRUCTURAL DESIGN ELEMENTS.

LIMITATIONS

This warranty specifically excludes adhesive and/or cohesive failure of the sealant due to:

- a) Natural causes such as lightning, earthquake, hurricane, tornado, fire, etc., or
- b) Movement of the structure resulting in stresses on the sealant which exceed Dow Corning's published specifications for elongation and/or compression for the sealant, whether due to structural settlement, design error or construction error.

And does not cover damage to, or failure of, the sealant due to:

- a) Disintegration of the underlying substrates, or
- b) Mechanical damage caused by individuals, tools or other outside agents.

REMEDIES

In the event of a claim under this warranty, you must notify Dow Corning within 30 days of the discovery of the claimed defect and provide Dow Corning with the opportunity to inspect. Dow Corning shall, for a period of 20 years from the date of purchase of the sealant, be responsible for the cost of replacement material and labor for any repairs made necessary by a failure of the sealant under this warranty up to a maximum of five times the purchase price of the sealant utilized to make the necessary repairs.

DOW CORNING SHALL NOT BE LIABLE FOR AND EXPRESSLY DISCLAIMS ANY LIABILITY FOR ANY DAMAGE TO THE CONTENTS OF THE STRUCTURE OR FOR CONSEQUENTIAL OR INCIDENTAL DAMAGE, WHETHER IN CONTRACT OR IN TORT, INCLUDING NEGLIGENCE. THIS WARRANTY IS IN LIEU OF ALL OTHER WRITTEN OR ORAL, EXPRESS OR IMPLIED WARRANTIES.

Construction Products TS&D

DOW CORNING

April 26, 1988

Paoli Construction
685 S. Manchester
Anaheim, CA 92802

Attention: Allan Swartz

Reference: JAMBOREE II - IRVINE. CA

Dow Corning has tested and reviewed the above referenced project based upon peel adhesion test results to Travertine jobsite samples and galvanized metal, and ageing characteristics of DOW CORNING® 795 Silicone Building Sealant, we have recommended DOW CORNING 795 Silicone Building Sealant for use on this project in a structural application.

For this application, the structural sealant has a design strength of 20 psi. This design strength has been industry standard for twenty plus years. Dow Corning structural sealants have not suffered any catastrophic failures during this time. Dow Corning offers a warranty which states that the sealant will not fail adhesively or cohesively for twenty years. Actual life of the sealant has not been determined because a QUV weatherometer cannot cause the sealant to become brittle, crack, harden, or lose adhesion.

Dow Corning Silicone Sealants have been on the market for twenty-five years and those twenty-five year old sealants are as rubbery and flexible today as they were when they were installed. Under normal weathering one can fully expect the sealant to maintain design loads for 50 years.

DOW CORNING 795 Silicone Building Sealant is recognized as a structural sealant in the following reports:

ICBO	NER 313
City of Los Angeles	Research Report RR24637
ICBO	4291

DOW CORNING

DOW CORNING U.S.A.

910 AUBURN COURT
FREMONT, CALIFORNIA 94538
Telephone: (415) 490-9302

June 26, 1986

Cygnus Inc.
1580 Lincoln St.
Suite 1200
Denver, CO. 80223

Attention: Jo Anne Fanganello

Reference: PRE-APPROVAL OF CYGNUS DESIGN WITH DOW CORNING® 795
SILICONE BUILDING SEALANT

The standard design for the Cygnus System incorporates structural silicone adhering tiles or panels to galvanized metal decking. The dead load on the sealant must not exceed one psi and the sealant shall not have a glue thickness less than 1/8". Under these conditions Dow Corning approves this design.

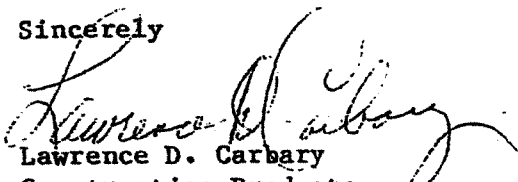
If any modifications exceed these limits, the system will no longer be pre-approved.

We will still require testing of substrates for each job the Cygnus licensee erects. This way we can better service our customers by being aware of their projects.

Please forward this letter to your licensees, as this letter can be used for architectural submittals.

If you need anything else please feel free to call me.

Sincerely


Lawrence D. Carbary
Construction Products
Technical & Service Development

L-4:el

cc: B. Schoenherr, Dow Corning Corp., Midland, MI #069

DOW CORNING U.S.A.

MIDLAND, MICHIGAN 48640
Telephone: (517) 496-4000

November 3, 1983

OFFICE OF THE STATE ARCHITECT
Structural Safety Section
107 S. Broadway, Room 3029
Los Angeles, CA 90012

Attention: Mr. Harold Dewdney

Reference: WEATHERING DATA: DOW CORNING® 790 SILICONE
BUILDING SEALANT
DOW CORNING® 795 SILICONE
BUILDING SEALANT

The following data are the results documented after exposing the above referenced sealants for 1500 hours in an Atlas Weatherometer. The configuration of the test specimen is according to ASTM Standards for evaluating "slab properties" of cured silicone rubber. This data does not represent the strength of any silicone sealant in a structural adhesive application. Also, the following data illustrates the limited change of initial and post cured properties of only two types of Dow Corning Silicone Construction Sealants.

Initial Cured Properties

7 Days @ 77F (25C) and 50% RH

	DOW CORNING® 790 Silicone Building Sealant	DOW CORNING® 795 Silicone Building Sealant
Durometer, Shore A	15	30
Ultimate Tensile Strength, psi (@ maximum elongation)	100	350 170
Tensile Strength, psi (@ 100% elongation)	29	87
Tear Strength, die B, ppi	27	30

Mr. Harold Dewdney
November 3, 1983
Page 2

Post Cured Properties

1500 Hours Exposure

	DOW CORNING® 790 Silicone Building Sealant	DOW CORNING® 795 Silicone Building Sealant
Durometer, Shore A	14	32 (2000 Hrs.)
Ultimate Tensile Strength, psi (@ maximum elongation)	68	214
Tensile Strength, psi (@ 100% elongation)	55	97
Tear Strength, die B, ppi	25	30

The above data represents minimal changes in durometer and tear for both sealants. DOW CORNING 790 Silicone Building Sealant decreased in ultimate tensile, but increased tensile at the 100% elongation measurement. DOW CORNING 795 Silicone Building Sealant performed similarly.

Similar testing was also done by Dow Corning on various premium organic sealants and it was found that usually, durometer and tear would decrease by 50 percent and Ultimate Tensile and Tensile at 100% Elongation would decrease approximately 60 percent after only 1000 hours in the Atlas Weatherometer.

Application of silicones in structural applications involve "composite" design. It is Dow Corning's opinion that the strength required to maintain DESIGN LOADS will be maintained for 50 years under normal weathering conditions. This opinion is based on accelerated and natural weathering data for the last 20 years.

If you need any further information, don't hesitate to call Betsy Bymaster, our Construction Specialist in your area (714)-556-7200 or me.

Sincerely,

David M. Horschig

David M. Horschig
Construction Products
Technical Service & Development
DOW CORNING CORPORATION
Phone: (517)-496-5980

cc: B. Miller - Dow Corning Corporation, Atlanta
B. Bymaster - Dow Corning Corporation, Irvine
B. Graul - Dow Corning Corporation, Irvine
H. Pracht - Buchtal USA, Atlanta
H. Jacobson - Buchtal USA, Atlanta

d2/ccc/rmc