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The following material resulting from the investigation under the above numbers is enclosed.

**Issue**

<u>Date</u>	<u>Vol</u>	<u>Sec</u>	<u>Pages</u>	<u>Revised Date</u>
2004/05/23	1		Revised Test Record 1-1	2005/03/21

Inspections at your plant will be conducted under the supervision of Mr. Heishin Yang, Head of Field Services, UL Korea Ltd., 33rd Floor Star Tower, 737 Yeoksam-dong Kangnam-gu, Seoul 135-984, Korea. PHONE: +822-2009-9170; FAX: +822-2009-9416; E-MAIL: Heishin.Yang@kr.ul.com.

Please file revised pages and illustrations in place of material of like identity. New material should be filed in its proper numerical order.

NOTE: Follow-Up Service Procedure revisions DO NOT include Cover Pages, Test Records and Conclusion Pages. Report revisions DO NOT include Authorization Pages, Indexes, Section General Pages and Appendices.

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**UNDERWRITERS LABORATORIES, INC.****333 PFINGSTEN RD. NORTHBROOK, IL 60062-2096****(847) 664-2014 FAX (847) 509-6395****DATE: OCTOBER 5, 2004****TO: J. T. BROWN  
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**NUMBER OF PAGES INCLUDING THIS PAGE: 9****JT,****I HAVE ATTACHED A COPY OF THE TEST REPORT AS REQUESTED.  
AN ADDITIONAL COPY WILL BE SENT TO KOREA.****REGARDS,****ROBERT S. KIEFER (EXT. 42014)  
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File R21541  
 Project 04CA21752

September 23, 2004

REPORT

on

ROOFING SYSTEMS, UPLIFT RESISTANCE

Under The

CLASSIFICATION PROGRAM

Roser Co Ltd  
 Kyongbuk; Korea, Republic Of

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GENERAL

INVESTIGATION:

The purpose of this investigation was to evaluate the uplift resistance capability of various metal roof covering products that were attached to plywood deck. Test data was developed in accordance with ANSI/UL 1897, "Uplift Tests for Roof Covering Systems."

For testing of the stone coated steel panel, three products were submitted for evaluation identified as "Spany", "Roserbond" and "Rowood". It was determined that the "Spany" panel would be representative of the three stone coated products. Therefore, testing was waived on the "Roserbond" and "Rowood" products.

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DESCRIPTION

PRODUCT COVERED:

The products covered by this Report are metal roof panels designated "Spany", "Roserbond" and "Rowood."

The products in this Report are Classified as to uplift resistance only.

USE:

The products are intended for use as building materials as permitted by authorities having jurisdiction.

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TEST RECORD NO. 1

## GENERAL:

Test results relate only to the items tested.

## UPLIFT TESTS:

## MATERIALS:

The following is a description of the materials used in the assemblies:

Wood Joists - The supports were nominal 2 by 10 in. (1-1/2 by 9-1/4 in. actual) No. 2 grade Spruce-Pine-Fir wood framing members.

Plywood - Nominal 1/2 in. (15/32 in. actual) thick APA rated, Grade B-C plywood.

Wood Battens - Nominal 2 in. by 2 in., No. 2 grade Spruce-Pine-Fir.

Felt Paper - Type 30 asphalt saturated felt.

Plastic - 6 mil thick polyethylene was used to prevent pressure leakage.

Fasteners (Nails) - 8d nails for plywood deck attachment and 16d nails to secure the battens through the plywood deck and the steel metal roof panel to the battens.

Fasteners (Screws) - No. 8 by 1-1/2 in. long hex-head screws were used to attach the metal roof products to the battens and plywood to the wood joists. No. 10 by 3-1/2 in. long phillips-head screws were used to attach the battens to the plywood deck.

Roof Covering - copper panel (17 in. by 52-1/2 in. over all, with 2-5/8 in. overlap) designated "Spany" and stone coated steel panel (16-1/2 in. by 53-1/4 in. over all, with 3 in. overlap) designated "Spany". The stone coated steel panel is made from 0.0165 in. thick steel and has an acrylic and stone-chip coating. The copper panel is made from 0.0197 in. thick copper.

## CONSTRUCTION OF TEST ASSEMBLIES:

The assemblies were constructed under the observation of members of Underwriters Laboratories' technical staff. Nominal 2 in. by 10 in., No. 2 grade wood joists were spaced 24 in. OC for all assemblies. One layer of 15/32 in. thick, Grade B-C plywood was fastened to the wood joists with No. 8 coarse thread 2-1/2 in. long screws. The screws were spaced 6 in. OC at the plywood joints and perimeter and 12 in. OC in the field for assemblies 1 and 2. In assembly No. 3, the plywood was attached to the joists with 8d nails, spaced 4 in. OC in the perimeter and 6 in. OC in the field. For all assemblies, Type 30 felt was stapled to the plywood deck.

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## Assembly No. 1

2 X 2 battens, spaced 14-5/8 in. OC was attached through the plywood deck with one No. 10 by 3-1/2 long screw at every batten/wood joist intersection. Polyethylene was then laid over the entire assembly. The "Spany" copper panel was then fastened to the battens with five, evenly spaced, No. 8 hex head screws, by 1-1/2 in. long, per full-length panel.

## Assembly No. 2

2 X 2 battens, spaced 14-5/8 in. OC was attached through the plywood deck with one No. 10 by 3-1/2 long screw at every batten/wood joist intersection. Polyethylene was then laid over the entire assembly. The "Spany" stone coated steel panel was then fastened to the battens with five, evenly spaced, No. 8 hex head screws, by 1-1/2 in. long, per full length panel.

## Assembly No. 3

2 X 2 battens, spaced 14-5/8 in. OC was attached through the plywood deck with one 16d nail at every batten/wood joist intersection. Polyethylene was then laid over the entire assembly. The "Spany" stone coated steel panel was then fastened to the battens with five, evenly spaced, 8d nails, per full-length panel.

## TEST PROCEDURE:

The Classification for uplift resistance, expressed in PSF, is derived from tests conducted in accordance with the Standard, "Uplift Tests for Roof Covering Systems", UL 1897. The test method subjects a minimum 10 ft by 10 ft test sample to various short-term (1 min increment) static pressures which represent the uplift forces imposed on a roofing system's securement to a specified roof deck when exposed to high velocity winds.

The test apparatus consisted of two sections: a top section measuring 10 ft by 10 ft to create a uniform vacuum, and a bottom section measuring 11 ft by 11 ft. The chamber is provided with a static pressure tap located such that the pressure readings are not affected by the velocity of the air into or from the chamber. A manometer is used to determine the vacuum pressure.

The pressure differences were adjusted such that a stabilized 30 psf uplift pressure was exerted upon the roofing system attachment and held for 1 min. This process was repeated with additional 15 psf maximum pressure increments, each held for 1 min.

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#### RESULTS

Assembly No. 1 was subjected to uplift pressure in accordance with the loading schedule through a maximum of 120 psf. Prior to and during the attainment of the 120 psf pressure, there was no sign of fastener withdrawal or damage to any of the panels. The mode of failure after 120 psf was the panel fasteners (screws) withdrew from the batten, lifting up the panels.

Assembly No. 2 was subjected to uplift pressure in accordance with the loading schedule through a maximum of 125 psf. Prior to and during the attainment of the 125 psf pressure, there was no sign of fastener withdrawal or damage to any of the panels. The mode of failure after 125 psf was the panel fasteners (screws) withdrew from the batten, lifting up the panels.

Assembly No. 3 was subjected to uplift pressure in accordance with the loading schedule through a maximum of 105 psf. Prior to and during the attainment of the 105 psf pressure, there was no sign of fastener withdrawal or damage to any of the panels. The mode of failure after 105 psf was the second course batten fasteners withdrew from the plywood, lifting up the batten and panels. The steel panel remained attached to batten.

#### PRACTICABILITY:

The construction materials used in the roofing systems were readily installed by qualified workers with tools and methods commonly used for construction work of similar nature.

Materials and installation procedures in accordance with those previously described in the Report are significant factors in the uplift resistance performance of the roofing systems.



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## CONCLUSION

The following conclusions represent the judgment of Underwriters Laboratories Inc. based upon the results of the examination, tests and data analysis presented in this Report, as they relate to established principles and previously recorded data.

The stone coated steel and copper roof coverings are judged to be eligible for Classification and Follow-Up Service of Underwriters Laboratories Inc.

Under the Service, the manufacturer is authorized to use the UL Classification Marking on such products which comply with the Follow-Up Service Procedure and any other applicable requirements of Underwriters Laboratories Inc. Only those products which properly bear the UL Classification Marking are considered as Classified by Underwriters Laboratories Inc.

The Classification Marking to be used for the roof coverings utilized in the above systems is illustrated below:

PREPARED ROOF COVERING MATERIALS FOR  
ROOFING SYSTEMS, UPLIFT RESISTANCE  
AS TO UPLIFT RESISTANCE

Roofing System Classifications will be promulgated as shown below:

PREPARED ROOF COVERING MATERIALS SYSTEMS:

- 1) Uplift Resistance: 120 psf  
**Joists:** Graded dimension lumber, No. 2 or better. Spaced a maximum of 24 in. OC.  
**Deck:** Min. 15/32 in. thick, Grade B-C plywood, all joints to occur over supports.  
**Battens:** 2 in. by 2 in. No. 2 grade wood battens, spaced a maximum of 14-1/2 in. OC, laid perpendicular to the wood joists.  
**Fasteners:** Fasteners used to attach the roof covering to the battens to be a minimum of five, evenly spaced, No. 8 hex head screws by 1-1/2 in. long, per full length panel. Fasteners used to attach the battens through the plywood (into the joists) to be one No. 10 by 3-1/2 in. long screw at every batten/wood joist intersection.  
**Underlayment:** Any UL Classified base or ply sheet, min. 2 in. side lap, attached per manufacturers recommendations.  
**Roof Covering:** Max. width 53-1/4 in. and 17 in. long (14-5/8 in. exposure). Manufactured from min. 0.0197 in. thick copper designated "Spany."

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2) Uplift Resistance: 105 psf  
**Joists:** Graded dimension lumber, No. 2 or better. Spaced a maximum of 24 in. OC.  
**Deck:** Min. 15/32 in. thick, Grade B-C plywood, all joints to occur over supports.  
**Battens:** 2 in. by 2 in. No. 2 grade wood battens, spaced a maximum of 14-1/2 in. OC, laid perpendicular to the wood joists.  
**Fasteners:** Fasteners used to attach the roof covering to the battens to be a minimum of five, evenly spaced, 8d nails per full length panel. Fasteners used to attach the battens through the plywood (into the joists) to be one 16d nail at every batten/wood joist intersection  
**Underlayment:** Any UL Classified base or ply sheet, min. 2 in. side lap, attached per manufacturers recommendations.  
**Roof Covering:** Max. width 53-1/4 in. and 17 in. long (14-5/8 in. exposure). Manufactured from min. 0.0165 in. thick coated steel designated "Spany", "Roserbond" and "Rowood."

3) Uplift Resistance: 125 psf  
**Joists:** Graded dimension lumber, No. 2 or better. Spaced a maximum of 24 in. OC.  
**Deck:** Min. 15/32 in. thick, Grade B-C plywood, all joints to occur over supports.  
**Battens:** 2 in. by 2 in. No. 2 grade wood battens, spaced a maximum of 14-1/2 in. OC, laid perpendicular to the wood joists.  
**Fasteners:** Fasteners used to attach the roof covering to the battens to be a minimum of five, evenly spaced, No. 8 hex head screws by 1-1/2 in. long, per full length panel. Fasteners used to attach the battens through the plywood (into the joists) to be one No. 10 by 3-1/2 in. long screw at every batten/wood joist intersection.  
**Underlayment:** Any UL Classified base or ply sheet, min. 2 in. side lap, attached per manufacturers recommendations.  
**Roof Covering:** Max. width 53-1/4 in. and 17 in. long (14-5/8 in. exposure). Manufactured from min. 0.0165 in. thick coated steel, designated "Spany", "Roserbond" and "Rowood."

Report by:



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