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Chamber of Commerce (RN) N° 156766
Rimini Company Register N° 00549540409
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OFFICIAL ACKNOWLEDGEMENTS:

MINISTRY OF PUBLIC WORKS: Law 1086/71 with Ministerial Decree D.M. 27/11/82 N° 22913 "Tests on building materials".

MINISTRY OF INDUSTRY COMMERCE HANDICRAFTS: Ministerial Decree D.M. 09/11/99 "EC certification for amusement units".

MINISTRY OF INDUSTRY COMMERCE HANDICRAFTS: Ministerial Decree D.M. 31/10/91 "EEC certification of the sound emissions of building site machines".

MINISTRY OF INDUSTRY COMMERCE HANDICRAFTS: Law Decree D.L. 27/01/92 N° 136 "EEC certification of the sound emissions of earth moving machines".

MINISTRY OF INDUSTRY COMMERCE HANDICRAFTS: Ministerial Decree D.M. 08/07/93 "EEC certification concerning the safety of toys".

MINISTRY OF INDUSTRY COMMERCE HANDICRAFTS: Ministerial Decree D.M. 30/07/97 "EEC certifications and conformity statements for the efficiency of hot water boilers fired with liquid or gaseous fuels".

MINISTRY OF INDUSTRY COMMERCE HANDICRAFTS: Notification N° 757890 "EEC certification for gas appliances".

MINISTRY OF INDUSTRY COMMERCE HANDICRAFTS and MINISTRY OF LABOUR AND SOCIAL SECURITY: Ministerial Decree D.M. 09/07/93 "EEC certification concerning simple pressurised vessels".

MINISTRY OF INDUSTRY COMMERCE HANDICRAFTS and MINISTRY OF LABOUR AND SOCIAL SECURITY: Ministerial Decree D.M. 04/08/94 "EEC certification of machines".

MINISTRY OF INDUSTRY COMMERCE HANDICRAFTS: "Verification assignments concerning the safety and conformity of products in relation to market surveillance and consumer safeguards".

MINISTRY OF INDUSTRY COMMERCE HANDICRAFTS: Ministerial Decree D.M. 02/04/98 "Issue of certificates of conformity for the energy specifications and performances of the components in buildings and systems".

MINISTRY OF THE INTERIOR: Law 818/84 and Ministerial Decree D.M. 26/03/85 with authorisation of 21/03/86 "Fire reaction tests according to Ministerial Decree D.M. 28/08/84".

MINISTRY OF THE INTERIOR: Law 818/84 and Ministerial Decree D.M. 26/03/85 with authorisation of 10/07/86 "Fire resistance tests according to Circular N° 91 of 14/09/81".

MINISTRY OF THE INTERIOR: Law 818/84 and Ministerial Decree D.M. 26/03/85 with authorisation of 03/07/82 "Fire resistance tests according to Circular N° 7 of 02/04/91 and standard CNVVF/CCI UNI 9723".

MINISTRY OF THE INTERIOR: Law 818/84 and Ministerial Decree D.M. 26/03/85 with authorisation of 12/04/88 "Tests on portable fire extinguishers according to Ministerial Decree D.M. 20/12/82".

MURST (MINISTRY OF UNIVERSITIES AND SCIENTIFIC AND TECHNOLOGICAL RESEARCH): Law 46/82 with Ministerial Decree D.M. 09/10/85 "Admission to the rolls of laboratories authorised to conduct applied research in favour of small and medium sized industries".

MINISTRY OF PUBLIC EDUCATION: Protocol N° 116 of 27/03/87 "Registration with the National research Registry File with code N° E049Y9Y".

SINCERT (Accrediting of Certification Bodies): Accreditation N° 057A of 19/12/00 "Quality system certification body".

SINAL (National Laboratory Accrediting System): Accreditation N° 0021 of 14/11/91.

SIT (Calibration Service in Italy): Accreditation N° 20 "SIT calibration centre for thermometric and electrical magnitudes".

ICIM (Industrial Certification Institute for Mechanics): "Laboratory tests concerning Product Certification Plans".

IMQ (Quality Mark Institute): "Laboratory tests concerning Product certification plans for flues".

UNCSAAL (National Union of Aluminium Steel Alloy frame makers): Acknowledgement of 28/03/85 "Laboratory for UNCSAAL certification tests on door and window frames and curtain walls".

UNI (Italian National Standardising Body - Certification Sector): Laboratory tests concerning Product certification plans for wood fireplaces with fluid in forced circulation and external door and window frames".

ASSOCIATION MEMBERSHIPS:

AIA: Italian Acoustics Association.

AICARR: Italian Association of Air Conditioning, Heating and Refrigerating.

AICQ: Italian Association for Quality.

AIPnD: Italian Association for non-Destructive Tests.

ALIP: Italian Association of Fire Laboratories.

ALPI: Independent Test Laboratory Association.

ASHRAE: American Society of Heating, Refrigerating and Air Conditioning Engineers inc.

ASSINDUSTRIA: Industrialists' Association of Rimini.

ASTM: American Body for Testing and Materials.

ATIG: Italian Technical Association for Gas.

CTE: Board of Building Industrialisation Technicians.

CTI: Italian Committee of Heating and Cooling technology.

EARMA: European Association of Research Managers and Administrators.

EARTO: European Association of Research and Technology Organisation.

EGOLF: European Group of Official Laboratories for Fire Testing.

UNI: Italian National Standardising Body.

CLAUSES:

This document refers to the tested sample or material only. This document cannot be partially duplicated without written authorisation from the laboratory

TEST REPORT N° 174679

Place and date of issue: Bellaria, 08/08/2003

Principal: BEMO SYSTEMS Gmbh & Co KG - Karl-Henschel-Strasse, 7 - 72770 REUTLINGEN-BETSINGEN (GERMANY)

Date on which test was requested: 04/07/2003

Number and date of job order: 22814, 07/07/2003

Date on which sample was received: 11/07/2003

Date on which test was conducted: 22/07/2003

Subject of the test: Test for watertightness of the metal roofing element by simulating rainfall and wind

Testing place: Istituto Giordano S.p.A. - Test field of Via San Mauro - 47814 Bellaria (RN)

Origin of sample: supplied by Principal

Denomination of the sample*.

The sample tested consists of a tunnel containing a portion of "BEMO" metal roofing and mainly consists of:

- portion of "BEMO" roofing;
- casing to create the tunnel walls, along with the portion of "BEMO" roofing;
- bearing structure.



(*) according to the Principal's declaration and inspections made by the Institute's technical personnel

Stamp of

This test report consists of 14 pages

Page
N° 1 of 14



The portion of roofing consists of:

- "BEMO - Normal Profil 65/500 - 1" panel 10,000 mm in length;
- modified "BEMO panel 10,000 mm in length and with female turn-up at the ends;
- modified "BEMO" panel 10,000 mm in length with male turn-up at the ends;
- 16 "BEMO - Halter 80/6" supports made of aluminium alloy.

The panels are made of 1 mm thick aluminium alloy and are connected together at the top of the end turn-up by means of male/female profiles formed by bending the metal plate. The male profile has an elastomer seal which holds the panels together.

The portion of roofing made with the panels described above is borne by 16 "BEMO - Halter 80/6" supports made of aluminium alloy.

The covering casing is made of 1 mm aluminium sheets bent in a U-shape and joined to the modified "BEMO" panels so as to form a channel measuring about 1000 x 300 mm crosswise and 10,000 mm in length.

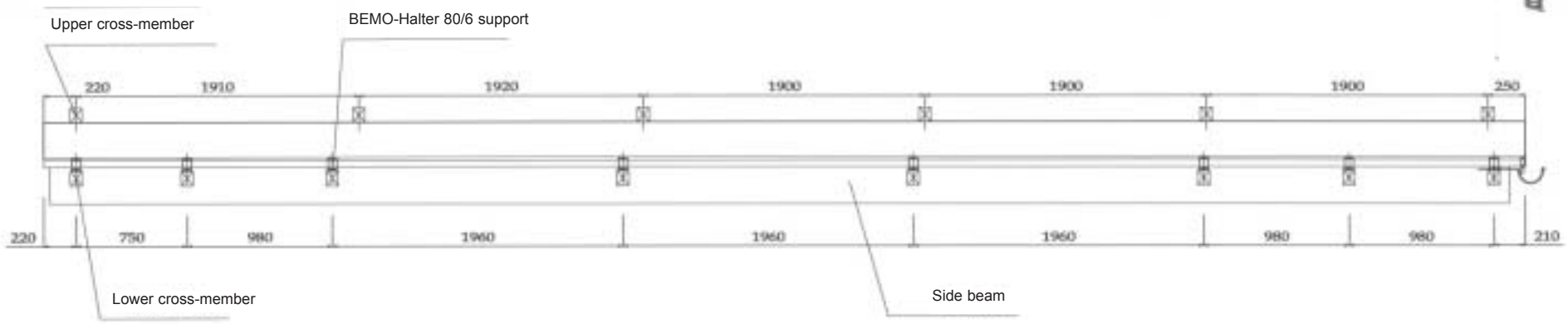
The bearing structure consists of two longitudinal beams made of laminated wood measuring 100 x 450 x 9850 mm and a series of wooden cross-members measuring 80 x 100 mm in section. The cross-members and beams are connected together with galvanised steel sheet brackets and self-threading screws.

The sample is illustrated in the following drawings and photographs.

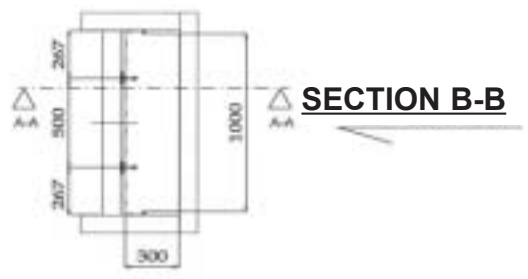
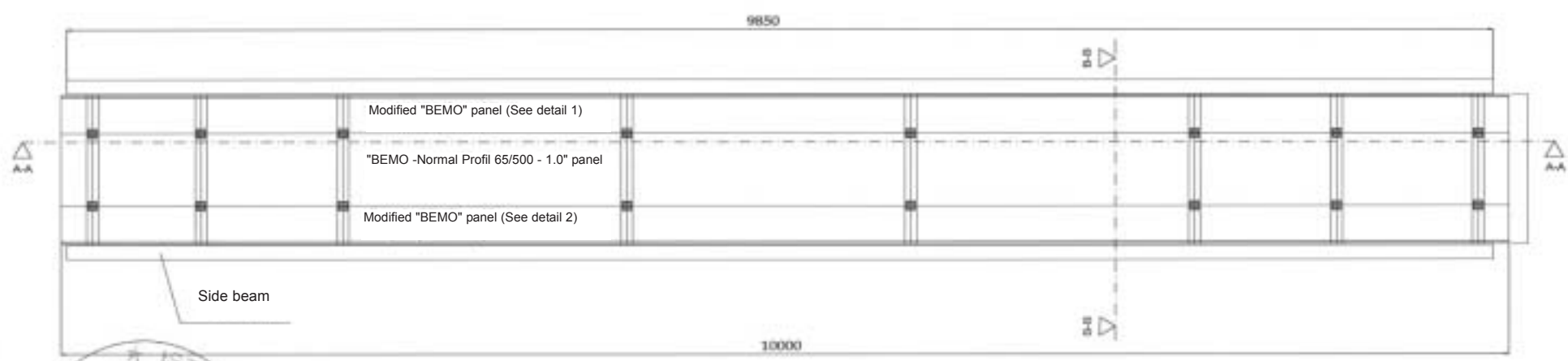




SECTION A-A

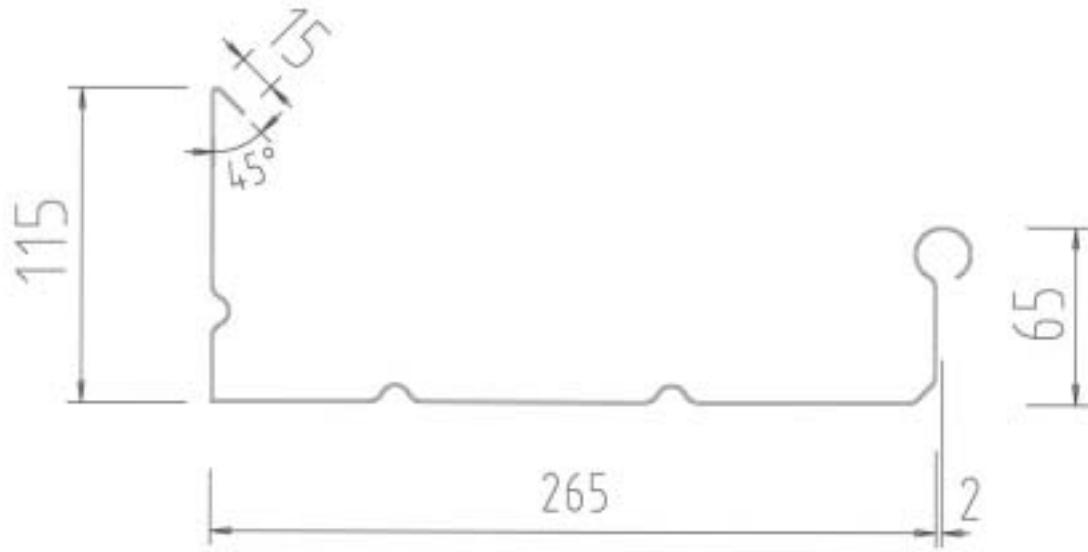


PLAN

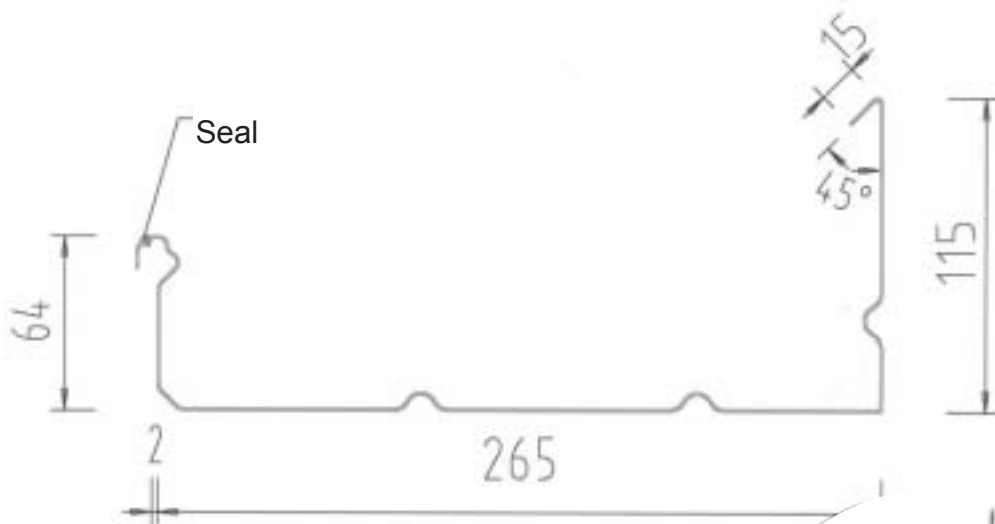




DETAIL 1: MODIFIED PANEL WITH FEMALE END TURN-UP

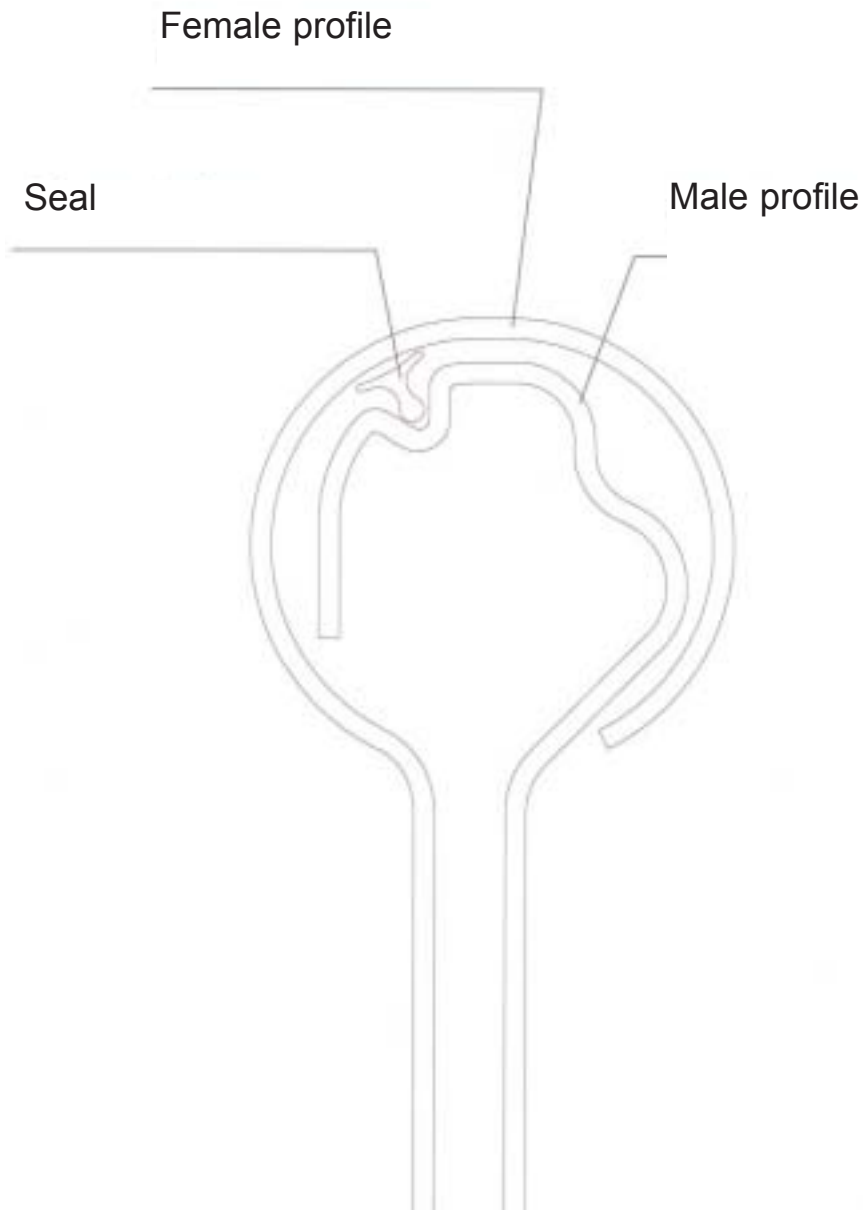


DETAIL 2: MODIFIED PANEL WITH MALE END TURN-UP

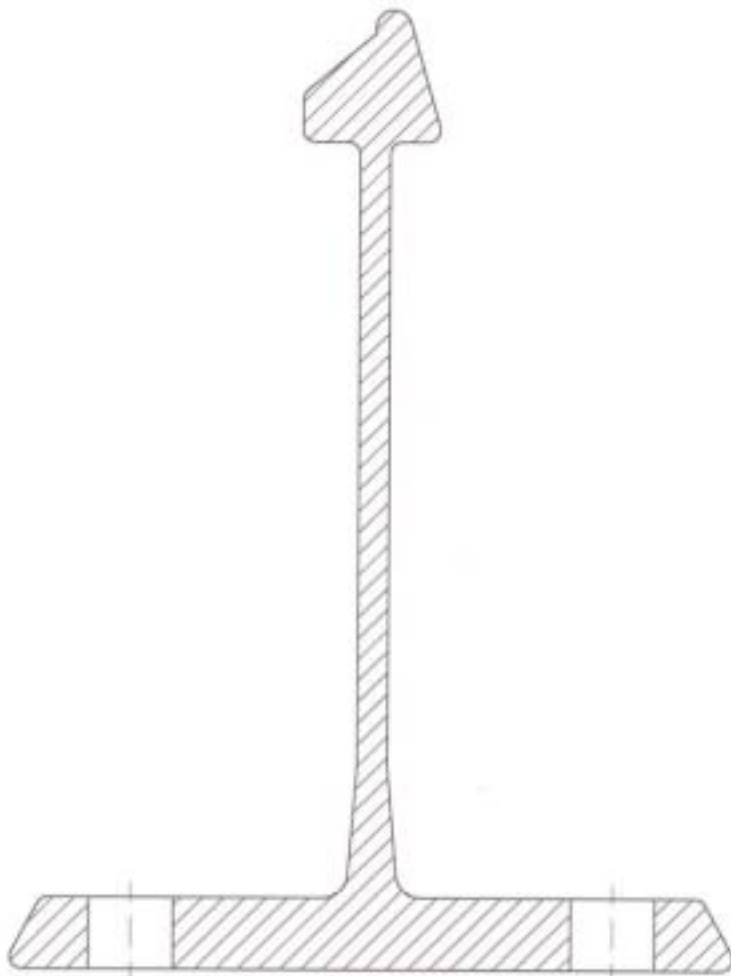




DETAIL 3: PANEL COUPLING ON A LEVEL WITH THE END TURN-UPS

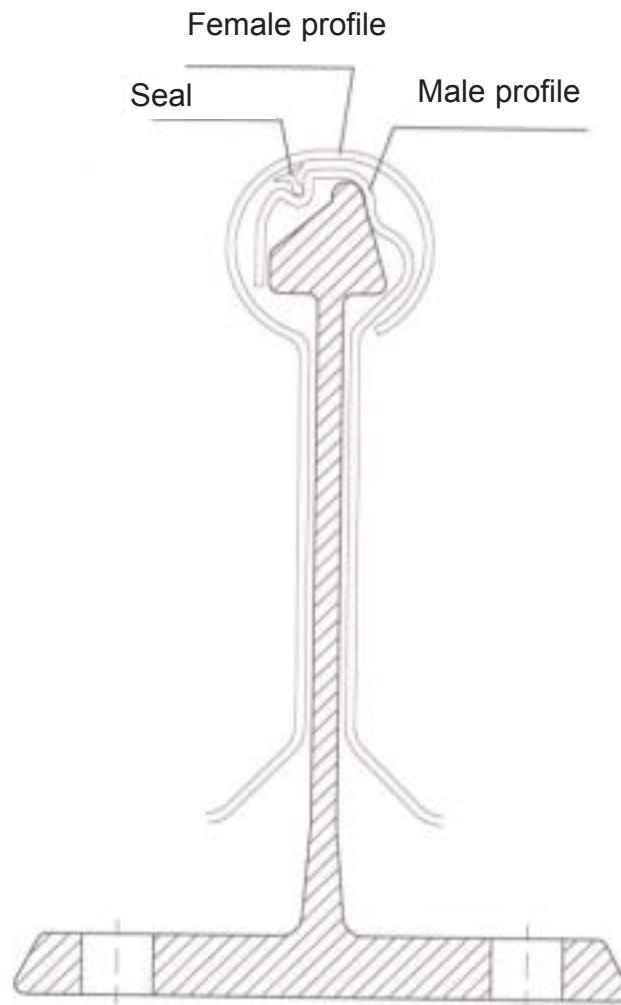


DETAIL 4: SUPPORT

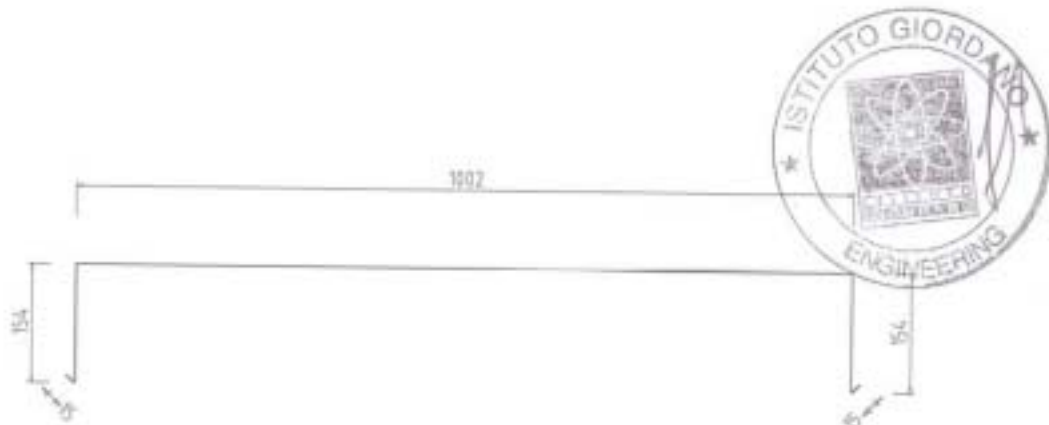




DETAIL 5: SUPPORT-PANEL CONNECTION



DETAIL 6: CHANNEL CASING





Photograph of the sample subjected to the test



Photograph of the sample subjected to the test:
Detail of the connection between the panels and panels-support.





Photograph of the sample subjected to the test:
Detail of the connection between the lower cross-members and longitudinal beams.

Test equipment:

The following equipment was used for the test:

- "FERRARI" centrifugal electric fan with relative drive inverter;
- network of spraying nozzles;
- pump to supply the spraying nozzles;
- set of "ASA" flowmeters to measure the flow of water that supplies the spraying nozzles. Measuring range 100-1000 l/h, precision $\pm 2.5\%$ of the full scale;
- "AIRFLOW" fan type air-speed meter to measure the speed of the air around the channel. Measuring range 0-30 m/s;
- "SALMIRAGHI" differential micromanometer of the difference in fluid level type for measuring the static pressure in the channel.





Test method.

The tested sample was installed on a bearing structure sloping 0.5% in the longitudinal direction. The fan was installed at one end so as to create an air current blowing in the same direction as the channel sloped, while the other end of the channel was left open to the atmosphere. The fan's rotation speed was regulated so that the air flowed at the rate of 25 m/s. The top of the channel was fitted with two rows of spraying nozzles at a 500 mm centre distance, on a level with the joints of the panels forming the roofing portion. During the test, the nozzles were supplied with water from a storage tank. The amount of water used by the nozzles was measured by the flowmeters installed on the water main.

The static pressure inside the channel about 1 m from the air inlet was measured during the test.

How the test was conducted.

The test began at 9.30 a.m. and ended at 5.30 p.m. with the wind speed set at 25 m/s. The water rate was regulated at 1242 l/h from 9.30 a.m. until 12.30 p.m. so as to simulate rainfall with an intensity of 120 mm/h while from 12.30 p.m. until 5.30 p.m. it was regulated at 2018 l/h to simulate rainfall with an intensity of 195 mm/h. The intrados area of the metal panels reproducing the roofing portion was accurately inspected visually at regular intervals of about 30 min during the test on a level with the joints between the panels, to check whether water was present either in the form of drops or whether it had simply wetted the surface itself.

A sample of the roofing portion was taken at the end of the test on a level with a support, so as to check the coupling between the panels and connection to the supports.

The test is illustrated in the following photographs.





The sample during the test.



Group of flowmeters.





Open side of the tunnel.



Side of the tunnel connected to the fan.





View of the interior part of the sample with the network of spraying nozzles.



A sample is taken of the roofing.





A sample is taken of the roofing.

Test results.

No water was found on the intrados surface of the sample either near or on a level with the joints between the panels. The static pressure measured in the channel was 80 Pa in the condition whereby rainfall was simulated with an intensity of 120 mm/h and 100 Pa in the condition whereby rainfall was simulated with an intensity of 195 mm/h.



The Test Technician
in Charge
(Dr.Eng. Giovanni Capitani)

Engineering Laboratory
Manager
Dr.Eng. Giovanni Capitani

The Chairman or
Managing Director
Dr.Eng Vincenzo Iommi