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Waterproofing system of a photovoltaic plant

An intervention on the roof of a shopping centre in Cervignano del Friuli (Italy)

by Roberto Protto*

In the Summer of 2010, the roof of the La Rotonda shopping centre in Cervignano del Friuli (Northern Italy) was waterproofed. The waterproofing system was installed before integrating the 780 kWp Sunova photovoltaic plant into the roof.

The waterproofing work was absolutely essential to guarantee a watertight seal against infiltration of atmospheric precipitations, deterioration of the structure and subsequent damage to the electrics and pipe-work and to ensure that the entire complex could be used in complete safety. The waterproofing system had to be designed in order to allow also total functional integration of the photovoltaic plant. The solution opted for was MAPEPLAN T M, a Polyglass waterproofing system with highly-advanced technical characteristics and a low impact on the environment.

Requirements of the Waterproofing System

Because of the critical nature of this particular intervention, the waterproofing system for the roof had the following minimum requirements:

- compatible and integrated with the specified Sunova photovoltaic plant;
- functional and long lasting (with a higher service life than the photovoltaic plant);
- simple, rational and safe during installation;
- featuring good compressive strength and suitable for foot traffic;
- with high solar reflectance index (SRI);
- not containing or emitting substances harmful to man or the environment;
- resistant to aspiration induced by the wind;
- adaptable to the movements

Photo 1. A view of the building upon completion of work, with the photovoltaic plant integrated into the roof.

Photo 2. Laying MAPEPLAN T M synthetic membrane.



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and settling of the split support structure.

The MAPEPLAN T M Solution of Linear Mechanical Fasteners

On the basis of the specifications and minimum requirements for the project, the MAPEPLAN T M system with linear mechanical fasteners was selected to waterproof the roof. The new waterproofing layer, 1.8 mm thick sheets of MAPEPLAN T M with 12 cm overlaps between the sheets, was applied dry over the wooden load-bearing structure. The sheets were heat-welded at the overlaps with manual and automatic hot air blowers to form "flat" thermo-welded joints. A separation layer in 200 g/m² non-woven fabric was laid prior to the waterproofing layer.

To contrast the aspiration effect of the wind, the waterproofing layer was fastened directly to the wood-

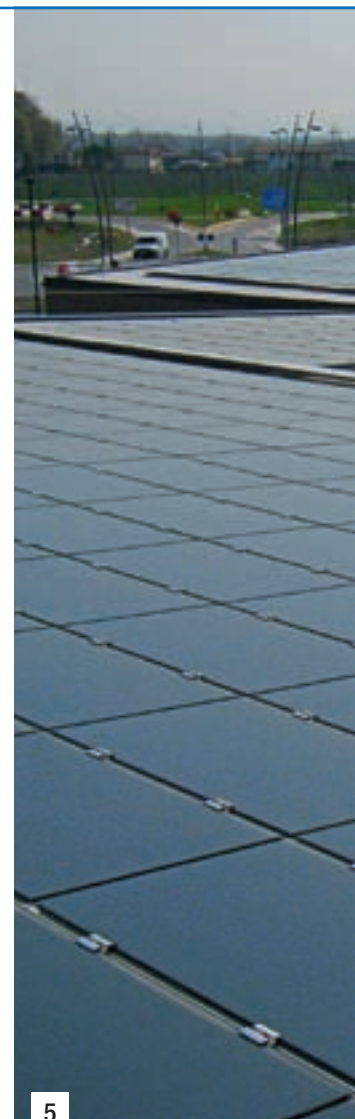
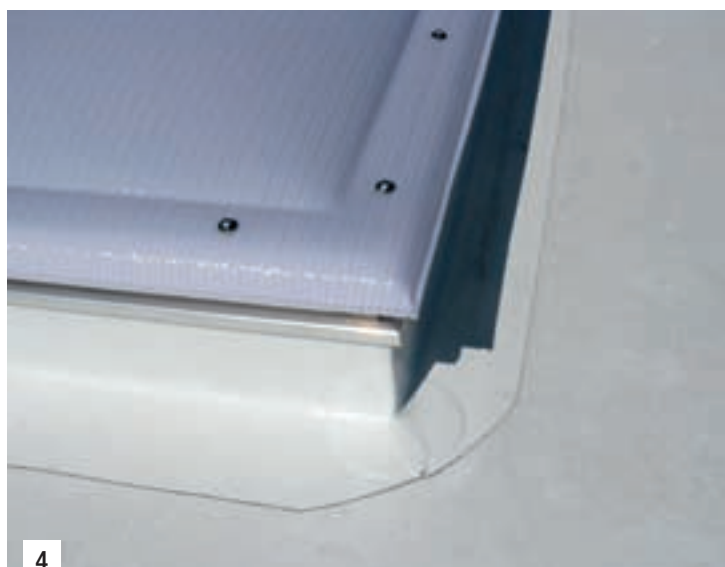
en load-bearing structure using special mechanical fasteners. We refer to the waterproofing in this article as a “system”, because all the accessories and auxiliary elements are perfectly coordinated, compatible and integrated with the MAPEPLAN T M waterproofing membrane. To sum up, the stratification of MAPEPLAN T M installed is as follows:

- old support layer: prefabricated sandwiched wooden panels with mineral wool insulation according to current norms and regulations;
- adjustment layer: 100% polypropylene non-woven fabric with a weight of 200 g/m² to form a regular surface to apply the new waterproofing membrane;
- waterproofing membrane: flexible TPO/FPO polyolefin layer such as MAPEPLAN T M 18, thickness 1.8 mm, applied dry and fixed in place with mechanical fasteners;
- heat welding of the overlaps using manual and automatic hot air blowers;
- mechanical fastening system: anchoring the new impermeable stratification to the load-bearing structure with a system of special mechanical fasteners in correspondence with the ribs on the sandwich panel support layer;
- final finishing and blending in of the various elements of the waterproofing membrane with profiles and tinwork made from sheet covered with MAPEPLAN T M.

Characteristics and Advantages of the MAPEPLAN system

The MAPEPLAN T M waterproofing system used for this intervention is technically-advanced and offers unique functional performance characteristics, such as the mechanical fastening system for the waterproofing membrane, which has the advantage of anchoring the new stratification solidly and directly to the underlying load-bearing structure.

The function of contrasting the aspiration effect induced by the wind is ensured by a special mechanical fastening system, calculated and sized according to



characteristics such as the height and shape of the building, the location of the building, the type of support layer, the waterproofing membrane and reinforcement and, finally, the estimated speed of the wind.

This mechanical fastening system allows the layer to be applied dry, that is, independently from the support layer, so that all the movements, cracking and settling of the support layer are not transmitted or have a negative impact on the waterproofing membrane, which has the possibility to move.

MAPEPLAN T M Waterproofing Membrane in TPO/FPO

MAPEPLAN T M is made from flexible polyolefin TPO/FPO and has innovative characteristics. Firstly, it contains no plasticisers and no volatile compounds. The flexibility of the membrane is given by the special chemical structure of the base polymer: the element which offers the flexibility is present in the molecular chain and

Photo 3. The first phase of installation of the Sunova photovoltaic plant.

Photo 4. A detailed view of a fillet between MAPEPLAN T M and a skylight’s surface.

it is bound to the chain through a chemical bond. This chemical bond is very strong and is difficult to separate, which translates into a longer life of the intrinsic characteristics of the layer and better resistance to aggressive substances and the action of atmospheric agents, micro-organisms and bacteria. The dimensional stability of the layer is guaranteed by internal reinforcing net and the “multi-extrusion coating” production process.

The internal high-strength, polyester net gives it very high tensile strength. This characteristic is indispensable in mechanical fastening systems to offer sufficient resistance to the aspiration effect of the wind.

The TPO/FPO membrane is highly ecological, in that it is free of plasticisers and volatile compounds and does not contain substances which are harmful for the environment or people. The modern, highly-technological production process was designed and con-



structured to have the lowest possible impact on the environment and to guarantee each main phase of the life of the waterproofing membrane (production, transport, installation, service life and final disposal).

MAPEPLAN T M Smart White Coloured Surface

The top layer of the waterproofing membrane applied, in this case MAPEPLAN T M SMART WHITE, was made in a special white colour which guarantees excellent reflectance of sunlight with an SRI value of 102. MAPEPLAN T M SMART WHITE reduces the surface temperature of the roof by 50% compared with a dark or black coloured covering and, as a result, also reduces the temperature inside the building and keeps it constant.

This leads to an unquestionable advantage in hot weather: the lower surface temperature means that air-conditioning systems may be optimised and used less to

reduce energy consumption and, therefore, energy costs.

It is important to note that the colouring is in the actual body of the material and is an integral part of the material itself, and is not a simple surface painting/treatment which would otherwise alter or deteriorate over the years.

The different surface colour of the layer also has the advantage of forming a signal layer, which shows up any accidental damage or scratches on the surface caused while work is being carried out after laying the sheets.

The “Multi-extrusion Coating” Production Process

The MAPEPLAN T M sheets are produced in a modern, highly-technological “multi-extrusion coating” plant which has a low impact on the environment. This production process applies the synthetic TPO/FPO matrix directly onto both faces of the reinforcing net at the same time, to guarantee that it is perfectly encapsu-

Photo 5. A view of the Sunova photovoltaic plant upon completion of work.

lated within the structure of the sheet. Thanks to this coating, MAPEPLAN T M forms a proper one-layer sheet which is not subject to delamination and is resistant to all forms of stress (physical, chemical and thermic).

Pre-laminated sheets which then need to be bonded together are not used to produce the MAPEPLAN T M sheet.

Special equipment and specifically trained layers are required for the installation of synthetic waterproofing membranes. This is why the supply and installation chain for MAPEPLAN synthetic waterproofing systems is only through specialised laying companies, so that final users only receive functional, durable waterproofing systems.

The MAPEPLAN waterproofing system integrates perfectly with the wide range of special accessories products supplied by Polyglass and Mapei. This global view and approach is the best guarantee for designers, laying companies, owners and final users that the work carried out is functional and durable, with access to complete, all-round, expert technical assistance. 

* Polyglass SpA Commercial and Marketing Director

TECHNICAL DATA

La Rotonda Shopping Centre, Cervignano del Friuli (Province of Udine, Italy)

Period of Construction: 2010 - 2011

Year of the Intervention: 2010

Intervention: supplying products for waterproofing the roof

Client: Sunova s.r.l.

Works Direction: Studio Tecnico Gregoris, Cervignano del Friuli

Contractors: CO.PA.RI scarl (for waterproofing the roof); Sunova s.r.l.

(for building the photovoltaic plant)

Coordinator: Mauro Redemagni, Polyglass SpA (Italy)

MAPEI PRODUCTS

Mapeplan T M (CE EN 13956): roofing and waterproofing synthetic membrane, manufactured by Polyglass, subsidiary of the Mapei Group. The technical data sheet is available at the web site www.polyglass.it. The MAPEPLAN T range synthetic waterproofing membranes, produced by Polyglass, have been formulated for applications on coverings, and conform to **EN 13956** standard.