RESTRUCTURING EXISTING ROOFS

This chapter is particularly important because the problem of restructuring or renovating existing roofs on old buildings presents difficulties that are not easy to resolve.
Appraisal of the soundness of the bearing structure of the existing roof (primary framework), is the task of the technical expert who must assess whether any deterioration exists. In that connection, it may be useful to point out that new roofing with the Tegola Canadese system provides several advantages. Particular among these, the "self-weight" factor may be determinative. The weights per square meter of the most common roofing materials are reported below.

ROOFING MATERIAL	Kg/m^2
TEGOLA CANADESE STANDARD TYPE	11
Fired brick roofing tiles (Marseille tiles, S-shaped pantiles, ...)	45/50
Fired brick coppi (curved or "channel style" roofing tiles)	60/100
Concrete tiles	50
Fiber concrete (flat sheets, corrugated sheets, etc.)	16/40
Slate (blackboard)	50/80
Stone slab work	100/300

Table 4

It clearly emerges that existing structures, restructured with new Tegola Canadese roof sheathing, will weigh much less and that overall load will consequently be reduced. In addition, if "plywood exterior" panels are used, weight will be allocated more uniformly as a result of the crossed ribbing which both distributes tensions more effectively and allows the standardization of the laying plan.

Fig.41

The advantages offered by Tegola Canadese technology in the restoration of old wooden roofs may be summed up as follows:

- Recovery of the bearing structure in the majority of cases.
- Reduction of the weight of roof sheathing to the benefit of bearing capacity and durability.
- The opportunity to standardize the surface slope by means of large plywood panels (3m^2 each)
- Smaller amounts of materials that must be transported to the roof and minimal unit weight.
- Ease of connection of roof coverings with non-geometric and/or irregular slopes.
- The opportunity to save surfaces from costly and troublesome patchwork.
- Speed of installation, with the possibility of daily work shifts and a resultant reduction in inconvenience for residents.
- Savings in labor and, as a result, in construction costs.
- Ability to estimate costs completely before work begins.
- Construction that conforms to earthquake-proofing laws without the need for costly inspections.

Fig.42

CONCRETE AND HOLLOW CLAY INFILL-BLOCK STRUCTURES

In the case of construction and renovation of roofing surfaces in concrete and hollow clay infill blocks, the first problem that requires resolution, in the event an inhabited attic is present, is to prepare actual thermal insulation to bring the building into compliance with the provisions of Legislative Decree 192/05.

If the attic space cannot be used as a living area or is not intended for that purpose, a simple adjustment of the regulations makes it sufficient to lay insulating material of appropriate size onto the extrados (upper surface) of the last horizontal surface. In addition, if existing roof covering needs to be replaced, after having provided for its removal and evaluated any remediation that needs to be carried out with regard to the structure that has been uncovered (including the application of a new layer of mortar at least 3 cm thick, to provide a perfectly even surface), installation proceeds as follows:

- Application of bituminous primer in order to stabilize dust based on 300 g/m^2.
- Torch application of a 4 mm-thick bituminous membrane modified with plastomers and reinforced with polyester non-woven fabric, which constitutes the attachment layer and seal for the bituminous shingles.
- Torch application of the Tegola Canadese roof covering in the model and color selected.

The building industry trend in the case of restorations is, where possible, to recover and use all available living space and, thus, to convert under-roof areas into mansard spaces. Under-roof areas, then, thanks to insulation techniques and to the introduction of special door and window treatments (roof windows), can become attractive and comfortable living areas.

In these situations, the construction of a Tegola Canadese ventilated roof is both easy and necessary. In fact, the lightness and size of Tegola Canadese materials facilitates their use. The new roof covering, with all ventilating and insulating materials included, will not increase structural load by more than 25-30 kg per m^2. The ventilation allows the humidity that has accumulated in the structure to evaporate, protecting insulating and other materials, and exponentially improving livability during the hot months. For additional information, consult the section, "Ventilated roof with structure in reinforced concrete, with inhabited attic."

EXISTING BITUMINOUS WATERPROOFING

In the event that slope roofing with bituminous waterproofing has been in place for some time but is no longer functional, several issues should be carefully evaluated before proceeding. For example:

- the kind of waterproofing (bituminous felt, waterproof membranes reinforced with glass fiber or torch-applied polyester, etc.) that exists
- aging
- visible defects (fractures, areas of separation, bubbles, slippage, etc.)
- insulation
- breathability

Once this information has been gathered, the decision can be made to save old waterproofing, overlaying a new waterproofing membrane and then torch-applying Tegola Canadese shingles, or to completely remove existing roof covering in order to rebuild a new roofing package.

- A third solution is to construct a "ventilated roof," attaching the battens at a right angle to the eaves with screw anchors, which pass through old roof covering and are attached to the underlying substrate. In this case, the state

of preservation of the waterproofing would no longer be of any importance for sealing, but a thermohygrometric check should nevertheless be conducted to avoid the formation of condensation.
Nonetheless, considering the complexity of the subject and the impossibility of establishing a foolproof evaluation method, our advice is to entrust analysis and judgment to an expert beforehand or to contact Tegola Canadese's technical support service.

OLD SHEET METAL ROOFING

Sheet metal roofing has long been used in some mountain areas. Deterioration caused by the corrosion occasioned by atmospheric conditions, and by discharges into the air from heating and industry, ensures that this kind of roofing will require frequent maintenance.
Tegola Canadese permits a radical solution, which may also be used to salvage the architectural identity of the roof: simply replace existing roofing or else recover the functionality of the under-roof space by putting it to use as an inhabited attic/mansard once adequate insulation and ventilation have been provided.
In most cases, sheet metal is laid over continuous planking and it is sufficient to remove the old sheet metal roofing and nail Tegola Canadese shingles into place directly over existing planking (consult the Tables for slope limits). Before laying Tegola Canadese shingles, it is a good idea to check the state of the planking, making sure to replace any deteriorated boards and to render the laying surface flat and continuous.
In the case of an under-roof area used as a living space, after the thermohygrometric checkup, it is not necessary to remove the old sheet metal roofing, which will function as a vapor barrier. The installation of the Tegola Canadese ventilated roof, whose weight (25-30 kg per m^2) creates no substantial burden on the structure, proceeds over the existing sheet metal surface. Begin by installing the battens to support the insulation, parallel to the eaves, and then proceed with the laying and construction of the classic "ventilated roof."

Fig.43

OLD ASBESTOS-CONCRETE ROOFING

The first analysis that should be carried out is to determine the state of preservation of asbestos-concrete roofing. Sometimes it is more convenient (and certainly safer) to replace existing materials rather than to attempt to remediate old asbestos-concrete sheets.
If, once roofing material has been removed, you are left with a concrete or mixed concrete/hollow clay block substrate, proceed with the approach indicated for new building design (see pp. 35-37).
If, instead, the bearing structure is not continuous, but is constructed of purlins or wooden beams, the solution is the following:

- removal of old roofing and related anchor materials, as well as flashing, channels, or metal gutters;
- creation of a wooden structure in fir battens of appropriate size, attached with wood screws or, if iron trusses are present, with sheet metal screws;
- installation of "plywood" panels nailed to the underlying battens and interconnected by means of metal clips;
- installation of Tegola Canadese shingles as indicated. If thermal insulation is required, the insulating material will be placed directly onto the surface of the roof of the attic space or between the battens if using the "ventilated roof" procedure.

In cases in which old roofing in corrugated asbestos-concrete is still usable or removal is not desired, new roofing can be constructed by applying properly contoured insulation boards with a waterproof membrane pre-bonded to the top side of the board (this board is specially designed to lay perfectly on top of the "wavy" corrugation of the asbestos-concrete sheets). The panels are attached with bolts or screws and with washers. In this way, a perfectly flat surface is created that allows torch application before a second waterproof membrane and, finally, the Tegola Canadese shingles, are applied.

Fig.44

Tegola Canadese shingles, nailed into place onto a wooden surface, produce a roof covering that becomes waterproof as the result of the overlapping of its elements. This installation method, which is described more fully in the installation instructions, requires a minimum roof slope which, in turn, must be considered in terms of the length of the slope. In fact, the length and the pitch of the slope determine the amount of water that will flow across it, and longer slopes increase the risk of infiltration. Because of that, our advice is to consult the Tables regarding the minimum values for nailability (Appendix 1) for each of Tegola Canadese's models, which are similar to what is shown in the Table below. In addition, these indications refer to laying surfaces that are stable and in good condition and in which there are no areas of subsidence.

STANDARD and LIBERTY Shingles

Roof slope	Length of the slope		
	Up to 7 m	From 7 to 10 m	From 10 to 15 m
Greater than 35%	Nailed installation	Nailed installation	Nailed installation
From 30% to 35%	Nailed installation	Nailed installation	To be waterproofed with bituminous menbrane
From 25% to 30%	Nailed installation	To be waterproofed with bituminous menbrane	
Up to 25%	To be waterproofed with bituminous menbrane		

Table 5
Installation method for Standard and Liberty shingles

N.B. If slope length is greater than 15m, ask Tegola Canadese's technical support for an opinion in order to determine feasibility and type of application.

If the slope or length of the roof do not permit a nailed installation, proceed with the following installation method: torch-apply a 4 mm-thick, polyester-reinforced bitumen-polymer sheet on the roof surface (planking, plywood, roof surface in concrete). Depending upon the kind of substrate used, a waterproof membrane must be chosen whose elongation percentage is suitable for the type of structure in question. Other than perfect waterproofing, the membrane chosen must ensure an effective bond both with the support and with shingles. Special attention must be paid to expansion joints.
Apply a coat of primer to the concrete substrate, followed by the application of the bituminous membrane, and finally by torch application of the Tegola Canadese product. Through the use of this installation scheme, Tegola Canadese protects against UV radiation and conserves the aesthetic appearance of the roof.
It should therefore demonstrate good adhesion, traction resistance, elasticity, and a bitumen covering compatible with that used on the bituminous shingle.

Fig.45

ROOFING IN MOUNTAIN REGIONS

In roofs in mountain regions (altitude greater than 900 m AMSL) or in areas with heavy snowfall, the minimum permissible slopes are equal to those of normal application increased by at least 5%, as shown in the following sample Table (which makes reference to the Standard shingle).

Example.
Installation method of Standard and Liberty shingles in mountain regions

Table 6

Installation method of Standard and Liberty shingles in mountain regions

Roof slope	Length of the slope		
	Up to 7 m	From 7 to 10 m	From 10 to 15 m
Greater than 40%	Nailed installation	Nailed installation	Nailed installation
From 35% to 40%	Nailed installation	Nailed installation	To be waterproofed with bituminous menbrane
From 30% to 25%	Nailed installation	To be waterproofed with bituminous menbrane	
Up to 30%	To be waterproofed with bituminous menbrane		

In mountain areas, regardless of the slope, particular attention must be paid to non-ventilated roofs where an inhabited attic exists. In these cases, technical precautions must be taken to avoid water return which could be created in connection with the heat bridge that forms between the perimeter wall and the overhang of the roof. Indeed, the presence of snow on the roof and reduced heat dispersion in the eaves favors the formation of ice dams which then create infiltrations (see p. 13).
As a result, it is advisable to torch-apply a 4 mm-thick bitumen-polymer sheet and polyester support beginning at the gutter and continuing up to 2 m from the inner face of the perimeter wall, on which the Tegola Canadese shingles are then torch-applied.
The same technology should be used if a differential heat dispersion is present from the roof as the result of unheated rooms that adjoin or are close to heated ones.
With the "ventilated roof," ice dams are not formed. Snow melts uniformly along the entire slope as a result of the action of the sun since heat dispersed from the attic via the ventilation chamber (which acts as a chimney) and vents, placed in corresponding positions along the ridge line, is discharged into the atmosphere. In addition, the existence of a snow layer improves the roof's thermal resistance because snow is an excellent insulating material and acts as additional insulation.

VENTILATION OF NON-INHABITED UNDER-ROOF SPACES

Where roofs in wood, concrete, or iron exist, particular attention must be devoted to the ventilation of under-roof spaces, rooms, or closed areas of the attic. The health and preservation of the building and its structures makes this a necessity.

The ventilation of attic areas is obligatory to avoid the possibility of the formation of condensation and the accumulation of heat. With Tegola Canadese, ventilation may be obtained through ventilation openings that can be used with any kind of structure.

The ventilation surface must be around 1/200 of the roof area (in flat projection), and 4/5 ventilation openings are thus needed for each 100 m^2 of roof.

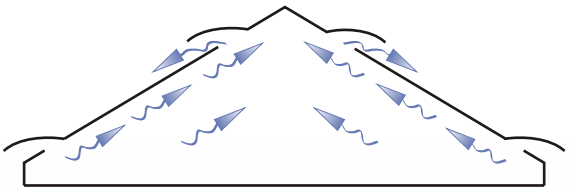

Fig.46

Special aerator
Fig.47

Standard aerator
Fig.48

Fig.49