NEW DESIGN ROOFS

In this section, we will discuss, as simply as possible, the proper design approach for the construction of roof coverings that are efficient and, at the same time, consistent with the objectives described and evaluated in preceding chapters.

Installation techniques are defined:

- For bituminous shingles that make it possible to build slopes with highly complex surface features and which are particularly suitable for the construction of extremely wide slopes with any degree of slant.

- For the thermal insulation of pitched roofs. Every part of a building loses heat, but the roof undergoes the greatest overall heat dispersion of the entire building. Today, energy loss can be reduced by thermally insulating the roof with appropriate materials. In this connection, it is important to distinguish between:

    - Thermal insulation of inhabited attics;
    - Thermal insulation of non-inhabited under-roof spaces.

  With regard to non-inhabited under-roof spaces, the insulation layer can be installed on the last horizontal surface, an ideal solution for the insulation of pre-existing roofs as well. In the case of the thermal insulation of inhabited atticsthat is, where insulated and/or ventilated roofing is presentit is preferable to apply the insulation layer on the extrados (upper surface) of the roofing slope.

- For ventilation, whose purpose is the drastic reduction of the amount of heat that the roof absorbs during hot weather and the elimination of water vapor that emanates from inside rooms during the cold season.

Fig.29

VENTILATED ROOF WITH STRUCTURE IN CONCRETE AND HOLLOW CLAY INFILL BLOCKS OR REINFORCED CONCRETE, WITH NON-INHABITED UNDER-ROOF SPACES

Where non-inhabited under-roof spaces are present, the technical options for constructing a ventilated roof are different. Simplifying the various possibilities, we propose an approach in which the under-roof/mansard space becomes an area in which air can circulate without impediment. The goal, with this technical approach, is to transform the non-inhabited under-roof space into a ventilation chamber and a laying surface for insulating material. Thus, the interior of the under-roof space cannot present obstacles of any kind (e.g., walls, enclosed spaces, etc.) that would block air circulation. The insulating material is laid onto the flat surface of the under-roof space and ventilation is finished with the application of ventilation openings on the roof in proximity to the perimeter wall (air inlet) and along the ridge (air outlet) in order to allow the discharge of warm air and the intake of cold air. The number of ventilation openings is related to the size of the roof in question. The designer may find Tables 12 and 13 (in Appendix 2) useful in this regard because, with respect to the length and the pitch of the slope, they establish the ventilating surface for every ml of inlet in the eaves and of outlet on the ridge. Tegola Canadese ventilation openings have a ventilating surface of 150 cm^2.

Installation Procedure:

Roofing structures in concrete and hollow clay infill blocks are composed of a bearing joist layout made of prefabricated reinforced concrete and of a series of hollow clay infill blocks that are laid directly on the joists. The surface of the roof is made flat with the casting of an appropriately thick concrete slab that forms the roof plane.

Neither the concrete slab nor the reinforced concrete platforms can be nailed because they are too hard or friable and do not provide sufficient grip for nails. Thus, the nailing of bituminous shingles is to be excluded. Proceed instead with the application of a bituminous solution in solvent (primer) on the concrete substrate. Once the primer has dried, a 4 mm-thick polyester- or glass-fiber reinforced bitumen-polymer sheet is torch-applied (UNI 8202 standard). After laying the waterproof membrane, the finished Tegola Canadese roof covering is torch-applied.

NB: For specifications, see the "Build The Roof" section of the Tegola Canadese website.

Fig.30

VENTILATED ROOF WITH STRUCTURE IN CONCRETE AND HOLLOW CLAY INFILL BLOCKS OR REINFORCED CONCRETE, WITH INHABITED ATTIC

The use of the attic as a living space necessitates insulation materials that ensure a comfortable living environment and reduce the negative effects of heat conditions on roofing structures. Insulating material is placed on the external surface. The choice of an insulating product is a function of the overall heat performance of the roofing, which is defined as the unit transmittance of the surface (U=1/Rt see appendix 5), and of the control of water vapor produced in the inhabited attic (see appendix 7). If these evaluations are not made carefully, the chemical-physical characteristics and the performance of roofing materials may deteriorate. During the winter months, the ventilated roof allows the dispersion of water vapor produced in the attic and, during the summer months, the dispersion of the heat that accumulates on the surface of the roof because of its exposure to the sun.

Installation Procedure:

Begin by installing the battens parallel to the eaves. The battens are attached to the bearing structure with screw anchors of an appropriate length while insulating material is simply placed between the battens. To protect insulating material, the "Difbar" water-vapor diffuser membrane is laid. Proceed with the laying of the counter-battens, at a right angle to the battens and applied to their supports with wood screws, in order to create the ventilation chamber. The size of the chamber needs to account for both the pitch of the slope and its length (Table 11, appendix 2). The ventilation chamber is finished with a continuous support of phenolic plywood (exterior type) or with an OSB panel that is attached with annular-ring nails every 15 cm. The interspacing of the battens determines the panel's bearing capacity (see the Tables in Appendices 3 and 4). The ventilation is completed with the careful sizing of the openings along the eaves lines and the ridge lines in order to allow the discharge of warm air and the intake of cool air (Tables 12-13, appendix 2).
Installation then proceeds with the application of the Tegola Canadese roof covering in the model and color selected. Installation is carried out with annular-ring nails, and waterproofing of the roof covering results from overlapping with other materials. If the pitch and/or the length of the slope don't permit impermeability with a nailed installation, proceed with the torch application on the planking of a 4 mm-thick bitumen-polymer sheet, reinforced with polyester non-woven fabric and over which the shingles are torch-applied.

NB: For specifications, see the "Build The Roof" section of the Tegola Canadese website.

Fig.31

VENTILATED ROOF WITH WOODEN STRUCTURE, WITH NON-INHABITED UNDER-ROOF SPACES

Where non-inhabited under-roof spaces are present, the technical options for constructing a ventilated roof are different. Simplifying the various possibilities, we propose an approach in which the under-roof/mansard space becomes an area in which air can circulate without impediment. The goal, with this technical approach, is to transform the non-inhabited under-roof space into a ventilation chamber and a laying surface for insulating material. Thus, the interior of the under-roof space cannot present obstacles of any kind (e.g., walls, enclosed spaces, etc.) that would block air circulation. The insulating material is laid onto the flat surface of the under-roof space and ventilation is finished with the application of ventilation openings on the roof in proximity to the perimeter wall (air inlet) and along the ridge (air outlet) in order to allow the discharge of warm air and the intake of cold air. The number of ventilation openings is related to the size of the roof in question. The designer may find Tables 12 and 13 (in Appendix 2) useful in this regard because, with respect to the length and the pitch of the slope, they establish the ventilating surface for every ml of inlet in the eaves and of outlet on the ridge. Tegola Canadese ventilation openings have a ventilating surface of 150 cm^2.

Installation Procedure:

At this point, once you have chosen the Tegola Canadese model to be used, consult the Tables in Appendix 1 in order to evaluate the proper installation method for the model you have chosen. Installation then proceeds with the application of the Tegola Canadese roof covering in the model and color selected. Installation is carried out with annular-ring nails, and waterproofing of the roof covering results from overlapping with other materials. In this case, it is helpful to place a protective and anti-skid membrane such as Startbar-s directly onto the tongue-and-groove planking or other wooden surface, thus facilitating the laying of shingles and protecting the laying surface during construction. If the pitch and/or the length of the slope don't permit impermeability with a nailed installation, proceed with the torch application on the planking of a 4 mm-thick bitumen-polymer sheet, reinforced with polyester non-woven fabric and over which the shingles are torch-applied.

NB: For specifications, see the "Build The Roof" section of the Tegola Canadese website.

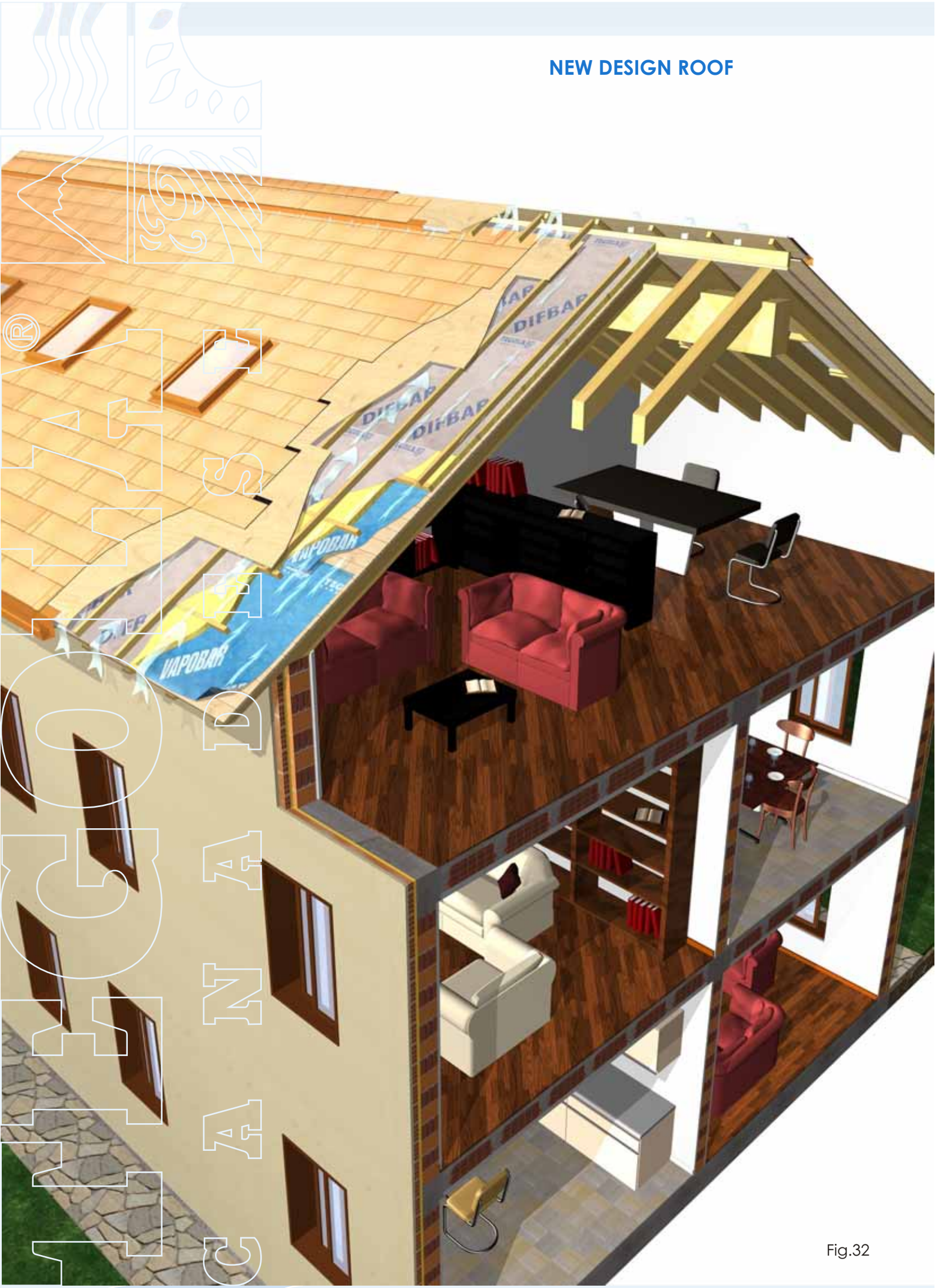

Fig.32

VENTILATED ROOF WITH WOODEN STRUCTURE, WITH INHABITED ATTIC

The use of the attic as a living space necessitates insulation materials that ensure a comfortable living environment and reduce the negative effects of heat conditions on roofing structures. The choice of an insulating product is a function of the overall heat performance of the roofing, which is defined as the unit transmittance of the surface (U=1/Rt see appendix 5), and of the control of water vapor produced in the inhabited attic (see appendix 7). If these evaluations are not made carefully, the chemical-physical characteristics and the performance of roofing materials may deteriorate. During the winter months, the ventilated roof allows the dispersion of water vapor produced in the attic and, during the summer months, the dispersion of the heat that accumulates on the surface of the roof because of its exposure to the sun.

Installation Procedure:

It is useful to place a membrane such as Vapobar, which acts as a barrier to water-vapor and which provides anti-dust and anti-wind protection, onto planking (or a suitable inclined wooden surface). The membrane is composed of a film and a polypropylene fabric, and its functions are to prevent the dust present in the ventilated roofing package from passing through the planking and falling into the attic, to manage the discharge of the water vapor that is produced in the attic without altering the thermal capabilities of the insulating material, and to maintain planking at an appropriate level of humidity. Begin by installing the battens parallel to the eaves. The battens are attached to the bearing structure with wood screws of an appropriate length while insulating material is simply placed between the battens. To protect insulating material, the "Difbar" water-vapor diffuser membrane is laid. Proceed with the laying of counter-battens at a right angle to the previous battens and attach them with wood screws, in order to create the ventilation chamber, whose size must account for both the pitch of the slope and its length (Table 11, appendix 2). The ventilation chamber is finished with a continuous support of phenolic plywood (exterior type) or with an OSB panel that is attached with annular-ring nails every 15 cm. The interspacing of the battens determines the bearing capacity of the panel (see the Tables in Appendices 3 and 4). The ventilation is completed with the careful sizing of the openings along the eaves lines and the ridge lines in order to allow the discharge of warm air and the intake of cool air (Tables 12-13, appendix 2).
At this point, once you have chosen the Tegola Canadese model to be used, consult the Tables in Appendix 1 to evaluate the proper installation method for the model you have chosen. Proceed with the application of the Tegola Canadese roof covering. Installation is carried out with annular-ring nails, and waterproofing of the roof covering results from overlapping with other materials. In this case, it is helpful to place a protective and anti-skid membrane such as Startbar-s directly onto the tongue-and-groove planking or other wooden surface, thus facilitating the laying of shingles and protecting the laying surface during construction. If the pitch and/or the length of the slope don't permit impermeability with a nailed installation, proceed with the torch application on the planking of a 4 mm-thick bitumen-polymer sheet, reinforced with polyester non-woven fabric and over which the shingles are torch-applied.

NB: For specifications, see the "Build The Roof" section of the Tegola Canadese website.

Fig.33

VENTILATED ROOF WITH IRON STRUCTURE, WITH NON-INHABITED UNDER-ROOF SPACES

Where non-inhabited under-roof spaces are present, the technical options for constructing a ventilated roof are different. Simplifying the various possibilities, we propose an approach in which the under-roof/mansard space becomes an area in which air can circulate without impediment. The goal, with this technical approach, is to transform the non-inhabited under-roof space into a ventilation chamber and a laying surface for insulating material. Thus, the interior of the under-roof space cannot present obstacles of any kind (e.g., walls, enclosed spaces, etc.) that would block air circulation. The insulating material is laid onto the flat surface of the under-roof space and ventilation is finished with the application of ventilation openings on the roof in proximity to the perimeter wall (air inlet) and along the ridge (air outlet) in order to allow the discharge of warm air and the intake of cold air. The number of ventilation openings is related to the size of the roof in question. The designer may find Tables 12 and 13 (in Appendix 2) useful in this regard because, with respect to the length and the pitch of the slope, they establish the ventilating surface for every ml of inlet in the eaves and of outlet on the ridge. Tegola Canadese ventilation openings have a ventilating surface of 150 cm^2.

Installation Procedure:

If the roof structure consists only of steel beams and rafters, and the substrate and roofing must still be designed, plywood panels, treated with phenolic resin for outdoor use, can be used. The panels are normally applied with interspacing of 48 cm or 61 cm (a submultiple of their size), which does not normally coincide with the interspacing of the secondary metal structure. For that reason, and in order to better compensate for the differential expansion between the metal structure and wooden paneling, it is advisable to install a framework of battens at a right angle to the metal structure and attached to it with metal screws of an appropriate length. The paneling is then attached to the battens with annular-ring nails at least 45 mm long. At this point, once you have chosen the Tegola Canadese model to be used, consult the Tables in Appendix 1 that relate to the installation method of the model you have chosen. Proceed with the application of the Tegola Canadese roof covering. Installation is carried out with annular-ring nails, and waterproofing of the roof covering results from overlapping with other materials. In this case, it is useful to place a protective and anti-skid membrane such as Startbar-s directly onto the tongue-and-groove planking or other wooden surface. This makes the laying of the shingles easier and protects the laying surface during construction. If the pitch and/or the length of the slope don't permit impermeability with a nailed installation, proceed with the torch application on the planking of a 4 mm-thick bitumen-polymer sheet, reinforced with polyester non-woven fabric and over which the shingles are torch-applied. If sheet metal is used as a roofing material and if it provides a smooth laying surface coplanar with Tegola Canadese roof sheathing, proceed with the flame-application of a 4 mm-thick bitumen-polymer sheet, reinforced with polyester non-woven fabric, over which the roof finishing in bituminous shingles is torch-applied.

NB: For specifications, see the "Build The Roof" section of the Tegola Canadese website.

Fig.34

VENTILATED ROOF WITH IRON STRUCTURE, WITH INHABITED ATTIC

The use of the attic as a living space necessitates insulation materials that ensure a comfortable living environment and reduce the negative effects of heat conditions on roofing structures. Insulating material is placed on the external surface. The choice of an insulating product is a function of the overall heat performance of the roofing, which is defined as the unit transmittance of the surface (U=1/Rt see appendix 5), and of the control of water vapor produced in the inhabited attic (see appendix 7). If these evaluations are not made carefully, the chemical-physical characteristics and the performance of roofing materials may deteriorate. During the winter months, the ventilated roof allows the dispersion of water vapor produced in the attic and, during the summer months, the dispersion of the heat that accumulates on the surface of the roof because of its exposure to the sun.

Installation Procedure:

Where visible metal roofing structures are present, the use of tongue-and-groove planking as a roofing material is advised. On the one hand, such material provides an adequate laying surface for the technology that follows and, on the other, it provides a pleasing internal finish. It is useful to place a membrane such as Vapobar, which acts as a barrier to water-vapor and which provides anti-dust and anti-wind protection, onto planking (or a suitable inclined wooden surface). The membrane is composed of a film and a polypropylene fabric, and its functions are to prevent the dust present in the ventilated roofing package from passing through the planking and falling into the attic, to manage the discharge of the water vapor that is produced in the attic without altering the thermal capabilities of the insulating material, and to maintain planking at an appropriate level of humidity.
Begin by installing the battens parallel to the eaves. The battens are attached to the bearing structure with wood screws of an appropriate length while insulating material is simply placed between the battens. To protect insulating material, the "Difbar" water-vapor diffuser membrane is laid. Proceed with the laying of counter-battens at a right angle to the previous battens and attach them with wood screws in order to create the ventilation chamber, whose sizing must account for both the pitch of the slope and its length (Table 11, appendix 2). The ventilation chamber is finished with a continuous support of phenolic plywood (exterior type) or with an OSB panel that is attached with annular-ring nails every 15 cm. The interspacing of the battens determines the bearing capacity of the panel (see the Tables in Appendices 3 and 4). The ventilation is completed with the careful sizing of the openings along the eaves lines and the ridge lines in order to allow the discharge of warm air and the intake of cool air (Tables 12-13, appendix 2). At this point, once you have chosen the Tegola Canadese model to be used, consult the Tables in Appendix 1 to evaluate the proper installation method for the model you have chosen. Proceed with the application of the Tegola Canadese roof covering. Installation is carried out with annular-ring nails, and waterproofing of the roof covering results from overlapping with other materials. In this case, it is useful to place a protective and anti-skid membrane such as Startbar-s directly onto the tongue-and-groove planking or other wooden surface. This facilitates the laying of the shingles and protects the laying surface during construction. If the pitch and/or the length of the slope don't permit impermeability with a nailed installation, proceed with torch application on the planking of a 4 mm-thick bitumen-polymer sheet, reinforced with polyester non-woven fabric and over which the shingles are torch-applied.

NB: For specifications, see the "Build The Roof" section of the Tegola

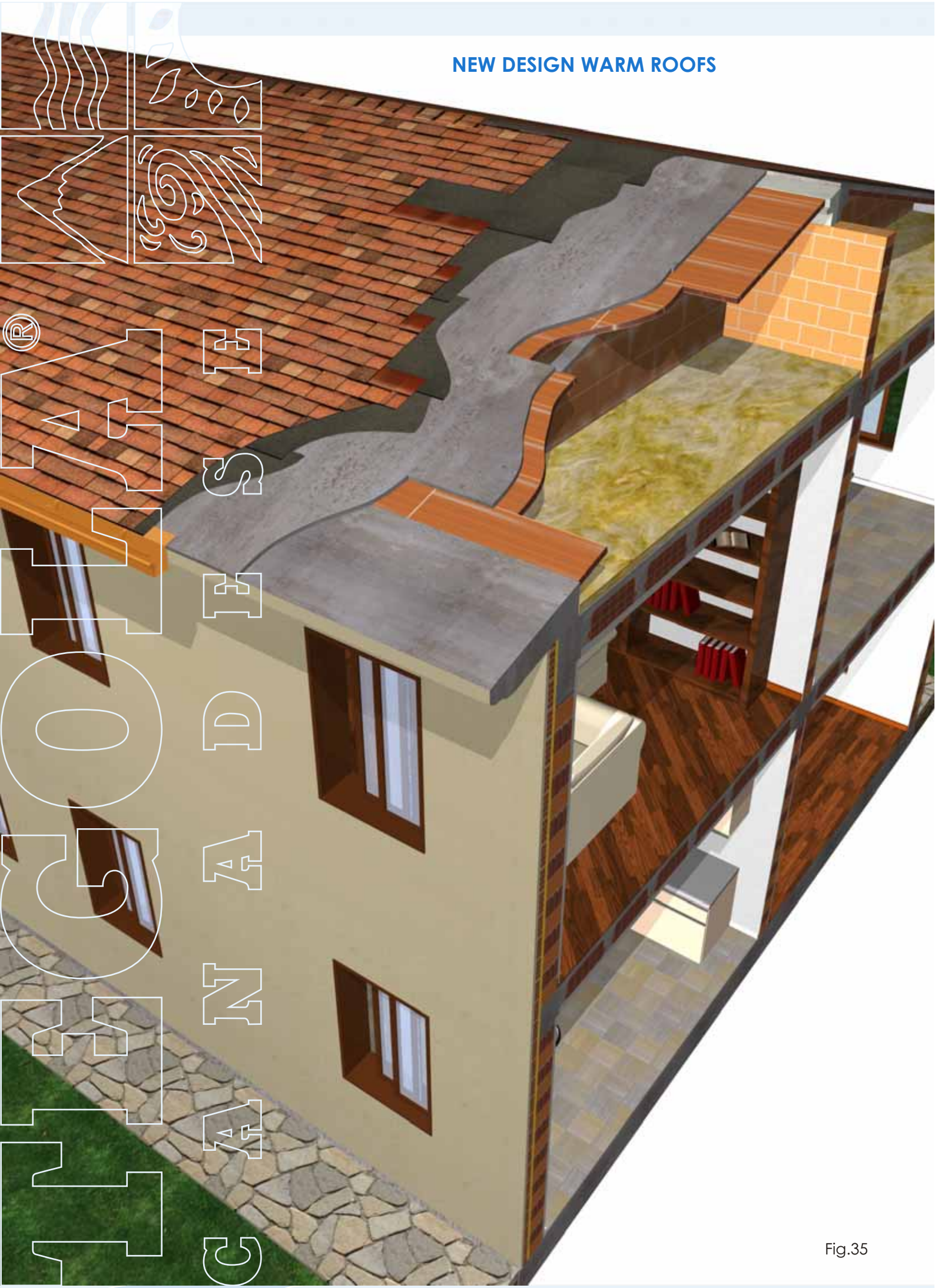

Fig.35

WARM ROOF WITH NON-INHABITED UNDER-ROOF SPACES

The technology for properly insulating a non-inhabited under-roof space, after having determined appropriate sizing in order to conform to regulatory requirements, consists of laying the insulating material directly onto the floor of the non-inhabited under-roof space.

Installation Procedure:

Once you have chosen the Tegola Canadese model to be used, consult the Tables in Appendix 1 in order to evaluate the proper installation method for the model you have chosen. If the laying plan permits nailing (Fig. 36), proceed with the application of the Tegola Canadese roof covering in the model and color selected. The installation is carried out with annular-ring nails, resulting in a roof covering that is waterproof as a result of overlapping with other materials. In this case, it is helpful to place a protective and anti-skid membrane such as Startbar-s directly onto the tongue-and-groove planking or other wooden surface, thus facilitating the laying of shingles and protecting the laying surface during construction. If, with a nailed installation, the pitch and/or the length of the slope don't guarantee impermeability, or if the laying surface does not allow nailing (Fig. 35-37), proceed with torch application of a 4 mm-thick bitumen-polymer sheet on the laying surface, reinforced with polyester non-woven fabric and over which the shingles are torch-applied.

Fig.36

Fig.37

Fig.38

WARM ROOF WITH INHABITED ATTIC

The use of the attic as a living space necessitates insulation materials that ensure a comfortable living environment and reduce the negative effects of heat conditions on roofing structures. Insulating material is placed on the external surface. The choice of an insulating product is a function of the overall heat performance of the roofing, which is defined as the unit transmittance of the surface (U=1/Rt, see appendix 5), and of the control of water vapor produced in the inhabited attic (see appendix 7). If these evaluations are not made carefully, the chemical-physical characteristics and the performance of roofing materials may deteriorate.

As explained in the paragraph that discusses warm roofs (p. 14), it is advisable to apply a vapor barrier such as "Alubar" directly onto the laying surface. This barrier keeps water vapor produced in the attic from reaching the insulating material, where external waterproofing will tend to prevent its discharge. The material used, whether it is rock wool with a bituminous surface or an extruded polystyrene with a pre-bonded membrane, must be attached to the laying surface with wood screws (Fig. 38) or metal screws (Fig. 40), screw anchors (Fig. 39), or large flange rivets, according to the laying plan. Washers must always be used in order to provide insulating materials and the roof covering with sufficient anchorage, resistance, and stability. The number of attachments per square meter is a function of the slope of the roofing and its wind exposure.
Torch-apply, above the insulating material, a 4 mm-thick bitumen-polymer sheet, reinforced with polyester non-woven fabric, which completes waterproofing and provides a sealing and anchorage layer for the bituminous shingles.
Torch application of the Tegola Canadese roof covering proceeds using the model and color selected.

Fig.39

Fig.40