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## **Preserving Frescos while Substituting the Wooden-Beam Floor**

Conservation des fresques lors du remplacement de planchers en bois

Erhaltung der Fresken während dem Ersetzen des Holzbodens

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In many old buildings of the "Ancient Centre" in Naples, the false ceilings carried out to mask the intrados of the wooden floors, were usually vault shaped and painted in fresco, in order to give greater solemnity to entertainment rooms and greater prestige to the owner. The usual shape was a "gaveta" vault that gives larger plane surface. The false ceiling, originally, was made of reeds ("canne") with a wooden trellis, from which derive the Italian term "incannucciata", then, in the course of time, the reeds were replaced with canvas. The wooden trellis was fixed to the wooden beams of the floor through little wooden bars, which was a remaining of the wooden trellis working. The trellis was usually made of chestnut. The section of the wooden elements, which constituted the trellis, was from about cm 3 x 3 to about cm 7 x 7, even if the section usually employed was about cm 3 x 5. The reeds or the canvas were coated with gesso and painted in fresco. The interstice resulted from wooden floor and the "incannucciata", to prevent that the latter went rotten, was ventilated through air intakes, called "ventarole", that shut by wire gauzes, connected the several rooms among them and outside.

Nowadays the engineers often are asked for giving their opinion on the stability of these old wooden floors. The problems of diagnosis of impairment due to the impossibility of access to the floor soffit because of the "incannucciata" are omitted in this paper in order to speak about the possible intervention to make on the floors once they are considered unsafe. To make this procedure clear, the traditional techniques of construction of the wooden floors in Naples is described briefly. The floors were made of raw beams, usually of chestnut, leaned on longitudinal walls for a length not less than 1/20 of the span. The distance of the floors from one axis to another was 80 - 90 cm. On the beams, in the zone included between two adjacent beams, called "valera", some halfround pieces, usually made of chestnut, called "panconcelli" or most generally "chiancarelle" were put orthogonally and in contact. On these "chiancarelle", a layer of scraps or masonry debris ("sfabbricina") mixed with scanty mortar was laid. This layer is called "riccio". A layer of good mortar or a light mix of lapillus, which formed a sort of cover, called "masso" was spread on the "riccio". On this "masso" the proper flooring is placed. Once the floor must be replaced, the choice inevitably falls on the steel beam floor. It is made of steel beams, hollow flat tiles and a light concrete filling casting. The beams are connected together with a net, or 8 with a mesh of cm 20 x 20, soldered to the beams. Everything will be completed by a cm 4 concrete slab casting. The choice is inevitable for a different reasons. First of all, the lightness of this kind of floor, next its peculiarity of having, like the wooden floor, points of support, and finally, as we can see later, the possibility of assembling it into parts connecting it to the "incannucciata".



After making the dimensional choices and reducing the members with the well known methods of the Science and Technics of construction, we examine the operative phases of substitution. The first phase consists in removing the flooring, next the "masso" and finally the "ricco" in order to lay the "chiancarelle" bare. This is the most delicate phase, because, generally the "chiancarelle" are very damaged, so any sharp movement or the use of wrong tools, can give rise to the fall of "sfabbricina" on the "incannucciata" with the its resulting damage. Thus the operation must be performed with great care using only bush-hammer and trowel and not other tools, such as shovels or picks. To preserve the "incannucciata" the floor should not be uncovered as a whole, but only a "valera" at a time, while at the beginning, two at a time in order to have two spans opened. After this, the "chiancarelle" should be removed. The "incannucciata" could be very damaged, in this case a skilled restorer should be called. Nevertheless if the trellis and the canvas, or reeds, are in good conditions, the only advisable operation is to stiffen the connections between the reeds or canvas and the wood. At the vault extrados, the connection of the reeds to the trellis takes place sticking strips of glass fibre cloth, firstly impregnated with bicomponent epoxy resin, or more economically, using strips of cloth sticked with no watery glue. Before removing the beams it is necessary to create temporary supports for the beam and to protect the canvas from possible small masonry debris and above all from the water casting. The temporary supports for the canvas could be made with wires fixed on bars orthogonally placed to the floor frame. The simpler and cheaper protection of the canvas is to put first a plywood sheet on the trellis, second cardboards and papers and finally a sawdust layer. To remove the beams it is necessary to widen the hole of housing to sling the beam and to saw in two parts. Now the wooden beams is replaced with the steel beam. The profile used is generally a hot rolled steel Fe 360 section IPE or NP. The profile must not be leaned directly against the tuff masonry, because, obviously, the pressure concentration could break the support stone. That's why a concrete or solid bricks bearing is created to support the beams. The support of the beams must be about 1/20 of the span and never less than cm 15. After placing the beams, the trellis, which support the "incannucciata", is connected to them. The connection, in the case of particularly deformed "incannucciata", is made with steel wires and thread-tensioner which will be used to settle the vault again. But if the vault is in good condition it is sufficient to bring back the connection into use through zinc plated steel wires tied to the trellis and the beam. Then the hollow flat tiles are placed and the holes of housing are sealed with a sand and cement mixture. When the concrete is set, the completing concrete is cast. After the setting of the last one, the plywood steels are removed, the cardboards and the sawdust are substituted and the operation for the next "valera" is repeated. At the last bay the cardboards and the sawdust are not employed, except the plywood sheets which will not be got back after casting. After completing the last span, the electro-soldered net is placed and the slab of cm 4 is cast, taking care of not mixing the concrete with the surplus water compared to the stoichiometrical necessary water in order to avoid damp stains on the "incannucciata".

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