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Analysis of the restoration and consolidation of thelate baroque church of Spirito Santo in Aversa

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Abstract

The analyzed topic concerns the final design for the late Baroque church of the Holy Spirit in Aversa (CE) restoration. In this regard, the contents of the aforementioned improvement project will be illustrated. Following a total revaluation of the tender project, it was necessary to identify detection and diagnostics techniques to correctly analyse the monument, with intervention methodologies that would allow the adequate valorization and the historical preservation, through endoscopic examinations, sonic tests, and the deformability and strength analysis of the masonry for a correct seismic analysis and the mensiochronological typification of the walls, the floors and the vaults. The interventions are based on a methodological perspective of compatibility, reversibility and distinctiveness. The main objective of the project was the functional and normative adjustment of the sacred space as a music room, improving its acoustics, climate mitigation and static behavior, through dedicated interventions and light materials, capable to integrate with the existing structure. Regarding the coherence and effectiveness of consolidations, the techniques used to repair and strengthen the structure were: replacement of the armed seams with harmonic steel tie-rods; injections of hydraulic lime mortars, sifted volcanic sand and zeolite; consolidation of the vaults with extradossal chains in the abutments, and the creation of a macro-truss, entirely isostatic, connected to the longitudinal walls with cylindrical hinges and bilateral trolleys, through dynamic constraints (shock transmitters), equipped with a ventilated roofing package made of larch, rock wool panels and an underbody slab, and corten-steel nodes. This technical solution has allowed the realization of a project capable to fully meet the tendering needs, for a rational reconfiguration of the monumental complex without sacrificing its historicized matter, for a new role in the urban fabric.

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Keywords: methodologies, valorization, historical preservation, consolidation, shock transmitters

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1. Introduction

The monumental episode in question, namely the Church of the Spirito Santo in Aversa (CE), was born in the seventeenth century near the city walls of the eleventh century to the monumental complex of Santo Spirito service, transfigured in the first half of the eighteenth century, according to made a late-Baroque program, including in their framework walls of the sacristy the surviving structures of the first Norman castle of leborina city.

Fig. 1. Front of the church.

Fig. 2. Interior of the church

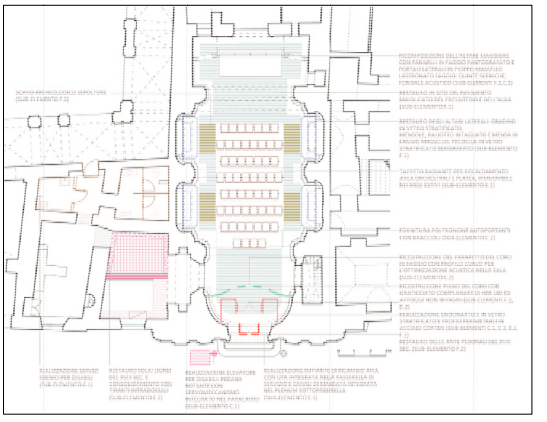

Fig. 3 Layout of the church, summary of the improvements offered.

Here, we describe the contents of the aforementioned improved offer, resulted awarded the contract, referring to the literature on the subject for the construction events episode monumental.

The actions proposed for the design and implementation of the restoration of the church, to be used as a music room, regarding the elaboration of an offer ameliorative inherent quality and technical merit of the materials, the architectural features, the structural, physical ones Techniques and plant, and the quality of the restoration methodologies. In relation to the knowledge of the structural characteristics, we were offered numerous diagnostic investigations mensiocronological typing of the walls, the floors, and sometimes; characterization of the wooden be characterization of

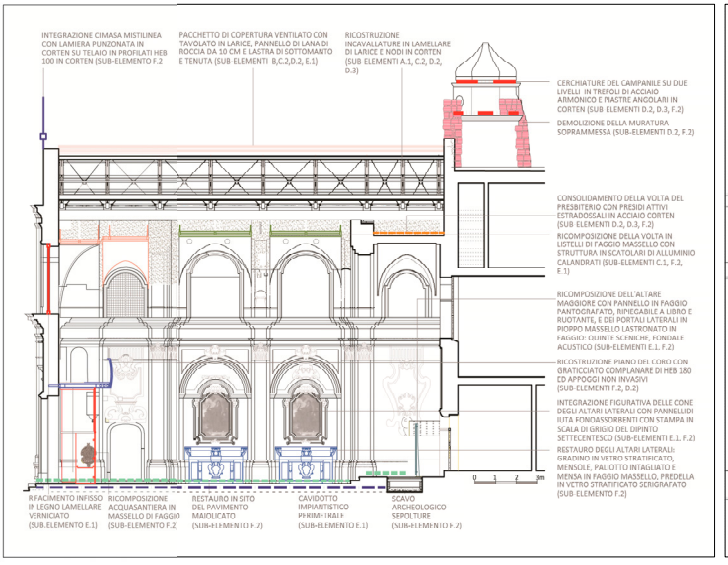

Fig. 4. Church of the Spirito Santo, summary of the impnts offered.

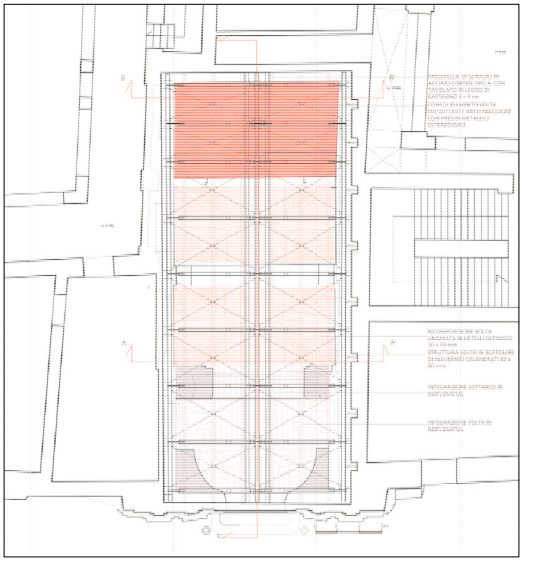

Fig. 5. Church of the Spirito Santo, technical layout, the attic.

the wooden beams of the floors of the sacristy with "*resistografo*"; performing inspection pits for foundations; about

rationality, consistency and effectiveness of consolidations has decided to take action by replacing the armed seams, of doubtful effectiveness, and invasive, with sliding rods of spring steel acts to anchor the main front of the church to the four walls of plug; injections and percoll of hydraulic lime mortars, volcanic sieved sand and zeolite; consolidation of times with extrados chains inserted into the abutments, between the vault and the decking, with the only solution able to inhibit the stretching of lamie and that. It allows to avoid the removal of the abutments, which also would result in the decompression of archivolted structures; for the choir loft, Reconstruction with castellated beams Corten steel connected to the masonry by means of always Corten cylindrical dormant: the intervention minimizes the removal of the wall mass for anchoring the new floor and reduces maintenance costs; for the floors of the eighteenth century sacristy, the restoration flanking the round beams a lightweight structure with a stainless steel post-tensioned cables; the replacement of the expected curb summit in reinforced concrete with a "*radiciata"* plate Corten steel, without indentations or sacrifice of matter; for the roof of the church, in place of the project hyperstatic structure, a macro-isostatic truss internally connected to the longitudinal partition walls by means of cylindrical and bilateral trolleys hinges, with dynamic constraints (shock transmitters) that bind horizontally the two sub-structures only in the case in which occurs a horizontal relative displacement between the longitudinal walls of the church, generated by a seismic wave. The technical solution adopted allows to constrain horizontally, in the head, the transverse walls in longitudinal ones, by passing each wall from the cantilever scheme, with displacement in a free head, leaning at the schema with displacement in the head prevented, with significant improvement of the index seismic safety. In order inexpensiveness of structural solutions it is stressed that the offered materials are compatible with existing ones, do not require maintenance (Corten) or they dilate the timing (larch). The steel phosphorus has also been offered for transmitters shock, as for all the installed metallic structures in the building, except for a few strands that are made of chromium steel (stainless steel). Dynamic constraints are cheap, reliable and virtually maintenance free.

In order to methodologies, techniques and instrumentation for the restoration, the improved offer contemplates: minimization of historicised matter sacrifice and chemical-physical compatibility of new materials; restoration (in place of scheduled replacement with horizontal elements in iron and wood) of the survivors of the floors traits in "*scorzate"* beams and "*chiancarelle"* the sacristy; restoration in situ (in place of the complete removal laid down in the tender project) of the tiled roofs of the classroom and the presbytery; renunciation to recesses for the insertion of the chains in the steeple (placing them on the pavements, with a more effective solution on the structural floor and non-invasive on a formal level); reduction of the cuts of the walls for the realization of the access to the baths compartments; renunciation to the deep recesses for the insertion of the curbs summit in reinforced concrete; minimization of masonry recesses for housing the steel beams of the heads of the new choir by having recourse to a cylindrical dormant Corten, with evident advantages also executive adoption, for grouting of the sleepers, of rheoplastic mortar of hydraulic lime and zeolite, in place of the lime mortar envisaged in the project for the interventions on the walls; renunciation to the removal of the abutments of the time, evidently of cultural value, equal to the matter in view, subrogate the invasive intervention of consolidation of lamie foreseen in project with "tie rods" extrados Corten of simple execution, effective and reversible; replacement of all structural elements and finishing the project based on race that make use of cement with hydraulic lime mortars or elements structural analogue office made of corten; renunciation for the complete use of iron armor, suppression of concrete structures, with the exception of screeds on basements ventilated crawl spaces, for which the welded mesh of the project is expected subrogate with a structural fabric FRG (fiberglass).

1.1. Architectural and compositional quality of project proposals for this place.

The documentation to the project, shows an appreciable effort of the historical knowledge. The geological surveys, coring, the geometrical relief and that of the crack pattern provide useful elements for the formulation of reasonable assumptions on the degradation, the actual characteristics of the materials and, ultimately, on the safety of the structure level. Endonartece is placed the chorus, which repeats, with modern materials (structure in sections of Corten, paving in solid chestnut, soffit in beech honeycomb), the disappearance cantoria, with a wooden parapet on "*piantoni"* steel whose design He obeys acoustic criteria. Such balustrade has a slightly convex vertical cross-section, in order to maximize the reflection of sound, optimizing, also for this aspect, the acoustics of the room. To substitute the side altars, transferred decades ago at St. Michael's Church, the offer ameliorative proposes, as an

alternative to the design based on race, synthetic recomposition canteens with beech panels and etched tempered glass plates, which let in Having regard to the building frame of the side altars. Similarly, the late altar with marble gates connected committed is repurposed as a fifth stage, also useful for the acoustic improvement, by means of two of beech wood panels, moved using binary.

In the sacristy, the project place-based competition includes the reconstruction of the floor in the round and "*chiancarelle"* beams, whose surviving fragments of the sector retains precious wrapped painted eighteenth century. The improved offer proposes the restoration, with the consolidation by anchors intrados steel.

It is proposed to maintain the geometry of the disappearance eighteenth time to *"incannucciata"*, reassembling the lamia with an aluminum box-like structure and calendered solid beech wood slats, spaced, for classroom central modules, also to improve the acoustic performance of the room. Investigations and fact-finding investigations to be carried out for the accurate knowledge of the factory and the choice of static consolidation of technical improvements.

1.2. Investigations and fact-finding investigations to be carried out for the accurate knowledge of the factory and the choice of static consolidation of technical improvements..

The agency is committed to conducting, within the Executive Project, a systematic campaign of instrumental measurements, diagnostic tests in situ and in the laboratory, performing an analytical examination of these materials and related forms of degradation.

Laser scanner survey. For the complete determination of geometrical artifact under investigation and reconstruction of an updated his detailed 3D model will use the laser scanning technology, with a laser scanner to the phase difference, which allows: rapid acquisition of the data; adequate precision to the aims of the project; possibility of positioning the tool near the surfaces to be detected, in confined spaces and without additional equipment or cables. The scans will be carried out by setting the instrument according to the following parameters: resolution: 1/10; Quality: 4x; scan time: 3.05 minutes; distance of the points in mm / distance of 10 m: 15,340; points in millions: 7.

GPR prospecting. For the prior identification of the cavities present in the subsurface and for the non-invasive determination of the stratigraphy of the vertical walls and the factory sometimes held systematic scans with georadar, SPR using a multifrequency system consisting acquisition unit to two channels for the simultaneous management of two monostatic antennas 600 Mhz and 1.6 Ghz, "K2" software for data acquisition and "IDS_Gred "for the development of the latter.

The investigations are programmed in the classroom, in the sacristy and in environments turned sopranos, with longitudinal and transverse scans of step 70 cm, identifying the scanning axes with a unique alphanumeric code and assigning the same code to the corresponding radargramma. The data acquired will be processed on site with the dedicated sensor-penetrating radar system software.

Pacometriche investigations. To locate the nails and the armature of iron wires used in the usual baroque stucco and any consolidation chains placed subtrack, will take place pacometriche investigations into the classroom and vertical surfaces of the chancel, using a covermeter Cover Master CMS9, digital, high accuracy with P331-H half-cell kit for corrosion analysis, with standard probe, for close-up bars, rods and probe for deep hole probe, softwares "EDTS" and "CoverMaster®" for the transfer and data processing.

The results will be compared with those of GPR surveys in order to have a single reading of all metallic elements identified.

Thermographic surveys. In order to identify the gaps of the stucco and plaster walls from the substrate, the presence of any tompagni and similar discontinuities of the wall mass, will be performed thermographic taken of the totality of the classroom vertical surfaces, the chancel and sacristy, employing a sensor that ensures an extremely high sensitivity and allows the analysis of large areas with high measurement accuracy, namely high sensitivity ergonomic thermographic system (0:08 ° C to 30 ° C) FLIR "ThermaCAM P65", with LocatIR ™ laser system for the integrated 'optimal combination of IR hot spots of the image with the physical target, processing software "ThermaCAM QuickView ™" and "ThermaCAM Reporter ™."

Prospecting endoscopy. The interior of the walls and of the abutments of the time will be explored also with 6 prospecting videondoscopiche practiced by inserting its probe into holes of 10 mm specially practiced. To this end,

it will use a flexible endoscope (fiberscope) PXL PRO XL series able to adapt to the change of the hole linearity. The system has a camera control system by means of a joystick and an articulation All-Way ™ which allow an easy positioning and re-orientation of the probe.

The relief allows to define the geometry of the building, an essential parameter for the mechanical definition of the structure, together with the materials and the loads acting. In the specific case, it seems to deepen the investigation material and degradation must be addressed and certainly the analysis of the crack pattern. The work performed on this last aspect should be pointed out by identifying the amplitudes of the slits and proposing the placement of the cornerstones for monitoring before and during the work, correlating it with the geotechnical type information and with the relief of the temperatures, to separate the physiological aspects from those pathological interpretation of the mechanisms in place. In particular, the leading edge appears detached and interested by a rotation towards the outside so that the evolution of differential subsidence confirmations are necessary between the different sectors of the factory. It is expected to integrate the investigations predominantly with non-destructive techniques, capable of providing a brief overview of the characteristics of the structure. They propose targeted endoscopic examinations with small diameter probes, sonic tests to evaluate the homogeneity of the walls, with flat jack tests, simple and double, to determine the stress state in the site, the deformability and the compressive resistance limit. The same test, with an innovative extrapolation, will be used to determine the shear strength of the masonry, which is essential for the purposes of a correct seismic analysis, without making use of the usual information from literature, generic and undersized. The foregoing in order to maximize the preservation of cultural heritage and minimize costs in respect of functionality and security requirements. In summary, the proposal provides for ameliorative-dimensional morphological typing of the walls, the floors and vaults. It is also proposed: the mechanical characterization of the load-bearing walls by means of a single screw jacks, to detect the magnitude of the voltages present in masonry structures, and double jacks, to locate the deformation characteristics of the masonry; the identification of the different types of constituents, the factory walls (masonry blocks two feet tall Norman era, "on construction sites" of the seventeenth century, in *"bozzette"* of the eighteenth century, in the nineteenth century blocks) by means of prospecting with georadar (with 1.6 Ghz antenna) and videoinspection in correspondence to possible discontinuities of masonry registers; the geometric and material characterization of the wooden beams located in the compartment sacristy, which are proposed to the restoration, with the degradation determination by resistografo RESI 400, with execution of three beam tests (two at the support, and a centerline); the execution of three inspection wells of foundations, aimed at the geometric characterization, material, structural and geotechnical foundations (two adjacency to the front, one in correspondence with the chancel); the installation on the facade of six automatic deformometri with precision to a thousandth of a millimeter and two inclinometers biaxial, connected to an automatic data acquisition unit, through which it will be possible to obtain real-time data on the evolution of the deformation of the structure, by over, it provides for the transfer of deformometri dynamic constraint system of trusses.

The final draft provides for the recovery of masonry mortars and degradation of four types of intervention mending by 'stitch and scuci' to replace deteriorated parts or masonry sarcire discontinuity, where it is in the presence of masonry to the crude (upper part of the building) or plasters or no finishing apparatus or poor value. Performed by tuff stones or bricks of the old building and full recovery common mortar additive hydraulic lime, with finished surface in the undercut (in the corresponding operational sheets state as a binder cement mortar).

Sarcitura of injury by means of lime injections gravity or low pressure in the presence of stucco and decorative elements: for simple casting (gravity) or horse drawn of the same (low pressure and carried out from the rear). Effected by injection of hydraulic lime mixture added with expansive and thinners products. armed sewing of some cantons, crosses and hammers, Regeneration by means of injections of hydraulic lime mixtures (added with expansive and thinners products), performed at low pressure and (if in the presence of decorative apparatuses) from the rear. Ameliorative The proposal provides for the complete replacement of the armed seams, of doubtful effectiveness and invasive, with sliding rods harmonic steel acts to anchor the main front of the church at four plug walls, two side of the main aisle of the church and two perimeter environment intended to wardrobe. It is expected to enter the chains of the cornice top surface level of the first order of the nave. In the presence of lesions in the walls it must be given a widespread response, consisting of "injection of mortars hydraulic base", to viscous consistency and non-shrinking, to be inserted in the walls in order to restore the continuity compression. In the absence of such intervention the wall portions separated by lesions (which can not move away from each other due

to the presence of the introduced rods) still have the possibility of approaching each other, with deleterious consequences. The filling of the voids and the sealing of lesions intends to stabilize the geometry of the building in the current configuration, achieving, however, a continuous structure, in which the various blocks can not move between them. The mortars for the stitch and scuci and fluid mortars for injection will be based on hydraulic lime, volcanic sieved sand and zeolite. For the times, the final plan to race based on two different types of intervention. For those of sacristy extrados contemplates a shell of reinforced concrete, reinforced with welded mesh turned up spiked with rods applied at a rate of 6 per square meter by means of perforation in the thickness of the vault and the intrados turned over. For the time on the chancel it provides an extrados mantle of composite materials, to be achieved by laying the extrados of bands of fabric in continuous unidirectional or bidirectional carbon fibers of high tenacity to be carried out after preparation of the substrate and shaving with epoxy putty, application of adhesive and carbon fabric; fiber incorporation with laminating resin.

The proposal ameliorative moves from the principle that the arches and vaults are very generous structural elements, capable of withstanding considerable mechanical flow ordeals. The monument in question presents paintings cracking by stretching of the time. Usually, the addition of new chains meet the set of the time is a simple, effective and economical. In this case, the Protection of formal values Baroque does not allow the reservoir to adopt this solution. It is therefore proposed to make recourse to a extrados chain (a "staple"), inserted into the volume between the vault and the overlying decking. The system consists of a beam, flexurally able to withstand loads applied in central positions, from which descend two diagonal rods, threaded. Operating from ' high by coring, these rods is inghisano in the masonry to level of taxes and finally, by tightening nuts, are put in traction. The horizontal component of the force transmitted at a time by means of the tie rods helps to confine laterally, preventing them to move apart.

The proposal is effective solution from the point of view of the static and the only one, as a model, can inhibit the stretching of the time. In this regard it is noted that the effectiveness of the insole of ca extrados and armature extrados with FRP presuppose the absence of horizontal sagging at tax level, what is not shown in this case. Furthermore, the ameliorative proposal can be realized in the absence of the emptying of the time, very invasive operation which also involves decompression of archivolted structures with possible irreversible damage of the same.

In the sacristy, the documents in the case it detects the presence of an eighteenth-century wooden ceiling of about half of the room and a false masonry along the boundary wall panel between the church and the sacristy. For the false wall in it envisages the creation of a support beam in Corten steel adapted to stabilize it and keep it in fact was. For the wooden beams of the slab reinforcement it is expected using the technique of wrapping of the beams ("guyed beam"), which allows you to combine the existing beam a new lightweight structure predominantly made with post-tensioned cables of stainless steel. It involves the insertion of two new Corten steel collars (at the centerline of the beam), which allow to reduce the bearing span of the beam and reduce the stress state. The system provides for the addition of two post-tensioned cables, which are applied to the intrados level in respectively in correspondence with the centerline of the beam and at the level of the extrados of the two pads. These rods pass under the centerline of the beam, supporting, without which its compression does not rest on the wooden beam. A facility was completed, the commissioning of the reinforcement will take place by means of tensioners. Finally, it involves the construction of walkways with girders of Corten steel and wooden plank for the connection between the slab and the chorus restored. without its compression does not rest on the wooden beam. A facility was completed, the commissioning of the reinforcement will take place by means of tensioners. Finally, it involves the construction of walkways with girders of Corten steel and wooden plank for the connection between the slab and the chorus restored. without its compression does not rest on the wooden beam. A facility was completed, the commissioning of the reinforcement will take place by means of tensioners. Finally, it involves the construction of walkways with girders of Corten steel and wooden plank for the connection between the slab and the chorus restored.

The project provides for covering the hoops of the perimeter walls by means of a chestnut wood bead laid on a continuous accommodation recessed anchored to the masonry by means of stainless steel threaded rods, spaced out every 50-60 cm, sealed with casting mortar shrinkage rheoplastic plywood. The wooden curb is made integral to the joints of steel glasses anchored to the masonry. This arrangement is accompanied by the consolidation of the masonry at the top by replacement of damaged parts to sew and scuci and / or by means of regeneration of the mortars injections. The final design of the program re-roofing truss made of cedar wood (in some elaborate,

laminated wood) with secondary framework of purlins, rails and planks. The trusses, that follow the rhythm dictated by the church transverse arches, they are bound iperstaticamente to the masonry by means of steel plates and anchor bolts. wooden roof timbers backward support, by means of wooden rods, wooden ribs of the reconstructed vaults, in nervometal (in some processed, such incannucciata).

The upper part of the masonry will be connected (circled) through a curb radiciato Corten steel setback placed on the summit of the masonry. It is expected to equalize the brickwork at the top with hydraulic mortar rheoplastic based on lime and zeolite, and on this lay a Corten steel plate, turned up vertically to about 30 cm on the inner facing. The latter will be connected to a plate placed on the external face by means of through bars of which the distance equal to the thickness of the masonry. The curb will radiciato with vertical steel connectors 8-10 inghisati rheoplastic mortar with natural hydraulic lime.

The roof of the church will be constituted by a macro-truss, internally isostatic, which will be connected to the existing structure (longitudinal baffles murari) by means of cylindrical hinges and two-sided trucks which will prevent the occurrence of stress states parasites due to the horizontal compulsions of the two sub-structures aforementioned. In order to improve the interaction in seismic incarrellato key on the side, it is envisaged the use of dynamic constraints (transmitters shock) that bind horizontally the two sub-structures occur only if a horizontal relative displacement between the two longitudinal walls of the church, generated by a seismic wave. The macro-truss consists of three tubular steel Corten oriented according to the longitudinal direction of the building, two placed at tax level and one in correspondence with the ridge. On said tubular, spaced at a distance of about 1.60 m, will be inserted steel plates, disengaged with respect to one rotation around the axis of the tubular (cylindrical hinge). These plates will be connected with the struts and wooden chains. To preserve the isostaticità of trilith obtained, the hinges present on the three tubes will be connected to each other by means of steel rods that constitute the bracing flap in the two planes of the wooden struts and in the horizontal plane of sets of the cover. These plates will be connected with the struts and wooden chains. To preserve the isostaticità of trilith obtained, the hinges present on the three tubes will be connected to each other by means of steel rods that constitute the bracing flap in the two planes of the wooden struts and in the horizontal plane of sets of the cover. These plates will be connected with the struts and wooden chains. To preserve the isostaticità of trilith obtained, the hinges present on the three tubes will be connected to each other by means of steel rods that constitute the bracing flap in the two planes of the wooden struts and in the horizontal plane of sets of the cover. The transmitters shock (dynamic constraint devices or temporary constraint) are used to create an effective constraint only in the presence of dynamic loads. In fact, if the structural elements to be connected they undergo very slow relative movements, for example caused by thermal deformation (or shrinkage, creep), these devices react with a very low strength, which does not prevent such movement. In this way, in the structure does not generate significant compulsions. Instead, under the action of dynamic loads, the reaction of the devices significantly increases, explicating the action of constraint. The transmitters shock then allow you to take advantage at the same time the advantages of an isostatic structure for the loads of exercise and a hyperstatic structure for dynamic loads (induced by the wind or an earthquake). In the specific case, in order to exploit the effect of horizontal diaphragm cover (which allows to obtain a box-like behavior of the building, and then the distribution of seismic actions between the different walls) and at the same time avoid the creation of states of coercion in the walls resulting from thermal expansion, they have been used eight dynamic constraint devices to connect the trusses to the walls, through the curb radiciato. The devices were arranged in correspondence of the sliding supports of the trusses (which on the other side are connected to the wall by fixed constraints). The technical solution adopted allows to constrain horizontally, in the head, the transverse walls (including the main front) to the longitudinal walls and vice versa, ie each wall passes by the cantilever scheme, with free head movement.

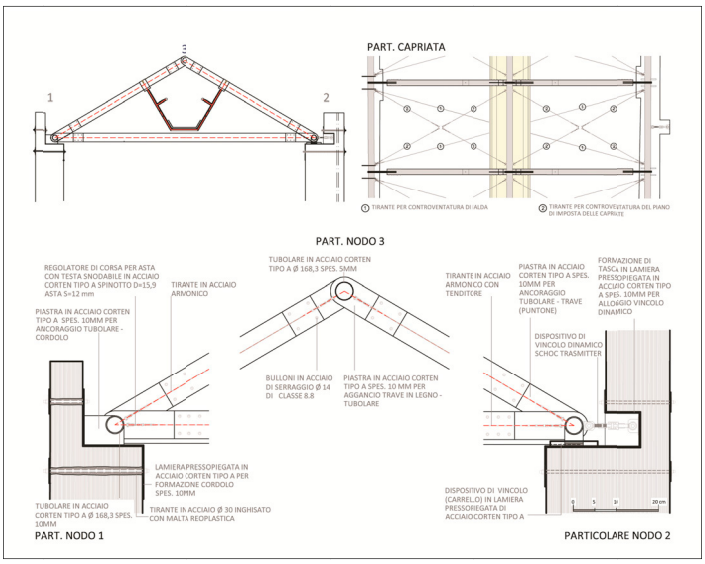

Fig. 6. Church of the Spirito Santo, construction details of the roof.

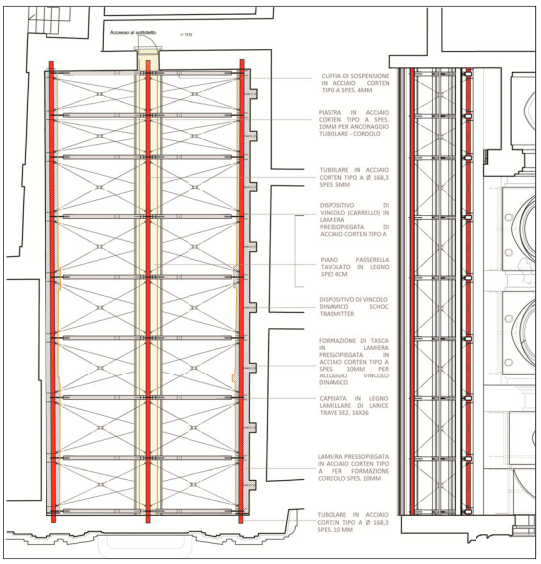

Fig. 7. Plant and longitudinal section, carpentry of the roof.

The transmitters shock (dynamic constraint devices or temporary constraint) are used to create an effective constraint only in the presence of dynamic loads. In fact, if the structural elements to be connected they undergo very slow relative movements, for example caused by thermal deformation (or shrinkage, creep), these devices react with a very low strength, which does not prevent such movement. In this way, in the structure does not generate significant compulsions. Instead, under the action of dynamic loads, the reaction of the devices significantly increases, explicating the action of constraint. The transmitters shock then allow you to take advantage at the same time the advantages of an isostatic structure for the loads of exercise and a hyperstatic structure for dynamic loads (induced by the wind or an earthquake). In the specific case, in order to exploit the effect of horizontal diaphragm cover (which allows to obtain a box-like behavior of the building, and then the distribution of seismic actions between the different walls) and at the same time avoid the creation of states of coercion in the walls resulting from thermal expansion, they have been used eight dynamic constraint devices to connect the trusses to the walls, through the curb radiciato. The devices were arranged in correspondence of the sliding supports of the trusses (which on the other side are connected to the wall by fixed constraints). The technical solution adopted allows to constrain horizontally, in the head, the transverse walls (including the main front) to the longitudinal walls and vice versa, ie each wall passes by the cantilever scheme, with free head movement.

Improvement in relation to the methodological choices, to the techniques and materials both in terms of optimization of the results and of execution times, which in terms of durability, reversibility, enhanced compatibility with these materials, the greater ease and economy in future maintenance operations, reduced environmental impact.

1.3. Improvement in relation to the methodological choices, to the techniques and materials both in terms of optimization of the results and of execution times, which in terms of durability, reversibility, enhanced compatibility with these materials, the greater ease and economy in future maintenance operations, reduced environmental impact.

The project place based on race provides, for the conservation interventions of matter (restoration) of the decorated surfaces, to a large extent interventions unrelated to the specific constituent material of the same (stucco linked with chalk and "armed" with nails and iron wire, floors and eighteenth of “scorzate chiancarelle” beams, papered with painted, the walls "to" seventeenth-century construction sites, and "bozzette", eighteenth century). The proposal relies on the increased chemical and physical compatibility criteria with the matter historicised the monument, conservation of each item of cultural value, distinctness and integrations of reversibility.

The minimization of the historical context regarding sacrifices and the chemical and physical compatibility of the new materials are ensured by providences listed below:

- restoration (instead of the expected replacement with horizontal elements in iron and wood) of the strokes in survivors of the floors and chestnut beams "*scorzate chiancarelle"* on the vertical of the sacristy (the lower one made even more precious by fragments of baroque paintings wrapped bearing the soffit, documented by photos attached to the project), consolidated with a system of harmonic steel strands intrados low figurative and of undoubted efficacy structural impact; such intervention allows to preserve as documentaries elements also wrought boulders lapillo and the overlying flooring grit;
- restoration in situ of the tiled roofs of the classroom and the presbytery, with the exception of Greek perimeter, disassembled to allow the construction of ducts plant, connected to the floor cassettes and adjacent uprights, which allow a fully wired and infrastrutturare the reservoir without opening any trace in the vertical surfaces; in the restoration site it allows to avoid the loss of a fraction of the eighteenth-century majolica during the disassembly phase and disseminated microtrauma to tinning of majolica removed;
- significant reduction in masonry cuts for the realization of the compartments for access to the baths;
- renunciation of deep recesses in the walls of the seventeenth century. provided by the project based on race for the insertion of the curbs summit reinforced concrete and wood, in favor of Corten steel plates, whose implementation requires only "*pareggiamenti*" with mortar rheoplastic hydraulic lime and limited and punctual grouting;
- minimization of masonry recesses for housing the new choir in the steel of the beams tested (however Corten) by having recourse to a cylindrical dormant Corten, which also carries out the cross-tie office and reduces the burglary to a borehole 12 cm in diameter, depth to 2/3 of the wall section, with obvious advantages executive (reduction of shakings that may microfratturare adjacent stucco, uselessness of unusual depth of the recesses for the insertion of the beams tested, uselessness of additional masonry removals historicised for the realization of dormant brick;
- replacement of all structural elements and finishing the project based on race that make use of cement with hydraulic or elements lime mortars structural analogue of office but made of corten.

Conclusions

The proposal addresses the issue of ameliorative conservatively key consolidation: recognize the different levels of complexity of the object, identifies the changes that have occurred over time and respects, imposed knowledge and analyzes that will seize the greatest number of data, in view of their conservation excluding allegations arising from a priori of historical thesis or aesthetics. The envisaged interventions do not interfere with the values of the monument and its evocative role, placing itself in a methodological perspective of compatibility, reversibility and distinguishability. The improvement project aims to achieve the functional and regulatory compliance of the sacred space, to use as a music room, improving the acoustics and light materials with specific interventions, integrated with existing structures.

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