The Repairs to the Dome of the Chapel of St. Gennaro's Treasure: the Eighteenth-Century Dispute between F. Sanfelice and G. Lucchese

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INTRODUCTION

The dome of St. Gennaro's Chapel was accomplished between 1608, the year in which the first stone was laid, and 1615, the year in which the building work can be considered completed, following the project of the Theatine Architect Francesco Grimaldi. Francesco Grimaldi, born in Oppido Lucano in 1543 and grown up in Rome between 1585 and 1598 assimilating the lesson of Bramante and Michelangelo, was one of the most important artistic expression of the Neapolitan 17th century. Author, between the end of the 16th century and the first years of the following century, of some of the most important Neapolitan religious edifices, Grimaldi was an artist who marked a change of taste somewhere between the local tradition and the first baroque architecture.

For the construction of the Chapel, Grimaldi planned a harmonious central plan in the form of a Greek cross, dominated by a big dome, of classical and Roman inspiration, resolving thus, the major problems which he had to face at the moment of the conception: the restraint deriving from the limited area in which the chapel had to be built and the difficulty in reconciling the antique pointed arches of the Cathedral with this new construction. In this study, we will not revise the historical-architectural events of the chapel construction, which can be examined in the existing bibliography, but instead we will look at the geometry of the dome, necessary for a static analysis, as well as the fissure outline, described in the surveys which are the subject matter of our study.

The dome, abutted on a high tambour of a circular base, circled on the summit **(fig.1)**, has a double dome with non-parallel generatrix curves **(fig.2)**. The solution of having a double dome, analogous to that adopted for the Dome of St. Peter, offers the advantage of a light construction and a greater protection from atmospheric pollution for the interior decorations and it also allows the interior of the dome to be made proportioned autonomously from the outer surface. As a matter of fact, the dome, is not abutted on the tambour summit, but it rises with a straight wall of about 16 palms, the so-called "false tambour", a typical element of the Grimaldian architecture, characterized by the presence of small openings of depressed arches. The outer dome, with elliptycal arches, visible to all city, which begins to curve at the height of 10.5 palms from the summit of the false tambour, has an external diameter of 73 palms (1 palm= 26.4 cm approx) and a maximum height from the lantern of 43 palms **(fig.3)**. The inner dome, on the other hand, set up on the summit of the straight wall, has an external diameter of about 60 palms and is approximately 37.50 palms high. Between the two domes there are eight buttresses of about seven palms thickness at the base and three palms at the top, whose function is to keep the two domes wedged. The thickness of the two domes varies from 3 palms at the top of the false tambour up to about 1.5 palms to the altitude of the double tambour, originally a form of connection between the two domes. The latter, a building of bricks of sixteen small pillars and sixteen small arches, is formed by two orders of tympanums: an external one, of 20 palms diameter from outside, and an internal one of 13 palms external diameter and an altitude of 14 palms. At the crowning of the dome, set up on the exterior dome, there is a small blind lantern in oak wood, finishing with two ampullas, of about 18 palms external diameter, 19 palms high and 1 palm thick. This substituted the original stone lantern which was in part damaged by an earthquake in 1688. In 1627, long before the building was completed, the first difficulties came to light and Giovanni Giacomo Conforto, in charge of the restoration, as well as repairing the damaged masonry, thought it would be convenient to reinforce the exterior dome so as to increase the stability of the building. The following earthquakes, especially one on the 5th of June 1688, created so much new damage as to induce the Deputies to appoint several Commissions of experts to verify the structural stability of the edifice. Their surveys, fundamentally differing, gave way to a long debate which continued for over twenty years and which can be completely reconstructed from the writings of the most authoritative supporters the two tendencies of the thought to which different experts belonged: the written accounts of the architects Giuseppe Lucchese and Ferdinando Sanfelice.

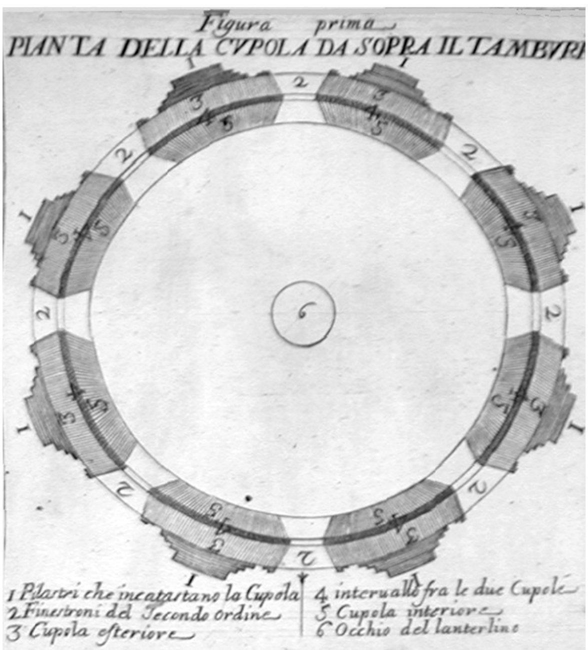

Figure 1. Tambour plane (Sanfelice 1708, fig.1)

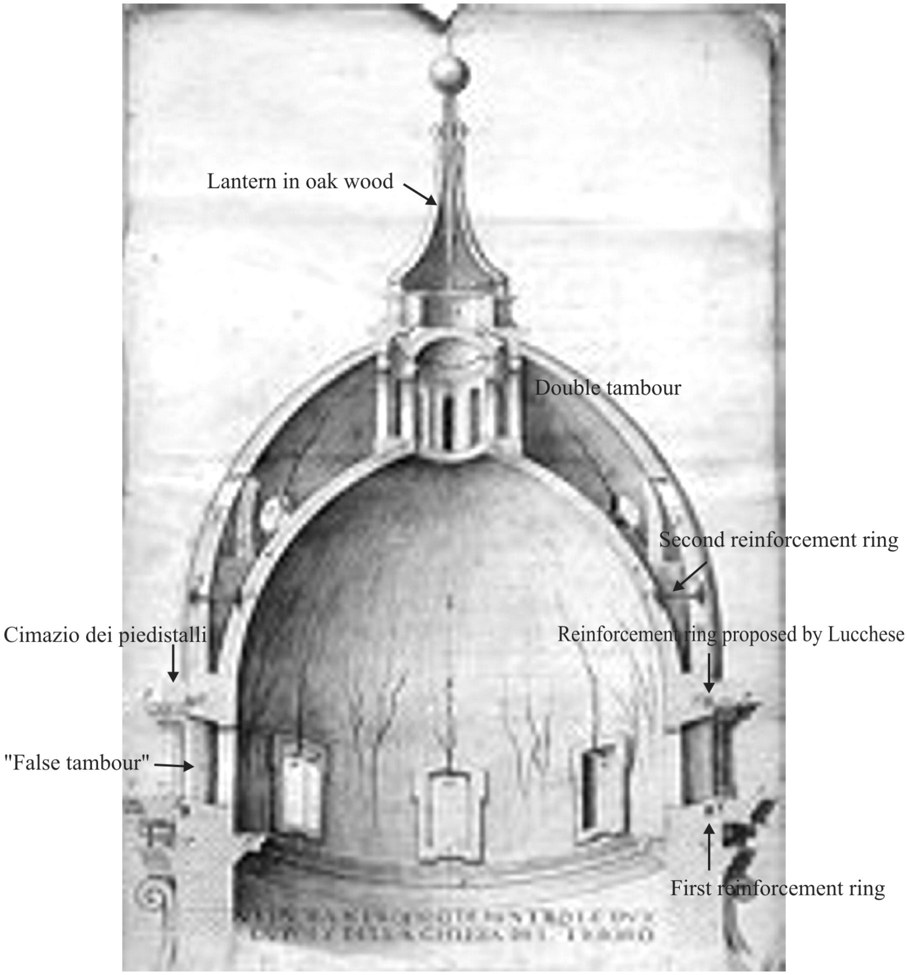

Figure 2. Cross section (Lucchese 1707, fig. 2)

Giuseppe Lucchese would not be considered a first rate Neapolitan architect; he has rather to be included in that larger team of technicians operating mainly through relatives, who carried on practises mainly connected with religious commissions. In fact, at the end of XVII century, families like the Manni, the Canale and the Lucchese were in some monastery's pay and had practises that included dealt with disputes between neighbours, works of modernization or reinforcement and, in some cases also the planning of new buildings. Giovanni Lucchese was an ordinary engineer of the "Monte dei Poveri Vergognosi" and for a long time was in the service of the "Monastero della Pietrasanta". In spite of the relatively few sources we have on Lucchese's professional career, the engineer seems to have had a good reputation among his contemporaries, judging by the fact that he was called upon to advise on the conservation of this Neapolitan building but his reputation was probably connected with his perceived technical competence rather than with his ability as designer architect. It is known that Lucchese had already encountered similar problems when after the earthquake of 1688 he had to buttress the dome of the church of the “Pietrasanta”. In this case, he had ordered the demolition of the lantern, which he judged too heavy for the structure and he had replaced it with a table-like structure on the underside of which a perspective of a lantern was painted and the dome was further restrained both at the level of the drum and of the ring.

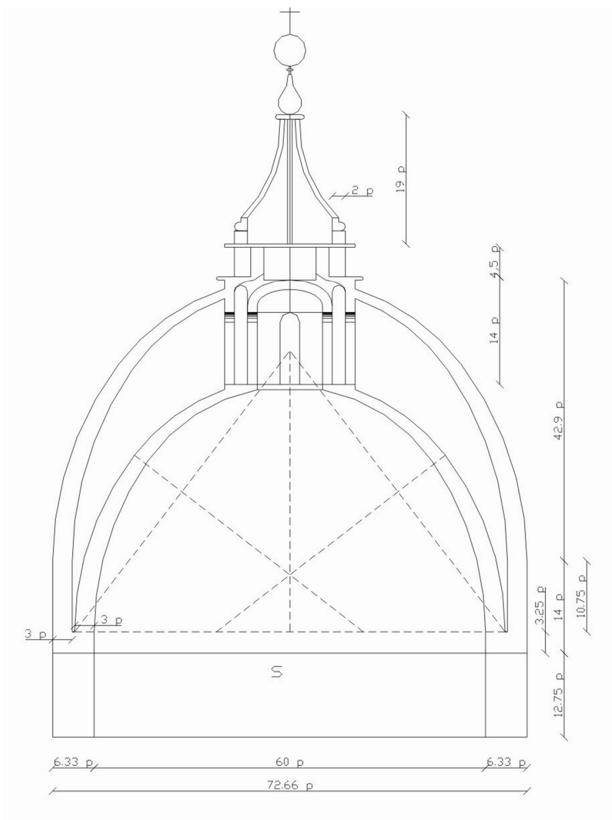

Figure 3. Dome geometrical data

In the debate about our dome, Lucchese’s attitude is substantially that of a technician interested into practical matters, while Sanfelice takes up a position oriented with respect to Grimaldi’s construction. After all, the position of the famous architect was perfectly consistent with the increasing sensibility to the themes of the ancient and of the classical that was characterizing Neapolitan architectural culture in those years, a sensibility nursed by the numerous debates connected with the various restorations started after the earthquakes. And in fact, in the occasion of the reconstruction of the dome of “Gesù Nuovo”, the Jesuits forced the architect Arcangelo

Guglielmelli to build a copy of the original model, planned by Valeriano in classical forms. Later, when it was decided to restore the façade of "San Paolo Maggiore", with the pronaos of the temple of "Castore and Polluce", Ferdinando Sanfelice, supported the preservation of the two surviving columns that the Theatines wanted to eliminate, and he also was the inspirer of the actual work done by Giuseppe Astarita. But the architect didn't have to contend only about the preservation of classical architectures; he also showed an unusual sensibility towards medieval buildings, so that in his proposal of modernization for the church of "Santa Chiara", he expressed, as De Dominici reports, that he didn't want "to damage the gothic windows of the building, but also the antiquity and the construction of the church."

In effect, the position assumed by Sanfelice in the debate about the dome would seem motivated not only by considerations of a merely technical character, but also by matters of cultural significance. His position next to Solimena, his erudition both in the liberal arts and in mechanical ones, and his love for the antiquities reported by the biographer De Dominici, had sharpened his sensibility towards the themes of the preservation and a respect of classical remains and as in the culture of the period the ancient and the classical coincided, so the architect devoted the same attention to the survivals of the Roman period, as the columns of "San Paolo Maggiore", and to the architecture of classical forms, as to the dome of the late Renaissance by Francesco Grimaldi.

Returning to the technical aspects of the survey (both the set of documents recovered from the archives and of those published by Sanfelice), it is clear that the dome showed widespread cracking in both the inner and outer layers, the illustrations highlighting the presence of various types of cracks, differing in gait and dimension. A first order of cracks, which are the widest present, can be found in the intrados of inner and outer layers. The cracks are scattered thanks to the presence of the reinforcement ring. From the survey of that time, the cracks in the tambour were thought to be of little importance but they also showed a horizontal crack in the two orders of tympanums connecting the two layers of the dome as can be seen in **(figs.2,4)**.

The documents in the archives, following the publication of the opinions of Lucchese and Sanfelice, show the Commission thought it necessary to carry out further inspections before authorizing any intervention or restoration, but the following surveys do not add any other significant elements to the debate, limiting themselves to supporting one or the other thesis or justifying a particular hypothesis. In 1711 the purchase of iron was deliberated and ordered for the reinforcement rings, but only in 1724, following a project by D. Teodoro Gallarano, was an intervention made on the Dome eliminating the two small tambours and building, in the cavity wall between the two domes, a wooden scaffolding held by tie-beams, so as to support the exterior dome. However few indications have remained of this original intervention so it is difficult to reconstruct the logic of design. Deferring to elsewhere the static interpretation of this interesting restoration, we will continue illustrating in detail the two major reports to capture the spirit of a debate which can be considered representative of a cultural turmoil in this period of transition.

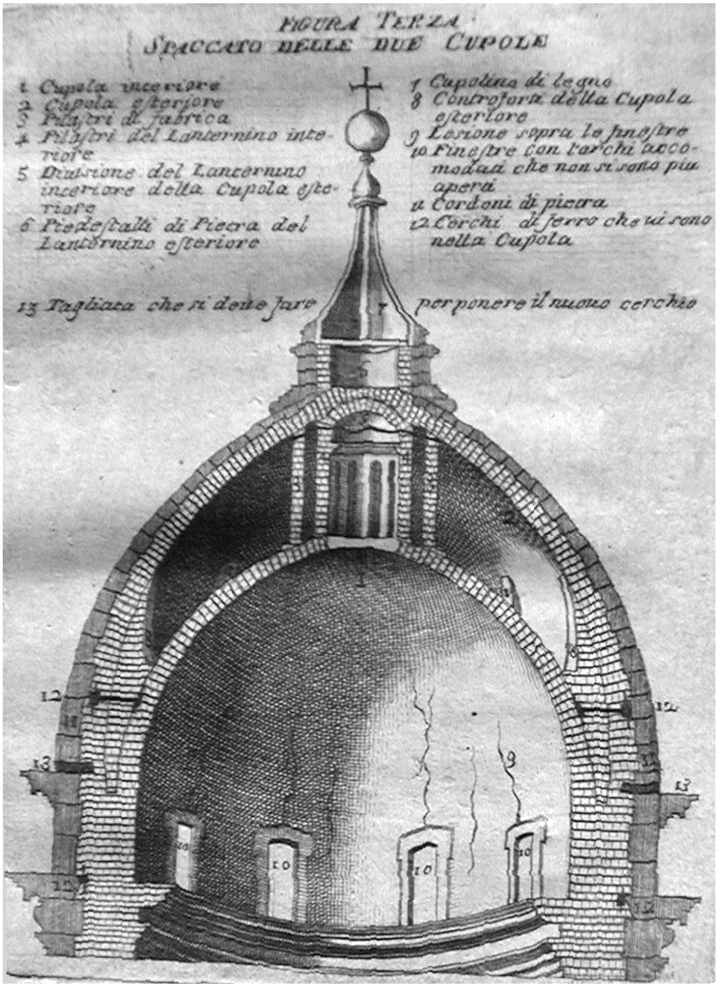

Figure 4. Fissure outline (Sanfelice 1707, fig. 3)

THE 1707 REPORT OF GIUSEPPE LUCCHESE

In the manuscript, Lucchese reaffirms what he had already maintained in the past: the urgent need to encircle the exterior dome with a further iron ring at the height of the "*cimazio dei piedistalli*", corresponding to the real impost of the interior dome where the damages are more widespread.

That this proposal for restoration, at an early stage, had been carried out by the Royal Commission is testified by documents of the Archives that testify the payment to the ironmongers of Atripalda in 1697, but the nine years that passed between the earthquake and the buying of the iron as well as the request of further surveys, demonstrating how the difference between the experts' opinions led the deputies to hesitate to an extreme degree in the execution of the work. The details of the proposal are preceded by a description of the geometry of the dome and of the damage **(fig.2)**; in these pages, mingled with technical details, various observations are present in which Lucchese, interpretating the static behaviour of the single structural elements and of the whole, creates the bases to justify theoretically his proposed interventions.

In the observations he lingers over the role of the ribs of three palms present in the exterior dome, built in stone from Sorrento and not adequately set into the structure, and he maintains that these pedestals apparently constitute a reinforcement to the masonry but in reality, " for being situated above the corbels cartouches […] they are being sustained rather than sustaining"; therefore the common base at the two domes is only 6 and 1/3 palms, a value which he considers absolutely under-sized in comparison to the Neapolitan custom. To support this theory he remembers that, for the constructions in "soft stones" the main walls of vaulted structures should have a thickness of 1/5 of span, "a certain rule based on various mathematic demonstrations, confirmed by the experience of so many edifices and put into practice by Masters of bricklayers and builders"; he also says that this measure should be furthermore increased if, on the same wall, a further cover stands. On these bases, taking into consideration the diameters of the two domes, he affirms that the supporting wall should be 25 palms thick: 12 palms to support the interior dome plus 13 palms for the outer dome.

Other interesting observations have to do with the interpretation of the three already existing reinforcements rings. The first ring is situated one palm under the external cornice of the tambour: its only function can be to hold the top of the tambour and the base of the straight wall. The second ring, is situated 28 palms from the first and therefore encircles the exterior dome just at the point in which this begins to curve. Lucchese describes this system and adds that it is

> "practiced by all the Architects to reinforce with big frameworks and to tighten with good rings and iron staffs the imposts on with some kind of curved wall, such as domes, or vaults which are supported by straight walls or perpendicular walls, tightening and maintaining the above mentioned walls straight that cannot dilate by the drift of such buildings"

The ring is formed by sixteen pieces reciprocally connected; from each joint a radial element is joined to a concentric ring that encircles externally the inner dome. This further ring, as far as Lucchese in concerned, contributes the inner dome stability and he presumes "it was placed there and at level with the outer dome so that it would give with its iron crossbars a major stability to the outer dome". Therefore the inner dome unloads its thrust directly on a walling below without any reinforcement rings. Lucchese comments on this:

> "the Architect who built such a dome thought to tighten with an iron ring the foot of the exterior dome, which is situated outside the wall without any cadastre: but the inner dome

situated in the interior part of that wall has as a cadastre all the masonry, which is at the basis of the above mentioned dome, so he thought it not necessary to put another iron ring, this was a very bad and dangerous decision for the dome. These two domes cannot be maintained for a long time without being encircled by iron rings seeing that the wall that supports them is very weak on the sides".

He concluded this first part of his report by reaffirming the necessity to put into place, as soon as possible, the ring that was already ordered and to order a further fine ring to be placed a few palms above the impost of the outside dome, which was strongly cracked probably due to damage caused by the existing reinforcement rings. In the second part of his paper Lucchese reports summarises the points on which other technical experts objections were based and the refutes their validity. In this note we will only relate the comments on the three principal points:

1. The ring weight (80 cantara, where 1 cantara = 90 kg) would have loaded excessively the dome, causing ulterior damage.

In his answer Lucchese says that the ring would not have loaded the dome but the basement, which is damaged not from the excessive weight but from the movement of the stones of the dome that, like quoins, thrust outward. It is interesting to note that in the margin of this passage bibliographic references to Guidi Ubaldi's mechanics texts, as well as Galileo's and Cartesio's are annotated. In a polemic tone, he maintains that the defamers do not know " the science of weight, because the load of 80 cantara is like the weight of a fly in a balance and this does not change the equilibrium".

2. the cutting of 1/2 palm along all the circumference and of 1 palm in correspondence to the connections would have weakened the foundation of the outer dome, only 3 palms thick. Besides the blows, necessary to tighten and close the different parts of the ring, would have damaged irreparably the inner dome and the frescos of Lanfranco.

In his answer he reminds us that the thickness of the wall, at that point, is 6 and 1/3 palms and not of 3 palms, as maintained by the detractors; therefore the slight reduction would have been compensated for by the containment effect given by the reinforcement rings. It also seems ridiculous to Lucchese that the hypothesis of tightening the rings is tantamount to a long earthquake and could make the building collapse: the intervention proposed is analogous to the one he made for the dome of the Pietrasanta in which "*the rings were tightened and closed without any damage to the edifice*".

3. The reinforcements rings were useless: the cracks did not depend on the weakness of the walls but on the weight of the small tambours that at first connected the two domes but now loaded only upon the top of the inner dome. To resolve the problem it would be necessary to pull down the whole or a part of these superstructures.

The author retorts that with this hypothesis it would be impossible to justify not only the cracks of the outer dome, but also typology of those found in the inner dome (that, as said before, present the widest cracks in correspondence to the dome impost and continue becoming thinner at the height of the reinforcements rings that already existed). If the cracks had been caused by the weight of the small tambours the greatest damage would have been found near the junction of these tambours and the interior dome. For Lucchese the hypothesis that the horizontal crack, that had separated the small tambours from the outer dome, had been caused by a lowering of the support of the inner dome, caused by the excess of weight is unjustifiable; regarding this matter he writes " the inner dome could never lower without lowering at the same time the outer dome because they are supported by the same pier." The origin of the crack is to be found in the oscillations caused by the earthquake in 1688 and the resultant lowering is strictly connected to the cracks that have widened the sides. And finally he criticised the demolition of the superstructures because this operation would cause the elimination of the collar in stone on which the lantern rests; the bull's dome would remain, in this way, without any reinforcement and, because of the several cracks that have nearly reached the summit, the outer dome could fall down on the inner dome.

THE 1708 ESSAY OF FERDINANDO SANFELICE

In the introduction to his report Sanfelice specifies that he has delayed the publication of his opinion until the passing of time and the occurrence of natural events (earthquake, lightings etc.) could demonstrate that the stability of the dome was not seriously compromised by the existing cracks; and he adds:

> " I have suffered much even in childhood observing that, other people's panic, who boast to be architects, have deformed many famous buildings of this City ruining them with the pretext of preserving them; therefore I acknowledge that these buildings have suffered much damage from these people rather than from earthquakes themselves".

Coherently, he affirms to be against the imposition of the new ring, considering it certainly useless and probably damaging. The reasons of his opinion can be synthesized as follows:

1. The pillars and the arches on which the tambour rests show only one crack, which is very old and considered by everyone to be of little importance; in the tambour the two thin cracks affect only the superior cornice.

2. In the inner dome one can notice some cracks, caused by the earthquake in 1688 and never repaired. At the extrados these appear to be of two ounces because of the damage to the plaster but observing carefully one can notice that that fracture is smaller "because if it were true then one could see through the cracks of the interior dome the Church

underneath". He then observes that the cornice of the windows, reconstructed in previous repairs, are in perfect condition.

3. The top of the two domes, during construction, had been connected by a tambour 14 palms high, so that the inner dome collaborated with the outer in supporting the original very heavy lantern. However the tambour is now detached from the outer dome and constitutes a useless weight for the inner dome.

4. Since the original lantern in stone had been substituted by one in wood, lighter and more proportionate, the cracks of the outer dome have not become any wider, as can be confirmed by the absence of movement in the lead plates of the roof covering. Therefore one can deduce that the origin of the instabilities should not be sought in the weakness of the structure itself but in the excessive weight of the initial upper structure, which has been removed. On this subject Sanfelice adds " an Architect affirms that the dome, according to his calculations, should have bigger walls" and he contrasts this opinion by comparing the dome of the chapel with other domes and, particularly, with that of S. Caterina a Formiello "which has not had any damage because its' lantern was of the right weight". He then continues saying that if the cracks had been caused by the "weakness of the walls they would fall down in the dome tambour whose wall is of the same thickness as the pier of the dome".

5. Some architects maintain that the cracks on the windows are due to the breaking of the iron rings. Taking into consideration how the building was set up, to justify all the fracture points, the reinforcement rings should have split in eight places; instead it is plausible to suppose that they are complete and that the dome has expanded because of an imperfect closure. These results can be justified from the measurement of the cracks that, as said before previously, are smaller on the interior to what it seems to be from the exterior and, above all, very far from being two palms as calculated by some architects. He considers this measurement absurd, noting that, if the circumference at the impost of the dome had widened by two palms, the straight wall that connects the impost to the pier should as a result be outside the lead, and this is denied by visual evidence.

6. Fearing the imminent fall of the structure, even if time and natural calamities have given proof of the solidity of the building, two Architects still have the opinion the ring ordered should be set up as soon as possible. With the pretext of protecting it, they want to eliminate 1 palm of *solid wall*, even if they considered it under measure, without considering " what strokes the epistyles will have to suffer and what a horrible jerking and shaking the dome will have to bear, in this way being a victim of a longer earthquake"; besides the cutting would deprive it of support from the stones from Sorrento which are in the outer dome.

Sanfelice concludes his report underlining the inappropriateness of setting up the ring "being sure of the damage and uncertain of the utility" and proposes, as well as works of maintenance such as the substitution of dangerous stones, that they should proceed with the demolition of the first enclosure of the interior tambour. He does not believe that such an intervention could have an effect on the stability of the outer dome, which is at the moment detached from the tambour and that if it needed such a support it would have fallen down already.

The report by Sanfelice received a reply in manuscript: "*Risposta al giudizio e parere fatto dalli sottoscritti Signori per il riparo che deve darsi alla Cupola della Cappella del Tesoro del Glorioso S. Gennaro*", transmitted to us in anonymous form; this manuscript constitutes the third episode in the debate about the reconstruction of the dome, but it is not reported in detail here because it doesn't introduce any new evidence.

THE THICKNESS CONTROL BY LAMBERTI PRACTICES

The debate between Lucchese and Sanfelice repeats, within the Neapolitan ambit, a national debate well-documented in Poleni's work "*Memorie Istoriche della Gran Cupola del Tempio Vaticano*" printed in Padova in 1748. These debates are reflected in S. Maria del Fiore in Florence, of the Cathedral of Montefiascone, of St. Marco in Venice etc., and show how the new, but yet uncertain, scientific theories on the behaviour of materials and of vaulted buildings are beginning to offer arguments contrary to the established *modus operandi* which had been based on a solid experience of building yards and on careful observations of the details. A point which characterizes the difference of opinion is the presumed weakness of the wall structures, in reaction to which both the authors, to back their positions, by making reference to other existing edifices. An alternative method for checking to see if the thickness of the walls conforms to eighteenth-century building practice, can be found in Vincenzo Lamberti's text "*La Statica degli Edifici*", printed in Naples in 1781, in which the Neapolitan engineer, following the example of Belidor's treatise, creates simple rules for the measure of structural elements, with an explicit reference to construction typology, for the building work and for the characteristics of the materials used, which are typical of the architecture in Campania. In the Chapter dedicated to the Vaults of Domes, the author identifies two problems to study: "the resistance in relation to oneself and the pier that supports them".

Before illustrating the *practice* it is necessary to declare beforehand that Lamberti always seeks the maximum weight that can be supported by an edifice, deducing the resistance of the latter in relation to the possible mechanism of collapse. In the case of the dome the author compares it to the problem of the arch maintaining that the failure of these architectural forms can only take place if there are fractures along the meridians. The rules to determine the maximum weight R, that can be support an arch, are deduced in analogy with that P of beam of the same material and thickness. The formula which he attains is that for a semicircular arch **(fig.5)**:

$$\frac{P}{R} = \frac{3}{5} \frac{FQ + AG}{BE} \qquad (1)$$

From which, arguing geometrical similitude, he obtains the relations valid for other typology of arch.

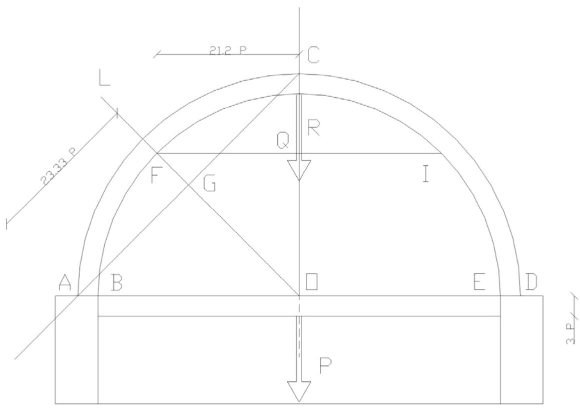

Figure 5. Beam–arch analogy (Lamberti 1781, Tav. II fig. 33.3 – redrawn)

To calculate the size of the domes which are not hemispherical, he refers to the practice already illustrated in chapter V in which he deals with non -circular arches (fig.6):

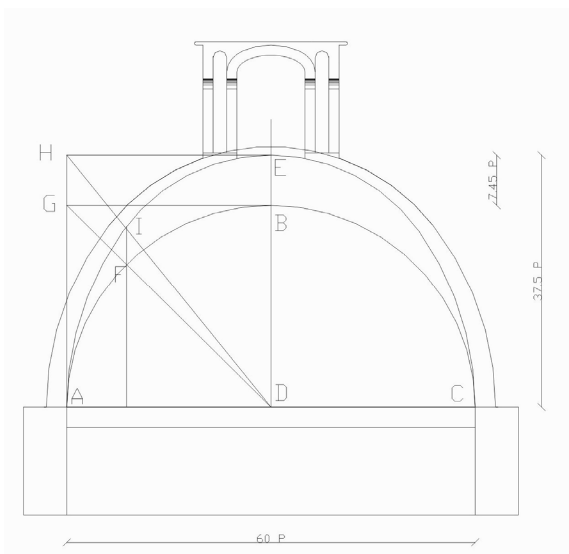

Figure 6. Geometrical data to calculate the elliptical arch thickness

“having to find the width of the arch AEC, that can sustain a certain weight, find the thickness of the beam AC of the how string, and that it is resistant to a assigned weight;

1. find the thickness of the semicircular arch ABC as said above;

2. find a proportion of a forth, after AD, half beam; BE, which is the excess weight of half the prism on the height DE, of the imperfect arch; and the excess weight of the prism AC on the size of the semicircular arch ABC, the sum will be the thickness of the arch AEC.

For lancet arches, the quantity calculated in point three must be subtracted instead of summed.

Wanting to verify with this method the thickness of the inner dome, without any significant reinforcement rings and therefore closer to the hypothesis of Lamberti, the following data have been considered:

1. the weight of a cubic palm of tufa from Campania equal to 30.7 rotola
(1 rotolo = 0.9 Kg);

2. the weight of the inner dome, equal to 553413.55 rotola; therefore to weight of one gore of 1 basic palm is 2670.4 rotola

3. the weight of the double tambours, equal to 607330.74 rotola; therefore the incidence on the gore is 241.3 rotola.

The thickness one arrives at, applying the above mentioned method, is 3.9 palms taking into consideration to weight of the double tambour and approximately 3.7 palms disregarding the effect of the first enclosure of the tambour as proposed by Sanfelice.

Comparing this result with the geometry of the dome, it is shown to be slightly under dimension only in the areas between the ribs. In the notice VI of Chapter IX the “practice” to resolve the second problem is explained **(fig.7)**.

“To have therefore the weight of the tambour that can sustain the dome you must first find the capacity, which is the surface of the section BLCFKE, and to it you must add the finishing profile O, decreasing or increasing the density to see if they are different from that of the tambour, this capacity should decrease in its dead force, and therefore you must…”

1. find CT as said before in the notice.

2. after the multiplication of the number 66.2 with the wall height; the product of the constant number 30 with the result above and with the value CT as noted in number one;

and the constant number 32.83 you must find the forth of the square root which will be the excess weight of the tambour.

The theoretical instrument used is still the angular lever. The final formulas, weighed down by long geometrical similitudes, defer to those already deduced in Chapter IV in which he deals with isolated walls. The originality of this approach consists, in our opinion, in the method: Lamberti resolves numerically a typical problem to deduce some factors that do not vary with the changing of the surface and, therefore, he defines a new procedure of calculation associating these constant terms with others, which are variable and exclusively depend on the geometrical data of the system under examination. Wanting to apply this practice to our structure it is necessary to make same preliminary considerations. Among the elements to be calculated there is the height of the pier, at whose base, in the proposed example, the fulcrum of the angular lever is located.

In our case the two domes (inner and outer) are placed on a straight wall of the 16 palms which rests on a tambour, whose summit is reinforced by rings; the absence of significant cracks in the tambour as well as in the arches underneath demonstrates the efficiency of the containment ring. Consequently in our opinion, a possible mechanism of over-turning can occur only at the base of the false tambour and verification of this can be made on the data of this element, without considering the structure underneath.

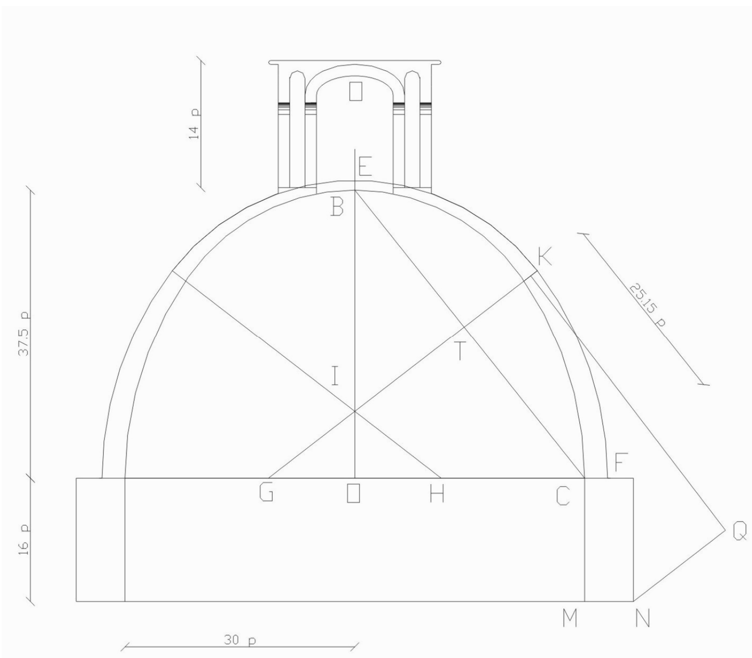

Figure 7. Geometrical data to calculate the “false tambour” thickness

Assuming, therefore, that the height of the pier is 16 palms, the thickness of the false tambour should be 12.9 palms, which is notably greater than the actual thickness, which does not exceed seven palms, but is near to that suggested by Lucchese who, for the inner dome, maintained it necessary to have a thickness of about 12 palms. It is however necessary to consider that the *practice* does not take into consideration the outer dome weight which, due to the presence of a further reinforcement ring at the height of its impost, represents, in our opinion, a stabilizing force.

If this effect is added to the resistance of the lever, the thickness of the false tambour should be 7.1 palms, that is less than one palm more than the real thickness. This last calculation, even if it follows the logic of the rules offered by Lamberti, but does not take into account the contribution of reinforcement rings, chains etc. who does not offer explicit formulas for the measurement of double dome structures.

CONCLUSION

The aim of this work has been the re-reading of two opinions, using eighteenth-century reasoning rather than current techniques. We have chosen to demonstrate the *practices* of Vincenzo Lamberti because his treatise, even if it is slightly later than the dispute, represents the first text, in the Neapolitan ambit, dedicated explicitly to the statics of buildings and in this treatise, as said before, we can find summarized the theoretical and practical rules typical of architecture in Campania. The results that have derived from these practices mentioned above, applying them only to the inner dome, have demonstrated a weakness of the wall thickness, justifying the perplexities of Lucchese and confirming that the interior dome, considered independent from the rest of the building, was under-sized when compared to Neapolitan custom. However, the stabilizing contribution of the outer dome must have been inferred by the expert, as the same Lucchese supposes in the reported passage, and taking into consideration its' effect the thickness of the walls could be shown to be quite sufficient, according to our calculations.

The careful analysis of the two reports confirms the different cultural backgrounds of the two experts. Lucchese, and his supporters, try to justify their arguments basing themselves not only on the experience acquired in building yards but also on the knowledge of new scientific rules, denouncing a more open-minded approach involving new techniques of reinforcement and less awareness of the importance of interpretation of the whole building. Meanwhile Sanfelice demonstrates extraordinary structural intuition. He is convinced, in spite of the evident cracks, that the building is stable and he does not believe it necessary to make use of theoretic arguments to justify his opinion. His approach, favouring conservation, induces him to refute any intervention that could alter the original project. The only discordant element in his report is the elimination of the first enclosure of the tambour that connects the two domes. An intervention that, as we have shown, would not have improved the static conditions of the inner dome. The logic and the coherence of both positions justify the hesitancy of the Deputation to carry out either one of the two projects of reinforcement.

A full acknowledgement of the more appropriate reinforcement intervention needs an approach that the instruments of that time could not provide. For this purpose a model of calculation is being drawn up, which takes into account seismic action, to check the proposals of Lucchese and Sanfelice as well as the intervention of Gallarano.

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