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HISTORY OF CONSTRUCTION CULTURES

8

VOLUME 1



edited by
João Mascarenhas-Mateus
and **Ana Paula Pires**



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HISTORY OF CONSTRUCTION CULTURES



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History of Construction Cultures

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Introduction: *History of Construction Cultures*

We are what we build and how we build; thus, the study of Construction History is now more than ever at the centre of current debates as to the shape of a sustainable future for humankind. Embracing that statement, the present work takes the title *History of Construction Cultures* and aims to celebrate and expand our understanding of the ways in which everyday building activities have been perceived and experienced in different cultures, times and places.

This two-volume publication brings together the communications that were presented at the 7ICCH – Seventh International Congress on Construction History, broadcast live from Lisbon, Portugal on 12–16 July 2021. The 7ICCH was organized by the Sociedade Portuguesa de Estudos de História da Construção (Portuguese Society for Construction History Studies – SPEHC); the Lisbon School of Architecture, University of Lisbon; its Research Centre (CIAUD); and the College of Social and Human Sciences of the NOVA University of Lisbon (NOVA FCSH).

This is the first time the International Congresses on Construction History (ICCH) Proceedings will be available in open access format in addition to the traditional printed and digital formats, embracing open science principles and increasing the societal impact of research. The work embodies and reflects the research done in different contexts worldwide in the sphere of Construction History with a view to advancing on the path opened by earlier ICCH editions. The first edition of ICCH took place in Madrid in 2003. Since then, it has been a regular event organized at three-year intervals: Cambridge (2006), Cottbus (2009), Paris (2012), Chicago (2015) and Brussels (2018).

7ICCH focused on the many problems involved in the millennia-old human activity of building practiced in the most diverse cultures of the world, stimulating the cross-over with other disciplines. The response to this broad invitation materialized in 357 paper proposals. A thorough evaluation and selection process involving the International Scientific Committee resulted in the 206 papers of this work, authored by researchers from 37 countries: Australia, Austria, Belgium, Brazil, Bulgaria, Canada, China, Dominican Republic, Ecuador, Egypt, Estonia, France, Germany, India, Iran, Ireland, Italy, Japan, Mexico, Netherlands, New Zealand, Norway, Peru, Poland, Portugal, Puerto Rico, Russia, Serbia, Spain, South Africa, Sweden, Switzerland, Thailand, United Arab Emirates, United Kingdom, United States of America, and Venezuela.

The study of construction cultures entails the analysis of the transformation of a community's knowledge capital expressed in the activity of construction. As such, Construction History is a broad field of knowledge that encompasses all of the actors involved in that activity, whether collective (contractors, materials producers and suppliers, schools, associations, and institutions) or individual (engineers, architects, entrepreneurs, craftsmen). In each given location and historical period, these actors have engaged in building using particular technologies, tools, machines and materials. They have followed specific rules and laws, and transferred knowledge on construction in specific ways. Their activity has had an economic value and belonged to a particular political context, and it has been organized following a set of social and cultural models.

This broad range of issues was debated during the Congress in general open sessions, as well as in special thematic sessions. Open sessions covered a wide variety of aspects related to Construction History. Thematic sessions were selected by the Scientific Committee after a call for proposals: they highlight themes of recent debate, approaches and directions, fostering transnational and interdisciplinary collaboration on promising and propitious subjects. The open sessions topics were:

- Cultural translation of construction cultures: Colonial building processes and autochthonous cultures; hybridization of construction cultures, local interpretation of imported cultures of building; adaptation of building processes to different material conditions;
- The discipline of Construction History: Epistemological issues, methodology; teaching; historiography; sources on Construction History;
- Building actors: Contractors, architects, engineers; master builders, craftspeople, trade unions and guilds; institutions and organizations;
- Building materials: Their history, extraction, transformation and manipulation (timber; earth, brick and tiles; iron and steel; binders; concrete and reinforced concrete; plaster and mortar; glass and glazing; composite materials);

- Building machines, tools and equipment: Simple machines, steam operated-machines, hand tools, pneumatic tools, scaffolding;
- Construction processes: Design, execution and protective operations related to durability and maintenance; organization of the construction site; prefabrication and industrialization; craftsmanship and workshops; foundations, superstructures, roofs, coatings, paint;
- Building services and techniques: Lighting; heating; ventilation; health and comfort;
- Structural theory and analysis: Stereotomy; modelling and simulation; structural theory and structural forms; applied sciences; relation between theory and practice;
- Political, social and economic aspects: Economics of construction; law and juridical aspects; politics and policies; hierarchy of actors; public works and territory management, marketing and propaganda;
- Knowledge transfer: Technical literature, rules and standards; building regulations; training and education; drawings; patents; scientific dissemination, innovations, experiments and events.

The thematic sessions selected were:

- Form with no formwork (vault construction with reduced formwork);
- Understanding the culture of building expertise in situations of uncertainty (Middle Ages-Modern times);
- Historical timber constructions between regional tradition and supra-regional influences;
- Historicizing material properties: Between technological and cultural history;
- South-South cooperation and non-alignment in the construction world 1950s–1980s;
- Construction cultures of the recent past: Building materials and building techniques 1950–2000;
- Hypar concrete shells: A structural, geometric and constructive revolution in the mid-20th century;
- Can engineering culture be improved by construction history?

Volume 1 begins with the open session “Cultural translation of construction cultures” and continues with all of the thematic sessions, each one preceded by an introductory text by the session chairs. The volume ends with the first part of the papers presented at the open sessions, organized chronologically. Volume 2 is dedicated to the remaining topics within the general themes, also in chronological order.

Four keynote speakers were chosen to present their most recent research results on different historical periods: Marco Fabbri on “Building in Ancient Rome: The fortifications of Pompeii”; Stefan Holzer “The role of temporary works on the medieval and early modern construction site”; Vitale Zanchettin “Raphael’s architecture: Buildings and materials” and Beatriz Mugayar Kühl “Railways in São Paulo (Brazil): Impacts on the construction culture and on the transformation of the territory”.

The editors and the organizers wish to express their immense gratitude to all members of the International Scientific Committee, who, despite the difficult context of the pandemic, worked intensively every time they were called on to give their rigorous evaluation of the different papers.

The 7ICCH was the first congress convened under the aegis of the International Federation of Construction History, founded in July 2018 in Brussels. Therefore, we are also very grateful to all the members of the Federation, composed of the presidents of the British, Spanish, Francophone, German, U.S. and Portuguese Societies and its Belgian co-opted member. A special thanks is due for all the expertise and experience that was passed on by our colleagues who have been organizing this unique and world significant event since 2003, and in particular to our predecessors from all the Belgian universities who organized 6ICCH.

The editors wish to extend their sincerest thanks to authors and co-authors for their support, patience, and efforts. This two-volume work would not exist but for the time, knowledge, and generosity they invested in the initiative.

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Finally, we are grateful to all members of the Local Committee and to the institutions that have supported both the 7ICCH event and the publication of these proceedings.

The Editors
João Mascarenhas-Mateus and Ana Paula Pires

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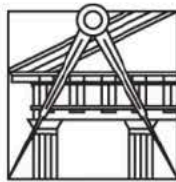
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Building the ephemeral in Turin, capital of the Savoyard states

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ABSTRACT: The extensive literature on ephemeral architecture in the modern age is rarely encountered in building historiography. Yet even the architecture of festivities or other recurrent occasions, especially in the capital cities of the *ancien régime*, demanded complex technical and decision-making processes just as much as the construction of palaces of more lasting importance. Such was the case we would like to present here: the celebrations of the wedding of the Savoy prince Vittorio Amedeo III with Maria Antonia Ferdinanda, *infanta* of Spain, which was celebrated in Turin in 1750. This paper looks at the creation of these decorative structures as strictly regulated processes, interwoven with the politics of the Savoyard kingdom just as much as the construction of palaces and strategic fortresses scattered throughout their territory. Erecting these temporary structures, therefore, required meticulous consideration, evidence of which can be found by delving into the archival sources.

1 BUILDING THE EPHEMERAL IN TURIN

1.1 *Ceremonies in the age of absolutism*

In the centuries of absolutism, Europe had a passion for rituals and ephemeral representations. In particular, they were set up on the occasion of significant dynastic events such as weddings, funerals and ascensions to the throne. Besides, plenty of religious and civil events were sponsored by local authorities such as municipalities. These multiple celebrations may have involved churches, palaces or the entire urban space (Fagiolo 1985, 2006).

If we look at the States of the House of Savoy, located in the geographical area straddling the Alps between France and Italy, there is now wide-ranging historiography on the subject (Devoti & Defabiani 2006; Gianasso 2006; Grosse 2016; Ieni 1989). Scholars above all highlight the aspects of political legitimisation, the iconographic and iconological dimensions, the historical-institutional facet, and also the contribution to a broader recognition of cultural contexts and the social and cultural history (Peyrot 1965). The literature traditionally makes many references to specific printed sources, particularly the *Relazioni* that, especially in the 17th century, describe and accompany ephemeral events, perpetuating them over time. But, above all, the literature defines the conceptual dimension of ephemeral events, emphasising the moment of conception, with its symbolic and political charge in which the celebrative intentions of the patron are expressed, or what Jesuit Father Claude-François Ménéstrier called, in the second half of the

17th century, the *pensée* of the feast. However, it is the same author who reminds us how the conception of the event constitutes only the first moment of a complex process: “Enfin il y a 3 choses à considérer dans un dessin, la pensée, l’ordonnance, l’exécution de la pensée c’est-à-dire qu’il faut un homme d’étude, un ingénieur et des ouvriers pour ce sorte d’entreprises” (Carandini 1997; Ménéstrier 1669).

The *ordonnance*, i.e., the actual design of the decorations and structures, which also includes the arrangement of the architectural orders and decorations, evidently requires subsequent execution by multiple workers and professional figures, working under the orders of an architect or engineer. It is precisely this type of organisation that we also find in the case of the festivals held in Turin, capital of the Savoyard state (Romano 1995). This system was a common element in European culture and not just local. In as early as the first decades of the 17th century, the Court in Turin was already keeping abreast of the most important international celebrations (Rabellino 2006; Rasetti 2006). For example, on the occasion of the death of his wife Micaela Catalina of Habsburg, Duke Carlo Emanuele requested organising the religious ceremony by consulting “the books of the funerals of emperor Charles V, king Francis and other kings of France, which can be found in our library” (Cozzo 2001).

Although the architectural and artistic dimensions of festivals received more attention in recent years, in addition to their symbolic values, scholars did not pay the same attention to the construction phase, which



Figure 1. False façade of San Carlo Church (ASTo, Corte, f. 65r, 1750).

is often considered a secondary element. The construction of ephemeral architecture is still a field of study that has not been much explored. Thus, what are the exchanges and relationships between the ordinary building site and the ephemeral architecture site? What are technological, economic and professional resources involved? What are the rules for standardising and controlling works that must have been completed in a few weeks, if not in a few days?

Archival documents can help us answer these questions, even if still provisionally: large-scale ephemeral structures are public worksites often documented with an abundance of textual and iconographic sources related to the construction. Also, contemporary descriptions, reports of visits and engravings allow us to read the scenography and spectacular results of the machines and built architecture. A paradigmatic case is the celebrations for the marriage of Prince Vittorio Amedeo, son of Carlo Emanuele III, to the *infanta* of Spain Maria Antonia Ferdinanda (1750). Many simultaneous works made it possible to set up “fires of joy” and “illuminations” in different parts of the city as well as in aristocratic palaces (Figure 1).

Several places in the city were equipped with spectacular *trompe-l'oeil* to complete projects that were still in progress: among these were the façade of *Palazzo Madama* towards *Via di Po* and the façade of the church of *San Carlo* in the square of the same name (Canavesio 1992).

This was not only a matter of setting up a temporary scenography, but also prefiguring the work in progress on the capital city, an always open and long-lasting construction site.

2 THE CONSTRUCTION SITE OF FESTIVITIES IN TURIN

2.1 The illumination

An interesting example of an ephemeral construction site was reported in 1750, for the celebration of the marriage of the Savoy prince Vittorio Amedeo III and Maria Antonia Ferdinanda, the *infanta* of Spain. The wedding took place in Madrid with solemn celebrations, which included events and theatre performances. The *Giornali di Tamietti* (Tamietti 1750) and Belmond's engravings are memories of these majestic celebrations. Belmond was the royal engraver and between 1751 and 1761 he represented three main events of the ceremonies (Bertagna 1981): the *fochi di gioia* (fireworks) at *Valentino*, the false façade of the Castle (Madama Palace) towards the *Contrada Nuova* (*via Po*), and *via di Dora Grossa* (today *via Garibaldi*). The leitmotiv was the “illumination”, a term used to indicate the ephemeral embellishment to illuminate streets and palaces for three consecutive days and which at the same time enhanced the architectural features along these same streets.

The concept of space and festivities in the Turin of the Baroque Age was redefined and gave birth to a new tradition. Space was no longer linked to the ceremonies of the 17th century (Rasetti 2006), but mainly based on the glorification of the capital city by illuminating its buildings with lights and candles placed on the façades according to well-defined schemes (as for the marriage of the prince Carlo Emanuele III to Anna Cristina Sulzabach in 1722, with “fires of joy” and “illuminations”). The *mastro tollaro* (lead worker), Bernardino Viani, from the state of Milan and winner of the tender, was charged to light the capital city with the provision of 10,000 sheet metal lights. These lightings were to be following the model shown and approved by the Council of Buildings and Fortifications at the price of 2 *monete*, 6 *denari* for each lighting (ASTo, 20 March 1750, f. 76 r). The contractors Giovanni Pietro Gobbi and Antonio Maffei were to be in charge of the decorations to light up the *Contrada Nuova*, including the square in front of the Castle (Madama Palace) and *San Carlo* square. The amount of material required was certainly high: for the *Contrada Nuova*, the provision was for 268 coats-of-arms for the mezzanine level and the same number for the upper floor (*piano nobile*) and the top floor at the price of £1, *soldi* 2 and *denari* 6. On the other hand, the material required for San Carlo square was 118 coats-of-arms for the arches, also at the same price as those for *Contrada Nuova*, 59 candlesticks to be placed above the intercolumns at £1, *denari* 10, and finally 118 stars on the top floor at £1, *soldi* 2 and *denari* 6 each (ASTo, 20 April 1750).

The instructions from the first royal architect, Benedetto Alfieri (Bellini 1981), meticulously described the construction of the various pieces of lighting as well as their exact location. The coats of arms and stars had to be built following the sample model. This must have been done in a circular or triangular shape and fixed with pitons to an iron ring to

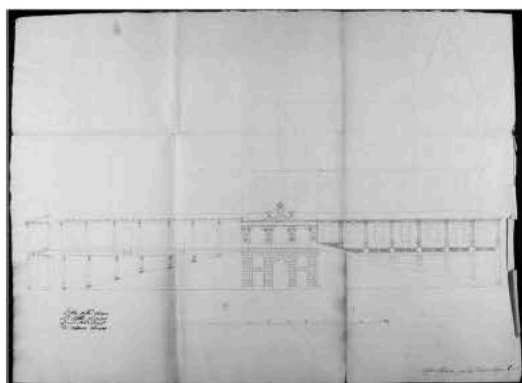


Figure 2. Spectacle for the *focchi di gioja* (fireworks) facing the *Valentino Reale* (ASTo, Corte, f. 71r, 1750).

be suspended and placed between the openings of the arcades. On top of the barriers of buildings, they had to put chains of lights, while on the sides of the windows, there were coats-of-arms with burning candles for three consecutive evenings. The building contractor had to make sure that the lighting lasted for at least three hours, soaking the wick of *acquarasa* (essence of turtine) to ensure this. To facilitate repeated re-filling of the lighting, the contractor had to bring with him metal sheet jars filled with liquefied animal fat. The jars had two holes for pour into the wick or have available fat in a dough form that had to be inserted with a sheet metal spoon.

2.2 Ephemeral for the *Valentino Reale*

Although lighting adorned various locations in Turin, the spectacle at *Valentino* was undoubtedly one of the most evocative because of its natural position set in the theatrical ambience of the Royal Palace. The illumination was set up along the roads that led to the *Valentino* where the theatrical performance took place (Cornaglia 2006) and stretching uphill to the other side of the river Po, where the fire machine was located. (Figure 2).

The painter Giovanni Battista Alberoni won the contract for the production along with the *Valentino* for the amount of £2,000, including testing the machine, and had to strictly follow the first architect's instructions (ASTo, 12 April 1750). These instructions defined the design to be drawn, i.e. frames, ashlar, statues, weapons and ornaments which embellished the fire machine. The fire machine was set up for the occasion at the temple of Hymenaeus, adorned with columns and statues, placed on a bridge parallel to the river-side, and surrounded by lights. At the background two rocky mountains were to be painted to represent the Alps and the Pyrenees from which flowed respectively the two rivers Po and Ebro (ASTo 11 March 1750).

Two large boats and others of smaller dimensions floated on the river Po, and were loaded with fireworks, intended to simulate a naval battle.

The workmanship of the two largest boats was accurately described in the *partiti* (contracts), signed by the craftsmen at work and kept at the State Archives of Turin. The vessels had to be made of wood, with bas-reliefs of trophies painted in oil using different colour tones of blue, red and yellow (emblems of the Crowns of Spain and Sardinia) with their shading, as well as ropes and sails, all painted of the same colours.

The construction of the boat skeleton, to be made according to the model built by the artillery officer at a scale of twenty fourth of *piede liprando* (an archaic measurement unit used in construction) (0.513 m), was entrusted to the carpenter Giuseppe Salazza for a price of £1,230. The vessels had to be equipped with well-straight trees, proportionate to their size, made of wood, well-seasoned and without any defect; they also had to be equipped with ropes, flags and all ornaments, as indicated in the model.

The contract also included a hall inside the *Valentino* for the carpenter Salazza to be able to collect and store the wood, nails and everything else needed for the construction of the boats. The *mastro indoratore* (gilder) Gaetano Leveghe was entrusted to decorate these boats on 9 March 1750 and had to carefully follow the model following which it had to be applied uniformly and proportionally. The construction of the vessels was set at the price of 30 *zecchini* each (about £10). It included the testing of the previous work, and the supply of the canvas necessary to cover the vessels to keep them safe in case of sudden rains as well as to prevent the painted decorations from deteriorating in the sun (ASTo, 16 March 1750).

2.3 The construction site for the fireworks exhibition

To ensure a fully embellished ceremonial space, there was the installation of a stage with side loggias on the riverbank of the Po to enjoy the fireworks exhibition. Giovanni Battista Ollivetto, who was from the Andorno valley, today known as Cervo valley, and Pietro Antonio Ostano, also from the Biella area, were entrusted with the task of building the stage with side loggias. Their work was to follow the design of Carlo Aliberti made according to the indications of the first royal architect, Benedetto Alfieri, and accompanied by the measurements provided by Benedetto Feroggio. Ollivetto and Ostano had won the contract by submitting a £1,950 reduction in the tender, thus reducing the price for the loggias to £3,000 (ASTo, 20 March 1750). The two craftsmen were responsible for the provision, at their own expense, of all the wood. The instructions indicated the quality of the wood with the quantity defined by Feroggio's calculations as well as all the nails and the metalware as per instructions.

The Alfieri's instructions (ASTo, 17 March 1750) describe the materials indicating the origins of the wooden elements (the Province of Susa) and their quality. The *remme* (beams) had to be in oak; the *paradossi* (strut) had to be necessarily made of *malegine* (larch), while the strips for the formation of the vault

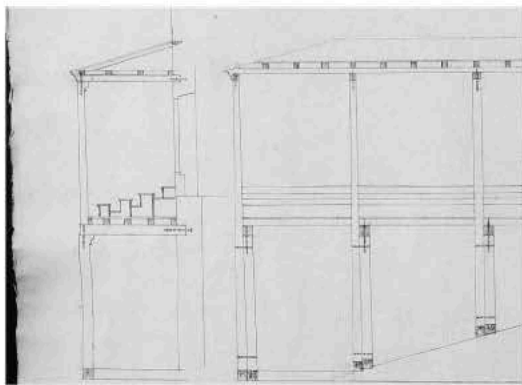


Figure 3. Detail of the temporary structure for the spectacle of boats on the Po by Carlo Aliberti (ASTo, Corte, f. 71r, 1750).

at the end of the closed loggia should have been made in *albera* (poplar). The building contractors provided nails excluding the brackets to hold the beams, which were instead provided by the Office of Factories and Fortifications. They also offered the grey waxed canvas to cover the loggias, which had to be secured with iron blades attached to the wooden beams, also decorated with ornaments and paintings.

All operations to be executed were then accurately reported: the loggias had to be built onto the two staircases located at the sides of the *Valentino*, starting from the side towards the river Po, as shown in the drawing (Figure 3) and accordingly to established measurements.

Works were to continue by drilling holes into the masonry to securely accommodate the beams, secured with iron *grappe* (brackets) at least 2 feet long (1.026 m) and nailed to the beams with iron plates to ensure maximum safety. Then, the wooden poles had to be inserted into the well-flattened ground, two for each span, always of the dimension dictated by the calculations of Feroggio. The floor at the base of the loggias and the scene was supported by poplar planks and joined together with at least three nails each. Both the stage and the loggia cover had to be well fixed into the masonry with two iron *lamme* (iron plates) each, which in turn were secured by nailing the timber together.

After this operation, seating was built, made of poplar wood, smoothed and well-polished on the upper side, measuring at least 10 ounces (0.42 m) in width and 12 ounces (0.50 m) in height. The following step was the construction of the parapet, and the pilaster, made with fine poplar planks and long beams stopped by uprights. With at least five nails, all well-fixed, for each axis, above there had to be an axis affixed, flattened and nailed, at least 3 ounces wide (0.126 m).

For producing the wooden rib, wooden strips had to be fixed at a maximum distance of 6 ounces (0.252 m) from each other to support the ceiling. The waxed canvas was fixed with iron nails. As specified in the contract, the two craftsmen Giovanni Stefano Ollivetto

(from Monforte d'Alba, Cuneo) and Giacomo Mercandino (from Pralongo, Belluno) were in charge of the provision of the grey coloured waxed canvas for covering the loggias (ASTo, 2 April 1750). This required 800 *rasi* (479 m) of grey waxed canvas, the quality of which was verified by the Office, at a price per *raso* of 17 *soldi* and 6 *denari*.

The instructions also specified that wood and tools were to be taken on-site to execute the works. A guard would have watched over the materials to prevent any robbery. At the end of the ceremonies, everything had to be carefully disassembled and, as indicated in the contract, the companies had to assign the materials to the Office, which would store them in the Royal Warehouses. Before settling the final balance of the payment, the building contractor had the following tasks: replace the *chiassili* (shutters) in the windows after having removed them to accommodate the spectacle; place the parapets back in front of the windows; ensure the closing of all the holes made to fix the wooden stage to the palace; and repair any damage that might have inadvertently happened.

The spectacular repertoire of festivities realised at the *Valentino* would have ended, with scenic effects and decorative settings of royal munificence according to the expectations of the royal court.

3 CONCLUSIONS

3.1 The importance of studying ephemeral construction sites

Analysing the documents, the first aspect that emerges concerns the articulation of the design and administrative process: in the case of the 1750 festivities, both mainly functional structures, such as the stages for the public, and elaborate decorations were built whether painted or with sculptural sections: machines for the fireworks, large facades painted on canvas that concealed Filippo Juvarra's two unfinished buildings and required the intervention of highly specialised artists and artisans. In all of these cases, even the simplest, every aspect of construction was controlled and managed with the same attention as that devoted to the construction of a royal palace: the entire administrative process – from the project to the tender, to the contracts with companies and workers, to the verification of the work in progress, to the final acceptance and verification that precedes the payment – followed the usual standards of rigorous control typical of the Savoy bureaucracy (Burgassi & Volpiano 2020). In the design phase, complex architecture models would be prepared, such as that made by an artillery officer for the construction of the two firework ships. Each piece of the woodwork for the construction of the supporting structures of the curtain walls was also rigorously designed and dimensioned, with precise indications of the different types of wood to be used. The accuracy of the design also included specific provisions for the supply of material and special permits to procure it, even if located some kilometres distant from the

capital city: "In case of need, the said *Impresarij* will be granted the licence to extract from the Province of Susa the quantities of Larch beams that will be necessary" (ASTo, 20 March 1750). The expression of this control is evident both in the always present executive, graphic drawings in scale (in *trabucchi*, an archaic measurement unit used in Piedmont during the old regime). These were the indications the contractors were provided by the first royal architect Benedetto Alfieri in the *istruzioni*. He coordinated the work and designed the façade of *Palazzo Madama* towards the Po. For the other works, he used the collaborators mentioned above Prunotto, an aide of Filippo Juvarra, and Aliberti, who was close to the world of theatrical scenography and figures like the painter Galliari who painted the large *telleri* (canvas).

It is therefore clear that strict control by the royal architect was essential to managing a multi-site construction programme. The complexity is not negligible, and the costs were very high: the whole festivities cost the public purse more than £335,000 and, for example, just the balcony decoration for the public at the Valentino was estimated at £2,000. By way of comparison, a few years later, in 1754, the refined wooden floors in the royal apartments of the *Venaria Reale* palace cost no more than £170 each (for the *Camera di Ricevimento* or Reception Chamber of HRH the Duke of Savoy £160); the precious polychrome marble floor of the new gallery cost, and including polishing and installation, slightly over £7,000.

As seen from the tender documents, materials were supplied by the contractors, although not always: canvases for the painted backdrops and metal brackets to connect the beams were always provided by the *Regi Magazzini*. The contracts of the *capomastri da bosco* (carpenters) often provided that the materials, after use, if still usable, would return to the property of the contractors. The necessity of assembly and disassembly allows us to intuit a rather complex logistics for the storage of materials (as seen, a particular room was set up for this purpose in the *Regio Palazzo del Valentino*).

There were still other costs, which extended beyond the end of the celebrations. Once the temporary structures had been dismantled, the documents remind us that it would have been necessary to repair any damage to the walls caused by the anchoring of the beams. In some cases, there was also the matter of compensating private owners who had had their properties temporarily occupied.

In conclusion, the building site for the ephemerals and the ceremonies also represents an ongoing research site that deserves further investigation.

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