



THE ARCHITECTURE OF FULL-SCALE MOCK-UPS

From Representation to Reality

NICK GELPI

The Architecture of Full-Scale Mock-Ups

The Architecture of Full-Scale Mock-Ups looks at the theory and contemporary practice of creating full-scale architectural mock-ups.

This book serves as an introduction to the various forms of full-scale mock-ups which occur today. To broaden the definition of mock-ups, Nick Gelpi dives deep into the use of mock-ups in seven high-profile and global contemporary case studies. Instead of the presentation drawings and final building photos, the documentation of case studies relies on process photos, interviews, and moments of tension in the execution of each building. With never before published content, case studies include buildings from all over the world, including the Quincho Tia Coral and Teleton Building, Copper House II, the Pérez Art Museum Miami, the Cité de L'Océan et du Surf Museum, and more.

Investigating unique case studies to answer how and when full-scale mock-ups occur today, this book is ideal for professionals and students of architecture studying materials and representation, design-build, and professional practice.

Nick Gelpi is a licensed architect in the state of Florida, and a Professor of Architecture who has lectured and published widely on the tensions between materials, construction, and representation in architecture. Currently Gelpi is an Associate Professor of Architecture at Florida International University in Miami, Florida.



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The Architecture of Full-Scale Mock-Ups

From Representation to Reality

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Foreword

The Indispensable Failure

Nader Tehrani

While the advent of the mock-up is nothing new, there is something that each historical era brings to its purpose that redefines its conceptual potential. In effect, it has had a transformational role as a medium of persuasion, giving rhetorical strength for great patronage, while also serving as a testing ground key technological innovations. This book brings urgency to the idea of the mock-up as artifact, and a view into the architectural discipline's recent history might explain a few things about its renewed relevance.

Building the Historical Moment

Revisiting the early-1990s, when after an era of repressed presence, the return of construction as a theme within architectural discourse engendered an important turnaround for the discipline. The preamble, of course, was not insignificant, and nor was it historically monolithic. The intellectual contributions of post-modernism and deconstruction did much to advance architectural thinking from the 1960s through the 1980s, and yet fell short of addressing building construction as the locus of academic speculation.

If post-modernism brought a renewed self-consciousness to the architectural act, it also expanded the historical framework from which we looked at history, culture, and architectural morphologies, overturning an era that had appealed to positivism as architecture's main narrative. In tandem, the advent of deconstruction, drawing from philosophy, literary criticism, and other fields did much to challenge architecture as an institution, but the forms it produced in the context of architecture did little to dismantle the very politics that drove patronage, construction, and tectonic thinking. In fact, arguably, while on the surface the forms produced by both movements may have seemed different at that time, in retrospect they shared much in common, relying on the integrity of architectural types (or fragments) on the one hand, and the techniques of collage and montage as the basis of their assembly, on

the other. More importantly, neither were invested in the materiality of building or a theory of construction as a site of intellectual inquiry.

Of course, while these movements were predominantly shared between the United States and Europe, its results were also neither singular nor monolithic. In the Iberic peninsula both Spain and Portugal enjoyed relative autonomy from these tendencies as they overcame an era of centralized governance. Spanish culture, having only recently come out from under the reign of Franco, maintained a relatively isolated relationship to architectural thinking from the rest of Europe; under Franco, the continued presence of the modernist project with the radical experiments of Miguel Fisac, Francisco Javier Saenz de Oiza, and Fernando Higueras produced a robust engagement with building experiments, while the post-Franco period of the 1980s extended the modernist project in a much more orthodox manner, save the work of very few like Enric Miralles and Carme Pinos, whose experiments held to the extremities posed by their predecessors. Still, both the Barcelona and Madrid School held tight relationships with practice and their engagement with “building” projects maintained a strong experimental thrust, always deeply invested in architecture as an act of fabrication.

Meanwhile in the 1980s, even while Switzerland was marked by characters like Mario Botta, Bruno Reichlin, and Fabio Reinhardt, all protagonists of the post-modern era, their work maintained a committed relationship to the ethics of construction as basis for speculation; this is also later evidenced in the work of the then-emerging names of Herzog & de Meuron, who double-handedly transported the theme of materiality – aligned with a reformed definition of craft – toward a new era, much of which today’s generations have inherited as a foundation. Much of this work, in both Spain and Switzerland, while alien to practice in the United States was becoming common to its academic institutions, especially after the arrival of Rafael Moneo, who played a pivotal role in bringing some of those voices to the Harvard Graduate School of Design.

The Mock-Up Installed

By the 1990s, the academy in the United States was split between a yearning for the type of construction experimentation seen in both Spain and Switzerland, on the one hand, and the emergence of the digital platform that, on the other hand, had seen its outlet in computer visualization and formal research as witnessed through the paperless studios of Columbia.¹

In contradistinction, a few practices were engaged in the difficult synthesis that would emerge out of these two tendencies, among them Foreign Office Architects (FOA), SHOP architects, and my own collaboration with Rodolphe El Khoury and Monica Ponce de Leon under the banner of Office dA. Our installation for MOMA’s exhibition “Fabrications: The Tectonic Garden,” curated by Terry Riley, was a precise response to this false dichotomy. The folded steel plate construction, anamorphically conceived, meticulously calculated and drawn in the computer, and then fabricated by Milgo Bufkin, was a stitching together of a pictorial idea that could only be delivered through computer-aided manufacturing. That is, in order to create

a series of mass-customized panels that would appear to be completely plumb, level, and flat from one perspectival station point, it would require a fabrication technique that could eliminate conventional tolerances as defined by the construction industry.

For Riley, this exhibition was an important dress-rehearsal for many things that were to come in the next two decades; in fact, the PS1 summer installations are an extension of the very premise he laid out: the idea that an architectural exhibition revolves not around representations such as drawings and models, *per se*, but the actual architectural fragment at full-scale. Maybe most importantly, one of the underlying aspects of this exhibition was a critique of both practice and the academy as they had evolved, with the academy becoming ever more submerged under meta-discursive aspects of theory and criticism, and with practice becoming increasingly acquiescent as a service industry with a total abdication of its agency to transform the built reality of the world around us. This was also an indication of the increasing calcification of patronage in the United States; few if any clients would place importance – or funding – in building innovation, while also handing over a great part of the architect’s instrumentality to the platform of contractors, project managers, and the building industry at large. From our perspective as thinkers and practitioners, the re-claiming of the means and methods of production was the most important challenge to architectural practice, and in great part what has led to a transformation of practice today.

It is, then, maybe a fortuitous coincidence that FOA’s Yokohama project was also premised on the idea of the fold, and the subsequent construction of the terminal while remaining faithful to its original idea transformed considerably, creating a composite structure with a vector active truss vault in combination with plate steel veneers that gave surface to its many folded facets. In contrast to the pure folded “stitched” details of the Office dA Fabrications installation, the FOA project required a mediated process of translation due to its shift in scale. If the Office dA mock-up adopted an invented detail as a catalyst for part-to-whole relationships, the FOA project needed to rely on three different Japanese ship manufacturers, who served as builders for the terminal, to mock-up slightly different variations of a design intent. This also helps to underscore the difference between the building of infrastructure on the one hand, and the bespoke development of an installation, on the other: one being played out against the panoramic narrative of politics, economies, and public patronage, while the other insulated to a larger degree within the confines of research, construction, and the transformation of industry bottom-up.

In the meantime, lacking the kind of competitions found in Europe that were the engine for the successes of many young firms, the more speculative firms of the United States retreated increasingly into the medium of installations as an avatar for architecture itself. The transformation of today’s schools – their fab-labs, workshops, and architectural pedagogies – are also a reflection of this historical passage. The results are varied as some graduates enter into practice with an entrepreneurial lens, sometimes entering architecture through the construction industry (Mark West’s fabric-formed concrete research being an early signal of things to come and Ensamble Studio’s full-scale constructions becoming part and parcel of their normative practice), through the arts (Tomas Saraceno and Anne Holtrop, both demonstrating that the context of the museum enabling certain feats that the architectural discipline would

never allow through its own constraints), or through the 1% clause (Ball Nogue and Iwamoto Scott, whose various architectural installations have become synonymous with mainstream academic practices); in turn, while some see the installation as a research conduit to a more immersive practice – engaging urbanism, complex building typologies, and programmatically charged projects, others have also seen the installation itself as the destination.²

The Mock-up Manifested: A Physical Form of Representation

The mock-up, as artifact, can also be seen against this immediate historical backdrop. As Gelpi brings panoramic nuance to the mock-up's *longue durée* by including varied manifestations and adaptations, he also offers a critical response to it by way of the unique historical moment of which he is a result. The last decade has seen radical transformations in both practice and the academy, in great part because of the way in which maker culture, fab-labs, digital printing, and DIY protocols have impacted ideas about manufacturing. Thus, while Gelpi probes into history with some depth, he is also deeply conscious of the instrumentality that this historical moment may yet bring: at once enabling us to adopt the research done in the academy to impact the building industry, while also imagining that the ability to make on one's own volition may not require the same reliance on a static definition of the construction trades.

Gelpi taps into the mock-up as the site of two very different historical subjects. On the one hand, he imagines the “unmediated” act of making as a craft that, through its own protocols, may engender invention, even if by accident; on the other hand, he is also deeply conscious that the advent of representation as a disciplinary precondition for the possibility of making architecture. In the latter, the intellectual predisposition of architecture as a discipline dispenses with craft altogether in lieu of a deeper investment in the possibility of radicalization of spatial, formal, and material protocols that do not require precision in labor as their basis for success. Moreover, Gelpi shrewdly braids together the idea that the process of construction – mock-ups in this instance – is in itself a design process that is the manifestation of a representational system; as such, he inverts the traditional temporal dichotomy between drawing and building, imagining that the physical mock-up is the basis for a new form of drawing, and thus a conceptual transformation about how we might see architecture as an intellectual construct.

Gelpi's conception of the mock-up as a medium is telling, especially given how it has been historically adopted in varied ways. If the sciences of the modern world did not always have the means to prove a structural theorem, the mock-ups of Antoni Gaudi, Frank Lloyd Wright, or Felix Candela would serve not only as a testing ground, but a process of re-calibration and its eventual proof. That these figures would radicalize the optimization of structures and the morphologies of architecture they imparted through the exploration of mock-ups become even more poignant when viewed in relation to the absorption of mock-ups in the corporate ranks of patronage today; most often, building mock-ups are now contracted as a

confirmation of preconceived ideas, and often after it is too late to transform or revise them for the actual building in question – alas a futile act in the theater of the public approval process.

The Mock-Up as Performance

While all mock-ups involve testing certain performance criteria, we come to understand that the varied definitions of performance are the critical factor in their evaluation. It is productive to think through a set of instantiations where the mock-up has served to advance an idea about architecture that could not have been done through other means. The wood models of Antonio Sangallo, prepared for the Pope, were not mock-ups in the strict sense; the millwork did not rehearse actual construction techniques imagined for the building, but the sheer scale of the model served as headgear and viewfinder, so that the Pope could envisage what would otherwise have to be “mediated” through other representational inventions such as perspective. In this instance, the translation from the two dimensional to the third, via perspective, might have seemed more daunting for the Pope than the conceptual shift in scale and materiality as proposed through a mock-up. The mock-up, as a large model, would entail the meticulous handcraft of woodworkers that could anticipate its expansion and contraction, and the very movement it would undergo as a result of both temperature and humidity fluctuations; in this sense, as an act of building, the model was itself a feat, and an end product, with its own means and methods, completely independent of the building it was meant to represent.

As such, the colossal Renaissance models were primarily optical mock-ups, and the verisimilitude of the St. Peter’s model only helps to radicalize the acceleration of optics as a field, something that is built into Palladio’s Teatro Olimpico as a stage set, where the image of the city is materialized through a gradient scale, bridging the idea of a model and mock-up into confluence through the anamorphic fabrication of its various streets. The theater also connects the artifice of stagecraft to architecture as an indelible part of the discipline. Within this context, projects such as Teatro Olimpico, the mock-up of Potemkin Village, and the construction of EUR, all speak to the ways in which architecture is called on to construct perception, not only in the appearance of its streets, but in the ways that those very streets amount to a form of representation about power, presence, or urbanity. Gelpi’s account helps us to better understand the fluid ways in which we can better understand the mock-up, as model, simulation, structural test, installation, or even building, underlining the speculative nature of building as research, no matter what scale or *raison d’être*.

The tension between the actuality of buildings, and the perception they produce is, of course, an indelible part of one of architecture’s main disciplinary characteristics: the theory of tectonics that establishes the tension between actual material performance and their requisite representational performance. The entasis of the Doric column has emblemized this theory for ages, but many of architecture’s so-called necessities are fraught with design choices that, by rule, entail varied options in their execution, and each of which offer a slightly different form of surplus. As such, visual

performance can be said to be a critical factor of even the mock-ups whose purpose is to test structural performance. Gelpi's passages on Mies Van der Rohe's Köller-Müller Villa and the Frank Lloyd Wright column mock-up for the Johnson Wax Building are apt examples of this argument, adopting these two buildings to demonstrate not only their structural, but so too their tectonic properties.

The Building as Mock-up

If performance were viewed from the perspective of an extended or deep history, then the systemic codification of architectural types can also be said to be construed around the idea of a mock-up. Not a mock-up in the strict sense of the term, the architectural type is rooted in an idea about a building's organizational, formal, or technological systems such that each iteration contributes to its overall contribution to the field. After all, it is in the context of Diocletian's Palace, the Escorial, and the Berlin Free University that we come to appreciate the transformations of the Rolex Center by Sanaa. Each conceived in a different era, in relation to varying social, political, and economic forces, their organizational makeup, between rooms, courts, and urbanistic layout, constitutes a type commonly referred to as a mat building. With a density and depth in plan that challenges the accessibility of light and air, all these buildings push certain limits to establish a meaningful relationship between part and whole; and yet, it is Sanaa's Rolex Center, whose introduction of the form active vaults that help give singularity to what would otherwise be an inaccessible mass, providing for a brilliant challenge to the many mock-ups that preceded it. In this sense, under the regime of typology, each building can be seen to serve as a mock-up for the next, building up a historical narrative of inventions along the way.

With the emergence of performance software, today there is a myriad of ways in which the idea of the mock-up has gained traction in the context of simulation. Beyond the reliance on the expertise of the consultant, designs are put under structural, environmental, and traffic engineering tests on a routine basis, if only to demonstrate their interiority to speculative design practices; digital mock-ups are part of the process, not just part of the proof. And yet, there is sometimes no substitute for the haptic, the physical, and the material. What can be more visceral than the plummet of a parabolic flight path to create an expanded understanding of weightlessness? In the architectural context, ironically, patronage rarely offers the space within which to research or advance innovations for their own purposes; that is assumed to be part of the responsibility of the architect's life commitments. Notwithstanding added pressures from the insurance sector, the idea of the production of new forms of knowledge through making remain academic in nature, and rarely underwritten by clients. For this reason, it is all the more awesome to understand those delicate historical moments when architects gained a different form of agency through making, if only to underwrite their own failures as a positive form of intellectual and professional advancement. In the article "Cheap and Handsome: The Cost of Efficiency in Mexican Development," Maria Gonzalez Pendas documents Felix Candela's calm reaction to the collapse of the Palmira Chapel after its first "decentering," effectively

underlining its process of construction as a central part of building knowledge – and its requisite efficiencies – not only for that building, but for the very industry to which he and his brother had given birth in Mexico City. While this model of practice still remains rare, Gelpi's book offers a lens into what potentials might await architectural practice if viewed from this expanded perspective.

In revisiting the historic footage of the collapse of the Tacoma Narrows Bridge, I have been impressed by the thoroughness of its documentation. Seemingly the product of a special effects studio, the footage is exactly the opposite: real footage un-doctored by any sort of representational deceit. The documentary, with the voice of Professor Farquharson, presents a calm restraint as he narrates the unfolding of dramatic events, balancing out the scientific evaluation of vortex shedding and resonant oscillation with the personal account of his daughter's dog stuck in the car at mid-span. Moreover, what this footage spectacularly presents is the tension that arises from the prospect of a sublime collapse, and unintended as it may have been, the fecundity of the full-scale mock-up as the basis for the production of new forms of knowledge.

Notes

- 1 Greg Lynn's article in *ANY* may serve as a good reference for this emerging debate. "Blobs, or Why Tectonics is Square and Topology is Groovy," *ANY* 14, May, 1996.
- 2 The established younger practices today are maybe too many to enumerate, but the research of studios like Ball Nogue, Situ Studio, Alibi studio, Matter Design, Matsys, or The Very Many have all contributed to the transformation of the thinking behind making as both a representational tool, while also advancing our conception of the building industry.



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Introduction

Figure 0.1 Frank Lloyd Wright observing the full-scale mock-up of his column design. Frank Lloyd Wright, S.C. Johnson Wax Administration Building (Racine, WI, USA) 1937.

Courtesy of Wisconsin Historical Society – WHS-ID1911.



FROM REPRESENTATION TO REALITY

In 2013, as the new building for the Pérez Art Museum Miami was nearing the final stages of construction, a separate set of buildings were being demolished on site. These smaller buildings lined the western edge of the site and were more costly per square foot than the museum itself. The Swiss firm, Herzog & de

Meuron, designed these sacrificial buildings but the general public would never see these structures; the public would only ever experience their impact. What is striking about the Pérez Art Museum Miami, is the degree to which it had already been built before finally being built, albeit in fragments, but at full-scale. These full-scale fragments are mock-ups. The many mock-ups constructed in Miami were dress rehearsals, anticipations of the final building, like a negotiation intended to mediate the local conditions on the ground with imaginations from afar.

At its best, a full-scale mock-up does not lead to a reconsideration of the broad conceptions of design. Rather, mock-ups solidify and deepen conceptual approaches through a series of detailed fine-tunings, transforming drawn representations into sometimes surprising realities. Mock-ups represent a powerful opportunity to engage the unpredictable entanglements of representation and reality, entanglements which are difficult to anticipate.

Mock-ups represent a transformation, as the flat media of the drawing is translated into the thicker materiality of the building, resulting in a new negotiated reality. For the Pérez Art Museum Miami, Herzog & de Meuron productively employed such full-scale mock-ups as both a conceptual and practical extension of the design process. In fact, Herzog & de Meuron consistently utilize mock-ups to push the boundaries of practice, ultimately dissolving the borders between designing and building, extending the reach of design beyond the page. They are not the only ones.

While the architectural profession increasingly engages in the construction of full-scale mock-ups generally, a few practices are uniquely experimenting with mock-ups to redefine assumptions about the design process and architectural practice. These unique practices not only use mock-ups to prove the physical viability of design concepts, but also to extend the architect's creative possibilities.

Through mock-ups, the architect can better anticipate the interactions of matter and form, and the particularities of site, absorbing these empirical observations into deeper forms of design. Approaching design with or without mock-ups, suggests different outcomes for the resulting constructions, respectively, one which is generic to its material surroundings or, preferably, one which is specifically immersed in its physical context.

As a result of being constrained to the page and at small-scale, conventional representations do not allow a deeper consideration of material properties and behaviors which will exist at full-scale. Mock-ups, instead, require representation to exist in the material world, distorting ideal representations with the internal forces of physical matter.

Mock-ups test uncertain ideas, providing new opportunities for experimentation and failures. These failures exist as both cautionary tales as well as new opportunities for innovation through pre-meditation. These pre-meditations enable deeper engagements with physical reality, negotiating design intent with the camouflaged realities of building and practice.

PHYSICAL FORMS OF REPRESENTATION

Mock-ups are a more articulate convention of representation, because unlike drawings, they are constructed of the same physical matter as the material objects that they also represent. This consistency allows them to more smoothly embody representation, avoiding the unpredictable distortions of translating from two-dimensional to three-dimensional or from representation to reality. As physical forms of representation, mock-ups can provide new insights and feedback not possible when constrained to immaterial representations. Through mock-ups, architecture is in a unique position to encompass not only formal and aesthetic concerns, but also to define the degree to which the physical world is embodied or avoided.

While diverse in scope and technique, mock-ups fit into a different category of representation, as hybrid conventions which are simultaneously drawing and building and occupy the territory where representation blurs into reality. Seemingly paradoxical, in a mock-up, the reality *is* also the representation.

While the motivations of mock-ups are contingent on the particularities of each project, not predefined by a standardized set of conventions, what they all have in common is a necessary motivation by the diverse issues of matter and materiality. Within drawings, materials are represented graphically, constrained by flat convention to descriptions of their extensive properties such as dimensions and boundaries. However, it is the intensive properties and characters of materials which are unique, but beyond the capacity for what drawings can communicate. These intensive properties and characteristics of materials need to be mocked-up to be seen, building qua building.

THE IMAGE OF STRUCTURE

Figure 0.2
Contractor Ben Wiltscheck climbs a ladder to determine how much more sand can be added, 1937. Frank Lloyd Wright, S.C. Johnson Wax Administration Building (Racine, WI, USA) 1937.

Courtesy of S.C. Johnson.



Mock-ups are not new. An early and important modern example of mock-ups is the mock-up of Frank Lloyd Wright's column design for the S.C. Johnson Wax Administration Building in 1936 (see Figure 0.2). Wright represented his unusually designed column with the usual conventions of drawing. But having reviewed the design, the column was rejected by the Wisconsin Industrial Commission. Because of its flaring top and slender base, the building department believed it would fail as a result of its unusual shape. To prove the adequacy of his design, Wright challenged the ruling of the commission by building one of the columns at full-scale. This full-scale mock-up demonstrated that

his unique shape not only functioned as designed, but also far exceeded the required structural load.¹ Simply stated, the physical realities of Wright's column could not be represented by drawing alone. It needed to be constructed to be understood. It needed to be built, to be built.

Here, the insufficiency of drawings highlights a shortcoming of our representational language. While drawings are sufficient for representing the image of form, or in this case the image of structure, they lack the capacity to communicate form's important relationships with matter. The flat drawing is an imprecise approximation of architecture. Only mock-ups successfully bridge that liminal space between drawing and physical building, that space between representation and reality.

FULL-SCALE REPRESENTATIONS

Whether or not they exist as monumentally as Wright's column, mock-ups are instrumental in solving constructability issues. However, these are not the only issues about which mock-ups can provide valuable insights. A central concern of mock-ups is the role of scale. Scale is not a passive condition, nor one which serves as a simple frame for zooming in and out. While the consequences of scale do impact constructability issues, they also serve a vital role in the experience of space and its effects.

An even earlier example of a full-scale mock-up highlights an alternative approach toward moving beyond small-scale representations. In 1912, Mies van der



Figure 0.3 Full-scale wood and canvas mock-up in the landscape. Ludwig Mies van der Rohe, Kröller-Müller Villa Project (Wassenaar, The Netherlands) 1912.

Mies van der Rohe: © 2016 Artists Rights Society (ARS), New York/VG Bild-Kunst, Bonn.

Rohe constructed a mock-up of one of his first commissions, the Kröller-Müller Villa. Unlike Wright's mock-ups, which consisted of only one piece of his building in isolation, a single column at full-scale, here Mies constructed the entire villa at full-scale. An additional but fundamental difference between Mies' and Wright's mock-up is one of materiality. While Wright utilized the actual materials of construction for his mock-up, Mies constructed this full-scale mock-up out of canvas and wood for a villa that he had designed to be built of stone. Mies's mock-up was intended to test at full-scale the effects of form and space, even landscape, without regard for the actual materiality of construction.

These two distinct examples exist at opposite ends of a wide spectrum of mock-ups, one which casts aside the limitations of drawing for what only can be represented in the material world itself, and one which disregards materials and only concerns itself with the consequences of space. Most contemporary examples of mock-ups function somewhere between these two extremes, to prove the constructability of certain designs, but also to incorporate full-scale considerations into the representational realm, and thus to extend the range of the architect's creative vision.

DRAWINGS AND BUILDINGS

If mock-ups exist between drawing and building, perhaps it is worth restating the terms of these boundary conditions. The terms "building" and "drawing" are categorically distinct but when placed in relation to architecture, they are framed side by side with unique interactions.

According to Oxford English Dictionary the term "drawing" is defined as "The formation of a line by drawing some tracing instrument from point to point of a surface; representation by lines, delineation; hence 'any mode of representation in which the delineation of form predominates over considerations of colour';² and alternately as "*The arrangement of the lines which determine form.*"³

The term "building" has broad reference, but for comparisons to "drawing" its differences include being three-dimensional and physical. The definition of the term "Build" references the act of constructing by physically joining separate parts or pieces of material together, generally at a larger scale.

BUILD, v ... To erect, construct (any work of masonry), and by extension, To construct by fitting together of separate parts; chiefly with reference to structures of considerable size, as a ship or boat, a carriage, an organ, a steam-engine (not, e.g. a watch or a piano).⁴

According to these definitions, several key differences can be gleaned. While drawings are assembled of lines on flat surfaces, buildings are constructed with three-dimensional parts. The definitions also highlight drawing as a mode of representation, which implies malleable scales, while building is the assembly of parts, at full-scale, and primarily of large scale format.