Abstract and Literal Practices

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PRODUCTIVE AND OBSTRUCTIVE ABSTRACTION

Architects do not make buildings. Architects specify size, shape, location, orientation, treatment and technique through the media of working drawings, specifications, contracts and addenda. In his seminal essay on the "Translations from Drawing to Building", Robin Evans articulates this central dilemma about the nature of architectural production and the necessity of abstraction, casting it in negative terms by describing it as a disadvantage:

> the peculiar disadvantage under which architects labor, never working directly with the subject of their thought, always working at it through some intervening medium, almost always the drawing, while painters and sculptor, who might spend some time on preliminary sketches and maquettes, all ended up working on the thing itself.[1]

The contention in this paper is that the abstraction of the intervening media of drawings and models in architecture is not always an obstructive handicap but rather can be thoroughly productive when understood and directed as a project in itself. These abstract practices are absolutely fundamental to what architects do. The inevitably of these necessarily abstract practices thus demands optimistic pedagogies and practices that are capable of swerving abstraction towards desirable ends, enabling cogent building performances. The evasions of contemporary abstraction seem most acute in the context of building envelope design, performance and durability. In what follows, I will discuss the current modes of abstraction through an analysis of recent design theories, techniques, and technologies. In doing so, I will articulate these productive and obstructive forms of abstraction and describe how they have shaped lectures and exercises related to building envelope durability in the design and building technology sequence at Northeastern University.

ABSTRACTION IN HERMENEUTIC VERSUS MATERIAL PRACTICES

Compositional inquiry in the last four decades was dominated by deliberately autonomous architects speaking to themselves about form, removed from the actual complexities of practice, real contexts, and our technics.2 This approach isolated and legitimated its formal ambitions through a conservative retreat into architecture's own formal, historical, and material syntaxes. The recurrent preoccupation has been linguistic conformance rather than architectural performance. With its aversion to technics, economics, architectural performance and even human comfort, this approach to architectural inquiry guided the profession towards pedagogical structures and modes of practice not prepared for the realities, problems, urgencies, or formal potential of current practice. In this period of inquiry, composition was characterized by the scenographic appearance of an object and its visual representation: size, shape, orientation, repetition, symmetry, proportion, rhythm, regulating lines, rotation, scaling, extrusion, lofting, and most recently, scripting. These techniques of object composition have been held as the formal attributes of architectural design. However, the efficacy of the resulting visually rich but deliberately inert and under-performing architecture is increasingly difficult to legitimate in the shifting social, economic, ecological, and intellectual conditions of the new century. The enduring, impoverished conception of a building as merely a composed object, rather than a set of active patterns, processes and effects, catastrophi-

cally denies the actualizing processes and performances of a building and its formative contexts and milieus. Within this mode of inquiry, the linguistic bent of abstraction was even further removed from the reality of building production on two accounts: the discourse was an abstraction of an abstraction (words describing design which in turn described a building) and, second, this doubly removed discourse was utterly indifferent to the activity of an architect (in favor of mimicking a philosopher or a social scientist). This obfuscated the role of building performance (a material practice) in favor rhetorical exuberance (a hermeneutic practice). Dreading the realities of these technics and contexts, the under-ambitious agendas of many formalists in recent decades have been inadequately engaged with the question of formation and thus never been fully formal. The topic of abstraction is central to this professional problem as well as central to a way out of these problematic practices.

SOFTWARE AND ABSTRACTION

Central to the nature of abstraction in contemporary architectural practice is a distinction that can be made between two categories of software that architects employ in the production of design. Whereas certain abstraction practices in architecture are frequently characterized by pixel-biased representational software appropriated from the film and animation industries (such as Maya and even Photoshop), others are characterized by information-biased instrumental softwares (such as computational fluid dynamics, parametrics, building information modeling or scripting software for example) that integrate a range of contextual data to produce and build information-rich figures. Like the distinction between material and hermeneutic practices, these two software types respectively offer productive and obstructive applications of abstraction in current architectural production. Architecture cannot be confused with, or accurately produced with, the inert pixels of purely representational software alone. Architecture is composed of information-rich lines, not pixels. It follows that representational regimes based upon lines that accrue intelligence are superior to the inert abstractions of pixel-based imagery.

A prime example of the potential for various digital production techniques to be dominated by appearance rather than performance is evident in the publication of Farshid Moussavi's, *Function of Ornament.* The impetus of the *Function of Ornament* is based upon the observation that the building envelope is an increasingly intense site of architectural investment from cultural, economic, environmental and technical points of view. Moussavi's central thesis, that "architecture's materiality is a composite one, made of visible and invisible forces," is a coherent beginning.[3] This thesis is a welcome expansion of what could constitute the term 'composition' in architecture and expands our assumptions about what is abstracted in architectural design. To explicate the thesis, the introductory text lightly engages several heavy topics: ornament, function, semiotics, construction, and affect/sensation. However, only affect is rigorously developed throughout the book and only an idiosyncratic functionality emerges. Moussavi privileges a type of function primarily associated with the imageability of capital-intensive iconic buildings rather than technical, structural, or performative functions. Moussavi's function is best understood as the complicit and embellished extension of the branding agenda of a building owner. If technical or performative agendas appear, it is presented as an alibi for affect, never the other way around. This expedient and evasive functionality permeates the book and is intensified by the choice of buildings, representational choices, and in the suppression of other functional logics such as construction. Moussavi intends to present "the construction of buildings and the production of affects as a seamless continuity."[4] Yet the representations willfully and consistently subvert construction for affect. There is an inexplicable focus on outward surface, a flattening and suppression of actual construction in the representations that is unnerving given the role of construction in this claim of continuity. For instance, the representation of Eladio Dieste's work lacks the mortar that engenders the masonry building's supple solid structural logic.[5] This drawing is unengaged with the material realities that yield its undulating affect, the focus of the study. The discussion of construction and function rarely rises beyond the rhetorical in the book. The result is a scenographic survey of ornament. Again, a Robin Evans observation that applies to such examples in representation in architecture is cogent here:

> "We have witnessed, over the past fifteen years, what we think of as a rediscovery of the architectural drawing. This rediscovery has made drawings more consumable, but this consumability has most often

> been achieved by redefining their representational role as similar to that of early twentieth-century paintings, in the sense of being less concerned with their relation to what they represent than with their own constitution. And so the drawings themselves have become repositories of effects and the focus of attention, while the transmutation that occurs between drawing and building remains to a large extant an enigma."[6]

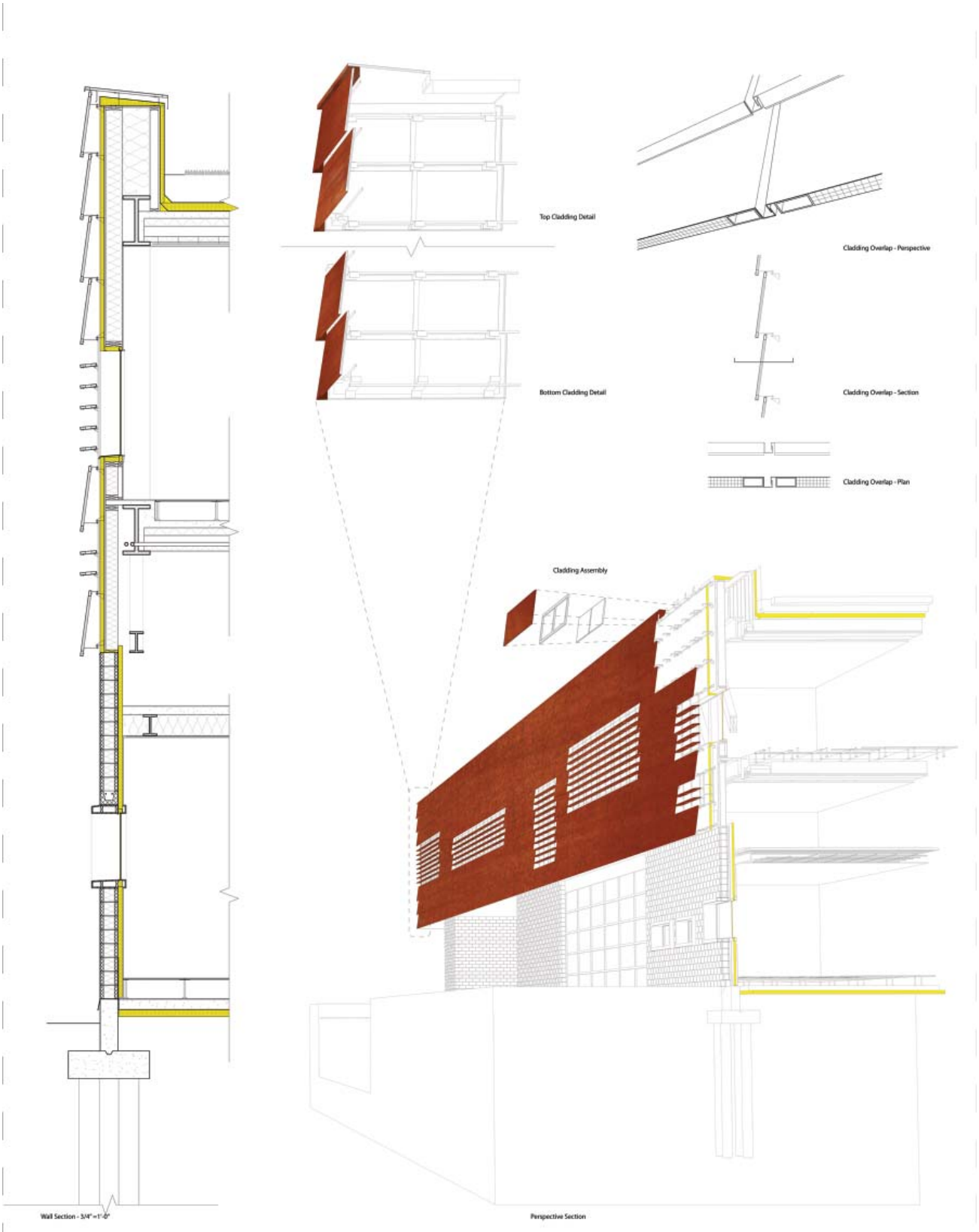
Likewise, however, it is equally possible to misappropriate instrumental, information-rich software. For example, in the case of computational fluid dynamic modeling—an increasingly frequent generator and optimizer of low-energy thermodynamic figures—Michelle Addington has demonstrated the flawed appropriations and abstractions of this modeling in architecture.[7] Her perpetually milieu-sensitive principle of operating at the scale of the active phenotype escapes some applications of computational fluid dynamics. This can incorrectly validate the behavior of the architectural organization, undermining the empathic impetus of the modeling. A question of actual behavior and scale—as much a question of time as space—now confronts architectural figuration. Similarly, models of 'integrated practice' or building information modeling (BIM) point towards integrated thermodynamic figures but remain constrained by interoperability problems of reconciling disparate and incomplete datasets, proprietary modeling codes, and modeling ambitions with a single, interchangeable architectural model. In short, BIM's empathetic ambitions are often undermined by its techniques of abstraction. Finally, the preponderance of recent work in scripting seems to chronically miss the epigenetic potential inherent in the technique, favoring the visual composition of the object.

Within this context of representational subterfuges related to abstraction, amplified in the context of digital production and representation, it is critical that students learn to control the representational utility of abstraction. The following description is an approach building envelope durability exercises as taught in an Integrated Building Systems course that departs from these observations about the nature of abstraction in contemporary design production. In this curricular sequence, like Moussavi, the building envelope is viewed as a primary element in contemporary architecture. However, the course and exercises are focused on constructability, serviceability, and durability as the basis of visual appearance, rather then opposite approach taken by Moussavi. In what follows, I describe the sequence of exercises that aim to help students understand the subterfuges of representation and abstraction while advancing their understanding of contemporary building envelopes.

ABSTRACTION IN BUILDING ENVELOPE DURABILITY IN DESIGN AND BUILDING TECHNOLOGY CURRICULA

"We should try more to devise structures which can harbor the mechanical needs of rooms and spaces and require no covering. Ceilings with the structure furred in tend to erase the scale. The feeling that our present-day architecture needs embellishment stems in part from our tendency to fair joints out of existence—in other words, to conceal how parts are put together. If we were to train ourselves to draw as we build, from the bottom up, stopping our pencils at the joints of pouring or erecting, ornament would evolve out of our love for the perfection of construction and we would develop new methods of construction. It would follow that the pasting on of lighting and acoustical material, the burying of tortured unwanted ducts, conduits, and pipelines would become intolerable. How it was done, how it works, should filter through the entire process of building, to architect, engineer, builder, and craftsman in the trades.[8]

In this short text on "How to Develop New Methods of Construction," Kahn describes a productive form of abstraction: the rehearsal of construction through the abstraction of the drawing process, searching for strategic architectural potential within the context of actual construction and performance. This observation helps establish a critical distinction between the abstraction of physical processes, behaviors and properties inherent in material practices as one mode of abstraction and the abstraction of non-physical ideas, concepts, and intentions inherent in hermeneutic practices as another mode of drawing. Kahn prompts us to continuously toggle between the actual thing or process and the drawing at hand to develop a building. In other terms, Kahn suggests that we use the abstraction of drawing to be literal about construction. This quote is central to a series of exercises issued for an integrated building technology and design studio at Northeastern University. The exercises alternate between digital and manual media in order for stu-



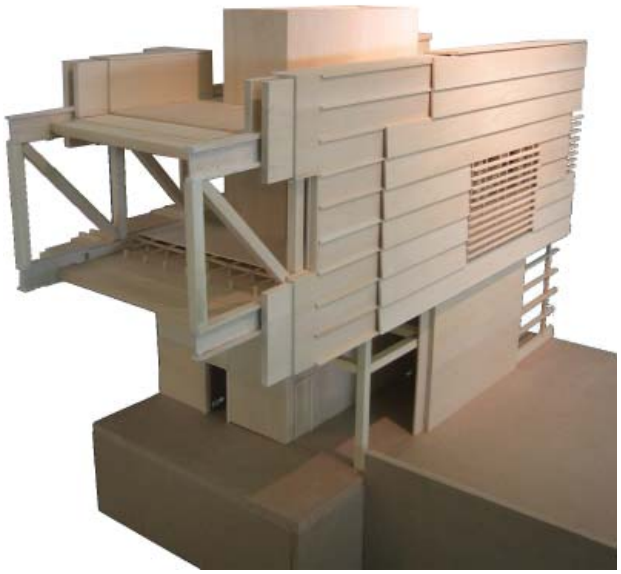
Detail Perspective

dents to learn how to swerve abstraction to be literal about construction and its effects.

The core of these exercises consists of a very detailed digital building envelope model—typically including a few bays of the building—that starts from a basic wall section. The initial two-dimensional CAD section is extruded, pushed and pulled in the digital model to arrive at a building envelope model that is articulated in such a way that also describes the sequence of envelope assembly. Here students encounter the many subterfuges of the wall section: the impossibility of its contained implications as the assembly switches materials or transitions from wall to window or turns a corner. As Stan Allen notes: "Projections are the architect's means to negotiate the gap between ideas and material: a series of evasions, subterfuges, and ruses through which the architect manages to transform reality by necessarily indirect means."[9] This building envelope model in turn serves as the basis of a large section perspective that is fabricated in such a way that the assembly of the building envelope and its completed façade effects are evident in the drawing. Next, the unit components of the building envelope (for instance a metal cladding panel or a panelized curtain wall unit) are then pulled out in perspectival space and towards the viewer. This provides an enlarged perspectival view of this fundamental unit and its details. Then, large, often full scale, details of that assembly are composed on the same digital drawing to demonstrate the unit's relation to the whole construction. Finally, other orthographic details are composed on the sheet as necessary for unusual conditions. The entire process proceeds though many iterations and through many types of software.

The centrality of an iterative process in this exercise is one of the drawing's most important and unchanging properties. In digital environments, however, students rarely engage a pithy iterative process. It is thus essential that students cycle through several software types as they proceed through the iterations. This imbues a sense of each software's utility but more importantly often reveals the ambiguities and falsehoods that each of the projections and softwares inherently contain. The cycling of three dimensional modeling of building envelopes and two dimensional wall sections forces students to imagine the three dimensional consequences of two dimensional projections. Similarly, the three dimensional modeling of the building envelope allows the students to study the non-standard conditions of the building envelope such as windows, doors, and corners in a rapid and more thorough manner than two dimensional studies allow. This is a key benefit of this process rarely available to hand mediums. The result is effectively a *digital analytique* in which section and detail information appear together at a range of scales. As Marco Frascari noted on the analytique, "in this graphic representation of a designed or surveyed building the details play the predominant role. They are composed in different scales in the attempt to single out the dialogue among the parts in the making of the text of the building."[10] This digital approach to the analytique has begun to yield some of the coherency inherent in a hand drawn analytique for the students.

Once the digital building envelope model is complete, students then build a ½" or larger physical building envelope model, a final rehearsal of the construction. Like the digital building envelope model, the models are fabricated in such a way that the assembly sequence is overtly expressed. The primary instruction for this final model is that a contractor should be able to build the entire building envelope based solely upon this model. "An architectural drawing is an assemblage of spatial and material notations that can be decoded, according to a series of shared conventions, in order to effect a transformation of reality at a distance from the author. The drawing as artifact is unimportant. It



is rather a set of instructions for realizing another artifact."[11] This becomes a design exercise in itself that teaches students to clearly articulate construction sequencing and assembly.

Students typically respond that they do not see buildings as they did before these building envelope exercises. They also comment that they fundamentally see the task of the architect in new ways as well after this series of exercises. The drawing is central to this transformation of the student's sensibility and students also respond that see the role of drawings quite differently as well. Other beneficial output engendered by the digital building envelope model included a series of sequence diagrams at both the building and building envelope scale that directly rehearse the sequence of construction, testing for constructability and serviceability. This further advances their understanding of the building as a series coordinated and integrated processes rather than merely the physical description of an object.

The most important advancement that students make in this series of exercises is that they begin to use the drawings and models as a rehearsal of the construction and performance of the building. In this way, abstraction is used to accelerate and anticipate the technical and formal life of architecture.

"Architecture itself is marked by this promiscuous mixture of the real and the abstract: at once a collection of activities characterized by a high degree of abstraction and at the same time directed toward the production of materials and products that are undeniably real…To understand representation as technique (in Foucault's broader sense of techne) is therefore to pay attention to the paradoxical character of a discipline that operates to organize and transform material reality, but must do so at a distance, and through highly abstract means."[12]

CONCLUSION

When abstraction remains an unquestioned assumption or is used to isolate design from the messy reality of building production, abstraction is a liability that obstructs sound buildings. However, when abstraction is used as the means to literal about the construction process and building envelopes, it sponsors more integrated, durable, and productive practices. It is thus critical to develop pedagogical structures that articulate the uses and abuses of abstraction in design and building technology courses.

ENDNOTES

1. Robin Evans. P. 160.

2. K. Michael Hays provides a thorough summation of the motives of this period of architectural production, followed by many relevant articles related to this point. K. Michael Hays Architecture since 1968. (Cambridge, MA: The MIT Press, 2000). p. x-xv.

3. Moussavi and Kubo, pg. 5

4. Ibid, pg. 9

5. Ibid, pg 45.

6. Robin Evans, Translations from Drawing to Building and Other Essays. The MIT Press, Cambridge, MA. 1997. p 160.

7. See Michelle Addington, "New Perspectives on Computational Fluid Dynamics Simulation" in, Advanced Building Simulation, A. Malkawi and G. Augenbroe, eds., (New York, Taylor & Francis Books Limited: SPON Press 2004). The history of these digitizing technologies in architecture and their antecedents suggest that new modeling and computational technologies alone do not guarantee novel forms of practice or new forms of practice. New computer technologies increasingly emphasize automation in the production of architecture: from design (scripting), analysis (computation fluid dynamics), and production (BIM and Digital fabrication). The history and effects of such automation is well documented. See Merrit Roe Smith, ed. Military Enterprise and Technological Change: Perspectives in the American Experience. (The MIT Press, Cambridge, MA, 1985). Retijles, J. Francis. Numerical Control: making a New Technology. (New York: Oxford University Press, 1991). David F. Noble, Forces of Production: A Social History of Industrial Automation. (New York, Knopf, 1984) and David F. Noble, American by Design. (Oxford, Oxford University Press, 1977).

8. Louis I Kahn, "How to Develop New Methods of Construction" Architectural Forum November 1954. p 157. reprinted in Louis I Kahn. Louis I. Kahn, Writings, Lectures, and Interviews. Edited by Alessandra Latour (New York: Rizzoli International Publications, Inc. 1991). This text originally appeared in Perspecta 2.

9. Stan Allen, "Practice versus Project" in Practice: Architecture Technique, and Representation. (Amsterdam: G + B Arts International, 2000). p. 2.

10. Marco Frascari. "The Tell-Tale Detail." Via 7 (1984), 22–37.

11. Allen. P 32

12. Allen. P. XXI.