

Precision in Architectural Production

PhD

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Abstract

In the professionalised context of contemporary architectural practice, precise communications are charged with the task of translating architectural intentions into a prosaic language to guarantee certainty in advance of construction. To do so, regulatory and advisory bodies advise the architectural profession that ‘the objective is certainty.’¹ Uncertainty is denied in a context which explicitly defines architectural quality as ‘fitness for purpose.’²

Theoretical critiques of a more architectural nature, meanwhile, employ a notably different language, applauding risk and deviation as central to definitions of architectural quality. Philosophers, sociologists and architectural theorists, critics and practitioners have critiqued the implications of a built environment constructed according to a framework of certainty, risk avoidance, and standardisation, refuting claims that communication is ever free from slippage of meaning, or that it ever it can, or should, be unambiguously precise when attempting to translate the richness of architectural intentions.

Through close readings of architectural documentations accompanying six architectural details constructed between 1856 and 2006, this thesis explores the desire for, and consequences of, precision in architectural production. From the author’s experience of a 2004 self-build residence in the Orkney Islands, to architectural critiques of mortar joints at Sigurd Lewerentz’s 1966 Church of St Peter’s, Klippan; from the critical rejection of the 1856 South Kensington Iron Museum, to Caruso St John Architects’ resistance to off-the-peg construction at their 2006 entrance addition to the same relocated structure in Bethnal Green; and from the precise deviation of a pressed steel window frame at Mies van der Rohe’s 1954 Commons Building at IIT, Chicago, to the precise control of a ‘crude’ gypsum board ceiling at OMA’s 2003 adjoining McCormick Tribune Campus Centre, this thesis explores means by which precision in architectural production is historically and critically defined, applied, pursued and challenged in pursuit of the rich ambiguities of architectural quality.

¹ Francis Hall, ‘Specifying for quality’, *The Architects’ Journal*, 199, 23, (8 June 1994) p.38.

² *British Standards Institute British Standards BS 4778-2:1991, Quality vocabulary - Part 2: Quality concepts and related definitions* (London: British Standards Institute, 1991), p.3.

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List of Abbreviations

American Institute of Architects (AIA).

Building Information Modelling (BIM).

British Standards Institute (BSI).

Computer Aided Drafting (CAD).

Computer Numerically Controlled (CNC).

The Edward Duckett collection, Art Institute of Chicago (Duckett Collection).

Friedman, Alschuler & Sincere (FAS).

Holabird & Root (H&R).

Illinois Institute of Technology (IIT).

McCormick Tribune Campus Centre (MTCC).

Mies van der Rohe Archive, Museum of Modern Art, New York (MoMA).

Papers of Mies van der Rohe, Collections of the Manuscript Division, Library of Congress, Washington, D.C (Library of Congress).

Office for Metropolitan Architecture (OMA).

Royal Institute of British Architects (RIBA).

University Archives and Special Collections, Illinois Institute of Technology, Galvin Library (University Archives, IIT).

Victoria and Albert Museum (V&A).

Victoria and Albert Museum of Childhood, Bethnal Green, London (Museum of Childhood).

1. Introduction: precision and the pursuit of certainty



Fig. 1.1 - Mortar joints at St Peter's, Klippan.

1.1 Aims

This research examines definitions, uses and abuses of precision in architectural production. Rather than constructed geometrical perfection, precision is specifically examined here in terms of the communication of architectural intentions between those who design and those who construct. Through historical and contemporary idealizations of exact alignments between intent, specification and constructed result, this thesis considers the context of professionalized architectural practice in which communications - drawings, sketches, models, specifications, letters, faxes, meeting minutes, memos and emails - are charged with the task of translating the rich ambiguities of architectural intentions into unambiguous instructions.

Despite explicit recommendations from regulatory and advisory bodies that only unambiguous instructions can guarantee certainty, and, by extension, a predictable quality, the ability of even the most precise instructions to unambiguously communicate architectural intentions has long been under debate. Even allowing for the ever-increasing growth of architectural instructions, particularly in the last century, achieving precise translations between architectural intent and constructed reality remains elusive. The ongoing desire to guarantee certainty in advance of construction, despite the inevitability of deviation from even the most precise of instructions, raises questions as to whether certainty can ever be achieved, and more urgently, whether it should. Alternative viewpoints frame deviation in architectural production not as only inevitable, but as productive.

Following two introductory narratives, this thesis closely reads construction documents accompanying four projects constructed between 1856 and 2006 in the UK and the USA, framing each within its cultural context as well as within broader historical and theoretical approaches to precision in architectural production. Each close reading aims to demonstrate that, first, no matter how precise the instructions, deviations between intent, specification, and constructed result were inevitable; and, second, that deviations invoked extraordinarily precise care from all involved. This research considers whether architectural quality as normally defined by architects – an extraordinary quality, in lieu of ‘fitness-for-purpose’¹ - may emerge not from certainty, but from the productive uncertainties of deviation.

¹ British Standards Institute *British Standards BS 4778-2:1991, Quality vocabulary - Part 2: Quality concepts and related definitions* (London: British Standards Institute, 1991), p.3. This definition will be explored in detail in Chapter 3.

1.2 Method: reading the documents of architectural production

The methodological approach of this thesis is derived from historical and contemporary theoretical writings which critically interpret the cultural context of architectural drawings, models, written specifications, practice manuals, industry publications, building standards, and legal guidance. As Matthew Cohen described:

Architectural historians who bring to their research an appreciation of the variable quality of architectural production, and who use the full range of observation-based and documentary research tools available to them in order to explore it, stand to broaden the discipline of architectural history.²

Here, Cohen accounts for the 'hybrid methodology' which framed his detailed study of Brunelleschi's St Lorenzo as positioned between archaeology, art history, and the practice of architecture. Precedents for analysing the documents of architectural production and their implications for architectural quality, such as Marco Frascari's 'The Tell the Tale Detail'³ and Dalibor Vesely's *Architecture in an Age of Divided Representation*,⁴ are evident throughout contemporary architectural theory. The precedents referenced here draw together methodologies from architectural history, architectural theory, construction history, observational analysis, data analysis, and social sciences, focusing specifically on what ethnographer Albena Yaneva referred to as the 'banality' of the concrete details of architectural practice. Introducing her observations of daily practice at the Office for Metropolitan Architecture (OMA), Yaneva wrote:

That a contemporary architect is not reducible to his autographic oeuvre is nothing that would surprise designers. Much less would the reader be amazed by a definition of architecture as a co-operative activity of architects and support personnel alike, humans and models, paints and pixels, material samples and plans, all of which would constitute the design world. Yet, such realistic accounts of contemporary architectural practices are still missing.⁵

² Matthew Cohen, 'Ugly Little Angels: Deliberately Uneven Construction Quality in the Basilica of San Lorenzo in Florence', *Architectural Research Quarterly*, 11 (2007), 276-80 (p.287).

³ Marco Frascari, 'The Tell-the-Tale detail' in *Theorizing a New Agenda for Architecture: an anthology of architectural theory 1965-1995*, ed. by Kate Nesbitt (New York: Princeton Architectural Press, 1996), 500-514.

⁴ Dalibor Vesely, *Architecture in the Age of Divided Representation: The Question of Creativity in the Shadow of Production* (Cambridge, Mass: London, England: The MIT Press, 2004).

⁵ For Albena Yaneva's *Made by the Office for Metropolitan Architecture*, Yaneva embedded herself in the offices of OMA Rotterdam over a two-year period, studying the

'Nobody ever does it', Koolhaas responded to Masao Miyoshi's desire that 'architects would write more about their practice.'⁶ The mundane everyday documentation of architectural practice offers rich potential for interpretation, and cannot be separated from theoretical discourses of architecture. In *The Details of Modern Architecture*, Edward Ford described the impossibility of separating discussions of architectural detailing, aesthetics, and history.⁷ Katie Lloyd Thomas's analysis of written specifications offered a 'deconstructive tactic' to bring to the fore that which normally 'remains out of sight in architectural discourse.'⁸ David Leatherbarrow's *Uncommon Ground* applied architectural history methodologies to a critical review of the implications of pre-assembled construction components.

'A gap opens up between the architecture as described in the official histories, and the architecture whose story is rarely told',⁹ Jeremy Till observed in *Architecture Depends*, arguing for the role of consideration of forces of the real and the everyday in critiquing 'great' architecture, and Paul Emmons's critical review of *Architectural Graphic Standards* refuted claims that any document of architectural production may be treated as benign or neutral, demonstrating that even the most apparently neutral of documents reveal cultural associations and inherent ambiguities.¹⁰ 'Most of us have examined contracts and specifications to learn about the character of buildings themselves', Catherine W. Bishir observed in her analysis of eighteenth century USA specifications in 'Good and Sufficient Language for Building': 'we can also look at such documents as a genre whose patterns of expression suggest the thought processes behind them.'¹¹ Adrian Forty's *Words and Buildings* brought to

daily processes of design as an ethnographer. 'It is an attempt to track architectural invention, which is usually considered to be abstract, via the concrete details of the architectural practice,' Alben Yaneva, *Made by the Office for Metropolitan Architecture: An Ethnography of Design* (Rotterdam: 010 Publishers, 2009), p.12.

⁶ Koolhaas cited the inclusion of graphs describing the economy of the office in *S,M,L,XL*, suggesting that such truths of architectural production are not considered permissible. Rem Koolhaas and Masao Miyoshi 'XL in Asia: A Dialogue between Rem Koolhaas and Masao Miyoshi', *Boundary*, 24: 2 (Summer, 1997), 1-19 (p.15).

⁷ Edward Ford, *The Details of Modern Architecture* (Cambridge, Mass; London: MIT Press, 1990), p.vii.

⁸ '[O]utside the literature of professional practice, almost nothing has been said about that other crucial description of the building- the specification.' Katie Lloyd Thomas, 'Specifications: Writing Materials in Architecture and Philosophy', *Arq: Architectural Research Quarterly*, 8 (2004), 277-83 (p.277).

⁹ Jeremy Till, *Architecture Depends* (Cambridge, Mass: MIT Press, c2009), p.19.

¹⁰ Paul Emmons, 'Diagrammatic Practices: The Office of Frederick L. Ackerman and Architectural Graphic Standards', *Journal of the Society of Architectural Historians*, 64 (2005), 4-21.

¹¹ Catherine W. Bishir, 'Good and Sufficient Language for Building', in *Perspectives in Vernacular Architecture, IV*, ed. by Thomas Carter and Bernard L. Herman (Columbia: University of Missouri Press, 1991), 44-52 (p.44).

the fore the significance of language in architectural production, examining the ‘flux between words and meanings’ in architectural discourse.¹² Finally, writing of architectural drawings and contract documents, Adam Sharr observed in *Reading Architecture and Culture* that:

[t]he gaps between their abstract conventions and people’s sensuous appreciation of the material world can yield important insights into the professionalised cultures of architects and others in the construction industry. It is important to appreciate the ideologies contained in, and around, the professional habits of building description, and the traces that they leave to be read in built form.¹³

The authors discussed here highlight the significance of closely reading the full range of written and drawn documents of architectural production, and offer methodologies to critically analyse the often overlooked impact of these documents upon the quality of the resultant built environment. These methodologies are then applied to six constructed projects.

Selecting six constructed architectural projects

This thesis presents two introductory narratives and four close readings of the documents which accompany the production of selected architectural projects. The introductory narratives set out the theoretical framework of the thesis;

- Wheelingstone: a design and self-build by a team of three including the author, constructed between 2004-2006 in the Orkney Islands, UK;
- Sigurd Lewerentz’s Church of St Peter’s in Klippan, Sweden, completed between 1962-1966;

Four close readings in two pairings then closely examine the questions raised by the introductory narratives;

- The 1856 Iron Museum of South Kensington, London, UK, paired with;
- Caruso St John’s 2006 entrance addition to the relocated Iron Museum, now forming the Victoria and Albert (V&A) Museum of Childhood, Bethnal Green, London, UK;

¹² Adrian Forty, *Words and Buildings: A Vocabulary of Modern Architecture* (New York: Thames & Hudson, 2000), p.14.

¹³ Adam Sharr, ‘Introduction: a case for close reading’ in *Reading Architecture and Culture: Researching Buildings, Spaces and Documents*, ed. by Adam Sharr (Abingdon, Oxon: Routledge, 2012), pp. 2-12 (p.3).

- Mies van der Rohe's 1953 Commons Building, Illinois Institute of Technology (IIT) Chicago, USA, paired with;
- The Office for Metropolitan Architecture (OMA)'s 2003 McCormick Tribune Campus Centre (MTCC), which now wraps Mies's Commons.

Focusing on the use and meaning of precision within architectural production, this thesis does not aim to offer a critical architectural opinion of the architectural qualities of each project. Instead, the research analyses the processes through which architectural intentions were translated, communicated and constructed and considers the implications of these processes in light of explicit demands for precision in architectural production. The selected projects embody key changes which have taken place in drawn and written communications over the last one hundred and fifty years, and were selected with the following considerations:

- The two introductory narratives and four close readings are interpreted as offering explicit ideological approaches to precision in architectural detailing;
- The projects were constructed between 1856 and 2006, a period reviewed here as central to the implementation of explicit desires for precision in architectural production;
- Each of the selected projects were personally significant in shaping my ongoing education as a practicing architect in Chicago, London, and Orkney.

Designing and self-building Wheelingstone raised questions for me regarding the relationship between rationalised predictions and the desire to work intuitively on-site. During this time, my first visit to St Peter's [Fig. 1.1] further challenged demands for predictive certainty as a guarantor of quality which I was wrestling with in my role in a large architectural practice. The decision to explore these through a PhD returned me to architectural projects which had, for me, notably embodied ideas of precision, standardisation and deviation. Individual narratives emerged from the idiosyncrasies of each project. One line in a specification for the Iron Museum, a sentence in an email for the Museum of Childhood; an aim stated by Mies in the 1920s; a chance conversation with the project architect regarding the IIT ceiling at the MTCC: each detail, as Frascari observed,¹⁴ told its own tale, narrating the architectural culture from which it emerged.

¹⁴ Marco Frascari, 'The Tell-the-Tale detail' in *Theorizing a New Agenda for Architecture: an anthology of architectural theory 1965-1995*, ed. by Kate Nesbitt (New York: Princeton Architectural Press, 1996), 500-514.

Primary sources

As a unique narrative emerged from each project, the methodology of reading the documentation for each project adapts according to the type, quantity, and availability of documents. As Ford noted:

far too much of the documentation, not to mention the fabric, of modern architecture has disappeared. A depressing number of the major buildings of the last hundred years survive only in fuzzy photographs: the buildings, the working drawings, and the specifications all have been discarded.¹⁵

The documentation studied includes a mixture of original project documentation, including drawings, sketches, models, written specifications, design statements, letters, faxes, emails, meeting minutes and office memos. The existence, format and preservation of such documentation varies widely, dependent on the historical period; the prevalence or use of written or drawn documentation; whether documentation had been archived in institutions, in office or in personal files; and to what degree the full range of documentation had been preserved and/or organised in an accessible manner.¹⁶ The fact that the documents were sometimes un-ordered and not available in public archives highlighted the methodological challenges of accessing the prosaic documents of everyday architectural practice, not often considered to be central to architectural theory, nor systematically archived for public collections. Each detail thus adopts an adjusted methodology according to the existence and accessibility of documentation, as described below:

- Material for the introductory case studies on Wheelingstone was from personal archives and memories, as the author was architect and builder;
- Original documentation for Sigurd Lewerentz' St Peter's was accessed from online photographic archives at <http://digitaltmuseum.se> and via correspondence with the Arkitektur-och designcentrum, Stockholm;
- Original documentation for the 1856 Iron Museum was viewed in archival storage at the Museum of Childhood, the V&A's Blythe House and the V&A Drawings Collections;

¹⁵ Ford, p.vii.

¹⁶ As an example, Beatrice Colomina, in interview with Koolhaas, noted that OMA office archives are 'incredibly chaotic' and that the work is also not public, to which Koolhaas confirmed OMA's rejection of an attempt by Aaron Betsky to set up an institute of OMA archives, noting, 'For me it would be a very heavy burden, the entombment of our thinking. We said no to the whole idea.' Beatrice Colomina, 'Rem Koolhaas in conversation with Beatriz Colomina' in 'oma/ rem Koolhaas 1996 2007' *El Croquis* 134/135 (2007), p. 351.

- Original documentation for the 2006 Museum of Childhood was accessed directly from Caruso St John Architects and Stone Restoration Services, and interviews carried out with Peter St John (Caruso St John Architects), David Kohn (David Kohn Architects, formerly Caruso St John Architects), Grant Turner (Stone Restoration Services), and Kevin Bain (Wallis Construction);
- Original documentation for the Commons was accessed from the University Archives and Special Collections, Illinois Institute of Technology, Galvin Library (IIT); The Edward Duckett collection, Art Institute of Chicago (Duckett); Mies van der Rohe Archive, Museum of Modern Art, New York (MoMA); Library of Congress, Washington, D.C (Library of Congress); and an interview carried out with Kevin Harrington (Professor Emeritus of Architectural History, IIT);
- Original documentation for the MTCC was provided directly by Greg Grunloh, (Project Architect, Architect of Record Holabird & Root), and Mark Schendel, (Construction Administrator, Studio Gang), with excerpts published with permissions from H&R, Studio Gang, and OMA. Neither OMA Rotterdam or OMA New York reported access to archived records of project correspondence for the MTCC.

All original documents cited in this thesis as correspondence to or from architectural practices still in existence - Caruso St John Architects, Holabird & Root, Studio Gang, and OMA - were obtained directly from the project architects or directors. Interviews for projects where the architectural practices are still in existence - The Museum of Childhood and the MTCC - focused on the experiences of those design team members who led in the daily operations of translating the project from concept through to construction. In all cases, with the exception of introductory location plans, the architectural practices' original drawings, sketches and site photographs obtained from the practices or archives are illustrated and analysed.

The analysis of original documentation is supported by reception histories, architectural reviews, published writings and speeches by the architects, architectural theories relating to the specific architects and projects and by academic, professional or statutory literature relevant to each of the details studied. The research employed a particular focus on critically analysing the language used in practice manuals, journals and newspaper reviews as an insight into the assumptions and beliefs which framed definitions of quality in architectural production particular to the time period of each project.

1.3 Structure

The thesis is structured in three parts. Part A presents two opening narratives of personal encounters which first raised questions for me regarding the desire for, or refusal of, precision and ambiguity in architectural practice. To set out the historical and theoretical context for these questions, Part B offers an analysis of varied definitions and critiques of precision in an etymological and literary context, and considers how the term 'precision' is specifically defined and applied within theories and histories of architectural production. Part C applies these discussions to four close readings of architectural details in the UK and USA constructed between 1856 and 2006. Each part is structured as follows:

PART A: PERSONAL ENCOUNTERS WITH PRECISION

Ch.2 Promises of precise control at Wheelingstone

Wheelingstone, the first of two opening narratives, is a private residence designed and constructed by the author in the Orkney Islands between 2004 and 2006. The tensions which emerged between an architectural intent and the constructed realities of a self-built flagstone wall challenged, for me, claims within the profession that precise communications can, or should, guarantee certainty in advance of construction.

Ch.3 The precise control of 'crude' joints at St Peter's

While Wheelingstone was under construction in Orkney, I visited Sigurd Lewerentz's St Peter's Church in Klippan, Sweden. This encounter led me to question the underlying premises of professionalised expectations that architectural practice must definitively quantify architectural quality well in advance of construction, refusing all deviation, risk, or uncertainty. This second introductory study explores, through the mortar joints of St Peter's, two contrasting languages which frame contemporary architectural practice, considering what Vesely terms 'divided representation.'¹⁷ Critiques by architectural writers which applaud St Peter's for deviating from normative construction practice are considered alongside recommendations set out by

¹⁷ This term is defined in Dalibor Vesely, *Architecture in the Age of Divided Representation: The Question of Creativity in the Shadow of Production* (Cambridge, Mass: MIT Press, 2004).

architectural journals, practice manuals and British Standards which explicitly deny the risk, deviation and ambiguities applauded at St Peter's.

PART B: INTERPRETATIONS AND USES OF PRECISION

The studies in Part A challenge expectations of precision as guaranteeing certainty, and begin to question the consequences of denying ambiguity. To explore the foundations of such expectations, Part B considers the etymological, philosophical, and historical foundations of these terms, and their historical applications within architectural practice.

Ch.4 Defining precision

This chapter explores varied definitions and applications of precision. After considering historical and contemporary thesaurus and dictionary definitions, a critical review follows of writings by Roland Barthes, Raymond Williams, William Empson, Mary Douglas, Isaiah Berlin, Maurice Merleau-Ponty, Pierre Bourdieu and Italo Calvino, each of whom address, challenge, refute or confirm claims that poetic ideas can or should be precisely conveyed or analysed.

Ch.5 Interpreting precision in architectural production

The varying definitions and critiques introduced in Chapter 4 are then applied to architectural production through a critical reading of the term 'precision' in UK and USA based practice manuals and journals. Recommendations and guidance to architectural practitioners offered in advisory and statutory publications in the later twentieth and early twentieth century are compared against theoretical writings on the processes of architectural practice in the same period,¹⁸ including writings by Dalibor Vesely, Alberto Pérez-Gómez and Louise Pelletier, Juhani Pallasmaa, Manfredo Tafuri, Jeremy Till, Jonathan Hill, Francesca Hughes, Edward Ford, Marco Frascari, Michael Cadwell, Nader Tehrani, David Leatherbarrow, Paul Emmons, Katie Lloyd Thomas, Katherine Shonfield, Richard Sennett and David Pye, as well as other writings on processes of architectural production, the emergence of professional expertise and the architectural profession and the sociology of the construction site. The

¹⁸ The writings reviewed are approximate to the time periods of the projects studied, namely 1856-2006.

fetishization of precision by architectural practice, the dependencies of architects upon others, the implications of instrumental language and the consequences of a built world denied of ambiguity are considered alongside proposals for the acceptance and celebration of unpredictability, uncertainty, and ambiguity as inevitable characteristics of architectural production, next explored in a historical overview of architectural production.

Ch. 6 Precision in the histories of architectural production

From Greek *syggrafē*, mediaeval concepts of the impossibility of geometric perfection, and the emergence of the drawing as a generative, rather than investigative, instrument in the late Renaissance, changing definitions of precision in the processes of architectural practice are considered prior to and following the explicit definition of scientific method in the seventeenth century. This chronological review of historical and contemporary literature then sets the scene for the projects studied in Part C, focusing on the ways in which desires for precision in architectural production shaped the development of the architectural professions in nineteenth and twentieth century UK and USA.

PART C: FOUR CLOSE READINGS OF PRECISION

In Part C, forming the body of the thesis, four key close readings of architectural projects or details are presented as two pairings. The 1856 South Kensington Iron Museum is considered alongside Caruso St John Architects' 2006 entrance addition to the same, relocated, structure; and Mies van der Rohe's 1953 IIT Commons Building is reviewed with OMA's adjoining 2003 McCormick Tribune Campus Centre. Spanning 150 years and two continents, these four works embody key debates in nineteenth, twentieth and twenty-first century UK and USA regarding the pursuit of precision in architectural production.

Ch.7 A precise specification for the 1856 Iron Museum

The construction of the 1856 Iron Museum in South Kensington, London, as the first, albeit temporary, extension to Brompton Park House, later renamed the V&A, was widely criticised by the architectural press and public alike. The contemporaneous journal *The Builder* proposed that its 'unmitigated' ugliness resulted from the omission of architectural design processes, captured by a one page specification which reduced architectural input to an

optional decorative façade. The 1856 Iron Museum, and its precursor, the 1851 Crystal Palace, manifested contemporary debates over the impacts of new construction materials and methods, changing contractual arrangements between architects and builders, and emerging demands for precise specifications. The relocation of the Iron Museum to form the V&A Museum of Childhood provides the starting point for the second case study, Caruso St John Architects' 2006 entrance addition to the same structure.

Ch.8 Anticipating precision at the Museum of Childhood.

Assertions by the architectural profession in the nineteenth century that precise communications could guarantee certainty and, by extension, control quality, are tested in this chapter through the examination of one detail - a 6mm mastic movement joint on the façade of Caruso St John Architects' 2006 entrance addition to the V&A Museum of Childhood in Bethnal Green. Caruso St John's addition predicted the use of prefabricated computer aided cut panels to permit complex yet economic decoration. Rigorously precise specifications and drawings set out expectations for exceptionally tight joints, formally permitting no deviation. The physical deviation of the constructed result from precise specifications was, however, anticipated in a process which employed precision to pursue shared understandings of quality. The critiques of standardised design and construction at the Iron Museum, and Caruso St John Architects' critical resistance to 'off-the-peg' construction are reviewed in this pairing as revealing the limits of the precise specification.

Ch.9 The precise control of deviation at the Commons

Two contrasting ideologies of detailing meet at IIT, Chicago, where OMA's 2003 MTCC adjoins Mies's 1953 Commons Building. Mies's objective of elevating industrial methods to the level of mediaeval craftsmanship is considered through original project documentation accompanying the design and construction of pressed steel windows at the Commons. As the sixteenth building to begin construction on the IIT campus, the Commons could be expected to manifest the perfection of a systematic approach developed over the course of a decade at IIT. Project documentation highlights deviations from typical construction practices in the form of unique adaptations and ambiguous constructions, reviewed here as emerging from the prioritization of precise architectural intentions over industrial methods.

Ch.10 A precisely crude ceiling at the MTCC

This final study examines project specifications for an exposed gypsum greenboard ceiling at OMA's MTCC. In contrast to Rem Koolhaas' writings on the absolute absence of detail in contemporary architectural practice and critiques of OMA's work as 'crude', this detail is demonstrated to have been specified with extraordinary precision. Negotiating organisational and contractual risks and uncertainties in deviating from standard manufacturers' recommendations, both Mies's Commons and the MTCC demonstrate the procedural challenges of accepting and celebrating uncertainty and ambiguity within even the most precisely defined processes.

Ch. 11 CONCLUSION: Productive deviations from certainty

Each architectural work examined in this thesis is read through the lens of expectations commonly attributed to precise communications in architectural practice. The thesis argues that, no matter how precise communications may be in advance of construction, no matter how systematised the approach, no matter whether precision is explicitly sought or rejected in pursuit of quality, exact compliance with even the most precise of architectural communications is first shown to be unattainable, and secondly is proposed as being insufficient in the pursuit of an architectural quality which exceeds minimal definitions of 'fitness-for-purpose.'¹⁹ The specific architectural qualities of each of the case studies were pursued most notably through deviations from the certainties of standardised practices. The ambiguities and unpredictability of deviations are shown by each of the case studies to be not only inevitable but critical in pursuing architectural quality.

¹⁹ BS 4778-2:1991, *Quality vocabulary*, p.3.

PART A: PERSONAL ENCOUNTERS WITH PRECISION



Fig. 2.1 - Constructing Wheelingstone.

Part A: Opening

The opening part of this thesis begins with two narratives. Both describe personal encounters with precision: the self-building of a flagstone-clad residence in the Orkney Islands, and a visit to witness the precisely controlled rough mortar joints at Sigurd Lewerentz's Church of St Peter's in Klippan, Sweden.

At Wheelingstone, the processes of converting an architectural concept to constructed reality demonstrated the complexities of predicting all aspects of a project in advance of construction, even on a small, seemingly simple, building for which I was architect, client, and builder [Fig. 2.1]. Discrepancies between precise prediction and constructed reality resulted in a physically and conceptually ambiguous flagstone wall. This wall embodied a simultaneous delight in, and aversion to, precision as a predictive tool, locating architectural quality between the promised certainties of precise predictions and the ambiguities of adaptation. The construction of Wheelingstone fundamentally challenged my interpretations of definitions of architectural quality as pursued within professional recommendations of certainty and the denial of ambiguity.

In the second chapter of Part A, definitions of architectural quality are further questioned in a comparison of published architectural narratives which applaud the ambiguity and risk achieved through the precise control of the mortar joints at St Peter's, and technical descriptions of recommended standards for mortar joints, which advocate the rejection of ambiguity and risk in lieu of precise control. Both studies begin to question assumptions that ever-increasing precision in architectural communications in advance of construction can or should act as a guarantor of architectural quality.

2. Promises of precise control at Wheelingstone



Fig. 2.2 - The wall as constructed: a flagstone, concrete block and timber frame wall at Wheelingstone.

2.1 Prediction and intuition

This thesis begins with an architectural project which captured, for me as an architect, the gap between the pleasure of precise predictions of architectural drawings developed in an architectural office, and an intuitive desire to act responsively to actualities of on-site construction. Wheelingstone was designed and constructed in the Orkney Islands as a one hundred and ninety-eight square metre self-build residence by myself and three partners¹ from 2003 to 2006.² Conceived as a timber frame insertion into an existing nineteenth century flagstone structure - as an unquestionably contemporary insertion into a historical ruin - the unanticipated demolition of the flagstone wall resulted in an unpredicted as-built detail of a salvaged flagstone cladding against 100mm concrete block, a cavity, and a timber frame.

Redundancy exists in this wall: either the flagstone skin, or the 100mm concrete block, can be dismissed as physically unnecessary in the wall's final form. As constructed, the wall is economically inefficient, conceptually questionable and ambiguous, being neither a solid wall construction, nor a timber frame cladding. This introductory narrative explores tensions which emerged in the production of this wall between conceptual intentions, precisely specified construction documents, the realities of construction and self-imposed guilt by an architect with a partly Miesian education. The chronological processes of the decision making for this wall are narrated through personal recollections, sketches, photographs and construction documents. The first exploration of detail in this thesis begins with the flagstone wall, as built [Fig. 2.2].

¹ The three partners were my husband, Kevin Hong, also an architect, a co-director in our practice Collaborative Design Studio; and my mother and father, respectively a teacher and marine biologist, who now reside in Wheelingstone.

² I was in architectural practice in Chicago, USA at the time design work began. Following an initial site visit to the Orkney Islands, off the north coast of Scotland, in 2003, early design proposals were exhibited as 'Progress and memory: interpretation of a longhouse' in *Speculative Chicago: a compendium of architectural innovation* (2003), and *Emerging Visions in Chicago Architecture*, Chicago Architecture Club, Chicago, Illinois (2004).

2. Promises of precise control at Wheelingstone

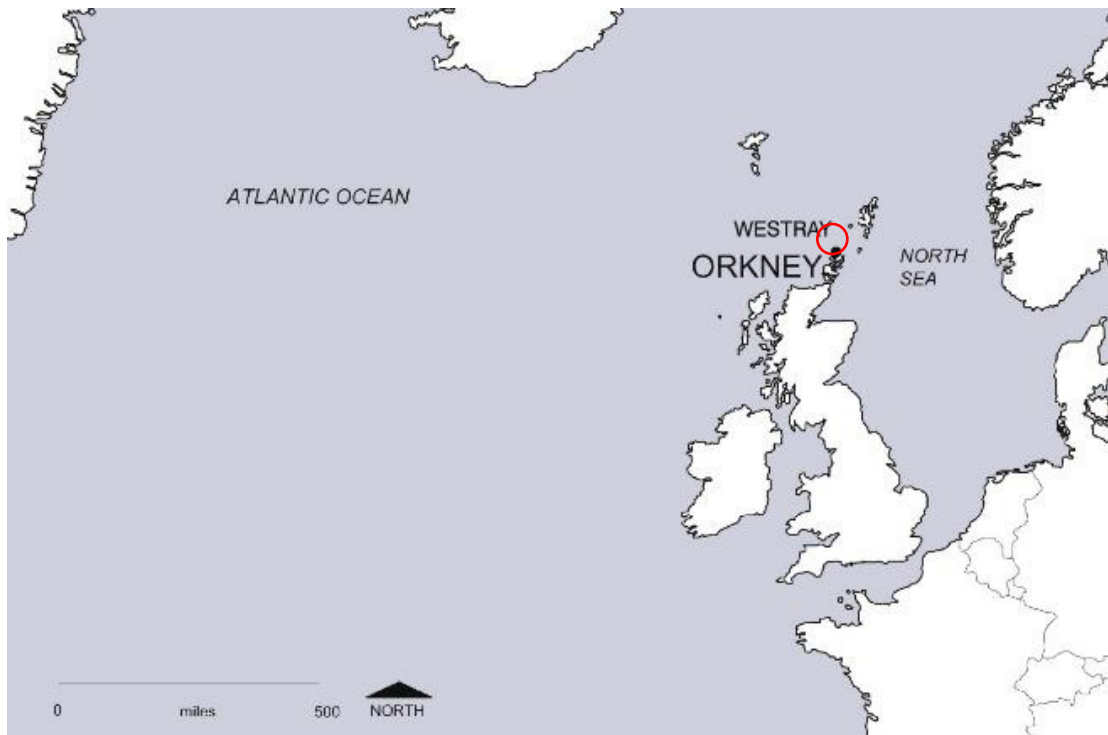


Fig. 2.3 - Location map of Westray, Orkney Islands.



Fig. 2.4 – The island of Westray, Orkney Islands, UK.

2. Promises of precise control at Wheelingstone



Fig. 2.5 - Location map of Wheelingstone, Westray, Orkney Islands.



Fig. 2.6 - Wheelingstone, as found, 2002.

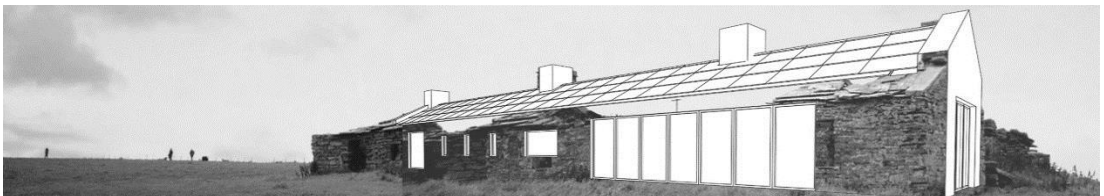


Fig. 2.7 - Wheelingstone, as proposed, 2003.

2.2 The flagstone wall, as built

The flagstone wall at Wheelingstone is 519.5mm thick, plus or minus, critically, the irregularities of reused flagstone. It consists of: 12.5mm plasterboard, a vapour barrier, 145mm timber studs, 150mm 'Rockwool' insulation, 12mm far eastern marine grade plywood, 'Tyvek' building membrane, a 50mm cavity, stainless steel wall ties, an unforeseen layer of 100mm concrete block, and a consequently pragmatically redundant skin of flagstone, varying in width from 200-300 mm, recycled from the 1840s longhouse upon whose footprint the project is constructed.³

This flagstone wall was the result of five years of planning, sketching, drawing, specifying, sourcing, and self-building, and more than a decade of architectural education and practice. With an aim of utilising standardised construction of off-the-shelf components for logistical and economic reasons, this small self-build project should have been straightforward to construct. The end result contains multiple adaptations, uncertainties and ambiguities, embodying a gap between the ideal and the actual, borne out of the pursuit of an architectural intent.⁴ The flagstone wall discussed in this introductory narrative negotiated ideals of retaining a flagstone wall laden with the weight of cultural, archaeological, geological, historical and personal expectations, and internalised ideologies borne from a professional architectural education. Designing and constructing Wheelingstone challenged, for me as an architect, the validity of professional recommendations that seek to define quality through certainty, in highlighting the intrinsic difficulties of predicting any project in advance of construction, and offering a definition of architectural quality attained through the uncertainties of deviation.

This small self-build construction emerged from an architectural intent to reconcile the cultural context of a nineteenth century Orkney Longhouse ruin⁵ with efficiencies

³ Katherine Shonfield highlights the complexities of technologies buried within contemporary cavity walls, as discussed in Ch. 5 of this thesis. Katherine Shonfield, 'Purity and Tolerance: How Building Construction Enacts Pollution Taboos', *AA Files* (1994), 34-40.

⁴ This will be linked to Dalibor Vesely's observations of the consequences of the gap between the 'best possible delineation of a project and the built result', and discussed more fully in Ch 5 of this thesis. Vesely, *Architecture in the Age of Divided Representation*, p.44.

⁵ The Orkney longhouse referred to here is a structure of flagstone walls and roofing, 78 x 15 feet, constructed in the 1850s according to Census reports. This type of construction, common throughout the Orkney Islands, is now largely uninhabited due to a decline in the population from a mid-nineteenth century peak, and demolition in favour of 20-21st century timber kit constructions. See Mhairi McVicar, 'Adaptation and continuity: mediating the regional and global in Orkney and Shetland', in *Regional Architecture and Identity in the Age of Globalisation*, 1 (CSAAR Centre for Studies of Architecture in the Arab Regions, 2007), 137-152.

promised by 21st century industrially produced standardised components. This was, for me and my husband - both architects with a decade of experience in architectural practice in the USA and UK, and my Miesian education in part at IIT⁶ - our first substantial experience in physical construction.⁷ A seemingly simple idea,⁸ envisioned in the abstract from an architectural office in Chicago following a first site visit, proposed retaining the ruins and neatly inserting a contemporary timber frame, a concept well enough established in the canon of architectural precedents.⁹ This simple idea was, of course, challenged by the actuality of an existing flagstone wall.

Wheelingstone, Westray, Orkney Islands

Wheelingstone is located on the island of Westray in Orkney, an archipelago of approximately seventy islands lying off the northern coast of Scotland [Figs. 2.3, 2.4]. Sitting in a one mile wide stretch of land which slopes gently from fifty metre high Atlantic cliffs in the west to a wide sandy bay in the east [Fig.2.5], the longhouse was a derelict ruin when we began designing [Fig. 2.6]. First appearing in an 1851 census survey,¹⁰ the long, low narrow seventy-eight by fifteen foot structure was laid

⁶ During a BSc in Architectural Studies at Scott Sutherland School of Architecture, Robert Gordon Institute of Technology, Aberdeen, UK, I spent a year on exchange at IIT, Chicago in 1991-92, followed by a year as an architectural intern in Chicago. Following my BSc, I completed my Masters in Architecture at IIT, remaining in Chicago until 2004 and qualifying as an Architect under the National Council of Architects Registration Board, USA, before working in architectural practice in London. My IIT education included traditional Miesian curriculum and new initiatives brought in by Dean Gene Summers, an ex-colleague of Mies.
⁷ That as architects we had little construction experience is not unusual: neither the UK nor USA require any on-site training prior to professional accreditation, although both countries require professional practice experience. See Mark Crinson and Jules Lubbock, *Architecture: Art or Profession?; Three Hundred Years of Architectural Education in Britain* (Manchester, UK; New York: Manchester University Press, c1994) for a discussion of historical debates over the relationship between the architect and the construction site, which will be discussed in Chapter 5 of this thesis. My father, a marine biologist, had more experience than either architect on site, having self-built several family home additions.

⁸ Adrian Forty describes the term 'simple' as 'one of the most overworked words in the architectural vocabulary', noting 'almost all modern architects [...] described their own work, or buildings they admired, in terms of simplicity'. Forty ascribes the 'only sense of 'simple particular to modernism' as linked to the 'rationalization of production', referencing Mies's discussions of Henry Ford, which will be discussed in Ch.9 of this thesis. Adrian Forty, *Words and Buildings: A Vocabulary of Modern Architecture* (New York: Thames & Hudson, 2000), pp.249-255.

⁹ Numerous precedents of precise interventions into historical structures exist, such as Carlo Scarpa's renovation of the Castelvecchio Museum, which Lucisco Magagnato describes as a 'linked sequence of precise, almost surgical operations' (Lucisco Magagnato, 'The Castelvecchio Museum' in Francesco Dal Co and Giuseppe Mazzario, *Carlo Scarpa: The complete works* (Milan; London: Electa /The Architectural press,1986), pp159-163 (p.159). More contemporaneous and local to my BSc education, Richard Murphy's interventions into the historical fabric of Edinburgh (Blytheman House, 1991; The Fruitmarket Gallery, 1993; Høgel House 1, 1995) drew inspiration from Scarpa's work. See *Richard Murphy Architects: Ten Years of Practice* (Edinburgh; The Fruitmarket Gallery, 2001).

¹⁰ Wheelingstone was named in the 1851 Census as inhabited by Thomas Cooper, 'farmer

out on an east-west axis in a climatically sensitive arrangement: the north side buried into the slight slope of the site, the western gable thickened against prevailing south-west Atlantic winds,¹¹ windows facing south, with Orkney flagstone comprising the primary building material throughout.

The Orkney landscape is notable for the abundance of exposed Caithness flagstone on the coastline. Formed as the bed of the ancient Lake Orcadie, laid down in mid Devonian times, the stone surfaces as horizontal layers, easily quarried and split as thin slabs for construction¹² [Figs. 2.8, 2.9]. Flagstone can be interpreted as geologically, historically, and poetically representative of Orkney. Neolithic flagstone dwellings, burial chambers and stone circles¹³ populate the islands; flagstone was carved by both Neolithic¹⁴ and Viking populations¹⁵ [Figs. 2.10, 2.11]. Twentieth century Orcadian poet George Mackay Brown's writings contained recurring themes of flagstone as protective, enduring, symbolic, linking the dialect of the islands to the act of constructing a stone wall as 'the slow laconic surging sentences, the few words considerately placed like stones on a dyke.'¹⁶ The geological, historical, archaeological and cultural significance, and the rich, rough tactility of the existing hand-laid wall underpinned our architectural intent to retain the wall.

Abandoned in the 1950s, the flagstone roof, when we began our project, had caved in; the exposed stone walls, bereft of supportive timber collar ties, had begun to lean, warning of instability, a condition which our proposals acknowledged by proposing large expanses of glass to replace areas of wall which we identified from an initial site visit as unstable. From our first visit, the retention of the existing flagstone walls and their attendant cultural significance captured our imagination as a compelling starting point for an architectural intent [Fig. 2.7].

of 6 acres', his wife, Eupheme, and two young children, Jeremiah and George.

¹¹ The design wind speed for the project was 126mph.

¹² Clive Auton, Terry Fletcher, and David Gould, *Orkney and Shetland: A Landscape Fashioned by Geology* (Edinburgh: Scottish Natural Heritage, 1996).

¹³ See Trevor Garnham, *Lines on the Landscape, Circles from the Sky: Monuments of Neolithic Orkney* (Stroud, Gloucestershire: Tempus Publishing Ltd, 2004); Alexander Fenton, *The Northern Isles: Orkney and Shetland* (Edinburgh: J. Donald, 1978); J. Gunn, *Orkney: The Magnetic North*. (Thomas Nelson and Sons, 1949).

¹⁴ The Westray Stone is a Neolithic carved stone discovered in a quarry excavation in Westray. See Naill M. Sharples, with contributions by, D A Birkett A Barlow, Ann Clarke, F MacCormick A S Clarke, M J Stenhouse, G Swinney, Caroline R Wickham-Jones and Clare H Yarrington, and illustrations by Marion O'Neil, 'Excavations at Pierowall Quarry, Westray, Orkney', *Proceedings of the Society of Antiquaries Scotland*, 114 (1984), 75-125.

¹⁵ Maes Howe is a Neolithic chambered tomb (2800BC) which was broken into by Norse peoples who carved runic descriptions into the walls. See Graham Ritchie and Anna Ritchie, *Scotland: Archaeology and Early History* (New York: Thames and Hudson, 1981).

¹⁶ George MacKay Brown, *An Orkney Tapestry* (London: Quartet Books, 1973), p.13.

2. Promises of precise control at Wheelingstone



Fig. 2.8 - Exposed flagstone on the north coast of Westray.



Fig. 2.9 - Collapsed flagstone roof slabs at Wheelingstone.



Fig. 2.10 - The Knap of Howar, approx. 3500BC, Papa Westray.



Fig. 2.11 - The Westray Stone.

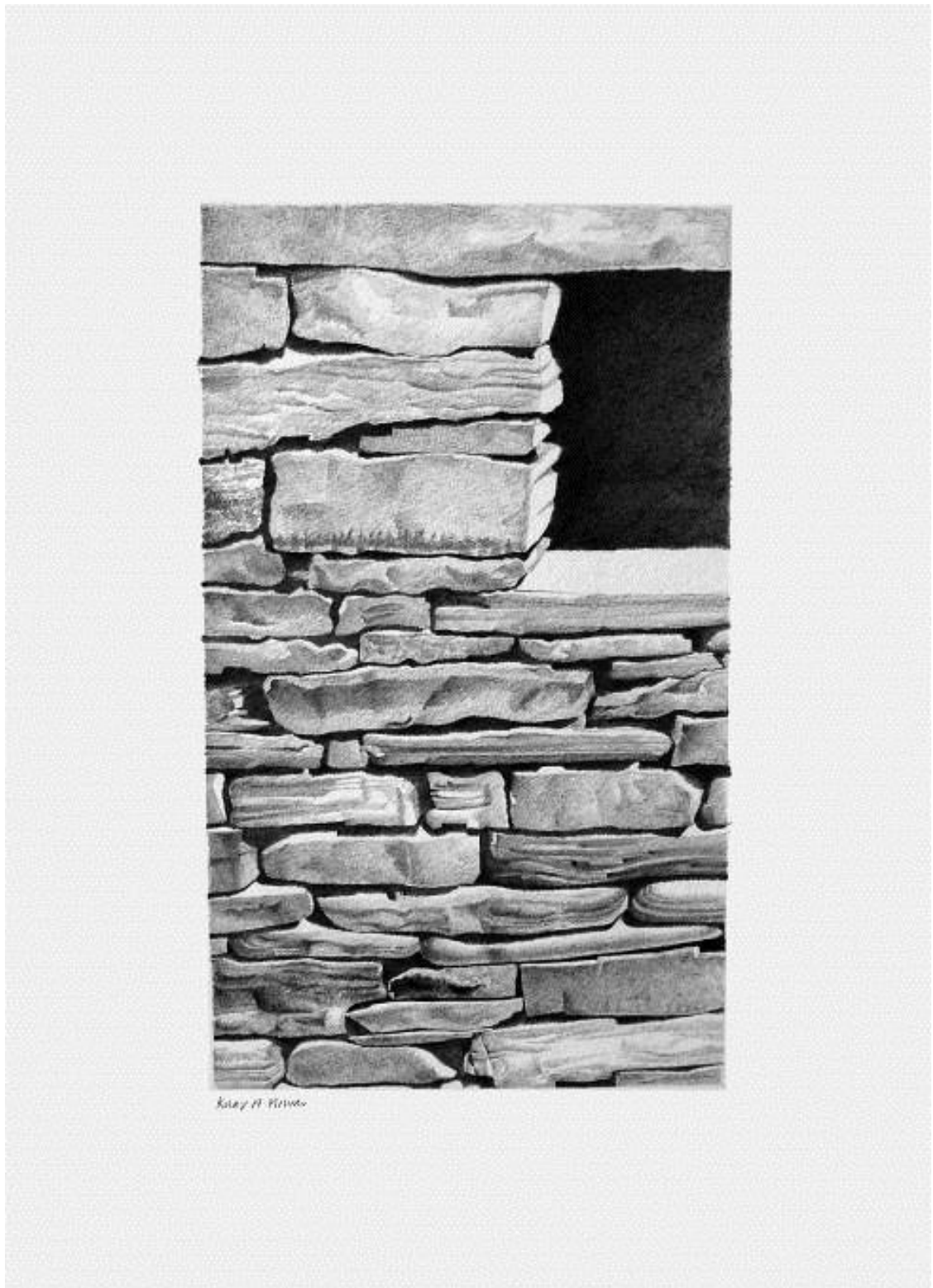


Fig. 2.12 – Pencil rendering of the flagstone wall of the Knap of Howar.

2. Promises of precise control at Wheelingstone

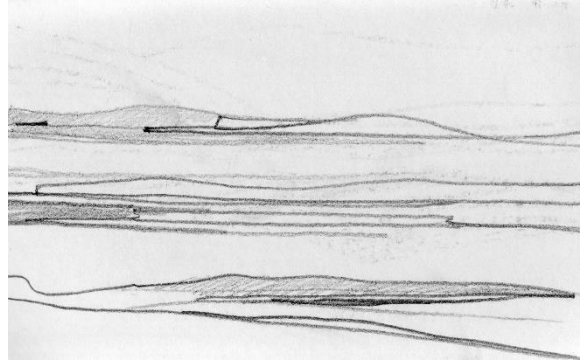


Fig. 2.13 - Sketches of views from Wheelingstone, 2003.

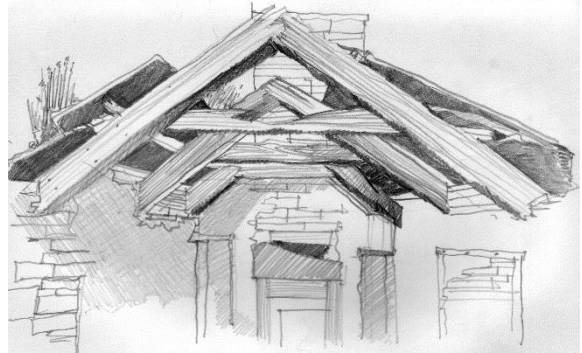
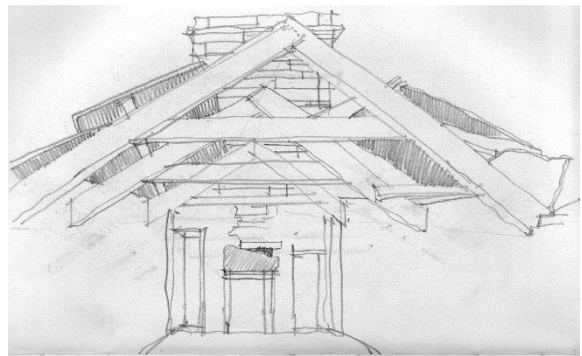


Fig. 2.14 - Sketches of Wheelingstone as found, 2003.



Fig. 2.15 – Sketch of Wheelingstone as found, 2003.

2. Promises of precise control at Wheelingstone

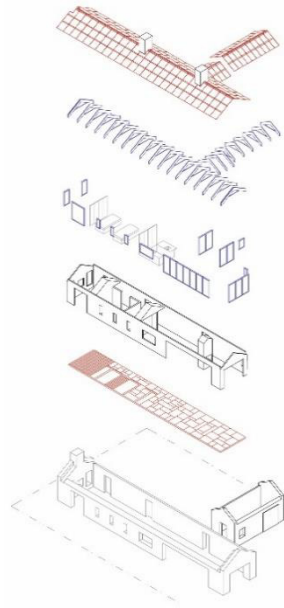


Fig. 2.16 - Wheelingstone: axonometric proposal for a timber frame insertion into the existing flagstone structure, 2003.

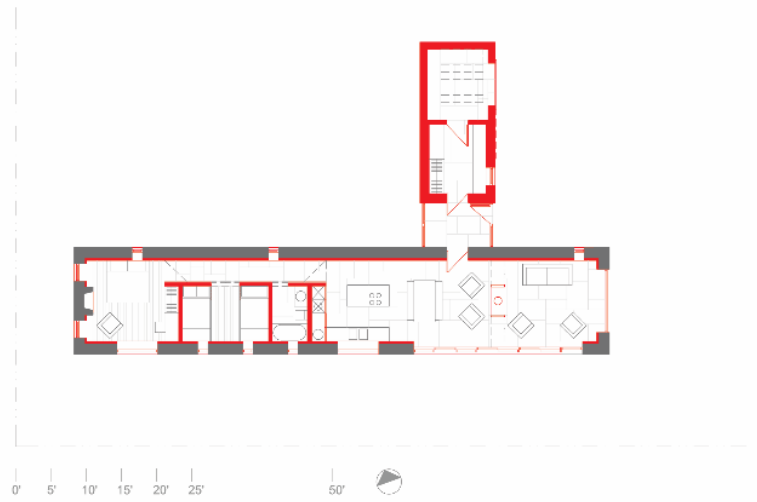


Fig. 2.17 - Wheelingstone: proposal for timber frame insertion into existing stone walls, plan, 2003.

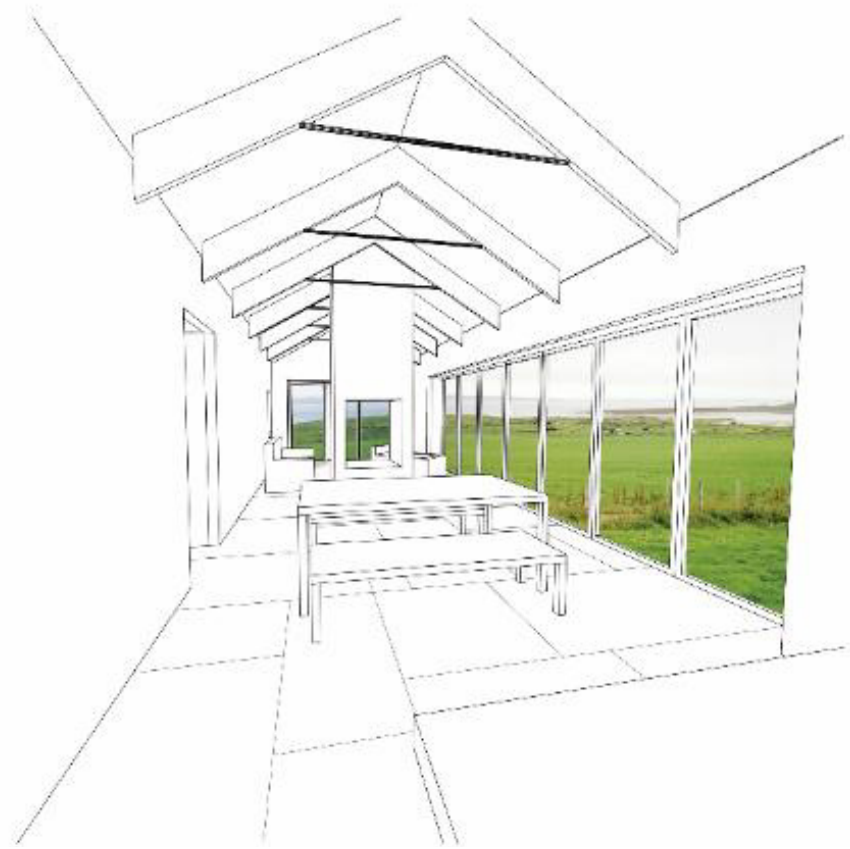


Fig. 2.18 - Wheelingstone: perspective rendering of first proposal, 2003.

2.3 Precisely defined intentions

We began by photographing, pacing, measuring, and sketching the site [Figs 2.12-2.15]. Hand-drawn sketches of landscape and ruins progressed into detailed AutoCad axonometrics, plans, and perspectives, communicating, from the outset, an architectural intention of a precisely controlled, modular, efficiently dimensioned timber frame inserted neatly into the existing stone wall, allowing for a presumed safe tolerance - approximately 100mm - from a comparatively unpredictable undulation of the existing stone. While retaining externally the existing flagstone, this construction strategy envisioned the economic and constructional efficiencies and predictability of standardised construction systems, promising a clean, controllable internal environment, one removed - physically and conceptually - from the roughness of the original construction¹⁷ [Figs 2.16 - 2.18].

The original flagstone walls at Wheelingstone were constructed as double wythes of horizontally layered flagstone with a clay filled cavity; a local construction system which had changed little for five thousand years. With once abundant labour to quarry and work the readily accessible stone, flagstone walls had once been, for the majority of Orcadians, the most available, buildable and economical system of construction. In the early 21st century, cheap and frequent shipping routes, regulations limiting the transport of explosives for quarrying stone, and labour costs of quarrying had superseded flagstone with prefabricated timber kit systems and concrete block as the most economic means of construction.¹⁸ Whilst timber kit houses may be challenged by residents, visitors and planning policies as 'alien' imports bearing little relation to the regional 'tradition' of the islands,¹⁹ the appeal of standardised kit homes is clear. Compared to longhouses - or to the cost of

¹⁷ In *Regional Architecture and Identity in the Age of Globalisation*, I discussed the history of the timber frame kit house in Orkney, noting that it can be traced back to the thirteenth century in the neighbouring Shetland Islands, where archaeologists Barbara E. Crawford and Beverley Ballin Smith's excavations of the farm of Biggings on the island of Papa Stour included the study of a *stofa*, a prefabricated timber structure imported from Norway, which used a massive stone wall – a *vernemur* - which protected the timber frame from wind, driven rain and salt spray. Derived from Norway and repeated in Shetland using locally available stone, the vernemur represented, to us, the exploitation of a progressive, global technology, individually adapted to specific site conditions through local skills and resources. See Barbara E. Crawford and Beverley Ballin Smith, *The Biggings Papa Stour Shetland: the history and archaeology of a royal Norwegian farm*, (Edinburgh: Society of Antiquaries of Scotland Monograph Series Number 15. 1999).

¹⁸ Nearby, the 3500BC Knap of Howar had been constructed with a double skin stone wall filled with midden – domestic waste such as shellfish fragments - as an early use of recycled insulation. See McVicar, 'Adaptation and continuity'.

¹⁹ See the Orkney Local Plan: Housing Policies, Orkney Islands Council, <http://www.orkney.gov.uk/media/Chapter_3_-_Housing.pdf> [accessed 12 September 2007]

renovating longhouse ruins - timber kits provided insulated, dry, clean, bright, spacious homes. Economic, easy to construct, and easily ordered over the internet or via post as complete packages of standardised timber systems made these, for many residents, the most viable option for the construction of a self-build home. At Wheelingstone, the retention of the flagstone ruins offered a poetic, cultural, tectonic and historical connection to this site. A timber frame insert, meanwhile, offered a predictable form of construction for our amateur self-build.²⁰ The roughness of a flagstone wall offered contextual allure; a timber frame the reassurance of imposing order: ideas central in our architectural educations, which had insisted both on conceptual and technical rigour.

This seemingly simple proposal was thus loaded with the weight of an architectural culture's assumptions of truth and authenticity, architectural concepts laden with complexity.²¹ As architects setting up a design practice, having recently passed USA licensing examinations and looking to prove ourselves, concepts such as 'truth' lurked behind our insistence that the flagstone wall be retained as an 'authentic' hand-made contextual wall. A gap, as important conceptually as physically, between the 'new' and the 'old' explicitly manifested the construction of a contemporary timber insert next to a flagstone wall.²² This desire for 'truthful' construction emerged from our own simplistic interpretations of Modernist tectonic clarity. Never entirely achievable in modernist constructions, the idea of truth in architectural construction is far more ambiguous²³ in a twenty-first century context where any expression of materiality in an external wall must negotiate regulatory structural and thermal demands; waterproofing, damp-proofing, cold bridging, and U-Values in an assemblage of systematised, prefabricated metal and plastic components.²⁴ The rich tectonic clarity and self-perceived honesty of the double wythe flagstone wall, satisfying nineteenth century standards as the most progressive technology of the time, no longer satisfied regulatory demands for energy efficiency, air tightness, and

²⁰ 'Amateur' in that, as architects, we had never before physically constructed a building beyond temporary timber installations as students.

²¹ Forty confirms the term 'Truth' as 'undeniably an important concept within architectural modernism', identifying three senses: 'expressive truth', 'structural truth', and 'historical truth', all three of which we were considering as central to our architectural intent. Forty, *Words and Buildings*, p.289.

²² *Vernacular Architecture in the Twenty-First Century: Theory, Education and Practice*, ed. by Lindsay Asquith and Marcel Vellinga (Abingdon, Oxon: Taylor & Francis, 2006) proposes the 'de-reification' of the vernacular as an evolving response to materials and methods.

²³ I will discuss the term 'ambiguity' in Ch. 4 and Ch.5 of this thesis.

²⁴ See Shonfield regarding the cavity wall, and David Leatherbarrow, *Uncommon Ground: Architecture, Technology, and Topography* (Cambridge, Mass: MIT Press, 2000) for discussion of standardizations; both will be discussed in Ch.5 of this thesis.

structural predictability, as well as my own desire, as an architect trained following a modernist curriculum, for perfectly smooth and plumb plaster walls, shadow gaps, and crisp junctions. These negotiations were tested first by the act of preparing construction drawings.

The act of drawing up our proposals in AutoCad highlighted fundamentally different characteristics between the design and construction processes of the existing flagstone wall and the proposed timber frame. The flagstone wall, constructed, we presumed, without drawings, or specifications, offered the romantic ideal of an intuitive, responsive, construction process; a long, slow, collaborative effort, perhaps drawing from accumulated knowledge and personal senses, and memories. It had been set out imprecisely²⁵ - the walls not square - employing, we assumed, rules of thumb, measured by body and site.²⁶ This was, of course, speculation, but had strong pull as a conceptual 'primitive' ideal of the architect working on site, with materials, in response to deep mental and physical knowledge of the context.²⁷ Given the allure of such visions, my drawing of the timber kit was, in contrast, meticulously predictable; a Cartesian 600mm metric modular system, drawn in CAD, setting out walls to rigorously modular dimensions. Timber, plywood, plasterboard adhered to manufacturers' specified modules. From these drawings, the exact quantity of materials could be predicted with a 10% contingency, supporting the fact that we would be ordering, preparing and installing all components ourselves, a reality which encouraged a desire for more prediction and control than might normally be outlined in a set of construction drawings. [Figs. 2.19 - 2.21] The gap between the stubborn irregularity of the physical flagstone wall - refusing to be neatly abstracted in CAD - and the predictive precision of the specified timber kit would now provoke a challenge to our architectural intent as construction began.

²⁵ For discussions of imprecise geometrical setting out and modern concepts of precision, see Nigel Hiscock, *The Wise Master Builder: Platonic Geometry in Plans of Medieval Abbeys and Cathedrals* (Aldershot: Ashgate, 2000). This will be discussed in Ch.6.

²⁶ For shifting concepts of measurement from embodied to abstracted, see Robert Tavernor, *Smoots Ear: The Measure of Humanity* (New Haven: Yale University Press, 2007). The shift from embodied to abstracted measurement will be discussed in Ch. 6.

²⁷ The romanticizing of intuitive, self-build vernacular architecture is central to modernist ideologies see Bernard Rudofsky, *Architecture without Architects: A Short Introduction to Non-Pedigreed Architecture* (New York: DoubleDay & Co, 1964). Adolf Max Vogt, *Le Corbusier, the Noble Savage: Toward an Archaeology of Modernism*, trans. by Radka Donnell (Cambridge, Mass MIT Press, c1998) explores the roots of le Corbusier's work in his childhood experiences and education, referencing regional Swiss pile-work lake dwellings dating from the Stone Age to the middle ages, and the Primeval Alpine Architecture of Valais.

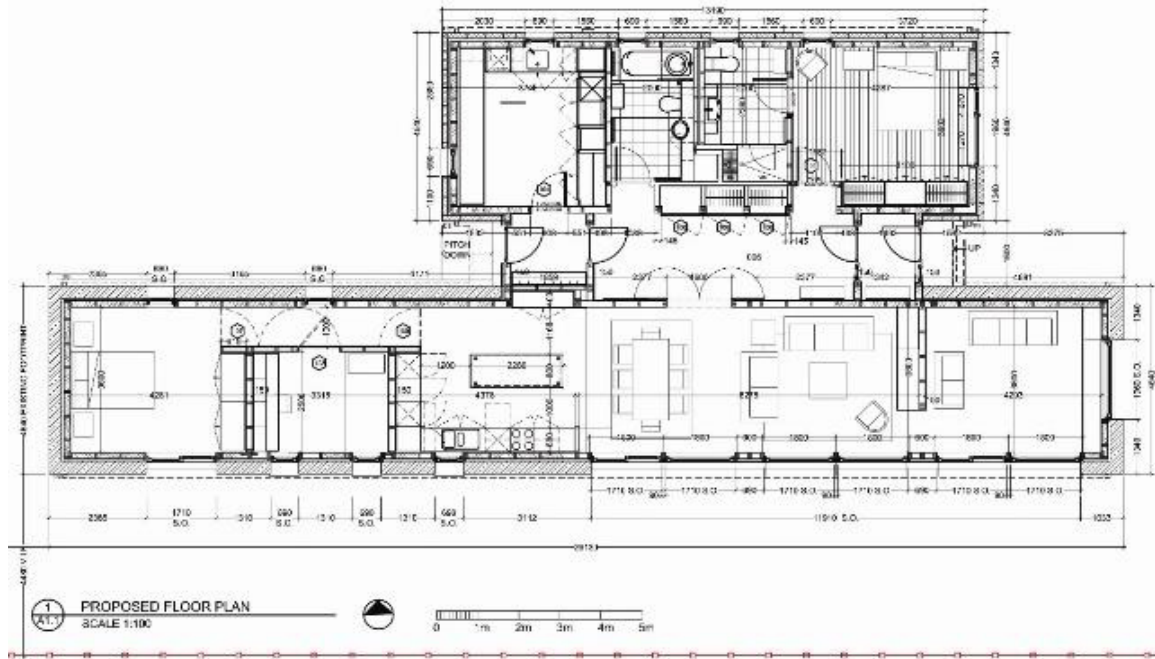


Fig. 2.19 - Wheelingstone planning permission, costing and construction drawings: plan. Rather than a generic graphic, this drawing accurately laid out each timber stud and concrete block, to allow for quantification in estimating and ordering. 2003 (prior to construction).

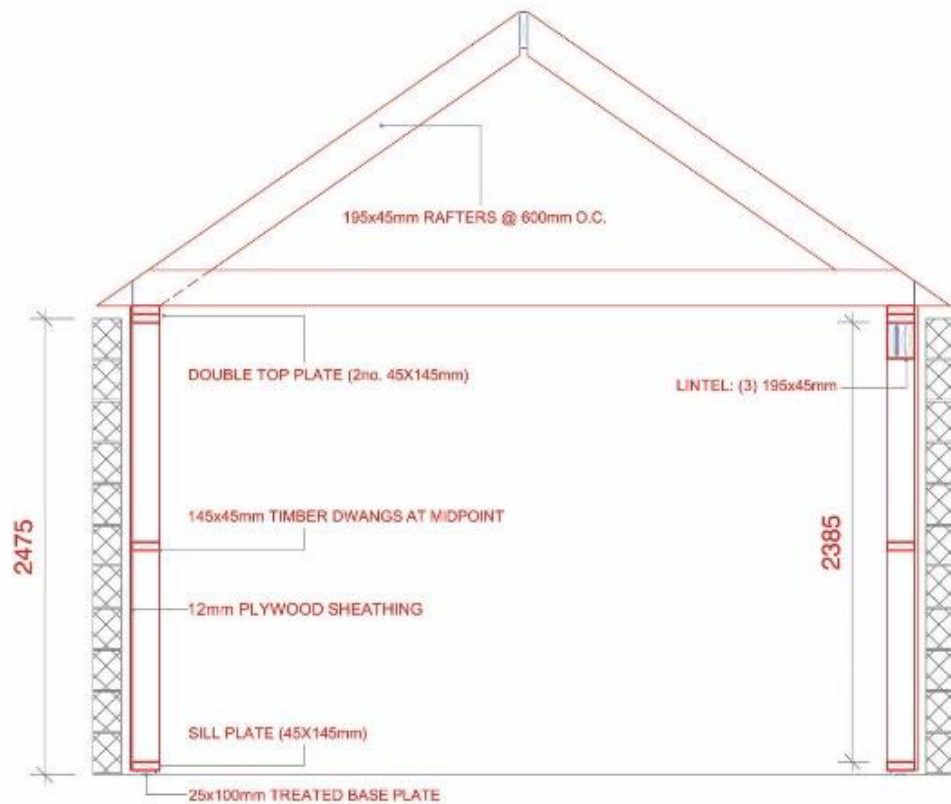
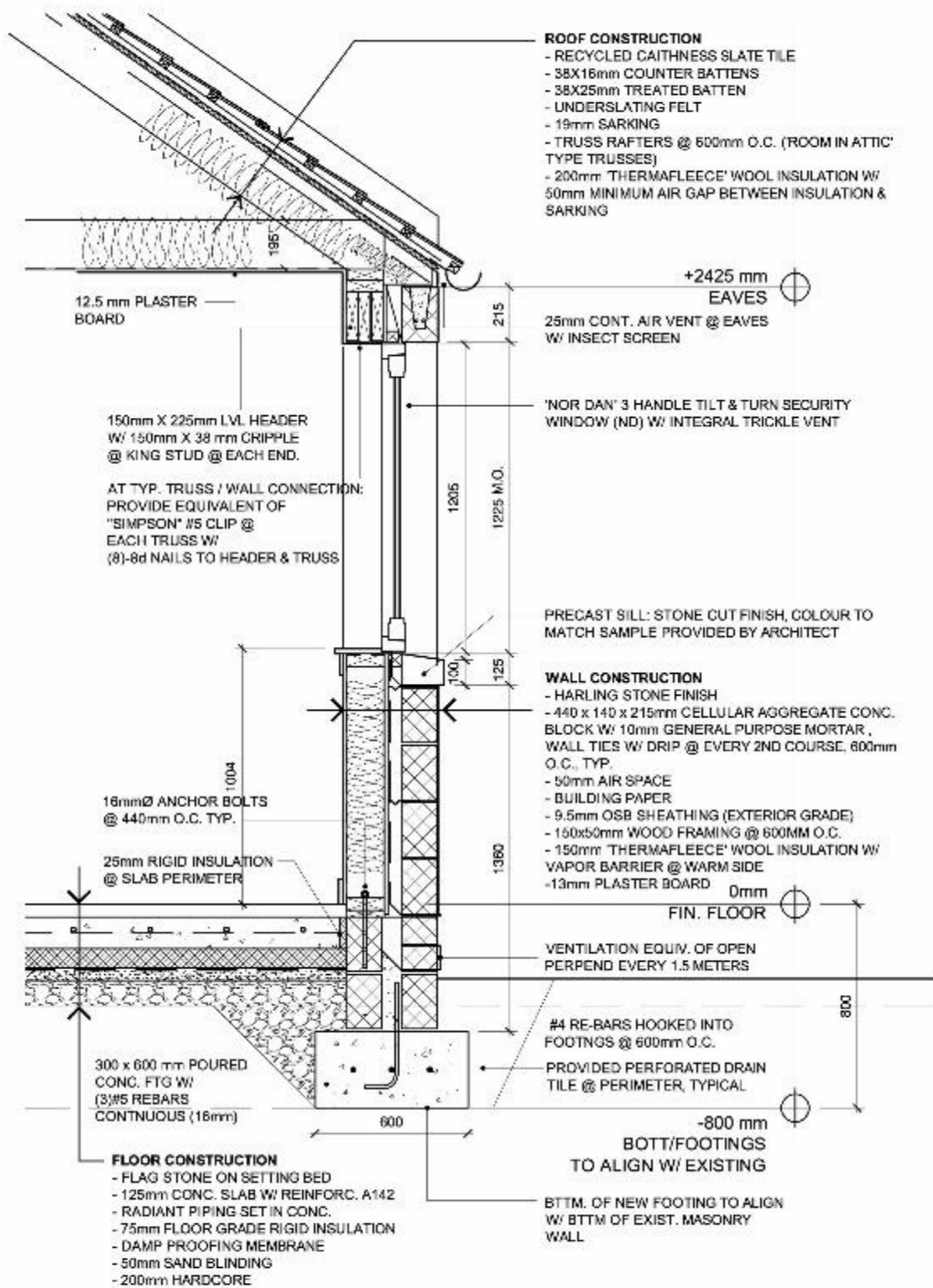


Fig. 2.20 - CAD sectional layout, for purposes of setting out dimensions of timber frame of the Phase 1 north addition, the aim of which was to achieve two cut lengths from one 4800mm length of timber stud, and an accurate relationship between the placement of the timber stud on sill and top plates and masonry dimensions, to avoid masonry cuts.

2. Promises of precise control at Wheelingstone



1
A3.1 DETAIL SECTION thru' north wing
scale 1:20

Fig. 2.21 - Cad detail sectional layout submitted for Building Regulations and for purposes of aligning masonry coursing with timber frame dimensions, 2003 (prior to construction).

2. Promises of precise control at Wheelingstone



Fig. 2.22 - Concrete block foundation wall of the north addition, Wheelingstone, 2004. All blockwork set out to avoid cutting.



Fig. 2.23 - Concrete block foundation wall of the north addition, Wheelingstone, 2004.



Fig. 2.24 - Concrete block foundation wall of the north addition, Wheelingstone, 2004.

2.4 The flagstone wall, as proposed

The wall, as proposed, was to be 525.5mm thick, plus or minus permitted tolerances of existing flagstone. It was to consist of: 12.5mm plasterboard, 12mm plywood, 150mm timber studs, 150mm sheep's wool insulation,²⁸ 'Tyvek' building membrane, a 50mm cavity, and existing 300-400mm flagstone walls, as the existing condition to which the precisely specified and drawn timber kit would be adapted.

The first construction phase in 2004, an addition to the north of the flagstone ruins was set out rigorously according to the drawings, [Figs 2.22-2.24] as yet unchecked by the presence of the neighbouring existing flagstone wall. Despite the allure of the neighbouring rough flagstone wall as a tectonic, poetic presence, there was, too a pedantic satisfaction and pride to be found even in a concrete block wall - the precise working out of the geometries, of the last uncut concrete block fitting perfectly into place, of the knowledge that, down the line, the alignment of a 440mm block dimension and a 600mm timber frame module would accept uncut modular plywood sheathing and plasterboard sheets. The ease of alignment between rigorously worked out CAD drawings and on-site construction, and the sense of order and control was, after all, enjoyable on site, an experience which took on a heightened dimension in relation to the existing flagstone wall, as, working beside it, the condition of the wall challenged the basis of our architectural intent.

Fifty years of exposure without a roof or collar ties had left the wall more unstable than first predicted by an initial site visit and our abstracted assumptions applied to CAD drawings. Our architectural intent depended on the assumption of a partial demolition of unstable areas of the wall, and the insertion of a stabilising timber frame in the remaining structure. A recommendation during construction from a visiting building inspector directed us instead towards the full demolition of the flagstone wall as unsalvageable: an option previously unconsidered. This option not only represented a significant unpredicted deviation from an otherwise meticulously planned set of construction documents, but it challenged the core architectural intent of our project, that of the bringing together of a poetic, historical contextual roughness with the order of a contemporary modular construction. To lose the flagstone would be to lose the architectural intent of the project.

²⁸ Construction budget dictated the revision of an original specification from the 'ideal', in terms of sustainability and contextual materiality, from sheep's wool insulation to a more typical industry standard, Rockwool®.

This flagstone wall had stood for over a hundred years, accommodating several generations of one family. From the site, we could see the site of the Knap of Howar on a neighbouring island, where a similar construction had remained intact for over five thousand years. Why was it that, in the early years of the twenty-first century, a desire for precise certainty - largely self-inflicted yet accentuated by regulatory requirements - could not accommodate the uncertainty of retaining this wall, in lieu of the certainty of rebuilding the same stones in the same footprint, on newly constructed and accurately calculated foundations? The process of taking down the stones would be labour intensive; the prospect of rebuilding, enticing on the one hand as an opportunity to spend a future summer building flagstone, and yet, on the other hand, deeply questionable as an architectural strategy. If the flagstone wall was to be removed and rebuilt, no longer could the project be presented - to critical colleagues in the architectural profession - as a modern intervention into the tectonic authenticity of a historical contextual condition. An unpredicted condition now challenged the certainty of our intentions.

The ambiguity of a redundant layer

Faced with uncertainty, we now sought to re-establish the certainty of a clearly defined architectural intent. Perhaps, we argued to ourselves, a rebuilt wall was in itself, truthful, demonstrating the inevitable deviations encountered in almost any architectural project. With reserved guilt, we dismantled the flagstone wall and restacked the stones nearby in preparation for reuse. The timber frame was quickly completed within the footprint of the removed wall by the end of the second summer, clad in plywood sheathing, and wrapped in a weatherproof membrane. Now, faced with the potential of leaving the membrane exposed over winter - neither recommended by the manufacturer, nor by our own knowledge of the site's extreme exposure - we were again self-directed to consider alternatives for intermediate protection of the timber structure. In originally celebrating the efficiency of the timber kit, we had not accounted for the deviation demanded by a slow rebuilding of the flagstone wall. To retain some of the poetic pleasure of the project, it became important to us that we rebuilt the flagstone ourselves, and not rush to complete the wall with hired labour prior to the onset of winter.

After investigating alternates of temporary sacrificial ply boarding, we concluded, reluctantly, that the most economic, available, and reliable solution on the island would be an intermediate protective skin of 100mm concrete block. Concrete blocks were made locally, were readily available, could be built quickly, and would

guarantee protection of the timber frame over winter. Yet this seemed, to us, to exacerbate the physical and conceptual redundancy of the flagstone wall. The seemingly simple translation of an architectural intent into a constructed reality was now at serious risk; the concrete block layer, once clad with flagstone, could be interpreted as redundant. Our once certain architectural intention would now be uncertain, risking our conceptual interpretations of what I, as a Miesian trained architect, interpreted as modernist tectonic honesty. It could, of course, have been physically possible, more pragmatic, and more constructionally honest to now discard the idea of using the flagstone. A render over the concrete block layer would be faster, would be acceptable as a well-tested construction system on the island, and could conceptually act as a clearer expression of current and material availability than a now redundant layer of reused flagstone which would require far greater labour to reconstruct. Physically, a rendered block would suffice; yet intuitively, ambiguously, this felt inadequate.

Personally, we had by now personally invested time, labour and care in the dismantling, sorting and stacking of the stones. We were by now acutely aware of the effort which had once quarried the stones and brought them to this site. For us, these flagstones belonged to this site. The stones had a value beyond that of a purchasable commodity; they continued to confirm what Orkney poet Mackay Brown had described as 'ghosts and kernels' on this particular site and in this particular situation.²⁹ The flagstones promised tactility, the appeal of weathered, hand-crafted, physical roughness. None of this, was of course, the real reason:³⁰ the real reason we wanted the flagstones was, simply, because we would not abandon the pursuit of our architectural intention. Without the flagstone, the project - for us - would lose its poetic sense: it would be standard, *ordinary*. Our definition of the architectural quality of this project was acutely defined by this unanticipated moment of decision-making to reconstruct the flagstone wall as something more than an ordinary solution, as a deviation from a standard, as an acceptable and necessary deviation from the certainty of our once precise intentions.

²⁹ 'It is a word, blossoming as legend, story, secret that holds a community together and gives it a meaning to its life. If words become functional ciphers merely, as they are in white papers and business letters, they lose their 'ghosts' – the rich aura that has grown about them from the start, and grows infinitesimally richer each time they are spoken. They lose more; they lose their "kernel", the sheer sensuous relish of utterance. Poetry is a fine interpretation of ghost and kernel. We are in danger of contenting ourselves with husks.' Mackay Brown, p.21.

³⁰ Mies van der Rohe had spoken in 1952 of the 'real reason' behind decisions he had made which prioritized aesthetic intuition over constructional efficiency: this will be discussed at more length in Ch. 9 of this thesis. 'Mies van der Rohe's New Buildings', *Architectural Forum* 97 (November 1952), p.99.

2.5 Deviating from a precise prediction

The relationship between an architectural intent and the pragmatics of construction at Wheelingstone highlighted the uncertainty of upholding a seemingly simple idea through unanticipated deviations from precise predictions. Our predictions of achieving the conceptual and constructional clarity of an efficient modern intervention within a salvaged historic shelter are now enmeshed within the layered ambiguities of the as-built flagstone wall. This small, seemingly simple project challenged us to position ourselves between the rationality of precise predictions made far in advance of construction, and our intuitive, emotional responses to unanticipated challenges which arose during construction.³¹

In 2006, Swiss architect Peter Zumthor wrote that ‘the design process is based on a constant interplay of feeling and reason.’³² The processes of contemporary architectural practice are expected to operate, according to recommendations made by the practice manuals, journals and standards which advise the profession, on the basis that the ‘constant interplay of feeling and reason’ which informs design must be halted at the point construction begins. When design ‘ends’, and construction begins, all decision making is expected to have been resolved; all decisions made; all aspects of the project predicted with absolute certainty. Constructing Wheelingstone demonstrated to us instead a certainty that any architectural project, no matter how small and simple, will deviate from even the most precise and certain of predictions. The interplay of feeling and reason continue well into the processes of construction; an actuality most practicing architects will be familiar with.

The next encounter which set out the questions posed by this thesis, a visit by the author to Sigurd Lewerentz’s Church of St Peter’s at Klippan, Sweden, challenges the legitimacy of advice that architectural quality is dependent on precise predictions made in advance of construction, suggesting, instead, that an architectural quality as defined by architects themselves may emerge from the risks, uncertainties and ambiguities which arise when architecture deviates from standardised predictions.

³¹ Roderick Kemsley and Christopher Platt describe their project at Auchoich Steadings, where ‘by force of circumstance, we found ourselves operating as an architect and skilled craftsman working in tandem – physically setting out the building, working with its fabric and assisting with its making, responsive to site and circumstance – effectively filling the void left by the almost complete demise of the traditional ‘master builder’. We would like to think it succeeds in ‘saying something’ with a certain breadth and depth of reference, about dwelling with architecture, in a certain place and time.’ Roderick Kemsley and Christopher Platt, *Dwelling with Architecture* (London and New York: Routledge, 2012), p.223.

³² Peter Zumthor, *Thinking Architecture* (Basel: Birkhäuser, 2006), p. 21.

3. The precise control of 'crude' joints at St Peter's



Fig. 3.1 - Mortar joints at Sigurd Lewerentz's Church of St Peter's, Klippan.

3.1 Precise deviations

Ch.2 described how the self-build of Wheelingstone challenged the precise predictions of an architectural intent formulated offsite in an architectural office. Despite the promise of control offered by my constant presence as architect and builder from concept to construction, apparent certainties guaranteed by precise planning in advance of construction were challenged during the actualities of construction by what Zumthor described as the interplay between feeling and reason, suggesting what may be lost in terms of 'feelings' if deviations from precise predictions made in advance of construction are to be altogether denied.

In 2005, while Wheelingstone was under construction, I visited Sigurd Lewerentz's Church of St Peter's in Klippan, Sweden [Fig. 3.1].¹ The experience was overwhelming, most memorably evoked by mortar joints which reject any notion of dimensional standardisation, remaining - apparently - unfinished, raw, uncontrolled. As a Miesian educated architect, I had struggled at Wheelingstone to reconcile desires for retaining precise predictions with a desire to work intuitively on site. With an interest in Zumthor's descriptions of the interplay between reason and feeling, I began to read architect's accounts of the making of the mortar joints at St Peter's. Three themes were apparent from these accounts. First, the narratives referenced common experiences of emotional intensity. Second, deviations from standard practices in the detailing of the project were consistently described as central to the quality of the work. Third, the dimensional deviations of the mortar joints at St Peter's were consistently described as rigorously predicted, yet controlled by daily adaptations, agreed between architect and builder on site during construction.

Returning to Wheelingstone, I struggled to reconcile the languages of professionalised architectural practice, in contrast to architects' definitions of quality at St Peter's, through terms such as 'enigmatic', 'irregular', 'crude', 'brutal' and 'shocking.' These contrasting languages highlight tensions between desires for certainty and deviation, setting out the thematic framework for this thesis. This chapter argues that the denial of deviation engenders a quality of averages and impedes a quality of extremes; and that the extraordinary qualities witnessed at Klippan arise from a different approach altogether.

¹ Work from this research was published as Mhairi McVicar, 'Passion and control: Lewerentz and a mortar joint' in *Quality Out of Control: Standards for Measuring Architecture*, ed. by Allison Dutoit, Adam Sharr and Jo Odgers (London: Routledge: 2010), pp. 92-102.

3. The precise control of 'crude' joints at St Peter's



Fig. 3.2 - Location plan of St Peters, Klippan.

Fig. 3.3 - St Petri Kyrka Exteriör. Vinterbild av med nakna träd i förgrunden. Långfasad (Exterior. Winter picture of the naked trees in the foreground. Long façade). Karl-Erik Olsson-Snoogeröd (photographer) Arkitektur-och designcentrum: ARKM.1986-106-182681-7.



Fig. 3.4 - St Petri Kyrka Exteriör. (St Peter's Church exterior). Karl-Erik Olsson-Snoogeröd (photographer) Arkitektur-och designcentrum: ARKM.1973-103-070-530.



3. The precise control of 'crude' joints at St Peter's



Fig. 3.5 - St Petri Kyrka Interiör (St Peter's Church, Interior) Karl-Erik Olsson-Snoogeröd (photographer) Arkitektur-och designcentrum: ARKM.1973-103-070-565.

3. The precise control of 'crude' joints at St Peter's



Fig. 3.6 - Mortar joints at St Peter's, interior floor.



Fig. 3.7 - Mortar joints at St Peter's, interior floor.



Fig. 3.8 - Mortar joints at St Peter's, exterior.

3. The precise control of 'crude' joints at St Peter's



Fig. 3.9 - Window detail at St Peter's.



Fig. 3.10 – Window detail at St Peter's.



Fig. 3.11- Window detail at St Peter's.

3.2 'Not a conventional neatness': measuring mortar joints

'His passion for joints is obvious,' Swedish architect Bengt Edman wrote in regards to the mortar joints at Sigurd Lewerentz's Church of St Peter's in Klippan, Sweden:

The goal here is evidently not a conventional neatness, but rather the demonstration of building activities under given local circumstances. It's like baking a bread. The bricklayer is present.²

Passion, deviation from a standard, and individual presence were highlighted here by Edman in a discussion of the mortar joints at St Peter's. Varying widely in dimensions, the mortar joints at times become a primary material, subsuming the brick, accommodating irregularities in floor, wall, roof, window, and door junctions in plan and elevation. The visitor to St Peter's could be forgiven for thinking, at first, that these unconventional mortar joints are simply crude and uncontrolled. The mortar joints at St Peter's are, however, consistently described as extraordinarily precisely controlled deviations, eschewing standardised recommendations for construction practices as typically defined by advisory and regulatory professional bodies which guide the architectural profession.³

Such deviations, achieved through ambiguity and risk, are applauded in narratives written by architects as central to the extraordinary qualities of St Peter's. This definition stands in direct contrast to standard recommendations which pursue the guarantee of a quality explicitly defined as 'fitness for purpose'⁴ by unequivocally rejecting ambiguity and risk within professional architectural practice. The two contrasting languages underlying such definitions are explored in this chapter.

² Bengt Edman, 'Lewerentz the Bricklayer', *Spazio E Societa*, 16 (1993), 76-83 (p.77).

³ For the purpose of this chapter, 'standardised construction practices' refers to UK professional practice in the 1900s to 2000s, aligning with the period in which I was educated as an architect and designed and constructed Wheelingstone.

⁴ British Standards Institute's definition of quality is: '4.1 Concept of quality. The word quality is used for several distinct purposes: a) in a comparative sense as degree of excellence, whereby products may be ranked on a relative basis, sometimes referred to as grade (see BS 4778-1); b) in a quantitative sense as in manufacturing, product release and for technical evaluations, sometimes referred to as quality level (see 8.1.7); c) in a fitness-for-purpose sense which relates the evaluation of a product or service to its ability to satisfy a given need. Within the context of this Part of BS 4778 and in accordance with established usage in the quality assurance field the word quality is used in the fitness-for-purpose sense as defined in 4.1.1. In order to improve communication and distinguish precisely between these three principal uses, it is recommended that the concept of grade and quality level be utilized as appropriate to avoid confusion, ambiguity and misunderstanding.' British Standards Institute *British Standards BS 4778-2:1991, Quality vocabulary - Part 2: Quality concepts and related definitions* (London: British Standards Institute, 1991), p.3.

St Peter's Church, Klippan, Sweden

The Church of St Peter's, Klippan, Sweden, by the Swedish architect Sigurd Lewerentz (1885-1975),⁵ was designed and constructed between 1962 and 1966 [Figs. 3.2 - 3.5] The parish church complex, comprising the church itself, separated by an L-shaped courtyard from an adjacent building containing parish offices, meeting rooms and a community hall, sits in a large garden site on the east of the town of Klippan, Western Sweden. One of a handful of significant projects completed at the end of Lewerentz's career, when he was in his eighties – St Marks in Bjorkhagen, Stockholm (1956-60), and the flower kiosk and caretaker's house for Malmo Eastern cemetery being the other key projects⁶ - St Peter's has attained a revered status among architects. Descriptions of this project by architects repeatedly focus on the brickwork forming walls, floors, vaulted ceilings, and, in particular, the extraordinary qualities of the mortar joints throughout.

The relentless quality of brick

The first point which is repeatedly made in architectural narratives is that almost every surface of St Peter's is brick. Brick floors, walls, vaulted ceilings, window reveals form the interior and exterior of the chapel, washrooms, and meeting rooms, relieved, as architect Adam Caruso pointed out, only by exposed timber ceiling in the community room.⁷ 'Paradoxically, the material intensity of St Peter's is almost too much to bear', Caruso wrote. 'It is as though Lewerentz is compelling us to confront the condition of our existence, all of the time.'⁸ The intensity of the brick construction is directly equated with an intense architectural experience - Caruso began his description of the project with a discussion of what 'almost perfect'⁹ may mean in architectural work - and a common thread in descriptions of the quality achieved at St Peter's is that of the ambiguities of what may appear, at first, to be straightforward. Architect Colin St John Wilson noted:

⁵ For a contextual bibliography which places Lewerentz's career amidst the converging and competing forces of National Romanticism, Classical, and Gothic influences, see Peter Blundell Jones, 'Sigurd Lewerentz: Church of St. Peter, Klippan, 1963-66', *Architectural Research Quarterly*, 6, no.2, (2002), 159-173.

⁶ Blundell Jones wrote that Lewerentz 'faded into obscurity as far as the profession was concerned, only to re-emerge quite suddenly with a handful of remarkable late works', citing St Peter's as the best of these. *Ibid.*, p.162.

⁷ Adam Caruso, 'Sigurd Lewerentz and a material basis for form' in Claes Caldenby, Adam Caruso, and Sven Ivar Lind, *Sigurd Lewerentz: Two Churches* (Stockholm: Arkitektur Förlag AB, 1997), pp. 53-55 (p.55).

⁸ *Ibid.*, p.55.

⁹ *Ibid.*, p.53.

We are not, in other words, being treated to an exemplary piece of candor in which the mysteries of building lore have been exorcised and the simple facts exposed at last. Instead, we are being presented with a theme of much greater depth and once again there is the element of strangeness [...]¹⁰

In St John Wilson's description, 'greater depth' emerges from discrepancy and enigma:

The building's mystery lies in the discrepancy between its *apparent* straightforwardness and its *actual* obliqueness. The harder you look, the more enigmatic it becomes.¹¹

Jonathan Hill described the ambiguity created by the gloom of purple-brown brick construction and the glare of unframed openings;¹² Janne Ahlin referenced the elusiveness of a gable in uncut brick.¹³ Enigma, mystery, strangeness in the building are linked here to definitions of architectural quality: the project is not as clear and straightforward as one might first imagine, but reveals greater depth and complexity upon ever closer scrutiny.

The control of the mortar joint

Having proposed a link between intensity, enigma, mystery and perceptions of architectural quality at St Peter's, narratives repeatedly highlight the mortar joints as extraordinary in their deviation from a standard. [Figs. 3.6 - 3.8]. 'The wall is rough brick, very rough with unusually wide joints', architectural historian Peter Blundell Jones begins his description of St Peter's. 'The pointing is not raked or trowelled as usual but 'bagged off', crudely wiped with an old sack, causing the bricks to be smeared.'¹⁴ Deviations from standard processes - 'unusually wide joints', 'not raked or trowelled as usual' - are highlighted by Blundell Jones as offering a 'new and unexpected architectural vocabulary' which 'throw into question' 'assumptions about building methods and 'good practice.'¹⁵ That the mortar joints are 'crudely wiped,' the bricks 'smeared' with mortar, might, to a casual observer, imply lack of care and attention. Ahlin related Lewerentz's pleasure in 'the imperfections of rejected bricks'

¹⁰ Colin St. John Wilson, 'Sigurd Lewerentz and the Dilemma of the Classical', *Perspecta*, 24 (1988), 50-77. p.60.

¹¹ *Ibid.*, p.60.

¹² Jonathan Hill, *Weather Architecture* (Abingdon, Oxon: Routledge, 2012), p.265.

¹³ Janne Ahlin, *Sigurd Lewerentz, architect 1885-1975* (Stockholm, Sweden: Byggeförlaget, 1987), 171.

¹⁴ Blundell Jones, p.159.

¹⁵ *Ibid.*

in the remains of a wall at the old brick factory at Helsingborg.¹⁶ As all narratives of the project reveal, all such imperfections were precisely controlled. St John Wilson introduced the theme of precise control through the identification of three rules:

In the first place we find that the use of brick is subject to three propositions stringently applied in the teeth of common sense compromise. First, Lewerentz proposes to use it for all purposes: wall, floor, vault, roof light, altar, pulpit, seat. Second, he will use only the standard, full-size brick; there will be no specially-shaped bricks. Thirdly, no brick is to be cut.¹⁷

Imposing a rule that no brick is to be cut is not a decision emerging from pragmatic concerns, as Blundell Jones highlighted:

This is not in the interests of time-saving and modular construction, far from it: indeed it is almost an ironic comment on that idea - made at a time when it was everywhere in force. For Lewerentz does so many difficult irregular things with his bricks that his rule creates more problems than it solves. So why?¹⁸

Deviation from a standard is recognised as a constant theme throughout St Peter's. In addition to specifying that no brick should be cut, Lewerentz, St John Wilson noted, 'then demanded that the bricklayers should use neither plumb-line nor spirit-level.'¹⁹ '[i]n some cases', Flora et al note, 'the mortar, which usually serves to join the courses of bricks, is many times thicker than the bricks themselves'.²⁰ In 'Working with tolerance', Stephen Bates and Jonathan Sergison observed that:

the usual modesty of brick was transformed by the way it was applied to form an enveloping surface. Through subtle transformation and the intensity resulting from rigorous conceptual strategies, these works questioned conventional association, offering a subjective and shifting experience of the world.²¹

Blundell Jones highlighted the construction of the windows, conceptually reduced to no more than a sheet of glass clipped to the face of a brick wall. This window detail, Blundell Jones observed, 'is a favourite with architects, for once seen it is never

¹⁶ Ahlin, p.173. This account is referenced in Hill, *Weather Architecture*, p.266.

¹⁷ St. John Wilson, p.68.

¹⁸ Blundell Jones, p.166.

¹⁹ St. John Wilson, Fig. 5 caption, p.68.

²⁰ Flora, p.336.

²¹ Stephen Bates and Jonathon Sergison, 'Working with Tolerance', *ARQ: Architectural Research Quarterly*, 3 (1999), 220-34.

forgotten.²² [Figs. 3.9 - 3.11] At St Peter's, deviations from the standard, from the conventional, are highlighted as engendering extraordinarily memorable and powerful qualities, and as demanding an equally extraordinary amount of care and attention, achieved through the almost constant presence on site of the architect; a third theme consistent to narratives which applaud the quality of St Peter's.

Precise drawings and continuous presence

In addition to the three rules described by Wilson, precise drawings were developed.²³ Lewerentz, St John Wilson continued, 'drew the setting-out of every brick at a scale of 1:20.'²⁴ These precise instructions, the narratives attest, did not in themselves control an approach which deviated from standard construction practices. 'The decision,' wrote Nicola Flora;

to use uncut bricks for the whole building, in fact, involved the commitment to be present every day on site to resolve problems arising there, calculating, in each case, the width of the mortar joint between the courses and allowing it to vary according to particular needs.²⁵

Ahlin noted that 'When construction started, only a few sketches existed, which mainly gave the building's measurements and location', and that Lewerentz was in hospital when construction began. 'When it was time for a test wall of brick to be constructed', Ahlin continued, Lewerentz for the first time visited the site':

[...] The wrong bricks had been delivered, and it was now not possible to execute the walls as he had intended. He had laid out the building on a brick module, an innovation within the construction industry which he was eager to try out. Its measurements deviated from those of common brick, meaning that runs of 100mm, instead of the 80mm which was the norm, had to be laid up. He had neglected to communicate this and consequently the brick that was delivered from Helsingborg was of the normal dimensions. At any rate, anything else was impossible given the chosen quality of brick: Helsingborg brick was not produced in the new brick modules [...] As a consequence of the modular dimensions he could not here manipulate the number of bricks per run, but had to take up the difference in broader mortar joints. It was difficult to set the brick

²² Blundell Jones, p.159.

²³ In 2015, the Arkitektur-och designcentrum listed an archive of over 150 drawings, including sketches, plans, sections, elevations, construction and installation drawings.

²⁴ St. John Wilson, Fig. 5 caption, p.68.

²⁵ Flora, p.336.

in this thickened mortar, especially with a flush joint, but in the end it worked out.²⁶

The account Ahlin gave here was one of opportunistic response to unplanned deviations, rather than precisely controlled intentions translated with exactitude into constructed result. Ahlin's descriptions of the process of developing drawings also conveyed the sense of instructions developing in tandem with construction:

Lewerentz' drawings were a story unto themselves. Many revisions and explanatory drawings reached the contractor's office. They were not easy to understand, and Lewerentz had to instruct further as to how they were to be read. At times he was late in handing them over, but even having delivered them he could telephone the office and ask them to hold off pending new information which would arrive with the next post. The situation was ameliorated when the gifted architect Michel Papadopoulos was hired. A series of precise drawings concerning the masonry were produced, and his services were further required when Lewerentz fell ill for a second time.²⁷

Upon Lewerentz's recovery, he was, Ahlin wrote, 'consumed' by the building. The almost constant presence of Lewerentz on site is a recurring theme in narratives, linking the physical presence of the architect to ideas of care and precise control, above and beyond the remit of precise drawings.²⁸ The project, Blundell Jones highlighted, was 'carried through with great fastidiousness and constant site-supervision.'²⁹ The presence of the architect, supplementing precise drawings, is described as permitting the risk of alterations and revisions during construction, the predictions of drawings setting out every brick to a scale of 1:20 overruled by conversations. Lewerentz and the site foreman Carl Sjöholm worked:

very closely together - often far into the evening, planning the next day's work [...] But throughout the evolution of the design there were endless alterations and on site revisions.³⁰ [Figs. 3.12 - 3.14]

'Lewerentz slowly made up his mind,'³¹ Colin St John Wilson wrote, by way of these conversations. 'Sjöholm's role', Ahlin noted, 'became that of recipient of a steady

²⁶ Ahlin, p.167.

²⁷ *Ibid.*, p.171.

²⁸ For the drawings, see *Architect Sigurd Lewerentz Vol. II Drawings*, ed.by. Claes Dymling, supervised by Janne Ahlin (Stockholm: Byggförlaget, 1997), pp.112-125.

²⁹ Blundell Jones, p.159.

³⁰ St John Wilson, p.76.

³¹ St John Wilson, p.77.

stream of ideas on how the current construction problems should be resolved.³²

The precise control of deviations from standard practices is explicitly linked in the narratives to conversations between architect and builder throughout construction.

Controlled deviation

The narratives of St Peters celebrate means by which Lewerentz deviated from standard practices. Such extremities bring with them risks of uncertainty and the possibility of failure. An apparently simple window detail, favoured by architects, is risky, complex and difficult to achieve, a detail, as Blundell Jones notes, 'only imitated by the brave.'³³ The mortar joints, deviating far from the consistency and certainty of a standard 10mm mortar joint, demanded an extraordinary level of attention and care from all involved. With each and every joint individually responsive to a unique circumstance, the work could no longer be constructed with standardised repetition, inattention, or thoughtlessness, demanding instead, as Blundell Jones concluded, 'unusual and ingenious arrangements.'³⁴

In standard construction practices for masonry, a prefabricated brick is cut and shaped to accommodate all dimensional irregularities of roof slope, masonry opening, or angled junction. A 'regular' masonry wall is to be laid out with 'nominal' 10mm, unless 'otherwise specified'.³⁵ At St Peters, this conventional hierarchy is inverted. The prefabricated bricks remain - with almost no exception - dimensionally consistent. With almost no brick cut, the hand-built mortar is instructed to reconcile all irregularities of form and construction. Permitting the hand-built mortar to vary invites interpretation: any interpretation is, by default, unpredictable. It cannot be exhaustively written or drawn in advance of construction and involve the risk of inviting the builder to personally interpret the architect's intentions through personal skill and knowledge. At St Peter's, as described in the narratives, the quality of the mortar joints could not be precisely written, predicted or measured, despite the presence of numerous precise drawings and predetermined precise instructions. Deviation occurred not only from standardised constructions, but from the rules Lewerentz had himself imposed. Challenging the certainty of the 'no brick shall be cut' rule, Simon Unwin discovered a cut brick on a visit to St Peter's. [Figs. 3.15, 3.16]

³² Ahlin, p.170.

³³ Blundell Jones, p.159.

³⁴ *Ibid.*, p.166.

³⁵ 'A.5.1.3.1 Masonry bond Lay units using a regular masonry bond with nominal 10 mm joints, unless otherwise specified by the designer.' British Standards Institute, *British Standards BS 5628-3:2005 Code of practice for the use of masonry - Part 3: Materials and components, design and workmanship*, (London: British Standards Institute, 2005), p.102.

Unwin observed that drawings by Lewerentz showed a whole brick in this location, but noted that the drawing 'didn't allow for alternate coursing.' It is impossible, Unwin concluded, to ever know with certainty whether Lewerentz had intended this deviation from both the drawing and the 'no brick cut' rule. 'I like to think he meant it', Unwin noted, 'even though the drawing shows otherwise! We shall never know.'³⁶ Despite the rule that no brick was to be cut, Lewerentz rushing forth as soon as he 'heard the sound of a brick being broken',³⁷ Ahlin suggested that Lewerentz:

was the first to deviate from his own rules when he sensed that they began to impede his vision. Rules were not there for their own sake. They, like he, were merely servants for that larger construction called life.³⁸

Deviation engenders uncertainty: here, the question of intent and control - Unwin's preference that Lewerentz controlled a deviation from his own rules - is preferable to the idea that the cut brick was uncontrolled. Control, even over deviation, remains critical in interpretations of architectural quality.

Qualitative measures of quality

As controlled deviations from standard construction practices, the mortar joints are central to architects' descriptions as demanding extraordinary care and attention throughout their production. Architectural narratives measure architectural qualities of St Peter's in terms rejected by standard recommendations for professionalized architectural practice: ambiguity, irregular, discrepancy. The precise rules established at St Peter's did not pursue quality through an exact alignment between prediction and constructed reality; they instead pursued quality through precisely considered on-site adaptations as construction progressed. This stands in direct contrast to the typical recommendations of contemporary architectural practice, which demands certainty in advance of construction, and denies deviation from predictions made in advance of construction. In a contemporary UK-based professional context of quantitative measure which specifically defines quality as 'fit for purpose', the architectural descriptions of the qualities of St Peter's are now contrasted against recommendations for mortar joints from the practice journals and standards which advise on the processes of contemporary UK architectural practice.

³⁶ Email from Simon Unwin to Mhairi McVicar, 15 May 2015, following a discussion.

³⁷ Ahlin, p.171.

³⁸ Ibid., p.173.

3. The precise control of 'crude' joints at St Peter's



Fig. 3.12 - Porträttbild av Sigurd Lewerentz och verkmästare Sjöholm, St Petrikyrkan [Portrait Photo of Sigurd Lewerentz and foreman Sjöholm, St Peter's Church]. Karl-Erik Olsson-Snogeröd (photographer) Arkitektur-och designcentrum: ARKM.1986-106-LEW-22-9.



Fig. 3.13 - Porträttbild av Sigurd Lewerentz och verkmästare Sjöholm vid St Petri kyrka [Portrait photo of Sigurd Lewerentz and foreman Sjöholm at St. Peter's Church] Karl-Erik Olsson-Snogeröd (photographer) Arkitektur-och designcentrum: ARKM.1986-106-LEW-22-8.



Fig. 3.14 - Sigurd Lewerentz med verkmästare Sjöholm på byggarbetsplats St Petri kyrka [Sigurd Lewerentz with foreman Sjöholm on construction site at St Peter's Church] Karl-Erik Olsson-Snogeröd (photographer) Arkitektur-och designcentrum: ARKM.1986-106-LEW-22-7.

3. The precise control of 'crude' joints at St Peter's



Fig. 3.15 - Deviation from a stringently applied rule: a cut brick, close-up, observed and photographed by Simon Unwin.



Fig. 3.16 - Deviation from a stringently applied rule: a cut brick, facade, observed and photographed by Simon Unwin.

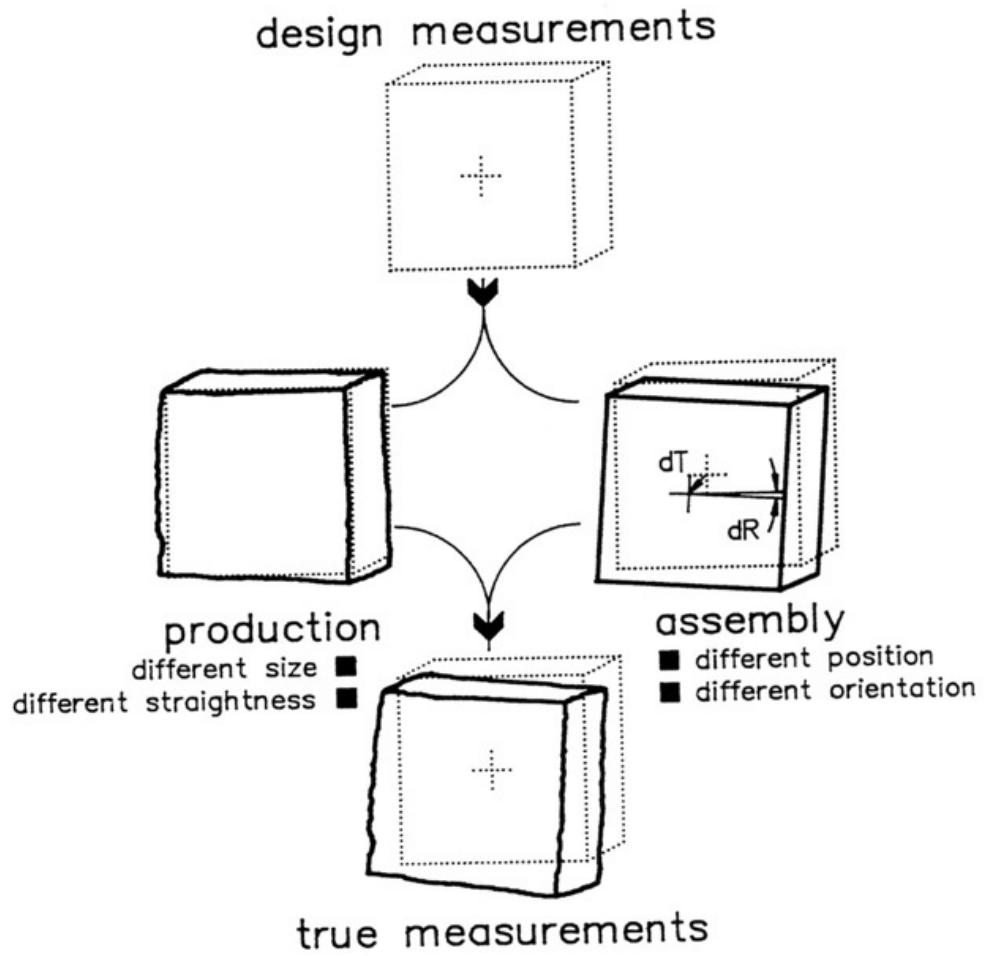


Fig. 3.17 - 'Dimensional and positional deviations of an element through production and assembly', Figure 1 in Eric Vastert, 'Specification of Visual Requirements for Regularity of Joints', *Architectural Science Review*, 41 (1998), 99-104 (p.99).

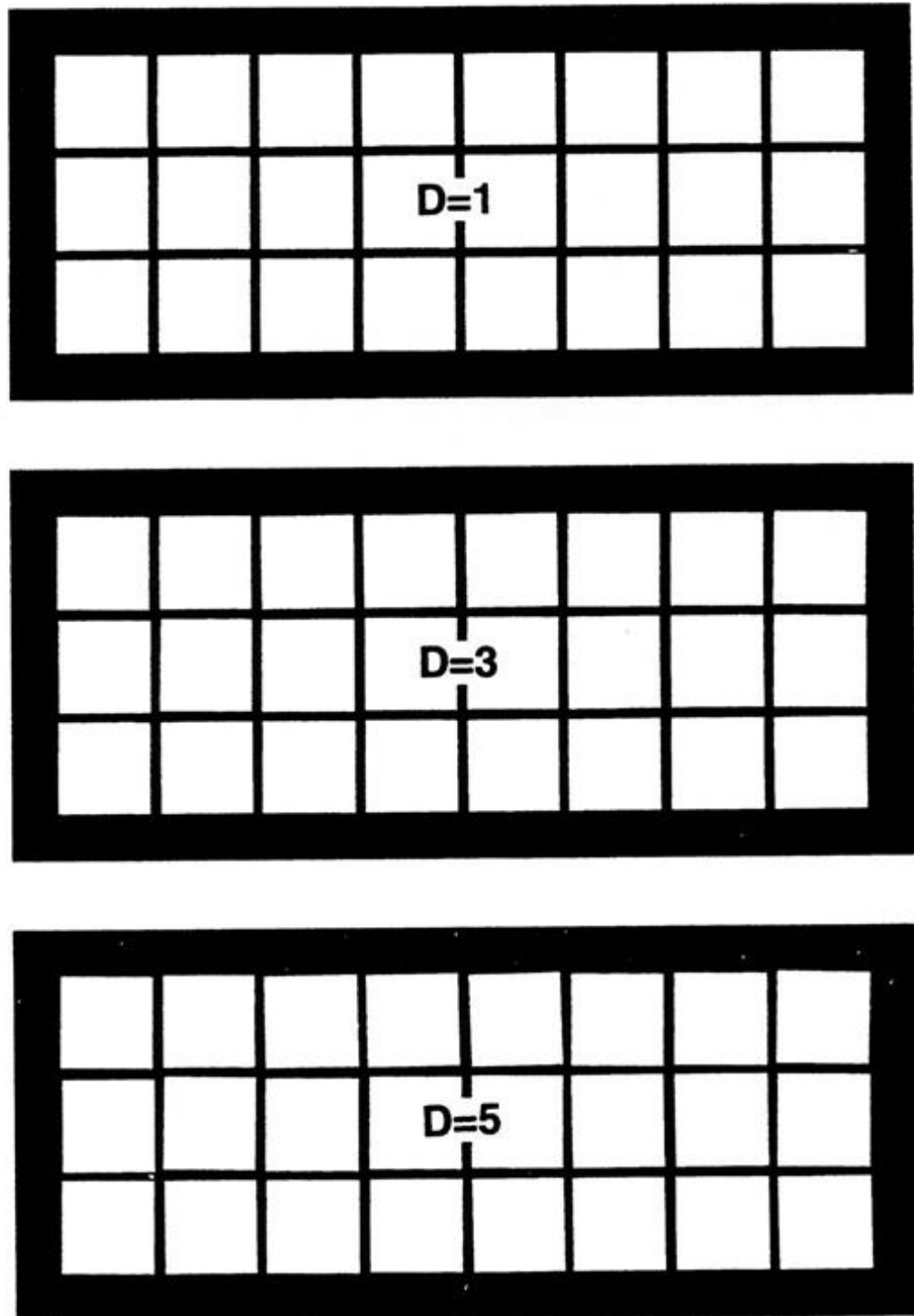


Fig. 3.18 - 'These three patterns give an impression of the scale D for the clarity of dimensional deviations. In the top pattern the dimensional deviations are on the threshold of visibility (Clarity $D=1$). The middle pattern has a clarity of $D=3$, an average value for regular patterns in facades. The bottom pattern has a value of $D=5$ '. Figure 2 in Eric Vastert, 'Specification of Visual Requirements for Regularity of Joints', *Architectural Science Review*, 41 (1998), 99-104 (p.99).

3.3 A quantitative definition of the quality of a mortar joint

Throughout the narratives which qualitatively describe Sigurd Lewerentz's St Peter's at Klippan, two key themes emerge: deviation from standard construction processes; and the precise control of every aspect of every deviation through a combination of strictly imposed rules, rigorous documentation and frequent on-site presence and conversation. The architectural narratives referenced here speak of St Peter's with the words enigmatic, obliqueness, mystery;³⁹ brutality, unexpected, irregularity, conflicting, brave;⁴⁰ ruthlessness, shocking, crude, messy;⁴¹ yet also with fastidiousness⁴², stringently⁴³ and deliberate.⁴⁴ Such extremities and contrasts are narrated as engendering an extraordinary architectural quality. 'That is what St Peter's is about', wrote Blundell Jones: 'it reveals the latent poetry that lay at the heart of Modernism before it became prosaic.'⁴⁵ An extraordinary quality is described at St Peter's as emerging through tolerances of uncertainty and acceptances of risk, negotiated not by precise prediction alone, but through engagement, care and passion. This extraordinary approach, attaining a mythical status in architectural narratives of the project, stands in stark contrast to the pursuit and definition of architectural quality as framed by contemporary UK standards.⁴⁶

'The objective must be certainty'

In 1994, an article by Francis Hall in *The Architects' Journal* stated:

the one certain opportunity available to an architect to set down a definitive and enforceable expression of standard and quality is by way of a properly drafted specification. If this is done, there is understanding and certainty all round. If it is not, there is often disagreement and disappointment.⁴⁷

'The objective,' Hall emphasised, 'must be certainty.'⁴⁸ In *Practical Specification Writing*, Jack Bowyer had earlier asserted that the specification writer must be able to 'express the architect's requirements in clear, technical and precise written form,

³⁹ St. John Wilson, p.60.

⁴⁰ Blundell Jones, p.159

⁴¹ Ibid., p.166

⁴² Ibid., p.159.

⁴³ St John Wilson, p.68.

⁴⁴ Blundell Jones, p.172.

⁴⁵ Ibid.

⁴⁶ The comparison of UK building standards - rather than Swedish building standards - emerged from the context in which I was designing and constructing Wheelingstone, and navigating the assumptions and definitions of quality according to UK standards.

⁴⁷ Francis Hall, 'Specifying for quality', *The Architects' Journal*, 199: 23 (8 June 1994) p.38.

⁴⁸ Ibid., p.38.

free from any ambiguity.⁴⁹ Given the narratives which define the architectural qualities of St Peter's, these objectives present an extraordinarily daunting task for any specification writer. Every intention of form, structure, profile, colour, texture, finish, joining, fixing, concealing, revealing, as well as poetic concept, belief, ideology and feeling, must be communicated by the architect, and interpreted and translated by the specification writer into a prosaic and quantifiable language, finally to be read, interpreted and translated into built reality by the builder. Hall's instructions assume that no unrecorded or unquantifiable conversation between architect and builder should have to take place before, during or after construction: the written instructions in themselves are directed to suffice. The requirements are daunting; but assistance is at hand.

In the UK, the onerous task of writing comprehensively precise, unambiguous, definitive, and enforceable specifications is offered by the *National Building Specifications* (NBS)⁵⁰ and the *British Standards Institute* (BSI),⁵¹ who have, since the early twentieth century, responded to the growing complexity of construction materials and methods with a comprehensive and continuously updating framework of generic and specific categories of technical language. The specification writer may turn to the language of BSI and NBS as a framework to outline and confirm virtually any aspect of the physical construction process. If the guidance is properly followed, the specification, construction and validation of a mortar joint may thus, it would seem, be assured of absolute certainty.

⁴⁹ Jack Bowyer, *Practical Specification Writing: a guide for architects and surveyors*, (London: Hutchinson & Co. (Publishers) Ltd, 1981), p.11.

⁵⁰ National Building Specification note that 'we are committed to offering distinctive, innovative specification and information solutions to construction industry professionals. We have produced specification products for over 40 years, including the recognized national standard specification system for the UK. Our NBS specification products cover building construction, engineering services and landscape design. We also produce a range of information products, including The Construction Information Service, a joint venture with IHS. From 2005 we have been publisher of the Building Regulations Approved Documents for England and Wales. [...] We are part of RIBA Enterprises Ltd which is wholly owned by the Royal Institute of British Architects (RIBA).' <<https://www.thenbs.com/about-nbs/introducing-nbs>> [accessed 12 June 2016].

⁵¹ Founded in 1901, BSI describe themselves as 'the business standards company that helps organizations all over the world make excellence a habit. For more than a century we have been challenging mediocrity and complacency to help embed excellence into the way people and products work. That means showing businesses how to improve performance, reduce risk and achieve sustainable growth.' <<http://www.bsigroup.com/en-GB/about-bsi/>> [accessed 12 June 2016].

The specification and validation of a mortar joint

British Standard 5628 Part 3 states that '[t]he joint is the medium where the variabilities due to both induced and inherent deviations can be absorbed.'⁵² The masonry joint, thus defined by BSI, is expected to remain dimensionally consistent - the nominal 10mm previously cited⁵³ - whilst accommodating predictable, unpredictable, man-made and material deviations. There is little room for error, and the specification writer could be forgiven in viewing the mortar joint with some trepidation and suspicion. The mortar joint is, after all, the most uncertain moment in any masonry construction, as Eric Vastert warned in *Architectural Science Review*:

The weak spots in the performance of buildings are not so much the building materials, but rather the connections between them. Dimensional variations of products become particularly clear in the joints, where they can disrupt the regularity in facades or tiling.⁵⁴

The brick, as a prefabricated unit subject to factory controlled tolerances and verifications, can be considered to be reasonably - not completely - predictable and consistent [Fig. 3.17]. The consistency of the mortar joint must remain, in comparison, in the hands of the bricklayer. The bricklayer must still bring to the site the often unwritten personal knowledge, skill, attention and care to control the quality of the 10mm mortar joint. It is in this moment of personal interpretation where the greatest uncertainty in a masonry wall lies. As a prefabricated unit, the brick may be tolerably predicted; as a personal interpretation, the mortar joint remains vulnerable: a lack of skill, or lack of care, or misinterpretation may invalidate the predictability, consistency and quality of the mortar joint as constructed, regardless of the precision of the written specification.

The mortar joint in construction is thus viewed as potentially deviant and disruptive, and not to be relied upon with certainty. The only final guarantee of quality lies in the

⁵² British Standards Institute, *British Standards BS 5606:1990 Guide to Accuracy in building*, (London: British Standards Institute, 1990) p.23.

⁵³ British Standards Institute, *5628-3:2005 Code of practice for the use of masonry*, p.102.

⁵⁴ The abstract for Vastert's article reads: 'This paper describes an aid that helps people to make proper decisions about visually acceptable deviations in measurements. With reference patterns and reference facades, the client and architect can indicate what kind of irregularity is maximally permissible. Depending on the specific concretisation (material, working details, contrasts) of a design, these requirements are turned into tolerances expressed in millimetres by means of a conversion table, thus meeting the required regularity. This tolerance should not be too broad which would make dimensional variations annoying, nor too narrow, which would result in unnecessary expenses.' Eric Vastert, 'Specification of Visual Requirements for Regularity of Joints', *Architectural Science Review*, 41 (Sept 1998), 99-104 (p.99).

validation of the mortar joint; in a final agreement between architect, specification writer and builder that the mortar joint, as constructed, meets all specified standards. Yet if the quality of the construction of the mortar joint is placed at risk through personal interpretation, the validation of the mortar joint is equally at risk. Final acceptance may involve the architect personally viewing the final construction to verify whether specified standards have been attained to the architect's satisfaction. Any process which requires personal judgement is necessarily unpredictable, uncontrollable, and uncertain. If 'certainty is the objective', such a process cannot remain valid. 'Although the architect's satisfaction may be a treasured thing' Francis Hall continued in *The Architects' Journal*, 'the question is whether it is a commodity which the contractor can reasonably cater for in his pricing and execution.'⁵⁵

The precise quantification of visual quality

BSI advises that 'design outputs should be documented in terms that can be verified and validated against design input requirements.'⁵⁶ This presents another onerous task for the specification writer of a mortar joint, who must predict with certainty the quantification of visual quality. BSI here offers little support, providing only a disclaimer that their specifications of permissible joint deviations are 'intended to provide satisfactory structural performance of the masonry. They should not be regarded as defining acceptability of appearance.'⁵⁷ If the specification writer is not permitted to rely on 'the architect's satisfaction' for acceptability of appearance, a more precise and predictable method of quantifying visual quality must be found. As a generic guide, BSI suggest the provision of an approved test panel of masonry, which is to be viewed next to a completed section of wall at a distance of three metres, at which distance the two panels should not differ 'significantly.'⁵⁸ This provision remains fraught with uncertainty and imprecision, given that the term 'significantly' is widely open to personal interpretation, potentially permitting the

⁵⁵ Hall, p.38.

⁵⁶ British Standards Institute, *British Standards BS ISO 9000-2:1997 Quality management and quality assurance standards - Part 2: Generic guidelines for the application of ISO 9001, ISO 9002 and ISO 9003*, (London: British Standards Institute, 1997), p.6.

⁵⁷ British Standards Institute, *BS 5628-3:2005 Code of practice for the use of masonry*, p.101.

⁵⁸ 'D.2.4. Assessment [...] When the sample panel is viewed at the same distance as the reference panel, without close scrutiny of individual bricks, the two panels should not differ significantly. NOTE A viewing distance of 3 m is normally satisfactory for the purposes of the assessment.' British Standards Institute, *BS 5628-3:2005 Code of practice for the use of masonry*, p.126.

'architect's satisfaction' to determine the outcome. Predictions of 'the architect's satisfaction' is uncertain; 'the objective is certainty.'

In *Architectural Science Review*, Vastert was specifically concerned with this dilemma, contending:

The problem particularly figures in connections or joints between elements where dimensional deviations can become visible and so large that they no longer are acceptable. But when exactly is that the case? Do we draw the line at 1, 2 or 5 millimetres? Indicating the proper visual tolerance is extremely difficult for a completely materialised and dimensionalised design. The quantification of the required visual performances of connections seems well nigh impossible.⁵⁹

'The architect's satisfaction' threatens certainty, relying as it does on personal judgement. Even the description of dissatisfaction with the quality of a mortar wall is difficult to precisely quantify. 'Facades have deviations that are too large and disrupt the subtle structure of measurements. Facades are often felt to be ugly',⁶⁰ Vastert concluded. Here, the validation of the visual quality of a mortar joint reverts to personal judgement, personal expectations, and intimate feelings. As an alternative to the uncertainty of personal judgement, Vastert proposed the mathematical formula $A = M \times C \times V$, in which the 'maximum permissible dimensional deviation A ' is equal to the multiplication of a measurement factor ' M ', a contrast factor ' C ' and a joint breadth ' V '. This formula, along with the recommended use of 'reference patterns' and 'reference facades' offered to quantify the acceptability of accumulative deviations which may occur throughout a façade:

Unwelcome surprises due to the undesirable distribution of dimensional deviations can be prevented by the following precautions:

- Only 10% of the dimensional deviations between the angles of elements may be larger than 0.7 times the maximum permissible dimensional deviation.
- Only one example from the 10% may occur for every joint crossing.⁶¹

Specification and application of this formula offered to quantify the acceptable visual standards of accumulative joint deviations. [Fig. 3.18] With this quantification, the

⁵⁹ Vastert, p.100.

⁶⁰ Ibid., p.100.

⁶¹ Ibid., p.101.

architect, specification writer and builder could seemingly reach mutual agreement without recourse to the imprecision of personal interpretation. Quality could, this formula implied, be predicted, constructed and validated with certainty, erasing further need for the uncertainty of the 'architect's satisfaction'.

'Fitness of purpose': specifying a quality of averages

The quantification of the visual quality of a masonry wall might here be taken to extreme measures - and raise questions as to its applicability amidst the actualities of the construction site⁶² - but this demonstrates the lengths to which quantification must go if validation of quality is to exclude all imprecision of personal interpretation. Such formulaic precision appears inevitable and necessary if the objective of certainty is ultimately extended to its logical conclusion. In requiring that the prediction, construction and validation of quality be quantifiably certain, the pursuit of certainty cannot allow the risk of emotional personal engagement, of feeling. In framing this as a risk, standards cannot rely upon personal engagement or care; it must therefore presume no more than average levels of skill or care throughout construction. In order to promise certainty under most circumstances, the language of specifications within BSI and NBS must be based on assumptions of average standards and lowest common denominators, and anticipate the worst of scenarios. The objective of certainty must be prepared for mutual mistrust, exploitation, lack of care, concealment of poor workmanship, or lies; all such possibilities must be catered for within the written specification. The objective of certainty delegates all control to the regulated professional giving instructions; the craftsperson remains subject to error, and is denied the freedom to make mistakes. In rejecting informal conversation and personal interpretation, Quality Control must set the goal low enough to achieve certainty under most circumstances; it cannot take the risk of aiming for the potentially unachievable, thus unpredictable and uncertain, goal of an extraordinary quality.

Defining Quality

BSI is unequivocally clear regarding this intention. Quality as defined by BSI is categorically not to be implied as a degree of excellence, but is instead defined 'in the quality assurance field in the fitness-for-purpose sense'.⁶³ Although this

⁶² The actualities of the construction site are discussed at length in Chapter 5.

⁶³ The 'fitness-for -purpose' sense is defined in 4.1 as 'the evaluation of a product or service to its ability to satisfy a given need.' British Standards Institute, *BS 4778-2:1991 Quality vocabulary*, p.3.

definition specifically applies to structural and technical standards of quality, repeated recommendations by NBS to refer to BSI standards leave the architect, specification writer and builder with little alternative than to accept this definition of quality as a significant standard within the construction process. Even at the level of the specification, construction and validation of a mortar joint, can 'fitness of purpose' be considered to be good enough? Quality assurance, Timothy Ostler pointed out in *The Architects' Journal*, 'will not make a bad architect a good one, but will just make him more consistent in producing bad architecture.'⁶⁴ A strategy of assuming the lowest common denominator may reliably predict consistency, but it must be willing to accept mediocrity as an outcome, given that it cannot invite or celebrate practices which contribute to the pursuit of quality as excellence; practices such as passion, care, risk, and engagement.

'It matters not so much what the thing is,' wrote John Ruskin in *The Stones of Venice*, 'as that the builder should really love it and enjoy it, and say so plainly.'⁶⁵ The languages of quality control assurance inverse this stance; it matters not at all what the builder thinks, or whether the builder enjoys it, or whether the architect cares; all that matters is the precise definition of what the thing is, and whether the thing is predictable and quantifiable with certainty, as largely driven by fears of litigation.⁶⁶ This has significant practical implications. George Atkinson, in '*Guide through Construction Quality Standards*', reported that 'lack of care was found to be a more important cause of faults on sites than lack of skill.'⁶⁷ It is, however, in the expectation of quality where the implications are most evident. A framework which assumes lowest common denominators cannot expect any more of its practitioners than 'good enough.' A culture which discourages conversation and engagement does not invite care to occur in practice; it anticipates scepticism, mistrust, and low expectations. It is difficult to ask for more than mediocrity in such circumstances.

⁶⁴ Timothy Ostler, 'Does Quality Assurance work?' *The Architects' Journal* (16 February 1994), p.32.

⁶⁵ John Ruskin, 'The Stones of Venice Vol I: II The Virtues of Architecture' in *The Works of John Ruskin Vol IX*, ed. by E.T. Cook and Alexander Wedderburn (London: Library Edition, Ruskin Library, 1903), p. 69.

⁶⁶ 'The first thing an architect will grab when there is a problem during construction is the specs, hoping that he or she is 'covered'. In arbitration and litigation over construction disputes, it is the specifications that attorneys on both sides pore over for quality standards, responsible parties, and protective clauses. It's frightening to think of trying to defend yourself in a lawsuit with a document that may have received less than 10 percent of your time and attention. The work may not be considered glamorous, but it is essential to the practice of architecture.' Christine Beall, 'Of specifications, liability, and the process of construction.' *Architecture: the AIA journal* 78(8) (1989), 110-112 (p.110).

⁶⁷ George Atkinson, *Guide through Quality Control Standards* (Wokingham: Van Nostrand Reinhold, 1986), p.19.

3.4 Two languages of architectural quality

Architectural narratives simultaneously describe St Peter's mortar joints as crude - physically rough, smeared, irregular - and precise - fastidiously controlled by drawings, stringent rules and constant site supervision permitting the daily adaptation of precise drawings. Here, physical and procedural deviations from standard construction practices are explicitly narrated by architects as engendering an extraordinary architectural quality. St Peter's offers a precision of engagement which permits, even demands, care and attention which emerges from deviation. Ambiguities in the translations of precise predictions were central to my own experiences at Wheelingstone, which pursued quality in the gap between a precision of certainty - the promise of control offered by standardised construction - and an engaged precision demanded by emerging ambiguities as the work deviated from predicted certainties.

Any architectural project, this thesis argues, must simultaneously navigate between these precisions - a precision defined by the desire for certainty in advance of construction, and a precision demanded by the ambiguity of deviations, inevitable in any construction and, I will argue in four close readings in Part C, productive in pursuing architectural quality. In understanding the differences and overlaps between these two understandings of precision, it is first necessary to understand how the key term precision, which frames these divergent descriptions of architectural quality, is defined, both by the architectural profession, and more broadly as it is applied to cultural and philosophical understandings. To set out a historical and theoretical framework for the case studies, Part B presents a critical review of the varied definitions and uses of the term precision, first through philosophical and literary discourses with reference to contemporary architectural theories, and subsequently as it is referenced and understood within the histories of architectural practice.

PART B: INTERPRETATIONS AND USES OF PRECISION



Fig. 4. 1 - Spirit level on a flagstone wall. Welsh School of Architecture undergraduate students Madeline Kinderman and Alex Whitcroft building a 'boat nose' at Westray Heritage Centre, Westray, Orkney Islands, in a 2007 workshop led by Mhairi McVicar.

Part B: Opening

'It should be the glory of an architect's specification,' A. Bartholomew wrote in his 1840 *Specifications for Practical Architecture*, one of the earliest examples of Master Specifications:

That it shall be so clear, that the builders, who are estimating from it the probable cost of the intended work, may have to ask no questions; that the specification, shall contain an exact comprehensive and proper description of the work, as it really *can* be and as it *ought* to be executed; omitting nothing whatever, which the architect's practical knowledge, experience, and foresight, may tell him must be included in the work; that the words of it, shall be so chosen and be so arranged that there shall not be the shadow of a doubt or ambiguity in any part of it, and that the whole of the intended work be completed without extra charge for things negligently omitted and without the possibility of a dispute upon the construction of any of the words of the specification.¹

The act of constructing Wheelingstone suggested that no matter how 'exact, comprehensive and proper' a specification may be, 'doubt and ambiguity' are not only inevitable but can be viewed as productive during construction [Fig. 4.1]. A review of two contrasting languages applied to mortar joints in Ch. 3 offered varying interpretations of precision in architectural production, from architects applauding 'irregular' deviations from standard construction practices, to Vastert's desire to avoid the 'unwelcome surprises of dimensional irregularities' in a denial of deviation from precise predictions.

To go deeper into the foundations of these contrasting languages, Part B reviews historical and contemporary interpretations of the uses and meanings of precision, first in terms of linguistic and philosophical definitions, and then as they are applied specifically within the theories and histories of architectural production, placing Bartholomew's statement above in a historical and philosophical context as a means to further explore Halls previously cited assertion that 'the objective must be certainty.'²

¹ Alfred Bartholomew, *Specifications for Practical Architecture: A Guide for the Architect, Engineer, Surveyor, and Builder to which is prefixed an Essay on the Structure and Science of Modern Buildings*, rev. by Frederick Rogers, 3rd edition (London: Crosby Lockwood and Son, 1893), p.1.

² Hall, p.38.

4. Defining precision

As the citation of Bartholomew's recommendations in the mid nineteenth century highlights, the guidance which has framed professionalised architectural practice, particularly in the last one hundred and fifty years, is underpinned by explicit definitions of precision as guaranteeing certainty. Any lack of precision in architectural instructions is emphatically rejected as leading only to doubt and ambiguity, and subsequently dispute. The interpretation and implications of the pursuit of precision, however, has been under dispute in literary theories by philosophers, literary critics, sociologists, and anthropologists, and in architectural theory by architects, architectural historians and architectural theorists. A review of dictionary and thesaurus definitions of precision first offers up more scope for interpretation than the recommendations which guide professionalised architectural practice might typically allow.

4.1 Precision as exactitude

The *Oxford English Dictionary (OED)* gives a key definition of precision, referenced from 1695, as:

2a. An instance of exactness or preciseness; a particular, nicety, minute detail, esp. of language.

This meaning is referenced in the *OED Thesaurus* as the 'quality of being specific or detailed.'³ This definition of precision as exactness is noted by the OED as:

2b. The fact, condition, or quality of being precise; exactness, accuracy' (first instance given from 1698)⁴

The earliest referenced usage of precision as exactitude is ascribed by the OED to philosopher John Locke in 1695, aligning precision with matters of economy in stating 'I have left out the utmost precisions of Fractions in these Computations.'⁵ The *OED Thesaurus* gives precision as the 'faculty of knowing, conformity with what is known, truth, freedom from error, correctness, exactness,' with synonyms in the *OED Historical Thesaurus* referenced as 'surety' (a1500), preciseness (1569), accurateness (1611), accuracy (1644), and exactness (1646). A sense of the

³ <<http://www.oed.com/view/Entry/149667?redirectedFrom=precision#eid28825753>> [accessed 13 March 2016]

⁴ Ibid.

⁵ J. Locke, *Further Considerations conc. Raising Value of Money* (1695)', in Ibid.

challenges of describing history with exactness - which will be discussed later in this chapter - is given by the *OED* in citing Thomas Hearne's 1698 *Ductor Historicus*; or, *A short system of universal history*:

'We..ought to look upon all the Projects of restoring the Antiquity of Times to a nice Exactness and Precision, as foolish and chimerical.'⁶

The sense of precision as 'exactness' is given, from the mid eighteenth century onwards, as applied more directly to quantitative accuracy and the idea of refinement towards numerical perfection:

2c. The degree of refinement in a measurement, calculation, or specification, esp. as represented by the number of digits given.⁷

The *OED Thesaurus* references this definition as 'mathematical number or quality' with synonyms in the *OED Historical Thesaurus* given as estimation (1508); approximate (1784) and rounding (1842).⁸ Reliability is finally added to the definition, referenced from 1876:

'2d. Statistics. The reproducibility or reliability of a measurement or numerical result; a quantity expressing this.

This sense of reliability is given in the *OED Thesaurus* as 'relative properties, ability to yield correct or concordant result', with synonyms in the *OED Historical Thesaurus* given as robustness (1533-4), and reliability (1909).⁹ Supplementing this definition of 'precision' as a noun as exact, true, correct, and reliable, the definition of precision as an adjective is given by the *OED* as:

⁶ Thomas Hearne, *Ductor Historicus*; or, *A short system of universal history*, 1st edition, 1698-1704 (2 vols.), i. ii. 14, in <http://www.oed.com/view/Entry/149667?redirectedFrom=precision#eid28825753> [accessed 13 March 2016].

⁷ '(1842) J. Gunmere *Elem. Treat. Astron.* (ed. 3) Preface, A table of Logarithmic Sines and Tangents to four decimal figures. These are convenient in many computations not requiring greater precision.' <http://www.oed.com/view/Entry/149667?redirectedFrom=precision#eid28825753> [accessed 13 March 2016].

⁸ *Ibid.*

⁹ '(1876) *Analyst* 3 137 The most usual method to compare the precision of different systems is by means of probable error.' <http://www.oed.com/view/Entry/149667?redirectedFrom=precision#eid28825753> [accessed 13 March 2016].

Possessing or intended to possess exactness of performance, execution, or construction' from 1875.¹⁰

This interpretation is given in the *OED Thesaurus* as 'mental: conformity with what is known, truth, freedom from error, correctness', and synonyms in the OED Historical Thesaurus as true (c1392), just (1556), precise (1561), sensible (1661), and exact (1665). These definitions give a progression, from the 16th century onwards, of the definition of precision as exactitude progressively aligned with truth (c1392), robustness (1533), accuracy (1611), sensible (1661), 'specific' (1690), freedom from error (1698), 'Probability / Statistics – ability to yield correct / concordant' result' (1885), reliability (1909) and 'mathematical / number / quantity' (1948). The *Oxford Thesaurus* also gives late twentieth century synonyms of 'precision' as including: '1: correctness, exactness, fidelity, faithfulness, exactitude, rigour, perfection, flawlessness; antonyms as inaccuracy, imperfection; 2: care, meticulousness, rigour, scrupulousness, unambiguousness, explicitness; and antonyms as looseness, sloppiness, and coarse, rough, crude, and unrefined.¹¹

The definitions, synonyms and antonyms of precision as 'exactitude' given above align with expectations placed on precision by the architectural profession: those of the pursuit of precision as a guarantor of certainty, and ideals of care, meticulousness and rigour as aligned with unambiguousness, flawlessness, perfection. Bartholomew's recommendations in 1840 highlighted the growing expectation that precise communications - 'exact, comprehensive, proper' communications could refute any doubt, any ambiguity, and any dispute.

As part A explored, my own experiences at Wheelingstone challenged the belief that any communication could ever be so precise as to refute any doubt or ambiguity, and provoked the question as to whether doubt and ambiguity could in fact be productive in clarifying the pursuit of an architectural intent. My review of St Peter's suggested that precision remains central even in pursuing deviations from the certainties of precise communications, in search of more ambiguous definitions of quality. In proposing the productive nature of doubt, ambiguity and deviation, a second definition of precision offers an understanding of what may be lost, in terms of quality, when precision, solely understood as exactitude, is pursued.

¹⁰ '(1875) *Encycl. Brit.* III. 263/1 The theory of the common balance as we see it working in every grocer's shop, and of the modern precision balance.

<<http://www.oed.com/view/Entry/149667?redirectedFrom=precision#eid28825753>> [accessed 13 March 2016]

¹¹ *Oxford Thesaurus Second edition* (Oxford: Oxford University Press, 1997).

4.2 Precision as abstraction

The *Oxford English Dictionary (OED)* gives the etymology of precision as follows:

Middle French, French *précision* action of cutting off, trimming (c1380), *exactitude* (1606) and its etymon classical Latin *praecīsiōn-*, *praecīsiō* act of cutting off, act of breaking off (in speech), truncated end, in post-classical Latin also separation, schism (late 4th cent.), excommunication (13th cent. in British sources), *precision*, *exactitude* (from 13th cent. in British sources) < *praecīs-*, past participial stem of *praecīdere* *precide* v. + *-iō* -ion suffix¹. Compare Spanish *precisión* (1507 or earlier), Italian *precisione* (a1642)¹²

Here, an initial definition, referenced from 1529, is given in the *OED* as:

1. Chiefly *Philos.* The action or an act of separating or cutting off, esp. the mental separation of one fact or idea from another; abstraction, definition¹³

This meaning is referenced in the *OED Thesaurus* as the 'mental capacity: separating of ideas'¹⁴ and synonyms referenced in the *OED Historical Thesaurus* as 'abstraction' (1579) with 'cutting short'¹⁵ as a now obsolete 15th century definition. This sense of precision referenced not quantitative certainty, but rather the mental abstraction, separation, and cutting off of ideas. In this interpretation, precision is gained only by losing something, by editing, abstracting, simplifying. This earlier definition of precision as separation, abstraction and cutting off becomes crucial in considering the implications of expectations that a conceptual architectural intention may be translated into precise communications which guarantee certainty and deny doubt and ambiguity.

The qualities applauded in my reviews of Wheelingstone and St Peter's - risk, deviation, irregularity - are denied in precision as a guarantor of certainty. Expectations that any communication of any kind may ever offer certainty, that any communication may ever be sufficiently comprehensive, that any communication

¹² The etymology of Precision is given by the *Oxford English Dictionary* as 'Of multiple origins. Partly a borrowing from French. Partly a borrowing from Latin. Etymons: French *précision*; Latin *praecīsiōn-*, *praecīsiō*. Variant forms are given as 15th century *precisione* (Sc.), and 15th century *precysyon*, 16th century onwards.

<<http://www.oed.com/view/Entry/149667?redirectedFrom=precision#eid28825753>> [accessed 13 March 2016]

¹³ <<http://www.oed.com/view/Entry/149667?redirectedFrom=precision#eid>> [accessed 13 March 2016].

¹⁴ *Oxford Thesaurus Second edition* (Oxford: Oxford University Press, 1997).

¹⁵ *Ibid.*

may ever be unambiguous have been emphatically refuted by literary critics, philosophers, anthropologists and sociologists. In the next section, writings by Roland Barthes, William Empson, Mary Douglas, Isaiah Berlin, Maurice Merleau-Ponty, Pierre Bourdieu and Italo Calvino offer alternative readings of the consequences of pursuing certainty through precisions of exactitude, freedom from error, and unambiguousness.

4.3 Examining claims of precise communications

'[A] text is made of multiple writings, drawn from many cultures and entering into mutual relations of dialogue, parody, contestation,' Roland Barthes observed in his 1967 *Death of the Author*, 'but there is one place where this multiplicity is focused and that place is the reader, not, as was hitherto said, the author.'¹⁶ In arguing that the 'unity' of the text resides 'not in its origin but its destination',¹⁷ Barthes proposed that the act of writing is itself interpretive, stating 'the writer can only imitate a gesture that is always anterior, never original.'¹⁸ 'We know now', Barthes confirmed:

that a text is not a line of words releasing a single 'theological' meaning (the 'message' of the Author-God) but a multi-dimensional space in which a variety of writings, none of them original, blend and clash. The text is a tissue of quotations drawn from the innumerable centres of culture.¹⁹

No matter how precise any text claims to be, it will always remain open for individual interpretation, based on the reader's personal experiences, interests, and agendas at any given moment in time. Any reader, Barthes further observed in *The Pleasure of the Text*, will interpret any text differently, and even between subsequent readings, will 'boldly skip (no-one is watching) descriptions, explanations, analyses, conversations'.²⁰ Describing *Tmesis* as a 'source or figure of pleasure', Barthes concludes:

It [tmesis] does not occur at the level of the structure of languages but only at the moment of their consumption; the author cannot predict tmesis: he cannot choose to write what *will not be read*.²¹

¹⁶ Roland Barthes, *Image, Music Text* (London, Fontana Press.1977), p.148.

¹⁷ *Ibid.*

¹⁸ *Ibid.*, p146.

¹⁹ *Ibid.*

²⁰ Roland Barthes, *The Pleasure of the Text*. trans. by Richard Miller (London: Cape, 1976), p.11.

²¹ *Ibid.*

That is, any instruction, no matter how exact, proper and comprehensive, remains dependent on who reads it, in what context, which parts they choose to read, and on how any individual reader chooses to consume and interpret it according to their individual experiences, prejudices, and desires.

Raymond Williams' *Keywords* similarly highlighted the complexities of guaranteeing shared meanings even when using the same words. Observing the common complaint between different generations that they 'just don't speak the same language', Williams defined this as referencing different kinds of valuations between different groups using the same words, resulting in 'a certain strangeness and unease', a process he described as 'central in the development of a language when, in certain words, tones, and rhythms, meanings are offered, felt for, tested, confirmed, asserted, qualifies, changed.'²² In trying to define any word, Williams warned, a range of current and historical meanings can be located, giving a breadth of options within and beyond the range of the 'proper meaning':

We find a history and complexity of meanings; conscious changes, or consciously different uses; innovation, obsolescence, specialization, extension, overlap, transfer; or changes which are masked by a nominal continuity so that words which seems to have been there for centuries, with continuous general meanings, have come to express radically different or radically variable, yet sometimes hardly noticed, meanings and implications of such meanings.²³

Extending such complexities to prose, literary critic William Empson proposed in *Seven Types of Ambiguity* that '[i]n a sufficiently extended sense any prose statement could be called ambiguous. In the first place it can be analysed.'²⁴

Describing analysis itself as proceeding from the poetic to the prosaic, from intuitive to intellectual knowledge - a description which may equally apply to the translation of any architectural intention into technical communications - the process towards prosaic knowledge was summarized by Empson as a desire to:

put the thing known into a coherent structure [...] Thus a poetical word is a thing conceived in itself and includes all its meanings; a

²² Raymond Williams, *Keywords: A Vocabulary of Culture and Society* (London: Fontana: Croom Helm, 1976), pp.11-12.

²³ *Ibid.*, p.17.

²⁴ William Empson, *Seven Types of Ambiguity*, Third edn (London Chatto and Windus, 1977), p.1.

prosaic word is flat and useful and might have been used differently.²⁵

In applauding understandings which may emerge through prosaic description, Empson warned against assuming that the translation from poetic to prose assures clarity or effectiveness:

Thus, in finding several words to convey the mode of action of a single word in a poem, I do not, of course, claim that the new words are any more simple in their action than the old one [...] ²⁶

That is, one poetic word may more precisely convey 'all the meanings' than several sentences of prose. Applying this observation directly to the term 'ambiguity', Empson provided several definitions:

'Ambiguity' itself can mean an indecision as to what you mean, an intention to mean several things, a probability that one or other or both of two things has been meant, and the fact that a statement has several meanings.²⁷

Furthering these extended definitions, Empson highlighted a respect for an ambiguity 'in so far as [it] sustains intricacy, delicacy, or compression of thought, or is an opportunism devoted to saying quickly what the reader already understands' - that is, in communicating a complex idea effectively.²⁸ In suggesting that 'ambiguity is not to be respected in so far as it is due to weakness or thinness of thought, [or] obscures the matter in hand unnecessarily,'²⁹ Empson's definition aligned with the architectural profession's rationale for avoiding ambiguity, but also challenges assumptions that *all* uses of ambiguity engender uncertainty, arguing instead that ambiguity may in fact be more effective in conveying rich and complex ideas. The framing of ambiguity as a positive characteristic was similarly explored in anthropologist Mary Douglas's *Purity and Danger*.

Defining an ambiguity as a character of statements capable of two interpretations, and an anomaly as an element which does not fit a given set or series, Douglas proposed that in practice, there is little difference.³⁰ Referencing Satres's writings on

²⁵ Ibid., p. 252.

²⁶ Ibid., p. 250.

²⁷ Ibid., pp.5-6.

²⁸ Ibid., p.160.

²⁹ Ibid., p.160.

³⁰ Treacle, as the cited example, is described by Douglas as neither liquid nor solid; an ambiguous sense-sensation, and an anomaly of liquid or solid. Mary Douglas, *Purity and*

Slickness, Douglas noted that unpleasant encounters with ambiguous substances may “confirm our confidence in the main classifications’,³¹ that is, provide the security of certainty. Ambiguity, Douglas wrote, is linked with primitiveness and disorder, yet we are still aware that ambiguity is inevitable and unavoidable. ‘From these earliest tactile adventures’, Douglas concluded, ‘we have always known that life does not conform to our most simple categories’,³² an observation shared by philosopher Isaiah Berlin.

Any attempts to unequivocally describe, order and categorize the ‘vague, rich texture of the real world’³³ is, Berlin suggested, doomed to disappoint. Berlin’s *The Hedgehog and the Fox* analysed Leo Tolstoy’s descriptions of history as:

a thick, opaque, inextricably complex web of web of events, objects, characteristics, connected and divided by literally innumerable unidentifiable links - and gaps and sudden discontinuities too, visible and invisible. It is a view of reality which makes all clear, logical and scientific constructions - the well-defined, symmetrical patterns of human reason - seem smooth, thin, empty, ‘abstract’ and totally ineffective as a means either of description or of analysis of anything that lives, or had ever lived.³⁴

Berlin highlighted crucial differences between the measurable and the impalpable, suggesting that it is in the frontier between these fields where the most violent clashes occur.³⁵ ‘Better, surely, not to pretend to calculate the incalculable’³⁶ he advised, advice at odds with almost all demands for unambiguous communications within architectural production, a demand which appears, according to Berlin’s definitions, not only impossible to achieve, but at odds with the nature of architecture itself as it attempts to creatively pursue the richness of lived

danger: an analysis of concept of pollution and taboo (London; New York: Routledge, 1966), p.37.

³¹ Douglas, p.38

³² *Ibid.*, p.38.

³³ Isaiah Berlin, *The Hedgehog and the Fox: An Essay on Tolstoy's View of History* (Chicago: Elephant Paperbacks, 1993), p.74, which analyses Leo Tolstoy’s view of history through *War and Peace*. My thanks to David Kohn for recommending this text during an interview regarding Caruso St John’s Museum of Childhood (see Ch.8).

³⁴ ‘The quarrel between these rival types of knowledge - that which results from methodological inquiry, and the more impalpable kind that consists in the ‘sense of reality’, in ‘wisdom’ - is very old. And the claims of both have generally been recognized to have some validity: the bitterest clashes have been concerned with the precise line which marks the frontier between their territories.’ Berlin, p.77.

³⁵ Analysing Leo Tolstoy’s descriptions of battlefields in *War and Peace*, Berlin observed that the orderly and rationalized account of what was expected to occur in the battlefield bore little resemblance to the actual events as they played out in the field.’ Berlin, p.30.

³⁶ Berlin, p.77.

experience. In *Phenomenology of Perception*, Maurice Merleau-Ponty challenged the primacy of scientific points of view in claiming to represent lived experience;

The entire universe of science is constructed upon the lived world, and if we wish to think science rigorously, to appreciate precisely its sense and scope, we must first awaken that experience of the world of which science is the second-order expression. Science neither has, nor will ever have the same ontological sense as the perceived world for the simple reason that science is a determination or an explanation of that world. [...] To return to the things themselves is to return to this world prior to knowledge, of which knowledge always *speaks*, and this world with regard to which every scientific determination is abstract, signitive, and dependent, just like geography with regard to the landscape where we first learned what a forest, a meadow, or a river is.³⁷

To represent reality is to be uncertain, Merleau-Ponty proposed, rejecting science as a source of 'absolute truth' and arguing the impossibility of ever achieving more than abstraction through scientific description. Fears that scientific analysis will abstract, cut off and remove the ambiguous richness of real life were framed in a more positive light by Pierre Bourdieu's challenge to the refusal of scientific analysis of literature. 'Why such insistence', Bourdieu queried in *The Rules of Art*:

on conferring upon the work of art – and upon the understanding it calls for – this *status of exception*, if not in order to stamp with prejudicial discredit the (necessarily laborious and imperfect) attempts of those who would submit these products of human action to the ordinary treatment of ordinary science, and thereby assert the (spiritual) transcendence of those who know how to *recognize* that transcendence?³⁸

Bourdieu acknowledged fears ascribed to science that in 'putting the love of art under its scalpel, might succeed in killing pleasure, and that, capable of delivering understanding, it may be unable to convey feeling',³⁹ arguing that scientific analysis can intensify an understanding and thus the ability to approach the artwork:

That is why scientific analysis, when it is able to uncover what makes the work of art necessary, that is to say, its informing formula, its generative principle, its *raison d'être*, also furnishes

³⁷ Maurice Merleau-Ponty, *Phenomenology of Perception* (Abingdon, Oxon: Routledge, 2012), p.lxxii.

³⁸ Pierre Bourdieu, *The rules of art: genesis and structure of the literary field* (Cambridge, Polity: 1996), p. xiv-xv.

³⁹ *Ibid.*, p. xvi.

artistic experience, and the pleasure which accompanies it, with its best justification, its richest nourishment.⁴⁰

Reconciling analysis with poetry, Italo Calvino began his essay 'Exactitude' by stating that 'the poet of vagueness can only be the poet of exactitude, who is able to grasp the subtlest sensations with eyes and ears and quick, unerring hands'.⁴¹ Giving a definition of 'exactitude' as 'a language as precise as possible both in choice of words and in expression of the subtleties of thought and imagination',⁴² Calvino challenged Giacomo Leopardi's assertion that 'the more vague and imprecise language is, the more poetic it becomes'⁴³ by analysing Leopardi's *Zilbadone* to demonstrate the:

exact and meticulous attention to the composition of each image, to the minute definition of details, to the choice of objects, to the lighting and the atmosphere, all in order to attain the desired degree of vagueness.⁴⁴

Arguing that exactitude is necessary to convey rich vagueness, Calvino concluded that 'the proper use of language, for me personally, is one that enables us to approach things (present or absent) with discretion, attention, and caution, with respect for what things (present or absent) communicate without words.'⁴⁵

The dual definitions of precision as exactitude, or as abstraction, and the proposals reviewed here which variously argue that no text can ever be unambiguous, that the complex richness of life cannot be captured, that scientific understanding may be vital in approaching deeper understanding, that poetry and vagueness may be attained through exactitude - begin to outline a framework for a closer reading of the expectations placed upon precision by the contrasting languages of the architectural profession identified in Part A. In the next chapter, recommendations for certainty in architectural production, as set out by regulatory and advisory bodies, are examined alongside architectural theories which consider the consequences, challenges, and potentialities of the pursuit of certainty through precision in architectural production.

⁴⁰ Ibid., p. xvii.

⁴¹ Italo Calvino, *Six Memos for the Next Millennium*, trans. by Patrick Creagh (London: Vintage, 1996) p.60.

⁴² Ibid., p.56.

⁴³ Calvino continues, 'I might mention in passing that as far as I know Italian is the only language in which the word vago (vague) also means "lovely, attractive." Starting from the original meaning of "wandering," the word vago still carries an idea of movement and mutability, which in Italian is associated both with uncertainty and indefiniteness and with gracefulness and pleasure'. Ibid., p.xvii.

⁴⁴ Ibid., p.xvii.

⁴⁵ Ibid., p.xvii.

5. Interpreting precision in architectural production

Contemporary architects are regularly urged by regulatory bodies, professional affiliations, practice journals, manufacturers and insurance bodies to promise certainty through precise instructions. The architect's instructions should, it is repeatedly and explicitly advised, predict all details in advance of construction. As Ch.3 highlighted, Francis Hall stated in *The Architects' Journal* in 1994:

The one certain opportunity available to an architect to set down a definitive and enforceable expression of standard and quality is by way of a properly drafted specification. If this is done, there is understanding and certainty all round. If it is not, there is often disagreement and disappointment.¹

Hall was unequivocal here; the written specification, properly drafted, was framed as the *one certain opportunity* to achieve expected standards. Yet the ability of any communications to ever be so precise as to be unambiguous, challenged by literary critics, sociologists and philosophers as discussed in Ch. 4, have been similarly challenged by architectural practitioners and theorists.

This chapter begins with a review of the types of recommendations which are typically offered to architectural practice by late twentieth and early twenty-first century UK and USA based practice manuals and journals.² The underlying cultural assumptions and the wider implications of these recommendations are then considered through a review of critical writings by contemporaneous architectural practitioners and theorists, including Dalibor Vesely, Alberto Pérez-Gómez, Louise Pelletier, Juhani Pallasmaa, Manfredo Tafuri, Kenneth Frampton, Jeremy Till, Jonathan Hill and Francesca Hughes. The promise of the architectural detail as a guarantor of certainty is questioned through writings by Edward Ford, Marco Frascari, Michael Cadwell, Nader Tehrani, and David Leatherbarrow. Paul Emmons and Katie Lloyd Thomas offer expanded readings of the cultural traces to be found within purportedly neutral and abstract communications and production processes. Progressing onto the act of construction itself, idealizations of perfectly ordered construction sites are challenged by Katherine Shonfield, Darren Thiel, Kate Ness

¹ Hall, p.38.

² As the four detail case studies are based in the UK and USA, from 1851 to 2006, the review in this chapter focuses on USA and UK practice journals from the late twentieth century to early twentieth century; Ch. 6 reviews histories from Classical Greece to mid twentieth century. Ch. 11 will consider developments since 2006, particularly related to claims of certainty related to Building Information Modelling (BIM).

and Stephen Groák. Finally, alternative approaches to the desire for certainty are considered through writings by Donald Schön, Dana Cuff, Howard Davis, Richard Sennett, and David Pye. In theorizing the daily processes of architectural practice from conceptual framework, through drawn detail, written specification, construction, and ending with a consideration of alternative strategies, the critiques reviewed here urgently highlight the implications of processes predicated upon exact and unambiguous methods of architectural production.

5.1 'The objective must be certainty'

'The objective', Hall had emphasised in his 1994 article, 'must be certainty.'³ As also introduced in Ch. 3, Jack Bowyer had similarly asserted in *Practical Specification Writing* that a 'specification writer must be:

- (a) Clear as to exactly what the architect has in mind when he prepared or issued the detail drawings for the project;
- (b) able to express the architect's requirements in clear, technical and precise written form, free from any ambiguity.⁴

Referring to detailed dimensioning systems in the USA publication *The Professional Practice of Architectural Detailing*, Osama A. Wakita and Richard M. Linde warned that the term 'approximately' is to be avoided because it is 'ambiguous and thus has no place in architecture.'⁵ Expectations that communications are to provide certainty can account for the exponential growth of communications from a single page illustrated contract of 1340 as described by Franklin Toker,⁶ to the hundreds of drawings, specifications, contracts, letters, faxes, and emails which now accompany any architectural project.⁷ In the *Architectural Record* in 1995, Robert Spencer Barnett suggested that the impetus behind this growth is fear, stating, '[e]ver-fatter project manuals are often driven by architects' fear that the slightest defect or omission may expose the specifier to liability.'⁸ Increased communications cannot in

³ Ibid., p.38.

⁴ Bowyer, p.11.

⁵ 'The term approximately is seldom used but it is necessary when the precise dimension is not known [sic]. It should be avoided because it is ambiguous and thus has no place in architecture.' Osama A. Wakita, and Richard M. Linde, *The Professional Practice of Architectural Detailing*, 3rd edn. (New York: Wiley, c1999), p.54.

⁶ See Franklin Toker, 'Gothic Architecture by Remote Control: An Illustrated Building Contract of 1340', *The Art Bulletin*, 67 (1985), 67-95.

⁷ For example, as Ch.10 will discuss, the specification for a ceiling detail alone at OMA's McCormick Tribune Campus Centre was six pages.

⁸ Robert Spencer Barnett, 'Choosing our words carefully', *Architectural Record*, 183.6 (June 1995), 32.

themselves provide the reassurance of the certainty of a lack of errors, as Walter Rosenfeld inadvertently demonstrated in *Progressive Architecture*:

No architect [sic] or specifier can realistically claim to produce perfect work, and contract documents are rarely without some omission, discrepancy, or some other flaw (alas), though perfection is certainly the goal.⁹

The specifier is, after all, only human; omissions, discrepancies, and errors are inevitable. This inevitability is not eased by a prevailing contractual culture in the UK which frequently cites a lack of precision in communications when disputes arise on site. *NBS* quote a 1994 *RIBA Journal* article which reported that 'poor specifications are the underlying cause for over 25% of architects' Professional Indemnity insurance.'¹⁰ Any error, omission or ambiguity in the specification may be seized upon as ammunition in a dispute; yet every specification inevitably contains errors, omissions and ambiguities. Even Harold Reeve Sleepers' exhaustive effort to provide a comprehensive set of clear guidelines for USA specification writers in the 1940 *Architectural Specifications* might, he admitted, contain errors:

No claim to perfection can be made, and there may be errors of omission and commission. It is the author's hope that, as these are found, they will be brought to his attention so that they may be corrected in future editions. Checking, correcting, re-checking and editing might well consume another year, and still inaccuracies and deficiencies might be found.¹¹

No matter how perfect or comprehensive a set of instructions may claim to be, they cannot ever be comprehensive enough.¹² 'Architects involved in quality work find that there are never enough drawings, nor enough details drawn,'¹³ Wakita and Linde acknowledged. Quality work - as opposed, perhaps, to standard work - is implied here as requiring something more than even the most precise of instructions may promise, opening up the possibility that, to convey an architectural intention,

⁹ Walter Rosenfeld 'Specifications: Killer clauses', *Progressive Architecture*, 72:2 (Feb 1991), 47.

¹⁰ <http://www.thenbs.com/products/nbsBuilding/index.asp> [accessed 8 May 2011]

¹¹ Sleeper's self-described aim was that of creating ready-made specification forms to ensure that the actual work of compiling a specification would be 'a simple and orderly process which could be safely and expeditiously performed under stress'. Harold Reeve Sleeper, *Architectural Specifications* (New York, London: J. Wiley & Sons, inc Chapman & Hall, limited, 1940), pp. vii-viii.

¹² A 2005 AIA article also reminded readers that 'the architects drawings cannot be used for construction', in that they only 'represent information sufficient for the contractor to begin 'the contractors's required work'. James B. Atkins and Grant A. Simpson, 'Drawing the Line', *AIArchitect* (5 September 2005).

¹³ Wakita and Linde, p.vi.

something *more* than precise instructions may be required, as proposed by numerous theoretical reviews of the processes of architectural production.

5.2 Theorizing architectural production

In *Architecture in the Age of Divided Representation*, Dalibor Vesely observed that the gap between theory and practice may be misleading, and that the daily pragmatics of practice may have more to offer than assumed. Architectural practice, Vesely proposed:

is not always practical; in fact, it is more often theoretical. We need only look at the nature of a typical brief or program, the criteria of design, and the conditions of its execution to grasp this elementary truth.¹⁴

A discrepancy, Vesely argued, between concept and construction is not only inevitable, but critical. 'From everyday experience', Vesely highlighted:

we know how wide the gap is between the best possible delineation of a project and the built result. The real intention is most often present in the margin between the design and what is explicitly specified. Each project rests on a network of communication that involves the silent language of craftsmanship and skills, drawings, sketches, and other visual representations as well as verbal descriptions and instructions.'¹⁵

In drawing attention to the significance of a 'gap' between a design intention and the explicit specification, Vesely highlighted the impossibility of ever fully describing any design intention, and challenged the implications of any system which claims to do so. Arguing that attempts to reduce design and building to 'that which can be specified *a priori*' are deeply problematic, Vesely stated that '[i]nstrumental thinking tends to impose its hegemony by creating a world that it can truly control.'¹⁶ In attempting to exactly describe design, the essence and richness of the space - qualities which cannot be clearly quantitatively described – must by necessity be cut out,¹⁷ omitting the:

¹⁴ Vesely, *Divided Representation*, p.12.

¹⁵ *Ibid.*, p.44.

¹⁶ Dalibor Vesely 'Architecture and the Question of Technology' in *Architecture, ethics, and technology* ed. by Louise Pelletier and Alberto Perez Gomez (Montreal: McGill-Queen's University Press, 1994), pp. 28-49 (p.31).

¹⁷ This references pre-seventeenth century definitions of precision as separation, abstraction, cut-off, as discussed in Ch. 4.

plenitude and simultaneous presence of everything that is visible in the space - these are some of the elements (phenomena) that cannot be directly represented and yet constitute the very essence of any particular space.¹⁸

One of the primary difficulties faced by a contemporary architectural profession, Vesely proposed, is its present inability to 'discuss technological problems from a non-instrumental point of view.'¹⁹ Instrumental language, in denying the ambiguity of poetic content, was described here as threatening to create, perpetuate and protect an instrumental world. Similarly, in *Architectural Representation and the Perspectival Hinge*, Alberto Pérez-Gómez and Louise Pelletier summarised expectations typically placed upon construction drawings within the architectural profession. Noting that '[a]rchitectural conception and realisation usually assume a one-to-one correspondence between the represented idea and the final building', Pérez-Gómez and Pelletier wrote:

They are expected to be absolutely unambiguous to avoid possible (mis)interpretations, as well as functioning as efficient neutral instruments devoid of inherent value other than their capacity for accurate transcription. Professional architects generally see architectural drawing in this light.²⁰

In highlighting 'value', Pérez-Gómez and Pelletier highlighted the conflict architects face when translating architectural intentions into precise technical language. Precision in technical architectural communications may purport to offer certainty; but 'neutral instruments devoid of inherent value' struggle to convey the complexities of spatial, poetic, tactile, cultural, historical, contextual and experiential concepts which underlie any architectural intention:

The poetical content of reality, the *a priori* of the world, which is the ultimate frame of reference for any truly meaningful architecture, is hidden beneath a thick layer of formal explanations. Because positivistic thought has made it a point to exclude mystery and poetry, contemporary man lives with the illusion of the infinite power of reason.²¹

¹⁸ Vesely, *Divided Representation*, p.44.

¹⁹ *Ibid.*, pp.30-31.

²⁰ Alberto Pérez-Gómez and Louise Pelletier, *Architectural Representation and the Perspective Hinge* (Cambridge, Mass: MIT Press, 1997), p. 3.

²¹ Alberto Pérez-Gómez, *Architecture and the Crisis of Modern Science* (Cambridge, Mass; London: MIT Press, 1983), p.6.

The 'richness and ambiguity of symbolic thought',²² Pérez-Gómez contended, is filtered out of the language of architectural production, with significant implications for the resultant built environment.

In *The Eyes of the Skin*, Juhani Pallasmaa challenged the 'abstracting and universalizing impact of technological rationality'²³ present throughout forces and patterns of management, organisation and production. 'Architectural space', Pallasmaa wrote, 'is lived space rather than physical space, and lived space always transcends geometry and measurability.'²⁴ Rejecting the 'focused vision' and 'conscious intentionality' of perspectival representation, Pallasmaa argued for the 'absent minded and unfocused'²⁵ gaze of bodily experience, of 'pre-verbal meanings of the world, meanings that are incorporated and lived rather than simply intellectually understood.'²⁶ This urged an approach which permits the rich ambiguities of a phenomenological approach to the built environment, which seeks to maintain or restore the primacy of the senses and of direct experience. Ambiguity is framed positively in this argument as permitting and reflecting the richness of lived experience. Arguing for ambiguity in architecture, Manfredo Tafuri proposed:

The success of all the poetics of *ambiguity*, in architecture as well as in urban design, is due, in fact, to the following reason: those who propose ambiguity, complexity and contradiction as communicative and formative materials of architectural and urban experience, know they are employing real conditions, know that they are making explicit something felt, more or less confusedly, by everyone. In a certain sense, history has a tendency to become ambiguous. Offering no certainties, history seems to offer itself as a mere collection of facts and things that wait to be given a meaning, in their turn, by each successive planning choice.²⁷

Tafuri rejected architectural criticism's simplification of the ambiguities and complexities of architectural history into ordered abstractions which present an analysis of architectural history as instrumentalizable. Criticism, Tafuri proposed, 'sets limitations to the ambiguity of architecture.'²⁸ Presenting architectural histories as ordered, rationalized and certain engenders idealizations that architectural

²² Ibid.

²³ Juhani Pallasmaa, *The Eyes of the Skin: Architecture and the Senses* (Chichester, John Wiley & Sons, 2005), p.39.

²⁴ Pallasmaa, p.64.

²⁵ Ibid., p.46.

²⁶ Ibid., p.25.

²⁷ Manfredo Tafuri, *Theories and History of Architecture* (London: Granada Publishing Limited, 1980), p.231.

²⁸ Ibid., p.231.

proposals must be similarly ordered, rationalised and certain, limiting the potential of such propositions to be open to the rich ambiguities of lived experience.

Kenneth Frampton's *Studies in Tectonic Culture* asserted the expressive potential of the tectonic. Writing that the 'full tectonic potential of any building stems from its capacity to articulate both the poetic and the cognitive aspects of its substance', Frampton asserted the primacy of the detail over the 'gratuitously figurative' overall image of a project, arguing that:

Everything turns as much on exactly how something is realised as on an overt manifestation of its form. This is not to deny spatial ingenuity but rather to heighten its character through precise realisation.²⁹

Building, Frampton concluded in his opening essay, 'is as much about the topos as it is about technique', listing the contradictory ambiguities of the role of building: neither high art, nor high technology, bringing together place-making, time, space and form, consummated by weathering forces, yet transcending mortality, it had, he concluded, 'everything to do with the unsayable.'³⁰

'One might think that an abstracted world can be ordered, beautiful and perfected' Jeremy Till, refuting the abstracted autonomy of architecture, observed in *Architecture Depends*, 'but in the end the real will come back to bite you.'³¹

Observing that, from Vitruvius' *Ten Books* onwards, architecture has been identified as 'an act of imposing order, of taking the unruly and making it coherent',³² Till cited philosopher Zygmund Bauman's definition of order:

The struggle of order is not a fight of one definition against another, of one way of articulating reality against a competitive proposal. It is a fight of determination against ambiguity, of semantic precision against ambivalence, of transparency against obscurity, clarity against fuzziness.³³

The determination in architecture to impose order and control is not only challenged by the actualities of ambiguity, ambivalence, and fuzziness in lived experience, but,

²⁹ Kenneth Frampton, *Studies in Tectonic Culture: The Poetics of Construction in Nineteenth and Twentieth Century Architecture* (Cambridge, Mass: MIT Press, 1995), p.26.

³⁰ *Ibid.*, p.27.

³¹ Jeremy Till, *Architecture Depends* (Cambridge, Mass: MIT Press, c2009), p.25.

³² *Ibid.*

³³ Zygmunt Bauman, *Modernity and Ambivalence* (Cambridge: Polity Press, 1991), pp.6-7. Referenced by Till, p.34.

Till highlighted, is particularly exposed in architectural practice, to the uncertainties of varied methodologies and dependences:

[a]n architect has neither the luxury of solitude, nor the precision of standard methods, nor [...] the comfort of a stable epistemology. Architecture is dependent upon others at every stage of its journey from initial sketch to inhabitation.³⁴

Jonathan Hill's *The Illegal Architect* located the desire for control within the act of drawing. 'The drawing is the principal language of mediation between the architect and the builder', Hill summarised:

Therefore, architects can only control what they can represent in words or images. For architects, the gap between the drawing and the building is an uncomfortable truth to be forcefully denied because it threatens their authority over architecture.³⁵

Referencing Barthes's *Death of the Author*,³⁶ Hill highlighted Barthes's rejection of 'the belief that an image, word or object is the carrier of a fixed message determined by the author', and argued that 'Barthes recognises that a profusion of ambiguities and interpretations inhabit the gap between writing and reading', a gap which Hill aligns with the gap in architecture between architect and user. Hill identified the architectural drawing and 'other means by which the architect denies or claims to control the user'³⁷ as a fetish. Expanding this observation to architects' appropriations of 'forms of experience more manageable and limited than the ones evident in the everyday occupation of architecture',³⁸ Hill cited architecture's appropriation of the scientific management of labour as an example of architecture's reliance upon determinable predictability in its production.

The professionalised drive to maintain control despite such dependencies by recourse to ever increasing precision in architectural communications was identified as a 'fetishization' by Francesca Hughes in *The Architecture of Error*. Noting that the degree of precision employed in contemporary CAD software - 'in which we

³⁴ Till, p.45.

³⁵ Jonathan Hill, *The Illegal Architect* (London: Black Dog Publishing Limited and the author, 1998), p.20.

³⁶ In Barthes, *Image, Music Text* (London, Fontana Press, 1977). See Ch.4 of this thesis.

³⁷ *Ibid.*, p.20.

³⁸ *Ibid.*, p.22.

draw brick walls (which we know will be built on muddy sites, by workers wearing thick gloves) to six decimal places,³⁹ Hughes observed:

[t]he wall drawn to several decimal places is an extraordinary methodological absurdity that, nonetheless, strangely does not seem to embarrass us. Quite the contrary - we exult in its exactitude. We ignore the false economy it exposes - the degree of precision employed far exceeds what is needed or could ever be enforced. But precision beyond all reason clearly predates the digital [...]⁴⁰

Hughes questioned the function of precision in architecture. How much of it, she challenged, 'is actually about controlling error', rather than some 'undeclared imperative' which drives this fetishization?⁴¹ Analysing precision in architecture through the lens of arts practices, scientific experimentation and philosophical discourse,⁴² Hughes reviewed the working practices of practitioners in the visual arts, including Barbara Hepworth and Gordon Matta Clark, as exploring 'the generative possibility of error as they deploy precision critically.'⁴³ These methodologies, Hughes argued, reveal a 'resistance to redundant precision with an intimacy with the medium they are working in.'⁴⁴ Direct engagement with materiality results in a specific mode of working in which the material directs the visual artist practitioners into unanticipated diversions. 'They know', Hughes concluded, 'how to direct *and* how to listen.'⁴⁵ Hughes interpreted the methodological absurdity of the desire for precision in architectural communications - the drawing and the specification - as the architect's means of substituting direct engagement with materiality and the matter of construction.

³⁹ Francesca Hughes, *The Architecture of Error: Matter, Measure and the Misadventures of Precision* (Cambridge, Mass: London, England: The MIT Press, 2014), p.5.

⁴⁰ *Ibid.*, p.5.

⁴¹ *Ibid.*, p.5.

⁴² Robert Hooke, Ivan Sutherland, Aristotle, Barbara Hepworth, Gordon Matta-Clark, Schrodinger, Georges Perec and Ludwig Wittgenstein are amongst the sources analyzed. Hughes' analysis specifically avoids 'any necessarily dumb prescription by which [an architectural] practice might operate critically within a critical economy of precision and error.' This would, she notes, need to evolve 'within the particular logic of each practice, and the potential configurations of this are therefore (I hope) as numerous as practice is diverse. I do not wish to shut down material imagination. Accordingly, rather than refer to specific contemporary projects, I have addressed instead more generalized ways of working in architectural practice and production: the language we employ in our accounts of form-finding; the differing precision roles we assign to different drawings types in the tracing of process; the application to technology's constructed neutrality in the face of the cultural indeterminacy that both riddles and makes a riddle of our epistemologies.' *Ibid.*, p. 11.

⁴³ *Ibid.*, p.11.

⁴⁴ *Ibid.*, p.12.

⁴⁵ *Ibid.*, p.12.

Writing of methodological overlaps between art, architecture and science, Ole. W. Fischer identified the 'continued search for technical perfection in design, the production process, and the product, a command of materials, technology, constructional detail and technical equipment - to such a point that the means used "vanish" from the viewer's perception.'⁴⁶ Questioning the dimensional limits of precision in architecture, Costano Caciagli argued in 'On Precision in Architecture', that 'the term "precision", in the sense of "respect for order and exactness", says everything and nothing.'⁴⁷ To deal with precision in a clear manner in architecture, Caciagli advised recalling the concept and function of drawings as:

Intellectual products that are dependent on visual perception, they are a foundation for the arts of form and for mimetic, symbolical and analogical languages. Historically, drawings would not have had the capacity for representing a synthesis of the operative, mnemonic and creative realities, had they not been flexible, being at any given time art. Technology, message, model, project, or all of these together.

'Architects do not build buildings', David Leatherbarrow wrote: 'they make drawings and models; at least that is what most do most of the time in most contemporary practices',⁴⁸ The severing of the architect from direct knowledge of materials was examined in detail in Leatherbarrow's *Uncommon Ground*. Leatherbarrow highlighted as 'the canon of our time'⁴⁹ the fact that most of the materials which architects will employ in architectural design have been pre-manufactured. Although the standardised details of pre-manufactured components may be aimed at assuring certainty within design and construction, Leatherbarrow urgently questioned the implications upon creative potential if architect, builder, and even supplier cannot sustain an intimate, embodied understanding of the pre-manufactured systems from which they create architectural form. 'When architects specify more and more premade products', Leatherbarrow observed:

creative thinking in construction becomes less and less likely as builders become more and more guarded [...] Nor would a professionally responsible architect be willing to approve an improvisation. The working of one component depends upon the working of others with which it is connected in the functioning of a

⁴⁶ Ole. W. Fischer 'Precisions on "Precisions" - Architecture, Art and Science?' in *Precisions: Architektur zwischen Wissenschaft und Kunst = architecture between sciences and the arts* ed. by Ákos Moravánsky and Ole. W. Fischer (Berlin: Jovis Verlag, 2008).

⁴⁷ Costantino Caciagli, 'On Precision in Architecture', *Nexus Network Journal*, 3 (2001), 11-15, p.11.

⁴⁸ Leatherbarrow, p.25.

⁴⁹ *Ibid.*, p.126.

system; which is itself often too complex for anyone on the site, or the architect, to understand.’⁵⁰

The inability of architect or builder to deviate from systematised prefabricated products denies, Leatherbarrow argued, invention, originality, and particularity:⁵¹ qualities which, as reviewed in Ch. 3, are applauded by the architectural profession as defining architectural quality, yet are challenged by objectives of certainty⁵² in daily professional practice. The certainty and control promised by precise means of architectural production are simultaneously desired and rejected by the architectural profession; ambiguity and deviation are simultaneously feared and applauded. Even the most inventive, original, *non-standard* architectural work is charged with promising certainty throughout each stage of its production, an expectation which is first focused on viewing the architectural detail as an instrument of control.

5.3 Ambiguities in precise architectural communications

‘[T]he use of a detail’, Wakita and Linde warned in *The Professional Practice of Architectural detailing*, ‘is the *only way* an architect or designer can have complete control over the appearance of the building and mastery over the final assembly.’⁵³ The belief that detailing can, and must, promise complete control and mastery was not always thus. ‘In one sense’, Edward Ford noted in highlighting the emergence of the detail as an instrument of control, ‘detailing was born when craftsmanship died.’⁵⁴ Noting the regularity of variations between Renaissance drawings and their constructed results - for which Ford assumes the ‘men who executed them had a fair degree of latitude in their adaptation of the design’⁵⁵ - Ford then compared the assumptions made by a set of architectural instructions drawn up in 1879:

the architect, Richard Norman Shaw, specified that “the space between the timbers be varied slightly in width,” and that the width of the boards be varied also. Shaw was obviously trying to achieve the imprecise look of a vernacular half-timbered house. The irony,

⁵⁰ Ibid., p.125.

⁵¹ Ibid., p.123.

⁵² Hall, p.38.

⁵³ Wakita and Linde, p.50.

⁵⁴ Ford acknowledged that details he re-presented in his volume, based as they were on construction drawings, were ‘subject to a certain degree of error, as these documents were sometimes departed from during construction, a truism familiar to any architect in practice. Ford, p.7.

⁵⁵ Ibid., p.7.

of course, is that he had to specify precisely how this imprecision was to be achieved, rather than leaving it to chance.⁵⁶

Ford highlighted here the emergence of the architectural detail as an attempt to precisely control the production of craftwork, regardless of whether the work itself was to be physically precise or imprecise. This interpretation defined the objective underpinning Shaw's detail as being complete control of the production of the work in advance of construction.

Marco Frascari's historical review of the role of the architectural detail in *The Tell the Tale Detail* similarly highlighted an instrumental shift in the role of the detail, from that of ordering an overall composition through which the builder could infer the whole from a few indicative details, working in a context of shared and common knowledge. First defining the role of the detail as generative in containing the possibilities of 'innovation and invention' and as expressing the process of signification, 'that is, the attachment of meaning to man-produced objects',⁵⁷ Frascari located the detail as bringing together the 'construction' and the 'construing' of architecture:

Elusive in a traditional dimensional definition, the architectural detail can be defined as the union of construction, the result of a logos of techne, with construing, the result of the techne of logos.⁵⁸

Frascari's historical review of the 'concept of details in different levels of architectural production' highlights the seminal shift brought about by the development of an industrial and economically motivated society, through which the detail was defined as a production drawing, a sense captured in Frascari's citation:

A French glossary was even more precise in this understanding of detail: "Detail: Specification or description of the work to be performed in the execution of a building."⁵⁹

Locating this definition within a context in which this common knowledge had been lost, and in which the detail thus assumed the role of 'verbal and graphic means for controlling the work of variable crews of vocationless workers who are unprepared

⁵⁶ Ibid., p.7.

⁵⁷ Marco Frascari, 'The Tell-the-Tale detail' in *Theorizing a New Agenda for Architecture: an anthology of architectural theory 1965-1995*, ed. by Kate Nesbitt (New York: Princeton Architectural Press, 1996), 500-514 (p.501).

⁵⁸ Ibid., p.500.

⁵⁹ Ibid., p.503.

for their own jobs and possibly even financially dishonest,⁶⁰ Frascari highlighted here a culture of distrust and lack of shared knowledge anticipated by recommendations for precise architectural drawings as instruments of control.

In the preface to Michael Cadwell's *Strange Details*, Nader Tehrani proposed that the demand for certainty in the final built result, rather than offering control, in fact disengages the architect from matters of production:

The architect is charged with the design; the builder is responsible for the means and methods of its construction - as long as it remains faithful to "design intent".⁶¹

This 'legal position' purporting to act as a 'guarantor of design implementation' both, Tehrani proposed, disempowers the architect and presents theoretical problems:

It further problematizes the relationship between design intent and material construction by not offering a mechanism of control to determine the degree of association between them; this often happens through performance specifications, substitutions, and additional alternatives that are woven into contracts - as if to suggest that any detail or any material will suffice, so long as the general effect is delivered.⁶²

'Severing the architect', Tehrani argued, 'from the means and methods of construction is somewhat like permitting the writer to use a certain vocabulary, but disassociating it from the very alphabet from which the text emerges.' Separation of architectural intent from the actual processes of production privileges, Tehrani argued, the 'image and its rhetoric' over the constructive method.⁶³

How can one not, for instance, differentiate between a cast-in-place concrete wall and a precast one, without simultaneously broaching significant material and philosophical questions?⁶⁴

Tehrani highlighted here a core challenge which any communication purporting to offer certainty through precision must acknowledge. Returning to previous discussions of precision as a process of cutting off or editing, and Berlin's dismissal of scientific description as ineffective in describing the 'vague, rich texture of the real

⁶⁰ Ibid., p.503.

⁶¹ Nader Tehrani, 'Foreword- A murder in the court', in Michael Cadwell, *Strange Details* (Cambridge, Massachusetts: London, England: The MIT Press, 2007), pp. vii-xii (p.ix).

⁶² Tehrani, p. ix.

⁶³ Ibid.

⁶⁴ Ibid.

world',⁶⁵ Tehrani's reminder of the ambiguities of philosophical questions which remain embedded within any architectural communication were highlighted in Paul Emmons's forensic examinations of *Architectural Graphic Standards*. Challenging the manual's self-assertion that it 'contained only factual information, "purposely devoid of aesthetic expression"⁶⁶ Emmons instead located cultural signifiers embedded throughout the manual's graphic diagrams:

Diagrams, even those purporting to be objective, are inevitably culturally influenced. The "Motor vehicle Data" plate in the first edition of *Graphic Standards* shows cars in silhouette to emphasize their dimensions and downplay their conspicuous style. These orthographic shadows were intended to reveal the facts but not the ornament of the car. [...] Yet the contours reveal and even highlight the car's style.⁶⁷

Despite all attempts to achieve unambiguous and neutral communications, diagrams, Emmons concluded, 'like history, are not thin and factual, but rich with meaning.'⁶⁸ The slippage of meaning in language, and its implications for architecture, was examined by Forty's *Words and Buildings*, which challenges assumptions that language is to be relied upon as exact, precise and prosaic:

what language itself allows is ambiguity, and a freedom from the relentless exactitude of drawing; where drawing demands finite precision – either there is a line or there isn't – language allows architects to deal with everything that they find difficult, or choose not to be precise about – nuances, moods, atmospheres. Where drawings pretend to project a reality, language is about keeping reality at bay. Language permits signification, it encourages one thing to be 'seen' as another, it stimulates the sense of potential ambiguity that lies at the basis of meaning, in a way that drawings can only do prosaically.⁶⁹

Katie Lloyd Thomas similarly argued that written specifications, which Hall had claimed as the 'one certain opportunity' to define standard and quality and thus guarantee understanding and certainty,⁷⁰ are imbued with ambiguity, inherited uncertainty, and cultural context.

Lloyd Thomas began by observing that the written specification is typically viewed as mundane, supplementary and secondary to the construction drawing, is rarely

⁶⁵ Berlin, pp.75, 77.

⁶⁶ Emmons, 'Diagrammatic Practices', p.4.

⁶⁷ Ibid., p.14.

⁶⁸ Ibid., p.15.

⁶⁹ Forty, p.39.

⁷⁰ Hall, p.38.

closely examined in the office, on the construction site, or in literature, and is typically bland, complex and specialized, inaccessible to all but the expert insider. Seemingly stripped of poetic and cultural content, the specification appears to offer little to theoretical considerations of architectural design. Lloyd Thomas proposed that as carriers of communications, even the most abstracted and edited specifications inevitably carry traces of political, social, and historical messages which project and reveal cultural meanings. While originally derived, Lloyd Thomas observed, from systematized frameworks such as NBS⁷¹, in use they are 'rarely written from first principles but are based on existing texts, repeated verbatim from project to project or adapted and amended for a new purpose.' Consequently, specifications are often 'unreadable and full of extraneous information and handed down errors'⁷² as a 'patchwork' of standardised versions and specific adaptations:

The sections of the specification with their very different language retain the traces and identities of the trades who authored them.[...] the language of the specification, however tied up and systematized, cannot erase its context in social, historical and economic practices.⁷³

Traces of cultural specificity, ambiguities and errors highlighted by Lloyd Thomas' readings of written specification are present throughout all aspects of architectural production, from the diagrams, drawings and written specification, to the organisation of the construction site itself which, as Katherine Shonfield, Darren Thiel and Kate Ness observed, has denied attempts to comprehensively rationalise and order the daily activities of architectural production.

5.4 The uncertainties of the construction site

In 'Purity and Tolerance', Katherine Shonfield critiqued rationalist idealizations of the construction site as a scientific laboratory, arguing that the translation of construction ideologies through the languages of 'common sense, practicality, the scientific, the honest and the rational'⁷⁴ explicitly deny the inevitabilities of uncertainty in reality itself as a self-perpetuating protectionist strategy. Shonfield instead imagined instructions for construction formatted as a cookbook recipe, conveying the messy and intuitive nature of the construction process more

⁷¹ See discussion of National Buildings Specifications (NBS) in Ch.3.

⁷² Lloyd Thomas, p.281.

⁷³ Lloyd Thomas, p. 282.

⁷⁴ Shonfield, p.34.

accurately than the typical 'car repair manual' scientifically rationalized format⁷⁵ which pursues a Fordist approach to construction conditions. Shonfield cited a RIBA Architectural Advisor's idealization of a future building site, 'devoid of mud and of such clinical precision' that it would consist of:

a group of almost white-coated, well paid workers, slotting and clipping standard components into place in rhythmic sequence on an orderly, networked and mechanised site, to a faultless programme, without mud, mess, sweat or swearing.⁷⁶

The realities of any construction site deny such idealizations, despite attempts to gain control through the use of prefabricated components, as Leatherbarrow had observed. The more construction processes become component based in pursuit of control, Shonfield highlighted, the more each joint between each component becomes a primary matter of concern, as an unavoidable moment which must depend on the care and skill of an individual builder - the least certain moment in construction, as Eric Vastert had warned in *Architectural Science Review*.⁷⁷ If perfection is the goal, then every joint is of paramount importance, and, as the specification of each joint becomes more precise, the likelihood increases that at least one joint will fail to meet expectations. '[I]n matters of tolerance', Shonfield wrote of the joint, 'statistics are irrelevant'.⁷⁸ Only one joint, one moment in construction, must fail in order to engender disappointment if uncompromising perfection is anticipated. Such anticipations are challenged by stubbornly messy, muddy, and unpredictable actualities, as sociologist Darren Thiel's research of the culture of the construction site confirmed.

⁷⁵ Ibid., p.35.

⁷⁶ Ibid., p.36, referencing Brian Finnimore, *Houses from the factory: System building and the Welfare State 1942-74*, (Rivers Oram Press: London, 1989) p.103. Finnimore wrote; 'In 1965 J. Carter, journalist and Architectural Advisor to the *RIBA Journal*, described a future building site devoid of mud and of such clinical precision that it would fully merit a place in the era that lay ahead. In years to come Carter envisioned a technocratic society of abundant provision for all classes where "worker and architect, builder and occupant then go back to their ample culture-filled, well organized leisure time". The contribution to this vision of wealth focused on by Carter was building technology: "a group of (almost) white coated, well paid workers, slotting and clipping standard components into place in rhythmic sequence on an orderly, networked and mechanized site to a faultless programme without mud, sweat or swearing.'" Finnimore was here citing John Carter, 'Components and the Architect', *RIBA Journal*, LXXIV (1967), 476-477. Carter's article was one of four focusing on the topic of component development, following the adoption of a policy by the Ministry of Public Building and Works towards 'co-ordinated metric-sized interchangeable components for building.'

⁷⁷ See Ch. 3 for a detailed discussion of this article. Vastert, p.99.

⁷⁸ Shonfield, p.37.

Thiel summarised the building site as remaining pre-industrial, little affected by the historical shift to industrialisation and post-industrialisation, with the specificity of the building industry's product leading to a 'relative immunity to technological and managerial innovation.'⁷⁹ Thiel observed that the construction site, changing daily, sometimes hourly, in form, is in actuality organized not by precise predictions, but through an adaptive and responsive process of orchestrated chaos. In daily practice, building work required abstract and embodied knowledge, learning and innovation. It is this 'complexity and necessity and innovation', Thiel proposed, 'that has partly shielded building work from the onslaught of automation, bureaucratization and ensuing managerial domination.'⁸⁰ Far from having all decisions precisely set out in advance on construction, Thiel cited Bob Reckman's observation that the builder must 'decide a thousand times a day what is good enough - where to place himself and his work amongst the almost infinite possibilities of perfection or compromise.'⁸¹ Building projects were similarly observed by Thiel to almost always veer off from original plans, necessitating a continuous process of innovation and problem solving on the part of the builder, regardless of the precision of any written or drawn instruction. The specifications, so crucial to Hall's claim of control and certainty, were described by Thiel as playing a minor role on the construction site, 'acting as guides rather than orders or tight templates'⁸² as the work on site inevitably veered from the idealised world of the specification.

The worker in the field must make hundreds, perhaps thousands, of individual, largely intuitive decisions which will improve, adapt, or compromise the ideals of the architectural project, but, as research by Kate Ness concluded, the workers who undertake the physical remain almost invisible in the complex organization of construction. Ness observed that as construction organizational structures move from the management of employees to the management of subcontractors, the organizational system in construction reaches a point where almost no-one knows who constructs a project, nor how they construct it. As Ness suggested:

the degree-qualified construction managers who supervise subcontract packages have no idea what is involved in the practicalities of the work. It is the workers themselves, and the

⁷⁹ Darren Thiel, 'Class in Construction: London Building Workers, Dirty Work and Physical Cultures', *The British Journal of Sociology*, 58 (2007), 227-51 (p.229).

⁸⁰ *Ibid.*, pp.230-231.

⁸¹ Bob Reckman, 'Carpentry: The Craft and Trade' in A. Zimbalist (ed.) *Case Studies on the Labour Process*, (London: Monthly Review Press, 1979), 73-102 (p.76). Cited by Thiel, p.231.

⁸² Darren Thiel, email correspondence with the author, 8 July 2010.

subcontractors' own foremen, who actually organise the work. [...] The 'modern' project management team sets forth what is supposed to happen, and afterwards records progress. Meanwhile, 'the workmen in the field are absorbed with the messy process of getting the work done'. Managers 'are barricaded behind a wall of paper defences while the real world of construction is taking place behind their backs.⁸³

Translations from concept to construction remain, almost inevitably, in the hands of individual builders, yet who they are as individuals, and what they actually do from moment to moment, is not precisely known. Regardless of the growing use of prefabricated components and assemblies, there will always be an inevitable moment where precisely prefabricated components meet each other in the actuality of the construction site. Drawings and specifications may precisely specify strict dimensional tolerances, but the field will inevitably exert its own influence. A moment of inattention, a misreading of one dimension, a rainy or windy day may intervene: the builder, too, is only human, and works in unpredictable and changing conditions, an observation shared by Steven Groák in *The Idea of Building*. Challenging idealizations that the contemporary building site could ever become a 'single organism, capable of overall coordination',⁸⁴ Groák argued that conceptions of the construction site as a co-ordinated single organism create false dichotomies between parts versus whole, quality versus quantity, the concrete versus the abstract, the unique versus the repetitive. These engender a 'fragmentation of communication and the generation of diverse, even conflicting, conceptual frameworks within the building process.'⁸⁵ Idealizations of a controlled, ordered construction site operate according to what Groák termed "Orthodoxies of Stability":

errors, omissions, smudged definitions, conflicts and fragmentations, discontinuities, failures of building programme and failures of building performance, disturbances of the supposed stable pattern. The orthodox framework of stability treats such anomalies as problems to be overcome or eliminated.⁸⁶

⁸³ Kate Ness, 'Not just about bricks: the invisible building worker' in A.R.J. Dainty (Ed.), Proceedings 25th Annual ARCOM Conference, 7-9 September 2009, Nottingham, UK. Association of Researchers in Construction Management (2009) Vol. 1, 645–54 (p.652) <http://www.arcom.ac.uk/-docs/proceedings/ar2009-0645-0654_Ness.pdf> [accessed 8 July 2016]

⁸⁴ Steven Groák, *The idea of building: thought and action in the design and production of buildings* (London, E & FN Spon, 1992), p.3.

⁸⁵ *Ibid.*, p.3.

⁸⁶ *Ibid.*, p.6. Shonfield similarly critiqued the construction detailing approach exemplified in Cecil Handisyde's *Everyday Details*: 'Handisyde's characterization of construction as a series of Problems (reflected in his chapter titles: 'Masonry walls: dpc at base of external walls'; 'External doors: position of frame', etc) means that details inevitably constitute

Arguing that construction involves matters which are 'specific, unique, complex, sometimes known but not quantifiable',⁸⁷ Groák offered an alternative view: one which could acknowledge that buildings are inherently unstable and constantly changing, treating gaps in knowledge not as unanticipated problems to be feared, but rather, he proposed, as '*characteristics* of buildings or building processes, the condition of the industry, at times to be relished.'⁸⁸ Alternative approaches which recognise, anticipate, accept and even celebrate, as Groák proposed, the uncertainties and ambiguities of architectural production, offer the possibility of making productive use of the inevitable uncertainties which arise through deviations from precisely specified instructions.

'It is impossible to say, in the world of construction', Shonfield stated, speaking of the languages of construction manuals, 'I wouldn't have started with that premise in the first place.'⁸⁹ Alternative viewpoints to an objective of certainty challenge the implications upon human relationships and the qualities of the built environment it produces, and instead propose, as Groák did, acceptances of uncertainty, indeterminacy, good faith, ambiguity, and the risk of productive deviation.

5.5 The productive nature of uncertainty

Accepting uncertainty is conceptually difficult for specialized professions, Donald Schön argued in *The Reflective Practitioner*. Schön linked the rejection of uncertainty to the increasing specialisation of professionals, suggesting that many practitioners are 'locked into a view of themselves as technical experts,' creating a self-defined role which must be maintained by applying 'techniques of selective inattention, junk categories and situational control' to preserve constancy of their knowledge-in-practice. 'Uncertainty is a threat; its admission is a sign of

Solutions. Within the context of the practical and the common-sense, the terms are fixed: there is a set of delineated classes of elements that you have to deal with; as in chess, the problem is only the relation of one to the other. It is impossible to say, in the world of construction, 'I wouldn't have started with that premise in the first place.' Shonfield, p.36.

⁸⁷ Ibid., p.4.

⁸⁸ Groák, p.6.

⁸⁹ Shonfield wrote the construction detailing approach exemplified in Cecil Handisyde's *Everyday Details*: 'Handisyde's characterization of construction as a series of Problems (reflected in his chapter titles: 'Masonry walls: dpc at base of external walls'; 'External doors: position of frame', etc) means that details inevitably constitute Solutions. Within the context of the practical and the common-sense, the terms are fixed: there is a set of delineated classes of elements that you have to deal with; as in chess, the problem is only the relation of one to the other. It is impossible to say, in the world of construction, 'I wouldn't have started with that premise in the first place.' Shonfield, p.36.

weakness.⁹⁰ Schön observed of practitioners who apply such techniques, a viewpoint shared in Dana Cuff's 1991 review of the architectural profession.

Cuff's *The Story of Practice* framed the development of the architectural profession as correlated to the desire for guarantees and certainties. 'The entire design process' Cuff summarised, 'as conceived by the AIA [American Institute of Architects], practitioners, and academics, is intended to reduce ambiguity about the outcome.'⁹¹ The inevitability and intrinsic nature of uncertainty within the design process is not typically recognised by professional bodies, yet architecture is, Cuff argued, intrinsically a profession which has a 'high degree of indeterminacy',⁹² involving contradictory forces, countless voices,⁹³ professional uncertainty, perpetual discovery and surprise. In the *Culture of Building*, Howard Davis cited an alternative approach as witnessed in Japanese construction contracts specifying that 'The Owner and the Contractor shall perform this contract sincerely through co-operation, good faith and equality.'⁹⁴ In a context where the 'culture's atmosphere is not litigious,' Davis notes, it is possible in Japanese building practice for initial drawings to be less detailed, and for 'many aspects of the design to be worked out during construction,'⁹⁵ instead of 'simply seeing the construction process as the fulfilment of a contract that had already completely specified the building.'⁹⁶ Changes to the original design are expected in a process which rely as much on the strength of human relationships as on precise contractual instructions.⁹⁷ The pursuit of certainty has engendered, Davis argued, abstracted relationships between those involved in making, and subsequently an abstracted built environment:

⁹⁰ Donald A. Schön, *The Reflective Practitioner: How Professionals Think in Action* (Aldershot: Arena, 1995), p.69.

⁹¹ Dana Cuff, *Architecture: The Story of Practice* (Cambridge, Mass: MIT Press, c1991), p. 96.

⁹² *Ibid.*, p.39.

⁹³ In addition to the complexity of the acknowledged team of architects, builders, subcontractors, engineers, and numerous specialist consultants, Cuff observes that 'a significantly larger group of interested parties' of long term participants, informal consultants and accidental influence presents a complex, diverse and unique set of relationships, in which it may be difficult to assign and understand areas of responsibilities, when even seemingly specialized professional expertise may remain ambiguous. *Ibid.*: see Chapter 3. Design Problems in Practice, section 2.Countless Voices pp.72-83.

⁹⁴ 'The first sentence of Article 1 of the standard construction contract in Japan reads. "The Owner and the Contractor shall perform this Contract sincerely through cooperation, good faith, and equality." General conditions of construction contract, revised Sept 1981'. Howard Davis, *The Culture of Building* (New York: Oxford University, 1999), p. 344, Footnote 9.

⁹⁵ *Ibid.*, p. 253.

⁹⁶ *Ibid.*, p.253.

⁹⁷ 'A modern contract leaves very little to the discretion of the builder and also does not assume many shared, implicit understandings between the builder and the client, or between the builder and the architect.' *Ibid.*, p. 190.

The more distant loci of control, the increase in the quantity and specificity of abstract documents of control, and the growth of a litigious atmosphere in the construction industry and in the building culture as a whole have developed hand in hand. Together they have removed people's ability to carefully apply human discretion to the making of the building and have contributed to the abstract and fragmented nature of the modern built landscape.⁹⁸

Writing of Zumthor's concept of a 'return to real things', Kemsley and Platt highlighted contemporary architecture's alienation from craft:

In times when the majority of buildings in the developed world are erected at lightning speed and on an international basis, their component products assembled on site by a workforce armed with electric screwdrivers, Zumthor's somewhat slower but thoughtful and meticulously crafted approach is ironically nothing less than radical.⁹⁹

That craft and care may be viewed as 'radical' in an industrialised society is disputed by Richard Sennett's definition, cited by Kemsley and Platt, of craftsmanship as 'an enduring, basic, human impulse, the desire to do a job well for its own sake.'¹⁰⁰ Sennett's *The Craftsman* argued for human discretion in making, acknowledging the positive role of ambiguity as well as the benefits brought by a 'mechanical quantitative society. [...] To do good work' Sennett wrote, 'means to be curious about, to investigate and to learn from ambiguity.'¹⁰¹ Sennett highlighted the importance of tacit knowledge - defined as knowledge which cannot be put into words - as opposed to explicit knowledge:

Proponents of absolutist standards of quality, however, have many worries about the interchange between tacit and explicit knowledge - as long ago as in Plato's writing on craftsmanship, the experiential standard is treated with suspicion. Plato views it as too often an excuse for mediocrity.¹⁰²

The distrust of tacit knowledge - of anything which cannot be put into words - the 'experiential standard' distrusted by Plato - has, Sennett argued, distanced technical skill from imagination, an argument explored at depth in David Pye's *The Nature and Art of Workmanship*.

⁹⁸ Ibid., p. 200.

⁹⁹ Kemsley and Platt, p.220.

¹⁰⁰ Richard Sennett, *The Craftsman* (New Haven: London, Yale University Press, 2008), p.9.

¹⁰¹ Sennett, p.48.

¹⁰² Ibid., pp. 50-51.

It is usual, Pye wrote, 'to equate 'good' with 'precise' and 'bad' with 'rough'. To do so is false. Rough workmanship may be excellent while precise may be bad.¹⁰³ Pye instead proposed that all workmanship 'is approximation, to a greater or less degree. Good workmanship is that which carries out, or improves upon the intended design.¹⁰⁴ Defining design as 'what, for practical purposes, can be conveyed in words and by drawing, and workmanship [a]s what, for practical purposes, can not',¹⁰⁵ quality of workmanship was here defined as corresponding to an intent:

let us provisionally give the name 'perfect' workmanship to that in which the achievement seems to correspond exactly with the idea [...] let us on the other hand give the name 'rough' to workmanship in which there is an evident disparity between idea and achievement.¹⁰⁶

'Perfect' and 'rough' were correlated not with physical qualities, but rather related to the idea of an 'exact' correspondence between idea and completed work, a definition aligning with the recommendations of practice journals discussed earlier. Emphasizing the workman's role in determining quality, no matter how precise the instructions, Pye argued that '[n]o designer can make bad workmen produce good workmanship,'¹⁰⁷ and challenged claims that quality emerges from certainty. Highlighting the value of uncertainty and risk by contrasting what Pye termed the 'workmanship of risk,' in which the quality of a result is constantly at risk during the process of making, with the 'workmanship of certainty' in which quality is predetermined before production. Pye proposed that the workmanship of risk, cannot guarantee predictable results, but that it instead provides 'an immensely various range of qualities, without which design becomes arid and impoverished.'¹⁰⁸ An 'exact' understanding of any designer's intention was explicitly understood by Pye to be impossible, both in terms of physical possibility,¹⁰⁹ and in terms of

¹⁰³ David Pye, *The nature and art of workmanship* (Cambridge: Cambridge University Press, 1968), p.13.

¹⁰⁴ *Ibid.*, p.13.

¹⁰⁵ *Ibid.*, p.1.

¹⁰⁶ *Ibid.*, p.15.

¹⁰⁷ *Ibid.*, p.1.

¹⁰⁸ *Ibid.*, p.4-8.

¹⁰⁹ Pye wrote: 'Socrates, in the *Phaedo*, maintains that the idea of absolute equality is suggested to us by the sight of things which appear to be approximately equal, because they remind us of something our souls knew before we were born. A similar contention could of course be made about absolute flatness or straightness. I prefer another explanation for I do not think there can be much doubt how we have arrived at the idea of an absolutely flat surface when nothing flat exists. Whenever we make something 'flat' and find it is not flat enough, we always find that by taking more trouble we can make it still flatter: or we have always been able to do so hitherto: and so we find it easy to imagine we are approximating to a perfect flatness which it is just beyond our powers or patience to reach.' *Ibid.*, p.14.

communicating intentions; any communication, Pye wrote, 'obviously falls far short of expressing the designer's full intention.'¹¹⁰ For workmanship to carry out, or improve upon, the intended design, Pye argued that the builder must first understand the underlying intention, and thus defined good workmanship as that which 'carries out or improves upon the intended design' and bad workmanship as that 'which fails to do so and thwarts the design.'¹¹¹ Good workmanship, whether free or regulated, was described by Pye as producing and exploiting diversity, and thus importing something of a 'natural environment' into a man-made environment. Diversity on the small scale, Pye wrote:

is particularly delightful in regulated workmanship because it maintains a kind of pleasantly disrespectful opposition to the regulation and precision of the piece seen in the large.¹¹²

Contending that regulated, repetitive work using someone else's design may be as rewarding as free work, Pye proposed that the problem of poor workmanship arises from misguided expectations of precision from situations or workers who cannot produce it. Quality of workmanship was defined here by the pursuit of mutual understanding – the hope that, when deviations inevitably occur, the craftsman can freely adapt the work with a deep understanding of the designer's intention:

Free workmanship is one of the main sources of diversity. To achieve diversity in all its possible manifestations is the chief reason for continuing the workmanship of risk as a productive undertaking.¹¹³

Crucial to this definition was the acceptance of the impossibility of an exact alignment between idea and result, the acceptance of deviation and the acceptance of the risk of deviation as productive, a concept explicitly denied in the typical guidance which continues to frame contemporary architectural production.

5.6 The ongoing pursuit of precision in architectural production

Summarising the apparent absence of detailed instruction in a written specification written in North Carolina in 1774, Catherine W. Bishir wrote:

Finally, we turn again to those broad terms, necessary, sufficient, good and workmanlike. On the surface these appear meaningless,

¹¹⁰ Ibid., p.21.

¹¹¹ Ibid., p.13.

¹¹² Ibid., p.72.

¹¹³ Ibid., p.83.

almost dismissals of matters of aesthetics, proportion, or workmanship. But because we are dealing with a restricted code and its use of “short words or phrases to stand for a whole complex of assumptions,” these terms are full of meaning. ¹¹⁴

Writing of contemporary written specifications, Bishir concluded that ‘like any restricted code, these documents incorporate by reference a whole set of community or trade knowledge and assumptions about what these qualities are.’¹¹⁵

Precise communications may be pursued, but, as this chapter has explored, all communications are challenged by the inherently messy, complex, indeterminate, risky actualities of architectural production. Over two hundred years later, an August 2013 issue 46 of *Perspecta* devoted to ‘Error’ began with an assessment of the certainties desired of contemporary architectural practice:

Architecture never goes entirely according to plan. While it would be impossible to build without norms – a word derived from the Latin term for a carpenter’s square – it seems equally inevitable that architects deviate from those norms. Design relies on calculated predictions that rarely unfold as expected; the experience of a building can never be fully prescribed; and the discipline itself often progresses through trial and error. Neither clearly negative nor self-evidently productive, error is an architectural process ripe for investigation. ¹¹⁶

Despite acknowledging that even the most precise instruction will likely contain ambiguities and errors, and that as-built works will deviate from predictions, recommendations for contemporary professional practice nevertheless continue to insist upon precise instructions as ‘the one certain opportunity’ to achieve certainty.

To better understand this desire, the final chapter of Part B explores the historical emergence of precision in architectural production. From ancient Greek documentations, to mediaeval imperfections, to the Renaissance ‘Albertian turn’ and the emergence of Cartesian doubt and empirical method, Ch.6 focuses on the explicit emergence in the nineteenth and twentieth centuries of the desire for precision in architectural production in the structuring of the UK and USA architectural professions, setting the scene for Part C and its close readings of the production of four architectural projects.

¹¹⁴ Catherine W. Bishir, ‘Good and Sufficient Language for Building’, in *Perspectives in Vernacular Architecture, IV*, ed. by Thomas Carter and Bernard L. Herman (Columbia: University of Missouri Press, 1991), 44-52 (p.50)

¹¹⁵ *Ibid.*, p.50.

¹¹⁶ Joseph Clarke and Emma Jane Bloomfield, ‘Introduction’, in *Perspecta 46:Error*, ed. by Joseph Clarke and Emma Jane Bloomfield (August 2013), 20-45 (p.21).

6. Precision in the histories of architectural production



Fig. 6.1 - Basilica of San Lorenzo, Florence: the nave. Ralph Deakin (photographer). RIBA Collections: RIBA27828.

6.1 Changing definitions of precision in architectural production

Ch. 5 proposed that the complex spatial, material and emotional qualities of an architectural intent are typically expected by recommendations which frame architectural production to be precisely abstracted as prosaic communications, a task disputed by those architectural theorists who challenge the implications of a built environment constructed from an objective of certainty. This objective represents a specifically contemporary interpretation of precision as Pérez-Gómez highlighted:

Before the seventeenth century, the primacy of perception as the ultimate evidence of knowledge was never questioned. [...] It was a world of predominantly mythical character, qualitatively different from our present universe of precision.¹

In referencing a 'present universe of precision', Pérez-Gómez highlighted here a conceptual shift which emerged between the fifteenth to seventeenth centuries. The Galilean revolution at the end of the seventeenth century severed historical connections between human and the divine, and number, technique and craft from magical association, defining measure instead according to physical exactitude. 'As qualities have been turned into abstract scientific quantities', Robert Tavernor argued in *Smoot's Ear*, 'so everything can be dissected into ever-smaller units of measurement, into measures incomprehensible to and remote from everyday human experience.'² The redefinition of measurement systems from the ontological and embodied to the abstracted and universal underpins any discussion of the definitions and expectation of precision in the historical processes of architectural production. In *Building in Time*, Marvin Trachtenberg highlighted in this conceptual shift the notion of time, pointing out that ambitious mediaeval building projects were launched when 'planned only in outline, incompletely financed, into an undefined future',³ an approach now utterly intolerable to economically minded organisational frameworks, but to which Trachtenberg linked the ability to pursue ambition, creative imagination, and 'zero tolerance' of mediocrity', highlighting the wider implications of architectural production as defined by quantitative measures of time, economy, and quality.⁴

¹ Pérez-Gómez, *Crisis of Modern Science*, p.9.

² Tavernor, p. 10.

³ Marvin Trachtenberg, *Building-in-Time: From Giotto to Alberti and Modern Oblivion* (New Haven; London: Yale University Press, 2010), p.16.

⁴ *Ibid.*, p.17.

To contextualise the implications of this shift, this final section of Part B presents a chronological historical overview of the origins of desires for precision in the processes of architectural production. Despite evidence of written documentation dating from 400 BC, and Vitruvius's stipulation of the necessity of knowing the work well in advance of construction, the impetus to precisely communicate the entirety of an architectural intent in advance of construction is discussed in this chapter as emerging within a Renaissance reframing of the architectural drawing from an exploratory to a predictive instrument. The philosophical abstraction of measure in the seventeenth century is next highlighted as fundamental to the explicit desire for geometric perfection, and as explicitly prescribed in the eighteenth century to be pursued through precise instructions. To set a detailed context for the four key studies which follow, this chapter finishes with a review of architectural cultures in early-mid nineteenth century UK, late nineteenth century Chicago, and early twentieth century Europe, introducing interpretations of precision in each context as framing the architectural cultures from which each of the studied projects emerged, embody and challenge. This review begins with the presence of architectural communications in classical antiquity.

6.2 Emerging precision in architectural production

Although architectural documentations have grown exponentially in the last century, they have always existed in some form, albeit with markedly different relationships to expectations of precision and certainty. As early as 400-500 BC, written construction documentation set out legal, quantitative and qualitative expectations of architectural works. John Gelder described written Greek project documents *συγγραφή* (*syggrafē*) dating from 500-400 BC as integrated composite documents produced for what we would now consider to be 'tender', comprising descriptions of the parties involved, project descriptions of products, workmanship, dimensions, quantities, and contract details. This documentation, Gelder noted, differed from contemporary expectations of exact predictions, in that full scale stonework drawings were created during construction and 'post-tender' as '(presumably) a collaborative affair between *architectōn* [...] and contractor.'⁵ Definitions of precision

⁵ Gelder wrote: 'Some construction accounts also mention payment for drawings or models, made post-tender. Design post-tender was (presumably) a collaborative affair between *architectōn* (ἀρχιτεκτων – mentioned in eleven of the nineteen documents) and contractor.' Gelder additionally notes that the reference to 'architect' does not align with the contemporary definition of the professional role. John Gelder, 'Integrated. Dis-Integrated. Coordinated. Re-Integrated', *ARQ Architectural Research Quarterly*, 16 (2012), 253-260 (p.254).

in terms of physical measurement also substantially differed from contemporary expectations. 'Ancient measures,' Robert Tavernor observed:

were neither as precise nor as finely subdivided as the modern scientific measures used today because they did not need to be. At first, local surveyors marked out territories with their own strides; builders and craftsmen sized and shaped materials using the best hand tools available. ⁶

In lieu of exactitude, understandings of precision within measurement systems in classical architectural forms were defined by embodied proportional relationships, as outlined in the first century BC by Vitruvius's *Ten Books*.⁷ Precision, as described by Vitruvius, was proportional, relational according to bodily measurement, and adjusted for human experience:

Symmetry is a proper agreement between the members of the work itself, and relation between the different parts and the whole general scheme, in accordance with a certain part selected as standard. Thus in the human body there is a kind of symmetrical harmony between forearm, foot, palm, finger, and other small parts; and so it is with perfect buildings.⁸

In this context, Vitruvius sought to establish immutable rules of symmetry and proportion for achieving 'perfect' buildings. 'Without symmetry and proportion there can be no principles in the design of any temple', Vitruvius wrote. '[T]hat is, if there is no precise relation between its members, as in the case of those of a well shaped man.'⁹ Establishing rules of symmetry and proportion 'from the members of the body', as the 'finger, palm, foot, and cubit', Vitruvius's acknowledgment of proportional adjustment in columns to account for the deception of the eye which is 'always in search of beauty'¹⁰ were directed from ancient sources which, Vitruvius proposed, established universal truths:

For in all their works they proceeded on definite principles of fitness and in ways derived from the truth of Nature. Thus they reached

⁶ Tavernor, p.4.

⁷ Vitruvius, *The Ten Books on Architecture*, trans. By Morris Hicky Morgan, PhD., LL.D., prepared under the direction of Herbert Langford Warren, A.M. (New York: Dover Publications, Inc., 1960).

⁸ Vitruvius, p.14.

⁹ Ibid., p.72.

¹⁰ 'These proportional enlargements are made in the thickness of columns on account of the different heights to which the eye has to climb. For the eye is always in search of beauty, and if we do not gratify its desire, a clumsy and awkward appearance will be presented to the beholder.' Ibid., p.86.

perfection, approving only those things which, if challenged, can be explained on grounds of the truth.¹¹

Vitruvius recommended a systematic ordering of such rules. 'I have thought', he stated, 'that it would be a worthy and very useful thing to reduce the whole of this great art to a complete and orderly form of presentation.'¹² These rules and their sources were, as prescribed by Vitruvius, to be have been carefully studied by the architect in order to gain authority, and to separate Practice - as 'the continuous and regular exercise of employment where manual work is done with any necessary material according to the design of a drawing'¹³ - from Theory - as the 'ability to demonstrate and explain the productions of dexterity on the principles of proportion.'¹⁴ Vitruvius ascribed the ability to 'demonstrate and explain' as emerging from a knowledge of an exhaustive list of subjects, including economics and estimating. Asserting that architects would be more careful in calculating and stating the limit of expense if 'well qualified by an exact scientific training',¹⁵ Vitruvius prescribed knowing the work in advance in order to be able to control and predict costs. *The Ten Books* ascribed architectural authority through the ability to communicate precise knowledge of an architectural work in advance of construction. This cannot be interpreted in terms of contemporary understandings of the architectural profession nor of architectural documentation. It would not be until the fifteenth century before prescriptive drawings would attempt to convey an entire architectural intention in advance of construction, and later still before they would be claimed as neutral instruments guaranteeing certainty. Mediaeval project documentation, in the interim, remained, Gelder noted, much like the Greek *syggrafē*.

As-built imprecisions in mediaeval architecture

Mediaeval construction processes remained distant from contemporary definitions and expectations of precision, both in terms of physical measurement and in terms of documentation. Gelder described mediaeval contract documents for tender as a single document called an '*indenture*',¹⁶ which included 'dimensions and quantities,

¹¹ *Ibid.*, p. 109.

¹² *Ibid.*, p.101.

¹³ *Ibid.*, p.5.

¹⁴ *Ibid.*, p.5.

¹⁵ Vitruvius's reference to a scientific training must of course be understood in a different context - a cosmological and ontological context - in comparison to a Post-Enlightenment definition of science as abstracted and instrumental. *Ibid.*, p.281.

¹⁶ Gelder, p.254.

as well as descriptions of products and execution.¹⁷ Drawings were still developed post-tender. Although Gelder suggested that the detail design was not collaborative but led by the contractor as designer-builder, he notes that ‘there was as yet, of course, no “profession” of architect as we understand it.’¹⁸ Franklin Toker, writing of a 1340 specification, similarly rejected the term ‘Gothic Architect’ as an inaccuracy, writing that the ‘masters’ of Fourteenth century building projects:

were not architects in the modern sense because their professionalism consisted of being able to both design and construct, while the professionalism of contemporary architects consists in their ability to draw up buildings with such specificity that they need *not* personally direct their construction.¹⁹

Toker acknowledged that the fourteenth century ‘master’ maintained some distance from the act of constructing, issuing instructions from an on-site office and employing a second-in-command on site. ‘The presumption is inevitable that it was through drawings’, he noted:

that the architect began to manage his building operations by remote control, and that it was this liberation from daily involvement at the construction site which fed his new and higher status. Certainly the making of drawings was regarded as the key attribute of the High Gothic Master Builder. Numerous miniatures, sculptures, and tombstones of the Gothic Master with his straightedge, set squares, compass, and dividers bear this out.²⁰

‘Liberation’ from the construction site would become a crucial distinction in defining the architect over the next five centuries. In terms of the physical exactitude of constructed works, applications of precision as defining quality remained distant from contemporary understandings. In *Wise Master Builder*, Nigel Hiscock described as-built geometries of mediaeval cathedrals as ‘little short of chaotic,’²¹ cautioning against assumptions ‘that mediaeval architects set out to achieve such degrees of accuracy, or were able to, or necessarily shared the modern concept of

¹⁷ Ibid., p.254.

¹⁸ Ibid., p.255.

¹⁹ Toker, p.67.

²⁰ Ibid., p.70.

²¹ Hiscock wrote: ‘In fact, all the evidence suggests that builders at least up to the thirteenth century had no accurate technique for setting out work, as many of the buildings testify. Irregularities were common in pier spacing, alignment and angles involving errors of 3% or more, sometimes much more. Neither are these defects only present in minor works in remote country districts. The main axis of Cluny was bent twice, Canterbury’s is misaligned twice and bent once, Laon’s nave tapers by 3%, Bourges by nearly 6% and the entire layouts of Vezelay and Notre Dame are little short of chaotic. If an accurate method had existed at all, it would surely have been employed on projects as prestigious as these.’ Hiscock, p.198.

precision.²² From inaccurate drawings, unstable drawings, the extrapolation of dimensions, inaccurate setting out or inaccurate construction without modern aids, he concluded:

it is evident both from known working practices and from the built results that precision was rare. In order, therefore, to recover any schematic design, if one existed, it is necessary to determine what might have been meant, as distinct from what was built.²³

In describing mediaeval drawings for construction, Hiscock noted that, 'almost without exception', they were produced to unidentified scales and without dimensions, deriving instead from proportional methods derived from geometric figures or numerical ratios to guide design and construction simultaneously.²⁴ Several different geometric systems may have been employed during the construction of one work, a practice which Gomez and Pelletier interpreted not as an inconsistency but rather as a 'layering of different responses to structural or symbolic problems that arose during the course of construction.'²⁵ Pérez-Gómez's descriptions of the construction of Gothic Cathedrals evoked a process in which all components were not precisely described, or even predicted, but considered, debated, and agreed as construction proceeded. While a holistic and 'symbolic' order prevailed, changes, Pérez-Gómez concluded:

were expected and welcome at every stage. Sensitivity to experienced reality always took precedence over any Platonic ideal or a priori planning decision.²⁶

Pérez-Gómez and Pelletier cautioned against reading mediaeval drawings in contemporary terms, highlighting that mediaeval architectural drawings 'could not be conceived as neutral artefacts that might be transcribed unambiguously into

²² Ibid., p.208.

²³ Ibid., p.275.

²⁴ 'The consequent lack of direct connection between design and dimension undoubtedly explains why mediaeval drawings were produced not only to unidentified scales but, almost without exception, without dimensions. Thus any design could be built anywhere provided an appropriate unit of measure could be arranged for it. There was simply no advantage in designing to any one particular scale. Consequently, with few exceptions, a proportional method of design, derived from geometric figures or numerical ratios, has generally been accepted as a logical probability' (p.5). Hiscock also noted that little is known for certain about how master masons devised layouts, suggesting that 'architecturally, the groundwork of a building finishes at the plinth, which is levelled off as a base for the superstructure to be raised by the team of builders.' Ibid., p.ix.

²⁵ Pérez-Gómez and Pelletier, p.9.

²⁶ Alberto Pérez-Gómez 'Introduction' in *Architecture, Ethics, and Technology* ed. by Alberto Pérez-Gómez (Montreal, McGill-Queen's University Press: 1994) pp.1-14 (p.9).

buildings.²⁷ Rather, the act of drawing was, in itself, divine. 'Projecting the geometric physiognomy of a building or city was a prophetic act', they stated, 'a form of conjuring and divining, not merely the personal will of the author.'²⁸ The 'architect' of the middle ages could not conceive of a 'whole' building, in that mediaeval building practice was essentially constructive:

From the footprint of the building, construction preceded by rhetoric and geometry, raising the elevation as discussions about the building's face continued, almost until the end. The master mason was responsible for constructing a model of the city of God on earth; but only the Architect of the Universe possessed a comprehensive foreknowledge of the project and was deemed capable of concluding the work at the end of time.²⁹

Constructed imprecision in constructed mediaeval works cannot be qualified in contemporary terms of precise alignments between design intent and constructed outcome. Only God could attain perfection: exact translations between geometric ideal and constructed form were not applied as definitions of quality. While the emergence in the fifteenth century of precise drawings prior to construction may appear to align more closely to contemporary expectations of precise instructions, detailed surveys of Renaissance architectural works suggest otherwise.

6.3 Analytical precision in early Renaissance drawings

Hiscock linked the emergence of the architect in a modern sense, as a designer distinct from a craftsman, with the development of graphic methods of communication from the first half of the thirteenth century.³⁰ A gradual shift from illusionistic design to communications of a more pragmatic nature developed in the fifteenth century as detailed pre-construction orthographic projections, a point Gelder highlighted as the beginning of 'dis-integration' of contract documents into separated, specialized documents.³¹ As specialization of separate roles in design

²⁷ Pérez-Gómez and Pelletier, p.9.

²⁸ Ibid., p.9.

²⁹ Ibid., p.8.

³⁰ 'Manuscript paintings depicting the act of creation were already common by the thirteenth century and show the divine creator as the architect of the universe, wielding his dividers to bring about order from chaos through the application of mathematical laws. By this time, architects were becoming identifiable from ordinary masons and other tradesmen and their names begin to survive.' Hiscock, p.x.

³¹ 'Dis-integrated: the Renaissance in Europe saw the rise of pre-construction drawings, using the orthographic triad – plan, section and elevation. These complemented the written documentation, thereby removing the need for it to cover building layouts, assembly descriptions and quantities.' Gelder, p.253.

and construction emerged, modern concepts of precision³² as a guarantor of certainty did not apply. Early Renaissance drawings were investigative rather than predictive, seeking to uncover ontological truths.

Although Renaissance Masters employed plan, section, elevation and perspectives 'with a degree of virtuosity and precision that has rarely been equalled since', the intent of this precision was not control, but the analysis of dimensional relationships in historical works., suggested Christoph Luitpold Frommel.³³ Pérez-Gómez and Pelletier similarly highlighted Filippo Brunelleschi's mathematically-based *perspectiva artificialis* not as a generative tool for design, but as a surveying technique to reveal the measured reality of the world of experience.³⁴

From illusionistic to instructive - construction drawings in the mid-15th century

The roots of the critical shift from illusionistic to instructive drawings has been ascribed in particular to construction drawings by Brunelleschi which were cited by Frommel as being the first to achieve a 'correct, central perspective of Florence Baptistry' and as drawing 'illusionistic architectural illustration towards more objective grounds.'³⁵ Brunelleschi's drawings were referenced by Stephen Kite as demanding 'new processes' in terms of instructing craftsmen at Florence's *Ospedale degli Innocenti*:

Battisti describes the challenge to workmen trained in late mediaeval procedures of building the Ospedale degli Innocenti, a project probably 'based – to everyone's surprise – on drawings done to scale and perhaps squared up for enlargement, drawings which were more specific than any wooden model but nonetheless required complicated explanation from the architect in person', while Manetti, Brunelleschi's biographer, describes the discomfort of builders faced with a 'drawing precisely scaled in small *braccia*.' In these aspects the Ospedale signifies a crucial juncture in architectural history: a moment when the achievement of greater intellectual control over construction also augmented the

³² Hiscock, p.208.

³³ Christoph Luitpold Frommel, 'Reflections on the Early Architectural Drawings', in *The Renaissance from Brunelleschi to Michelangelo : The Representation of Architecture*, ed. by Henry A Millon and Vittorio Magnago Lampugnani (London: Thames and Hudson, 1994), pp. 101-122 (p.101).

³⁴ 'During the early Renaissance, measuring the world's physical and cultural features was a crucial, novel activity that interested many architects like Filippo Brunelleschi, Filarete, and Francesco di Giorgio. The constellation of artistic practices, including painting, perspective, architecture, and surveying, was driven by a search for truth and by a desire to reveal the "measured" reality of the world of experience.' Pérez-Gómez and Pelletier, p.20.

³⁵ Frommel, p.102.

dangers of a loss of engagement with the tactility and weight of the building process itself.³⁶

Despite a critical shift in the drawings' role from that of exploratory to prescriptive, and despite the description of Brunelleschi's drawings as 'precisely scaled', definitions of quality did not yet align to expectations of perfect alignments between instructive drawing and constructed result. Ford observed that Renaissance drawings often had little resemblance to the finished buildings, particularly in details such as column capitals.³⁷ Demonstrating Ford's observation, Matthew Cohen's detailed survey of Brunelleschi's 1442 Basilica of San Lorenzo, [Fig. 6.1] 'notable for the precision of its proportions,'³⁸ uncovered 'the most pronounced irregularities'³⁹ and 'notably uneven quality of execution in the decorative stonework', described by Cohen as being comparatively 'expressive and sublime' and 'crude by comparison, occasionally distressingly so.'⁴⁰ Cohen's physical and historical survey identified two distinct phases of construction at the Basilica, the second phase of which he interpreted as having been rushed for logistical reasons, resulting in poorer quality finishes in terms of dimensional accuracy and degree of detail. Historical construction processes described by Cohen at the Basilica evoke comparison with contemporary architectural production. The delegation of supervision on site in lieu of the designer-architect's daily presence to the *capomaestro*, or foreman, Michelozzo,⁴¹ variations of construction quality attributed to time constraints, descriptions of rough levels of finish, sloppy workmanship, design simplifications, construction mistakes, and impacts of personal experiences upon construction quality, may be familiar to any architect in contemporary practice:

personal dramas - Cosimo's anxiety, Pagno's expedient
construction management, the errors of anonymous masons
rushing to meet a deadline - are written into the stones of the

³⁶ Stephen Kite, *Adrian Stokes: an Architectonic Eye: Critical Writings on Art and Architecture*, (London: Legenda, 2009), p. 106.

³⁷ Ford, p. 7.

³⁸ Cohen wrote: 'Patrick Nuttgens summarizes the significance of the Basilica of San Lorenzo in Florence in one sentence; "S. Lorenzo is notable for the precision of its proportions." Indeed, the notion that the proportions of this building impart to it positive qualities such as precision, beauty, harmony, perspectival rationality and *all'antica* refinement has long stood as a virtual axiom of architectural history.' Matthew A. Cohen, 'How Much Brunelleschi? A Late Mediaeval Proportional System in the Basilica of San Lorenzo in Florence', *Journal of the Society of Architectural Historians*, Vol 67, No.1 (March 2008), 18-57 (p.18).

³⁹ *Ibid.*, p. 21.

⁴⁰ *Ibid.*, p. 21.

⁴¹ 'Michelozzo, as much businessman as architect, oversaw a large number of construction projects and almost certainly put someone else in charge of day-to-day operations at San Lorenzo after construction recommenced in 1442 v.' Cohen, 'Ugly Little Angels', pp.286-7.

basilica of San Lorenzo just as surely as are the formal iconographies of its forms and ornament.⁴²

Cohen's survey of San Lorenzo revealed a constructed work which varied enormously in terms of geometrically consistent workmanship.⁴³ Despite the emergence of detailed pre-construction documentation as predictive instructions, quality remained dependent on the unpredictable confluence of personal, economic and time constraints, highlighting deviations in the geometric qualities of an architectural work nevertheless lauded for its perceived geometrical exactitude and its role in establishing precise instructions in advance of construction.

The development of precise instructive drawings in the Renaissance began to serve a multitude of functions as the processes of architectural design and construction separated into instrumental specialized roles. Leon Battista Alberti, Frommel wrote, made a distinction 'with almost polemical rigour' between 'the orthogonal design procedures which an architect was to follow, and the architectural perspective representation of the painter'.⁴⁴ The emergence of the architectural model was attributed by Frommel as an attempt to provide 'greater guarantees that a project would be carried out completely' by providing definitive information about site and arrangement through the model's dependence on the generation of plan, section and elevation.⁴⁵ For Alberti, model and drawing were not alternates, but 'complements necessary for the completion of the complete project',⁴⁶ again marking a seismic shift in architectural production:

⁴² Ibid., p.287.

⁴³ Costantino Caciagli argued against the use of contemporary survey instruments in measurements of historical works: 'I do not hold it correct, from either a conceptual or an operative point of view, to survey an existing piece of architecture from the thirteenth century using an instrumentation that is different from the one that was used in its construction. Indeed, I will go even further. In order to perform a survey that is philologically correct, it is necessary to ban every optic instrument (level tachimeter, total station, laser measures, optically corrected photographs), to use instead instruments that are similar to those used in the construction [...] A precise and rigorous survey, accomplished using all the technology that can produce a precision to within fractions of millimetres and reconstituted automatically, given the useless precision and the cold mechanicalness, not to mention the complete foreignness to the means adopted for construction of the villa, cannot help to comprehend the compositional and structural criteria that lie at the base of Palladio's project.' Caciagli, pp.13-14. Cohen described his own survey method as using the 'simplest possible measuring techniques' of steel tape measures and a plumb line, and measurements of ceiling heights with a laser measuring device.' Cohen, 'How much Brunelleschi?', p.45. Cohen's survey can be applied to question contemporary approaches to quality as defined by constructed exactitude, in line with Caciagli's observations above.

⁴⁴ Frommel, p.105.

⁴⁵ Ibid.

⁴⁶ Ibid.

In utterly separating the elaborated project from its realization, in giving greater importance to the *lineamenta* [organising lines], or artistic design, Alberti completed the last passage in the process that had been developing since the Gothic style.⁴⁷

Trachtenberg categorically located a desire for certainty in advance of construction within Alberti's rejection of what Trachtenberg termed 'Building-in-Time' in which there had previously been no clear separation of stages of designing and building:

Alberti tacitly but categorically rejected this ubiquitous method. He fractured the holistic unity of the design/build process, opening an unbridgeable chasm between designing and building. In his ideal architectural world - in absolute antithesis to contemporary practice [...] all of the learned, extended, redundant, and comprehensive planning and replanning would precede construction [...] Any changes during execution were ruled out.⁴⁸

In *The Art of Building in Ten Books*, Alberti began by clarifying his definition of the architect: 'for it is no carpenter that I would have you compare to the greatest exponents of other disciplines: the carpenter is but an instrument in the hands of the architect',⁴⁹ codifying here a clear separation of designer and maker. The *Ten Books* defined *lineamenti*, or lineament as 'the correct and precise outline, conceived in the mind, made up of lines and angles, and perfected in the learned intellect and imagination',⁵⁰ emphatically separated from the matter of material. It is, Alberti advised, 'quite possible to project whole forms in the mind without any recourse to the material, by designating and determining a fixed orientation and conjunction for the various lines and angles.'⁵¹ Alberti offered lineament as a means of control abstracted from builder and material alike:

All the intent and purpose of lineaments lies in finding the correct, infallible way of joining and fitting together those lines and angles which defined and enclose the surfaces of the building. It is the function and duty of lineaments, then, to prescribe an appropriate place, exact numbers, a proper scale, and a graceful order for whole buildings and for each of their constituent parts, so that the

⁴⁷ Ibid.

⁴⁸ Trachtenberg, p.72.

⁴⁹ Leon Battista Alberti, *On the Art of Building in Ten Books*. trans. by Joseph Rykwert, Neil Leach and Robert Tavernor (Cambridge, Massachusetts; London, England: The MIT Press, 1988), p.3. 'The essential difference between Alberti and Vitruvius was 'that the ancient writer [Vitruvius] tells you how the buildings that you may admire as you read him were built, while Alberti is prescribing how the buildings of the future are to be built.' Joseph Rykwert, 'Introduction', in Alberti, p.x.

⁵⁰ Alberti, p.7.

⁵¹ Ibid., p.7.

whole form and appearance of the building may depend on the lineaments alone.⁵²

Writing of Alberti's *lineamanti*, Pérez-Gómez and Pelletier highlighted the development of perspective drawing as now enabling 'the full geometric idea of a future building (specifically the plan and the façade) to be conceived in the mind's eye of the architect.'⁵³ For the first time, the full architectural project was designed and communicated through written, drawn, and modelled form in advance of construction: yet such documents still retained embodied measurement and ontological meaning.⁵⁴ Precise construction drawings did not yet claim to communicate with abstracted and neutral certainty, a concept which would only finally emerge in the sixteenth and seventeenth centuries with the separation of measurement from embodied human experience.

⁵² Ibid., p.7.

⁵³ Pérez-Gómez and Pelletier, p.23.

⁵⁴ 'Alberti described through proportions only, and did not link them to a particular measuring scale; he was stressing the universality of his findings, that they were relevant for an adult body - male and female - of any height.' Tavernor, p.32.



Fig. 6.2 - 'The five orders of columns in architecture' in Claude Perrault, *Ordonnance des cinq especes de colonnes selon la methode des anciens* (Paris, 1683), pl. 1. RIBA Collections: RIBA10173. Perrault described this plate as containing 'all that has been explain'd in the first Part which treats of the Proportions common to all the Orders.'



Fig. 6.3 - 'Primitive hut' in Marc Antoine Laugier, *Essai sur l'architecture* (Paris, 1755), frontispiece, Charles Eisen. (1720-1778). RIBA Collections: RIBA3488-61.

6.4 'Describing 'reality with absolute precision'

'Galileo', Kenneth Frampton wrote in 1998, 'destroyed the integrity of appearance and being, and helped thereby to introduce Cartesian doubt as the fundamental basis of the scientific method',⁵⁵ throwing into doubt any reliance upon human senses to convey truth. From Francis Bacon's development of empirical research, pursuing quantitative knowledge in pursuit of perfection and allowing the possibility of humankind's restoration to a prelapsarian condition, to Rene Descartes' philosophical framework of 'Cartesian Doubt' which promoted the certainty of quantitative measure over the uncertainty of qualitative human senses, and John Locke's denial of the ability of the embodied mind to measure space and time,⁵⁶ the late sixteenth and early seventeenth century disembodiment of measurement engendered a search for a universal measurement system.⁵⁷

The latter half of the seventeenth century consolidated the refutation of traditional metaphysics, connecting mathematical theory with everyday life through Isaac Newton. For Newton, according to Pérez-Gómez, 'the origin of geometry was not intellectual but practical; geometry was only a part of universal mechanics, whose objective was to 'postulate and demonstrate with precision the art of measurement.'⁵⁸ Newton's relation between theory and practice thus 'aspired to be no more than a mere description of the technical means and not a discussion about its meaning',⁵⁹ laying the foundations for Positivism⁶⁰ and the belief that it was possible to know a part meaningfully without knowing the whole. With the cosmological link between human and divine reason now severed, the task of theory became that of disclosing the 'rationality evident in the natural order.'⁶¹ This would take place through an inductive rather than deductive process, and precision would play a key role in establishing specific criteria within inductive reasoning, vital

⁵⁵ Kenneth Frampton, 'Industrialization and the Crises in Architecture', in *Oppositions Reader: Selected Readings from a Journal for Ideas and Criticism in Architecture*, 1973-1984, ed. by K Hays (New York: Princeton Architectural Press, 1998), pp. 39-64 (p.40).

⁵⁶ See Ch.2, 'Science and Measure', in Tavernor, pp.37-61 for a detailed discussion of the emergence of Cartesian doubt.

⁵⁷ Tavernor discusses the Royal Society and its foundation in 1660 (1632-1723) as exploring possibilities for universal measurements. Tavernor, p.46.

⁵⁸ Pérez-Gómez, *Crisis*, p.78.

⁵⁹ *Ibid.*, p.78.

⁶⁰ As derived from Auguste Comte's 'A General view of positivism', originally published in 1848, which described its primary object as being to 'generalize our scientific conceptions, and to systematize the art of social life.' Auguste Comte, *A General view of positivism*, trans. By J.H. Bridges (London: Truber and Co, 1865), p.8.

⁶¹ Pérez-Gómez, *Crisis*, p.81.

in identifying, describing, explaining and attaining the components of a perfect rational order.

From Bacon to Voltaire, the application of scientific method from the seventeenth century onwards emphasised qualitative method and inductive reasoning, pursuing the accumulation of knowledge of parts in order to progress towards the perfect whole. Precision now represented the pursuit of the exact construction of the ideal - precision defined as exactitude from the mid seventeenth century⁶² - and this cultural shift was paralleled in architectural theory and practice as architecture, too, pursued a disembodied geometrical perfection. The publication in 1691 of Bullet's *Architecture Pratique* was highlighted by Pérez-Gómez as:

the first book to provide a concrete application of mathematics to the problems of mensuration and the determination of volumes in all types of building operations. Bullet claimed he had been shocked when he realized that there was no treatises on a subject that was "an absolutely indispensable science for determining with precision the cost of a building."⁶³

While the need to accurately predict costs had been identified as early as Vitruvius, Pérez-Gómez described Bullet's work as the first attempt to establish precise construction programs based on quantitative data, including costs, general and particular specifications and building systems.⁶⁴

The seventeenth century separation of theory and practice translated, in architectural production, to formalised distancing of the architect from the labour of the craftsman, and the increasing importance of architectural communications as an instrument of control. Pérez-Gómez and Pelletier highlighted Girard Desargues' vision of perspective theory as an 'effective instrument to control the transition between the concept and the built work',⁶⁵ and Villaplano and Carmuel's framing of the architect as a generator of ideas, analogous to God's own vision - all definitions dismissing handwork as out-with the scope of the architect, and framing drawing as a controlling device.⁶⁶ Emmons's survey of architectural authority in early modern England highlighted John Evelyn's elevation of architecture from a 'mechanical' to a

⁶² It was in this period too that the definition of 'precision', according to the OED Historical Thesaurus, begins to shift from that of 'separation and cutting off' to that of 'exactitude', as 'care and attention', reflecting the cultural shift which had taken place. See Chapter 4.

⁶³ Pérez-Gómez, *Crisis*, p.223.

⁶⁴ *Ibid.*, p.225.

⁶⁵ Pérez-Gómez and Pelletier, p.174.

⁶⁶ *Ibid.*, pp.174-175.

'liberal art' by arguing architectural design as derived from pure geometrical principles, separating architecture from the manual act of construction.⁶⁷

The relationship of the architect to the act of construction was, Crinson and Lubbock argued, central to two fundamentally opposing viewpoints manifested between the seventeenth and eighteenth centuries by Inigo Jones and Christopher Wren. Wren's framing of the architect as a Master Craftsman deeply embedded within the processes of the construction site was epitomized by his Royal Works, described by Crinson and Lubbock as a version of the mediaeval building lodge:

not just as an organization for erecting and measuring buildings but also as a school of architecture and of building in its broader sense, wherein all manner of skills and aptitudes might be nurtured and developed.⁶⁸

Inigo Jones' earlier contrasting vision of the architect as an 'Artist-Intellectual' distanced from the manual labour of the site through academic training was attributed by Crinson and Lubbock as setting the foundations for the eventual formation of the Royal Academy of the Arts in 1768, which Crinson and Lubbock describe as 'the first institution upholding the architect as a cerebral figure distanced from the mechanical or manual aspects of building.'⁶⁹ This, along with the appearance of Pupillage training, is usually taken, Crinson and Lubbock proposed, 'to mark the emergence of the first model of professionalism in architecture',⁷⁰ superseding Wren's framing of the architect trained on site as a 'Master Craftsman.' As the definition of the architect became distanced from the manual act of construction, expectations of quality as defined by geometrical perfection, and of remote control through precise instructions, began to take on increased prominence.

Geometry as a pure idea was central to Claude Perrault's interpretation of discrepancies between the ideal and constructed reality. Perrault's *Ordonnance* conveyed a system of proportions for the Classical orders as 'a rational guarantee

⁶⁷ See Paul Emmons, 'Architecture before Art: Imagining Architectural Authority in Early Modern England', *arq: Architectural Research Quarterly*, 10 (2007), 275-83.

⁶⁸ Mark Crinson, and Jules Lubbock, *Architecture: Art or Profession? Three Hundred Years of Architectural Education in Britain* (Manchester, UK; New York: Manchester University Press, c1994) p.7.

⁶⁹ Crinson and Lubbock, p.8.

⁷⁰ *Ibid.*, p.8.

of perfection⁷¹ in which the 'ideal had absolute priority over physical reality'⁷² [Fig. 6.2] Pérez-Gómez observed of Perrault that he had anticipated that the ideal could be attained in constructed reality through the use of rational system, framing any inability to do so as an error:

Significantly, Perrault blamed the carelessness of craftsmanship for this lack of correspondence, imagining again a one-to-one relation between a rational theory and architectural practice.⁷³

Comparing proportional rules and observations of classical proportions as laid out by historical scholars, including Vitruvius, Palladio and Scamozzi, Perrault had observed that none, 'with all their great Ability, could obtain such Approbation as to have their Precepts receiv'd for the Rules of the Proportions of Architecture [...] For Instance,' Perrault detailed:

they gave the Corinthian Column nine diameters and an half; fifteen Minutes and an half, as it is in the Porch of the Pantheon; not ten Diameters eleven minutes, as it is in the three Columns of the Forum, Romanum: but that they made them exactly sometimes nine Diameters and an half, sometimes ten; and that the Negligence of the Workmen of the Antique Remains, is the only real cause of the Defect in these Proportions that they are not exactly according to the true ones, which, it's reasonable to believe were established by the first Inventors of Architecture.⁷⁴

This interpretation of varying proportions of Classical and Modern works firmly attributed the authority of 'true' proportions to an original 'Inventor' of Architecture, assuming a separation of design and construction from the earliest works of architecture, and attributing any discrepancy between geometrical ideal and constructed work to negligence of craftsmen, establishing, also from the earliest works, a sense of distrust between designer and maker.

By the end of the eighteenth century, Pérez-Gómez and Pelletier wrote of Monge's late eighteenth-century geometrical formulations, the desire had become that of being able to '*describe* reality with absolute precision.'⁷⁵This division was further

⁷¹ Pérez-Gómez, *Crisis*, p.29.

⁷² In contrast to Vitruvius' recommendation of optical adjustments, which architects prior to Perrault had cited as explaining discrepancies between ideal proportions and constructed actuality, Perrault denied optical adjustment. Pérez-Gómez, *Crisis*, p.32.

⁷³ *Ibid.*, p.34.

⁷⁴ Claude Perrault, *A treatise of the five orders of columns in architecture*, trans.by John James (London, Benj, Motte, 1708), p. xvii. The subtitle notes, 'To which is attached a discourse concerning pilasters and of several abuses introduced into Architecture.'

⁷⁵ Pérez-Gómez and Pelletier, p.304.

codified by the establishment in 1747 of Peronnet's *Ecole des Ponts des Chausees* which identified, for the first time, the profession of engineering as distinct from architecture. Kenneth Frampton has argued that this division formalized engineering's role as a utilitarian imperative, 'untrammled by symbolization'⁷⁶ while further fragmenting architecture's placement between theory and practice, setting into place a widespread search for 'true' principles as a means of confirming the authority of the architect. Along these principles, Laugier's 1753 *Essai* [Fig. 6.3] proposed, Pérez-Gómez wrote, that 'architecture should have as sound principles as does science.'⁷⁷ Applying empirical methods to establish universal underlying principles, Laugier applied a 'precise rational operation'⁷⁸ in establishing dimensional relations as a generator of meaning: proportions 'derived from an ordered and harmonious nature whose *mathemata* could be evidently perceived by man.'⁷⁹ In a cultural context which was denied the certainty of cosmological order, certainty was now to be derived from precise geometrical principles derived from rational scientific method, and their controlled translation into constructed reality. Ken Alder's review of representation and tolerance in Enlightenment France aligned 'the making of identical parts requiring new forms of technological representation - mechanical drawing and production tolerance'⁸⁰ - and suggests that in the hands of eighteenth-century engineer-technologists developing tools of manufacturing tolerance, 'mechanical drawing went from being a pictorial representation of the artifact, to a rigorous (thin) definition of its physical form.'⁸¹ The establishment of the *Ecole Polytechnique* in 1794/5, and Durand's *Précis des Leçons*, would further systematise this response in the eighteenth century.

The birth of the 'modern' architect (1750-1800)

The appointment in 1795 of Jean-Nicholas-Louis Durand as Professor of architecture at the *Ecole Polytechnique* was highlighted by Tavernor as the birth of modern architecture,⁸² epitomizing the adoption of rational scientific method and the

⁷⁶ Frampton, 'Industrialization', p.43.

⁷⁷ Pérez-Gómez, *Crisis*, p.61.

⁷⁸ *Ibid.*, p.64.

⁷⁹ *Ibid.*, p.65.

⁸⁰ Ken Alder, 'Making Things the Same: Representation, Tolerance and the End of the Ancien Regime in France', *Social Studies of Science*, 28 (1998), 499-545 (p.500).

⁸¹ *Ibid.*, p.504.

⁸² 'The separation of the human body from architectural discourse that Durand initiated was as decisive as the separation of the king's body from the authority of the State. Attempts were made to reconnect them, but, for the most part, architectural expression was now the servant of rationality and science. Architecture was to become global, even universal in outlook, and – in a profound sense – modern architecture was born.' Tavernor, p.115.

explicit rejection of human measure and experience. Durand's curriculum at the *Ecole*, established to meet the 'technological demands of post-Revolutionary France',⁸³ emphasised mathematic reasoning over the arts and humanities, promoting building technology and delegating the 'art' of architecture to ornament and decoration as a sub-discipline of civil engineering. Through the *Précis des leçons d'architecture données à l'École Polytechnique* Durand conceived the study of architecture as a systematic analysis of its parts, writing of architecture as 'being the composition of the whole of buildings, which is nothing other than the result of the assemblage of their parts.'⁸⁴ Sergio Villari's analysis of Durand highlighted this as a radical redefinition of architecture, from a monolithic conception of a whole to something produced by a composition of parts.⁸⁵ The explosion of a holistic order into constituent parts demanded a new order, for which Durand turned to typological classification. The *Leçons* concluded with an examination of the generic principles of buildings and their constituent parts, creating a 'true and proper typological classification' and demanding exactness:

reassembling the elements within the overall totality of the building – that is to say, analyzing them – enables us to reach exact ideas, just as we succeeded in creating an exact idea of architecture by analysing with this procedure the general idea.⁸⁶

Exactness, defined here as the reductive analysis of constituent parts into a coherent order, was to be achieved by editing and simplifying, rejecting all that is 'not solidly related to the principles of simplicity, economy and convenience.'⁸⁷ Meaning would emerge from the resolution of the architectural problem: Durand's rational theory, 'free from metaphysical speculation',⁸⁸ was instead guided by the modular grid of the *mécanisme*,⁸⁹ overtly rejecting, as Pérez-Gómez and Pelletier

⁸³ *Ibid.*, p.111.

⁸⁴ 'Thus all of the architectural materials in the *Précis des Leçons* is divided into three parts: "architectural elements", "composition in general", and "analysis of genres" Sergio Villari, *J.N.L. Durand (1760-1834): Art and Science of Architecture* (New York: Rizzoli, 1990), p.59.

⁸⁵ 'This mechanism is of interest for at least two important reasons. The first, of a strictly historical nature, has to do with the evolution from a monolithic conception of the work of architecture to its radical redefinition as something produced by composition of parts: the single, entire, and well-finished Palladian body, already reeling under the blows of the baroque principle of hierarchy, is shattered now by the nearly serial composition of its elements. In particular, the architectural space explodes, fracturing itself, its supposedly eternal indissolubility threatened at the core. The fragments now have need of a norm that can govern their combinatory order.' Villari, p.61.

⁸⁶ *Ibid.*, p.65, citing Durand, *Partie Graphique*, p.92.

⁸⁷ *Ibid.*, p.15.

⁸⁸ Pérez Gómez and Pelletier, p.298.

⁸⁹ *Ibid.*, p.298.

noted, any 'artistic' means of representation in pursuit of 'character',⁹⁰ in an attempt to remove the subjective viewpoint in favour of precise objectivity.

'Method was everything', Tavernor wrote of Durand, summarising the late eighteenth century impetus towards precise measurement free from metaphysical speculation and pictorial representation.⁹¹ In Durand's *Precis*, man did not inhabit qualitative place, but precisely measurable universal Cartesian space, concepts underwritten by the legal designation of the length of the metre in 1793. Gaspard Monge's 1798 *Géométrie descriptive* was highlighted by Pérez-Gómez and Pelletier as 'the first truly synthetic and systematised method that could be applied universally to all arts and crafts.'⁹² These texts are described by Pérez-Gómez and Pelletier as laying the foundations of a rational approach based on quantitative methods which has become the basis of building operations in the industrialized world, relying on the clear separation of theory and practice. Conceptually, and, as the nineteenth century proceeded, professionally separated from the craftsman, architecture pursued as a rationalized order of categorized parts would occupy a primary place in architectural debates as the promises of the Industrial Revolution took hold.

6.5 The promises of industrially produced precision

The Industrial Revolution of the late eighteenth and early nineteenth century presented unprecedented opportunities and challenges for the working practices of both architect and builder. Henry Cort's development of the puddling process in 1784 had rendered the use of iron in construction economical on a large scale, while new industrial and civic building typologies - railway stations, factories, public exhibition spaces, museums - demanded large internal volumes, turning to structural systems from industrial infrastructure. Improved and new transport networks allowed, for the first time, building materials to be transported economically and in large quantities over long distances. Together, these

⁹⁰ Ibid., p.299.

⁹¹ Tavernor wrote: 'Architectural design was more akin to organising an efficient military campaign than being a physical representation of human aspirations and understanding – which is how it had been regarded before the appointment. Method was everything. Durand's approach was based on the misconception that man does not inhabit a qualitative place, but universal geometrical space. The objectivity of infinite Cartesian geometry was promoted over traditional, subjective notions as to what constituted inhabitable space. Expanding the rational mind took precedence over satisfying sensual desires of the body.' Tavernor, p.112.

⁹² Pérez-Gómez and Pelletier, p.304.

innovations presented a more complex and varied architectural and building culture within which architects and builders had hitherto worked, challenging shared, accumulated knowledge of materials and methods, within a shifting philosophical framework which advocated certainty and exactitude.

In this shifting framework, Bishir's analysis of late eighteenth century specifications captured the form of agreements which had, she described, sufficed as standard practice since mediaeval times in England, and in the USA from settlement through to the nineteenth century. Describing an example 1774 specification which left out much of the detail and appeared to be 'casual' or 'inadequate', Bishir noted that specifications such as these assumed that both parties knew more than was stated. The written or drawn instructions:

were not sufficient in themselves but, as I suggested earlier, as part of a complex system at work. These documents, like any legally binding agreement, included as much as their makers believed necessary. Those things that went unstated, on the other hand, were those the participants in the contract saw no need to write down. It is into this seeming gap between what was said and what was left unsaid – which is no indication of things done and left undone – that we need to look.⁹³

The specification analyzed by Bishir relied upon a well-established cultural framework which could, for the most part, assume that each party in a contract was familiar with long standing traditions of working with primarily local materials, repetitive methods, limited building typologies and forms and shared expectations, presumptions which were irrevocably altered in the nineteenth century. Writing of the Great Exhibition of 1851⁹⁴ as occasioning 'major reassessments of the condition of culture and society in relation to the new productive system and the environment it produced', Stanford Anderson observed:

Modern industry ruptured ancient relationships among makers, products and users - disjunctions, owing to the division of labor, between workers and the objects produced; a correlative standardization of the products; and an increasing emphasis on fashion and obsolescence as stimulants to consumption. The Great Exhibition of 1851 in the Crystal palace in London assembled the machines and products of modern industry in a prefabricated iron and glass building before a popular audience – building and audience themselves being representatives of the same change in productive means. 1851 occasioned major reassessments of the condition of culture and society in relation to the new productive

⁹³ Bishir, p.45.

⁹⁴ The Crystal Palace and the Great Exhibition of 1851 will be discussed in Ch. 7.

system and the environment it produced. Although such evaluations need not have hinged on a rejection or even a radical critique of mass production, the immediate consequences of industrialization were sufficiently open to criticism as to lend strong support to the Arts and Crafts movement which, under the leadership of William Morris, attempted to reintroduce craftsmanship as the primary means of cultural production.⁹⁵

The arts and crafts movement presented a counter-argument, arguing against machined perfection in favour of the imperfections and mistakes made by hand crafted processes, an argument which was applied to the advocacy of Gothic Architecture. In *Arts and Crafts*, Peter Davey notes Ruskin's rejection of Classical Architecture as 'the Architecture of slavery, aiming at perfection of execution.'⁹⁶ A 'truly Christian and humane architecture', Ruskin set out, must be imperfect, allowing what he referred to as 'Savage'.⁹⁷ Ruskin's *The Stones of Venice*, in particular the chapter, 'The Nature of the Gothic', set out a social critique of industrial capitalism, and in particular, of economist Adam Smith's concept of the division of labour. Arguing that the worker, rather than acting as a part in a well-oiled machine, should be given freedom to think creatively, and to use his own hands in lieu of machinery, Ruskin's stance against mechanization and standardization rejected the certainty of control in favour of the ambiguities of human discretion:

You can teach a man to draw a straight line, and to cut one; to strike a curved line and to carve it; and to copy and carve any number of given lines and forms, with admirable speed and precision; and you will find his work perfect of its kind: but if you ask him to think about any of those forms, to consider if he cannot find any better in his own head, he stops; his execution becomes hesitating; he thinks, and 10 to one he makes a mistake in the first touch he gives to his work as a thinking being. But you have made

⁹⁵ Stanford Anderson, 'Modern Architecture and Industry: Peter Behrens and the Cultural Policy of Historical Determinism', *Oppositions* 11 (Winter, 1977), 52-71 (p.54).

⁹⁶ Peter Davey, *Arts and Crafts Architecture* (London: Phaidon Press Limited, 1995), p.18.

⁹⁷ Ruskin defines 'Savage' in *The Stones of Venice* as: 'I believe, then, that the characteristic or moral elements of Gothic are the following, placed in the order of their importance: 1. Savageness. 2. Changefulness. 3. Naturalism. 4. Grottesqueness. 5. Rigidity. 6. Redundance' and of the word 'Savage' Ruskin expands, 'As far as the epithet was used scornfully, it was used falsely; but there is no reproach in the word, rightly understood; on the contrary, there is a profound truth, which the instinct of mankind almost unconsciously recognizes. It is true, greatly and deeply true, that the architecture of the North is rude and wild; but it is not true, that, for this reason, we are to condemn it, or despise. Far otherwise: I believe it is in this very character that it deserves our profoundest reverence'. John Ruskin, 'The Stones of Venice' Vol II: VI The Nature of Gothic' in *The Works of John Ruskin Vol X*, ed. by E.T. Cook and Alexander Wedderburn (London: Library Edition, Ruskin Library, 1903), p. 185.

a man of him for all that. He was only a machine before, an animated tool.⁹⁸

Davey references this particular argument as having 'profound consequences' on a developing arts and crafts movement. Pugin, Davey notes, was 'prepared to grant machinery a limited role provided it was not used to imitate handwork', an argument rejected by Ruskin who strictly advocated Gothic 'naturalism' via the craftsman who 'not only expressed his own imperfections in his art, but, by close observation of nature, the imperfections of his subjects too.'⁹⁹ Ruskin's advocacy of Gothic rejected the promises of exactitude offered by machined processes:

Men were not intended to work with the accuracy of tools, to be precise and perfect in all their actions. If you will have that precision out of them, and make their fingers measure degrees like cog-wheels, and their arms strike curves like compasses, you must unhumanize them. [...] On the other hand, if you will make a man of the working creature, you cannot make a tool. Let him but begin to imagine, to think, to try to do anything worth doing; and the engine-turned precision is lost at once. Out come all his roughness, all his dulness, all his incapability; shame upon shame, failure upon failure, pause after pause: but out comes the whole majesty of him also; and we know the height of it only when we see the clouds settling upon him.¹⁰⁰

Arguments against machined perfection were also applied to the emerging development of applied prefabricated ornament: Pugin's *True Principles*, Davey noted, set two 'great rules': which were to influence the whole Arts and Crafts movement:

1st, that there should be no features about a building which are not necessary for convenience, construction or propriety, 2nd that all ornament should consist of the essential construction of the building.¹⁰¹

Arguments which sought to locate architecture as necessarily embedded throughout a project, and not reducible to a prefabricated application of ornament, had been central to the arguments set out in Adolf Loos' essay '*The Principle of Cladding*' which critiqued 'empirical' methods;

⁹⁸ Ibid., pp.191-192.

⁹⁹ Davey, p.18.

¹⁰⁰ Ruskin, 'The Stones of Venice: Vol II: VI The Nature of Gothic' in Cook, *Works Vol X*, p.192.

¹⁰¹ Davey, p.15.

There are architects who do it the other way around. Their imagination creates not rooms but walls, the rooms being the space left inside the walls. Then they clad the internal walls with the material that seems most appropriate. That is the empirical route to art.¹⁰²

Promises of machined precision - which will be discussed in detail in Ch. 7 - were rejected by those architects who read in their promises a threat of the loss of craftsmanship, of meaning and of architectural value in the face of an empirically driven context, a fear which was captured at the close of the nineteenth century by the collection of letters, titled *Architecture: A profession or an Art*, produced in 1892 by the Memorialists, led by Richard Norman Shaw and Thomas Graham Jackson, in protest of RIBA's proposals to introduce compulsory examinations in 1882 as an attempt to define the control, authority and role of the architectural profession. The proposal to formally define and regulate the use of the term 'architect' through examinations, and a perceived emphasis on the business side of the profession - upheld by an 1891 opening address from RIBA president John Macvicar Anderson defining the architect as 'artist, constructor and man of affairs' - split opinion between those who viewed architecture as a profession requiring protection and regulation, wholly dependent upon commerce and economic organization and closely linked to engineering and surveying profession; and those who upheld that architecture was an art which could be neither defined nor regulated. At the heart of the memorialists' protests was the fear that Architecture, subject to examinations and defined by formulae, would become 'a dull, lifeless thing of no value to any one.'¹⁰³ Art, they held:

is not an ornamental something - a gilding or a varnish - which may be laid upon bare construction and so transform it into architecture. It is an influence, a motive that must reign supreme from the very first moment, and guide the construction equally with considerations of strength and security. [...] Construction is not a science, as Mr. Anderson would have it; statics and dynamics are sciences; but construction is an art, and when cojoined with design a fine art - in fact, architecture.¹⁰⁴

These views expressed fears that architecture would hitherto be defined by values of costs, predictability and certainty; that the ambiguous, indefinable values of art

¹⁰² Adolf Loos, *On Architecture*, trans. By Michael Mitchell (Riverside, California: Ariadne Press, 2002), p.42

¹⁰³ R. Norman Shaw and T.G. Jackson, eds., *Architecture, a Profession or an Art: Thirteen Short Essays on the Qualifications and Training of Architects* (London: John Murray, 1892), p.viii,

¹⁰⁴ *Ibid.*, p.xxi.

and craft would become subservient to the precise accountability of quantitative concerns; that architecture might, if defined quantitatively, rather than qualitatively, be reduced to no more than an ornamental surfacing, an optional and luxurious extra, reducing or removing the need for the architect altogether.

The response to such fears, turning first to Arts and Crafts visions of return to a pre-industrial culture, were to be refuted by the progression of the Industrial Revolution. As Stanford Anderson summarised,

It also became clear that the course of industrial production could not be reversed without drastic consequences for a population that had been reorganized to suit the processes of industrialization.¹⁰⁵

An alternative viewpoint embraced the concept of a regulated profession in order to reassert the value of the architect. Closing the nineteenth century, Auguste Choisy's 1899 *Histoire de l'Architecture* envisioned the architect as 'an absolute master-demiurge, in total control of the building operation from conception to execution, capable of a synthetic understanding that would ensure the act of design to be in agreement with the "Truth."' This vision of the architect at the turn of the twentieth century now turned to precision explicitly as a tool with which to uphold total control of a complex process, a vision which had been clearly stated by the American Institute of Architects (AIA) upon its formation.

6.6 Scientific and practical perfection in a USA profession

When the AIA formed in 1857, it declared its aims for the architectural profession as 'scientific and practical perfection.'¹⁰⁶ As in the UK in the same period, the architectural profession in the USA was undergoing a process of defining the role and expectations of the architect, transforming from a historically Beaux-Arts inspired and largely unregulated field to a strictly regulated profession focused on the efficiency of organizational structures which could work within the demands of complex and multi-disciplinary construction projects. This posed a challenge for

¹⁰⁵ Anderson, 'Cultural Policy of Historical Determinism', p.54.

¹⁰⁶ <http://www.aia.org/about/history/AIAB028819> accessed 22 August 2012. At that time the architectural profession in the USA had no legal requirements governing the use of the title architect, nor over the provision of architectural services: both were first defined by 1866 fee schedule drawn up as the first contract document from the AIA.

architectural practices, as Andrew Shanken, observed, in locating themselves between cultural aspirations and pragmatic considerations.¹⁰⁷

In his research into the organizational structures supporting industrial standardization, Shanken suggested that the scale of building operations in the late nineteenth century 'forced the building industry to rationalize' from an 'intimate and quasi-familial basis of business'¹⁰⁸ in a context which demanded increased certainty in costing, construction methods, and communications to accommodate increasingly complex projects. 'The simple erection of a skyscraper, for instance,' Shanken observed:

called for a level of organization that only surfaced during times of war. The unprecedented tons of steel, brick or terracotta, piping, glass, and the myriad of materials needed to finish and appoint the interior of increasingly large buildings taxed the manufacturers and distributors of materials, and the builders of the day.¹⁰⁹

Thomas Leslie similarly highlighted the growing complexity of building operations at the end of the nineteenth century in the USA as fundamentally altering the role of the architect. Tall buildings in particular involved:

[c]ollaboration and communication among architects, engineers, builders, industrialists, and clients. Tall building design in this era- as today- exceeded the abilities of single minds or even single firms. Successful conception and execution required extensive integration of structural, planning, fabricational, and constructional techniques. This was only possible through widespread collaboration and the sharing of knowledge by means of relatively new media such as professional meetings and journals. With such complexity, and with structural, cladding, and other systems so tightly woven together, the tall building required architects to adjust subtly their traditional roles as omnipotent master builders, and to cede important responsibilities in structural engineering and construction methodology.¹¹⁰

¹⁰⁷ 'For architects, who were shedding the remnants of the builder-architect tradition for the Beaux-Arts model of the artist, consumer culture could be shocking. While Mary N. Woods rightly argues that "capitalism ... was the milieu of American architectural practice" in the nineteenth century, architects struggled to reconcile the pragmatic demands of doing business with their aspirations to high culture.' Andrew M. Shanken, 'From the Gospel of Efficiency to Modernism: A History of Sweet's Catalogue, 1906-1947', *Design Issues*, 21 (Spring 2005), 28-47 (p.30).

¹⁰⁸ Ibid., p.29.

¹⁰⁹ Ibid., p.30.

¹¹⁰ Thomas Leslie, 'Built Like Bridges: Iron, Steel, and Rivets in the Nineteenth-Century Skyscraper', *Journal of the Society of Architectural Historians*, 69, No 2 (June 2010), 234-61. (pp. 255-256).

In addition to the need to co-ordinate emerging areas of specialist expertise, the architectural profession and construction industries were also required to respond to expectations of increased dimensional exactitude in construction, greater efficiencies, and the certainty of greater predictabilities offered by the emerging field of materials science.

The development of factors of safety by engineer William Rankine in the 1850s made allowances for the 'inevitable inaccuracies' of mathematical models, introducing what Bill Addis termed 'the art of approximation', or being 'as precise as is necessary.'¹¹¹ Rather than drawing from decades or even centuries of accumulative experience, a scientific understanding of material properties permitted the rapid development and application of new construction systems, working to increasingly defined structural tolerances and limits. The implementation of greater economies and efficiencies of construction in the reconstruction of 1880s Chicago would fundamentally define expectations of the role and promise of precision in architectural production.

From masonry to iron to steel: the development of tall buildings in Chicago

Colin Rowe's 'Chicago Frame' identified a confluence of circumstances at the end of the nineteenth century as acting as a catalyst for the development of the iron skeleton frame and the curtain wall within the Chicago School of architecture,¹¹² converting the European 'idea' of the steel frame as to constructed 'fact' in Chicago.¹¹³ 1880s Chicago sat globally at the forefront of innovations in producing standardised components on an industrial scale to meet the construction demands of ever taller structures.¹¹⁴ William Le Baron Jenney's 1884-85 Home Insurance Building has been hailed as the 'progenitor of skeleton-frame construction'¹¹⁵ in

¹¹¹ Bill Addis, *Building: 3000 Years of Design Construction and Engineering* (London; New York: Phaidon, 2007), p.464.

¹¹² Carl Condit gives the name 'The Chicago School of Architecture' in Carl Condit, *The Chicago School of Architecture: A History of Commercial and Public Building in the Chicago Area, 1875-1925*, (Chicago and London: The University of Chicago Press: 1964)

¹¹³ Colin Rowe, *The Mathematics of the Ideal Villa and Other Essays* (Cambridge, Mass: The MIT Press, 1983), pp.99-101.

¹¹⁴ 'Before the late nineteenth century, wind bracing had rarely been more than a minor consideration in structural calculations, because in heavy masonry buildings the dead weight of brick or stone construction absorbed all but the most severe lateral and overturning forces imposed by wind. However, the lighter weight of skeletal buildings, their increased height, and the nature of steel and iron connections necessarily brought this issue to the fore. The designers of the tall buildings of the 1880s in Chicago were among the first to recognize this problem and to solve it with dedicated lateral or shear systems.' Leslie, p. 237.

¹¹⁵ Wermeil noted that the Home Insurance Building, while not a skeleton frame construction, used iron framework in the street facades and 'inspired architects to experiment with

introducing the use of Bessemer steel in construction and in separating structural frame from façade.¹¹⁶

The columns of tall buildings constructed in Chicago in the 1890s were, Leslie noted, 'increasingly sophisticated, of more scientifically studied material and of more mathematically calculated shapes'.¹¹⁷ Works including Holabird & Roche's thirteen storey Venetian (1891-2), Burnham & Root's twenty-one storey Masonic Temple (1891-2), and Holabird & Roche's Old Colony Building (1893)¹¹⁸ were underpinned by visions of the potentials of industrial production. An 1890 article by Jenney, 'An Age of Steel and Clay' had predicted a 24 hours a day, 365 days a year factory which would mechanically produce fire clay or terracotta in a 'continuous, controllable, swift and economic process of production',¹¹⁹ permitting 'precision combined with speed',¹²⁰ as Ulrich Pfammatter summarized in *The Making of the Modern Architect and Engineer*. Precision, in the context of the architectural profession of late nineteenth century Chicago, was now linked not only to questions of control and certainty, but to elevated expectations of speed, efficiency and economy to meet the commercial demands of high-rise developers in the USA in the 1880s. The development of large commercial architectural practices and

supporting loads, including the outer walls, on the frame alone. They succeeded in creating skeleton frames around 1890. Contemporaries quickly recognized that the exterior part of such a building was no longer a wall in the traditional sense but an enclosure, and coined the term 'curtain-wall.' Thus skeleton frame construction came into being.' Sara Wermiel, 'Introduction of Steel Columns in US Buildings, 1862-1920', *Proceedings of the Institution of Civil Engineers Engineering History and Heritage*, 162 (February 2009), 19-27 (p.21).

¹¹⁶ Addis highlighted the Home insurance Building as a 'landmark in the history of building construction,' in supporting the masonry façade with beams at each floor level, and introducing the use of Bessemer Steel, instead of wrought iron, above the sixth floor. Addis, p.391.

¹¹⁷ Ibid., p.391.

¹¹⁸ Leslie, pp. 242-243.

¹¹⁹ Ulrich Pfammatter, *The Making of the Modern Architect and Engineer: The Origins and Development of a Scientific and Industrially Oriented Education* (Basel: Boston: Berlin: Birkhauser, 2000), p.174. Pfammatter cites 'An Age of Steel and Clay', *The Inland Architect and News Record*, XVI: 7 (Dec 1890), 75-77 (p.77).

¹²⁰ 'Thus did three lines of development, intellectually and pragmatically converging in the person of Jenney, result in the establishment of the "Chicago School": The tradition of iron skeleton construction developed for British textile industry initially separated the outer wall from its load-bearing function and broke up the roof construction into lighter layers; the French tradition of engineering then resulted in perfecting the use of steel in supporting structures and in reapportioning the quantity of material used for the components; the American approach introduced a new principle of economy. Therefore, in Jenney's work the French industrial school of thought embodied by the École Centrale is combined with a fundamental American principle, namely a combination of standardizing construction components (interchangeable parts) with pre-fabricated elements in a secure workshop and mass produced material of a consistent quality coupled with fast and easy assembly; in other words, precision combined with speed – a precursor to the production maxim that began with automobile production, "time is money".' Pfammatter, p.177.

construction firms at the end of the nineteenth century in the USA now operated in a cultural context framed by a scientifically-driven focus upon precision as a guarantor of economic certainty. This ideology permeated all aspects of the architectural profession and construction industry, from the hierarchical organization of architectural practices, to the commercial expansion of construction firms.

The General Contractor and the Lump Sum Contract

The emergence in the USA of the 'General Contractor',¹²¹ coupled with the development of whole contracts to erect large, complicated building projects, and the demand for cost certainty in advance of construction through the adoption of a 'Lump Sum Contract'¹²² raised questions of trust and collaboration between architect and builder and aligned them with precise specification in advance of construction.¹²³ The influence of General Contractors upon design decisions as detailed as the selection of a particular steel section from a particular manufacturer¹²⁴ played a critical role as high-rise construction moved the architectural profession and contracting industry into uncharted territory amidst the

¹²¹ The General Contractor emerged, Sara Wermeil summarized, from combined factors of increased specialization and complexity in construction: 'The emergence of the general contractor was a manifestation of the trend toward specialization in the USA building industry. When superintending a myriad of tradesmen on large projects became too much for architects, builders created the role of the general contractor, which relieved architects of many job-site responsibilities.' Sara Wermeil, 'Norcross, Fuller, and the Rise of the General Contractor in the United States in the Nineteenth Century', in *Proceedings of the Second International Congress on construction history*, (2006), 3297-3313 (p.3311).

¹²² In the USA, a media-hyped obsession with the speed of construction had initially encouraged the adoption of the 'Cost-Plus contract', in which 'the general contractor was paid a fee to engage subcontractors and manage the work, while the owner paid the actual construction costs (labour and materials). Under this contract, costs did not have to be guaranteed in advance of construction, and thus construction could begin before drawings and specifications, required for bidding of costs, were completed, giving the advantage of speed. However, as Wermeil writes, 'since the contractors fee rose along with construction costs, cost-plus contracts that were loosely drawn or lacked a guaranteed maximum encouraged builders to overspend'. Ibid., p.3307.

¹²³ The emergence of the 'General Contractor' was paralleled in the UK with respect to the 'Master Builder': the UK context will be discussed in Ch.7 of this thesis.

¹²⁴ To render the scale of operations financially viable, early USA general contractors expanded their activities beyond the management of subcontractors. Wermeil highlights the means by which the expansion of USA firms such as Norcross Brothers (1864-1924) into the manufacturing and supply of materials directly influenced detailed design decisions in architectural practice. Wermeil, 'General Contractor' p.3303. Wermeil's study of the steel column argued that the widespread adoption in Chicago of the Z-bar steel column was influenced by mills, and contractors who 'pushed' specific products due to financial arrangements. George A. Fuller Co, who, Wermeil notes, is attributed as one of the first general contractors in Chicago due to his use of the cost-plus contract for the Chicago Opera House block in Chicago in 1884-5, 'built many of the early Chicago skyscrapers, and consequently these buildings had Carnegie's [Steel Company] Z-bar columns – not because the column style was the best necessarily, but because it was what Carnegie Steel Company supplied.' Wermeil, 'Introduction of Steel Columns', p.24.

emergence of specialized professionals and growing commercial pressures. Chicago architectural practices adopted a rationalized strategy in order to maintain control within a rationalized context, creating and embedding specialist roles directly within their organizational structures and setting functional and financial considerations at the forefront of their operations.

'Delegation, specialization and hierarchy' in late nineteenth century USA

As the UK debated the definition of architecture as an art or a profession in the late nineteenth century, the AIA's aims of 'scientific and practical perfection' were manifested in the organizational structures of mid-nineteenth century USA architectural practices. Mary Woods summarized 1860s - 1870s USA architectural offices as 'centers for the production, distribution, cataloguing, and archiving of drawings, specifications, and other documents'¹²⁵ in adherence to recommendations from professional journals such as the *American Architect and Building News*, and *Inland Architect* on means of maximizing 'efficiency and productivity.'¹²⁶ Driven by financial and functional considerations, the drive towards efficiency was, Woods noted, exemplified by the need to maintain control over the increasing complexity of documentation required for large projects:

The number of drawings and copies required for a major building in the 1890s, estimated at between 3,500 and 5,000, drove the formation of these practices. Elaborate written specifications were also necessary, for bidding purposes as well as construction.¹²⁷

'Delegation, specialization, and hierarchy became the watchwords in these big firms',¹²⁸ Wood summarized, with roles assigned to specification writers, job superintendents, office managers for supervising staff and the increasing separation and specialization of roles in architectural production.¹²⁹ By the 1880s, Addis noted,

¹²⁵ Mary Woods, *From Craft to Profession: The Practice of Architecture in Nineteenth-Century America* (Berkeley University of California Press, c1999) p.121.

¹²⁶ *Ibid.*, p.121.

¹²⁷ Woods highlights the development of Blueprints in the 1850's, which removed the need for one specialism: the 'tracers', or employees who copied drawings. *Ibid.*, p.121.

¹²⁸ *Ibid.*, p.127.

¹²⁹ 'Although partners might follow a project from initial sketches to design drawings to working drawings to final construction, staff members in these large offices usually worked on only one discrete part.[...] Partners like Root [of Holabird & Root] might make a daily tour of the drafting room to review the work on the drawing boards. A specifications write and his staff drafted the written instructions. Designated job superintendents were the responsible for working with the contractors, supervising site work, and writing progress reports. At critical stages the partners also visited the site.' Woods also notes that a defined office protocol was supported by the physical segregation of specialist roles within office layouts. *Ibid.*, pp.127-128.

most Chicago architectural firms had at least one partner with an engineering background¹³⁰ as the structural and environmental engineering requirements of increasingly large and complex buildings moved beyond the scope of a single author.

The fear that Loos and the memorialists had expressed - that the architectural profession would be reduced to a provider of facades - was answered in Chicago by the embedding of scientific specialisms within Chicago architectural practices, and the adoption of a design ethos focused on financial and functional concerns.¹³¹

Writing of the design processes underlying Burnham and Root's Montauk Building, Addis argued:

Financial, functional, and technical requirements were studied with equal intensity and embraced in the design to ensure that the building would be successful. Such a utilitarian approach to building design, and the role of building engineering, had of course been applied to earlier commercial buildings such as mills and warehouses, but never before had the engineer's central role and the need for engineers to embrace non-technical (financial and functional) issues been so strongly emphasized.¹³²

In a development boom¹³³ which demanded acute administrative and financial skills, Chicago architectural practices were applauded for their business acumen as much as design capabilities, particularly on their ability to ensure profits for their private market clients in delivering projects on time and within budget.¹³⁴ The explicit demand for efficiency and productivity which had manifested itself through the

¹³⁰ Addis, p. 397; Woods, p.127.

¹³¹ Addis noted that engineering innovations made by Jenney, Adler & Sullivan, Burnham & Root and Holabird and Roche, each of whom included one or more partners who had trained as an engineer, had supported the reduction of costs and increased the speed of constructing steel frame buildings. Addis, p.451.

¹³² Ibid., p.394.

¹³³The 'robust building economy' of the late 1870s led to an unprecedented volume of work: Woods reported that 'Burnham and Root designed more than two hundred buildings in only eighteen years. Woods, p.121.

¹³⁴ Woods wrote: '*The Economist* eulogized William Holabird in 1923; he was "not only a success in his profession as an architect, but he was a success as a businessman as his buildings...were always profitable for their owners...This was the result of talent and clear thinking directed seriously along the lines of beauty and utility." Woods, p.125. Woods also noted: 'When Robert Peabody gave his presidential address at the AIA convention of 1901, he acknowledged that the large office was now a professional fact of life. American architects as diverse as Charles McKim and Dankmar Adler agreed on one fundamental point: a successful professional practice required entrepreneurial initiative and business acumen. Just what business tactics and procedures were professionally appropriate remained vague. The AIA sanctioned the large offices' organization, hierarchy, and bureaucratization as ways to deal with architectural practices driven by private building markets.' Ibid., pp.136-137.

processes of manufacturing, construction and architectural practice, would be encapsulated at the beginning of the twentieth century throughout the USA and Europe by the principles of scientific management. The extension of industrialization into all scales of production, from manufacturing, to construction, to design, into even household management, was epitomized in the first decades of the twentieth century by Taylor's principles of scientific management, Gilbreth's and Gantt's translations of Taylor into construction, and Ford's assembly lines.

Synthesizing art and technology: early twentieth century Europe

From the formation in 1906 of Sweet's catalogue in the USA as a means to categorise and order the now hundreds of prefabricated products available to the USA architecture profession and construction industry,¹³⁵ to the appearance in 1908 of the assembly line produced Ford Model T, to the precise definition of the Metre itself in 1913,¹³⁶ the desire for the precision of scientific rationalization became framed as an everyday fact. In 1911, USA engineer Frederick Taylor's *The principles of Scientific Management*¹³⁷ attempted to rationalize the activities needed to complete manufacturing tasks down to, as Siegfried Gideon observed, 'the fraction of a second.'¹³⁸ Taylor's principles found their lasting application in the

¹³⁵ 'Sweet's Catalogue, that almost mythic fixture of promotion in the building industry, arose in 1906 in response to what architects called the "catalogue problem." Besieged by thousands of catalogues of irregular size and format, the architect or builder could scarcely keep up with the proliferation of building materials in the emerging national economy, let alone organize and read the trade catalogues generated by a building industry stoked by the emerging field of advertising. Sweet's systemized the chaotic lines of communication between architects, builders, engineers, and manufacturers, regularizing the typography and size of trade catalogues, and binding them in one large reference book with an index.' Shanken, 'Sweet's Catalogue', p.28.

¹³⁶ Writing of James Clerk Maxwell's and, subsequently, Albert A. Michelson's experiments with determining absolute weights and measures through light, Tavernor notes; 'This new level of precision gratified astronomers and physicists in particular, and in 1913 the metre was determined by the International Bureau to be equal to 1,553,164.13 cadmium red line wavelengths.' Tavernor, p.150.

¹³⁷ Siegfried Giedion noted that Taylor had developed his principles while working in factories and steel companies, including close collaboration with the Bethlehem Steel Company, 1898-1901. Siegfried Giedion, *Mechanization Takes Command* (New York: Oxford University Press, 1948), pp. 96-98.

¹³⁸ Siegfried Giedion wrote of Taylor's aims: 'Taylor and his successors do not want to command only. They provide for departments through which the worker himself can suggest improvements and share in the economies. The gifted workers may perhaps benefit, but the average man cannot escape automatization. [...] He would have his 'fundamental principles of scientific management worked out in every sphere of life, in 'the management of our homes, farms, of the business of our tradesmen, of our churches, of our governmental departments. The significance of his work lies in a further increase of mechanical efficiency. He is a specialist of the 1900 type: He conceives the object of his research – the factory – as a closed organism, as a goal in itself. What is manufactured in it and for what purpose are questions beyond his scope.' Giedion, pp. 99-100.

construction industry via mechanical engineer Henry Gantt's 1910 Gantt Chart, a visual tool for comparing the targeted and the actual progress of projects¹³⁹ which aimed to reduce and rationalize the time spent on, and costs of, large construction projects.¹⁴⁰ In the first three decades of the twentieth century, the rise of Taylorism and scientific management, the assembly line, seeking, as Gideon summarized, 'production, ever-faster production, production at any cost', raised questions with regards to the benefits of the scientific impulse for the assembly line, and the human repercussions of a period defined by Giedion as the 'time of full mechanization', in which mechanization penetrated 'the intimate spheres of life.'¹⁴¹

On both philosophical and scientific fronts, the certainty of scientific rationalism was under critical challenge in the first decades of the twentieth century. Robert Tavernor's research into measurement referenced German physicist Werner Heisenberg's 1927 uncertainty principle as challenging the concept of causality central to modern science,¹⁴² French philosopher Henry Bergson's belief in the unpredictable,¹⁴³ Einstein's emphasis of intuition in scientific theory¹⁴⁴ and Heidegger's phenomenological framing of human perception as the only authentic

¹³⁹ '[Taylor's principles] were championed in the construction industry by the building contractor Frank Gilbreth (1868-1924), who, to some extent, gave them a bad name through the overenthusiastic use of stopwatches to time the activities of construction site workers down to the last second. By the mid-1920s American trade unions had already ensured that such extremes were on the decline.' Addis, p. 453

¹⁴⁰ 'The construction statistics for many of the 1930s skyscrapers in America are truly astonishing. The steel frame of the Empire State Building was built at an average speed of four and a half stories per week, for a total of just 410 days for the entire building.' Ibid., p.453.

¹⁴¹ As Giedion summarized the period between the two World Wars, 1918-1939. Giedion, p.41.

¹⁴² 'Between 1915 and 1930 the mainstream of physics was concerned with the development of a new conception of the fundamental character of matter, known as Quantum Theory. This theory contained the Uncertainty Principle, formulated by the German physicist Werner Heisenberg in 1927, which states that precision in measuring processes has its limitations, that it is impossible to specify precisely certain quantities simultaneously. Probability calculations are used in quantum mechanics to replace the precise predictions of classical mechanics. The Uncertainty Principle - also known as the indeterminacy principle - appeared to contradict the traditional conception of causality, which is central to the method of modern science. Causality is the belief that the cause of any event is the event that preceded it back to the root cause, which contributes to an understanding of the fundamentals of the natural order.' Tavernor, p. 175.

¹⁴³ 'The French philosopher Henry Bergson (1859-1941) maintains that ultimate reality is not bound by exact causal sequences. Life is a process of growth in which the unpredictable, and therefore the own cost, constantly acquires instead of cause and effect, Bergson advanced a theory of evolution based on the spiritual dimension of human life.' Tavernor, p.175.

¹⁴⁴ '[Einstein] believed that scientific theory was [arrived at creatively through intuition, and was not based on experiments alone. The goal of modern science is to be able to state a good theory simply, by reducing what is known about the natural world into a unified and minimal statement.' Tavernor, p.176.

means of measurement,¹⁴⁵ accepting the uncertainty and the ambiguity of individual will. The impact of scientific rationalisation into all aspects of architectural production, and life itself, formed the basis of vigorous architectural debates in the first three decades of the twentieth century, ranging from the anti-industrial, pro-handcraft stance of the Arts and Crafts movement, the relative acceptance of machined production applied to the craft of Art Nouveau, the advocacy by the Deutscher Werkbund in 1907 of the potentials of mass-production,¹⁴⁶ and W.R. Lethaby's call at the 1917 RIBA Conference on architectural education in the UK for 'highly organized scientific training' to prepare architects for the many complex and technical matters they faced.¹⁴⁷

In his 1922 *Form in Civilization*, Lethaby critiqued the 'mystification of architecture' as isolating 'the common building art from the common interest and understanding of ordinary men':

In its mystery, vague and vain pretensions may be shrouded, in its shadows hide many minor superstitions about correct design, the right style, true proportions [...] All the ancient arts of men are subject to the diseases of pedantry and punditry - music, painting, poetry all suffer from isolation and professionalism.¹⁴⁸

Denying claims of architecture as a 'Fine Art' by the definition of fine art as free from human need, Lethaby refuted the argument that 'bare utility and convenience are not enough to form a base for a noble architecture, as long as 'bare utility' was not to be interpreted in a 'mean and skimping and profiteering' way. We confuse ourselves, he continued,

With these unreal and destructive oppositions between the serviceable and the aesthetic, between science and art. Consider any of the great forms of life activity - seamanship, farming,

¹⁴⁵ 'Indeed, the true nature of measure and number for Heidegger is appreciated through all the senses - and it is the poet (and, of course, the visual artist, such as Duchamp) who can reveal its qualities, by inducing thought, imagination and reflection. [...] According to Heidegger's way of thinking, the only authentic measure on earth is the all-embracing perception of humankind, through the relation of body and mind. This measure is realised and best enjoyed through the heightened awareness of time, memory and the natural qualities that exist around us.' Tavernor, p.178.

¹⁴⁶ See Anderson, 'Cultural Policy of Historical Determinism', p.56.

¹⁴⁷ For a discussion of Lethaby's address on 2 May 1917, titles 'Education of the Architect', see Frank Jenkins, *Architect and patron: a survey of professional relations and practice in England from the sixteenth century to the present day*, (London, Oxford University Press, 1961), pp.176-177.] The address is in W. R Lethaby, *Form in civilization : collected papers on art & labour* (London: Oxford University press, 1922), pp 122-132.

¹⁴⁸ Lethaby, pp. 6-7.

housekeeping - can anyone say where utility ends and style, order, clearness, precision begins?¹⁴⁹

Lethaby looked to scientific method specifically to render the arts and beauty accessible to the common man, to simplify language and clear it of mystery and lyricism, and to embed architectural design in all matters of everyday life:

The method of design to a modern mind can only be understood in the scientific, or in the engineer's sense, as a definitive analysis of possibilities - not as a vague poetic dealing with poetic matters [...] Once more I venture to say that the living stem of building design can only be found by following the scientific method.¹⁵⁰

This stance on scientific method maintained a core belief in beauty, delight, and 'worthy and complete workmanship by competent workmen, while accepting the impossibility of a return to earlier modes of craft production.' In criticizing vagueness, poetics, and mystery, Lethaby here framed an attempt to mediate science and art in pursuit of an ordered, precise, and a well-crafted environment.

6.7 Mediating science and art

For USA and European architects who accepted and embraced industrialization as an irreversible replacement of traditional craft industries, such principles were consistently interpreted as means, rather than ends; the ends remaining the pursuit of the spiritual, of human satisfaction, of passion. In the first decades of the twentieth century in Europe, writings and works by Peter Behrens, Le Corbusier, and Mies van der Rohe directly responded to the opportunities and challenges of industrialization and standardization by turning to the promises of precision. Describing the cultural context of architectural debate in the first decades of the twentieth century, Stanford Anderson highlighted Peter Behrens' relationship with the AEG, beginning in 1907, as emblematic of the pursuit of a 'viable relationship between the abstractions of the artist and the material conditions of production.'¹⁵¹

Behrens' partnership with a technological industry had set out the aim of bringing about 'the synthesis of technology and art in order that modern civilisation might be elevated to a true culture.'¹⁵² In lieu of a technology which 'pursued its own ends but

¹⁴⁹ Ibid., pp. 9.

¹⁵⁰ Ibid., pp. 95.

¹⁵¹ Anderson, 'Cultural Policy of Historical Determinism', p.59.

¹⁵² Ibid., p. 62.

one that was sensible to the artistic will of the time,¹⁵³ a core problem of how to 'infuse mass production with meaning and spirit ("*Künstlerisch zu durchgeistigen*") by artistic means'¹⁵⁴ was approached, Anderson wrote, through philosopher Alois Riegl's proposal for:

the missing link between the established concept of the *Zeitgeist* and specific artistic acts. This link he termed *Kunstwollen* – the will to art. At the first level, *Kunstwollen* accounted for the artist's control of the creative process against the practical dictates of the problem itself. However, to account for the determining criteria behind the unified style of a time, this apparently free will of the artist came to be associated with a collective, goal-oriented, motivating volition shared by the entire culture of which the artist was a part. For Behrens, this meant an acceptance of the spirit of the times which he perceived to involve "an absolute clarification of spatial form to mathematical precision."¹⁵⁵

The potential to reconcile a technological imperative with the free will of the artist under a collective motivation and thus reconcile positivist science with artistic creativity, and an agenda of embracing the economy, order and clarity offered by industrialization, were to be mediated by the critical directive towards an intellectual and spiritual aim. Precision, as defined in writings by Behrens, Le Corbusier and Mies van der Rohe in the first three decades of the twentieth century, was employed towards attaining a spiritual resolution through the means of exactitude. In response to the German publication in 1924 of Henry Ford's *My Life and Work*, Mies van der Rohe wrote:

Nothing illuminates more clearly the situation in which we find ourselves than the fact that [Henry] Ford's book could trigger such a strong reaction here in Germany. What Ford wants is simple and illuminating. His factories show mechanization in dizzying perfection. We agree with the direction Ford has taken, but we reject the plane on which he moves. Mechanization can never be goal, it must remain means. Means toward a spiritual purpose.¹⁵⁶

¹⁵³ Ibid., p.63.

¹⁵⁴ Anderson highlighted the Deutsche Kunstgewerbeausstellung exhibition in Dresden on May 12 1906, an exhibition of twelve artists and twelve firms involved in the applied arts, initiated by Muthesius and including Behrens and Bruno Paul, and the setting for a speech by social-democrat politician Frederich Naumann: "Many people do not have the money to hire artists, and consequently many wares are going to be mass-produced; for this great problem, the only solution is to infuse mass production with meaning and spirit ("*Künstlerisch du durchgeistigen*") by artistic means.' Ibid., pp. 63-65.

¹⁵⁵ Ibid. pp. 56-57.

¹⁵⁶ Ludwig Mies van der Rohe, Lecture in Fritz Neumeyer, *The Artless Word: Mies Van Der Rohe on the Building Art* (Cambridge, Mass: MIT Press, c1991), in Appendix 1: 1922-1927, 249-251 (p.250). Neumeyer notes: 'The place, date and occasion of this lecture are not known. Unpublished manuscript of June 19 1924 (collection of Dirk Lohan, Chicago).

Mies' insistence upon viewing industrial mechanization as the means towards a spiritual purpose, rather than as the end in itself, ¹⁵⁷ was echoed in Le Corbusier's 1929 publication, *Precisions on the Present State of Architecture and City Planning*, in which Le Corbusier defined precision as a rational will to impose order, based on an underlying, unchangeable essence:

Precision has created something definitive, clear and true, unchangeable, permanent, which is the *architectural instant*. This architectural instant commands our attention, masters our spirits, dominates, imposes, subjugates. Such is the argumentation of architecture.¹⁵⁸

In a series of ten lectures in Buenos Aires, Le Corbusier set out an argument for the rationalisation and simplification of architectural thinking as a means of defining an underlying essence:

Simplicity is the result of judgment, of choice, it is the sign of mastery. Tearing oneself away from complexities, one will invent means showing a state of consciousness. A spiritual system will become evident by a visible play of forms. It will be like an *affirmation*. A step that leads from confusion towards the clarity of geometry. [...] Thus simplicity is not poverty, but simplicity is a choice, a discrimination, a crystallization having purity itself for object. Simplicity is a concentrate.¹⁵⁹

Precisions wrote of exactness,¹⁶⁰ of economy, of the idea that 'To create architecture *is to put into order*.'¹⁶¹ 'Let us verify, meditate, measure, define, before going further',¹⁶² Le Corbusier continued. Architecture was, on one hand, seemingly to be reduced to scientifically rationalised production. 'You are an organiser, not a draftsman', Le Corbusier warned.¹⁶³ Yet on the other hand, *Precisions* argued for passion:

Reason shows the means.

Passion shows the way.

¹⁵⁷ As will be discussed in detail in Ch.9 of this thesis.

¹⁵⁸ Le Corbusier, *Precisions on the Present State of Architecture and City Planning*. trans. Edith Screiber Aujame (Cambridge, Mass: MIT Press, 1991), p.72.

¹⁵⁹ *Ibid.*, p.80.

¹⁶⁰ 'One more word: the pilotis are the result of calculations, and their elegance of the modern tendency to economy (here taken in its noble sense). Pilotis: making predetermined points responsible for holding up exact loads in accordance with exact calculations, *without any waste*.' *Ibid.*, p.49.

¹⁶¹ *Ibid.*, p.68.

¹⁶² *Ibid.*, p.70.

¹⁶³ *Ibid.*, p.230.

From the plan of the machine for living - city or house - the architectural work enters into the plane of sensitivity.

We are moved.¹⁶⁴

Writings by Behrens, Le Corbusier, Gropius and Mies van der Rohe defined precision as a means to edit the unnecessary back to an original essence, and offered a view of precision as a positive and clarifying force. In 1937, as he prepared to relocate to Chicago, a letter from Mies letter to Henry J. Heald, president of IIT (then named AIT) explicitly defined clarity and systematic structure as overcoming the uncertainty of the cultural realm, proposing a curriculum which would leave 'no room for deviation.'¹⁶⁵ Later writings by Mies would explicitly reject the 'irresponsibility of individual opinion',¹⁶⁶ a stance applied both to the processes of architectural design and to acts of construction.¹⁶⁷ Industrial processes offered the possibility of denying the uncertainty of individual workmanship: precision would be attained through industrial methods of construction, determined in advance of construction.

Precise organization, specifically highlighted by Le Corbusier as providing the basis for modern planning and the modern dwelling,¹⁶⁸ in that it offered the route towards standardised industrialisation - 'standard components, prepared in factories, made perfect by industrialization'¹⁶⁹ - was described by le Corbusier as removing the need

¹⁶⁴ Ibid., p.82.

¹⁶⁵ Mies wrote: In contrast to the mastery of the material world and the high development in the technical and economic fields, the lack of a determining force in the cultural realm leads here to an uncertainty which can be overcome only through sufficient insight into spiritual relationships [...] For this reason I have undertaken to develop a curriculum which in itself incorporates this clarifying principle of order, which leaves no room for deviation and which through its systematic structure leads to an organic unfolding of spiritual and cultural relationships.' Letter from Mies van der Rohe, the University Club, 1 West 54th Street, New York City, to Mr. Heald, 10 December 1937 [translation]. Reproduced from the Collections of the Manuscript Division, Library of Congress.

¹⁶⁶ Mies van der Rohe, Manuscript in Library of Congress. Inaugural address as Director of Architecture at Armour Institute of Technology, testimonial dinner at Palmer House, Chicago, Nov 20 1938.

¹⁶⁷ In 1923, Mies advocated the use of ferroconcrete as a means of controlling construction processes to deny the uncertainty of craftsmen on the construction site, writing:

'Ferroconcrete demands the most precise planning before its execution; here the architect still has everything to learn from the shipbuilding engineer. With brick construction it is possible, even if not particularly advisable, to let the heating and installation crews loose on the house as soon as the roof is up; they will in the briefest time transform the house into a ruin. With ferroconcrete such a procedure is impossible. Here only disciplined work will achieve the desired result.' Mies van der Rohe, 'Building', reprinted in Neumeyer, p.243. Neumeyer notes the article was previously published in *G*, no.2 (September 1923), p.1.

¹⁶⁸ 'It is on their precise organization that both modern planning and the modern dwelling must be founded.' Le Corbusier, p.90.

¹⁶⁹ Ibid., p.91.

for ‘discouraging crowds of masons, carpenters, sheet metal workers, roofers, plasterers, joiners, electricians, etc., etc....’¹⁷⁰, turning instead to ‘*assembly workers*’ and offering a disparaging view of the construction process shared by Mies’ writings in the same period.¹⁷¹ The promises, in the first decades of the twentieth century, of scientific management principles and the assembly line had always been accompanied by questions of the ability for such methods to ever promise certainty and control, and of fears that scientific methods threatened to oversimplify, stripping out the richness and complexity of life. Conjoined within Behrens’s, Mies’s and Le Corbusier’s advocacy of precision as permitting technical economy, rationality, certainty and standardisation were, crucially, discussions of passion, joy, poetry, and the spiritual.¹⁷² For each, precision was a means, not an end in itself, pursuing the less definable uncertainties of spiritual purpose, passion, and joy, arguments repeated in Walter Gropius’ *Total Work Concept* in 1956.

Writing in 1956, Gropius rejected interpretations of his ideas as ‘the peak of rationality and mechanisation’:

This gives quite a wrong picture of my endeavours. I have always emphasized that the other aspect, the satisfaction of the human soul, is just as important as the material, and that the achievement of a new spatial vision means more than structural economy and functional perfection. The slogan ‘fitness for purpose equals beauty’ is only half true. [...] Only perfect harmony in its technical functions as well as in its proportions can result in beauty. That makes our task so manifold and complex.¹⁷³

Industrialisation, for Gropius, posed a threat only to the architect who continued thinking in terms of old craft methods. In order to regain equal status with the scientist, engineer, and builder of an industrial age, the architect, Gropius argued, had to likewise adopt precise methods, to envisage precise assembly plans, which could be assembled rapidly, accurately, and with partly unskilled workers, in a predictable process.¹⁷⁴ While the capability of the workers on site was, again,

¹⁷⁰ Ibid., p.91.

¹⁷¹ See Mies van der Rohe, ‘Building’ in *G*, no.2 (September 1923), p.1. Reprinted in Neumeyer, pp.242-243 (p.243).

¹⁷² Pérez-Gómez and Pelletier interpret Le Corbusier’s *Modulor* as a means to reunite abstract metric measurement with the practical, symbolic and meaningful measure of the human body, manifesting a desire to offer an architecture embedded in cultural meaning within the abstraction and universality of a machine age. Pérez-Gómez and Pelletier, p.354.

¹⁷³ Walter Gropius, *Scope of Total Architecture* (London: George Allen & Unwin Ltd, 1956), p. 22.

¹⁷⁴ ‘Since all the standardised machine-made parts will fit together accurately, house erection at the site on the basis of precise assembly plans can be performed rapidly and with a minimum of labor, partly with unskilled workers, and under any conditions and season.

distrusted, the idea of teamwork was emphasized. 'Total architecture', for Gropius, demanded a broad and comprehensive vision, which could not be achieved by architect alone. 'To do such a total job', Gropius concluded, the architect 'needs the ardent passion of a lover and the humble willingness to collaborate with others'.¹⁷⁵ Echoing Le Corbusier's recognition of the poetic and passionate, Gropius highlighted that:

the idea of rationalisation, which many people aver is the outstanding characteristic of the new architecture, is only its purifying role. The other aspect, the satisfaction of the human soul, is just as important as the material.¹⁷⁶

Satisfaction, for Gropius, would emerge from individual variation emerging within a purified cultural standard. The concept of a Total Work Concept, rather than limiting the architect, was framed as offering the promise of variety and freedom, according to Gropius. Gropius presented precision, as had Behrens, Mies and Le Corbusier, as an editing instrument to locate the 'essential and typical' as a means of returning to a common understanding, necessary when historically shared understandings had been lost. Refuting the monotony of mechanisation and standardization, Gropius wrote of restoring 'purpose, sense and life', and unburdening the individual to allow for creative impulse.¹⁷⁷

Above all, this method avoids once and for all the numerous embarrassing surprises and unpredictable hazards which are inevitably connected with the conventional methods of construction: failure of building elements to fit due to inaccurate wall dimensions or to the effects of moisture, unforeseen patchworks due to construction damage, loss of time and rent due to delays in drying, as well as the consequences of the usual haste in the design of custom-made house plans. Instead, we shall be blessed with exact fit of the various machine-made component building parts, with a fixed price, and with a brief, accurately predictable and guaranteed assembly time for the house.' Gropius, pp.146-147.

¹⁷⁵ Ibid., p.170. See also Herbert, Gilbert, and Mark Donchin, *The Collaborators: Interactions in the Architectural Design Process* (Farnham; Burlington: Ashgate, 2013), p.3, on Gropius and *The Architects Collaborative*.

¹⁷⁶ Gropius, p.70.

¹⁷⁷ 'Thus the Bauhaus was inaugurated in 1919 with the specific object of realizing a modern architectonic art, which like human nature was meant to be all-embracing in its scope. It deliberately concentrated primarily on what has now become a work of imperative urgency – averting mankind's enslavement by the machine by saving the mass-product and the home from mechanical anarchy and by restoring them to purpose, sense and life. This means evolving goods and buildings specifically designed for industrial production. Our object was to eliminate the drawbacks of the machine without sacrificing any one of its real advantages. We aimed at realizing standards of excellence, not creating transient novelties. Experiment once more became the center of architecture, and that demands a broad, coordinating mind, not the narrow specialist [...] This explains our concentration on the design of technical products and the organic sequence of their processes of manufacture, which gave rise to an erroneous idea that the Bauhaus had set itself up as the apotheosis of rationalism [...] The standardization of the practical machinery of life implies no robotisation of the individual but,

Amidst a vast production and an almost limitless choice of goods and types of all description, we need to remember that cultural standards result from a selective process of seeking out the essential and typical. This voluntary limitation, far from producing dull uniformity, should give many individuals a chance to contribute their own individual variation of a common theme, and so help to evolve again the integrated pattern for living that we abandoned with the advent of the material age.¹⁷⁸

Deviation from a standard was envisioned here as emerging from a process of precision as an editing force to create 'essential and typical' cultural standards, which could then be permitted to expand to allow for 'individual variation.'

Throughout the first half of the twentieth century, the acceptance and embedding of industrial processes was tempered with a search for a more spiritual meaning: the role of the individual in attaining this was central to the debate. Whether to control and deny the uncertainty of individual opinion, or create a standardised order from which individual variation might arise, the concept of precision as an instrument to edit and order a new cultural understanding was central to architectural debate in the first half of the twentieth century. As industrialisation and standardisation began to take hold, manifested through Taylor, Gilbreth and Ford, precision was sought as an instrument to control the uncertainty of the individual, yet simultaneously to define a new order from which individual variation could emerge.

For architectural modernists of the early twentieth century, industrial standardisation was framed as offering the means, not the end. Central to arguments put forth by Behrens, Mies, Le Corbusier and Gropius was the sense of the spiritual emerging from a purified order attained by the editing force precision. Gropius' emphasis, in the middle of the twentieth century, of the role of individual variation in elevating the typical to a cultural standard, offered a means by which threats of oversimplification and loss of richness could, in fact, be addressed through precision.

6.8 The disputed consequences of precision

The explicit recommendation Bartholomew had outlined in 1840 - that the specifications be 'so exact, comprehensive and proper' that there 'be not the shadow of a doubt or ambiguity in any part of it'¹⁷⁹ has been challenged in this section both in terms of the impossibility of ever achieving such certainty, and in

on the contrary, the unburdening of his existence from much unnecessary dead weight so as to leave him freer to develop on a higher plane.' Ibid., p. 24-25.

¹⁷⁸ Ibid., p.17.

¹⁷⁹ Bartholomew, p.1.

terms of the consequences of the pursuit of precision as a guarantor of such certainty. Etymological, philosophical and literary interpretations of 'precision' reveal multiple definitions in addition to that of the typical sense of 'exactness' which frames recommendations such as Bartholomew's in architectural production.

Pre-seventeenth century understandings of 'precision' offered a sense of breaking off, cutting short, editing and abstraction. Such definitions align with critiques of the pursuit of certainty. The impossibility of ever achieving certainty in any form of communication, and the loss of richness and meaning when certainty denies any form of ambiguity in the translation of architectural intentions has been urgently identified by the authors reviewed here. Architectural journal articles which explicitly assert that certainty is the objective and that ambiguity has no place in architecture admit to the inevitability of 'inaccuracies and deficiencies'¹⁸⁰ in even the most precise of documents. The historical emergence of the demand for precision as 'exactness' in architectural production is contextualised within a post-Galilean reframing of understanding, through which ontological bodily experience was superseded by scientific certainty, setting the foundations for contemporary architectural expectations that all aspects of architectural production must be free of the uncertainty of individual interpretation.

The remaining part of this thesis presents four close readings of constructed architectural details which embody such debates. Returning to the early nineteenth century, the 1856 Iron Museum is read as a manifestation of the promises of certainty through standardised production and Caruso St John's 2006 entrance addition to the same relocated structure as a pursuit of the precision attainable through prefabricated processes. Mies van der Rohe's 1954 IIT Commons Building is analysed as a promise of precise standardization, paired with OMA's 2003 adjoining McCormick Tribune Campus Centre as a rhetorical refutation of precise detailing. These four close readings challenge, refute, and reveal unexpected narratives of the aims and consequences of the pursuit of precision in architectural production.

¹⁸⁰ Harold Reeve Sleeper, *Architectural Specifications* (New York, London: J. Wiley & Sons, inc Chapman & Hall, limited, 1940), p.viii.

PART C: FOUR CLOSE READINGS OF PRECISION

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articles exhibited, if it be desired that they should be placed at the Society's disposal for transfer to the Government.

The Society has reason to know that a public functionary of the United States has offered to purchase one of the largest collections in the Exhibition, and it is thought probable that similar offers may have been made to other exhibitors.

It would scarcely be creditable to this country that, when one of its Societies has brought together from all parts of the world a valuable collection of interesting and instructive objects, instead of means being found for retaining it permanently in public use, a foreign Commissioner should be allowed to purchase the collection, and transport it to the other side of the Atlantic.

By order of the Council,
(Signed) P. LE NEVE FOSTER, Secretary.

Enclosure B.

(1.)

19, Great George Street, Westminster,
London, June 13th, 1855.

GENERAL SPECIFICATION OF IRON BUILDING suited for a MUSEUM.

The accompanying drawings represent the plan, elevations, and sections.

The building would be rectangular in form, 266 feet long, and 126 feet broad, and about 30 feet high to the eaves. The floor would be raised 2 feet off the ground, and be supported by joists resting on main foundation frames, or on dwarf walls, as may be deemed most advisable.

The building would cover an area of 3,700 square yards, exclusive of the galleries, which give an additional space equal to 2,700 yards, making an entire space for exhibition of 6,400 yards, or 1½ acres. The walls of the building would be composed of cast-iron uprights or standards placed 7 feet apart, and tottled to a foundation frame of timber, or rest on concrete foundations, as the nature of the ground may render it expedient. The spaces between the columns would be filled up with corrugated sheets, and the interior of the walls lined with boarding, tongued and grooved.

The lower story would be lighted by windows, filling up the space between each alternate pair of standards, the runner which stiffens the wall forming the lintel of the same.

The building would be covered by three segmented roofs, each 42 feet span, supported on the outside walls, and on two intermediate rows of columns. The trusses would be of malleable iron, 7 feet asunder, and covered with corrugated sheets. A sky-light 12 feet wide, and raised

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18 inches from the surface, would run along the entire ridge of each roof, the sides being fitted with moveable wrought-iron louvres.

Galleries 42 feet wide would be constructed down each side of the building, and fill up the whole space beneath two of the roofs. They would be connected at the ends by cross galleries 21 feet wide. And these galleries would be carried by a system of longitudinal and cross girders—the longitudinal girders being placed 1½ feet apart, and at an equal distance from the outside walls, and supported by columns placed 14 feet asunder. The cross girders spring from each of the standards of the outside walls, the principal ones resting on the interior columns, and the intermediate ones being tottled to the longitudinal girders. Joists are fixed between the cross girders, and the flooring spiked to them. The galleries are fenced by a light trussed railing, and lighted by the sky-lights in roof.

There would be six flights of stairs leading up from the ground-floor, one 7 feet wide at each angle, and two in the middle of the nave 14 feet wide. The water off the roof would flow into cast gutters beneath the eaves, which would discharge down the main columns of the building, and be carried off by a system of pipes beneath the floor.

A pair of cast ventilators, sufficiently large, would be placed in the walls between the windows on both floors, and the vitiated air escape by the louvres under the sky-light.

The entrance and exit to the building is effected by the doors placed beneath the verandah, within the recess at each end.

The whole of the iron work would be covered, within and without, with three coats of oil paint, and the interior wood casing varnished two coats.

The cost of the building as above specified, and shown in accompanying drawings would be about nine thousand eight hundred pounds (9,800*l.*); if with an architectural front of cast-iron from 1,000*l.* to 1,400*l.* additional, according to design.

Heating with a system of hot-water pipes giving a radiating surface of not less than 16,000 superficial feet, will cost from 900*l.* to 1,000*l.*

(Signed) CHARLES D. YOUNG & Co.

(2.)

GENERAL REMARKS.

The building would be constructed in bays of 14 feet square, or a multiple of that number. By adopting this principle, we obtain greater economy in first construction, facility of extension, or removal and re-erection.

In the absence of any instructions to the contrary, the whole building is calculated to be of the strongest and most substantial character, and the various materials the best of their respective kinds.

Fig.7.1 - 'GENERAL SPECIFICATION OF IRON BUILDING suited for a MUSEUM', Charles Denoon Young & Co.

Part C: Opening

This final part of four chapters offers close readings of the documents accompanying the production of four architectural projects. Chapter 7 begins with a concise written specification for the construction of the 1856 Iron Museum in South Kensington, considered here in conjunction with testimonials and summaries of Parliamentary Select Committees who debated, in 1812 and 1828, the ability of specifications to deliver certainty, as well as contemporaneous reviews of the 1851 Crystal Palace as a precedent for the Iron Museum. The production of the Iron Museum, this chapter argues, manifested the implications of the pursuit of certainty above all other considerations. Ch. 8 returns to the same, relocated, iron structure, now the V&A Museum of Childhood in Bethnal Green, London, fronted by Caruso St John Architects' 2006 entrance addition. Caruso St John's explicit specifications for extraordinarily fine joints on a decorative stone façade are read in the context of underlying understandings that the joints as constructed would deviate from precise specifications. Precision, this chapter suggests, was instrumental in pursuing shared understandings of an architectural quality which could not be defined or measured by geometries alone.

In Ch. 9, the production of Mies van der Rohe's 1954 Commons Building at IIT, Chicago is measured against promises of industrialised standardisation and Mies's aims of elevating industrial methods to the level of mediaeval craftsmanship. As the sixteenth building to begin construction at IIT, the Commons could be expected to manifest a refined system, following fourteen years of iterative development of an edited detailing palette on the same urban campus for the same client. Mies's absence could have been controlled by a system which permitted no deviation. Documentation of steel window details instead present over a year of negotiations between multiple authors and deviations from standard prefabricated components. The final close reading remains with the Commons in OMA's adjoining 2003 McCormick Tribune Campus Centre. Pairing Mies's citation of 'God is in the details' with Koolhaas's assertion that 'issues of [...] detailing are moot', Ch. 10 tests Chicago architectural critic Blair Kamin's charges of 'crude' detailing by examining the 'IIT ceiling', a 'greenboard' ceiling bereft of a standard finish of paint. Following a competition brief which invited risk taking, documentation for this ceiling shows not only an extraordinary level of care applied to a 'crude' detail, but also highlights the extent to which the design team went to in upholding a deviation from the promised certainties of standardised construction components and practices.

7. A precise specification for the 1856 Iron Museum

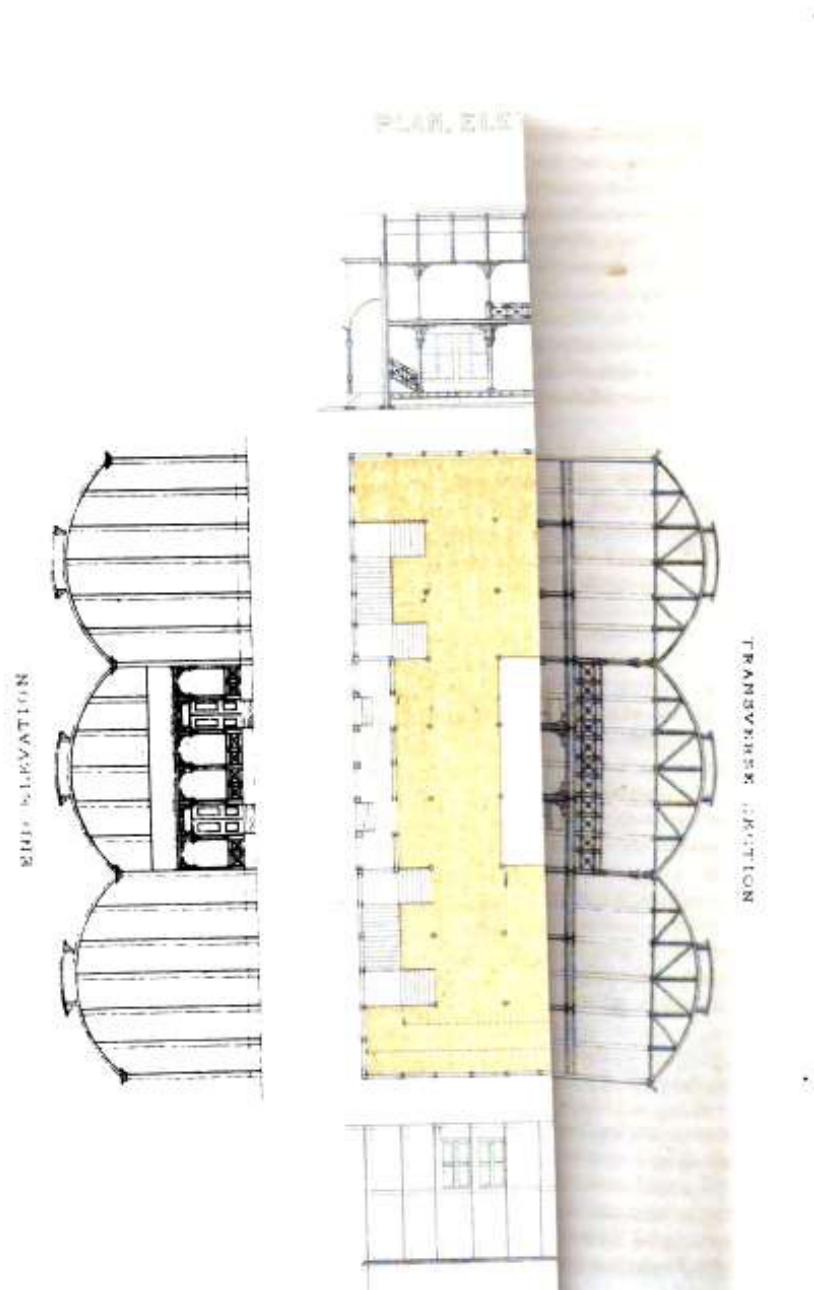


Fig. 7.2 - Drawings accompanying the 'GENERAL SPECIFICATION OF IRON BUILDING suited for a MUSEUM', Charles Denoon Young & Co.'

7.1 'An architectural front of cast iron'

The cost of the building as above specified, and shown in accompanying drawings would be about nine thousand eight hundred pounds (£9,800); if, with an architectural front of cast iron from £1,000 to £1,400 additional, according to design.¹

The paragraph above concludes a written specification for the Iron Museum, a three-bay iron structure designed and constructed in 1856 by a firm specialising in prefabricated iron structures, Charles Denoon Young and Company. [Figs 7.1, 7.2]

Constructed as the first, albeit temporary, addition to Brompton Park House as part of the newly created South Kensington Museum (later renamed the Victoria and Albert Museum, or V&A)² the structure, originally clad in painted corrugated iron, was gradually dismantled from 1867,³ relocated to Bethnal Green and re-clad in brick by Victorian architect J.W. Wild, eventually becoming the Museum of Childhood. In 2006, a new entrance addition by Caruso St John Architects provided the civic façade the Museum had lacked in its previous iterations. Critiques of the 1856 Iron Museum highlighted the challenges of defining the value of architecture in a context framed by an objective of certainty.

'The building would be rectangular in form, 266 feet long, and 126 feet broad, and about 30 feet high to the eaves', Young's specifications began, continuing:

The walls of the building would be composed of cast-iron uprights or standards placed 7 feet apart, and tottled to a foundation frame of timber, or rest on concrete foundations, as the nature of the ground may render it expedient. The spaces between the columns would be filled up with corrugated sheets, and the interior of the walls lined with boarding, tongued and grooved. [...] The lower storey would be lighted with windows, filling to the space between each alternate pair of standards, the runner which stiffens the wall forming the lintel of the same.

The building would be covered by three segmented roofs, each 42 feet span, supported on the outside walls, and on two intermediate

¹'General Specification of Iron Building suited for a Museum', London, June 13th, 1855. Enclosure B in Appendix T, *Third report of the Commissioners of the Exhibition of 1851, Presented to both Houses of Parliament by Command of her Majesty, London 1856*, p.270. This specification is also reprinted in John Frederick Physick, *The Victoria and Albert Museum: The History of Its Building* (Oxford Phaidon, 1982) Appendix 1 p.281.

² The South Kensington Museum was renamed the Victoria and Albert Museum in 1899. Physick, p.13.

³'The Boilers remained in position until 1866, when they were partially dismantled. The parts taken down were removed in 1867-8 and re-erected to form the framework of the Bethnal Green Museum. What was left was demolished in 1899.' Physick, p.26.

rows of columns. The trusses would be of malleable iron, 7 feet saunder, and covered with corrugated sheets. [...] The entrance and exit to the building is effected by the doors placed beneath the verandah, within the recess at the end. The whole of the iron work would be covered, within and without, with three coats of oil paint, and the interior wood casing varnished two coats.⁴

'Its ugliness is unmitigated', *The Builder's* review of the proposals concluded on 19 April [Fig. 7.3]. 'Railway sheds and locomotive depots often have some little bit of art or taste about them, but here there is nothing: up one side and down the other, all is blank and offensive.'⁵ Central to *The Builder's* critique was the omission of a professional architect from a process perceived as focused on economy and standardised and repetitive efficiency in lieu of architectural value as 'art':

We begin a work which should essentially be a work of architecture, with no regard to its purpose, and none to its aesthetic effect: we omit, in short, all planning and design. On such a system, in place of a process of *art*, the production of this museum building was a matter of mere multiplication, and the employment of trade-capital.⁶

The Iron Museum embodied 'a system of management', *The Builder* continued, 'which expects good results to follow from hurrying to a conclusion by means of omitting the very design and logical process of conception essential to the production or successful issue of any work.'⁷ The system of management cited by *The Builder* had emerged out of organisational and contractual changes which had taken place in the first half of the nineteenth century – most significantly, the drive for economic certainty and the subsequent adoption of the Contract by Gross, the associated emergence of the Master Builder, and the display, at the 1851 Great Exhibition, of the promises of industrial standardisation.

The design, construction, dismantling, relocation, recladding and entrance additions to the Iron Museum offers a narration of the associated promises and fears attached to the pursuit of precision in architectural production. To read a succinct written specification for a 'Iron Building suited for a Museum', this chapter begins with 1812 and 1828 Parliamentary Select Committee debates, setting the context for the pursuit of certainty through standardised precision as applauded at the Crystal Palace and vilified only five years later at the Iron Museum. [Figs. 7.4 - 7.7]

⁴ 'General Specification of Iron Building suited for a Museum', in *Third Report*, p.270.

⁵ *The Builder*, 19 April 1856, p.213.

⁶ *The Builder*, 24 January 1857, p.46.

⁷ *Ibid*, p.46.

7. A precise specification for the Iron Museum



Fig. 7.3 - Exterior view of the south front entrance of the South Kensington Museum (the 'Brompton Boilers'), Victoria and Albert Museum, England 1862. Charlotte Thurston Thompson, photographer, commissioned by Department of Science and Art of the Committee of Council on Education. © Victoria and Albert Museum: No.33966. This image appears to show the porte-cochere addition which Prince Albert had reportedly shipped in from Scotland (Sheppard, p.98).

7. A precise specification for the Iron Museum

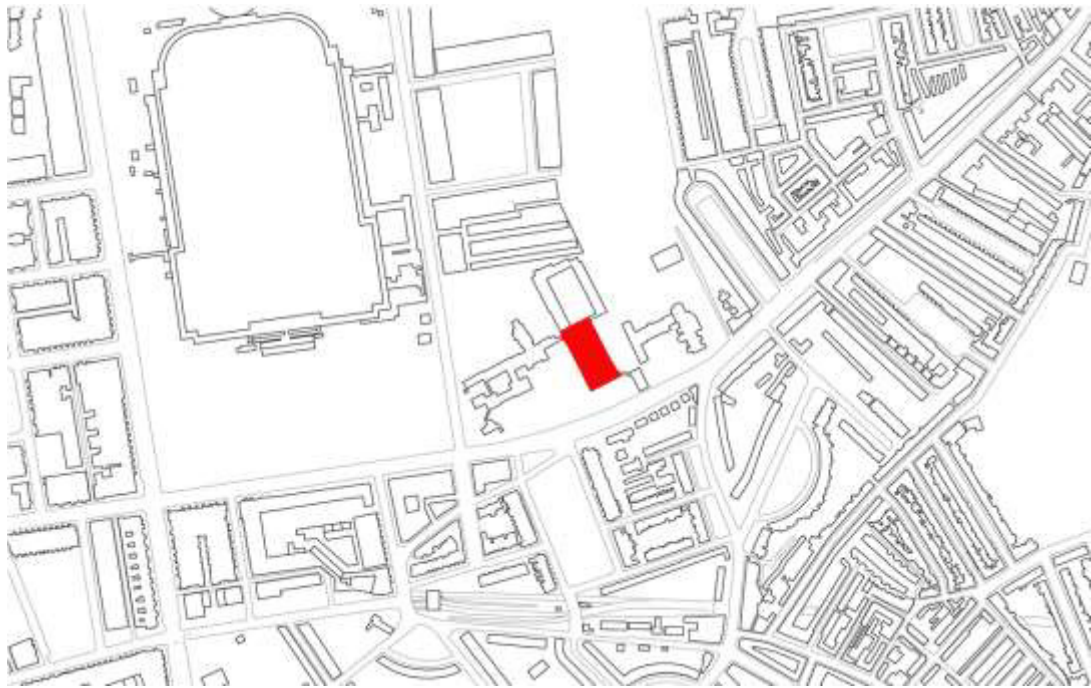


Fig. 7.4 - Original location of the Iron Museum at Brompton Park House in South Kensington.

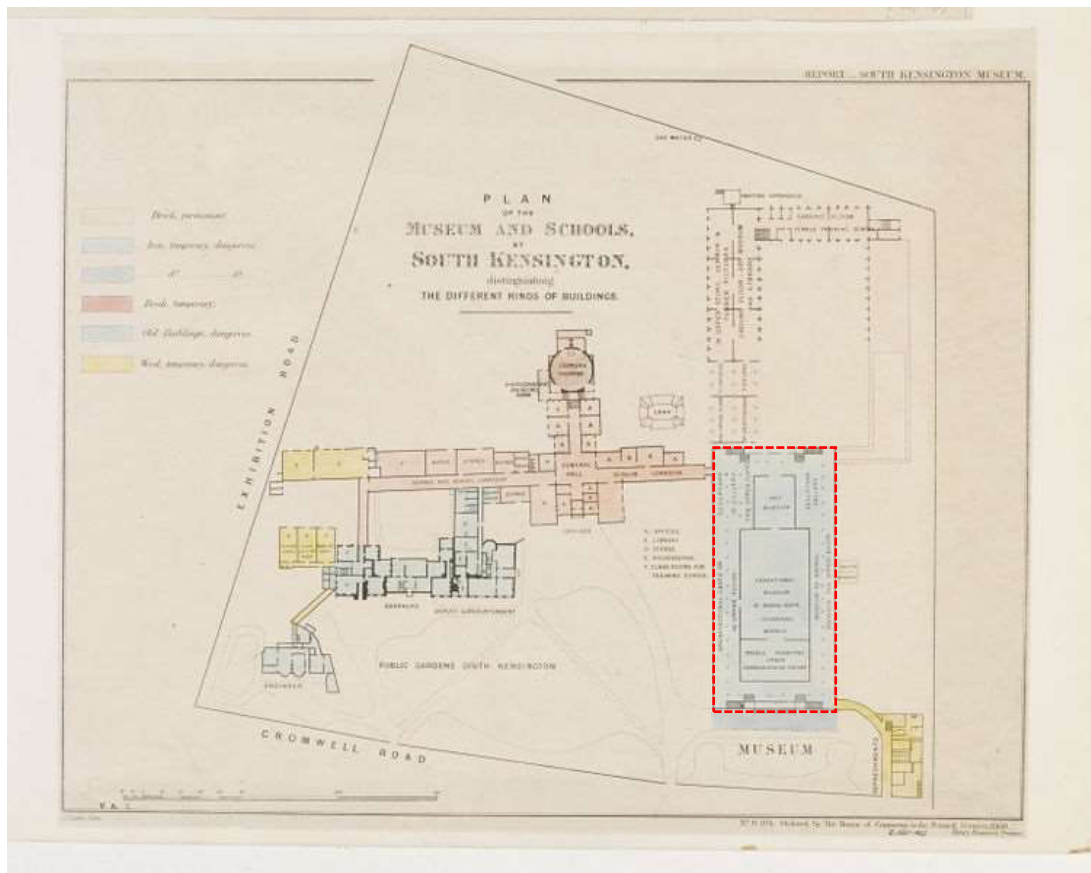


Fig. 7.5 - Plan showing the location and interior plan of the Iron Museum at Brompton Park House, South Kensington, on the lower right hand side. (London, 1860). J. Basire, Lithographer: Presented by Madame Mangeot. © Victoria and Albert Museum: No.E.1321-1927. (Red highlight by author).



Fig. 7.6 - Exterior view of the South Kensington Museum (the 'Brompton Boilers') under construction looking south east, 1856. Lance Corporal B.L. Spackman, photographer. Commissioned by Department of Science and Art of the Committee of Council on Education. © Victoria and Albert Museum: No.34976.

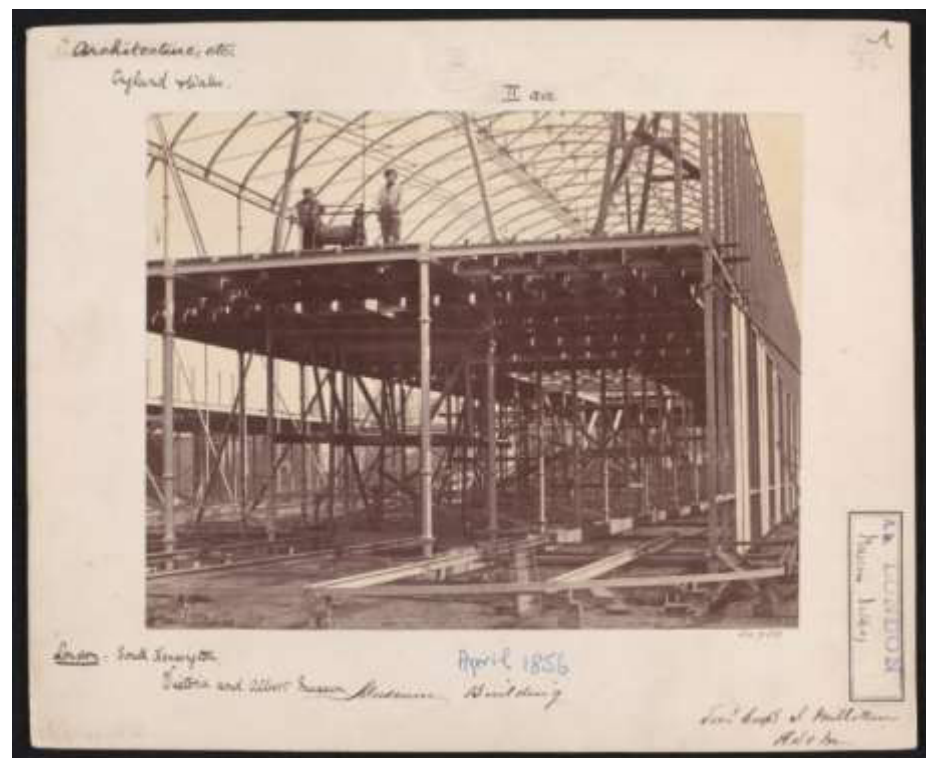


Fig. 7.7 - Exterior view of the South Kensington Museum (the 'Brompton Boilers') under construction, looking south with the houses of Cromwell Road and Thurloe Square visible in the background, 1856. Lance Corporal B.L. Spackman, photographer. Commissioned by Department of Science and Art of the Committee of Council on Education. Victoria and Albert Museum: No.34988.

7.2 Debating nineteenth century architectural production

The charges that *The Builder* had levelled in 1856 in response to proposals for the Iron Museum - that of the production of a museum building led by 'trade capital' and 'mere multiplication' in place of a process of art⁸ - captured the tenor of debates which had taken place in the first half of the nineteenth century with regards to value and architecture. 'An economy-minded public which had to foot the bill discovered the traditional inability of architects to keep within their estimates',⁹ M.H. Port highlighted in 'The Office of Works and Building Contracts in Early Nineteenth Century England.' During the first half of the nineteenth century, E.W. Cooney similarly observed:

the industry's customers, including public bodies, came to believe that the best basis on which to arrange for building was to obtain competitive tenders for the work to be carried out by one builder at a fixed cost.¹⁰

A report produced by *The 1812-1813 Commissioners of Inquiry into the Conduct of Business in the Office of Works* had reviewed alternative proposals for public works contracts and the cost implications of each. Arguing for the necessity of precise estimating at a time when most contracts were still carried out by 'measurement and valuation',¹¹ and when works were still largely carried out by individual trades operating within a guild, the *1812-13 Report* described a case study of the superintendence of works carried out by architect James Wyatt at Somerset House and at the Houses of Parliament, noting that Wyatt had reported that he had performed:

all the duties of an Architect; he prepared the original Plans and Estimates, and furnished the working Drawings; he appointed the persons employed in the different lines of duty, and gave such attendance himself as was necessary and usual for an Architect to give, and he made up and brought forward the Accounts, and delivered them to the Audit Office for examination.¹²

⁸ *The Builder*, 24 January 1857, p.46.

⁹ M. H. Port, 'The Office of Works and Building Contracts in Early Nineteenth-Century England', *The Economic History Review*, 20 (1967), 94-110 (p.94).

¹⁰ E. W. Cooney, 'The Origins of the Victorian Master Builders', *The Economic History Review*, 8 (1955), 167-176 (p.174).

¹¹ *Ibid.*

¹² 1812-13 (258) *Report from the Commissioners of Inquiry into the Conduct of Business in the Office of Works*; Appointed by ACT of 52 GEO. III, Cap.41, Ordered by the House of Commons, to be printed, 3 June 1813 (House of Commons Parliamentary Papers Online, 2006), p.53.

Accepting that the 'usual' duties of an architect had been observed, the Commissioners nevertheless then critiqued Wyatt's methods of determining costs prior to construction,¹³ focusing on a perceived lack of precise information prior to construction. 'The Plans and Estimates of these Works were generally prepared by him [Wyatt], but not always before the Works were commenced,'¹⁴ the Report noted:

It is obvious from this statement, that the precaution of endeavouring to ascertain the whole probable expense of a Work before it is undertaken, has not been observed in these extra Works¹⁵

'This mode of proceeding' the *1812-13 Report* also critiqued, 'in respect of public Works, as collected from Mr Wyatt himself, appears to us extremely loose and inaccurate.'¹⁶ Expressing the desire 'that precise arrangements should be made, and agreements entered into,'¹⁷ the report conveyed that modes of practice as employed by Wyatt were no longer considered sufficient for contemporary expectations of cost certainty, and, through subsequent testimony by architects, went on to consider alternatives such as the Contract by Gross, in which one builder agreed to 'erect the whole of a building at a predetermined price.'¹⁸

Although Contracts by Gross had previously been applied to individual trades, the idea of one contract applying to a whole building was debated by the Select Committee in terms of whether they offered greater certainty or posed greater risk. Advocates of contracting in gross, Port notes, declared 'that this was the only certain way of keeping within ones estimates,'¹⁹ arguing that the advance fixing of costs through one contract and one builder would provide greater control of materials, and thus guarantee greater certainty of costs.²⁰ Opponents predicted that

¹³ 'It has not been Mr. Wyatt's practice to require actual admeasurements, or regular Bills, during the progress of a Work, prior to the advance of money to the Tradesmen; but he received Statements from time to time of sums to which they considered themselves entitled, which were referred to the person who had measured the Work, for the purposes of ascertaining whether their claims were within bounds,' *1812-13 Report*, p.53.

¹⁴ *Ibid.*, p.52.

¹⁵ *Ibid.*, p.52.

¹⁶ *Ibid.*, p.54.

¹⁷ *Ibid.*, p.54. This statement is notable in presenting an explicit demand for the term 'precise', with historical definitions of precision in this period, according to the *OED Historical Thesaurus* (see Ch. 4) now including 'exactitude', 'care' and 'attention'.

¹⁸ Port, p.94.

¹⁹ *Ibid.*, p.94.

²⁰ In *The Culture of Building*, Howard Davis described a 1734 contract for 10 St James Square which 'contains a passage indicating that even explicit instructions do not explain adequately the detailed reality of the building: "And as it is next to impossible to enumerate or insert every particular work and thing requisite to be done in and about the building and completely finishing the said premises to be done in and about the building and completely

the necessity of staying within a fixed cost would inevitably lead to contractors submitting low bids, risking bankruptcy or encouraging tradesmen to ‘scamp’ the work ‘to bring it off at a profit’,²¹ engendering lower quality workmanship through the employment of cheaper and less qualified tradesmen,²² a view outlined in architect George Saunders’s testimony to the 1812 Select Committee.

‘A party’, Saunders wrote, ‘undertaking the whole of a Building seeks a profit either by employing other tradesmen at inferior prices, or by executing Works himself.’²³ Focusing on the adoption of the Contract by Gross by emerging organisational structures termed ‘Master Builders,’ Saunders predicted an erosion of quality and a lack of pride in craftsmanship as the inevitable result of tradesmen selected by a Master Builder intent on making a profit despite a low tender.²⁴ The architect, having no direct control over each trade, Saunders argued, would be powerless to control workmanship during construction, and would instead be forced to redirect control through increased precision in communications prior to construction.²⁵ Difficulties of meeting expectations of precision were central to Saunders’s argument:

To make what is called a close Estimate of a Building, requires drawings and descriptions of all parts in detail; of the internal mechanism, dimensions, and materials, as well as of all the outward forms; the necessary time not being devoted for doing this effectually in making a contract in the gross, much is estimated by guess, either involving the contractor in difficulties, or if he is artful, furnishing him with the means of easily wronging his employer. No specification for a contract in the gross, however long, has ever yet been found sufficient to ensure a due execution of what is requisite; except in very small, plain or rough Works.²⁶

finishing the said premises pursuant to the said drawings plans Elevations and Sections and Agreement before mentioned It is mutually agreed between the said parties to these present that the same shall be left to the care and management of the said Henry Flitcroft to see the same duty performed and executed according to the intent and meaning of these presents.’ Davis, p. 192.

²¹ Port, p.94.

²² This situation is described in detail in the novel, Robert Tressell, *The Ragged-Trousered Philanthropists* (Oxford: Oxford University Press, 2008) first published in 1914.

²³ ‘Appendix, No. 39 (B) Letter from George Saunders Esquire, to Peter Grant, Esquire [...] October 15 1812’ in *1812-13 Report*, p.195.

²⁴ ‘The employment of persons without discrimination, is the reason that so little good work is now done. The pride which tradesmen, who confine their attention to one branch of business, formerly took in their work, cannot be expected while they see large concerns given to men who have not applied themselves to acquire the necessary knowledge; and while superior work is not duly appreciated and encouraged.’ Saunders, *1812-13 Report*, p.195.

²⁵ ‘Mr. Jenkins, loc. Cit. argues that inferior workmanship, due to the replacing of independent master craftsmen by master builders, obliged architects to give more detailed working drawings and specifications.’ Port, 101, footnote 7.

²⁶ Saunders, *1812-13 Report*, p.194.

Saunders's claim that only 'very small, plain or rough Works' could be sufficiently described by a specification²⁷ embodied fears of those nineteenth century architects who saw in the demands of the Contract by Gross an erosion of their ability to influence the quality of workmanship.²⁸ This was a fear intrinsically linked to the role of the Master Builder as an organizational framework which demanded radical redefinitions of the role of precision in architectural communications from both the architects' view, as they sought to uphold control over architectural quality, and from that of the emerging role of Master Builders as they sought to guarantee cost certainty in advance of construction.

The emergence of the Master Builder and specialists

By the mid nineteenth century, the UK contracting industry had changed significantly.²⁹ Cooney suggested that economy, rather than technological advances, served as the catalyst for the emergence of the Master Builder and the erosion of the Guilds. The 'Master Builder', defined as a builder who employed, 'more or less permanently a relatively large body of labourers and workmen in all the principal building crafts,'³⁰ was emphatically different from that of the varied and specialized trade guilds whose organizational roots reached back to the twelfth century and in which each trade - stonemason, carpenter, metalworker - had worked independently on a building project, billing their services through 'measurement and valuation.'³¹ By the end of the eighteenth century, the guilds had been subject to increasing criticism from philosophers and economists including Adam Smith, Jean Jacques Rosseau, and Karl Marx for their rigidity in controlling social rank and prices. Critiques of the guild system as complicated and inefficient³² opened opportunities for new, large and complex organisational structures in construction, as embodied by Thomas Cubitt's (1788-1855) contracting organisation.

²⁷ Although the fact the constructed outputs of neither Wheelingstone - a small work - or St Peter's - an apparently 'rough' work could be comprehensively described by a specification in advance of construction dispute even Saunders's claim for the specifications.

²⁸ Port writes, 'Another criticism, that contracting in gross depressed the status of the workman, and consequently deteriorated standards of workmanship, was not really reconcilable with the desire strictly to control expenditure.' Port, p.101.

²⁹ 'In the space of half a century an industry which had been organized primarily on a craft basis had, without the stimulus of any important technological advances, thrown up a group of large, complex and markedly capitalist businesses' Cooney, p. 173.

³⁰ Cooney, p.168.

³¹ Cooney notes that the system of measuring and valuation assumed that 'good work at 'fair' prices could be obtained by adding the master craftsman's or builders customary gross profit of 15 per cent to the current cost of labour and materials.' Ibid., p.174.

³² Ibid., p.171.

The title of 'first' Master Builder was ascribed by Cooney to Cubitt, whose contracting business, developed between 1815-1820, set up an organizational framework to oversee the entirety of a building project, employing each of the major trades in a permanent workforce of over a thousand men who were promised continuous employment.³³ An enterprise of this size, Cooney observed, led Cubitt to begin speculative work 'on a large and predictable scale', in order to maintain employment not only for the workmen, but also the new ranks of foremen and clerks who oversaw and organised the large-scale operations.³⁴ Emerging from the demand to precisely predict costs, attention turned to the means by which precise measurements of quantities could be calculated with certainty.³⁵ The pursuit of greater precision in measuring became manifest in the publication of guidance such as the 1828 *Improved Builders Price Book* and the emergence of the quantity surveyor in the UK. In an economically driven context in which Master Builders relied upon ensuring continual profit for a large workforce, questions remained over whether the Contract by Gross could provide certainty and trust, or whether it would engender mistrust³⁶ and lead to a deterioration in standards of workmanship. Calls for yet more comprehensively detailed drawings and specifications as the perceived means of achieving quality would now be subject to regulatory and contractual methods in pursuit of control and certainty as guarantors of quality, as evidenced in 1828 Select Committee debates.

³³ Ibid., p.172.

³⁴ Cooney attributes the founding of Cubitt's organisational structure to a contract for the London Institute of Finsbury Circus, which bound Cubitt under a penalty to finish the building within a given time. This left Cubitt 'determined not to be left at the mercy of this complicated and inefficient system' and the subsequent creation of his contracting and speculative business effectively offered a means of control in stricter circumstances.' Ibid., p.171-172.

³⁵ 'Do you ever find these persons dispute in the measurement of the Board of Works? - At the time the measure is taking, they very often dispute; if it is half an inch more or less, it is closely attended to; when they urge great repetitions of the work, whether a piece of timber will measure three inches and a quarter or three inches and a half, makes a difference in great numbers of the same, and allows of some dispute; and if it cannot be decided at the time, it is afterward settled by the heads of the department.' 1828 (446) *Report from the Select Committee on the Office of Works and Public Buildings*. Ordered by the House of Commons to be Printed, 19 June 1828 (House of Commons Parliamentary Papers Online, 2006), p.97.

³⁶ Saunders testified to the 1812-13 Select Committee; 'Contractors knowing the unavoidable insufficiency of specifications, are frequently not scrupulous about the amount they agree for; and before the Building is far advanced, will find out what quantity, and what kind of work can be done for that sum to make it a profitable concern, taking advantage as much of the omission in the specifications as will answer the purpose'. Saunders, *1812-13 Report*, p. 194.

The 1828 Select Committee

The 1828 Select Committee Report on the Office of Works and Public Buildings continued to debate the impact of the Contract by Gross on certainty of costs and quality, admitting that the Contract by Gross had not yet delivered on the desire for certainty:

it must be confessed, that the responsibility of the Architect is extremely diminished, when the examination of the several charges is taken out of his hands, as well as the measuring of the work, which is stated universally to be a source of great uncertainty and cavilling, and not unfrequently of imposition and overcharge.³⁷

The debates centred around issues of uncertainty. Despite acknowledgments that works carried out under the Contract in gross were alleged to be 'more liable to be slighted in the execution', and that frauds were 'more frequently practiced in carrying on and conducting the several parts',³⁸ the Committee concluded that, if fraud and evasions could be circumvented by strict supervision:

with the supervision of clerks of the works and other men bred to the profession, belonging to and dependent upon the office, and with such accuracy in the specifications as the ability and experience of the attached Architects cannot fail to insure [...] they [the Committee] are therefore inclined to think, that with precise specification and careful superintendence, and where all deviations from the original plan are avoided, the system of Contracts in gross might be found to be the least expensive.³⁹

A lack of certainty and control prior to construction, the *1828 Report* concluded, had been responsible for defects in many works, lamenting the 'changes and alterations in their plans, even during the execution of the buildings, and to a want of due consideration and determination upon the entire edifice before any portion was begun.'⁴⁰ The inability of the Contract by Gross to thus far deliver certainty could, the Report assured, be overcome with yet more 'precise specification and careful superintendence' and avoidance of 'all deviations from the original plan' despite the fact that such certainty had not yet materialised. These claims were simultaneously supported and rejected by architects who provided testimonials to the *1828 Report* of their experiences in practice.

³⁷ *1828 Report*, p.5.

³⁸ *Ibid.*, p.5.

³⁹ *Ibid.*, p.5.

⁴⁰ *Ibid.*, p.6.

Two architects who testified to the *1828 Report*, John Nash, who spoke in favour of the Contract by Gross, and Robert Smirke, who spoke against it, explicitly turned to the question of precise specifications to support their arguments. Nash testified that the Contract by Gross, in requiring the architect to provide precise specifications, would encourage thoroughness and professionalism. 'An architect before he can make a contract in gross must make a specification', Nash stated:

in which specification he must set down every thing that can possibly occur, if he omits any thing, it will come in the shape of a bill afterwards, to avoid which he must digest the whole of his plan. Before an estimate in gross can be made he must digest his plan, and every part of it must be made out, and he must put down on paper every detail that will possibly happen; and therefore you are sure that the architect must do his duty in the first instance; that alone would, I think, be sufficient to induce any person building, to contract in gross.⁴¹

The duty of the architect, in Nash's explicit terms, was to 'put down on paper every detail that will possibly happen', a statement which conveyed just how far relationships between architects and builders had diverged, and how far expectations of certainty had developed. Nothing was to be left to the discretion of the builder, for to allow this was to admit ambiguity into a process now framed by a lack of familiarity and the expectation of mistrust. Specifications as envisioned by Nash would encourage the architect to adequately 'do his duty, 'benefitting both builder and client by providing certainty in advance of and during construction. Smirke, on the other hand, spoke of specifications as a potential source of misuse by the builder. Echoing Saunders's comments eleven years earlier, Smirke argued that no specification could ever avoid any ambiguity:

I do not think it possible to detail the specification of an extensive public building, so as to afford any advantage whatever; it would hardly be possible to avoid some ambiguity in parts of it, which the contractor would not fail to take advantage of.⁴²

Smirke raised here the inevitability of ambiguity remaining within a specification,⁴³ associating such ambiguity, in a context which demanded and expected certainty, with the potential for abuse by the builder. The adoption of the Contract by Gross thus held implications not only with regard to the quality of Works, but also on

⁴¹ 'John Nash, Esq, one of the Architects to His Majesty's Board of Works, called in; and Examined.' 3 April 1828' in *1828 Report*, p.54.

⁴² 'Robert Smirke, Esq. One of the Architects of His Majesty's Office of Works, called in: and Examined. 29 April 1828.' *1828 Report*, p.75.

⁴³ This recalls Ch. 5's discussion of Empson's claim that all prose is inherently ambiguous.

relationships between architects and builders, concerns which were at the forefront of discussions surrounding the formation and regulation of the Architectural Profession.

Defining an Architectural profession

When the Institute of British Architects formed in 1834, later to receive its Royal Charter in 1837,⁴⁴ much of its early work was 'concerned with formulating rules for fees, practice and conduct'⁴⁵ in response to disputes and claims between architects and builders. Protection of the newly defined profession was to be supported by the attempt to settle long-held debates by unambiguously defining the role, tasks and expectations of a professional architect, in attempts to clearly separate the architect from other specialists in the construction industry. By the start of the Victorian period, Dixon and Muthesius wrote in their review of Victorian architecture:

the architect had emerged as a recognizable professional designing and supervising the erection of buildings. He came to rely on a separate quantity surveyor to supply him with accurate figures on which the builder could base his tender for the work. The architect relied for his remuneration on fees based on the value of work done. It became professionally less acceptable for him to dabble in speculative building or in contracting to supply materials for building, as had Adams and Chambers in the eighteenth century, and Nash in the early nineteenth century. The speculative builder took over one function, the civil engineer another.⁴⁶

In the early nineteenth century, the architect was still far from formally defined. The system of pupillage training⁴⁷ was unregulated, and could be inconsistent and abusive,⁴⁸ and most architects were subject to no professional regulation.⁴⁹ As

⁴⁴ < <http://www.architecture.com/TheRIBA/AboutUs/Ourhistory.aspx> > [accessed 27 July 2010].

⁴⁵ Ibid.

⁴⁶ Roger Dixon and Stefan Muthesius, *Victorian Architecture* (London: Thames and Hudson, 1978), p.11.

⁴⁷ The pupillage system apprenticed a young architect with an office to learn the trade. See Crinson and Lubbock, p.22.

⁴⁸ The worst examples of such abuses were parodied by Charles Dickens's portrayal of Pecksniff in *The Life and Adventures of Martin Chuzzlewit* (serialised between 1843-1844).

⁴⁹ 'All sorts of people', Frank Jenkins noted, 'used the style 'architect' [...] Members of the Institute were bound by a professional code, but there were many others practicing as architects, purely on their own terms, at liberty to charge whatever fees they liked, to canvass for work, and to indulge in profitable but undesirable alliances with builders.' Frank Jenkins, *Architect and Patron: A Survey of Professional Relations and Practice in England from the Sixteenth Century to the Present Day* (London: Oxford University Press, 1961), p.223. Jenkins notes that although RIBA had defined rules of professional conduct, very few self-described architects were members: only 153 out of 1,675 architects recorded by an 1841 census survey were members of RIBA. Jenkins, p.211 footnote 1.

architects set out to define their professional status, advisory publications emerged, aimed at supplying the professional with defined and quantifiable standards.⁵⁰

Specifications for Practical Architecture

In 1842, J. Gwilt's *Encyclopaedia of Architecture* set out prescriptive expectations for architectural drawings and specifications. Describing drawings as 'expressing by lines all that occurs for the development of every part of the details of a building, in plan, elevation and profile, each part being placed for the use of the workman with clearness and precision'⁵¹ in order to 'prevent any mistake',⁵² Gwilt emphasised that:

the importance of an accurate specification or description of the materials and work to be used and performed in the execution of a building, is almost as great as the preparation of the designs for it. The frequent cost of works above the estimated sum, and its freedom from extra charges on winding up the accounts, will mainly depend on the clearness, fullness, and accuracy of the specifications⁵³

In a climate of increasing mistrust between the architectural profession and the building industry, ever-more precise specifications from the architect were now explicitly promoted as a tool to protect against inferior workmanship and to defend the architect from litigious claims.⁵⁴ Soon thereafter, Alfred Bartholomew's 1846 *Specifications for Practical Architecture* directly attributed litigation to imprecision in specifications. Beginning with a section titled, 'Of the exactness requisite in the practical profession of architecture, and how far it is influenced by the correctness of specifications and working-drawings', Bartholomew began his publication by stating:

The whole course of practical architecture requires, in all its details, the most minute and indefatigable exactness of execution: the architect cannot plead therefore want of method and exactness in the measures which it is his business to take for the proper direction of the artificers who are to act in pursuance of his mandates: and

⁵⁰ See Tilo Amhoff, "except Where Herein Otherwise Directed": Building with Legal Documents in Early Nineteenth-Century England', *ARQ: Architectural Research Quarterly*, 16:3 (September 2012), 238-44.

⁵¹ J. Gwilt, *The Encyclopedia of Architecture: Historical, Theoretical, and Practical*. Rev. ed / with alterations and considerable additions by Wyatt Papworth; with a new foreword by Michael Mostoller (New York: Crown, 1892), p.794.

⁵² *Ibid.*, p.794.

⁵³ *Ibid.*, p.699

⁵⁴ 'The frequent cost of works above the estimated sum, and its freedom from extra charges on winding up the accounts, will mainly depend on the clearness, fullness, and accuracy of the specifications; though it is but justice to the architect to state that extras arise almost as often from the caprice of his employer during the progress of the work, as from the neglect or carelessness of the architect in making the specification.' *Ibid.*, p.699.

hardly can he with any grace call to account those under him who have, perhaps, acted with more precision than himself.⁵⁵

Attributing most of the disputes between the builder, architect and employer to ‘that want of accuracy in the execution of his work [...] from his drawings and specifications not being made with the precision sufficient to insure exactness of execution,’⁵⁶ Bartholomew emphasised expectations of precise communications:

The turn of a phrase, the situation of a single word, the causing or the avoidance of a possible ambiguity, may sometimes involve the question of many hundreds and even many thousands of pounds.⁵⁷

Accepting that ‘[w]ith every possible care, accidental mistakes will still occur’,⁵⁸ Bartholomew nevertheless observed that architects lacked sufficient education, training or experience⁵⁹ to understand new materials in construction,⁶⁰ describing a context in which the architect could no longer be relied upon to understand the materials he worked with, and in which the builder was selected according to economy rather than skill. Bartholomew advised the architect that ‘[i]t is not sufficient for him to trust the clerk-of-the-works [...] or to the foreman of the work’.⁶¹ Nor, Bartholomew warned, could it be trusted that the builder is skilled or even competent, observing that, ‘[a] contractor is rarely *now* employed because he is known to be a skilful and faithful man.’⁶² Acknowledging that good work could not be forced by a contract alone, Bartholomew nevertheless argued that bad work most often happened without contract, framing his specifications as an attempt to reduce ‘bad building.’⁶³ From the 1812 and 1828 Select Committees to Bartholomew, UK architectural practice in the first half of the nineteenth century was framed by anticipations that ever more precise communications could deliver economic certainty and guarantee quality, anticipations which were tested as prefabricated standardised systems made their formal appearance at the 1851 Crystal Palace.

⁵⁵ Bartholomew, p.1.

⁵⁶ *Ibid.*, p.2.

⁵⁷ *Ibid.*, p.2

⁵⁸ *Ibid.*, p.2

⁵⁹ ‘Of defects in buildings resulting from professors of architecture practicing before they have acquired sufficient knowledge.’ *Ibid.*, p.11.

⁶⁰ In Bartholomew’s specifications, he gives the admission that iron is not understood, noting ‘[t]he worst property of iron beams and girders is their uncertain nature.’ *Ibid.*, p.22.

⁶¹ *Ibid.*, p.2

⁶² *Ibid.*, p.6

⁶³ *Ibid.*, p.5.

7.3 The exactitude of the Crystal Palace

The result of a competition process which had ultimately rejected the input of the architectural profession, the Crystal Palace, constructed for the 1851 Great Exhibition in London's Hyde Park, divided opinion amongst an emerging architectural profession. It was applauded by *The Builder* for the perfect fit, correctness and repetitive regularity of its construction.⁶⁴ Critics of the Palace, most notably John Ruskin, dismissed it as no more than a magnified conservatory,⁶⁵ signaling the final end of craftsmanship - and by extension, human discretion - as a primary means of production.

By the advent of Queen Victoria's reign from 1837-1901, the 'Industrial Revolution' had been under way for several decades, beginning in the latter half of the eighteenth century. Advances in materials, mechanisation and transportation had led a transition from a manual-labour based economy to one based on machine-based manufacturing.⁶⁶ At the time of the Great Exhibition of 1851, Britain, Dixon and Muthesius observed, 'was moving to the height of her industrial prosperity [and] the zenith of her economic dominance' as 'the first country in the world to industrialize.'⁶⁷ 'Victorian architecture', Dixon and Muthesius proposed, 'is the reflection of unprecedented social, intellectual and technological change',⁶⁸ the impacts of which upon architectural practice were most explicitly manifested in the critiques of Joseph Paxton's Crystal Palace for the Great Exhibition.

⁶⁴ *The Builder*, Saturday 4 Jan 1851, p.1.

⁶⁵ John Ruskin, 'The Opening of the Crystal Palace considered in some of its relations to the prospects of Art', 1854, in Cook and Wedderburn, eds., *The Library Edition of the works of John Ruskin*, (London, New York: Ruskin Library and Research centre, 1903-12), 12, <<http://www.lancaster.ac.uk/depts/ruskinlib/Edinburgh%20Lectures>> [accessed 3 July 2016], pp.417-432 (p.419).

⁶⁶ In their account of the context of Victorian Architecture, Dixon and Muthesius highlight the beginning of significant social, economic and technological changes with that of the development of the steam engine. Developed initially for the purpose of pumping out coal mines, and later applied to smelting processes for iron, the steam engine was then in turn exploited for the development of transportation infrastructure, including bridges, canals and railways by engineers such as Sir Thomas Telford (1737-1854), Isambard Kingdom Brunel (1806-1859) and Sir William Fairbairn (1789-1874). New transportation networks allowed for the rapid expansion of new industries and the cheap movement of goods and materials over greater distances, fundamentally changing the social and economic patterns of the UK, and, in turn, altering the materials and methods employed in the architecture profession and construction industries. See 'Introduction', Dixon and Muthesius, pp.8-29.

⁶⁷ *Ibid.*, p.8.

⁶⁸ *Ibid.*, p.8.

The production of the Crystal Palace

Described by John McKean as ‘the first clear architectural application of [Adam] Smith’s principle,⁶⁹ of division of labour, the Crystal Palace, conceived as a temporary 800,000⁷⁰ square feet modular cast iron, wood and glass structure, had been commissioned following an unsuccessful international competition in 1850. Requiring ‘a space between three and four times as large as that occupied by any previous exhibition abroad’,⁷¹ the project had demanded planning and execution on an industrial scale. An invitation on 13 March 1850⁷² for architects to provide ‘suggestions for the general arrangements’ required for the Exhibition had received 233 designs and specifications,⁷³ none of which were considered to satisfy either the ‘principle or detail’ of the brief.⁷⁴ ‘Plans of an architectural character were generally too monumental, too much divided, and far too expensive,’⁷⁵ the Commissioners concluded. None of the architectural proposals had resolved the unprecedented demands required of an industrial scale, temporary nature and rapid construction. Following an attempt by the Committee to blend together ideas from the submitted entries,⁷⁶ a solution emerged from landscaper Joseph Paxton’s (1803-1865) experience as head Gardener of Chatsworth House in designing standardised industrial production of glass-houses, and engineer-contractors Fox and Henderson’s experience of railway building.⁷⁷ An alternate design famously sketched up by Paxton [Fig. 7.8] was taken up, as Dixon and Muthesius report:

While at a meeting of the Board he [Joseph Paxton] sketched out his idea for the Exhibition building on the blotting paper. This was on 11 June 1850. Events moved quickly. In eight days he had produced the necessary drawings. His design was published in *The Illustrated London News* on 6 July. A tender of £150,000 was hurriedly produced from the firm of Fox and Henderson and on 15 July the Building Committee recommended the acceptance of Paxton’s design. In nine months the building was completed.⁷⁸

⁶⁹ John McKean, *Crystal Palace: Joseph Paxton and Charles Fox* (London: Phaidon, 1994) p.20.

⁷⁰ *First report of the Commissioners for the Exhibition of 1851*, p.xxiii.

⁷¹ *Ibid.*, p.xxiii.

⁷² *Ibid.*, p.xxiv.

⁷³ *Ibid.*, p.xxiv.

⁷⁴ *Ibid.*, p.xxiv.

⁷⁵ *Ibid.*, p.xxv.

⁷⁶ See report in *The Builder* (25 May 1850) p.241.

⁷⁷ For a detailed account of the 1851 Exhibition competition see McKean, pp.9-20.

⁷⁸ Dixon and Muthesius, pp.101-102.

Paxton's design permitted the fast, economical construction of a temporary structure which could adequately house the Great Exhibition.⁷⁹ The constructability of the iron system was stressed in contemporary accounts as an advantage. A letter to *The Builder* went as far to call the Exhibition Building 'the *ne plus ultra of art* - the perfection of scientific combinations: iron and glass will be the only materials tolerated during the aim of common sense.'⁸⁰ 'In setting forth the advantages of the plan', *The Builder* reported on 20 July 1850, 'the designer says:

the construction of this building has been so arranged, as to admit of all its parts being prepared and delivered ready for fixing in place, and being put together and taken down far more easily than an ordinary brick building, which will greatly reduce all the constructive operations on the ground, lessen the number of labourers employed, and any amount of possible inconvenience to the neighbourhood.⁸¹

Working details were drawn up by Fox, and the ironwork production organised by Henderson.⁸² [Figs. 7.9-7.11] As well as functionally meeting the needs of the Exhibition, Paxton's use of iron was reviewed as offering an innovative, original and contemporary response, factors which had been, *The Builder* asserted, missing from nineteenth century UK architecture.

'For three centuries', an 1843 article in *The Builder* had lamented, 'we have been flitting about, reviving old styles, but settling upon none, as indeed was certain to be the result, for nations do not make steps in retrogression'. Adapt your buildings, the article continued, to the specific need, the location and the materials available, and there would be no further need to consider what 'style' to build in; it would emerge from the circumstances. 'To iron, then, we look, as the determining circumstance in our career as an original architectural people', the article, titled 'Most important invention as affecting architecture' concluded.⁸³ Iron, as presented at the Crystal Palace, held the promise of an innovative and original architecture emerging from systematic industrial production: innovative work which, crucially, could also offer to meet expectations of economic certainty through precise production methods.

⁷⁹ 'Had Mr. Paxton's design been submitted in competition, it would have been snubbed and scouted like the rest, merely because it was a common sense design, and adapted to its purpose' Henry B. Garling, 'The Building in Hyde Park and the profession', *The Builder*, 9 February 1851, Letters, p. 109.

⁸⁰ *Ibid.*

⁸¹ *The Builder*, Saturday 20 July 1850, p337.

⁸² Dixon, p.102.

⁸³ Thomas Graham, 'Most important invention as affecting architecture', *The Builder*, 25 March 1843, pp.77-78.

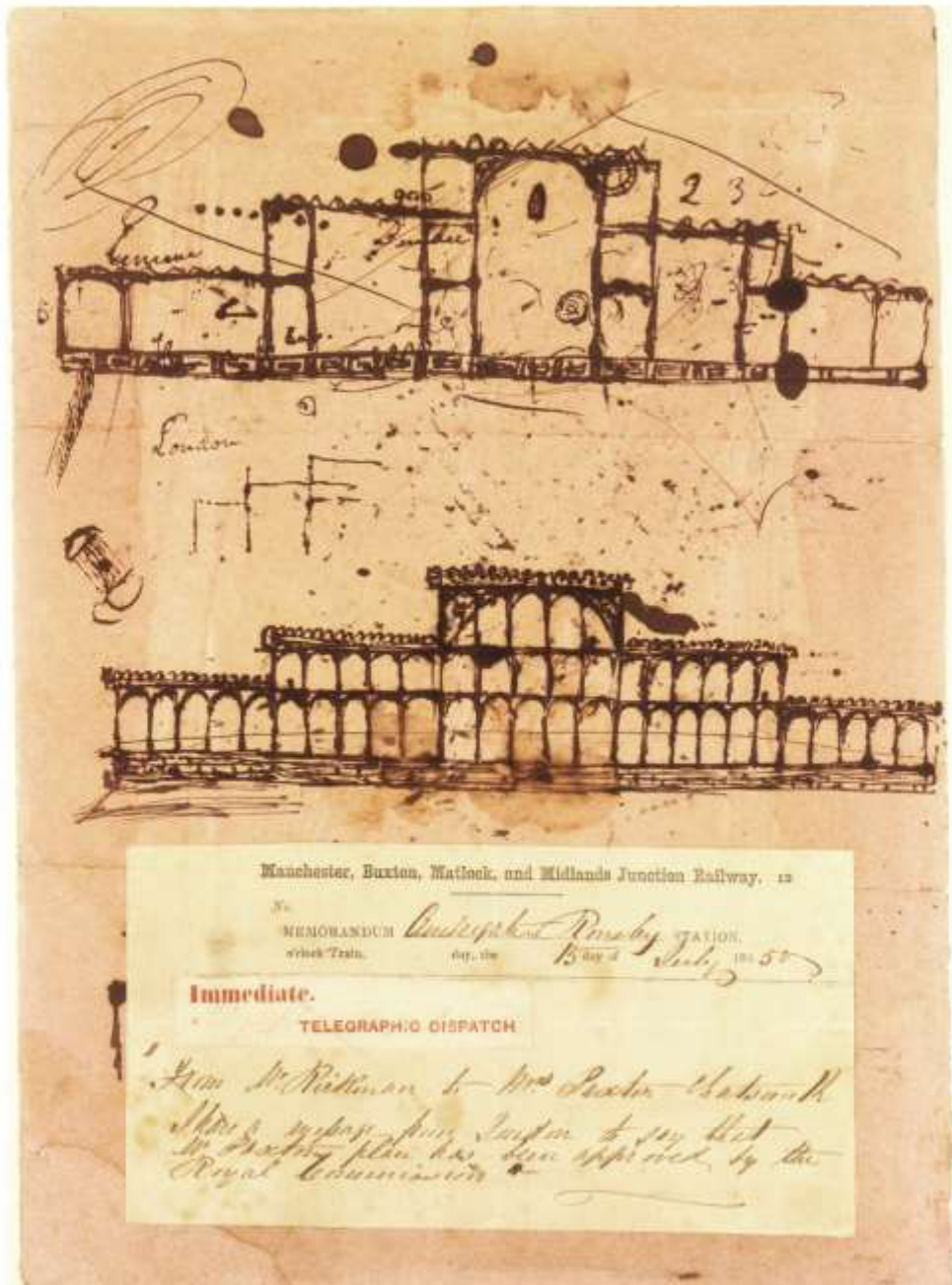


Fig. 7.8 - Sir Joseph Paxton, The Great Exhibition building, Architectural sketch, (Derby, England: 11 June 1850). © Victoria and Albert Museum: No.E.575-1985.

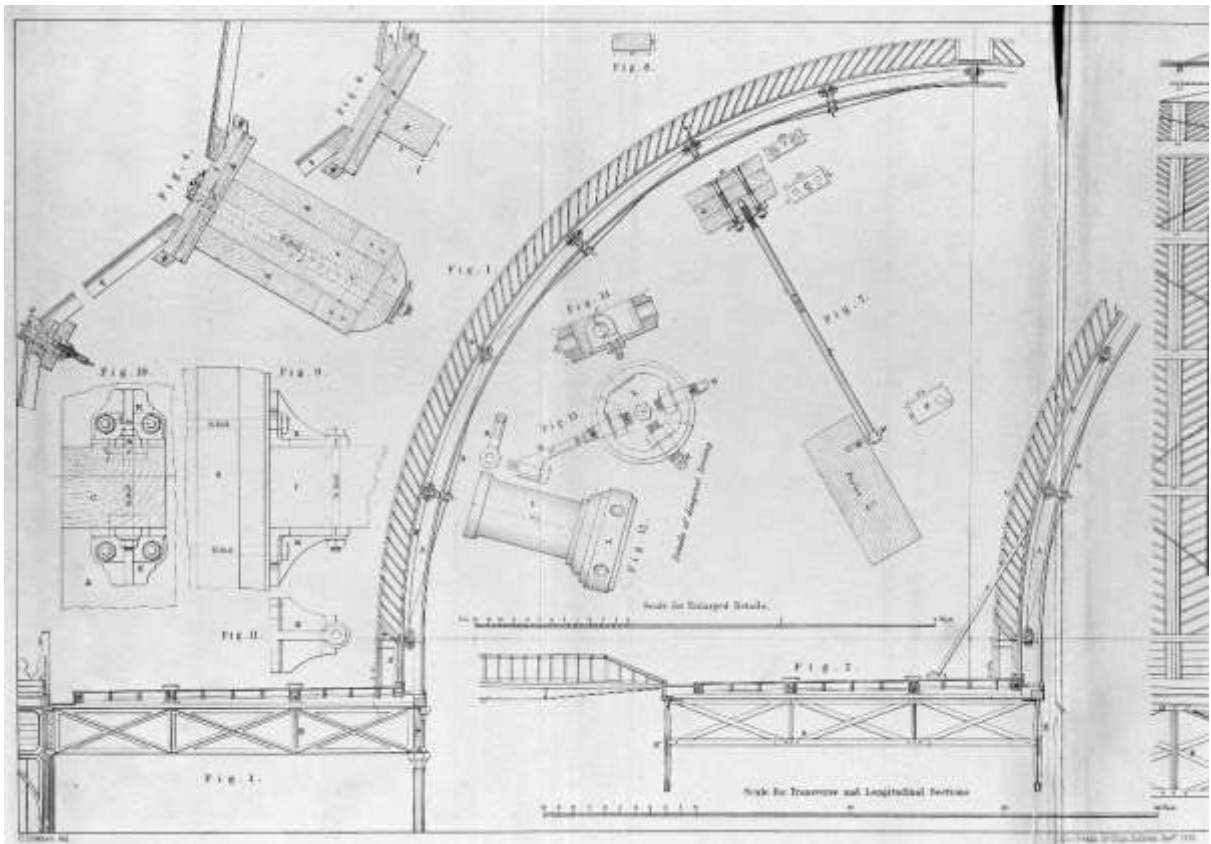


Fig. 7.11 - Crystal Palace, Hyde Park, London: details of transept roof (The Building erected in Hyde Park for the Great Exhibition of the Works of Industry of All Nations 1851 (London, 1852), plate 18 (left-hand side) Source; Charles Downes. RIBA Collections: RIBA10091.



Fig. 7.12 - The Great Nave, Crystal Palace (London, England: 1854) Henry Philip Delamotte, photographer. © Victoria and Albert Museum: No.39286.

The promise of industrial standardisation in iron

Initially overlooked by architects since its first structural application at Coalbrookdale Bridge in 1777, iron had recently been adopted as a significant architectural element at Henri Labrouste's 1843 Bibliotheque Ste-Genevieve in Paris. Paxton's use of iron at the Crystal Palace was not, in itself, innovative; by the mid nineteenth century, iron was already in industrial use in railway stations and factories, as well as prefabricated temporary structures in the colonies. An 1851 letter from Henry Gribbel to *The Builder* observed, 'It is a great mistake to suppose that buildings of iron are a novelty in England. This class of building has been known in our colonies for many years.'⁸⁴ First applied structurally to the bridges and aqueducts of Telford, Brunel and Fairbairn, iron had appeared as prefabricated cast and corrugated iron buildings shipped to locations in the colonies, including America and Australia, by firms such as Charles Denoon and Young, who would later design and construct the 1856 Iron Museum.⁸⁵ The wider architectural potential of iron was highlighted by Professor of Architecture C.R. Cockerell, who suggested:

Iron might be termed the osteology of building. Hitherto the architectural system had proceeded on statics and equipoise of molecules, as if the human frame had been built without bones. Now our buildings would have bones, giving unity and strength which never before existed.⁸⁶

In separating structure from skin, iron, *The Builder* reported, would for the first time, free architects from a cyclical debate over historical style. Having struggled for 'three centuries' to find a 'style' original and unique to Britain, which could respond to the particular needs of a contemporary context. Iron now seemed to offer a way forward. *The Builder* summarised Cockerell's lecture:

Let us look to the daily evidences of transition, and help them with these forms and laws of taste which the architect of the beautiful is best qualified to recommend; and there need be no fear but that the builders of the nineteenth century will, in their structure, at all events, exhibit abundant originality.⁸⁷

⁸⁴ Henry Gribbel, 'Iron Buildings not a novelty', *The Builder*, 9 March 1851, pp. 152-153 (p.152).

⁸⁵ Several corrugated iron manufacturers exhibited their wares in Joseph Paxton's colossal Crystal Palace, including Morewood and Rogers, Tupper and Carr, and C.D. Young & Co.' Adam Mornement, and Simon Holloway, *Corrugated Iron: Building on the Frontier* (London: Frances Lincoln 2007), p.35.

⁸⁶ *The Builder*, 12 Jan 1856, p.13.

⁸⁷ *Ibid.*, p.13.

The opening of the 1851 Crystal Palace in May 1851 had been reviewed by *The Builder* as living up to this promise. ‘The coup d’oeil is, indeed, magnificent’, *The Builder* reported on 9th May 1851. ‘The impression of grandeur with immensity must constitute a new experience, we should think, to everyone on entrance.’⁸⁸ [Fig. 7.12] Focusing on the grandeur and scale of the constructed work, earlier reviews in January 1851, upon release of the plans, had explicitly praised the systematic precision of the proposal:

The correctness with which all the 2500 columns have been placed is very striking. Regularity has been secured, and the task of construction simplified by making all parts of the plan multiples of one small manageable figure. A perfect fit is thus secured with much greater ease, while the repetition of the same dimensions renders confusion or complexity impossible.⁸⁹

The ‘perfect fit’ promised by iron was portrayed as offering the possibility of a contemporary and original architecture in nineteenth century Britain. ‘The Crystal Palace is the mid-nineteenth century touchstone, if one wishes to discover what belongs wholly to the nineteenth century and what points forward into the twentieth’, Nikolaus Pevsner wrote in *The Sources of Modern Architecture and Design*, highlighting that this iron and glass project ‘was designed by a non-architect, and it was designed for industrial quantity production of its parts’,⁹⁰ two factors which would hitherto hold significant implications for architectural production. Although the architectural profession’s involvement was limited to the margins of refinement and interior colour schemes,⁹¹ for *The Builder*, the application of industrial materials and processes embodied a new architecture freed from historical constraints,⁹² satisfying unprecedented economic expectations and manifesting the potential of materials and methods of the Industrial Revolution. For John Ruskin, the Crystal Palace signalled the end of craftsmanship as the primary mode of cultural production, the end of the appreciation of aesthetic value, and an urgent challenge to the architectural profession in an economy minded context. Ruskin published an unequivocally hostile review of the Crystal Palace, dismissing any claim that it promised a new architecture. ‘For three hundred years’, Ruskin wrote:

⁸⁸ *The Builder*, 9 May 1851, p.293.

⁸⁹ *The Builder*, 4 Jan 1851, p.1.

⁹⁰ Nikolaus Pevsner, *The Sources of Modern Architecture and Design* (London: Thames and Hudson, 1986) p.11.

⁹¹ Andrew Saint, *Architect and Engineer: A Study in Sibling Rivalry* (New Haven, Conn; London: Yale University Press, c2007) p.6.

⁹² Saint described the Crystal Palace as ‘the original raw engineering concept that stuck in the architectural imagination.’ Saint, p.6.

the art of architecture has been the subject of the most curious investigation; its principles have been discussed with all earnestness and acuteness; its models in all countries and of all ages have been examined with scrupulous care, and imitated with unsparing expenditure. And of all this refinement of inquiry, - this lofty search after the ideal, - this subtlety of investigation and sumptuousness of practice, - the great result, the admirable and long-expected conclusion is, that in the centre of the 19th century, we suppose ourselves to have invented a new style of architecture, when we have magnified a conservatory!⁹³

In Ruskin's writings, the Crystal Palace represented no more than a utilitarian system magnified to a civic scale.⁹⁴ Hailed by *The Builder* for its perfect fit, correctness, and regularity, embodying, for some, the promise of a new architectural approach freed from historical stylistic debates, Ruskin instead reviewed the Crystal Palace as a manifestation of the fears attributed to a rationalised systematisation of architectural production. Critiques of the apparent rejection of architectural value and human discretion in craft at the Crystal Palace were heightened five years later in universally hostile critiques of the 1856 Iron Museum. At the 1856 Iron Museum in South Kensington, precise production may have manifested the certainties of an economic, fast and easy construction; reviews declared it a failure in terms of architectural value.

⁹³ Ruskin, 'The Opening of the Crystal Palace', pp.418-419.

⁹⁴ McKean's review of the Crystal Palace argued that the construction process must have engendered pride amongst those who built it, refuting Ruskin's argument. McKean, p.28.

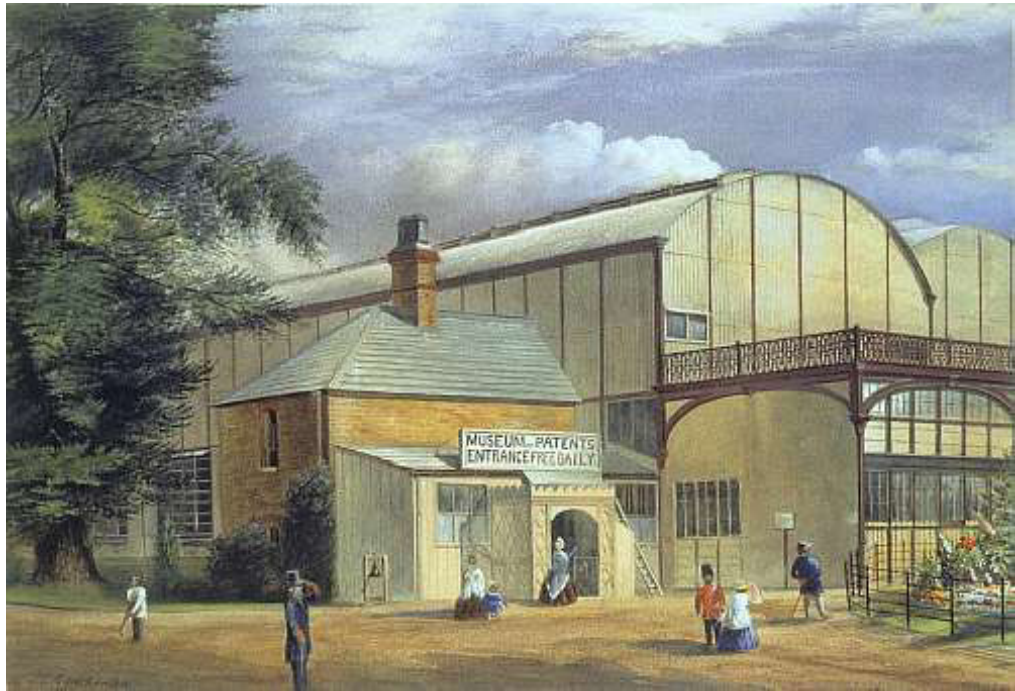


Fig. 7.13 - South Kensington Museum: South End of Iron Building. J.C. Lanchenick (Artist), Watercolour. © Victoria and Albert Museum: No. 2816.

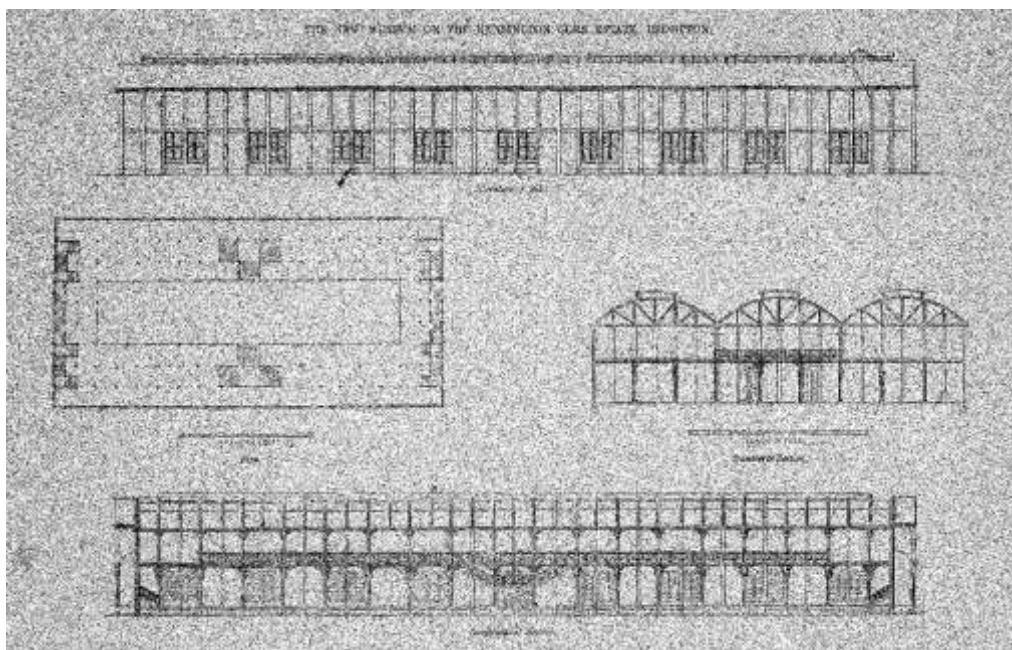


Fig. 7.14 – 'The New Museum of the Kensington Gore Estate, Brompton. Plan, sections and elevation which accompanied Charles Denoon Young & Co.'s specifications, published in *The Builder*, 10 May 1856, p.263.

7.4 The design, construction, and rejection of the Iron Museum

When the Royal Commission for the Exhibition of 1851 recommended the establishment of an institution 'to serve to increase the means of Industrial Education, and to extend the influence of Science and Art upon Productive Industry,'⁹⁵ the Commissioners, headed by HRH Prince Albert, initially approached the architect Gottfried Semper, who had joined the staff of the Department in 1852,⁹⁶ to prepare plans for buildings on the Great Exhibition site of Brompton Park House.⁹⁷ 'Semper made a model', Sheppard wrote

but to the Prince's disappointment the Commissioners' advisors thought that the scheme could not be made to pay [...] In its place, the museum's first home in South Kensington was to be less ambitious and perhaps more British - a large iron shed.⁹⁸

Prince Albert instead proposed the erection of a temporary iron house, obtaining from Parliament 'a vote for £15,000 for the erection of an iron museum capable of being moved to another site' as an 'avowedly 'temporary' commission 'in observance of wartime economy.'⁹⁹ The 1851 Commissioners received a written specification and attached drawings from Charles Young and Company,¹⁰⁰ a firm which specialised in the design and supply of, as a pamphlet they produced stated, *Iron Structures for Home and Abroad*.¹⁰¹ Young's pamphlet had stated of cast iron that:

⁹⁵ Physick, pp.19-20.

⁹⁶ 'Semper was 'a political exile in London 1850-55'. Alan Baxter & Associates, *The Museum of Childhood at Bethnal Green Conservation Plan* (unpublished, prepared for and archived at the Museum of Childhood, February 2004), p.3. Also see F.H. W Sheppard, Editor, *Survey of London, Volume XXXVIII The Museums Area of South Kensington and Westminster* (London: The Athlone Press, University of London, 1975), p.98.

⁹⁷ Physick noted that 'Semper produced plans and a model made of painted cardboard, which for some years was exhibited in the Museum, but unfortunately seems now to have disappeared.' *Ibid.*, pp.22-23. Baxter & Associates noted that the drawings 'long thought lost, were rediscovered in the 1990s. His designs, rejected by the Government as much too grand and expensive, seem to have been intended for the Brompton Park House site, and therefore constitute the first ideas for the South Kensington Museum.' *Ibid.*, p.3.

⁹⁸ *Ibid.*, p.98.

⁹⁹ 'The model does not survive but the Prince's very rough and faint scribble of his idea on blotting paper is in the Museum.' Sheppard, p.98.

¹⁰⁰ *Ibid.*, p.23.

¹⁰¹ 'In about 1856, Charles D. Young & Co. published a pamphlet of their work in wrought, cast and corrugated iron, entitled *Illustrations of iron Structures for Home and Abroad*.' Gilbert Herbert, 'A Cast Iron Solution', *Architectural Review*, 153 (1 June 1973), 367-373 (p.367).

A planning report produced for the Museum of Childhood by Alan Baxter & Associates noted: 'Young's was originally an Edinburgh firm of ironmongers, established c. 1840. By the 1850s it also had offices in Glasgow, Liverpool and London and was one of a number of well-known Scottish iron foundries specializing in the export of iron buildings to the colonies

no other material affords greater scope for the display of architectural effect than cast-iron. The most elaborate mouldings or the finest tracery work can be executed in it with a success not attainable in any other.¹⁰²

For the Iron Museum, Young & Co's concise specification was less elaborate, listing dimensions and quantities of stairs, ventilators, windows and doors, and a finish of 'three coats of oil paint', concluding – and returning to this chapter's opening quote -

The cost of the building as above specified, and shown in accompanying drawings would be about nine thousand eight hundred pounds (£9,800); if, with an architectural front of cast iron from £1,000 to £1,400 additional, according to design.¹⁰³

In offering an 'architectural front of cast iron from £1,000 to £1,400 additional, according to design,' this specification reduced architecture to an optional extra: a luxury to omit if costs did not permit. This one line captured the precarious position of a developing architectural profession in the mid-nineteenth century as the value of architecture was debated within idealisations of precise production, debates which were captured by reviews, positive and negative, of proposals for the Iron Museum.

When reviewing Charles D. Young & Co's proposals, the question of architectural value was not raised as a concern by the Commissioners, whose praise instead highlighted simplicity, economy and ease of construction:

Irrespective of its simplicity and cheapness, and the remarkable facility with which it can be constructed, it enjoys the great advantage, in a pecuniary point of view, of being designed of a material which possesses a permanent pecuniary value, to which the cost of the labour employed in its construction bears only a small proportion. While, therefore, it could on the one hand at any time be taken down and re-erected, if necessary, on another site, or in another form, at a very trifling expense, it could, on the other

and America. A pamphlet produced by the firm in c. 1856 claimed that 'they have supplied all classes and dimensions, from the humblest cottage to Mansions of the greatest extent and most elegant design – from the small Store-room to extensive ranges of Warehouses - and from the temporary Meeting and School-house to Churches capable of accommodating two or three thousand persons, with Galleries and Spires, and in every style of architecture...'. The company supplied ironwork for Chelsea and Westminster Bridges on London (1851-58 and 1854-62), for the Dublin Crystal Palace for the Irish Industrial Exhibition of 1853, and for the Manchester Art Treasures Exhibition building of 1857. The structure of the Manchester exhibition building was designed by the civil engineer William Dredge, who, according to one report in the *Graphic*, also provided the design for the Iron Museum in South Kensington.' Baxter, p.23

¹⁰² Charles D. Young & Co, *Illustrations of iron Structures for Home and Abroad*, cited in Herbert, p.367.

¹⁰³ Physick, p.281.

hand, be resold, should circumstances render it hereafter desirable, at no great deterioration of value.¹⁰⁴

Value was defined here strictly in terms of economy and efficiency - a fast, cheap and re-usable solution, using a material which had promised an innovative future for an architectural profession struggling to define, to an 'economy minded public',¹⁰⁵ its own value amidst claims of retrogression and costliness. Architectural reviews of the Iron Museum defined value in different terms. *The Builder's* criticisms of the Iron Museum on 19 April 1856 began by describing the project as 'three huge boilers placed side by side',¹⁰⁶ giving rise to the nickname 'The Brompton Boilers' [Fig. 7.13], and reported a perceived lack of architectural input in the process.¹⁰⁷ The project, *The Builder* claimed, had been developed entirely on the basis of function and economics, and was thus inappropriate - 'a loud-speaking disgrace to the country',¹⁰⁸ *The Builder* continued - for a building which was to serve as a national civic institution. This review was not a rejection of the promise of industrial methods or of iron in particular, but an accusation that architecture had been discarded from a process predicated on costs and speed of construction. 'The fact that iron has great capabilities is understood and acted upon', *The Builder* continued, 'But, both in structure and decoration, iron has been grievously misused'.¹⁰⁹ '[C]onsiderations of beauty' had been omitted, the review concluded, from a process focused on economy and efficiency:

What the building is, it became, simply, because certain essential work in design and contrivance, necessary to the good result in any building, was altogether omitted.¹¹⁰

Organizational management, constructional efficiencies and economic concerns led the process, *The Builder* charged, concluding of the lack of architectural input that, '[i]n the public mind, a *professional* opinion was fast getting to be of no worth.'¹¹¹ On

¹⁰⁴ *Third report of the Commissioners*, Appendix T 265-266.

¹⁰⁵ Port, p.94.

¹⁰⁶ *The Builder*, 19 April 1856, p.213.

¹⁰⁷ 'Messrs. Young and Co. who are the contractors for the works, claim in the newspapers the exclusive credit of the design: Sir William Cubitt overlooks them, and there is a resident engineer acting on behalf of the commissioners.' *The Builder*, 19 April 1856, p.213. The *Builder* also hinted, that Young and Co.'s selection may have been linked to the fact that they 'quite promiscuously' shared offices with Sir William Cubitt, who, in addition to his role in his brother Thomas Cubitt's construction firm, was also one of the 1851 Commissioners. See also Physick, p.24, for his discussion of the *Builder's* critique of the design and construction process of the Iron Museum.

¹⁰⁸ *The Builder*, 24 January 1857, p.213.

¹⁰⁹ *Ibid.*, p.46.

¹¹⁰ *Ibid.*, p.46.

¹¹¹ *Ibid.*, p.46.

10th May 1856, as construction was in progress, *The Builder* published plans and elevations of the Iron Museum [Fig. 7.14] with a detailed account of Young's specifications, remarking that the 'only imaginable excuse for its ugliness is the allegation that the structure is to be merely a temporary one.'¹¹²

The Iron Museum opened on 22 June 1857,¹¹³ to continued condemnation from *The Builder*, who noted 'the frightful ugliness of the iron building [and] the avoidance of architectural supervision and its results in the external appearance.' Baxter noted that the principle of the building was similar to the Crystal Palace, as 'a skeleton of iron columns and girders, which could be closely bolted together.'¹¹⁴ Unlike the Crystal Palace, 'but like most station sheds at the time' Young's design used little glass, confining glazing to windows in alternate bays at ground floor level on the flanks, and a continuous skylight along the crown of each roof. The exterior corrugated iron, Baxter noted, resembled a warehouse design in a Young's 1856 pamphlet. Praising the 'exceptionally slender T-section members' used in the roof, Baxter's conservation plan observed one deviation from the specifications:

The initial design seems to have been amended in execution, since the sections, elevation and plan illustrated in *The Builder* on 10 May 1856 do not show the arched struts [...] of the roof structure as shown in nineteenth-century photographs of the interior at South Kensington and as extant.¹¹⁵

The most positive reviews of the Museum were offered by F.H.W. Sheppard, who wrote in his *Survey of London* that '[i]nternally the modular construction gave an acceptable effect',¹¹⁶ and Herbert, who wrote of the museum that it had made 'a considerable contribution':

Young here adopts the principle of prefabrication and translates it into other materials. The aesthetics of the museum are no doubt inelegant, but its ruthless, standardised façade is perhaps the most honest, clearcut expression of modular construction of its day, and presages the aesthetics of system building of our own age.¹¹⁷

These reviews simultaneously captured the most feared and hoped-for promises of industrialised construction, as had been debated prior to the iron Museum's construction – that it offered an innovative way forward in an new expression of new

¹¹² *The Builder*, 10 May 1856.

¹¹³ Sheppard, p.98.

¹¹⁴ Baxter, p.7.

¹¹⁵ *Ibid.*, p.7.

¹¹⁶ Sheppard, p.98.

¹¹⁷ Herbert, p.370.

materials and methods; or that it represented the ruthlessness of economically driven desires for certainty. Regardless of any aesthetic critique, the Iron Museum was short lived in South Kensington. Beset from the outset with physical problems,¹¹⁸ it leaked, suffered from condensation, metal corrosion and drainage problems and was not strong enough to take the Architectural museum's collection of plaster-casts.¹¹⁹ The structure was partially dismantled in 1866, and removed incrementally over the next two decades. [Figs. 7.15, 7.16] Divided into three portions, it was offered to authorities in the north, east, and west of London to create district museums.¹²⁰ Following years of lobbying by local philanthropists for a trade museum, Bethnal Green was the only district to take up the offer, and a portion transported to its present location, to form the Bethnal Green Museum,¹²¹ later the Bethnal Green Museum of Childhood. On 14 November 1865, George Smith & Co quoted £10,300 for 'taking down seven bays of the Iron building at the South Kensington Museum and re-erecting the same complete as a District Museum in accordance with the drawings prepared for the same'.¹²² In October 1867, estimates were received for taking down and re-erecting a portion of the boilers, and a contract awarded to S. Perry & Co.¹²³ Portions were removed by December 1867, and construction began at Bethnal Green in 1867-68.¹²⁴

James William Wild (1814-92), an architect employed by the South Kensington Museum's Department of Science and Art as an expert on Arabic Art, and the chief assistant to Colonel Henry Scott,¹²⁵ was credited with the development of the relocated structure, turning to a load-bearing modelled brick skin in lieu of the corrugated iron cladding so vilified at Brompton Park. Wild's ambitious proposals to endow the Iron Museum with civic value were communicated by drawings which narrated the freedoms and challenges of Victorian eclecticism, the unwritten ambiguities of traditionally shared understandings and the ambitions of a Victorian architect curtailed by demands for economic certainty.

¹¹⁸ See. Physick, pp.25-26.

¹¹⁹ Baxter, p.8.

¹²⁰ <http://www.vam.ac.uk/moc/about_us/historyofbuilding/index.html> [accessed 29 July 2010.]

¹²¹ Physick, p.26

¹²² V&A Blythe House Archives, File ED 84/4 Tender Book No.2 1863 Oct-1865 Dec.

¹²³ Physick, p.145.

¹²⁴ 'Late in 1867 the greater, northern part of the iron museum was removed (and subsequently re-erected at Bethnal Green).' Sheppard, p.113.

¹²⁵ 'Wild seems to have been the actual designer of buildings in South Kensington for which the department's official records name Henry Scott as architect. The single drawing signed by Wild makes the Bethnal Green Museum Wild's most firmly attributable work for the Department'. Baxter, p.14.

7. A precise specification for the Iron Museum



Fig. 7.15 - External view of 'Brompton Boilers' at South Kensington before removal to Bethnal Green, showing Cast Courts in background. 1872. Isabel Agnes Cowper photographer. Commissioned by Department of Science and Art of the Committee of Council on Education. © Victoria and Albert Museum: No. 72:431.



Fig. 7.16 - South Kensington Museum, remains of the 'Brompton Boilers', south of the Cast Courts, under demolition with Secretariat block on left, the Cast Courts in background and tower of Holy Trinity Church in distance. 1897. Commissioned by Department of Science and Art of the Committee of Council on Education. © Victoria and Albert Museum: No.PH.4176-1897.

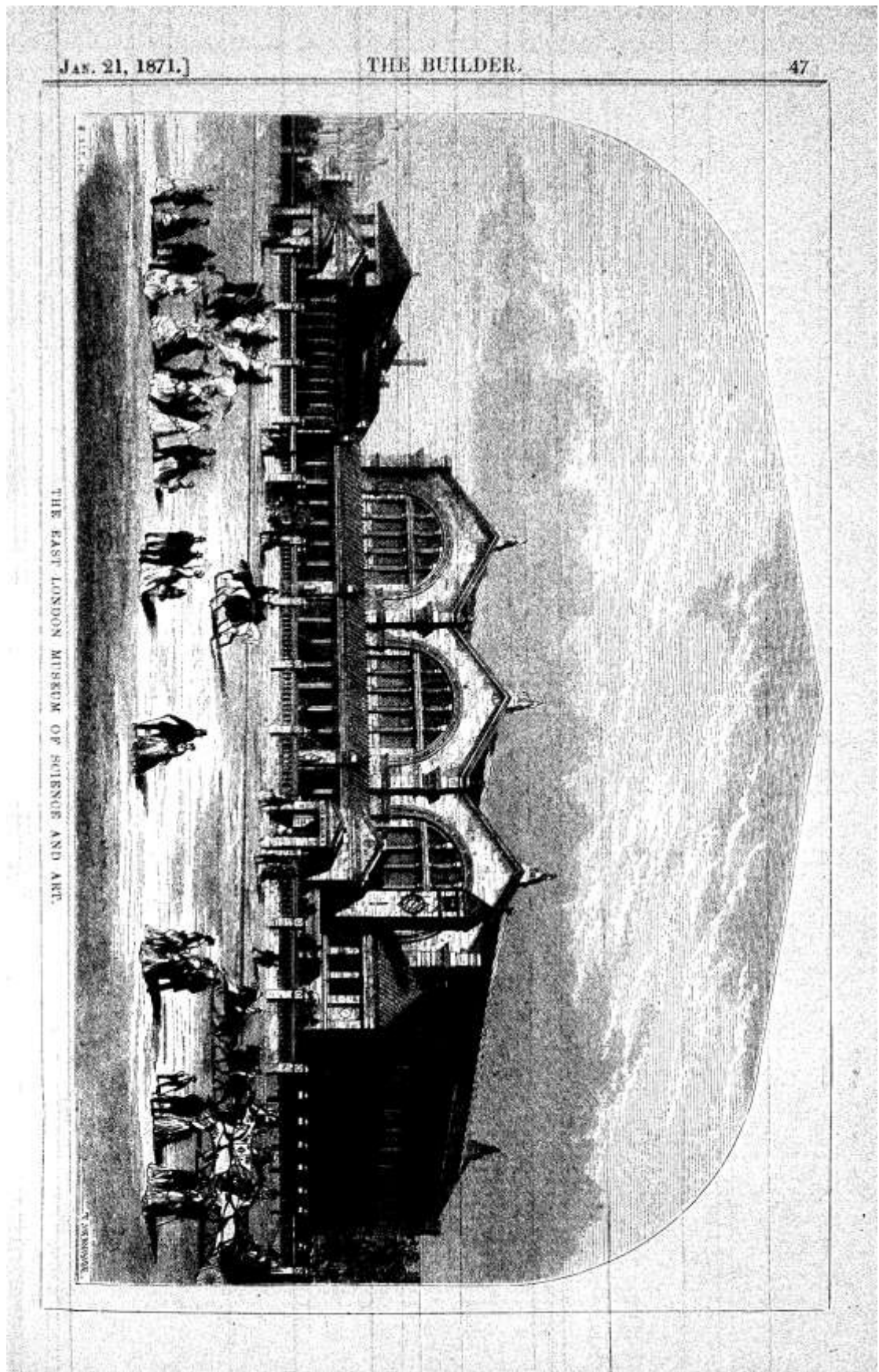


Fig. 7.17 - 'The East London Museum of Science and Art'. J.W. Wild's watercolour of his entrance addition proposals for the addition to the relocated Iron Museum. *The Builder*, Jan 21 1871, p.47.

7. A precise specification for the Iron Museum



Figure 7. 18 - Design by J. W. Wild for the completion of the Bethnal Green Museum building with a tower and curator's house (ca. 1867, photographed) Commissioned by Department of Science and Art of the Committee of Council on Education. © Victoria and Albert Museum: Museum number: E.1116-1989.

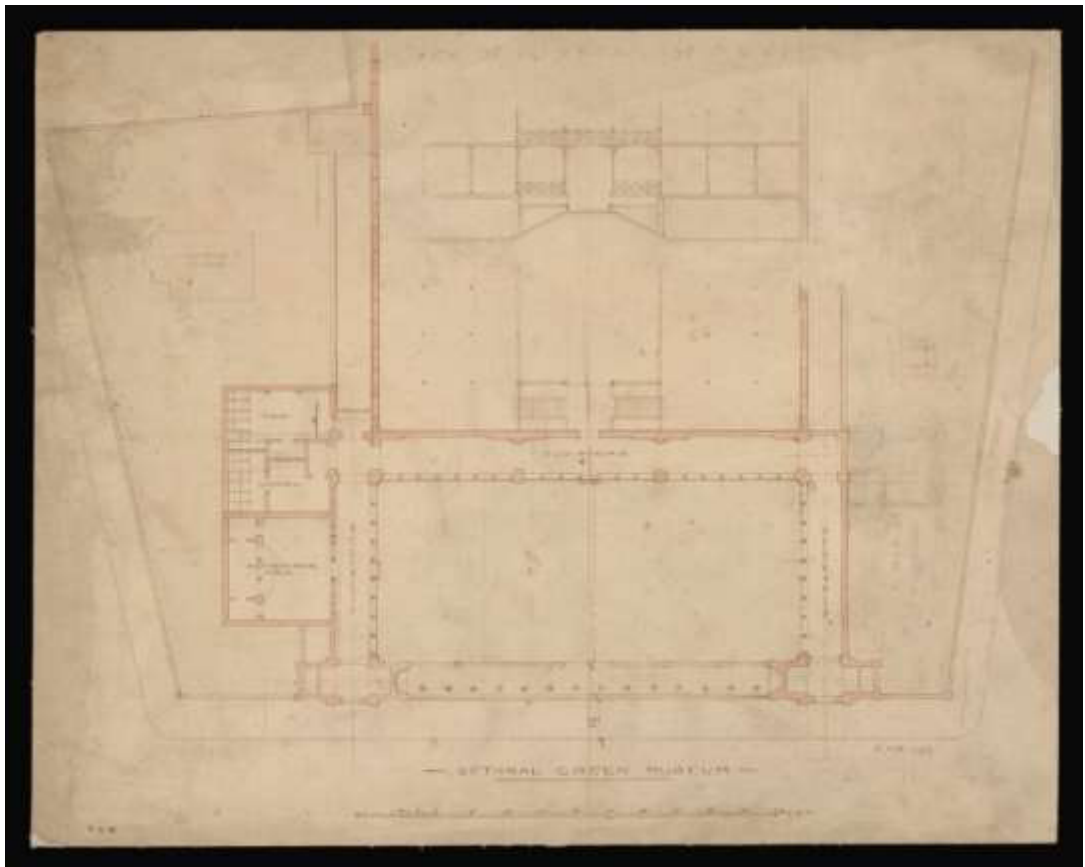


Fig. 7.19 - Plan of the proposed western part of the Museum: 'unsigned but obviously by J.W. Wild', Bethnal Green Museum, 1860s. © Victoria and Albert Museum: No. E.1072-1927.

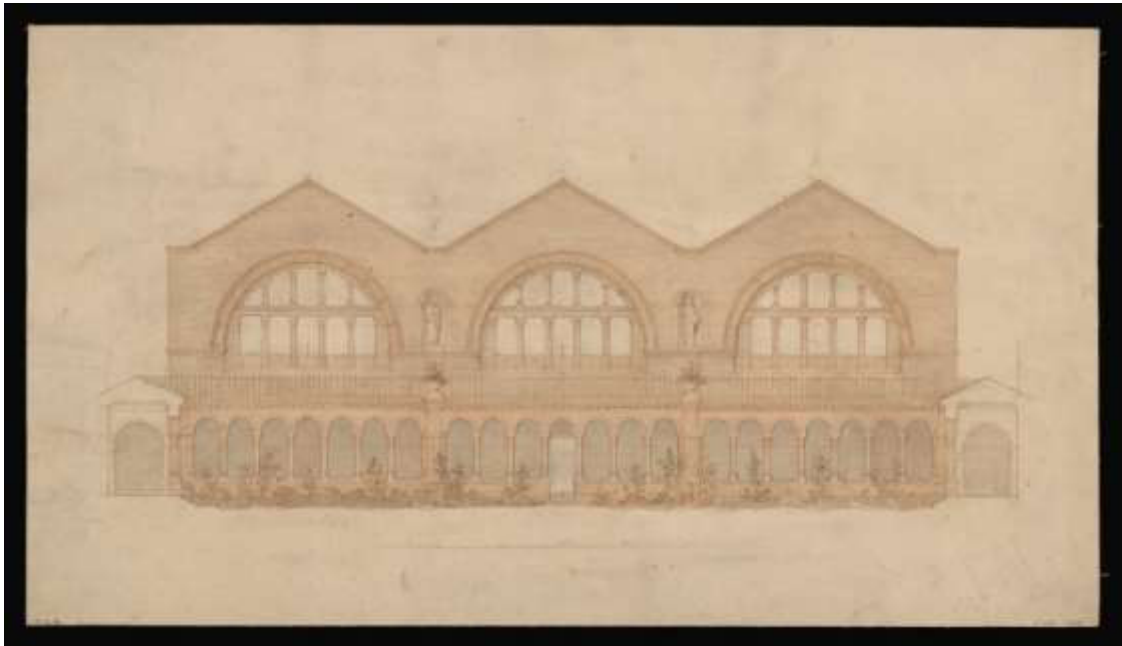


Fig. 7.20 - Drawing for the façade of the Museum: 'unsigned by obviously by J.W. Wild'. Bethnal Green Museum; English; 1860s. © Victoria and Albert Museum: No E.1081-1927.

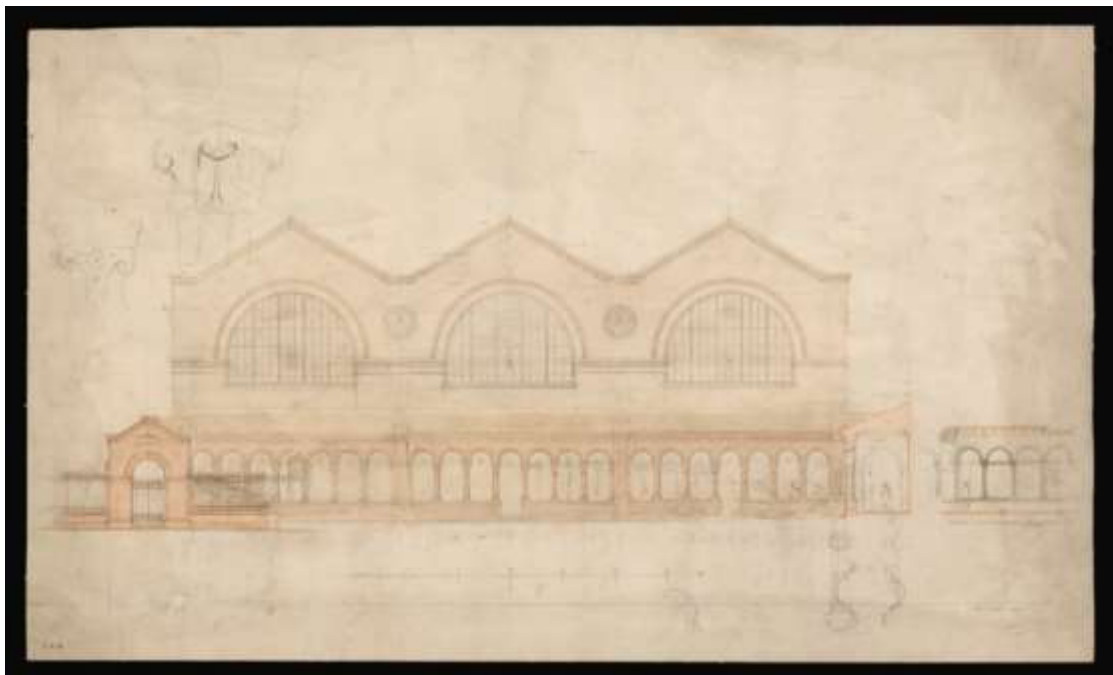


Fig. 7.21 - Drawing for the façade of the Museum: 'unsigned by obviously by J.W. Wild'. Bethnal Green Museum, 1860s. © Victoria and Albert Museum: No. E.1075-1927.

7.5 Architectural ambitions for the Bethnal Green Museum

Described by Alan Baxter & Associates in a 2004 conservation plan prepared for the Museum of Childhood as an ‘adventurous’¹²⁶ architect and ‘the leading authority on the theory and practice of Arab Art’,¹²⁷ Wild was the son of the watercolourist Charles Wild, and received an early training in Gothic Architecture under George Basevi.¹²⁸ Upon forming an independent practice, Wild completed six churches in what architectural historian John Summerson termed as a ‘Free-Gothic’ manner, before completing his most significant early work, Christ Church, Streatham in 1840-2, listed as Grade I,¹²⁹ constructed before Wild’s later travels to the Mediterranean and the Middle east. Baxter suggested that design influence and support may have come from Wild’s brother-in-law, Owen Jones (1809-1874), author of the 1856 *The Grammar of Ornament*, to which Wild had contributed.¹³⁰ Jones, responsible for the painted decorative interior at Christ Church, was also thought to have contributed to the exterior of brick polychromy.¹³¹ Following travels to Egypt, Turkey, Greece, Italy and Spain, Wild’s work on return exhibited an ‘unusually wide-ranging knowledge of historical styles and precedents’,¹³² evidenced through works including The St Martin-in-the-fields Northern District School (1849-50), and the Docks Water Tower, Grimsby (1851-52) (Grade I).

In 1851, Wild was appointed as ‘decorative architect to the Great Exhibition’¹³³ and later as an expert on Arabic Art for the South Kensington Museum. After the death in 1867 of Francis Fowke, the chief architect to the Department, Wild became assistant to the new Chief Architect, Henry Scott. ‘Wild’, Sheppard noted, ‘seems to have been Scott’s right-hand man in matters of design’.¹³⁴ While at South Kensington, Wild was attributed for design contributions to the interior planning and structural arrangements of Scott’s Science Schools, (1866-71), and was credited as having had sole responsibility under Scott for the Eastern and Western Galleries¹³⁵

¹²⁶ Baxter, p.17.

¹²⁷ Obituary, *The Times*, Nov 11 1892, Obituaries, p.10.

¹²⁸ John Summerson, ‘An Early Modernist: James Wild and his work’, *The Architects’ Journal*, 69 (9 January 1929), 57-63 (p.58). Also see Baxter, p.16.

¹²⁹ Christ Church is described by Baxter as ‘a precocious amalgamation of Byzantine, Romanesque and Islamic influences [...] largely of yellow brick, also incorporates elements of structural polychromy, an unusual feature at this early date.’ Baxter, p.16.

¹³⁰ See Owen Jones, *The Grammar of Ornament* (London Day and Son, 1856).

¹³¹ Baxter, p.16.

¹³² *Ibid*, p. 17.

¹³³ Sheppard, p.94.

¹³⁴ Baxter, p.17.

¹³⁵ Sheppard, p. 94.

and involvement in the Architectural Cast Courts (1870-73).¹³⁶ Wild ended his career as Curator of Sir John Soane's Museum, a position he held until his death in November 1892.¹³⁷ Described as being 'more remarkable for knowledge than for production', he had, *The Times* remarked in its obituary, left behind but few examples 'of his taste in works of the Byzantine' style.¹³⁸ The eclectic nature of Wild's work paralleled key architectural debates of the nineteenth century in a period in which and new principles were sought, and it is this which underpins Baxter & Associates' description of Wild as 'an important figure in the context of Victorian architectural eclecticism.'¹³⁹ John Summerson wrote of Wild:

[...] for sheer originality and independence of thought expressed in an age when architects still directed their ideas along the narrow lines of literal revivalism those works are unusually interesting. Wild was a modernist in the truest sense of the word, and although his works were not sufficient in number of importance to exert any type of influence in his time, they are of surpassing significance as historical landmarks, and even today they stand on their own merits as examples of imaginative and unconventional design.¹⁴⁰

This review, applauding Wild's work as 'unconventional,' in its 'originality' and 'independence of thought', reinforced the profession's stance on architectural value: that it emerges from independent and original thinking, in contrast to the pressure the architectural profession faced within the mid-nineteenth century to increasingly work within stricter constraints of economic certainty. Compared to the 'pecuniary value' the Commissioners had praised of Young's Iron Museum's specifications, Wild's first proposals for the relocated Iron Museum were notably more ambitious.¹⁴¹ Published in *The Builder* on 21 January 1871, an evocative watercolour attributed to Wild [Figs. 7.17, 7.18] proposed an expansive front addition towards Cambridge Heath Road as a U-shaped arrangement of colonnades, wings and ancillary buildings, a tower, curator's house, 'library on one side, refreshment-room and house on the other, with corridors leading to the road'¹⁴² [Figs. 7.19-7.21], described by Baxter as an attempt to reconcile the scale of the Boilers and provide a civic entrance towards Cambridge Heath Road:¹⁴³

¹³⁶ Ibid., p.18.

¹³⁷ *The Times*, 11 November 1892, Issue 33793; col F, p. 10.

¹³⁸ Ibid.

¹³⁹ Baxter, p.19.

¹⁴⁰ Summerson, p.62.

¹⁴¹ Sheppard described Wild's work as assistant to Scott as having a 'tendency to gigantism' and 'bigness and massiveness.' Sheppard, p.94.

¹⁴² *The Builder* 21 Jan 1871, p.49.

¹⁴³ Baxter, p.14.

The picturesque grouping and smaller scale of the ancillary buildings would have been an effective foil for the symmetry and greater monumentality of the main building. In their scale, character and arrangement they would have had an effect scarcely rivalled in contemporary British architecture, let alone in the buildings being constructed in South Kensington at the time.¹⁴⁴

'Glamorous' renderings, such as Wild's first proposals, were often a consequence, Jenkins suggested, of architects becoming more hampered by the increasingly restrictive economic demands under which they worked:

The desire of the architect to represent his building as he would like it to appear, were he financially unrestricted, is of course understandable, and many Victorian drawings should be interpreted, perhaps, not so much as dishonest attempts to win the confidence of unwitting clients, but rather as the yearnings of designers, frustrated by the climate of a commercial society.¹⁴⁵

Wild's original evocative watercolour perspectives of his ambitious proposals for a revised entrance sequence to the relocated Iron Museum can be read in this context as an attempt to add architectural value to an inherited project driven by an objective of economic certainty. The original proposals as set out by Wild's perceptive rendering were never constructed, a result of cost constraints imposed as the Museum neared completion in 1870.¹⁴⁶ Instead, the redevelopment of the Museum proceeded, with modifications attributed to General Scott¹⁴⁷ and a much reduced entrance structure, criticized from the outset as never fully meeting the Museum's needs and as entirely failing to appropriately convey the civic significance of the Museum.¹⁴⁸

¹⁴⁴ Baxter, p.14. Baxter suggests comparison with the Gardeners House and Roman Baths, Charlottenhof, Potsdam, by K.F. Schinkel.

¹⁴⁵ Jenkins, p.207.

¹⁴⁶ 'the Treasury has just now determined not to erect these.' *The Builder* 21 Jan 1871, p.49.

¹⁴⁷ 'the Bethnal Green Museum design, made in the following year [1871] and carried out, after modifications, by General Scott, shows that Wild still retained his individuality, although the intense vitality of his early designs is absent. [...]. Wild's original design showed a forecourt with a cloister on three sides leading to the refreshment room and library wings. But two sides of the cloister as well as the refreshment room, library, and a great deal of sculpture, were omitted in execution.' Summerson, p, 60.

¹⁴⁸ 'The entrance colonnade attached to the west façade is in keeping with the style of the exterior of the main building but has none of its flair, let alone the picturesque qualities of the rejected scheme for a larger colonnade and ancillary buildings. In the inadequacy of the facilities it houses, its failure to give proper emphasis to the main entrance and the weak relationship it create with the street frontage, the colonnade might be said to perpetuate some of the faults of the Iron Museum in South Kensington.' Baxter, p.23.

'The Prince and Princess go to open the Brompton Boilers - the bane of superfine critics and anyhow artistic eyesores', *The Standard* reported on 22 June 1872.¹⁴⁹ The critical reaction against the original manifestation of the Boilers still lingered.¹⁵⁰ A sense of economy still applied to the façade in its new iteration, described by *The Builder* as being 'wholly of brick, moulded where necessary.'¹⁵¹ The Museum had, the *Daily News* reported before the formal opening, 'the South Kensington appearance of red brick, solidly, with a slight show of artistic design to indicate its quality,'¹⁵² including structural monochromatic modelling of the brick façades¹⁵³ disassociating the 'Boilers' from its original iron cladding. In comparison to contemporaneous buildings for the V&A in South Kensington, which made significant use of terracotta decoration, 'all of it by decorative artists',¹⁵⁴ the Bethnal Green façade has been described as more 'strictly architectural in character.' Other than exterior frieze panels designed by Frank. W. Moody,¹⁵⁵ Wild's façades displayed an austerity 'partly due to the enforced economies', but also, Baxter proposed, 'a reflection of the greater control exercised by the architect in charge.'¹⁵⁶

The question of the architect's control applied here to the extent to which craftsmen working on decorative elements had free reign, and the extent to which their work would be predetermined by the architect. The degree to which each detail of an architectural work could be exhaustively known in advance of construction, so central to earlier Select Committees debates, was increasingly central to a nineteenth century architectural culture which, in addition to responding to new materials, methods, organisational structures and contractual agreements, had rejected 'absolute rules' in lieu of eclecticism. In a context within which it was less

¹⁴⁹ 'The Bethnal-Green Museum', *The Standard* (London, England), 22 June 1872, p.5.

¹⁵⁰ *The Standard* sympathized with the South Kensington Museum in having to deal with 'the production of such a gooselike offspring, which, with all the play of maternal enthusiasm, they can hardly look on as a swan.' *The Standard*, 30 May 30 1872.

¹⁵¹ Messrs. Perry & Co, under the direction of Lieut-Col. Scott; Mr James Wild, architect, mainly assisting in the design. The Building is wholly of brick, moulded where necessary.' 'The East London Museum of Science and Art', *The Builder*, 21 Jan 1871, p.49.

¹⁵² 'The Bethnal-Green Museum', *Daily News*, 22 June 1872.

¹⁵³ The South Kensington buildings tended to 'depend for a good deal of their effect on vivid, original decoration, all of it devised by decorative artists, not by Fowke or Scott'. Baxter, p.21.

¹⁵⁴ *Ibid.*, p.21.

¹⁵⁵ The originals of these drawings have not yet been digitized, and my own photographs cannot be reproduced here for copyright reasons, but can they be viewed at the Victoria and Albert Museum drawings collection, Museum nos. 7326 / 1 to 6, listed as 'Original design drawings, for the external decorative frieze panels at Bethnal Green Museum designed by J. W. Moody about 1870; Paper, English, 1868-1872.' The Museum of Childhood describe these as 'drawings which were squared up so they could be reproduced as full-size cartoons for the mosaic-makers to follow.'

¹⁵⁶ Baxter, p.21.

possible to assume shared knowledge, eclecticism, in removing the authority of stylistic precedent - and bringing to the fore the question of whether architecture could be reduced to an optional, decorative, extra - now served as a further catalyst for calls for precise instructions to ensure control.

Architectural authority and control

Dixon and Muthesius's review of Victorian architecture posited eclecticism and the increased use of decoration as reflecting major philosophical shifts of the period, and embodying the rejection of 'absolute rules.' A conceptual shift in values proceeding from the Enlightenment had emphasised diversity and individuality interpreted within architectural practice as a rationale for rejecting the historically absolute authority of Classical architecture and its associated hierarchal ornamentation.¹⁵⁷ In lieu of evaluating the quality of a work of architecture through its adherence to pre-established principles and 'detailed laws of proportioning, which assured aesthetically satisfying results',¹⁵⁸ it could now be judged on its own merits of beauty, surprise or even awe, and the Victorian architect could variously turn to Neo-Classical, Neo-Gothic, the picturesque, French, Italian and Greek influences, or an amalgamation of all.¹⁵⁹ The refutation of an absolute truth reinvigorated, Dixon and Muthesius suggested, an urgent search for guiding principles as to what might constitute a 'correct' or 'original' approach to architecture in nineteenth century Britain, as *The Builder* had earlier lamented in its advocacy of innovations offered by iron. Owen Jones's 1856 *The Grammar of Ornament* attempted to define principles for an original architecture defined by its own cultural context, arguing:

Architecture is the material expression of the wants, the faculties, and the sentiments, of the age in which it is created. Style in Architecture is the peculiar form that expression takes under the influence of climate and materials at command.¹⁶⁰

Setting out a definition of an architecture original to its age and place, and rejecting Classical Authority, Jones emphasised the key idea that architecture was necessarily embedded throughout every aspect of construction. 'Construction

¹⁵⁷ In the nineteenth century, Dixon and Muthesius wrote, 'This hierarchical system was finally turned upside down, in that a tradesman's villa could show more architectural display than the municipal buildings of a small town.' Dixon, p.18.

¹⁵⁸ *Ibid.*, p.18.

¹⁵⁹ *Ibid.*, p.20.

¹⁶⁰ Owen Jones, *The Grammar of Ornament* (London Day and Son, 1856) p.5.

should be decorated', Jones proposed. 'Decoration should never be purposely constructed.'¹⁶¹ A.W. Pugin's *True Principles* asserted: 'Architectural features are continually tacked on buildings with which they have no connexion, merely for the sake of what is termed effect, and ornaments are *actually constructed*, instead of forming the decoration of *construction*, to which in good taste they should always be subservient.'¹⁶²

Emerging in a context which threatened to demote architecture to no more than an optional decorated façade - embodied by the one-line item in a specification at the 1856 Iron Museum's iteration in South Kensington - this debate was more than an aesthetic one. At its core, it was a cultural argument designed to inescapably embed architecture throughout all processes of construction, to defend against the possibility of becoming an optional extra in a context driven by economic certainty. The brick façade at Bethnal Green spoke not of industrialised advances and instead maintained the historical familiarity materials and methods of a load-bearing brick façade, but a stricter architectural vocabulary, stripped of additive decorative works, spoke instead of architectural control and reduced freedom for decorative craftsmen. From the one-page specification and accompanying drawings for the original iron Museum, to Wild's evocative perspective renderings, the final set of archived drawings for the reduced scope of the Bethnal Green Museum as constructed, signed by Scott, can be analysed for their placement in the role of architectural drawings as a fulcrum between traditional crafts and industrialised control. Neither precise by contemporary standards, in referencing familiar materials and methods, nor open-ended, in communicating an architectural intent which left little room for free craft, they narrate a historical juncture between drawings of a less prescriptive nature which anticipated and relied upon the expertise of the craftsman, and precisely instructive drawings which aimed to assert complete control over all processes of construction.

¹⁶¹ Ibid., p.5.

¹⁶² A.W.N. Pugin, A.W.N., *The True Principles of Pointed or Christian Architecture*, 1841 (London: Academy Editions, 1973) p.1.

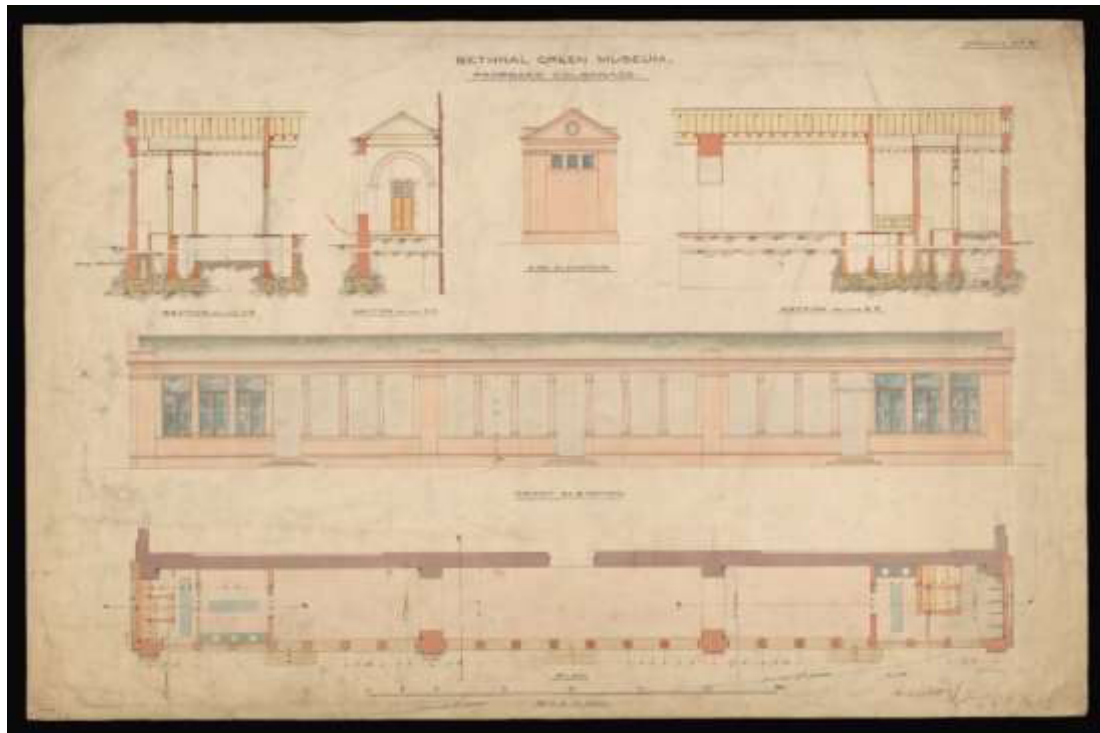


Fig. 7.22 - Proposed colonnade (Henry Scott). Bethnal Green Museum, 1860s. © Victoria and Albert Museum: No.E.1058-1927. This plan shows the reduced scope proposal for the front entrance.

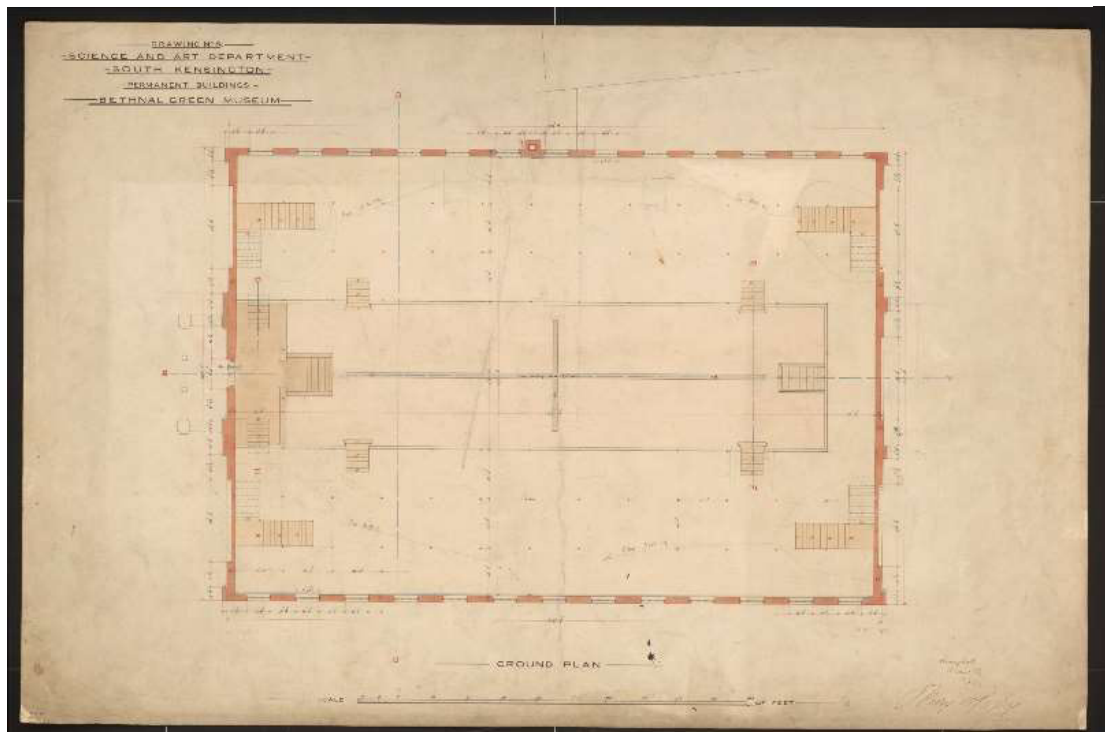


Fig. 7.23 - Plan for the Museum / Ground floor plan .Signed by Henry Scott and dated 13 Nov 1867. Bethnal Green Museum, 1860s. © Victoria and Albert Museum: No E.1081-1927.

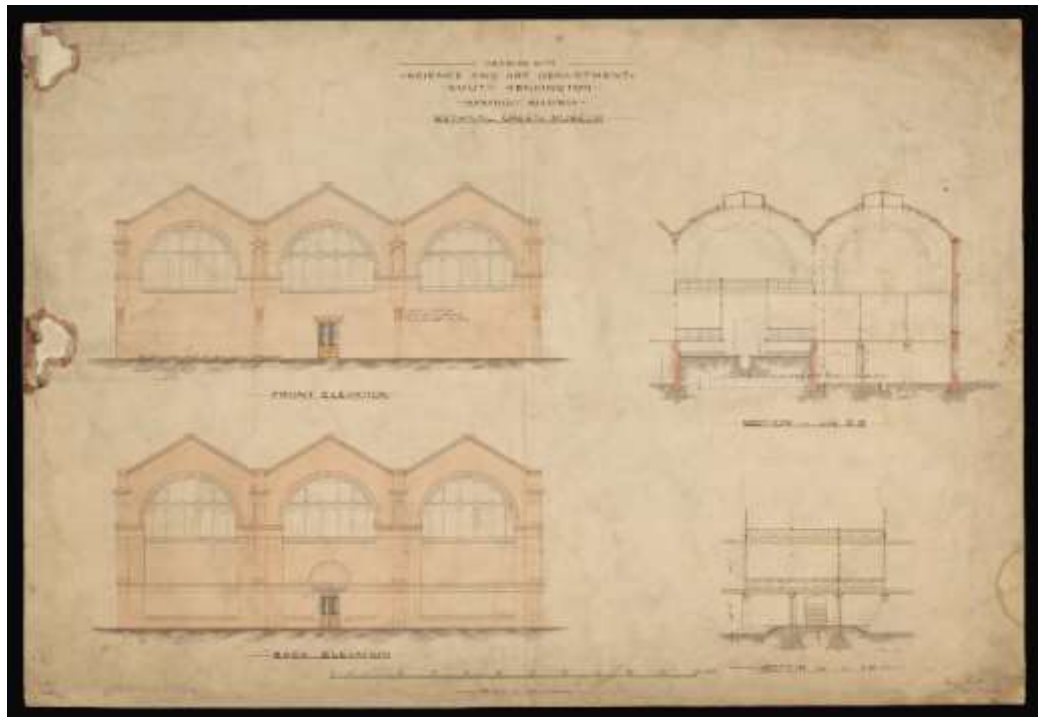


Fig. 7.24 - Front elevation drawing no 31 (sections and elevations of Museum). Signed by Henry Scott and dated 5 October 1868. Bethnal Green Museum, 1860s. © Victoria and Albert Museum: No. E.1069-1927.

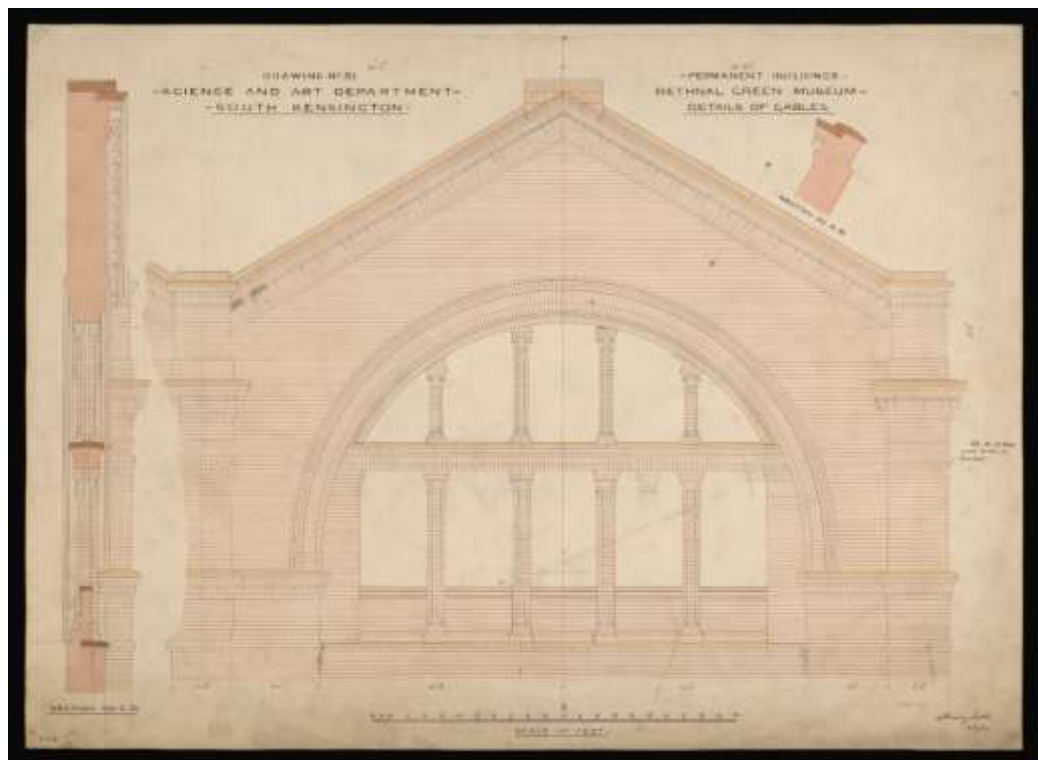


Fig. 7.25 - Details of Gables (Henry Scott). Bethnal Green Museum; English; 1860s. © Victoria and Albert Museum: No E.1070-1927.

7.6 'Different drawings playing different roles'

Historically, architectural works based upon familiar construction methods and materials had typically been able to rely upon drawings which communicated only overall intent, rather than the specifics of each detail. Not only had this level of communication previously been considered sufficient, but, as Jenkins argued, it had also communicated a respect of the builder's craft:

Down to the end of the eighteenth century, broadly speaking, the drawings made for the builder had been concerned with *finished* appearances, e.g. the position and size of window openings, profiles of mouldings, and the dimensions of rooms. Although timber scantlings, wall thicknesses, and the like were specified in agreements, it was largely up to the builder to produce the required appearance by his own knowledge and skill. The architect would rarely have attempted to instruct a tradesman in forming, for instance, a brick arch or bedding a timber panel, and such were the standards of craftsmanship that it would have been presumptuous for him to do so.¹⁶³

From the end of the eighteenth century, the impact of new industrially-derived methods and materials, and new contractual relationships between architect and builder in the first half of the nineteenth century had challenged such presumptions. Giles Worsley described Regency architectural drawings at the turn of the nineteenth century as:

one of the great ages of architectural draftsmanship [...] an age in which draftsmanship was taken very seriously, with different drawings playing different roles: design drawings, presentation drawings, working drawings, record drawings.¹⁶⁴

The increasing desire for pursuing control and certainty through increasingly detailed instructions can be seen through a series of recommendations published from the start of the nineteenth century. In 1819, Peter Nicholson's *An Architectural Dictionary* advocated that Working Drawings 'consist of plans, elevations, and sections, of the whole, and all the parts of an edifice, to as large a scale as may be found convenient.'¹⁶⁵ Worsley cited an 1824 competition brief for the Royal Manchester Institute which specified, in part to limit the number of entries, that 'The Plans, Elevations, and Sections were to be upon a Scale of 3/16ths of an inch, the

¹⁶³ Jenkins, p.205.

¹⁶⁴ Giles Worsley, *Architectural Drawings of the Regency Period 1790-1837: From the Drawings Collection of the Royal Institute of British Architects* (London: Andre Deutsch Limited, 1991), p.x.

¹⁶⁵ *Ibid.*, p.23, citing Peter Nicholson, *An Architectural Dictionary*, II (London, 1819).

Plans and Geometric Drawings to be tinted with Indian Ink, without backgrounds.’¹⁶⁶ Worsley also cited the Regency architect William Burn’s described practice of drawing out ‘the plans with the minutest accuracy, dimensioning with his own hand every part and detail with particular clearness’ as indicative of: ‘any Regency architect whose drawings survive in quantity. Through the use of detailed drawings,’ Worsley continued:

Regency architects exercised a very direct control over their buildings. Like Burn their aim was ‘to afford no excuse to the builder for any mistakes and blunders.’ The volume of fifty-six contract drawings by Francis Edwards for St John the Baptist, Hoxton, of 1824 contrasts strikingly with the relatively limited number provided by eighteenth-century ecclesiastical architects.¹⁶⁷

By 1842, Gwilt’s *Encyclopaedia of Architecture* argued that drawings ‘made to a twelfth or a twenty-fourth part of their real size’ would supply the wants of the workman ‘where there is no complication in the distribution or arrangement, and where there is a simple treatment of regular forms, of right angles and the like’,¹⁶⁸ echoing again Saunders’s 1812 claim that precise specifications were possible only in the case of ‘very small, plain or rough works.’ Where, however, ‘the variety of forms used is infinite from the variety of the circumstances’ Gwilt now recommended that ‘nothing short of drawings of the full, or at least of half, the size will safely guide the workman’.¹⁶⁹ instructions, as Jenkins concluded, of ‘an infinitely more meticulous nature than before.’¹⁷⁰ By the second half of the nineteenth century, expectations of

¹⁶⁶ Worsley, p.16.

¹⁶⁷ *Ibid.*, p.23.

¹⁶⁸ ‘2491a. It is obvious that though drawings made to a twelfth or a twenty-fourth part of their real size may well enough supply the wants of the workman where there is no complication in the distribution or arrangement, and where there is a simple treatment of regular forms, of right angles and the like; yet in all cases wherein we have to deal with the minor details of architecture, and in construction, where the variety of forms used is infinite from the variety of the circumstances, nothing short of drawings of the full, or at least of half, the size will safely guide the workman.’ Gwilt, p.794.

¹⁶⁹ Yet even where precision at the scale of 1:1 was advised, some ambiguity was permitted, allowing for reconciliation on site. Recommending a specification for brickwork, Gwilt proposed, ‘2293a. BRICKLAYER [...] The moulded bricks to be carefully made in accordance with the detail drawings, and to be trimmed up before they are placed in the kiln. They are to be made a little thicker than the other bricks, so that the beds and joints may be rubbed true before they are laid; they are to be set in fine mortar, and (before the scaffolding is struck), they are to be rasped, rubbed with gritstone, and the arrises to be made as straight and true as stonework.’ Permitting terms such as ‘a little thicker’ conveyed an expectation that the brickmaker would still know to what extent ‘a little thicker’ would be. *Ibid.*, p.724.

¹⁷⁰ ‘In the nineteenth century, in addition to the tradesman’s inferior ability, the introduction of new materials (like cast iron, pressed brick, terra-cotta, faience, and numerous patented products), the requirements of various acts governing building, drainage and so forth, and the desire for economy necessitated the production of constructional drawings of an infinitely

exhaustive written and instructions appeared to be embedded. In his review of the 1866-7 Law Courts competition, Colin St John Wilson described Alfred Waterhouse's project entry:

The project was set out, as required of all the competitors, in a lithographed report of 93 pages, containing a written exposition, schedules of accommodation, a cost report, drawings and photographs of perspective renderings.¹⁷¹

The drawings for the reduced scope of work at the Bethnal Green Museum - plans, elevations, sections, and gable detail, signed by Henry Scott for a design attributed to Wild [Figs. 7.19-7.25] - can now be read as drawings which represent a moment between two cultures of communication in architectural production; a historic tradition of drawings reliant upon shared assumptions of materials, methods, and definitions of quality; and emerging expectations of precise written and drawn instructions for each and every detail.¹⁷²

These drawing simultaneously speak, in their cultural context, of increased architectural control over the freedom given to craftsmen. They communicate an architectural intention of a façade treatment of structurally modelled brick, in which architectural decoration was inescapably embedded within the structural materiality of the façade, ensuring architectural civic value could not be reduced to an optional extra, while reducing the scope of any artist-craftsmen to exhibit individual freedom in decorative work. At the same time, in lacking explicit instructions at the level we would anticipate in the twenty-first century, they can be read as demonstrating still-present assumptions of shared knowledge of craftsmen working with historically familiar materials and methods, leaving more of the scope to the inherited and ongoing skill and knowledge of the craftsmen than would today be permitted.

more meticulous nature than before. The position developed progressively throughout the century, and today it is necessary, or at least safer practice, to provide the building with detailed drawings of the most commonplace feature. For the same reasons, specifications too became fuller and more detailed. In earlier times what was, in effect, the specification had been embodied in the contract agreement itself, as we have seen in the case of the eighteenth-century agreement for Heathcote's House, and the sixteenth-century contract for the Fortune Theatre. During the nineteenth century the specification emerged as a separate, frequently lengthy document - although, with the drawings and later the bill of quantities also, it still formed a binding part of the contract.' Jenkins, p.205.

¹⁷¹ Colin St John Wilson, *Architectural Reflections: Studies in the Philosophy and Practice of Architecture*. Second edn (Manchester and New York: Manchester University Press, 2000), p.207.

¹⁷² Following archival visits to the Museum of Childhood, V&A drawings collection, V&A Blythe House, and reviews of literature by Physick and Baxter, I have been unable to locate further construction drawings or written.

7.7 Architecture as an optional extra in a precise specification

The controversies surrounding the Iron Museum in its varied incarnations aligned with debates as the nineteenth century ended over the definitive role of the architect in an economically defined context drawn towards predictability, certainty, and standardised efficiencies, in which the role of precise communication would explicitly shape early twentieth century responses. At every stage, the value of the Iron Museum had been determined economically: it had been subsequently critiqued at every stage for a lack of architectural value, in a process which had begun in 1856 with a written specification and accompanying drawings which appeared to align with the 1812 and 1828 Select Committee's calls for precise instructions, in advance of construction, as a guarantor of economic certainty.

A concise written specification and accompanying spare drawings of a prefabricated iron structure clad in corrugated sheeting tested the Select Committees' criteria that all aspects of the work could be set out in advance of construction in order to guarantee economic certainty and, by extension, control quality. In its first incarnation, the processes leading to the Iron Museum pursued certainty in advance of construction, but the constructed result was critically reviewed as absent of an architectural quality, even if quality was to be defined as fitness of purpose. The 1856 Iron Museum, a major new civic architectural work, designed and constructed without the services of an architect, embodied the threat of architecture as reduced to the optional extra offered by Young's precise specification. Precision in the specifications and assembly of the 1856 Iron Museum pursued the certainties of economic value: but such certainties could not guarantee an architectural quality as valued by architects.

The next close reading moves forward 150 years to examine Caruso St John's 2006 façade fronting the Museum of Childhood in Bethnal Green, reviewed as revealing the limits of the precise communications which are still today posited as a primary means by which to control quality, and value, in architecture. Quality as constructed at the 2006 Museum of Childhood, the next chapter will argue, was dependant not upon a perfect match between ideal and construction, but on the specific and intentional use of precise communications to induce shared understandings between designer and builder.

8. Anticipating precision at the Museum of Childhood

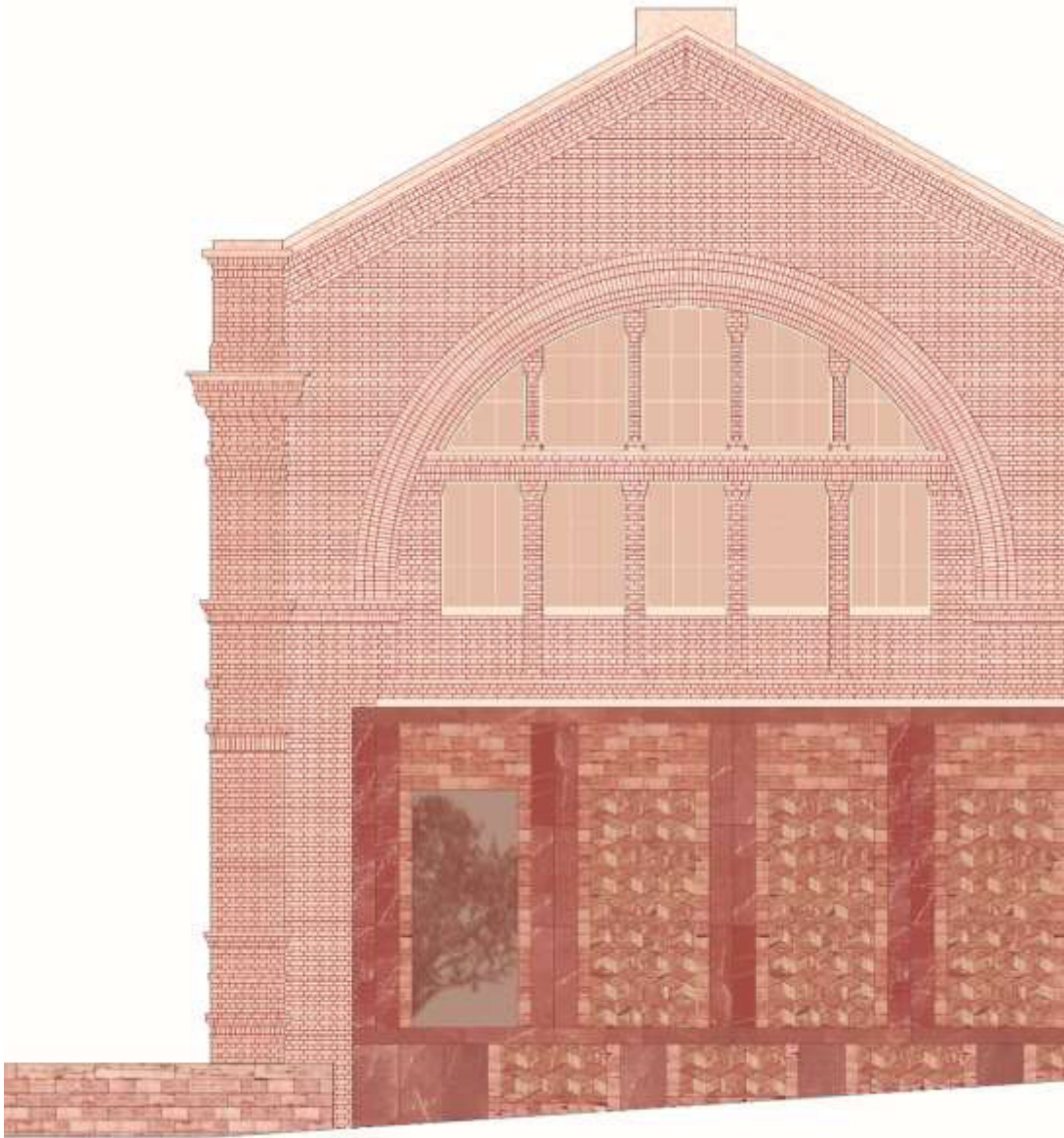


Fig. 8.1 - Design development drawing, partial west façade, Museum of Childhood.
Caruso St John Architects, 2004.

8.1 The limits of precision

'Nitroseal MS100' mastic joints frame either side of an illusionistic column within the decorative CNC cut stone façade [Fig. 8.1] of Caruso St John Architects' 2006 addition, which provides a new entrance at the front of J.W. Wild's 1856 modelled brick façade at the Victoria and Albert (V&A) Museum of Childhood in Bethnal Green, London. The extraordinarily precise communications which accompany the design and construction of this joint are, in this chapter, demonstrated as exemplifying typical recommendations which guide contemporary architectural practice. I will argue that even these most precise of instructions did not in themselves act as the 'one certain opportunity' - as Hall had stipulated - of setting down a definitive and enforceable expression of standard and quality, nor did they, in themselves, provide understanding and certainty.¹

Rather, the architectural intent - an intent defined by far more than dimensional specifications - was pursued through ongoing conversations extending beyond precise specifications which acted as no more than the opening statement. The specifications, adaptations, conversations and interpretations which framed the design and construction of a 6mm mastic joint in this decorative stone façade narrate the anticipation of the limits of precision in controlling the quality of a constructed work of architecture.

¹ Hall, p.38.

8. Anticipating precision at the Museum of Childhood.

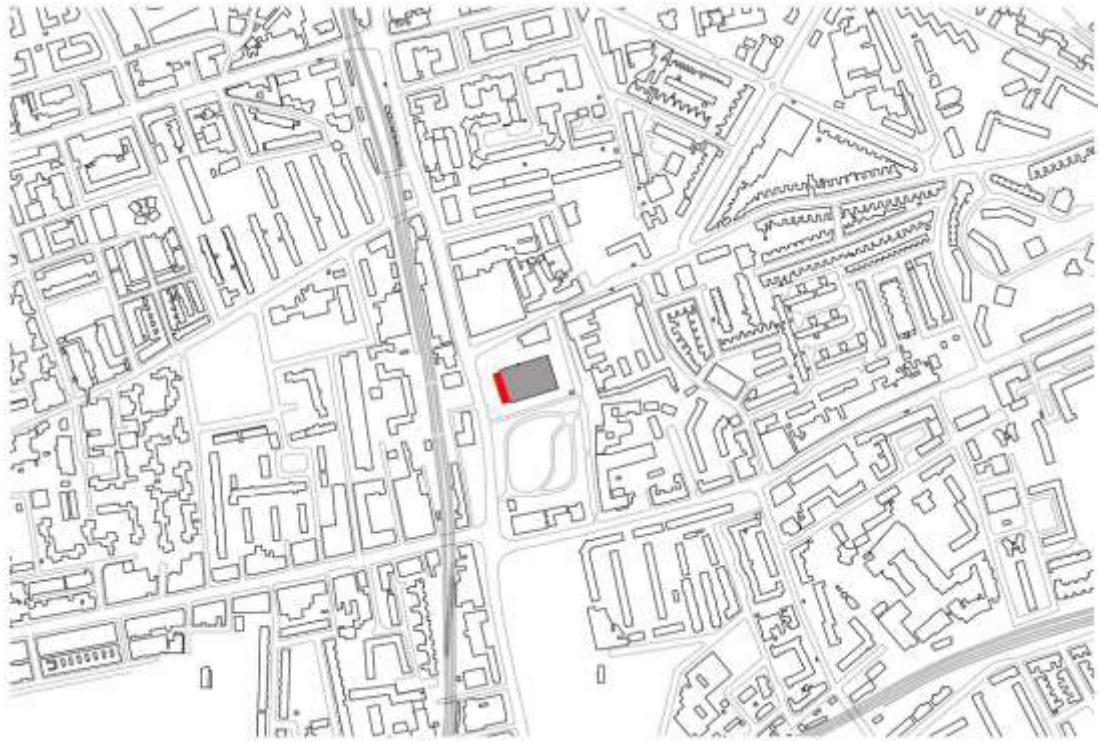


Fig. 8.2 - Relocated Iron Museum as Bethnal Green Museum of Childhood, and 2006 Caruso St John front addition to west facade.



Fig. 8.3 - Concept sketch, '176-Sketches' project file. Museum of Childhood, Caruso St John Architects.

8. Anticipating precision at the Museum of Childhood.



Fig. 8.4 - Model images, 176 - Museum of Childhood, Caruso St John Architects.

8. Anticipating precision at the Museum of Childhood.



Fig. 8.5 - Design development drawing, west façade, Museum of Childhood. Caruso St John Architects, 2004.



Fig. 8.6 - '176 - Sample Panel'. Design development drawing of the decorative stone cladding façade of the Museum of Childhood, Caruso St John Architects, 2005.

8. Anticipating precision at the Museum of Childhood.

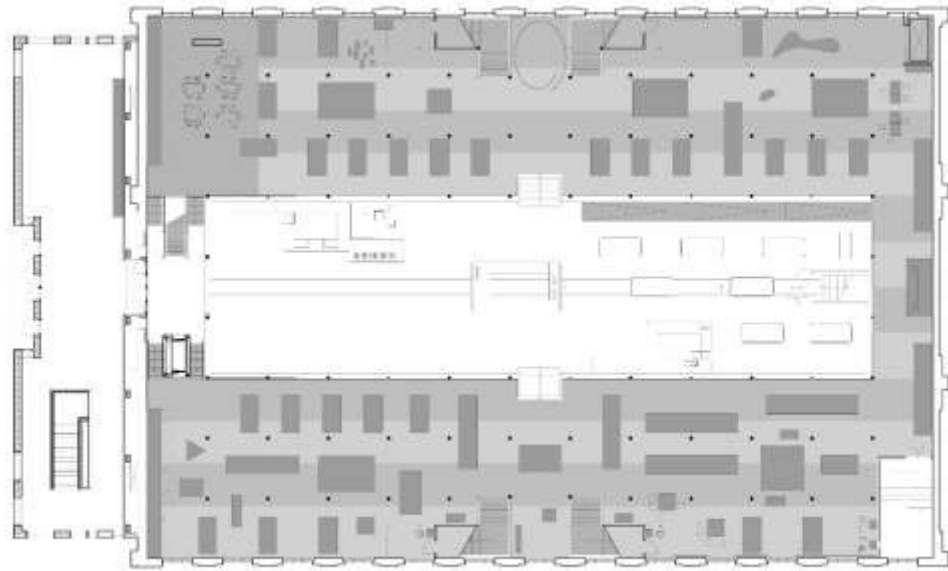


Fig. 8.7 - 176_L12_61. Plan, Development and Presentation folder, Museum of Childhood, Caruso St John Architects.

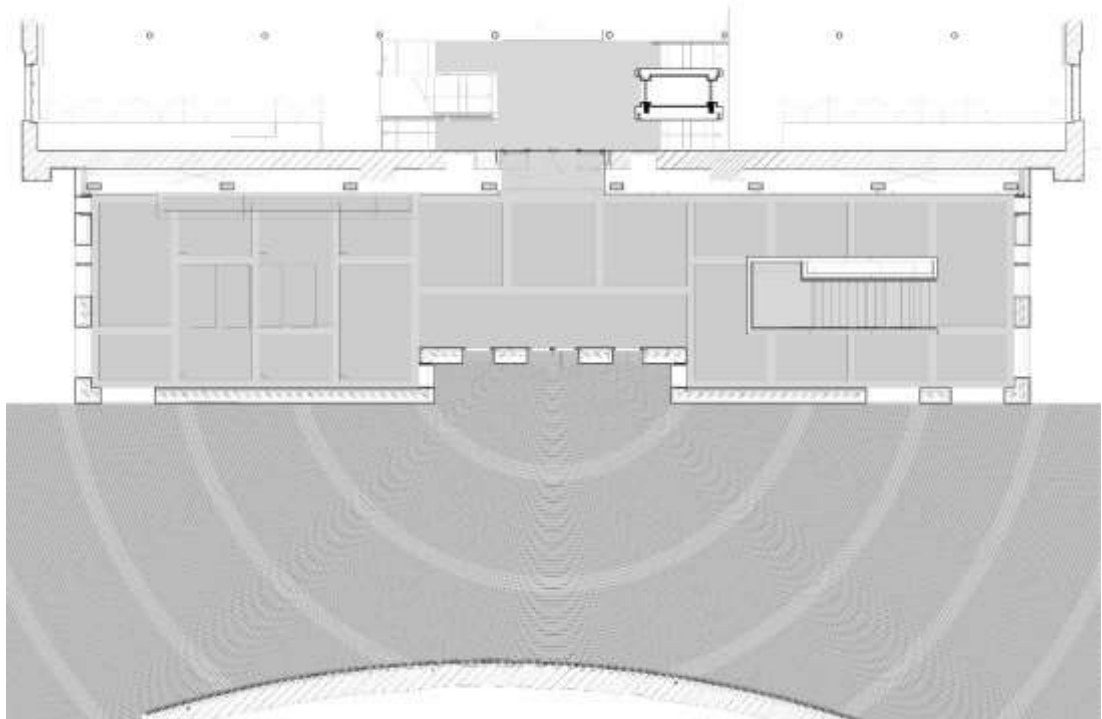


Fig. 8.8 - 176_L12_20. Plan, Development and Presentation folder, Museum of Childhood, Caruso St John Architects.

8.2 'The Architect sets the standards'

In 2002, the V&A Bethnal Green Museum of Childhood selected London-based architectural practice Caruso St John Architects to masterplan a renovation, the second phase of which proposed a new entrance addition to the west façade facing Cambridge Heath Road (Fig. 8.2). In response, Caruso St John focused on the possibilities of complex ornamentation offered by contemporary stone-cutting technologies, proposing to mediate the hand-laid decorative brick and mosaic patterning of J.W Wild's façade with the exactitude and economy offered by contemporary stone cutting CNC - computer numerical controlled - processes. A concept design process [Fig. 8.3] culminated in what Peter St John described as a 'simple' yet 'intense'² box; a rectangular one-storey volume placed in front of the existing brick façade, tightly wrapped in a patterned stone skin [Figs. 8.4 - 8.8]. Caruso St John outlined their intent in a design statement, repeated again here. 'In the 19th century', Caruso St John noted:

such decoration was carried out by hand. With the rise of industrialised processes in the building crafts so decoration became prohibitively expensive. However, with recent advances in computer controlled stone cutting it is again possible to achieve complex decorations at an affordable price.³

Expectations of precise communications which had occupied the nineteenth century architectural profession were also manifest: Caruso St John's drawings and written documents meticulously conveyed their intentions in accordance with contemporary recommendations for mode of professional architectural practice. That the constructed result of specified 6mm and 4mm joints did not align precisely with the geometric ideal was not only accepted but anticipated, in a process dependent on conversation, mutual understanding, interpretation, intuition and handcrafted skill for the pursuit of quality within the façade of a national civic museum.

The Victoria and Albert Museum of Childhood at Bethnal Green

The Victoria and Albert (V&A) Museum of Childhood at Bethnal Green today houses the Victoria and Albert Museum's collection of childhood-related objects and artefacts, including artefacts from the 1600s to the present day. Receiving up to

² Peter St John interview with author, 11 May 2009.

³ Caruso St John Architects, David Bonnett & Associates Access Consultants, *Planning Report Revision A, Museum of Childhood at Bethnal Green* (Unpublished Report, August 2004), p.13.

200,000 visitors per annum, including approximately 60,000 in school parties,⁴ the Museum focuses upon themes of childhood, past and present, and runs a wide variety of public programmes aimed at local and international visitors.⁵ Initially treated as an outpost of the South Kensington Museum, the Bethnal Green Museum, as it was first named, became a repository for a diverse range of items not displayed in South Kensington, including collections from the Great Exhibition.⁶ Following closure during World War I, the Museum began to re-organise in 1922 under head curator, Arthur Sabine, who sought to make the Museum more child friendly after noticing that it was 'frequently filled with bored, noisy children.'⁷ After serving as a British Canteen for the general public in World War II, the Museum increased its collection of childhood-related objects in the two decades after the war under Director Roy Strong as the Museum of Childhood, at which point all childhood-related collections were consolidated at Bethnal Green, and all non-childhood related objects sent back to South Kensington. In 1974, the museum was inaugurated as the Museum of Childhood.⁸

All changes which had occurred since its opening in 1872 had taken place without investment in the building structure, and by the start of the 21st century the museum was in need of physical and programmatic attention, having fallen into physical disrepair⁹ and self-critiqued as not 'really engaged with the local community.'¹⁰ A new Director, Diane Lees,¹¹ had described her role, Deputy Director Robert Moyer noted, as being to 'turn around the Museum of Childhood.'¹² In January 2002 the Museum of Childhood commissioned Caruso St John Architects to master-plan a significant renovation of the Museum, a brief which Caruso St John interpreted as charged with creating an 'appropriately impressive presence' for the Museum to 'engender community pride and increase awareness of the Museum.'¹³

⁴ Caruso St John Architects and David Bonnett & Associates, Access Consultants, *Planning Report, Museum of Childhood at Bethnal Green* (Unpublished Report February 2004), p.4.

⁵ http://www.vam.ac.uk/moc/about_us/index.html accessed 3 sept 2010.

⁶ Items such as Food and Animal Products, a loan of eighteenth century French Art from Sir Richard Wallace (comprising items which would later become the Wallace collection), and contributions of gifts the Royal family had received.

<http://www.vam.ac.uk/moc/about_us/historymuseum/index.html> [accessed 23 Sept 2010].

⁷ Ibid.

⁸ Caruso St John, *Planning Report*, p.4.

⁹ The Planning Report highlighted 'declining audiences, run down facilities and unfocussed services.' Caruso St John, *Planning Report*, p.4.

¹⁰ Robert Moyer interview with author, 12 November 2009.

¹¹ Diane Lees was Director from 2000-2008. Robert Moyer interview.

¹² Robert Moyer interview.

¹³ Caruso St John, Phase 2 New Entrance Building and Forecourt (unpublished report) 23 April 2003.

Renovating and developing the Museum of Childhood

'The Museum is home to a permanent collection of international significance', a 2004 Caruso St John Planning Report noted: 'it is ideally placed to deliver a modern, socially inclusive agenda.'¹⁴ Following the completion of the first phase of work refurbishing the interior first floor galleries in March 2003, the second phase of the Masterplan focused on the historically problematic entrance structure, with an aim of improving the physical entrance sequence as well as more appropriately projecting the value of the Museum as a national civic institution. 'The existing entrance is insufficient in area to cope with the large volume of visitors, especially school groups', Caruso St John's report summarised, 'while the toilet facilities make an inappropriate public face to the Museum, effectively blocking any connection between the museum interior and Cambridge Heath Road.'¹⁵ Caruso St John's proposals for the demolition of the 1872 entrance structure included a conservation report prepared by Alan Baxter & Associates, which argued:

The entrance colonnade attached to the west façade is in keeping with the style of the exterior of the main building but has none of its flair, let alone the picturesque qualities of the rejected scheme for a larger colonnade and ancillary buildings. In the inadequacy of the facilities it houses, its failure to give proper emphasis to the main entrance and the weak relationship it creates with the street frontage, the colonnade might be said to perpetuate some of the faults of the Iron Museum in South Kensington.¹⁶

Recommending the demolition of Wild's reduced entrance structure, Caruso St John's proposals were focused on giving the Museum 'a more open and active relationship to its surrounding gardens, as well as forming a more impressive front to the whole ensemble.'¹⁷ A cut stone façade, acknowledging Wild's 'highly decorative'¹⁸ masonry façade on the iron structure beyond, looked to technological innovations to achieve precise, complex patterning, in a risk-averse construction culture which typically prefers standardised methods and materials. From the start, the brief for the Museum anticipated that this project would deviate from standardised production.

¹⁴ Caruso St John, *Planning Report*, p.4.

¹⁵ *Ibid.*, p.6.

¹⁶ Baxter, p.23.

¹⁷ Caruso St John, *Planning Report Revision A* (August 2004), p.15.

¹⁸ *Ibid.*, p.13.

Phase 2 Project Brief

A Phase 2 consultancy brief in Nov 2003 containing a procurement strategy encapsulated the task for an architectural practice at the turn of the twenty-first century, conveying expectations regarding precision, certainty, control and quality which had framed the context for the Iron Museum. 'The Architect sets the standards for specification and quality', the report began, 'and particularly on a project of this nature he should remain involved throughout the construction phase to monitor and retain control at all times.'¹⁹ In stark contrast to the 1856 Iron Museum, 'Quality' was specified in the *Project Brief* as following:

Quality must be to the high standards necessitated by the prestigious nature of the project, in terms of design, material selection and workmanship.²⁰

This definition anticipated expectations of achieving something extraordinary. In 1812, architect George Saunders had conveyed the difficulty of ever achieving precise instructions except in 'very small, plain or rough' works, anticipating the demand for 'control at all times' outlined in the 2003 Phase 2 project brief. Here, the non-standardised nature of the design was emphasised:

As the design of the front extension is fairly unique contractors may at first glance be nervous about aspects that may not be immediately apparent. As with any project it will be essential that any contractor contractually committing to a price is confident that there are no hidden risks.²¹

Anticipating a 'fairly unique' prestigious project of high quality, yet permitting no 'hidden' risks, this statement embodied the concerns which had occupied the

¹⁹ *The Museum of Childhood at Bethnal Green Phase Two – Project Brief Architect / Interior Designer. November 2003. Prepared for Museum of Childhood at Bethnal Green. Prepared by Focus Consultants (UK) Limited.* (Unpublished report, accessed at Museum of Childhood), p.6.

²⁰ *Phase Two - Project Brief*, p.3.

²¹ *Ibid.*, p.5. This briefing was included in a Procurement Strategy section which considered alternative options for Procurement, including Traditional Single Stage, Traditional Two Stage, Design and Build and Management. Setting 'Key objectives' as including Cost, Quality ('must be to the high standards necessitated by the prestigious nature of the project, in terms of design, material selection and workmanship'), Time, Value for Money, and Maintenance of Visitor Experience, the report assessed the options against criteria including: 'Will Architect remain in full control of detailed design?' and 'Will Architect be in a strong position to demand quality workmanship?' as well as 'Can Client changes be incorporated without undue risk of penal cost or contractual claim?' and 'Can design development changes be accommodated at no extra cost?' The report concluded: 'All in all a procurement approach involving a single larger Contractor from the start engaged on a Two Stage or Management Contract basis, could be justified as a means of mitigating certain risks, particularly on high value projects.' *Phase Two - Project Brief*, pp.3-12.

architectural profession and construction industries throughout the 19th century: the uncertainty of deviating from any standard form of construction, the desire for cost certainty in advance of construction, and the avoidance of risk. The brief for the entrance addition to the Bethnal green Museum of Childhood anticipated a 'fairly unique', prestigious, high quality project, in a context of a prevailing contractual culture focused on cost certainty and risk aversion.²² Expectations conveyed by this brief that these parallel aims would be defined, monitored and controlled by the architect throughout the project anticipated the promises of precise instructions. Caruso St John Architects' extraordinarily precise instructions for a 6mm mastic joint on the west façade of the Museum of Childhood are read here as anticipating the limits of precision in architectural communications as a guarantor of quality.

²² The Procurement Strategy cited above highlighted a focus for this 'prestigious' project on themes of quality, workmanship, and architectural control. These emphases were in notable contrast with concerns raised by the architectural profession critiquing PFI procurement contracts (Private Finance Initiative introduced in 1992: see *Treasury Seventeenth Report* <<http://www.publications.parliament.uk/pa/cm201012/cmselect/cmtreasy/1146/114604.htm>> [accessed 31 July 2016]). Multiple reports of PFI's negative impact on design quality were published in this period, including;

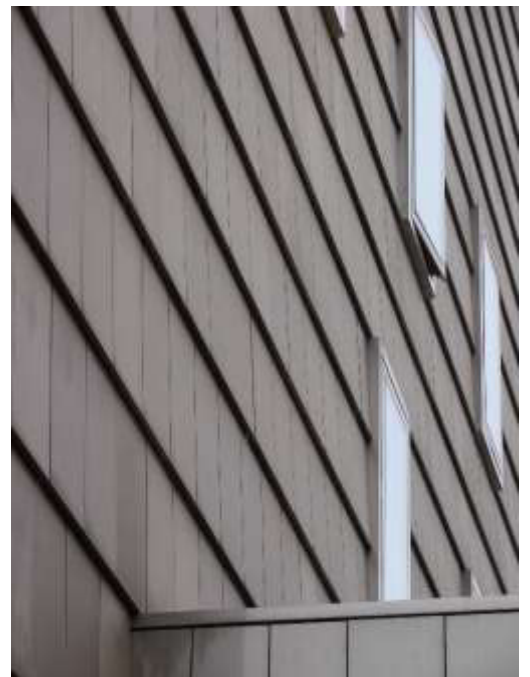
- 'The government needs to look at the whole nature of the build-up time on these projects, the lead-in work and the importance given to design', Ed Dorrel, 'Audit quango hammers PFI design' *The Architects' Journal*, 16 January 2003, p.4;
- 'design was given negligible importance', Astragal, 'PFI reviewed' *The Architects' Journal*, 2 October 2003, p.66;
- 'The increasingly complex and legally fraught business of commissioning, designing and procuring public buildings is often cited as justification for the downgrading, even exclusion, of architecture. Design is presented as an optional extra, a bolt on - nice but not essential. The reverse is true', Simon Allford, 'Even Mies would have trouble making a success out of PFI' *The Architects' Journal*, 18 March 2004; p.22;
- 'Rethinking Construction' answers a government obsession with statistics via a misdirected plethora of new measurements of performance. We are bombarded with supposed successes - jobs finished on time and budget - because we still use historical tools that entrench anachronistic thinking. Measurement remains a straitjacket, focusing on cost, not value; quantity, not quality; and the short term. There is no satisfactory method for measuring the long term. Little is done to explore the allocation of risk; we remain focused on the cost of procurement.' Simon Allford, 'Performance Pedants offer us progress in a straightjacket' *The Architects' Journal*, 29 July 2004, p.16.

An article by Peter Davey in October 2003 strongly denounced PFI, noting 'The British Government has largely taken the line that architectural quality is irrelevant as long as there is appropriate quantity [...] Virtually no products of the PFI system have architectural quality'. Peter Davey, 'Building for Authority', *The Architectural Review*, 216:1280 (1 October 2003), 42-43 (p.43). In this context the discussion of quality at the Museum of Childhood stood not only in contrast to economically led decisions at the Iron Museum in its original and relocated context, but also to a prevailing procurement culture in the UK in 2003.

8. Anticipating precision at the Museum of Childhood.



Fig. 8. 9 - Walsall New Art Gallery, Caruso St
John Architects.



8.3 A resistance to ‘off-the-peg construction’

Caruso St John Architects were formed in 1990 in London by principles Adam Caruso and Peter St John.²³ Stating a practice belief in the ‘emotional and physical qualities of construction’,²⁴ the practice’s writings, speculative projects and constructed projects display a fastidious attention to the materials and methods employed in construction, establishing emotional resonance by evoking relationships between contemporary interpretations of material-based constructions and the contextual history of each specific project.²⁵ In manifesting their statement that the practice resists ‘off the peg construction’,²⁶ each project reinterprets a key material in a subtly unconventional manner, resulting in work which is quietly challenging, appearing simultaneously familiar and new. Over-scaled terracotta tiles clad the New Art Gallery in Walsall [Fig. 8.9]: the unrelenting use of brick at Brick House (2001-2005) evokes Lewerentz²⁷; precast concrete panels become delicate and ethereal at Nottingham Contemporary (2004-2009). Any recalibration of ‘off the peg’ materials and construction systems demands, as St Peter’s had demonstrated, extraordinarily close attention from all involved, a demand which Caruso St John approaches through research, both within office practice and through critical writing.

‘I think that the most significant writing by architects’, Adam Caruso wrote in 2008, ‘has been developed in parallel to their work in practice.’²⁸ The practice adopts a critical stance which argues for cultural continuity, engagement with existing

²³ Adam Caruso, a graduate of McGill University, Canada, had previously worked with architect and educator Florian Beigel and Arup Associates, and Peter St John, a graduate of the Bartlett, University College London and the Architectural Association, had formerly worked with Richard Rogers, Florian Beigel, Dixon Jones and Arup Associates. Both Caruso and St John, in addition to practice, taught at the University of North London (1990-2000) and were visiting professors at the Academy of Architecture in Mendrisio, Switzerland (1999-2001), as well as holding a Professor of Architecture position (Caruso, 2002-2004) and a Visiting Professor Position (St John, 2001-2004) in the Department of Architecture and Civil Engineering at the University of Bath. <http://www.carusostjohn.com/practice/> [accessed 07 February 2011].

²⁴ <http://www.carusostjohn.com/practice/> [accessed 07 February 2011].

²⁵ By the time the Museum of Childhood opened in 2006, the practice’s completed works included a private residence on the Isle of Wight (1992), a House in Lincolnshire (1994), North London Mews House (1998 addition), the Walsall New Art Gallery in Walsall (1995-2000), for which the practice received a 2000 RIBA Award and a Stirling prize shortlist, and Brick House (2001-2005), which received a Stirling prize nomination.

²⁶ <http://www.carusostjohn.com/practice/> [accessed 07 February 2011].

²⁷ In 1997, Adam Caruso co-authored Claes Caldenby, Adam Caruso, and Sven Ivar Lind, *Sigurd Lewerentz: Two Churches* (Stockholm: Arkitektur Förlag AB, 1997).

²⁸ Caruso describes the practice’s own early writing as ‘arduously composed, one line at a time, by Peter [St John] and I sitting with one piece of paper and two pens, discussing and arguing every word.’ The writings which emerged are described by Caruso as ‘central to the development of our work.’ Adam Caruso, *The Feeling of Things* (Barcelona: Ediciones Poligrafa, 2008) p.7.

situations, and the ethical, social, artistic and emotional impact of architectural work.²⁹ Prior to the design and construction of the Museum of Childhood, published writings had set out a stance which rejected perpetual novelty as anti-critical, and which critiqued a materialist, managerial definition of architectural practice, while advocating engagement with economic, social and technological forces.³⁰ Summarizing the momentous changes of the 19th century in his essay 'Traditions', Caruso highlighted architects such as Sullivan, Berlage and Wagner for their engagement with the political and economic powers of the day, as well as sustaining a cultural role for architecture. Advocating political, economic, and technological engagement, Caruso argued for complexity and ambiguity in making work of a permanent and lasting quality aimed at invoking emotional resonance.³¹ This critical stance is sought through a deep engagement with, rather than a retreat from, the processes of architectural production.³² The aim of a contextualized and resonant architecture deploys contemporary technologies and materials to emotionally engage with historic and existing conditions.³³

The pursuit of an extraordinary precision at Lewerentz's St Peter's was discussed in Chapter 3 as emerging from the extraordinary control in advance of and during construction demanded by a deviation from a standard. This precise - obsessive -

²⁹ Caruso St John's writings and built work argue for cultural, historical and technical engagement as a 'more radical formal strategy.' See Caruso, 'The Tyranny of the New' in *The Feeling of Things*, p.35.

³⁰ Including 'The Tyranny of the New' (1998), 'The Feeling of Things' (1999), and 'Traditions' (2005), all now re-published in Caruso, *The Feeling of Things*.

³¹ Art practice has long recognized the emotional capacity held within the world of things, and has adopted a suitably expanded definition of the environment. Architecture, which profoundly and irrevocably engages the world around us, has not. It continues to be defined in narrow, materialist terms.' Caruso, 'Energy and Matter' in *The Feeling of Things*, p.15.

³² Caruso specifically references Ruskin's stance: 'While critics like Ruskin may have thought that only the reversal of this economic expansion could save civilized society, architects like Sullivan, Berlage and Wagner invented architectures that enabled them to engage with these new forces as well as sustain a cultural role for architecture.' Caruso, 'Traditions' in *The Feeling of Things*, p.23. In 'Ontology', Caruso wrote: 'Alongside attempts to make architecture that closely tracks the contemporary neo-liberal mainstream are more deliberate efforts as a slower and more careful production. An architecture that takes advantage of the unprecedented separation of construction from technical limitations and rhetorical discourses. This difficult work attempts new kinds of material spatial conditions that take full advantage of the idea of construction as an aesthetic judgement.' Caruso, 'Towards an Ontology of Construction' in *The Feeling of Things*, p.31.

³³ A description of Lewerentz's Church of St Peters by Adam Caruso encapsulated this stance: 'I have been to a very small number of buildings that are almost perfect. They are characterized by a mastery of the act of building that has nothing to do with displays of virtuosity and everything to do with an all pervasive, existential character that fills their every pore. This character is usually indistinguishable from that of their architect, not in the conventional manner of the artist-genius and the work of art, but as a result of a completely internalized, synthetic way of working where issues of construction and thematic intent become one.' Caruso, 'Sigurd Lewerentz and a material basis for form', p.53.

control of the processes of construction is evidenced within Caruso St John's approach to the processes of architectural practice, which operate according to extraordinarily strict principles of precise control in defining and documenting each project. In interview, Peter St John defined a good architect as one who makes less compromises³⁴ in discussing the question of how to make any building of quality. 'It's not easy', St John acknowledged:

[...] there's a number of things. One is to really care and to put an enormous amount of effort into your research and also the detail with which you illustrate your expectations. So the quality of the drawings is absolutely vital, if you want to get what you expect, and that's a very complicated negotiation between invention, research, and working with the consultants to know what's realistic and what can be built, and what can be afforded, and it's always about money.³⁵

The drawings for the Museum of Childhood, which St John describes as 'very detailed [...] there's a great precision in the nature of the drawings, which I think is unusual, you won't get that very often',³⁶ are notable in that they are precise from the earliest phases of project, and spare in quantity and content. Precision is evidenced as a strictly controlled editing process: every line, every dimension, every word matters and is specific in intent. From initial concept sketches, proposals moved immediately to detailed Photoshop facades using scans of material stone samples, progressing to concise orthographic CAD construction drawings. The drawings are a philosophy within a cultural context, suggested St John, acknowledging that any ambiguity in drawings may be exploited, a point echoing the 1812 Select Committee debates. Ultimately, St John concluded, it is about care:

It matters hugely, because if you don't care about those things, then rapidly you'll lose all the will to make the effort to make things beautiful.³⁷

The role of the act of caring was additionally highlighted by David Kohn as project architect for the Museum of Childhood, who stated he takes 'a huge amount of pleasure out of a precise building. You recognize care, thought, energy, enthusiasm out of things well made. They give pleasure.'³⁸

³⁴ St John interview with author, 11 May 2009.

³⁵ Ibid.

³⁶ Ibid.

³⁷ Ibid.

³⁸ David Kohn interview with author, 1 May 2009.

Precision, here, was referenced as embodying care, of things well-made, a definition of quality quite different from British Standards' definition of quality as 'fit for purpose'. In intrinsically linking the pursuit of quality with the effort and level of detail of architectural instructions, Caruso St John strictly adheres to recommendations which have shaped professional architectural practice since the early nineteenth century: but precise instructions is, in the practice's built and written work, fundamentally supported by a demand for *care*. This critical stance engages simultaneously with the pursuit of precision through exactitude – the quantitative, the instrumental and the rational - as well as the allowance of the ambiguous through the emotive, the intuitive and the qualitative.

Acceptance of and participation in the political and economic context of contemporary architectural practice was, at the Museum of Childhood, manifested by a practice ethos of creating extraordinarily precise instructions to maintain control and avoid ambiguity, in accordance with the recommendations which had framed architectural practice since the 19th century. This ethos, however, is imbued with the pursuit of the ambiguity of emotion, care and pleasure. Returning to the core problem of architectural communications - of any communication which attempts to convey a rich and complex idea - 'the poetical content of reality' as the 'ultimate frame of reference for any truly meaningful architecture',³⁹ as Pérez-Gómez had highlighted - the means by which Caruso St John sought to control and convey a rich and complex idea as it progressed from conceptual ideal to constructed reality can be explored through the communications which accompanied it.

³⁹ Pérez-Gómez, *Crisis*, p.6.

8. Anticipating precision at the Museum of Childhood.



Fig. 8.10 - Pages 3, 9 and 12 from Caruso St John Architects, *Planning Report C*, 2004, showing an early proposal for stainless-steel wrapped timber fins at the entrance addition to the Museum of Childhood.

8. Anticipating precision at the Museum of Childhood.

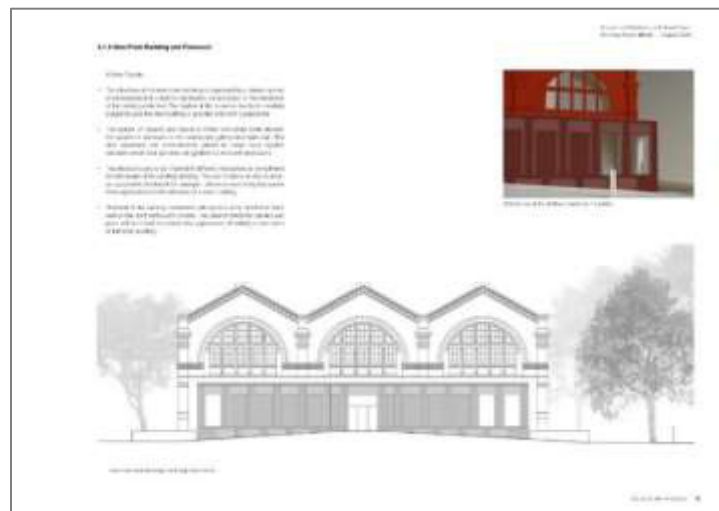


Fig. 8.11 - Pages 9, 12 and 13 from Caruso St John Architects, *Planning Report Revision A*, August 2004, showing revised proposals for a CNC cut stone façade, Museum of Childhood.

8. Anticipating precision at the Museum of Childhood.

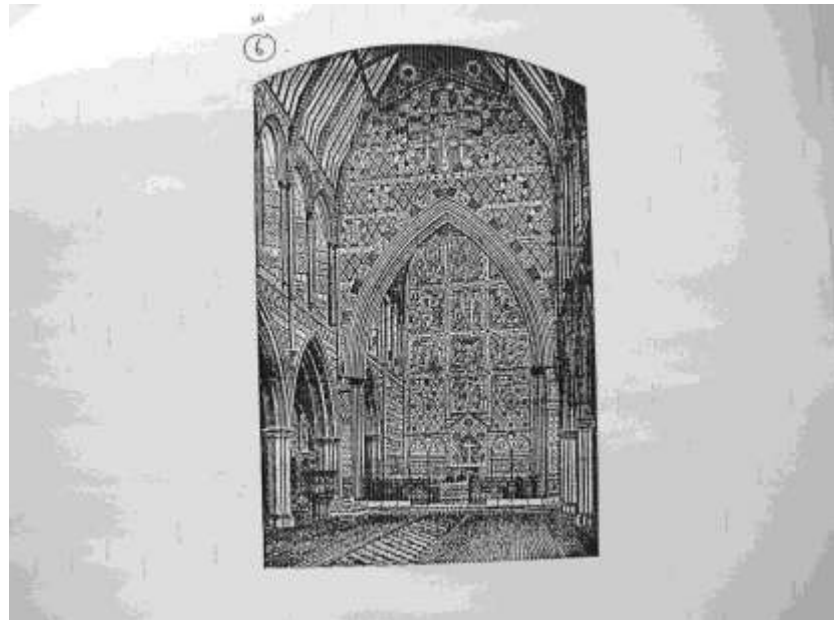


Fig. 8.12 - Excerpts from Caruso St John 'Sketches' folder, 176 / Museum of Childhood files, Caruso St John Architects.



Fig. 8.13 - Basilica of Santa Maria Novella, Florence: west facade seen from the southwest / Alberti, Leon Battista (1404-1472), Ristoro da Campri, Fra (d. 1284), Sisto Fiorentino, Fra (d. 1290), Talenti, Jacopo (d. 1362) Photographer: Ralph Deakin (photographer). RIBA Collections: RIBA3375-54.

8.4 'A very fine joint, like marquetry'

Caruso St John's first proposal for the entrance addition to the Museum of Childhood, developed between September 2003 and February 2004, comprised a lozenge shaped addition of thin, closely spaced, engineered timber posts clad externally in satin stainless steel [Fig. 8.10] This fine screen, Caruso St John wrote, would have a 'quality of lightness and serial repetition that has been chosen to complement the delicate and rational iron structure of the main building.'⁴⁰

Highlighted that '[r]ecent innovations in the manufacture of laminated timber allow the timber structure to be extremely thin and delicate, Caruso St John concluded that '[w]hile this technology is advanced on the Continent, this structure will be an innovative example in the UK.'⁴¹ This intent - the application of a technically innovative material solution - would remain central throughout the the project.

Despite the ambivalence surrounding its nineteenth-century reception, by the early twenty first century proposing any revision to the Museum was controversial in itself. Caruso St John's February 2004 planning report was accompanied by a lengthy Conservation Plan researched and prepared by Alan Baxter and Associates, detailing the history of the Iron Museum, the Bethnal Green Museum and architect J.W. Wild's biography. The report concluded that the existing entrance colonnade was not an element of high special interest, a status assigned to many other aspects of the main building. Following numerous consultations,⁴² English Heritage and the Victorian Society expressed concerns over the 'lozenge' scheme's relationship to Wild's brick façade, requesting that Caruso St John develop an alternative.⁴³ A revised planning report submitted in August 2004 [Fig. 8.11] focused on themes of decorative facades, proposing a rectangular volume tautly wrapped in a patterned stone skin:

The elevation of the new front building is organised by a simple system of representational columns and beams, as employed in the elevations of the existing main hall [...] The elevations are to be

⁴⁰ Caruso St John, *Planning Report*, p.12.

⁴¹ *Ibid.*, p.13.

⁴² Consultations included: The Heritage Lottery Fund Assessment Panel (May 2003), CABE (July 2003), English Heritage (June and November 2003), Tower Hamlets Conservation Department (2002 and June 2003), the Victorian Society (2004), the Bethnal Green campaign and local residents (2004), Tower Hamlets Access Office (January 2004), and Building Control and LFEPA (December 2003). Caruso St John, *Planning Report*, p.20.

⁴³ 'Revisions to the original report of May 2004 concern the new front building only. A redesign of the front building facade has been made in close consultation with English Heritage and the Victorian Society in light of concerns raised by both parties over the original scheme.' Caruso St John, *Planning Report Revision A*, p.3.

finished in different red stones to compliment the brickwork of the existing building. The use of stone on the facades, as opposed to brickwork for example, allows a more richly decorative finish appropriate to the entrance of a civic building.⁴⁴

Emphasising continuity with the existing Museum through the rhythm, materiality and colour of the stone patterning, Caruso St John's report noted, 'The original Wilde [sic] proposal for the front colonnade was highly decorative in the fashion of the day':

We propose that the façades of the new front building are also decorated to compliment the mosaic friezes on the north and south elevations of the main hall provide [sic] further embellishment to the otherwise reduced brickwork of the main hall. The facades are to be clad in different coloured stone tiles with very fine joints, like marquetry. The smooth flat finish will be given depth through the use of repetitive illusionistic patterns in the infill panels.⁴⁵

Very fine joints, 'like marquetry' were highlighted here as a central architectural intent. Caruso St John's August 2004 planning report cited Illusionistic decoration at the sixteenth century Colleoni Chapel in Bergamo, ceramic floral tiles on Auguste Perret's 25 Rue bis Franklin, Caruso St John's own proposals for 'a façade made like marquetry' in a competition entry for the National Museum of Swiss Culture, Zurich, and numerous untitled references in a 'Sketches' folder [Fig 8.12]. Project architect David Kohn evoked eleventh and twelfth century *opus sectile* Cosmati pavements;⁴⁶ Peter St John described the origins of the patterned façade as emerging from 'images that I liked of early Renaissance churches in Venice and Florence, in particular the façade in the front of Santa Maria Novella by Alberti' [Fig. 8.13].⁴⁷ St John described the decision to work with a decorated façade as:

working with the spirit of the Victorian building [...] with the flow rather than against the flow, and the idea that the building might in some way play the role of the marble façade of the Alberti church, that it was a decorated front, which clearly was the frontage to a shed behind.⁴⁸

The flatness of Alberti facades was highlighted by St John. In early Renaissance examples, the joints, St John explained:

⁴⁴ Ibid., p.12.

⁴⁵ Ibid., p.12.

⁴⁶ Kohn interview with author, 1 May 2009.

⁴⁷ Peter St John interview with author, 11 May 2009, referencing Leon Battista Alberti's Santa Maria Novella in Florence (1456-70).

⁴⁸ Ibid.

are very fine; that's because they are load bearing stone, and there is a sense of the overall beauty of the individual stones, which you don't get in a contemporary stone building where the joints are larger, they're not so obviously load-bearing.'⁴⁹

In a contemporary non-load bearing stone façade, St John continued, 'there's not this overall flatness which you get in the Alberti elevations.'⁵⁰ This flatness set ambitions for the Museum of Childhood; 'that it shouldn't be something heavy, where the individual stones are emphasized, which would be the case if you had big joints. It would be something shimmering and more decorative.'⁵¹ This anticipated a high level of dimensional precision in the joint specifications, with implications for economic viability and control during construction. In pursuit of both, Caruso St John looked to contemporary technologies: prefabricated panels of ten millimetre thick CNC cut stone tiles bonded to a fibreglass and aluminium honeycomb 'Fibrestone' substrate to deliver economic yet precise construction.

⁴⁹ Ibid. In *The Stones of Venice*, Ruskin discusses 'incrustation' at length, as 'the incrustation of brick with more precious materials' (p.93) 'the Cathedral of Florence,[Santa Maria del Fiore, 1367-1436] built of brick and coated with marble, the marble facing is so firmly and exquisitely set, that the building, though in reality incrustated, assumes the attributes of solidity.' (p.94) Ruskin, 'The Stones of Venice: Vol IV St Marks' in Cook and Wedderburn.

⁵⁰ Ibid.

⁵¹ Ibid.

8. Anticipating precision at the Museum of Childhood.

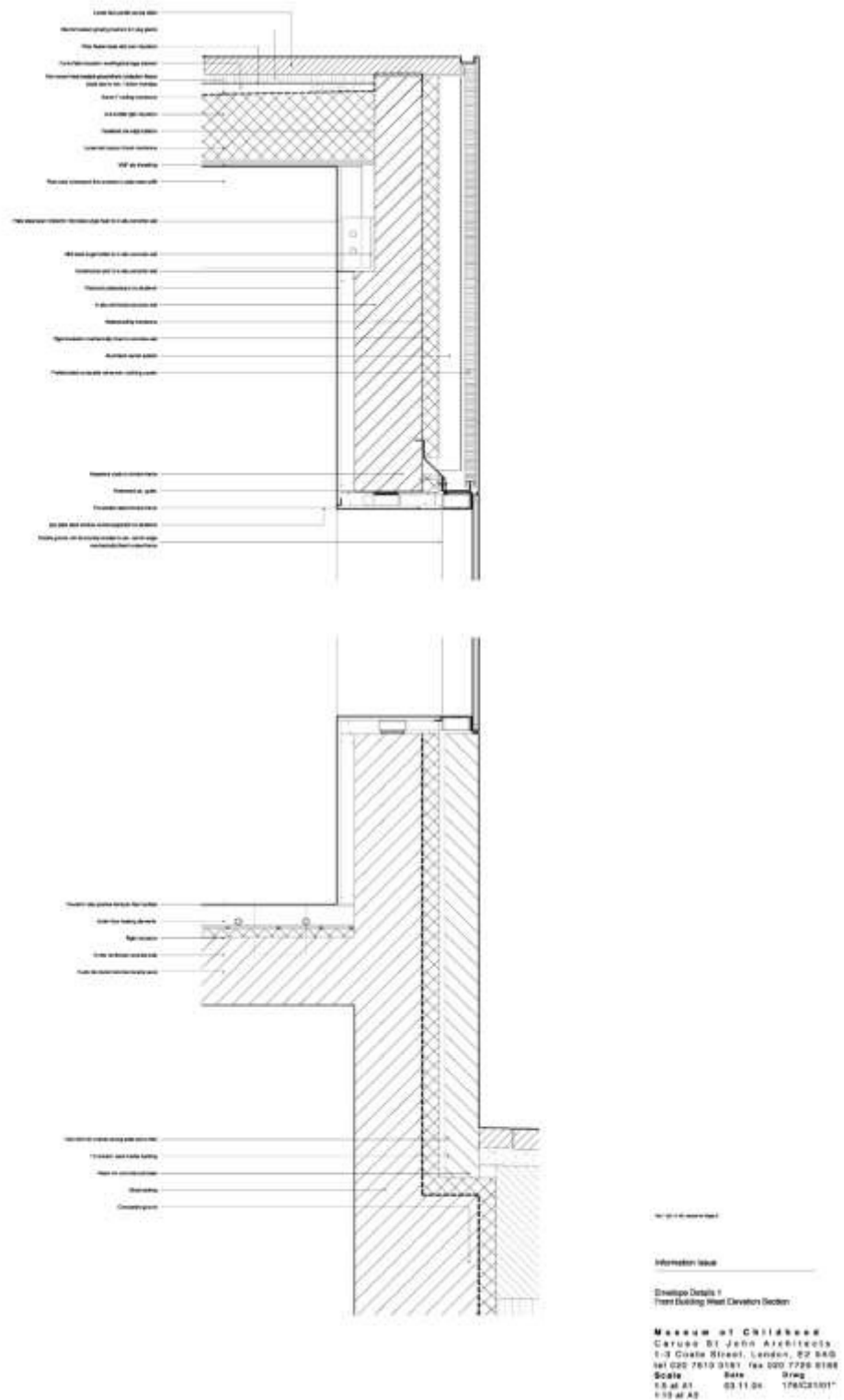


Fig. 8.14 - Drawing 176/C21/01 Envelope Details 1 / Front Building West Elevation Section. Information Issue 03.11.04. Caruso St John Architects.

8. Anticipating precision at the Museum of Childhood.

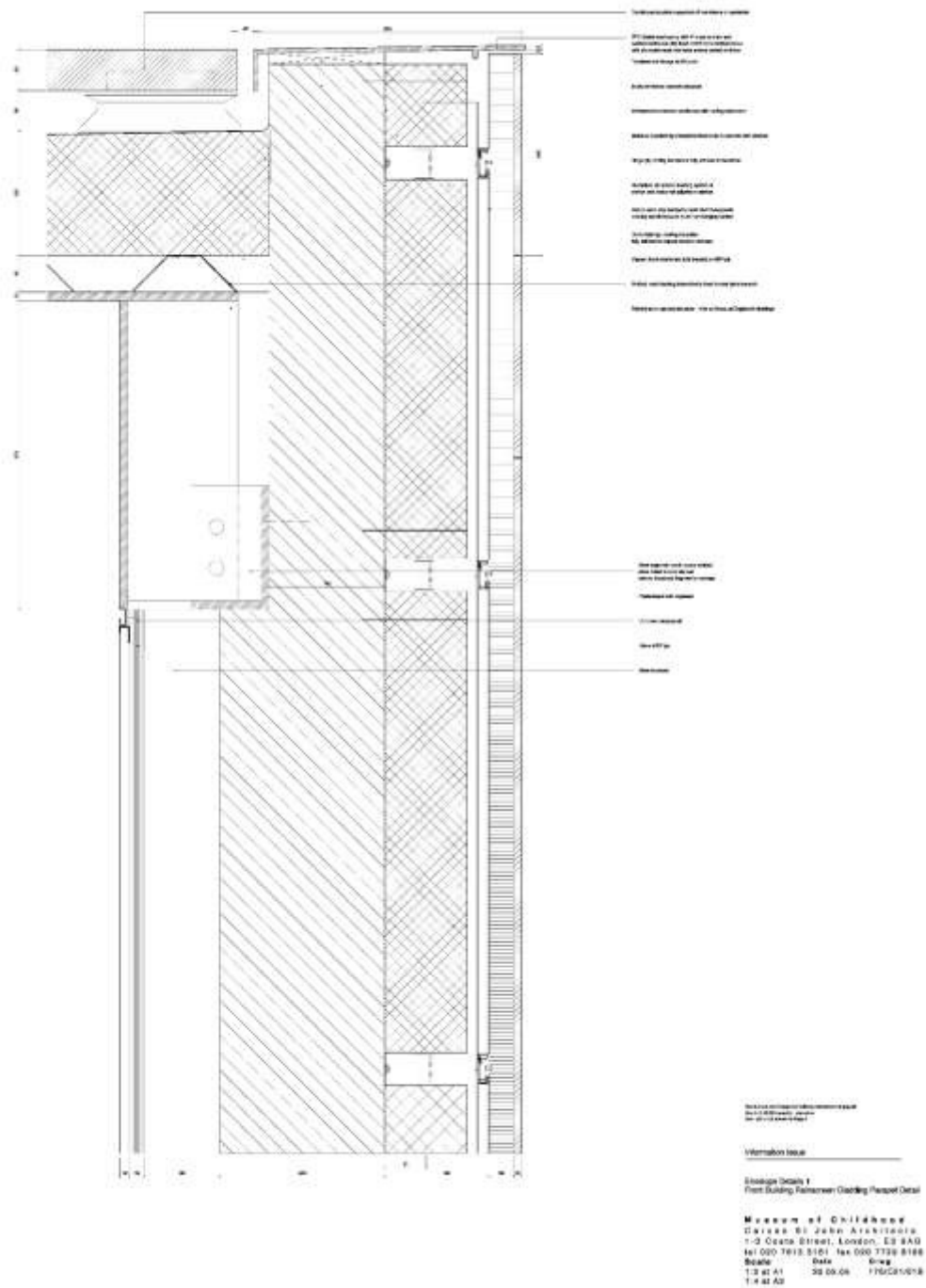


Fig. 8.15 - 176/C21/01B Rev B information issue 20.05.05 / Envelope Details 1 Front Building Rainscreen Cladding Parapet Detail / Museum of Childhood. Caruso St John Architects.



Fig. 8.16 - 'Fibrestone' sample panel in Caruso St John Architects' office on Coates Street. Photographed May 2009.

8. Anticipating precision at the Museum of Childhood.

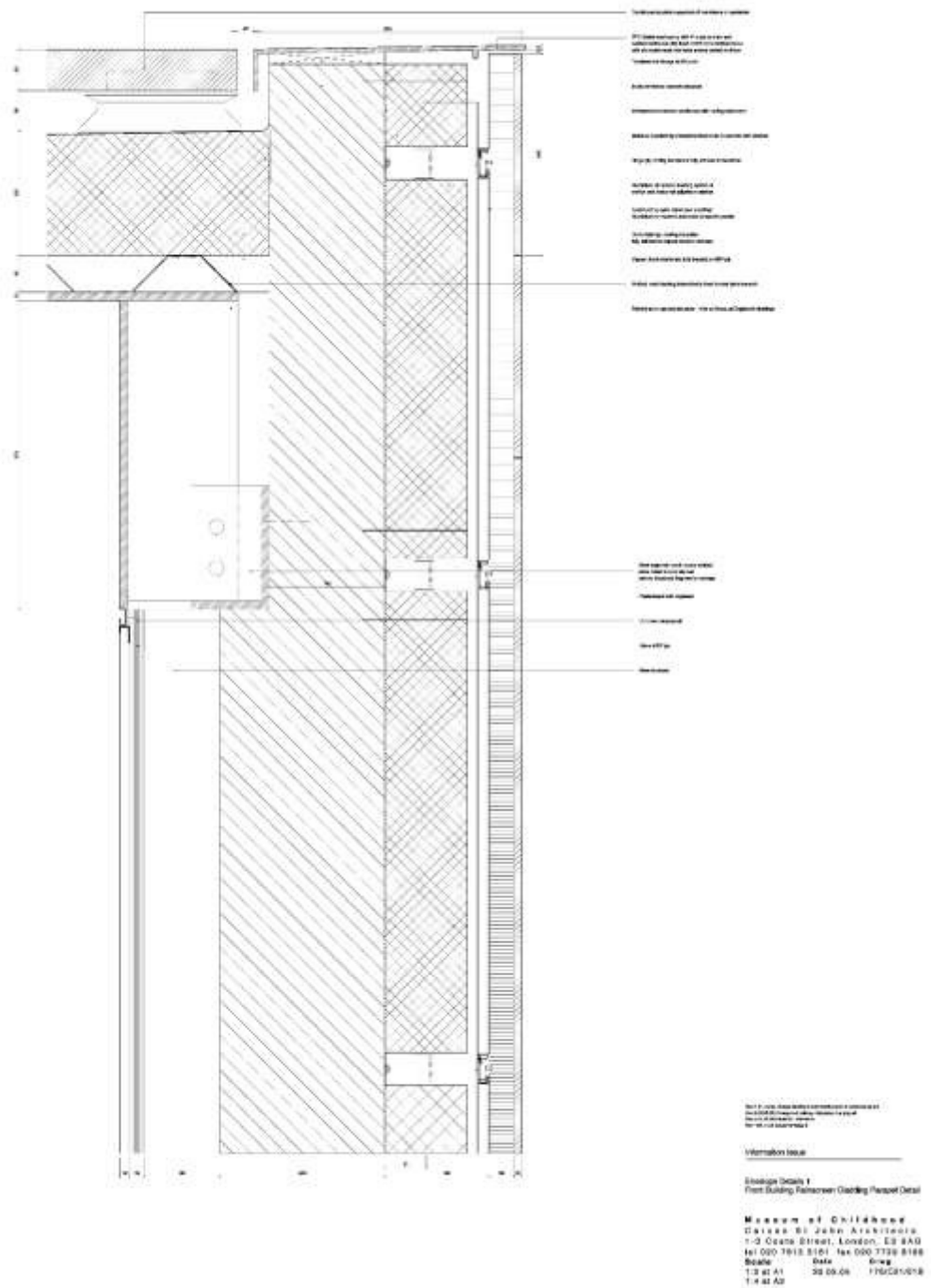


Fig. 8.17 -176/C21/01B Rev C information issue 20.05.05 / Envelope Details 1 Front Building Rainscreen Cladding Parapet Detail / Museum of Childhood. Caruso St John Architects.

8. Anticipating precision at the Museum of Childhood.

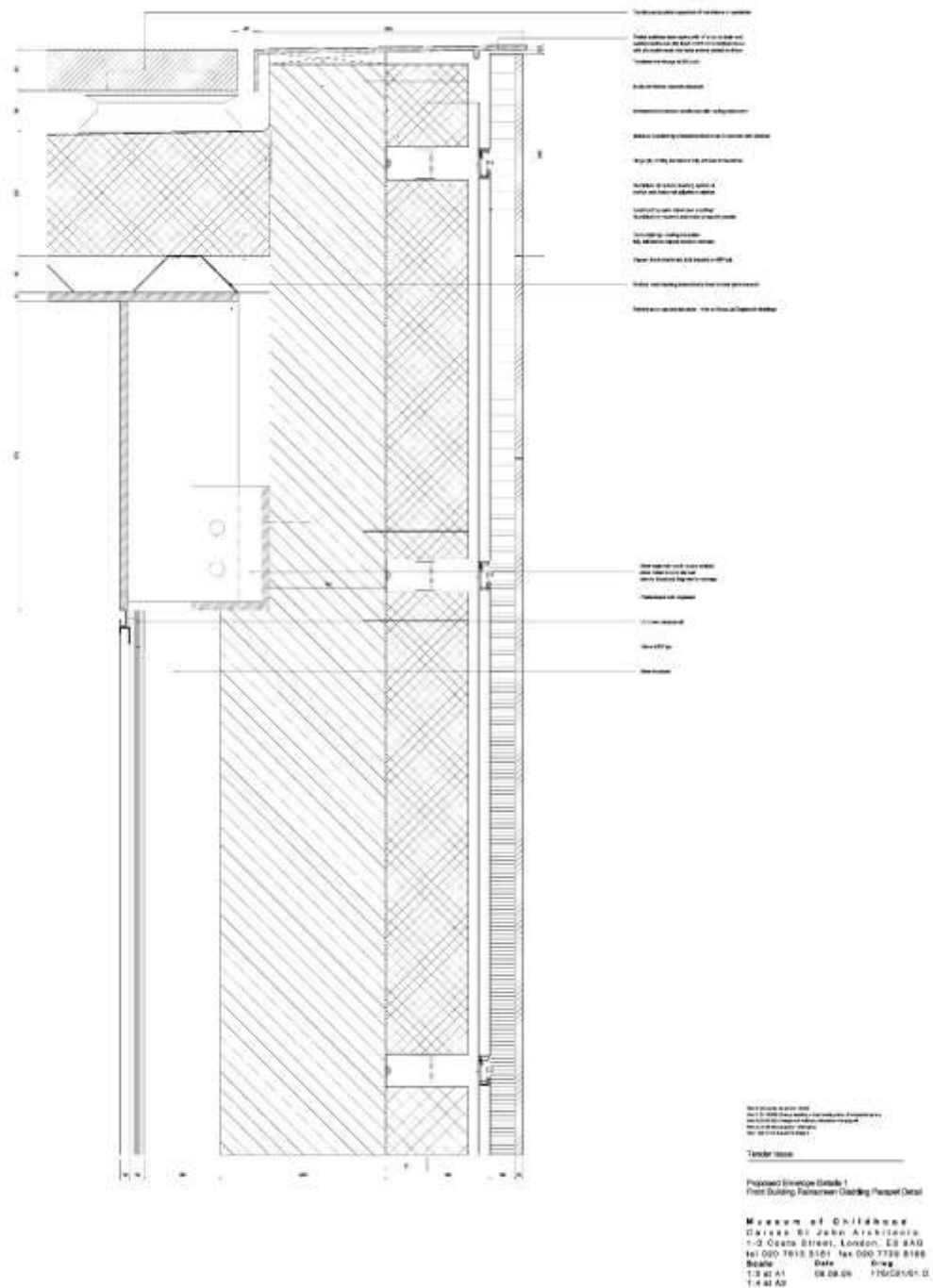


Fig. 8.18 - 176/C21/01E - Preliminary Construction Issue Phase 2 proposed Front Building. Parapet Detail Rev E (06.01.06) Issued for prelim construction, [...] depth of façade build up increased' / Museum of Childhood. Caruso St John Architects.

8.5 Precisely specifying a very fine joint

Caruso St John Architects' Drawing 176/C21/01 issued for information on 3 November 2004 [Fig. 8.14] specified 'prefabricated composite rainscreen cladding panels' to sit over an aluminium carrier system on an *in-situ* reinforced concrete wall. Assembled under factory conditions, this method allowed the specification of joints as fine as three millimetres. Revision B to the drawing [Fig. 8.15] on 20 May 2005 further specified 'honed stone tiles bonded to aluminium honeycomb packing panels hung on an aluminium hanging system', dimensioned as 10mm tiles on 30mm honeycomb, a system which was tested through a full-size mock-up sample. [Fig. 8.16], and which remained the proposed means of construction until August 2005, when discussions of an alternate construction system appeared on the drawing as 'Revision C (01.08.05) Change cladding to load bearing stone & composite panels.' [Fig. 8.17] A revised annotation on this drawing allowed for either 'Load bearing stone rainscreen cladding / Aluminium honeycomb and stone composite panels', still dimensioned in width as 10mm tiles on a 30mm honeycomb substrate. This annotation remained for a tender issue of the drawings as Revision D (08.08.05). The alternate of using a load-bearing system, rather than the prefabricated honeycomb panels had been discussed in an email from Kohn to the façade engineers,⁵² in which Kohn noted that stonemasons on site had indicated a preference for building 'the whole façade of load-bearing stonework rather than using the Fibrestone panels for reasons of long term performance', as well as cost-saving potential.⁵³

It had become clear that, although joints within individually prefabricated panels could be constructed to tight tolerances, movement joints between individually

⁵² Dana Cuff noted in *The Story of Practice* that 'the debate continues over the issues of specialization and generalist training', suggesting that the institutional and ideological response of the architectural profession has largely been to train architects as generalists. Cuff, p.258. Writing specifically of the need for Façade Engineers, a 2006 article in *The Architects' Journal* noted that 'the architect at the top of the design process, as the accepted primary specifier, may not have enough specialist technical knowledge or time to deal with the first problem; and - no single party in the fragmented supply chain has the breadth of design responsibility to control or manage the reconciliation of the conflicting design and performance issues, though one or other may be handed this responsibility. As a result a specification may be issued with a number of performance requirements, each perfectly reasonable in its own right, but impossible to satisfy in a single solution.' Peter Thompson, 'A Specialist Façade Engineer can help resolve Design Issues', *The Architects' Journal*, 5 October 2006, pp.41-43. These issues - the ideological response of the architectural profession as a generalist, the expertise of the specialist, and the limits across the design team in possessing specialized technical knowledge of disparate components - will be explored in detail in Ch.10, with reference to writings by Koolhaas and Leatherbarrow.

⁵³ David Kohn, *Re: Museum of Childhood*, Email, 18 October 2005.

prefabricated panels would be required to be substantial. The honeycomb solution, Peter St John noted:

would have required substantial joints, which is why it was rejected. We went for the low-tech solution, which was by far the better solution, it was much more flexible. There wasn't supposed to be any cutting on site, and I don't know whether there was much at all, but if there had to be it could have been done, but with the honeycomb thing there was no flexibility at all.⁵⁴

This acknowledgment that there would be a requirement for on-site flexibility, despite the presence of precise drawings and specifications, highlighted the condition of tolerance, and the ability to adapt to on-site conditions to achieve the design intent of a smooth surface with precise fine joints, like marquetry.

With load-bearing construction offering better long term performance, cost savings, and a closer adherence to the architectural intent, Preliminary Construction drawings, issued as Rev E on 6 January 2006, confirmed the revision of the prefabricated stone panel to a 'loadbearing stone cladding', dimensioned as 50mm [Fig. 8.18]. Construction of these 'very fine joints, like marquetry' would revert from the factory tolerances promised by prefabrication, to load-bearing cut stones individually hand-laid *in-situ*. The precision of each joint in this decorative façade would depend upon those physically constructing the wall, in a process which now focused intensely on the specification of the joints. As demolition and construction began, Caruso St John Architects sought to precisely convey their high expectations for this façade.⁵⁵

The joint, the most vulnerable aspect of construction as Vastert,⁵⁶ and Shonfield⁵⁷ had observed, would now depend upon the care of each individual stonemason

⁵⁴ St John interview with author, 11 May 2009.

⁵⁵ Caruso St John site photographs show demolition of Wild's colonnade as complete by 16 Feb 2006 [Image filed in Caruso St John as 176_sitephoto_160206_01].

⁵⁶ 'The weak spots in the performance of buildings are not so much the building materials, but rather the connections between them.' Vastert, p. 99-104 (p.99).

⁵⁷ Shonfield wrote of tolerance and intolerance: 'The very idea that it is possible to establish a *measurable*, quantifiable dimension for tolerances seems erroneous. The concept of tolerance is a central tenant of liberalism: hence the statement 'I disagree with what you say, but I defend to the death your right to say it.' Within such a philosophy there can be no exceptions. It's no good saying, 'I can't endure you, as I've just spent 369 days putting up with another 369 like you' - that is *intolerance* - despite the other 369. The *AJ* article claims that its survey demonstrates that only one in 370 joints will differ from the specified design width by more than the 'maximum tolerance'. But we know that the installation of just one panel outside the tolerance allowed will cause a leak: the mastic will tear, a hole will appear and water will get in. This leak will affect the whole building. It doesn't matter that it is only one panel out of 370: in matters of tolerance, statistics are irrelevant, for tolerance must be

laying each stone by hand. A nine-month period of discussions between Caruso St John, the façade engineers, the contractors and the stonemasons began in which emails, faxes, meeting minutes, and records of phone conversations confirmed, emphasised and debated the precise instructions conveyed by construction drawings and specifications.

In pursuing the architectural intent of a smooth illusionistic façade with 'fine joints, like marquetry', the adaptation of the original means - a prefabricated panel which promised the certainty of points as fine as 4mm - to an *in-situ*, hand built construction which would now be dependent on the care and skill of each builder on site. Central to these discussions would be the proposal by Caruso St John to deviate from standard practice for the placement and size of a mastic movement joint. Caruso St John's desire to eliminate or minimise the potential interruption of movement joints threatened to deviate from British Standards guidelines.

'What would prompt deviation from a well-travelled route?' David Leatherbarrow had questioned in *Uncommon Ground*. 'Where does one begin when acceptable solutions are everywhere around?'⁵⁸ The difficulties contemporary practices face when deviating in any way 'from a well-travelled route', of breaking with 'the canon of familiar products'⁵⁹ are now followed through the documents produced to control a 6mm joint at the Museum of Childhood as an architectural intent proceeded to construction.

able to accommodate even the most extreme circumstances.' Shonfield, p.37. Shonfield is citing an AJ Technical Sheet 'Joints and Jointing' in *The Architects Journal* (23 April 1969), 1125-8. In this, she notes, the *AJ* states that 'there is no such thing as a traditional, modern or industrialized building, only a difference of the constituent parts, with different scales; and jointing techniques.' Thus all previous disputes on the history of styles are dismissed by paragraph 1.02 of a joint-information package. In the context of construction, science's role is to render everything measurable, to attach a number to it, and to make sure everything keeps to its assigned class.' Shonfield, p.37.

⁵⁸ Leatherbarrow. p.130

⁵⁹ *Ibid.*, p.130.

8. Anticipating precision at the Museum of Childhood.



Fig. 8.19 - Demolition of Wild's colonnade complete. 176_sitephoto_090206_03. Caruso St John Architects.



Fig. 8.20 - Façade panel sample constructed on site. 176_120906_07. Caruso St John Architects

8. Anticipating precision at the Museum of Childhood.

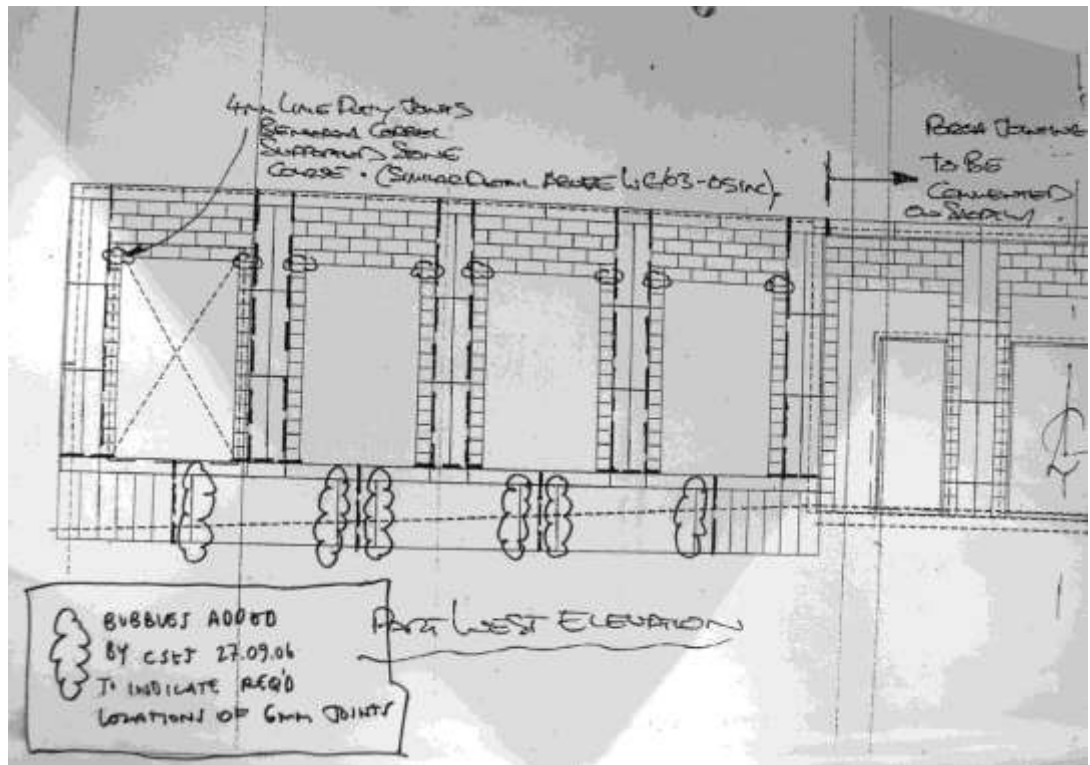


Fig. 8.21 - Marked up shop drawing highlighting locations of 6mm movement joints. Fax from David Kohn, Caruso St John Architects, 27 September 2006.



Fig. 8.22 - Construction of stone cladding underway. 176_120906_03. Caruso St John Architects..

8.6 The construction of a very fine joint

The specification of mastic mortar joints which supported an architectural intent of a smooth, illusionistic façade with ‘very fine joints, like marquetry’ challenged industry expectations of standardized materials and methods. The deviation from a standard - first in a proposal to eliminate movement joints, and subsequently in a specification which required more movement joints than were required by warranty, demanded extraordinary attention and care from all involved. A prefabricated system may have promised certainty, but had not guaranteed alignment with an architectural intent, which would now be sought through a far more uncertain process of handcraft. The letters, faxes and emails which accompanied the design, specification and construction of a 6mm mastic joint are now read as narrating the means by which precise control was sought even as constructed deviations were anticipated.

No vertical movement joints

‘We would like to work towards there being no vertical movement joints on the west façade’, project architect David Kohn emailed the contractors on 20 March 2006, with mark-ups of Stone package drawings which had been issued on 3 March. ‘I understand [...] that this should be possible’, Kohn continued, if [the contractors and façade engineers] co-ordinate over the movement expected in the concrete shell.’⁶⁰ Responding that the inclusion of movement joints was related to thermal expansion as well as structural movement, the contractors noted that they had ‘included movement joints in line with British Standards guidelines, therefore should Caruso St John wish to remove movement joints from the design, we would require an instruction covering this request.’⁶¹ Attached to the correspondence was an extract from British Standards BS 8298: 1994,⁶² which stated:

The units and the structure to which they are fixed are both liable to dimensional changes which are most likely to be differential. These

⁶⁰ David Kohn, *Re: Museum of Childhood: Façade Package*, Fax, 20 March 2006.

⁶¹ L.D. O’Connor, *Re: Museum of Childhood – External Stone Cladding*, Letter, 27 March 2006.

⁶² British Standards states that ‘The width of the movement joint will depend on a number of factors: the distance between the movement joints, the expected amount of movement and the maximum strain that can be accommodated by the sealant. Movement will have two main components, thermal and moisture, and the magnitude of the movement can be estimated by the method outlined in 3.13. [...] The recommended allowance for joint width should not be less than 10mm per 6 metre length of cladding, a specification which could be practically accommodated by one movement joint per pier. BS 8298: *Code of practice for design and installation of natural stone cladding and lining* (1994) Section 3.11.4.3 *Movement joints*, pp.26-27.

should be accommodated by the provision of movement joints so that the cladding is not disrupted.⁶³

'Disrupted' references the threat of a physical anomaly: that the stone cladding may crack if a movement joint is not physically carried through from substructure. For Caruso St John's architectural intent, disrupted held a quite different meaning: the threat that the presence of a vertical movement joint would disrupt the architectural intent of a smooth, uninterrupted wall.⁶⁴ This ambiguity - the double meaning of this phrase - would set in place a prolonged period of intense discussion and close attention from all involved to negotiate a deviation from a 'standard' movement joint.

An architectural intent of a smooth façade of fine joints like marquetry deviating from standardised joint dimensions in specifying mastic movement joints as fine as 6mm⁶⁵ raised the uncertainty and risk of stepping outside standardised processes, and demanded high levels of workmanship. As demolition progressed on site [Fig. 8.19] Caruso St John's expectations of precise adherence to their concise instructions were emphasised by an email from Kohn on 5 May 2006. Noting a discrepancy of 35mm in a concrete pour, Kohn emphasised that '[t]he dimensional precision and finish of these areas is of critical importance to the building's appearance and we will expect a very high level of workmanship.'⁶⁶ Precision in the drawings and specifications was, this correspondence highlighted, to be strictly adhered to in construction, a point further emphasised by Caruso St John's response to a stone façade sample constructed on site in June 2006. [Fig. 8.20] 'Further to our inspection of the stone façade sample earlier today', Kohn faxed on 22 August 2006:

We noted that:

- The joints between the stones are all 5mm. The joints should be 4mm and 6mm at movement joints. This is critical given the number of joints there are in the façade.

⁶³ BS 8298: 1994, Section 3.11.4.3 *Movement joints*, p.26.

⁶⁴ The question of 'removing joints from facades' remained on the agenda in an email from Kohn on 2 April 2006 and in a procurement meeting on 4 April 2006.

⁶⁵ 'Well on the mastic joints you'd expect 10 mil. On the stone side of it, I mean they're, what are the rubroids, they're 4 mil? You'd probably have wanted 6 mil, not majorly different, but different from what the architect's concerned.' Grant Turner (Stone Restoration Services) interview with author, 12 February 2010.

⁶⁶ David Kohn, 176 / *Museum of Childhood: Concrete works*. Fax, 9 May 2006.

[...] we therefore ask that you erect a new sample that can demonstrate the workmanship and finish required⁶⁷

Expectations that the constructed façade would align exactly with the dimensions specified in Caruso St John's specifications were again explicitly reinforced by Kohn on a marked-up shop drawing on 27 September 2006 [Fig. 8.21] in response to a fax from the stone supplier:

[..] it is imperative that the 6mm mastic joints are located on the outside edges of the red quartzite columns, and not in the middle of the column, in all instances. The joint in the middle of the column should be a 4mm mortar joint. This is central to the architectural intent of the project.⁶⁸

This key statement can be read, on one hand, as instrumental; an objective, factual instruction regarding the correct placement and dimension of a joint accommodating movement between decorative cut stone panels on a facade. This fax instructs technical matters, using a specialized vocabulary inaccessible to those outside the architectural profession. It largely speaks of quantitative matters: a 6mm mastic joint and a 4mm movement joint.

On the other hand, this fax can be interpreted as a poetic statement. It speaks to the significance of ornamental expression, of relationships between technology, tradition and historical context, and of the pursuit of quality within contemporary architectural practice. It references the centrality of 'the architectural intent' as a specification which could not be quantitatively defined, as per Vesely's proposal that 'the real intention is most often present in the margin between the design and what is explicitly specified.'⁶⁹ As Emmons's analyses of diagrams in *Architectural Graphic Standards*, Shonfield's dissections of technical language,⁷⁰ and Lloyd Thomas's philosophical interpretations of written specifications revealed,⁷¹ poetic intent may be revealed as embedded throughout even the most prosaic of documents in

⁶⁷ David Kohn, *176 / Museum of Childhood: Stone sample*. Fax, 22 August 2006.

⁶⁸ David Kohn, *176 / Museum of Childhood: Stone Cladding*, 27 September 2006.

⁶⁹ Vesely, *Divided Representation*, p.44.

⁷⁰ As discussed in Ch.5, Shonfield questioned the ability of the technical language of construction documentation to convey intentions, noting 'the books [detailing construction manuals] bland, matter-of-fact style is singularly effective in eradicating controversy and lack of faith- the presentation in the style of a car repair manual makes the search for belief systems seem absurd.' Shonfield, p.35.

⁷¹ 'Unlike the ideal language of the orthographic drawing, the language of the specification, however tied up and systematized, cannot erase its context in social, historical and economic practices.' Lloyd Thomas, p.282.

architectural practice. A closer reading of Kohn's statement reveals the means by which an architectural intent was pursued through precise anticipations of deviation.

Reading the specification for a Nitro Seal MS100 mastic movement joint

In reading the statement, we begin with the 6mm mastic joint. Caruso St John Architects' thirty-five page written specification for the stone cladding façade contained a specification for a mastic sealant forming movement joints throughout the façade:

Z22 Sealants [...]

- Joint Dimensions: Within limits specified for the sealant.⁷²

The specification for the sealant - in this case a 'Fosroc Nitro Seal MS100 Mastic'⁷³ - appears to be straightforward, using a system of categorisation derived directly from National Building Specification (NBS) standards.⁷⁴ Following the instructions in this specification, Fosroc Nitro Seal's own product specifications state that 'Nitro Seal MS100 may be applied to joints between 5 and 35 mm wide.' Additional guidance to establish the permissible tolerances of the mastic joint is offered via a mathematical formula describing a 'Movement Accommodation Factor (MAF)' which establishes 'the theoretical / minimum joint width knowing the expected maximum working movement of the joint.'⁷⁵ For further qualification of standards and tolerances, Fosroc directs us to British Standards BS 6093:1993, 'Design of joints and jointing in building construction', which allows that the designer should 'Modify the design of the joint to meet all the requirements at the positions where it occurs.'⁷⁶

All appears clear, certain and unambiguous. Caruso St John had specified a 6mm mastic joint on either side of an illusionistic column, itself bifurcated by a 4mm mortar joint. This was, Kohn's 22 August 2006 fax had emphasised, 'central to the architectural intent of the project': that of a smooth, uninterrupted façade, with 'very

⁷² Caruso St John Architects, *Museum of Childhood at Bethnal Green Specification Revision C December 2005*, (unpublished specification, Rev. C. (16.12.05) Issued for Contract signing with amendments), p. 129.

⁷³ Stone Restoration Services Ltd, *O&M Manual – Museum of Childhood, Bethnal Green, London* (Unpublished O&M Manual, 8 December 2006), p.3.

⁷⁴ NBS are a UK master specification system dedicated to providing 'concise, technically accurate and up-to date' specifications'. NBS downloaded 05 May 2011.

⁷⁵ Fosroc Nitro Seal MS100 Product Specification sheet 14 CI/SfB:YT4 (January 2006) p.195.

⁷⁶ British Standards Institute, *BS 6093:1993 Code of Practice for Design of Joints and Jointing in Building Construction*, Section 4 Design of joints: 4.4 Procedure for the design of a joint, e). (p.3).

fine joints, like marquetry.’ Kohn’s pairing of a quantitative instruction - two 6mm mastic joints framing a column, one 4mm mortar joint within - with a qualitative one - ‘the architectural intent of the project’ highlighted the urgency of this instruction. The architectural intent of the project was at stake here.

That there were any vertical movement joints at all was a challenge in itself. The pursuit of an architectural intent had already rejected prefabricated panels because of the excessively wide joints required between panels. The preference to eliminate a movement joint could not meet the requirements of British Standard recommendations. A subsequent proposal sought two movement joints, framing each side of an illusionistic column, not only meeting but now exceeding British Standards guidelines for movement joints. *Exceeding* the minimum standard was also a deviation from standard practice.

BS 8298 Section 3.11.4.3 *Movement joints* specified that ‘the recommended allowance for joint width should not be less than 10mm per 6m length of cladding.. In exceeding the minimal necessity, the ‘10mm per 6m length of cladding’ guideline would physically be accommodated by one movement joint per column. Visually, however, Caruso St John sought to emphasise the rhythmic patterning of piers and infill, specifying two 6mm mastic movement joints, one on each side of an illusionistic column. When the design team questioned the need for two movement joints framing each column, in lieu of one central movement joint to achieve minimal recommendations, the response from Kohn was unequivocal:

As far as 6mm vertical expansion joints are concerned, they have always been shown on either side of the red quartzite columns with a 4mm joint in the middle of the column. We will not accept changes to this.⁷⁷

Returning to Leatherbarrow’s query - what would prompt deviation, and why? - this fax gives some indication of the attention and care required even in specifying a mastic movement joint surplus to standard requirements. In deviating from a standard recommendation, or that of the minimum necessary to meet definitions of quality as ‘fit for purpose’, Caruso St John would have to persuade others of the significance of this additional joint, in order to pursue a definition of quality based on an architectural intent.

⁷⁷ David Kohn, undated correspondence, filed between correspondence on 27 September 2006 and 16 October 2006.

To define 'architectural intent' according to NBS' direction that all wording be 'precise, concise, unambiguous and clear'⁷⁸ would appear to be difficult at best. This phrase as it applied to this particular project referenced multiple meanings. From historical precedents to contemporary interpretations of materiality, from predictions of prefabricated exactitude to dependence on hand-construction, from an insistence on dimensional perfection as a mechanism for controlling quality, to an underlying understanding that dimensional perfection was neither achievable nor an indicator of quality, this single phrase contained numerous, overlapping, and contradictory meanings: the richness of ambiguity as explored by authors from Vesely to Empson. Similar ambiguities can be located within even the most prosaic of instructions, including those by Fosroc and British Standards.

Fosroc's specification allows the word 'theoretical' - 'the theoretical / minimum joint width knowing the expected maximum working movement of the joint' - amidst otherwise quantitative instructions. While referencing a scientific theorem - the idealised dimensional tolerance - the inclusion of this conjectural and speculative word allows for an alternative reading, introducing a degree of speculation. No matter how precisely specified an idealised geometric dimension may appear on paper, the actuality of the constructed result can never - quite - align perfectly with the geometric ideal, a reality which has been in place as long as idealized geometries have been employed to inform construction processes.⁷⁹

British Standards, meanwhile, noted that the design of the joint must be modified to meet 'all the requirements' at the positions where it occurs. This might, at face value, simply reference the physical tolerances of any movement joint and the requirement to comply with regulations and standards. If, however, this phrase is read in another meaning, it expands to consider all possible requirements including the architectural intent which underlay the project, as referenced by Kohn.

At the Museum of Childhood, Kohn's faxed reference to 'the architectural intent' perhaps came closest to communicating the ideological values which underlay expectations of precise mastic and mortar joints. Despite Hall's insistence that the

⁷⁸ <<http://www.thenbs.com/topics/designSpecification/articles/centuryBuildingSpecificationPractice.asp>>[accessed 2 March 2010].

⁷⁹ As discussed in Ch.6, see Hiscock, *The Wise Master Builder* for a discussion of accepted discrepancies between idealized geometries and constructed results in mediaeval construction practices, and Trachtenberg's *Building in Time* for a discussion of the shift, from a building evolving through construction, to what Trachtenberg describes as Alberti's fracturing of a unified design/build process and the demand for comprehensive planning and its exact translation of instruction into built form.

specification provides 'the one certain opportunity' to lay down 'definable and enforceable expressions of standard and quality', the definition of quality as applied to these joints shifted as the project progressed, from an initial definition based on dimensional exactitude to a mutually agreed understanding of quality based on the subjective, intuitive relationship of imperfectly dimensioned joints. To achieve the poetic intent of an intensely patterned skin wrapping the façade, integral to the project from the beginning, it would be critical that the joints did not visually disrupt the stone patterning. It would be critical, that the construction team understood this and did not substitute a purely practical solution, which would satisfy British Standards, but erode the specified design intent. It would be critical that all worked to shared expectations of craft, skill and care in understanding 'all the requirements' of a decorative stone façade. A precise building had been defined by Kohn as communicating 'care, thought, energy, enthusiasm' and 'pleasure.' Quality would be defined not only by the objective dimensional precision of a constructed result, but through subjective concepts of care, enthusiasm and pleasure, concepts which critically shaped definitions of constructed quality of the façade [Fig. 8.22].

In pursuing a deviation from a standard - a mastic movement joint surplus to minimum warranty requirements - project correspondence from Caruso St John set out precise dimensional specifications, insisting on strict adherence to these in the constructed result, specifying a tolerance of less than one millimetre as the degree of unacceptable discrepancy between a rejected five millimetre sample joint and the specified pattern of four and six millimetre joints. Expectations for these joints extended beyond quantitative measure and minimum warranty standards, to include the rich multiplicities of an architectural intent established by Caruso St John's critical stance. The quality of the constructed façade would be dependent not on dimensional measures, but on attaining a shared understanding of the significance of each aspect of this façade. Project documentation insisted on an uncompromising stance of 6mm mastic joints framing a column, bifurcated by a 4mm mortar joint. That the constructed result did not precisely meet this was not only accepted, but understood and predicted.

8. Anticipating precision at the Museum of Childhood.



Fig. 8.23 - Shop Drawing of Stonework. Drawing 1909/GA/01 stone key layout to west, north & south elevations. Museum of Childhood. Issued August 2006 / amended 7/9/06; 14/9/06; 1/11/06. Stone Restoration Services.

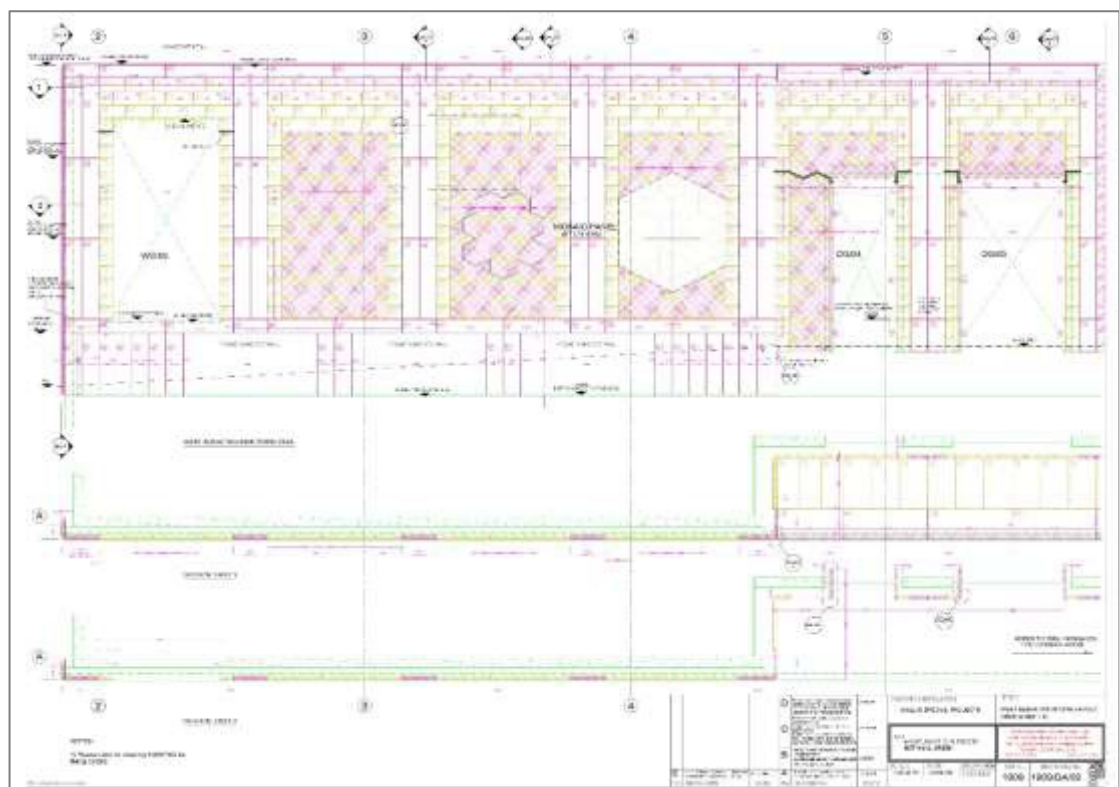


Fig. 8.24 - Shop Drawing of Stonework. Drawing 1909/GA/02 west elevation stone layout (Grid lines 1-6). Museum of Childhood. Issued June 2006 / amended 10/8/06; 8/9/06; 27/09/06 / 2/10/06. Stone Restoration Services.

8. Anticipating precision at the Museum of Childhood.

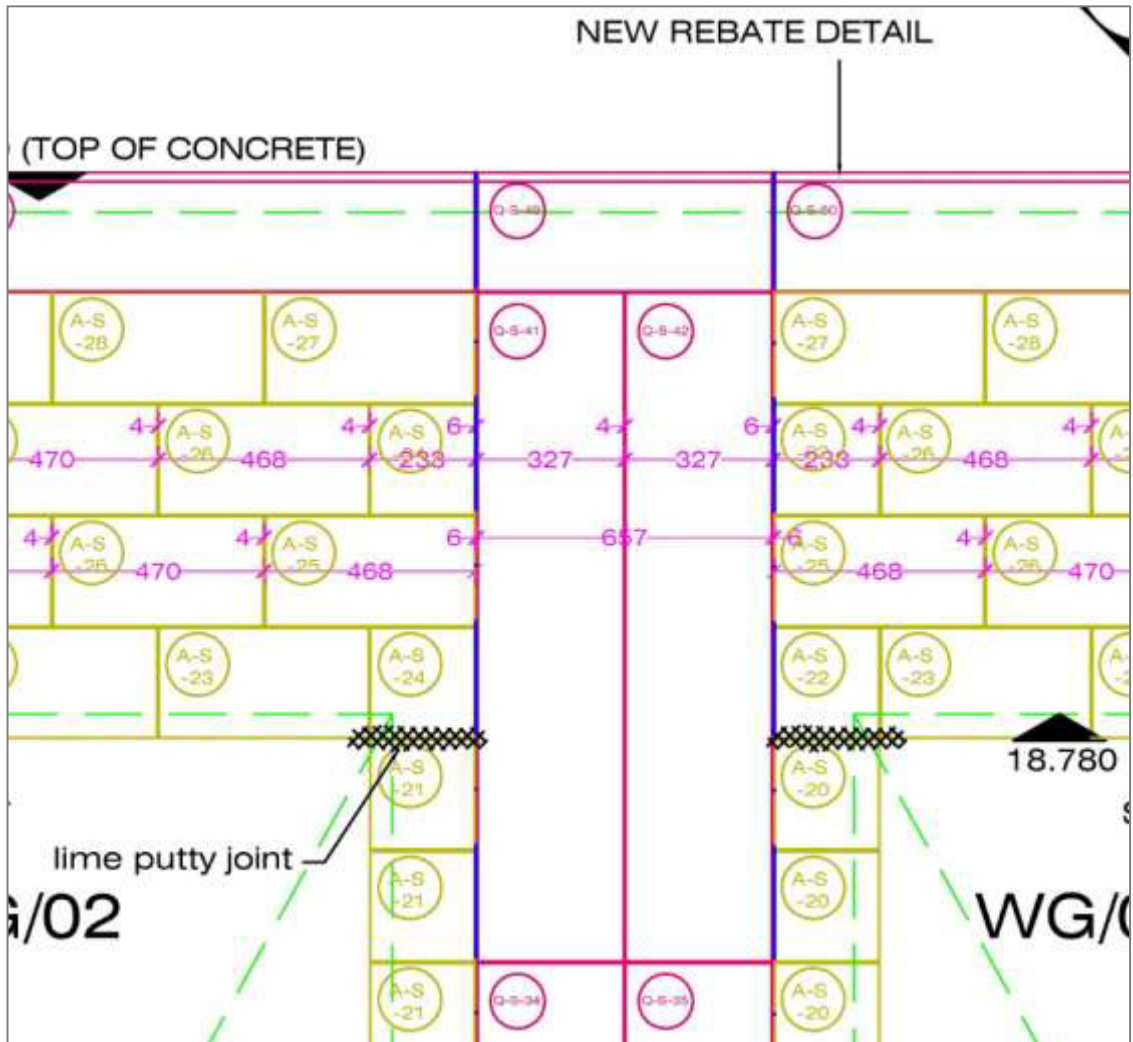


Fig. 8.25 - Detail of Shop Drawing of Stonework, showing the 'column' with 6mm mastic joints and 4mm mortar joints. Drawing 1909/GA/02 west elevation stone layout (Grid lines 1-6). Museum of Childhood. Issued June 2006 / amended 10/8/06; 8/9/06; 27/09/06 / 2/10.06. Stone Restoration Services.

8. Anticipating precision at the Museum of Childhood.

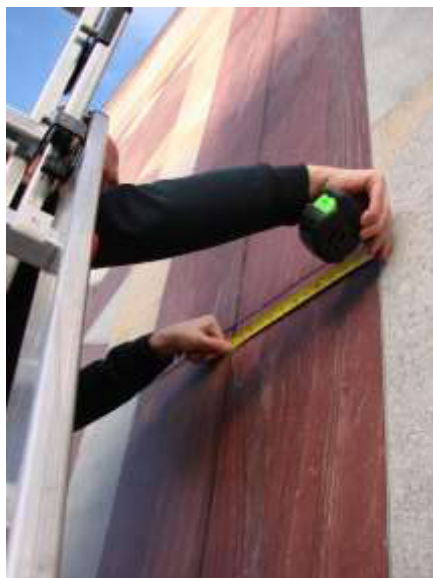


Fig. 8.26 - The joints as constructed at the Museum of Childhood, November 2009.

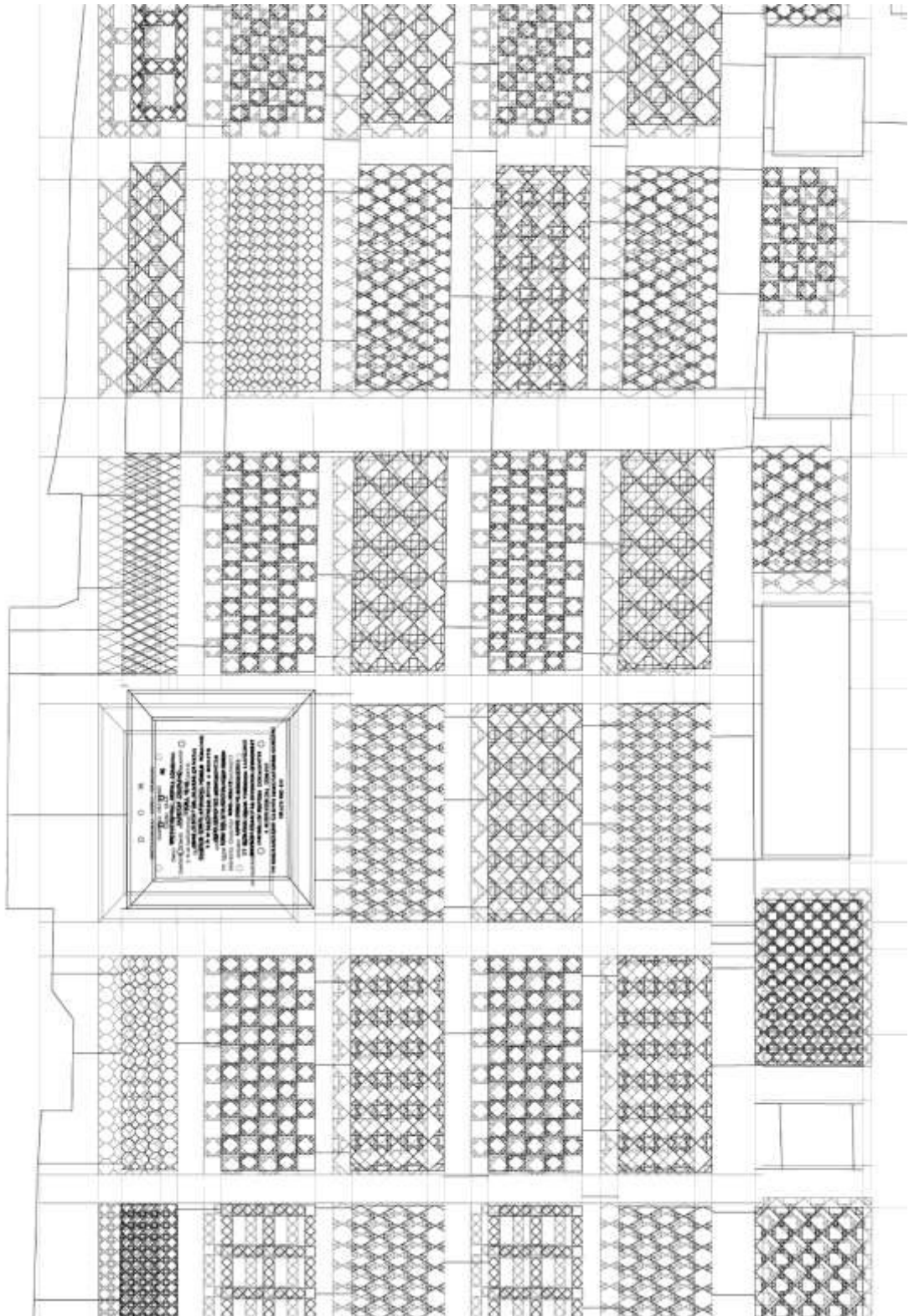


Fig. 8.27 - 'Perfect , Imperfect' overlay drawing of the differences between the geometric ideal and the 'as built' conditions of the twelfth century Cosmati pavement in Santa Maria in Cosmedin, Rome, surveyed by Louise Hoffman, James Paul, and Sabine Rosenkrantz in 2004 for David Kohn's Undergraduate Studio 5 at London Metropolitan University.

8.7 Deviating from the idealised

The façade as constructed at the Museum of Childhood does not exactly adhere to the critical 4mm and 6mm joint dimensions bifurcating and framing the columns anticipated by Caruso St John's specifications and drawings, and subsequently translated as detailed shop drawings by the stone subcontractor, Stone Restoration Services [Figs. 8.23-8.25]. As constructed, individual joints vary, more or less, between 2mm to 10mm [Fig. 8.26].⁸⁰ The pre-cut stones are occasionally slightly chipped at corners; corners of individual stones do not precisely align; individual joints vary in width along their length, above and beyond the degree of precision rejected in the earlier site sample, of a discrepancy of one millimetre.⁸¹ They vary, instead, by 2, or 6, or 8 millimetres. If evaluated quantitatively, the façade as constructed does not precisely meet the specifications.

Kohn's insistence throughout the documentation that the constructed work align exactly with the specification of 6mm and 4mm joints might be read as uncompromisingly quantitative, as demanding quality through expectations of exact dimensional adherence. In such a scenario, it might be anticipated that the façade of the Museum of Childhood cannot be defined as meeting expectations. However, Kohn's referencing of the Cosmati pavements and his exploration of these in an undergraduate studio taught by Kohn offer an expanded reading of the wider intentions conveyed by his precise instructions.

Cosmatesque imperfections

The Cosmati pavements, a series of renowned mosaic pavements throughout Europe, were constructed in the eleventh and twelfth centuries by four generations of the Cosmati, whose reputation in skill and craft was widely acknowledged. Intricate patterns of varying stones laid out in complex geometrical patterns, widely

⁸⁰ As measured on 23 November 2009 by Mhairi McVicar and Mark Sustr, with the permission of Museum of Childhood.

⁸¹ In 'Contested Fields', I analyzed a 25mm discrepancy between the J.W. Wild façade and Caruso St John's addition, described as 'imperfect' by St John. This paper noted as a key argument; 'Although it is unlikely that anyone will notice the 25 millimeter discrepancy, which is difficult to locate even when alerted to it, whether anyone will notice it is not the point at stake. It is quite simply the fact that this compromise physically exists. It is not the conceptual clarity which disappoints, nor the specific dimension of the compromise itself, but rather the physical fact of a discrepancy; one which speaks to the underlying disappointment which any architect may face in contemporary practice.' Mhairi McVicar, 'Contested fields: perfection and compromise at Caruso St John's Museum of Childhood' in *Architecture and Field/Work*, ed. by Suzanne Ewing, Jeremie Michael McGowan, Chris Speed and Victoria Clare Bernie (London: Routledge, 2010) pp. 138-150 (p.144).

debated as holding cosmological significance.⁸² As constructed, the pattern and dimensioning of the constructed pavements differ, sometimes widely, from the geometrical ideal. Led by Kohn, the 2004 Undergraduate Studio 5 at the London Metropolitan School of Architecture measured a Cosmatesque pavement, developing a drawing titled *Perfect / Imperfect* which overlaid the geometric ideal with the constructed reality [Fig. 8.26]. Crucially, for Kohn, the difference between the geometric ideal and the constructed result did not signify a lack of craft or care, but rather demonstrated an essential aspect of construction: that the geometrical ideal can never be attained, even in the most exemplary of craftwork.⁸³ Despite geometric imperfections and ambiguities, the Cosmati pavements remain widely acclaimed as works of art, beauty, craft and care. Quality, here, was understood as a projection of poetic and cosmological significance, rather than adherence to unachievable demands to attain a perfect geometrical ideal. At the Cosmati pavements, in the context of care and skill, geometric imperfections were ultimately insignificant. Kohn summarised:

Reality is nothing like the intellectual construct.[...] Reality and imagined geometries; that difference is being human, is what being human, to exist is. The drawing by the students showed this difference.⁸⁴

Although the specifications for the Museum of Childhood appeared to insist upon uncompromised geometric perfection, the reminder that the joints were ‘central to the architectural intent of the project’ spoke of wider intentions than that of the exactitude of a geometric ideal. A reference to an ‘architectural intent’ is inherently ambiguous, not in the sense of uncertainty - ambiguity as rejected by the recommendations guiding architectural practice - but in the sense of containing multiple meanings. Empson’s proposition that rich, complex, multi-layered ideas are more efficiently approached through qualitative interpretation rather than quantitative measure,⁸⁵ and Berlin’s denial of claims that the ‘vague rich texture of real life’ could ever be communicated precisely,⁸⁶ align with the complexities and richness of ideas underlying the specification of an architectural intent for a joint.

⁸² See L. Grant and R. Mortimer, eds., *Westminster Abbey: the Cosmati pavements*, (Aldershot, Burlington VT: Ashgate Publishing, 2002).

⁸³ Kohn interview with author, 1st May 2009.

⁸⁴ *Ibid.*

⁸⁵ Empson, pp.5-6.

⁸⁶ Berlin, p.74.

As with the Cosmati pavements, the quality of this project did not depend upon the uncompromised construction of every joint as exactly 4mm and 6mm. The architectural intent - a proportional system, derived from historical precedent, in which the representation of a pier and infill rhythm was to be enhanced by the precisely considered hierarchical proportioning of joints - was most clearly communicated, amidst the complex layers of professionalized specializations and bureaucracies, by the progression of conversations between architect and builder.

The aim of a precise specification

Shared expectations are frequently difficult to establish in construction projects where architect and builders are unfamiliar with each other, a point Kohn noted in relation to the Cosmati pavements, suggesting that widespread knowledge of their skill permitted trust in their craftsmanship. A constructed pattern could be dimensionally imprecise, yet still reviewed as of exceptional quality.⁸⁷ The pattern itself, Kohn suggested, contained shared cosmological meaning, acting to give significance to the work carried out by the builders. In the absence of a shared cosmological significance in the pattern of the Museum of Childhood façade, Kohn described the specifications, which demanded extraordinary dimensional precision, as substituting for shared understandings, but crucially acting as a means, rather than an end. 'The forcing of the 4 and 6mm is to elevate the importance,' Kohn emphasised. 'The difference is trust.'⁸⁸ Having never previously worked with these stonemasons, extraordinarily precise instructions were instrumental in establishing high expectations of craftsmanship. Rejecting an initial sample for a discrepancy of one millimetre emphasised, from the start, that high expectations of care and skill were expected: that close attention would be paid to every joint.

'It sounds terrible, but it's a battle. It's a battle to get what you want'⁸⁹ Peter St John concurred of communications between architect and builder. In an earlier interview, he noted that 'we want good working relationships with the builder, but we also want things to be perfect.'⁹⁰ Working towards both goals, Caruso St John's documents meticulously described the project in drawn and written form to establish expectations of quality. The control of quality as the project moved into construction emerged from the numerous emails, faxes and conversations which supplemented,

⁸⁷ As also demonstrated by Cohen's 'Ugly Little Angels', and Hiscock.

⁸⁸ Kohn interview, 1st May 2009

⁸⁹ St John interview, 11 May 2009.

⁹⁰ St John interview, 28 November, 2008.

adapted, and interpreted the precise specifications. 'There is', Kohn stated 'always a degree of compromise and reason. [...] You have to invest heavily in the conversations post contract to make it work well':

I spend a large amount of time on the phone: follow every single point of responsibility to the end. I see it as a web, its pleasure - obsessive. I find out how far it goes and get a sense of who is interested, energetic. Who can be cajoled into doing what you want, or into suggesting alternatives which are better. Rather than saying 'I want this and I'm going to get it' which suggests a kind of control. I see that as ineffective and disempowering.⁹¹

In contrast to his written instructions which set out uncompromising specificity, Kohn's verbal descriptions focused on what he described as 'jujitsu': a martial art based on the premise that weakness defeats strength. It is, he suggested, a 'soft pushing back, massaging' rather than returning force with force.⁹² Kohn's descriptions focused on interpersonal relationships: he emphasised the need to talk directly to people, to 'ask everyone questions, about tools, about frame of mind; to understand the way they work. To play on what people enjoy doing.' Current systems of management, he noted, 'are demonstrating less and less trust.'⁹³ To establish trust, Kohn described a process of following every point of responsibility to those people who physically craft the end product, building up, through dialogue, common expectations of quality.

The dialogue of a conversation - in contrast with the monologue of a written instruction - opened up the ability to respond to unforeseen, yet inevitable, compromises during construction. 'The collaborative effort of the construction team'. St John wrote to the client towards the end of construction with regards to issues on-site, 'will make it difficult for us to be strict with the contractor on all these matters.'⁹⁴ 'There was more team spirit in the end', St John observed in interview. Collaboration and trust, developed over the project superseded dimensional exactitude, refuting Francis Hall's claim that the precise specification offers the 'one certain opportunity' to establish standards. At the Museum of Childhood, precise instructions defined high expectations of craftsmanship, but served as no more than the opening statement of a long conversation.

⁹¹ Kohn interview, 1 May 2009.

⁹² Ibid.

⁹³ Kohn published on this subject in David Kohn, 'Jujitsu Urbanism' in *Made at WSA*, 5, (2009). p.38.

⁹⁴ Peter St, John, 176 / Museum of Childhood, Letter, 11 December 2006.

8. Anticipating precision at the Museum of Childhood.



Fig. 8.28 - Construction of the stone cladding, Museum of Childhood, 15 November 2006. Caruso St John Architects.

8. Anticipating precision at the Museum of Childhood.



Fig. 8.29 – Project folders for 176 / Museum of Childhood, offices of Caruso St John Architects.

8.8 'You don't actually hit the tolerances'

In lieu of the original concept of prefabricated stone panels achieving tight joints due to predictable and economical control in a factory condition, Grant Turner, Managing Director of Stone Restoration Services, described instead a construction process where individual masons worked on each panel, adjusting the placement of individual cut stones throughout the construction process [Fig. 8.27]:

if your stones creeped a little bit one way, and they were tighter, you'd go a little bit the other way, we just- it does sound a bit hit and miss but it was more the fact of seeing what fitted- and it wasn't a big task, you'd just go, 'that one's ok'.⁹⁵

Rather than measuring each joint, Turner noted that "it's more a visual effect," one that depended on seeing the entire panel laid out as a whole, rather than defining quality according to the dimension of each joint.⁹⁶ Although Caruso St John's specifications clearly set out uncompromising standards for joint widths, reinforced by Kohn's rejections of samples over a discrepancy of one millimetre, Turner was clear that the constructed result did not match Kohn's instructions. "[W]hat I would say, if you actually look at what's up there, and you measure the joints, you don't actually hit the tolerances that are requested," Turner confirmed. The tolerances described in the instructions were largely superseded by intuitive improvising during construction:

Tolerances are very difficult to state, because you've got to know what distance, the level, whatever. When you're trying to pick up with these, what I was trying to get through to David is, I was confident that we would visually achieve what he wanted, but as to we worked with it, if we didn't fix- as I say, when we were putting this up, it's like taking five of these, exactly the same stones, but one would fit in better there than it would there, and that's what we did, and the bloke, the foreman Graham was looking at it, going, well I don't like that one, move that one there.⁹⁷

⁹⁵ Turner interview with author, 12 February 2010.

⁹⁶ 'What we find is, with the fixing, and what David [Kohn] was doing, he'd comment, but we'd say don't look at it until we've finished it, and the other thing we'd say is not to look at it until it's pointed, because when you get, if you get two corners where it's not picking up, once it's pointed, they do, because there's...it sounds like we're trying to hide the fact, but if you look at this from this view here, these pictures, they're crisp, but with the joint, your eye goes to the joint, the whiteness of the joint, not the point [...] It's finishing it, don't leave a job, you always point it- if you leave it open for the architect, the architect's never happy, but you point it, it finishes it.' Ibid.

⁹⁷ Ibid.

Turner described here a process of intuition and adaptation on site, of care and skill, and of considering the work as a completed whole, rather than as a series of individually identical measured joints. The specifications, as Kohn pointed out, set a standard and establish a reputation. "It's different on paper than it is to put actually into place," Turner highlighted, but he confirmed the role precise instructions played within the process, acknowledging that if Kohn "hadn't pushed the tolerances side of it as much as he did, I don't think the results would have been as good."⁹⁸ It was, Turner summarised, "quite a, sort of, relationship to build up, there were a lot of phone calls, chat, so that he [Kohn] was getting what he wanted."⁹⁹ This level of engagement was not in itself standard: "we had an extraordinary amount of time with David [Kohn]", Turner acknowledged.¹⁰⁰ This was due, Turner suggested, to the short timespan in which things had to happen, and the specification of very fine joints which pushed standard tolerances to the limit.

The joints, as physically constructed, could not be controlled by the strictly specified dimensional tolerances as set out in multiple precise specifications and drawings.[Fig. 8.29] A comprehensive and precisely written thirty-five page specification, exemplifying all recommendations of contemporary architectural practice, could not fully convey an architectural intention of a smooth façade with fine joints, like marquetry. Constructing the façade in-situ, in a manner akin to a brick veneer, relied instead upon the individual discretion and judgement of each stonemason setting each stone in place, working to an understanding of the 'architectural intent' of the project as agreed and developed between architect and builder over the course of construction.

⁹⁸ Ibid.

⁹⁹ Ibid.

¹⁰⁰ Turner suggested that it is less common to be able to talk to the architect during construction: "Some main contractors like us to deal with architects, some don't. They like to have the control." A generation ago, Turner suggested, "we'd get a lot of architects that would come to us, more the old school architects, would come to us and go, I've got this thing, what do you think? And we'd sort of discuss it and talk it through." A substantial change in the way projects are discussed is due to the way in which contractors are now nominated: years ago, you used to have nominations, so an architect would come, he'd come to us, and say, I've got this scheme, and I'd like you to look at doing this and that, brilliant, so we'd go through it, you could then nominate us. The way it happens nowadays, you have your scheme, [xx] gets hold of your drawings and does a take-off, then it goes to the contractor, the main contractor, has four to six weeks to tender a job, by the time they've got it, and they go to the subs, a specialist subcontractor, by the time they've got it, and get it to us, we've got it for a very short period, and then it goes in, and then it all comes down to cost - unfortunately nowadays it's all about cost.' Ibid.

Constructed quality - different from idealised quality - depended not upon a perfect dimensional alignment between the specification and the constructed result, but upon an alignment with the wider architectural intentions underlying the dimensions.

The construction of the decorative facade required subtle adjustments of individual joint widths across the façade which responded to the unique imperfections of each individual stones. Turner described a process in which each stonemason working on an individual panel would step back and view the panels during construction, judging, intuitively, with experience and skill, how to offset one joint against another, balancing proportions and hierarchies of varying tolerances of irregular mastic joints, mortar joints and cut stones as a whole across a façade, working towards an agreed understanding of the final appearance of a very flat surface, with very fine joints. 'It's also about keeping your nerve', St John recalled,

when things go wrong, which they almost always do when you're working on projects of this kind where you've got a deadly combination of it not being very big, very complicated in design, with a low budget.¹⁰¹

In contemporary architectural practice, architect and builder typically cannot anticipate that they will share common definitions of quality at the beginning of any project. In the absence of familiarity, trust or common understandings amidst a large and multi-layered team of specialists working together for the first time, the precise specification of an inflexible geometric ideal acted as an instrument - a means to an end - to alert all involved to the high expectations of the care which would be required to carry the work out in the field.

¹⁰¹ St John interview, 28 November, 2008.

8. Anticipating precision at the Museum of Childhood.

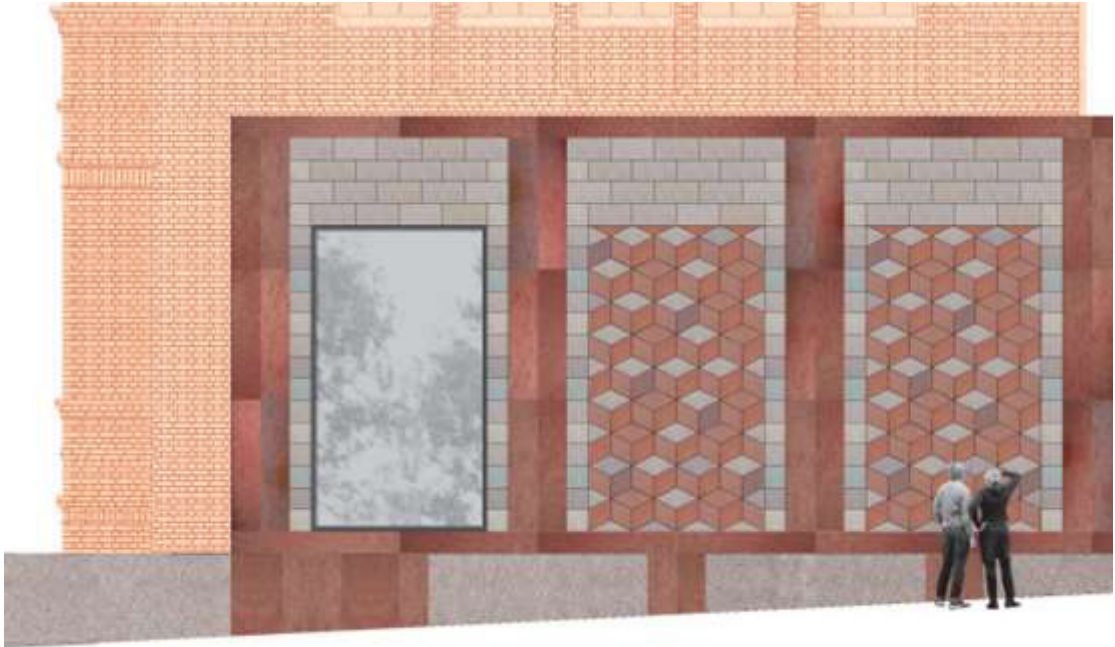


Fig. 8.30 - Design development drawing, west façade, Museum of Childhood. Caruso St John Architects.



Fig. 8.31 - Constructed west façade, Museum of Childhood, Caruso St John Architects.

8. Anticipating precision at the Museum of Childhood.



Fig. 8.32 - Detail of constructed west façade of the Museum of Childhood entrance addition. Site Photos / Stone 14.7.05 /DSC00230.jpg, Caruso St John Architects.

8.9 Defining what you want

The precise letters, faxes and emails upholding the written specifications and detailed drawings pursued a shared understanding between architect and builder of the significance of these joints as they were translated from poetic ideal to constructed reality. In any architectural project, the poetic ideal is inevitably translated, adapted, improved or compromised in construction. As Vesely observed, the act of drawing itself is an act of translation; the act of writing, similarly, is an attempt to translate a poetic ideal into a language for construction. In this translation, much depends on an understanding of design intentions, as Pye argued in *The Nature and Art of Workmanship* when he suggested that all workmanship 'is approximation, to a greater or less degree. Good workmanship is that which carries out, or improves upon the intended design.'¹⁰² Constructed quality, by implication, cannot be achieved by an exact adherence to the specified dimensions. Quality may emerge from a common understanding of design intentions, so that adjustments, when they do occur, remain in sympathy with, or improve upon, the intended design. The underlying hope of a written instruction may be that the builder will understand the poetic intent of the instruction, and undertake adaptations within this understanding.

Just as Berlin had warned that 'clear, logical and scientific constructions [...] seem smooth, thin, empty, 'abstract' and totally ineffective as a means either of description or of analysis of anything that lives'¹⁰³, Davis had observed that 'abstract documents of control', in engendering a litigious atmosphere, had 'removed people's ability to carefully apply human discretion to the making of building.'¹⁰⁴ At the Museum of Childhood, even a comprehensive 35-page specification - an exemplar of recommendations for communications in professional practice - could not communicate the nuances embedded in expectations of standards and quality. Instead, as this project progressed, innumerable conversations, letters, faxes, sketches, meetings and phone calls between architects and builders slowly, incrementally, developed a multi-layered, indefinable, ambiguous definition of quality. Understanding ambiguity, not as vague, but as conveying many complex meanings simultaneously; moments of ambiguity embedded throughout the

¹⁰² Pye, p.13.

¹⁰³ Berlin, p.74.

¹⁰⁴ Davis, p. 200.

specifications for movement joints on the façade of the Museum of Childhood teased out definitions of quality which could not easily be quantitatively described.

Precise dimensional instructions referred to far more than dimensional exactitude. In pursuing, as Peter St John stated, definitions of 'what you want, to achieve quality', a rigorous insistence upon perfection throughout the project was vital in first setting standards for high expectations of quality. It served to alert the builders of the value of this civic project: to 'elevate the importance' of this facade, as Kohn emphasized. As with the Cosmatesque pavements, to evaluate quality at the Museum of Childhood by measuring dimensional alignment with the geometric ideal would be to overlook the qualities achieved within the project. The Museum of Childhood façade reads, as intended, as a smooth, flat, taut skin, reinterpreting the hand-laid modelling of Wild's façade as a strictly two-dimensional yet richly patterned civic façade. While the architectural intent began with the exactitude promised by CNC, quality was achieved in the field through the deviations of hand-laid imperfections.

Located between perfection and compromise, this façade determined its quality not through dimensional exactitude, but through the sense of obsessive care which was applied at every stage of the project. Quality was pursued in the lacuna between the precise predictions of the office and the conditions of the field. 'For me it wasn't about whether the wall was perfect', Kohn summarised of the project. 'For me it was perfect enough'. 'Perfect enough' provides a final definition of quality which remains unquantifiable [Figs. 8.30-8.32]. While discrepancies within the facade may be read as imperfections, their acceptance of 'precise enough' was dependent upon the understanding and trust which built up between architect and builder as the project unfolded. Like the imprecise joints of Cosmati pavements, the fact that constructed reality does not match the specified ideal is not in itself an indicator of quality; rather, collaborative working processes had developed a trust that those who constructed the project had worked with care. In lieu of promises of prefabricated processes and adherence to precise specifications, the Museum of Childhood came to rely upon the care of individual craftsmen laying individual stones. Here, the 'architectural intent' was reached not by uncompromising adherence to precise specifications, but through the unpredictable and largely undocumented care of those who conceived of and constructed the work. Such concerns are evidenced too in the final pairing of case studies, that of Mies van der Rohe's 1956 Commons Building at IIT in Chicago, USA, and OMA's adjoining 2003 McCormick Campus Centre.

9. The precise control of deviation at the Commons



Fig. 9.1 - The Commons, IIT, Office of Mies van der Rohe (1955) Hedrich-Blessing (photographer) © Chicago History Museum: HB-18679-C.

9.1 A meeting between Mies and OMA

'God is in the details', Mies van der Rohe was cited in 1959.¹ 'Issues of composition, scale, proportion, detail are now moot', countered Rem Koolhaas of the Office for Metropolitan Architecture (OMA) in 1995.² These two contrasting ideologies of the architectural detail meet at the Illinois Institute of Technology, Chicago, (IIT) where Mies's 1954 Commons shopping centre [Fig. 9.1] is now adjoined by OMA's 2003 McCormick Tribune Campus Centre (MTCC).³ Despite the architects' contrasting rhetoric, there are numerous similarities in the contexts within which each detail was conceived and constructed. Neither Mies nor Koolhaas was physically present during daily construction; both led growing architectural practices at the time of construction that were simultaneously undertaking multiple projects in multiple locations. Both projects were required to balance the economic pressures of a limited university budget with ambitious aims to market the university to prospective students. Both architectural practices delegated construction drawings and site supervision to associate architects, working within organisational structures of clients, building contractors, sub-contractors and suppliers. In each case, the work was shaped by underlying architectural ideologies which highlighted the role of the architectural detail in contemporary architectural practice.

When OMA's 1998 competition entry for the MTCC proposed to subsume Mies's Commons, there was an outcry - perhaps predictably - among parts of the Chicago architectural community.⁴ Koolhaas responded with the essay 'Miesstakes.'⁵

¹ 'On Restraint in Design', *New York Herald Tribune*, 28 June 1959. Marco Frascari suggested the source of the maxim "God lies in the detail" lay in 'the German version of the adage, *Der liebe Gott steckt in Detail* [...] used by Aby Warburg to indicate the foundation of the iconographical method for researching in art history. The French version has been attributed to Gustave Flaubert, and in this case the maxim indicates a manner of literary production.' Frascari, p.23.

² Rem Koolhaas, *S,M,L,XL* (New York: The Monacelli Press, Inc., 1995), p.500.

³ Research included in this chapter has been published as: Mhairi McVicar, 'The production of the Commons: Mies van der Rohe and the art of industrial standardisation' in Katie Lloyd Thomas, Tilo Amhoff, and Nick Beech, eds., *Industries of Architecture, AHRA Critiques: Critical Studies in Architectural Humanities, Vol. 11*. (Abingdon: Routledge, 2016), pp. 49-59; and Mhairi McVicar, 'God is in the details/'The detail is moot': A meeting Between Koolhaas and Mies's in Adam Sharr, ed., *Reading Architecture and Culture: Researching Buildings, Spaces and Documents* (London: Routledge, 2012), pp. 165-178.

⁴ John Vinci, 'IIT plans forget history', *Chicago Tribune*, 20 March 2000.

<http://articles.chicagotribune.com/2000-03-20/news/0003200048_1_landmark-status-rem-koolhaas-architectural-historians> [accessed 20 July 2011].

⁵ In 'Miestakes', Koolhaas stated that the Commons could be 'read in two ways: a surprisingly accommodating, elegant shed, intended by Mies to be *common, to absorb*

Highlighting numerous customizations which the Commons had accommodated in the five decades since its construction, Mies, Koolhaas argued, had been 'uninterested' in the construction of the Commons, implying that Mies's apparent lack of direct involvement rendered this work less untouchable than others in the Miesian *oeuvre*. As the sixteenth building by the office of Mies van der Rohe to begin construction on the IIT campus,⁶ the production of the Commons might reasonably be expected to manifest ideals which Mies had set out from his earliest published writings in the first decades of the twentieth century, envisioning standardized systematic processes which could control the elevation of industrial production to an art with no possibility of deviation. The Commons could conceptually draw from a strictly defined systematic approach, refined by decades of speculative and constructed iterative testing of a repetitive and edited palette of planning, materials and detailing. Mies's absence at the Commons, whether physical or in terms of his attention, is reviewed here as testing the control which a precisely refined system could offer: the potential of the Commons as perfected industrial method.

As a study of the Commons led by architect Thomas Beeby highlighted,⁷ as-built details deviated from standard construction sequences and processes, at times eschewing constructional efficiencies to achieve aesthetic representations of industrialised perfection, echoing similar decisions made elsewhere in Mies's work. This chapter give a detailed insight into the processes behind one set of details at the Commons - pressed steel window mullions and operable frames - through documentary evidence of project correspondence. The correspondence, sketches, drawings, shop drawings and office memos highlight the complexities of controlling

whatever iterations of student life are thrown up – to undergo brutal retrofits, each unit an addition to an ultimately aleatory, forever unfinished composition; or a pathetically martyred icon, full of wounds, scars, legible degradations. In the first reading, it retroactively becomes part of [OMA's] Student Centre. The saintly scenario can only culminate in its second coming. Rem Koolhaas, 'Miestakes', in *Mies in America*, ed. by Phyllis Lambert (Montreal: New York: Canadian Centre for Architecture and Whitney Museum of American Art, 2001), pp. 716-743 (p. 741).

⁶ An IIT press release on 2 March 1953 announcing that 'A \$275,000 combined student commons and shopping centre will be the next new building to be constructed on the mushrooming campus of Illinois Institute of Technology [...] It will have sections of buff brick and will harmonize with the 13 completed buildings and two others now under construction on the Institute's fast-growing campus.' IIT Archives. For the purpose of this thesis, this press release will define the Commons as the sixteenth Mies building to begin construction at IIT.

⁷ Thomas Beeby, 'Toward a Technological Architecture? Case Study of the Illinois Institute of Technology Commons Building', *Perspecta*, 31, Reading Structures (2000), 10-21.

the translation of an architectural intent - that of perfecting industrial methods - to constructed reality within the frameworks of daily architectural practice. At the Commons, deviations from standardized practice and standardized components demanded negotiating the challenges of structural capacities, time and cost parameters, liabilities, and the daily negotiations of questions of control and responsibilities between multiple internal and external individuals.

Proposed steel muntins of 1" x 2 ½" steel plates with ½" x ½" glass stops holding sheet glass at the Commons extend up to 15' height, supported by a single horizontal section, itself spanning 12' between supports.⁸ Elsewhere, a steel clerestory window composed of an operable sash by Hope's Windows, Inc., was set into a bar stock frame by Gerber Ornamental iron, with glazing and caulking by 'others', a detail which involved the input of five organizations over a period of fourteen months. The seemingly effortless simplicity of an industrialized aesthetic demanded extraordinary attention in upholding an architectural intent as it negotiated structural, economic, time, regulatory and organizational challenges in deviating from earlier concepts of perfected industrialized standardization.

Precision, this chapter will argue, was employed at the Commons not as a device to guarantee control by industrialised perfection, as Mies had once declared, but rather as a conceptual framework for negotiating the deviations, ambiguities and uncertainties encountered in the daily processes of architectural production in pursuit of an aim Mies had stated earlier in 1924: that of elevating industrial methods to the level of mediaeval craftsmanship [Fig. 9.2].

⁸ The term 'muntin' is used by Associate Architects Friedman Alschuler & Sincere (DAS): 'The section which the boys have developed for the muntins holding the large plates of glass consists of a 1" x 2 ½" plate with four ½" x 1 ½" glass stops. These muntins are in some cases 15' long and are supported in these cases at the intermediate point by a horizontal section of the same size, which is in turn 12' long between supports.' Letter from FAS to Mr. L. Mies Van der Rohe, RE: I.I.T. Commons Building, 24 March, 1953, MoMA. *OED* online definition as: 'An upright post or bar; (later) spec. a vertical divider (esp. a central one) between panes of glass or panels of door.'
<<http://www.oed.com.abc.cardiff.ac.uk/view/Entry/123831?redirectedFrom=muntin&>> [accessed 15 July 2016].



Fig. 9.2 - Mies van der Rohe on construction site at IIT. Main Building is in the background to the south-west, suggesting that this may have been the construction of Navy (Alumni), Perlstein and Wishnick Halls in 1946-1947. University Archives and Special Collections, Illinois Institute of Technology, Galvin Library: 1998.033 Biographical file.

9.2 Industrial methods and mediaeval craftsmanship

'As I was born into an old family of stonemasons,' Mies van der Rohe wrote in his 1924 article 'Building Art and the Will of the Epoch!' ('Baukunst und Zeitwille!'), published in *Der Querschnitt*, 'I am very familiar with hand craftsmanship, and not only as an aesthetic onlooker. My receptiveness to the beauty of handwork does not prevent me from recognizing that handicrafts as a form of economic production are lost.'⁹ Our needs, Mies continued:

have assumed such proportions that they can no longer be met with the methods of craftsmanship. This spells the end of the crafts: we cannot save them any more, but we can perfect the industrial methods to the point where we obtain results comparable to mediaeval craftsmanship.¹⁰

Referencing Henry Ford's publication of *My Life and Times* as presenting 'mechanization in dizzying perfection,'¹¹ Mies proposed in the same year that if industrialization was successfully carried out, 'then the social, economic, technical and even artistic questions will solve themselves.'¹² This was envisioned as a fundamental reorganization of the building trades and the wholesale adoption of industrial materials and processes. 'The industrial production of all parts', Mies wrote:

can only be carried out systematically by factory processes, and the work on the building site will then be exclusively of an assembly type, bringing about an incredible reduction of building time. This will bring with it a significant reduction of building costs. The new architectural endeavours, too, will then find their real challenge.¹³

⁹ Ludwig Mies van der Rohe, 'Building Art and the Will of the Epoch!', translated and reprinted in Neumeyer, *Artless Word*, p.246. Neumeyer notes that the article by Mies van der Rohe was published in *Der Querschnitt*, 4, no 1 (1924), 31-32.

¹⁰ *Ibid.*, p.246.

¹¹ Ludwig Mies van der Rohe, 'Lecture' in Neumeyer, *Artless Word*, 249-251 (p.250). Neumeyer notes: 'The place, date and occasion of this lecture are not known. Unpublished manuscript of June 19 1924 (collection of Dirk Lohan, Chicago).'

¹² Ludwig Mies van der Rohe, 'Industrial Building', in Neumeyer, *Artless Word*, 248-249 (p.248). Originally published in *G.* no. 3 (June 1924), pp. 8-13.

¹³ *Ibid.*, p. 249.

Biographical accounts¹⁴ highlight Mies's family background in a traditional craft industry¹⁵ and a direct connection to a hands-on understanding of materials, a theme reportedly emphasized by Mies himself¹⁶ despite his unromantic view of the future of his father's industry.¹⁷ Industrialization promised 'a fundamental reorganization of the building trades' and the adoption of appropriate materials:

As long as we use essentially the same materials, we will not change the character of building, and this character, as I have already pointed out, determines the method of construction. The industrialization of the building trades is a matter of materials. Technology must and will succeed in finding a building material that can be produced technologically, that can be processed industrially [...]¹⁸

¹⁴ Rather than a comprehensive overview of Mies's speculative and built work - which can be found in multiple existing sources including Franz Schulze, Phyllis Lambert, Detlef Mertins, and Fritz Neumeyer, extensively referenced here - this research focuses on key statements made by Mies in his published writings or speeches which focus on promises of industrialization and its relation to themes of precision in architectural production.

¹⁵ '[Mies's] Father Michael was always happiest with the tools of the trade, an attitude he evidently communicated well enough that Mies van der Rohe's lifelong love of materials and his care in the detailed rendering of them must owe something to examples learned at home.' Schulze describes the family trade and Mies's father's role as representational of a traditional industry in irreversible decline: an outcome of the industrial revolution and the growing influence of capitalism. Schulze suggests that Mies's placement for early education at cathedral school, which 'tended to add theory to rule of thumb, thus to educate as well as train' was a move destined to 'sever the boy's [Mies's] connection with the family's tradition.' Mies is quoted as emphasizing the practical nature of this training - "You understand, the curriculum was no theoretically contrived program. It was based on experience, on the sort of thing tradesmen really had to use." Schulze also emphasizes the hands on nature of Mies's training, noting, 'If he had little formal training, he earned his own calluses, and he deeply valued the turn he did on the scaffolds following trade school.' Franz Schulze, *Mies Van Der Rohe: A Critical Biography* (Chicago; London: The University of Chicago Press, 1985), pp.12-14.

¹⁶ Kevin Harrington, Professor Emeritus, IIT, notes that Mies 'told people that one of the things he was proudest of was getting his journeyman's licence as a bricklayer as a young man.' Kevin Harrington interview with author, 6 May 2010.

¹⁷ Schultz suggests that Mies 'pictured his father as a craftsman reluctant to act the businessman but one who collided eventually and unavoidably with the changing values of changing times,' Schulze, p.12. Neumeyer wrote: 'In [Mies's] very first statements from the early twenties, Mies had already accepted the inevitability of progress. But the fervor of his manifestos, which proclaimed his initial commitment to the new conditions, soon was accompanied by doubt that added a note of critical distance to his endorsement of modernism. It was not so much the acknowledging of the facts of the new epoch, with its own inventory of technology and economy, but the attitude man assumed toward these givens that became decisive in his view. Architecture therefore was no longer viewed merely as a matter of function and technology, as Mies had originally defined it in the twenties, but as a "life process," an "expression of man's ability to assert himself and master his surroundings.' Neumeyer, p.xi.

¹⁸ Mies, 'Industrial Building' in Neumeyer, *Artless Word*, p. 248.

Arguing in favour of engagement with the processes and materials of industry, Mies's writings consistently tempered this directive with the primary aim of a 'spiritual purpose.' Key to Mies's aim of perfecting industrial methods to the level of mediaeval craftsmanship was the conceptual tension between *Zeitgeist* as the general spiritual, cultural and intellectual spirit of a given society, and *Kunstwollen* as an individual artistic will.¹⁹ Mies's employment in Berlin with Bruno Paul²⁰ and Peter Behrens, his associations with the Novembergruppe, the Deutscher Werkbund, the architects' association Der Ring, and his exposure to the works of Karl Friedrich Schinkel²¹ and H.P. Berlage set the foundations, as Franz Schulze and Fritz Neumeyer have described extensively, for writings by Mies in the 1920's which explicitly rejected aesthetic and individual speculation, urging instead 'the most precise planning,'²² in applying only the 'means of our time.'²³ The 'building art' [Baukunst und Zeitwille], Mies wrote in 1924:

is always the spatially apprehended will of the epoch, nothing else. Only when this simple truth is clearly recognized can the struggles for the principles of a new building art be conducted purposefully and effectively. Until then it must remain a chaos of confusing forces.²⁴

¹⁹ Stanford Anderson suggested that 'the philosopher Alois Riegl supplied the missing link between the established concept of the *Zeitgeist* and specific artistic acts. This link [Riegl] termed *Kunstwollen* – the will to art. At the first level, *Kunstwollen* accounted for the artist's control of the creative process against the practical dictates of the problem itself. However, to account for the determining criteria behind the unified style of a time, this apparently free will of the artist came to be associated with a collective, goal-oriented, motivating volition shared by the entire culture of which the artist was a part. For [Peter] Behrens this meant an acceptance of the spirit of the times which he perceived to involve "an absolute clarification of spatial form to mathematical precision." Stanford Anderson, 'Modern Architecture and Industry: Peter Behrens and the AEG factories', *Oppositions: a journal for ideas and criticism in architecture*, 23 (1981), 52-83 (pp. 56-57).

²⁰ An affidavit from Bruno Paul notes: 'Mr. Ludwig Mies van der Rohe, Architect, concluded his architectural studies in 1907 at the State School of Arts of the Museum of Industrial and Applied Arts in Berlin. As a student he worked on architectural projects in my master - studio (Lehratelier). As the Director (at that time) of this State Educational Institution which was merged in 1925 with the State Academy of Fine Arts, I certify to his (Mr. Mies van der Rohe's) successful completion of his studies.' Library of Congress.

²¹ In a BBC interview, Mies described Schinkel as 'still really the greatest representative in Berlin; Das Alte Museum in Berlin was a beautiful building - you could learn everything in architecture from it - and I tried to do that.' The interview is published in Graeme Shankland, "Architect of the 'Clear and Reasonable'", *The Listener*, British Broadcasting Corporation, LXII: 1594 (October 15, 1959), 620-622 (p.622).

²² As discussed in Chapter 6, Mies applied the idea of precise planning specifically to ferroconcrete in the 1923 article 'Building'.

²³ 'Create form out of the nature of the task with the means of our time.' Mies van der Rohe, 'Office Building', in Neumeyer, p.241.

²⁴ Mies, 'Building Art and the Will of the Epoch!' in Neumeyer, *Artless Word*, p.245.

In seeking to clarify chaos, Mies advised against a 'nominalism' and 'lack of order' following the decay of the Middle Ages and the beginning of the Renaissance:

Whereas man in the Middle Ages was committed, internally and externally, to the community, now takes place the great detachment of the individual, who conceives himself entitled to advance his talents and develop his forces.²⁵

This condition - what Mies referred to as a lack of '*Bildung*'²⁶- would lead, Mies argued, to 'the excessive aggrandizement of the personality, an unbinding of the will to power, and of unrestrained arbitrariness.'²⁷ A resolution to such chaos was proposed within technology and science:

We do not need less but more technology. We see in technology the possibility of freeing ourselves, the opportunity to help the masses. We do not need less science, but a science that is more spiritual; not less, but a more reliable economic energy. All that will only become possible when man asserts himself in objective nature and relates it to himself.²⁸

Emphasizing that 'rationalisation and typification are only the means, they must never be the goal',²⁹ the European translation of Mies's written work and speeches into built form manifesting the aim of elevating industrialized materials and processes as a spiritual art was most famously tested at the German Pavilion at the 1929 International Exposition in Barcelona: a commission, Schulze proposed, 'so free of practical limitations that [Mies] could make pure architecture out of it.'³⁰ Although summarized by Schulze as 'Mies's European Masterpiece and quite

²⁵ Mies, 'The Preconditions of Architectural Work' in Neumeyer, *Artless Word*, 299-301 (p.299). Neumeyer notes 'Lecture held at the end of February 1928 in the Staatliche Kunstbibliothek Berlin; also on March 5, 1928, at the invitation of the Arbeitsgemeinschaft für Frauenbestreben (Work Association for the Women's Movement) of the Museumsverein and the Kunstgewerbeschule Stettin in the auditorium of the Marienstiftsgymnasium in Stettin; as well as on March 7 at the invitation of the Frankfurter Gesellschaft für Handel, Industrie und Wissenschaft (Frankfurt Society for Trade, Industry and Science) in Frankfurt am Main. Unpublished manuscript in the collection of Dirk Lohan, Chicago.'

²⁶ *Bildung* is translated by Neumeyer as holding connotations of 'forming', 'learned', or 'cultivated'. Neumeyer, *Artless Word*, p. 299.

²⁷ Mies, 'The Preconditions of Architectural Work' in Neumeyer, *Artless Word*, p.299.

²⁸ *Ibid.*, p.301.

²⁹ Mies, 'Foreword to the Official Catalog of the Stuttgart Werkbund Exhibition "Die Wohnung"', in Neumeyer, *Artless Word*, p.258. Neumeyer notes: The exhibition "Die Wohnung" (Housing) ran from July 23 to October 9, 1927; the catalog was published by the exhibition directorate (Stuttgart, 1927).'

³⁰ Schulze, p.153.

possibly the capstone of his life's work,³¹ the Pavilion evoked ongoing critical analysis, including Robin Evans's³² analysis of the ambiguous role of the eight slender steel columns, composed of four steel angles separated by steel plates and wrapped in a nickel skin. The joints of the nickel skin were overlapped by end plates secured by screws,³³ [Fig. 9.3] concealing the rough construction within.³⁴ In the USA, upon declaring to IIT President Mr. Heald that his proposed architecture curriculum would pursue 'truthful expression'³⁵, Mies's first constructed works in America began with the exposed finished construction of a standardized wide flange steel beam; a detail borne out of emerging materials science and an industrialized, pragmatic, economy driven construction context. In pursuing the perfection of industrialized methods, Mies's exposed steel details at IIT, Farnsworth House, and 860-880 Lake Shore Drive famously tolerated deviations from standard construction practices and his own earlier ideals.

³¹ Ibid., p.152.

³² Robin Evans, 'Mies van der Rohe's Paradoxical Symmetries' in Robin Evans, *Translations from Drawing to Building and Other Essays* (Cambridge, Massachusetts: The MIT Press, 1997), pp. 233-277.

³³ Receiving the commission in July 1928, Mies worked, Schulze reports, with 'atypical speed and decisiveness', hiring, by October, a 'complement of assistants' who were in place, Schulze is careful to highlight, 'obviously to execute ideas already formed'. emphasizing a process of delegation rather than collaboration. Schulze, pp. 152-153. The Barcelona Pavilion confirmed Mies's status as one of the leading authorities in Modern Architecture, furthered by the Tugendhat House in Brno (1929) and Mies's tenure as Director in the last days of the Bauhaus. Mies's growing reputation abroad was most notably confirmed with his inclusion, under Philip Johnson's patronage, in New York's Museum of Modern Art seminal 1932 Exhibition of Modern Architecture. Domestically, his fortunes were changing, under the changing artistic, intellectual and political climate through the rise of the Nazi party, and the dwindling of wealthy patrons. See Schulze Ch.5. 'Depression, Collectivization, and the Crisis of Art, 1929-36', pp. 174-204, for an account of this period.

³⁴ Further detailing at the Barcelona Pavilion which deviated from industrialized methods or 'truthful' expression included traditional brick foundations; and stone wall panels hanging on a concealed metal framework. This framework was visible on the back of the exterior perimeter walls, which used stone cladding only on the front, public, side.

³⁵ 'Step I is an investigation into the nature of materials and their truthful expression.' Letter from Mies van der Rohe, the University Club, 1 West 54th Street, New York City, to Mr. Heald, 10 December 1937 [translation] Library of Congress.



Fig. 9.3 - Barcelona Pavilion reconstructed column, photographed 2008.

9.3 Perfecting industrial methods in Chicago

On 10 December 1937, upon arrival in the USA, Mies wrote from the University Club, New York City, to Mr. Heald, the acting president of the then named Armour Institute of Technology (AIT), to present his proposed program for the Architectural Department. 'I have with intention delayed the completion of the plan', Mies wrote:

to give myself time to acquire sufficient insight into American conditions to enable me to adjust my proposals more fully to the cultural situation here.

In contrast to the mastery of the material world and the high development in the technical and economic fields, the lack of a determining force in the cultural realm leads here to an uncertainty which can be overcome only through sufficient insight into spiritual relationships [...]

For this reason I have undertaken to develop a curriculum which in itself incorporates this clarifying principle of order, which leaves no room for deviation and which through its systematic structure leads an organic unfolding of spiritual and cultural relationships.³⁶

Clarity, order, and the refusal of uncertainty and deviation - 'no room for deviation' - laid the foundations for a systematic structure from which spiritual and cultural meaning would be pursued. The pragmatism and organizational structure of the American context offered this possibility. The 'strength of the existing organizational and technical forces', Mies wrote, 'assures the possibility of an original and meaningful solution of the cultural question.'³⁷ The emphasis on first establishing an order was manifested in the three steps Mies proposed for an architectural education:

Step I is an investigation into the nature of materials and their truthful expression.³⁸ Step II teaches the nature of functions and

³⁶ Letter from Mies to Heald, 10 December 1937, Library of Congress.

³⁷ Ibid.

³⁸ The idea of an 'understanding of materials' had a particularly resonant meaning in relation to the emergence of materials science from the 1850's onwards, implicating an scientific understanding of the properties of materials, as well as the understanding which could emerge from hands-on work with materials.

their truthful fulfillment. Step III: on the basis of these technical and utilitarian studies begins the actual creative work in architecture.³⁹

The critical sequential relationship between the practicalities of architectural practice and the creative work in architecture were further addressed by Mies at a testimonial dinner ten months later on 10th October 1938 at the Palmer House, Chicago, in which his proposed education program was further laid out:

Architecture is rooted with its simplest forms entirely in the useful, but it extends over all the degrees of value into the highest sphere of spiritual existence, into the sphere of the significant; the realm of pure art.⁴⁰

The declaration of the 'useful'⁴¹ as a root for the higher ambitions of spirituality; of pure art, had a particular resonance in Chicago, a city predicated upon considerations of the pragmatic, elevated by an equally strong sense of ambition and innovation.

The emergence of the Chicago steel frame: from masonry to iron to steel

Located in the flat plains of Midwest USA on the western shore of Lake Michigan, Chicago had emerged from swamplands of native wild onions to become a trading centre at the confluence of water and rail networks, developing its wealth on the basis of livestock trading and slaughterhouses, and later, steel industries. Incorporated as a city in 1837, with a population of 3000 in the 1830 census, Harold M. Mayer and Richard C. Wade noted in their historical analysis of Chicago that by 1830, nearly all the elements that would characterize the twentieth century city were

³⁹ Letter from Mies to Heald.

⁴⁰ Alexander Scriber, Armour Institute, Victory 4600 Re: L. Mies van der Rohe address at testimonial dinner - Palmer House 10/18/38 - Chicago. Library of Congress.

⁴¹ The Library of Congress archived translation reads 'Architecture is rooted with its simplest forms entirely in the useful', compared to a version referenced by Lambert and Neumeyer, which states; 'Architecture is rooted with its simplest forms entirely in practical considerations', a statement which Lambert compares with a 1950 address in which Mies declared that 'it is true that architecture depends on facts, but its real field of activity is in the realm of significance.'" The 'semantic shift' in the intervening twelve years from 'practical considerations' to 'facts' is highlighted by Lambert as revealing something of Mies's experience of building in America: the revision in the original 1938 address from 'the useful' to 'practical considerations' also reveals something of the pre-occupation Mies must have had with the practicalities as well as the conceptual aims in starting architectural practice in America. Phyllis Lambert, 'Mies Immersion' in *Mies in America*, ed. by Phyllis Lambert (Montreal: New York: Canadian Centre for Architecture, 2001), 192-580, pp.223-224.

present.⁴² Already the hub of the major transportation routes in the USA, a meat packing plant foreshadowed Chicago's place as the 'hog butcher of the world'; grain elevators and warehouses formed a link between 'the urban merchant and the rich farmlands of the Middle West' and the development pattern of a central business hub with outlying suburban residential districts was in place. By the time the city was virtually razed to the ground by an 1871 fire, it had a population of 300,000. Chicago treated its almost complete dereliction as an opportunity to build a modern city at an unprecedented scale and speed. A week later, 5,497 temporary structures had been erected and 200 permanent buildings were under construction.⁴³

The rapid expansion of the city following the fire which had spread through wooden structures created an impetus for increased regulatory and organizational structures. In 1872, the State of Illinois enacted the *Cities and Village Act*, which granted local governments greater powers to regulate health, safety and welfare,⁴⁴ including a focus on fireproofing and an Ordinance outlawing wooden structures. Fire limits, defining areas of the city within which all structures would be required to be constructed of fire-resistant materials, were first adopted in 1845, covering the entire city by 1874.⁴⁵ In 1875 this was followed by a Building Code regulating materials and methods of construction, enforced by a newly created Department of Buildings. A development boom lasting until World War One increased values of downtown property; this, coupled with the widespread adoption of elevators following Elisha Otis's 1853 development of a braking system, supported developer demands for taller downtown commercial buildings. This demand was initially answered in masonry construction, which quickly reached its limits as a structural system, as Leslie's study of iron in the nineteenth century observed.⁴⁶ As masonry systems reached their practical limits, the metal frame gained recognition as a potential alternate, drawing inspiration from iron and steel bridge engineering.

⁴² Harold M. Mayer, and Richard C. Wade, *Chicago: Growth of a Metropolis* (Chicago and London: University of Chicago Press, 1969), p.30.

⁴³ *Ibid.*, p.117.

⁴⁴ Joseph P. Schwieterman, and Dana M. Caspall, *The Politics of Place: A History of Zoning in Chicago* (Chicago: Lake Claremont Press, 2006), p.6.

⁴⁵ <<http://www.encyclopedia.chicagohistory.org/pages/457.html>> [Accessed 23 August 2012].

⁴⁶ 'The thick masonry walls of the Monadnock (Burnham and Root, 1892) and the Woman's Temple (Burnham and Root, 1892) touched the limits of masonry bracing, with walls of cyclopean thickness at their bases that discouraged shop owners and that settled with alarming unevenness.' Leslie, p. 240.

The Chicago steel industry

Until the 1890s, wrought and cast iron structural systems dominated tall building construction.⁴⁷ Requiring more precisely controlled manufacturing processes than iron, steel largely remained a specialty product until the demands for increasingly taller buildings and longer bridge spans approached the practical limits of iron as a structural system.⁴⁸ Leslie's study of the transition from iron to steel in building construction highlighted demands for increased precision throughout the processes of manufacturing standardized steel components, from structural calculations,⁴⁹ to the manufacturing process itself, to construction methods, suggesting that a major factor in supporting the adoption of steel was the dimensional accuracy, predictability and consistency demanded by tall buildings and long bridge spans.⁵⁰

The adoption of steel in construction supported the rapid development of the USA steel industry,⁵¹ with Chicago benefiting from its geographic location at the confluence of primary resources for iron and steel,⁵² establishing the first steel mill in the USA, the North Chicago Rolling Mills, in 1865. A decade later, Meyer and Wade noted in their historical study of Chicago's growth, 'more steel rails were rolled in Chicago than in any other American city. The foundation of the city's

⁴⁷ 'In the USA, metal building frames appear initially in the 1850s, coincident with introduction of solid wrought, also called rolled, iron beams or joists. Buildings with interior metal frames built between the 1850s and the 1880s typically had masonry bearing walls, cast-iron or wrought-iron girders, wrought-iron floor joists and cast-iron columns.' Wermiel, 'Introduction of Steel Columns', p.19.

⁴⁸ Leslie writes of the collapse of the Tay bridge in Scotland in December 1879, 'In December 1879, the Firth of Tay Bridge in Scotland collapsed in winds that were well within its claimed structural limits. A subsequent investigation proved that the bridge failed through a combination of poorly designed and manufactured connections.' Leslie, pp. 238-239.

⁴⁹ Leslie notes that in the 1890's, 'the mechanics of wind loads were poorly understood, and engineers could not agree on the loads, precisely, for which they were to design.' Leslie, p.240. Attempting to calculate design loads for wind pressure had previously required the profession 'to rely on direct observation and a theoretical mechanism for turning this observation into the reliable calculation of design loads. Such an empirical approach necessarily entailed grave unknowns'. Ibid., p. 246.

⁵⁰ 'Once out of the mold, [iron] columns could not be altered, and were often slightly out of plumb, dimensionally inaccurate, or slightly twisted by the violence of the cooling process. Cast-iron column construction was, therefore, reliant on connections that allowed great tolerance and that did not require careful alignment.' Ibid., p. 246.

⁵¹ From two USA sites using the Bessemer process in 1864-65, by 1880 steel output in the US had reached 3.7 million gross tonnes. Wermiel, 'Introduction of Steel Columns', p.19.

⁵² 'Organized on an almost imperial scale, it went into the Lake Superior region for ore, into Pennsylvania, Ohio, and southern Illinois for coal, and into Michigan for limestone. The three basic ingredients had their rendezvous along the forks of the Chicago river.' Mayer and Wade, p.52.

primacy in the manufacture of the central product of modern society had been laid.⁵³ The end of the railroad boom prompted steel producers to diversify, developing open-hearth steel works to produce standardized steel products acceptable for building construction.⁵⁴ In 1876, The Carnegie Steel Company published its first handbook,⁵⁵ marketing precisely manufactured standardized steel shapes, connections and details for standard usage.⁵⁶ In *Historical Building Construction*, Donald Friedman highlighted the ability of machine-produced wrought iron and steel sections to offer consistently repetitive sections. 'A series of floor beams for a building,' Friedman wrote, 'even if rolled in different mills and worked in different shops, would be similar enough to be interchangeable within the $\pm \frac{1}{2}$ " tolerance common in frame construction.'⁵⁷ The search for greater dimensional exactitude, predictability, and cost effectiveness engendered the development of new standard shapes, as Leslie highlighted in his description of the progression from hollow steel columns to H-columns.⁵⁸ Bolted or riveted rolled steel offered almost the ductility of wrought iron, and greater dimensional accuracy,⁵⁹ as well as faster construction methods.⁶⁰ Wermiel observed that the desire for exactitude and efficiency in structural calculations, construction methods and speed, and in building economies

⁵³ *Ibid.*, p.52-54.

⁵⁴ 'With the end of a railroad boom and falling demand for rails in 1884, steel manufacturers sought to diversify into products other than rails. It was at this time that steelmakers began to build open-hearth steel works. They turned to open-hearth steel to make steel products that engineers and architects would accept.' Wermiel, 'Introduction of Steel Columns', p.20.

⁵⁵ Donald Friedman, *Historical Building Construction: Design, Materials & Technology*. 2nd edn (New York; London: W.W. Norton and Company, Inc., 2010), p.88.

⁵⁶ Mary Woods observed that in the USA, construction as an assembly of prefabricated components originated in timber construction in the 1830's: 'When architects, builders and owners simply ordered building components from catalogs and had them delivered to the site, carpenters and masons became assemblers of industrialized parts. They were no longer highly skilled craftsmen who designed building elements, selected materials, and executed the work.' Woods, p.149.

⁵⁷ Friedman, p.88.

⁵⁸ 'The struggle to reconcile ideal performance with the need to minimize eccentric loading constituted the primary narrative of steel column design for a generation.' Leslie, p. 250.

⁵⁹ Leslie wrote: 'Steel's ductility, workability and reliable strength permitted columns whose shapes were better able to balance ideal static geometry with ease of fabrication and assembly. First, the tighter quality control with which the material was susceptible permitted much greater confidence in its performance and allowed smaller factors of safety. Second, steel rolling processes produced more consistent products than casting, as air bubbles were pressed out of the soft material, and impurities tended to be widely distributed, rather than concentrated, by the constant kneading of the hot steel. Third, steel could be rolled to precise, thin dimensions, which allowed easier bolting and riveting.' Leslie, p.251.

⁶⁰ 'By 1904, the average riveting gang of five (one tending a small furnace, two to toss and catch the hot rivets, and two manning the riveting hammer) could fix over 200 rivets in a nine-hour day, with an average cost per rivet of under ten cents.' Leslie, p. 249.

had led the development from rolled steel hollow metal sections to H-Sections as standardized construction.⁶¹ The Bethlehem Steel Company, Friedman noted:

introduced wide-flanges into common use as columns, specifically to replace the built-up plate girder “I” and box shapes previously used. [...] ⁶²

By 1907, the Bethlehem Company was advertising three classes of wide flanges – ‘I’s’, ‘girder beams’ and ‘H columns’, eventually blending into each other as the W-shape,⁶³ which came into popular use at the end of the 1920s.⁶⁴ By the end of the 1930s, the standardisation of steel construction was supported by the American Society for Testing and Materials (ASTM), formed in 1898,⁶⁵ and Standard Specifications first published in 1923 by The American Institute for Steel Construction (AISC), founded in 1921 to ‘bring consistency to the design and construction standards for structural steel used in building construction.’⁶⁶ The introduction in the 1920s of gas and electric welding of steel members⁶⁷ promised a more reliable means of creating fully rigid connections between steel members, and, as Addis noted, ‘brought to steel structures an elegance that could never be achieved with riveted or bolted connections.’⁶⁸

⁶¹ See Wermeil, ‘Introduction of Steel Columns’.

⁶² ‘They became so popular in that capacity that the phrase “Bethlehem column” was used for years to indicate wide-flange columns.’ Friedman noted that as late as 1924, built-up columns were still considered to have an economic advantage under certain conditions: when complicated beam-to-column connections were needed and the wide flange sections had flanges or webs thicker than 1 inch; when material price was of overriding concern; and when columns loads were extremely high.’ Friedman, pp.91-94.

⁶³ ‘More efficient shapes with wider flanges and mostly parallel flange surfaces were produced starting around 1927 by Carnegie Steel Company, which later became part of U.S. Steel. These were called CB Sections, or Carnegie Beams. Most structural steel beams produced and used in the U.S. today are a form of the CB-Section, commonly called wide-flange beams and officially designated as W-shapes.’ Kurt Gustafson, ‘Evaluation of Existing Structures’, in *Steelwise / Modern Steel Construction* (American Institute of Steel Construction (AISC), February 2007).
<http://modernsteel.com/Uploads/Issues/February_2007/30762_steelwise_eno.pdf> [accessed 19 October 2012].

⁶⁴ Built-up column forms were popular in the USA until the 1920’s. Friedman, p.91.

⁶⁵ ‘In 1900, ASTM developed standards for structural steel materials: ASTM A7 for bridges and ASTM A9 for buildings. These standards defined minimum requirements for the steel materials used in these applications, bringing uniformity to the varying standards published by the individual producers of the time.’ Gustafson, p.42.

⁶⁶ *Ibid.*, p.42.

⁶⁷ Welded connections were introduced as an alternate to bolted connections which required ‘large numbers of holes set close together creating stress concentrations.’ Addis, p.458.

⁶⁸ One of the first welded steel structures in a building was a roof truss at the Electric Welding Company of America, Brooklyn, New York 1920. The first fully welded steel frame

The dimensional exactness, predictability and consistency offered by standardized steel components had significant implications for the organizational structures of the USA architectural profession and construction industries, which had witnessed, as discussed in Ch.6, a complete re-organization of the relationships between architects and contractors amidst the emergence of specialized professionals, growing commercial pressures upon both architect and contractor, and emerging materials science. These led to, Shanken summarized, the transformation of the architectural profession from the 1930s 'from one grounded in the ideal of the architect-artist to one whose survival depended, in part, upon business acumen, technical competence, and public relations skill.'⁶⁹ This framed the context of professional practice and the building industry in which Mies would set up a Chicago-based architectural practice to take on the task of master planning a college campus.

structure was in 1926, five story building at Westinghouse Electric and Manufacturing Company, Sharon, Pennsylvania. Addis, p. 460.

⁶⁹ Andrew M. Shanken, 'Architectural Competitions and Bureaucracy, 1934-1945', *Architectural Research Quarterly*, 3 (1999), 43-55 (p.43).

9. The precise control of deviation at the Commons



Fig. 9.4 - Site of IIT campus, looking north, prior to construction of Mies's masterplan. University Archives and Special Collections, Illinois Institute of Technology, Galvin Library: Aerial Photos Binder 1 1940-1951 (1940) Image #1.1, Box 1998.277. The site of the Commons is shown in red (added by author).



Fig. 9.5 - Campus development aerial view proposed campus, IIT [looking north-east]. Kaufmann & Fabry Co. (photographer) photo No. 962 (Ca 1941) Chicago 41-2022-2. University Archives and Special Collections, Illinois Institute of Technology, Galvin Library. 1998.277 IIT Aerial Photos Binder 1 1940-1951 (1941) Image #2.1. The site of the Commons is shown in red (added by author).

9. The precise control of deviation at the Commons



Fig. 9.6 - Minerals and Metals Research Building, Illinois Institute of Technology, Chicago, (14 April 1944) Hedrich-Blessing (photographer) © Chicago History Museum: HB-07890-B.



Fig. 9.7 - Minerals and Metals Research Building, Illinois Institute of Technology, Chicago (1944) Hedrich-Blessing (photographer) © Chicago History Museum: HB-07327-A.

9.4 Systematization, delegation and deviation

Taking up the role of Director of a School of Architecture and faced with the task of masterplanning the largest single campus commission since Jefferson's University of Virginia,⁷⁰ Mies arrived into a rapidly growing and ambitious city with a technically advanced and highly organized development and construction industry. In June 1940, the Illinois Institute of Technology was formed by the consolidation of Armour Institute of Technology and Lewis Institute.⁷¹ Following an initial search for new quarters for the Armour Institute, a final decision to stay⁷² necessitated an ambitious response to the urban problems of Chicago's infamously blighted near-South Side⁷³ which had been identified for large-scale demolition and redevelopment.⁷⁴

Aspirations for the IIT campus were ambitious yet pragmatic, demanding 'simplicity and flexibility [as] the theme of the entire new campus,'⁷⁵ according to a brief

⁷⁰ Lambert, 'Mies Immersion', p.223.

⁷¹ On 21 December 1943, the first meeting of the Building and Grounds Committee of the Board of Trustees of Illinois Institute of Technology defined as its first responsibility 'the adoption of a detailed and complete building plan to be ready step by step for immediate action at the time when the building program might proceed at the close of the [Second World] war,' the first requirement of which being described as the acquisition of real estate with an initial boundary of '31st and Michigan, 35th and the railroad', the area shown in Mies's 1941 photomontage of models. IIT / Buildings & Grounds Committee Minutes 1943-1955, Box 1998.213. IIT Archives.

⁷² Whiting wrote; 'The desire to maintain the existing site was largely mandated by the much-publicized blighted condition of the neighborhood; the Institute could ill afford to purchase land elsewhere for what it could get from selling its holdings'. Sarah Whiting, 'Bas-Relief Urbanism: Chicago's Figured Field', in *Mies in America*, ed. by Lambert, pp. 642-91 (p.656). Mayer and Wade suggest the Institute 'courageously decided to stay and to throw their weight into the effort to create a new environment'. Mayer and Wade, p.380.

⁷³ 'Just south of the Loop was the Near South Side, once the city's most fashionable neighborhood, now its worst slum [...] Most of the buildings were erected in the nineteenth century; many lacked modern plumbing and electricity. [...]. As early as 1943 the *Plan Commission's Master Plan of Residential Land Use* called for total demolition of twenty-three square miles of blighted and near-blighted residential areas.' Mayer and Wade, p.378-380. See also Daniel Bluestone, 'Chicago's Mecca Flat Blues', *Journal of the Society of Architectural Historians* 4 (1998), 382-403.

⁷⁴ See Fukuo Akimoto for a review of Homer Hoyt's Chicago Land Use Survey, which assigned 'eight types of planning areas - blighted areas, near blighted areas, conservation areas, stable areas, arrested development areas, progressive development areas, new growth areas and vacant areas' This identified the near south side as '1942 status - Blighted and Near-blighted' and 'Future Status - rebuilt'. Fukuo Akimoto, 'The Birth of 'Land Use Planning' in American Urban Planning', *Planning Perspectives*, 24 (2009), 457-83 (p.477). For a history of Zoning in Chicago, see Schwieterman and Caspall's descriptions of Daniel Burnham's Plan of Chicago of 1909. Schwieterman and Caspall, pp 11-14.

⁷⁵ Illinois Institute of Technology News Bureau, May 13 1946 'Alumni Memorial'. News Releases May-June 1946, Box 1998.149, IIT Archives.

focused on scientific and technological study.⁷⁶ The long gap, Lambert observed, between the commencement of the design of the IIT campus in 1938, and construction of the campus following World War II⁷⁷ afforded Mies's fledgling Chicago practice the opportunity to refine proposals in extraordinary detail.⁷⁸ In his inaugural address to AIT, Mies spoke of every decision leading to a 'definite clarification of principles and values.'⁷⁹ The IIT campus, in scale and timespan, offered Mies the potential of conceiving, developing, and refining a precisely defined system, of perfecting industrial methods to the level of mediaeval craftsmanship in an iterative and repetitive system within the daily challenges of architectural practice.

Establishing an architectural practice in Chicago

Beginning with an informal commission from IIT's President Heald,⁸⁰ Mies set up an office in the Railway Exchange Building opposite the Art Institute, where the architecture school of the then-named AIT was located. A first administrative task was to establish Mies's registration, in accordance with the Illinois Architectural Act

⁷⁶ 'Ludwig Mies van der Rohe [...] one of the world's foremost exponents of functionalism, has incorporated into college buildings the principle of design known as the skeleton system, used before only in utility buildings in this country.' IIT News Bureau, 13 May 1946 'Alumni Memorial'. News Releases May-June 1946, Box 1998.149, IIT Archives.

⁷⁷ The design of the IIT campus began in 1938, with construction put on hold until the close of the 2nd World War in 1945, with the exception of the 1943 Minerals and Metals Building and the Engineering Research Building, both of which were prioritized for their research into the war effort. News Releases May-June 1945, Box 1998.149, IIT Archives.

⁷⁸ A period of intense activity in 1939-1940 successively working through alternates of plans and perspectives of the campus design, arriving in 1940 at a 'final' scheme is described by Lambert as enabling Mies to grasp the highly technical program, understand a new culture, and explore the design of the campus and its buildings.' Lambert, 'Mies Immersion', p. 260.

⁷⁹ Mies van der Rohe, Inaugural address as Director of Architecture at Armour Institute of Technology, Testimonial dinner, Palmer House (20 Nov 1938). Library of Congress.

⁸⁰ When I went there it was a very little school,' Mies later recalled in a discussion at the AA in London. '[IIT President Heald] 'said to me one day: 'Mies, you had better think about a campus.' That was all the commission I had. We never made a contract as long as he was there.' H. T. Cadbury-Brown, 'Ludwig Mies Van Der Rohe ', *Architectural Association Journal* (July-August 1959), 26-46 (p.35). Lambert suggests that the informality of this commission may have been a necessity, due to the fact that a campus plan had 'already been made in 1937 by Holabird & Root, a leading architecture firm that staunchly supported the Department of Architecture', Lambert, p.225. Schulze also describes the secrecy surrounding the commission: 'But there was already another campus plan in the works, begun earlier by Alfred Alschuler, a member of the Armour Board of Trustees and a veteran conservative Chicago architect. Head found little to like in it [...] Heald bypassed the bureaucracy and secretly invited Mies to prepare a design of his own. The strategy was to announce Mies's plan only when it was completed, presuming it would be sufficiently impressive to overshadow Alschuler's. Shortly after Mies commenced work on the project, Alschuler died, leaving the way open to a rival he never knew he had.' Schulze, p.221.

which forbade the practice of architecture without a certification of registration.⁸¹ Mies's work on the campus, assisted by two Berlin students,⁸² began in 1938 with a quantitative analysis of IIT's programmatic needs.⁸³ Mies's treatment of the site as a tabula rasa⁸⁴ [Figs. 9.4, 9.5] emerged within a political planning context which envisioned urban planning according to a logic of precise scientific determinacy,⁸⁵ applied from the scale of the masterplan to the scale of the detail according to a campus brief which emphasized systematic organization for scientific research. As

⁸¹ In 1897, Illinois became the first state to adopt an architectural licensing law, which, unlike the UK, restricted the provision of architectural services as well as the use of title. A copy of *The Illinois Architectural Act*, (Springfield: State of Illinois, Department of Registration and Education, 1951) is held in the Mies van der Rohe archives. Correspondence from the State of Illinois Department of Registration and Education in November 1939 acknowledged Mies's application for registration as a registered architect and his ten dollar cover fee, and offered Mies an oral examination on November 20-22, 1939, noting their insistence that Mies provide proof of his preliminary education and experience, in spite of the obvious 'difficulty in securing your foreign credentials' from Germany, now in a state of war. Letter from State of Illinois Department of Registration and Education, November 7, 1939, to Mr. Ludwig Mies Van Der Rohe, Blackstone Hotel, Chicago, Illinois. Sufficient reassurance must have been provided, as on 2nd January 1940, Mies was registered as an architect under the provisions of the Illinois Architectural Act. Letter from State of Illinois Department of Registration and Education, Certificate Number 2822. Mies subsequently also applied for registration as a Registered Professional Engineer in Civil Engineering. Library of Congress.

⁸² Sandra Honey writes that Mies was first assisted from 1938-42 by two Berlin students, William Priestly and John Rodgers, and joined by George Danforth in 1939 as 'the first IIT student to work in Mies's office.' Sandra Honey, 'The Office of Mies Van Der Rohe in America - Buildings and Projects', *UIA International Architect* (1983), 48-50 (p.48).

⁸³ Lambert described the design process for the campus as beginning with the program. 'Danforth recalled, Lambert writes, 'that the overall plan was still quite elementary when he [Danforth] joined the office, but that Mies "was beginning to deal with some of the programs that were sent – office sizes and that sort of thing – and he was trying to get this into order." Danforth's work began with "throwing a grid over the very big plot plans of the whole site." The dimensions of the grid were based on a modular dimension established by studying the initial program of estimated space requirements for the individual academic and research departments of the Institute.' Lambert, 'Mies Immersion', pp. 228-229.

⁸⁴ Sarah Whiting discusses in detail the idea of 'tabula-rasa- often attributed to Mies's campus proposal, placing it in the political context of the wider slum clearance and urban renewal programs, and comparing it against the two alternate Beaux-Arts proposals which had been developed for the campus. Sarah Whiting, 'Bas-Relief Urbanism: Chicago's Figured Field', in *Mies in America*, ed. by Lambert, 642-91 (p.643).

⁸⁵ Urban renewal programs initiated post World War II through local and state legislation, such as the Neighborhood Redevelopment Corporation Act of 1941 (amended in 1953), the Blighted Areas Redevelopment Act of 1947, the Relocation Act of 1947, and the Urban Community Conservation Act of 1953, focused initially on outright demolition and slum clearance, and only later began to include efforts to conserve neighbourhoods. Arnold Hirsch, 'Urban Renewal' <<http://www.encyclopedia.chicagohistory.org/pages/1295.html>> [Accessed 23 August 2012]. See also Garrett Power, 'The Advent of Zoning', *Planning Perspectives*, 4 (1989), 1-13, and Akimoto, p.459, on the roots of American Zoning as emerging in 1907 in New York as derived from German planning principles, and in particular Harold Bartholomew's zoning surveys of Washington DC and his development of a land use classification system, published as *Urban Land Use: Amounts of Land Used and Needed for Various Purposes by Typical American Cities, An Aid to Scientific Zoning* in 1932.

well documented, a twenty-four foot module,⁸⁶ derived from analyses of programmatic grids and varying room arrangements framed the development of the campus as a whole. The masterplan set out the placement of every column,⁸⁷ primarily within a precisely edited palette of three primary materials⁸⁸ - rolled steel, brick and glass⁸⁹ - and an exhaustively refined detailing system for the junctions between these materials.

An exposed wide flange beam at Minerals and Metals

As Mies's first constructed work in the USA, the 1943 Minerals and Metals building [Fig. 9.6] has been critiqued as 'neither a masterpiece nor an exemplar of the IIT building type he perfected later',⁹⁰ reviewed instead as Mies's first adjustment to a new American context. Early proposals for the use of built-up steel cruciform columns as derived from Mies's constructed European precedents⁹¹ were

⁸⁶ 'As Danforth explained,' Lambert writes, "[Mies] felt that the module was a very important thing to determine...so that buildings wouldn't be positioned in a haphazard sort of way in the future, that it would be a guiding principle.' Lambert, 'Mies Immersion', p.229.

⁸⁷ Mies described this grid as mechanical help, and the sole deviation from it, at Crown Hall, as spiritual: 'You have to realize there are different stages of order. The real order is what St. Augustine said about the disposition of equal and unequal things according to their nature. That is real order. If you compare the Architects' building [Crown Hall] with the other campus buildings you can see that. When I put a grid over the whole campus, that was a mechanical help. No one had to speculate where we put our columns. We put columns on crossing points of the grid all the way through. In the Architects' building I went away from the grid; I took just the grid in a larger measure but the elements are not in the grid any more. The grid was twenty-four and here the column distances are sixty feet apart. I think the Architects' building is the most complete and the most refined and the most simple building. In the other buildings there is more a practical order on a more economical level and in the Architects' building it is more a spiritual order.' Shankland, p.620.

⁸⁸ Concrete skeleton structures were proposed and constructed, including the IIT dormitories (Graduate Halls, 1954), which Mies described as 'my first defeat. I wanted to build it in steel and glass. The president of the Building and Ground Committee was the president of Prestige. He visited our building and he was against it. So we had to build it in concrete.' Mies van der Rohe quoted in Cadbury-Brown, p.39.

⁸⁹ Lambert highlights Mies's proposals in 1944 for the [unbuilt] Library and Administration Building as significant: 'Designed as an exquisitely detailed steel structure and enclosure, the building's significance is that it permitted Mies to work through the elements of a universal space [...] With the brick, steel and glass curtain wall buildings at IIT, Mies has established the beginnings of a structural language; he could now turn to the problems of structure as it defined space.' Lambert, 'Mies Immersion', p.325.

⁹⁰ Schulze, p.223.

⁹¹ Lambert wrote; 'The widely discussed columns at Barcelona and Tugendhat, 'made up of angle sections [...] were also masked, encased in highly polished chromed-bronze sheet metal.' (p.279). Lambert also argued that the initial proposal to use a cruciform column – best suited to a two-way span structure - on a long one-way span layout demonstrated that, early in his transition to building in Chicago, 'Mies was unsteady in his grasp of structural concepts, even though from his earliest days in America the word structure permeated his discourse.' Lambert, 'Mies Immersion', p. 290.

superseded at Minerals and Metals by the use of exposed rolled steel sections, specifically wide flange beams.⁹² [Fig. 9.7] This transition to a more structurally efficient component was, Lambert proposed, guided by Mies's relationship with Holabird and Root,⁹³ an established Chicago firm who had played a key historical role in the development of the Chicago steel frame and use of the Wide Flange beam.⁹⁴ The question of the extent to which Chicago's architectural practices and projects and the common use and availability of standardized American steel construction influenced Mies's detailing of the exposed rolled steel frame is,

⁹² By Mies's arrival in 1938, the use of the standardized Wide Flange steel beam was prevalent in Chicago, a fact which would quickly establish itself as a central concern in Mies's American work. Lambert writes: Neither nascent nor climatic in Mies's work, the recognition of the potential of the unmasked industrial rolled-steel section was the key to the materiality of architectural form as a totality, both structurally and as the architectural expression of the structure. This recognition, an epiphany, was for Mies the result of intense study, thought, and practice throughout the previous years, and while the articulation of 860-880 and Farnsworth stand at the epicenter of the defining moment, they also prefigure his elaboration and refinement of the materiality and spatiality of the high-rise complex and the universal-space clear-span building.' *Ibid.*, p.333.

⁹³ Lambert quotes a letter from Holabird and Root to Mies: 'The letter, addressed to Mies by his associate architects Holabird & Root, provided preliminary calculations for columns composed of four four-inch-by-four-inch angles, confirmed three months later in a memo regarding another campus building that Mies was designing: "Mr Van der Rohe would prefer to use steel construction, with star shaped columns." However, the structure of the sixty-three foot span of the foundry hall, which was to support a five-ton capacity crane, required substantial, rigid steel frames whose girders would connect to the columns in a continuous and fluid flow of forces. [...] The most direct way to attach the skin to the column was with flanged I-sections that would be welded to the column on one side [...]' *Ibid.*, p. 289.

⁹⁴ The role of Chicago architects and engineers, and of Chicago itself as a city in which construction was dominated by engineers and steel construction, on Mies's development of the wide-flange detail at IIT has also been discussed at length by William H. Jordy. The possibility that Mies's adoption of the steel wide flange column was influenced by Chicago and its construction norms is debated by Jordy against Mies's own claims that he took taxis everywhere and thus did not see, nor was largely influenced by, Chicago norms. Jordy writes, 'How easy, too, to make the comparable generalization about Mies's work. He came to Chicago and saw the straightforward use of metal skeletal construction, boldly infilled with glass, that characterized the tall office buildings put up at the end of the nineteenth century – the buildings that Siegfried Gideon popularized as the group achievement of the 'Chicago School.' Here, unfortunately, the neat generalization collides with Mies's own denial, in an interview with the critic Katherine Kuh. "I really don't know the Chicago School. You see, I never walk. I always take taxis back and forth to work. I rarely see the city. [...] As to your question, no; living in Chicago has had no effect on me. When I first arrived, I immediately went to the campus of the then Armour Institute (now the Illinois Institute of Technology). I felt I ought to turn around and go home." The spectacle of Mies foiling the art historian's generalization by taking taxis has its ludicrous, and humbling, aspect. Whether or not the shell of a taxicab insulated Mies as completely from his environment as he asserted, in essence what he said is undoubtedly true. Mies has always been a fundamental thinker about buildings, engrossed in the fundamental study of theoretical buildings in ideal sites whenever he had no commissions, which in Europe was most of the time.' William H. Jordy, edited and with an introduction by Mardges Bacon, *"Symbolic Essence" And Other Writings on Modern Architecture and American Culture* (New Haven Yale University Press, c2005), pp. 209-210.

Lambert suggested, key to any discussion of Mies's work in America.⁹⁵ Relating Mies's anecdotal rebuttal that living in Chicago had no effect upon him, William Jordy argued that:

Whatever Mies *might* have done had he stayed in Europe with respect to the creation of a straightforward, structural aesthetic, he did it in the United States. And tightly as he may have incarcerated himself in taxicabs, he nevertheless immediately sensed that steel framing was the standard means of construction for commercial and large-scale buildings in the United States.⁹⁶

Jordy suggested that 'something would also seem to be owed to the willingness of Americans to take risks, to their enthusiasm for innovation and experiment'⁹⁷ and the particular characteristics of local technical precedents and the local work force;

The American structural tradition favored the frame rather than the wall and depended on a high degree of prefabrication of building parts that could be assembled rapidly and easily by a labor force that, by European standards, was at once scarce and expensive, in part specialized and in part ill-trained [...] this expression of the frame and the prefabricated part marks a difference (not absolute but decisive) from characteristic European practice. Mies's concern with the frame and the prefabricated part in his American work is obvious.⁹⁸

'In short', Jordy concluded, applying his observation both to Mies and Gropius, 'the emphasis on the container in Europe becomes an emphasis on the component in America.'⁹⁹ Whether Mies was influenced by Chicago or not, the underlying structure of the cruciform column at the Barcelona Pavilion in 1929 and Tugendhat in 1930 had aligned with existing construction practices for built-up steel column design up to the 1920s,¹⁰⁰ as did the use of the W-shape, and the decision to weld rather than bolt, in his first Chicago work. Mies's as-built construction drew from contemporaneous developments in industrialized construction standards. His expressed desire to perfect industrial methods to the level of mediaeval

⁹⁵ 'A key question one must ask about Mies in America is where and when does he first encounter and begin to think about unmasked steel structure and the potential expressive power of the rolled steel section?' Lambert locates this as early as Mies's entry into Behrens' Berlin office in 1908. Lambert, 'Mies Immersion', p.278.

⁹⁶ Jordy, p.218.

⁹⁷ Ibid, p. 220.

⁹⁸ Ibid, p. 216.

⁹⁹ Ibid, p. 217.

¹⁰⁰ As described by Friedman, p.93.

craftsmanship emerged, Neumeier has suggested, through the device of ‘technical perfection’:

In Mies’s hands, the banal constructional element of the I-beam was elevated to the level of the classical, just as Behrens had done with the shape of the iron girder. Modern industry and the standards of technical perfection provided the means to create form out of necessity and architecture out of construction.¹⁰¹

Having iteratively established a systematic masterplan, the first physical adjustment of Mies’s vision of industrialized perfection to the Chicago context was manifested as the Minerals and Metals building through the first iteration of a strictly limited palette of materials and details. From this first construction, it was demonstrated that no matter how precisely defined, deviations from strict predictions would occur. On April 9 1945, six years after Mies’s office had begun work on the IIT campus design, an IIT press release announced a \$13,200,000 program for IIT, allocating \$10,000,000 of this to buildings and campus.¹⁰² Following this, a detailed inventory of ‘building specifications’ was released on April 22 1945 detailing specifications for sixteen buildings.¹⁰³ The specifications outlined an ordered, iterative program of

¹⁰¹ Fritz Neumeier, ‘A World in Itself: Architecture and Technology’ in *The Presence of Mies*, ed. by Detlef Mertins (New York: Princeton Architectural Press, 1994), pp. 70-83 (p.74).

¹⁰² The press release noted that ‘The original campus program of Illinois Institute of Technology, conceived in 1941, has been expanded to include an area bounded by 31st Street, Michigan Avenue, 35th street and the New York Central Railroad.’ The Report noted that the Metals Research buildings of Illinois Tech’s Armour Research Foundation had been completed, with the second [Engineering] partially, and the remaining buildings ‘awaiting construction when steel priorities are relaxed’, with plans providing for ‘sixteen additional buildings ranging in cost from \$300,000 to \$750,000.’ Press Release 9 April 1945, News Releases Dec 1944-Apr 1945, Box 1998.149, IIT Archives.

¹⁰³ Two additional projects were noted, a power house and a locker building. The press release contained specifications of function, proposed construction type, footprint dimensions and height in stories, façade materials and square and cubic footage. The detailed specifications for the eighteen projects identify several construction typologies, including ‘Concrete Skeleton Building’ (Engineering Research Building, Metallurgy Building, Mechanical Engineering Building), ‘Steel Skeleton Building’ (Metals Research Building, Auditorium, Physics and Electrical Engineering Building, Chemical and Civil Engineering Building, Library and Administration Building, Humanities Building, Chemistry Building, Architecture and Applied Building, Research Foundation Building, and Gas Institute Building), ‘Skeleton Building’ (Shops Building, Lockers Building), and ‘steel construction’ (Fieldhouse). This included, for example, a specification for a ‘SHOPS BUILDING’ as: Skeleton Building 72’ x 312’, one storey high (17 ½’). Enclosed in glass except for 7’ of brick wall. Contains 96,768 sq.ft. and 1,161,216 cu.ft. This snapshot of the campus shows a level of development six years into the process, following the completion of the Metals Research building and while the Engineering Research building was under construction. A further press release on May 27, 1945, announced that construction would start as soon as steel priorities could be obtained, noting that ‘architectural plans have been prepared’ and

construction, governed in plan and section by a regulating grid in a twelve foot base-multiplier. One anomaly appears in this inventory: the completed 'Metals Research Building', with a reported footprint of 168 ½ x 63 feet. This already constructed building alone did not align with the idealized projection of a precisely dimensioned grid determining all aspects of the campus, revealing the actuality of constructed results: a mismatch between an idealized grid and a completed construction, highlighted in a dimensioned deviation of a half-foot. The inventory captured the idealization which had been projected onto architectural practice since the mid-nineteenth century: a precise, defined, complete prediction of an architectural work, every square foot quantified and costed with certainty, and the ambiguities of construction which challenged such idealizations. The first decade of Mies's work would, in addition, navigate the challenges of controlling a precisely defined architectural intention through delegation and collaboration in a rapidly growing internal and external team of architects, associate architects, engineers and product suppliers.

Delegation and control in Mies's office

Biographical narratives and visual images of Mies emphasize not only the idea of his direct connection to materiality,¹⁰⁴ but also the priority of Mies's personal control over all aspects of his work.¹⁰⁵ At IIT, this necessitated control over an ever expanding team of internal and external associates and consultants, and an increasing number of consecutive commissions. The second constructed IIT

including costs for each building. News Releases Dec 1944-Apr 1945, Box 1998.149, IIT Archives.

¹⁰⁴ For example, [an undated] memo in Mies's office files states: "Ludwig Mies van der Rohe was born in 1886 in Aix-la-Chapelle. He comes from an old family of stonemasons. The handicrafts tradition maintained there developed his unusual sense for quality in materials and workmanship." Library of Congress. Similarly, a June 19 1953 press release from Illinois Institute of Technology on the occasion of Mies's first visit back to Europe emphasized the importance of Mies's physical relationship to construction: 'Never having received a formal architectural education, he learned the first lesson of building - the placing of stone upon stone - from his father, a master mason and proprietor of a small stone-cutting shop.' News Releases June-Aug 1953. IIT Archives. The emphasis upon Mies's personal control and presence is also encapsulated in images such as; 'Farnsworth House: Mies van der Rohe supervising laying of the travertine floor [summer 1950]', Plate 4.172 in Lambert, p.344; Mies van der Rohe with Charles Genther and construction foreman, 860-880 Lake Shore Drive Apartment Buildings, 1950/51, Plate 4.194 in Lambert, p.364; Gene Summers and Mies van der Rohe in the New York office, 219 East 44th Street, with full-scale wood mock-up for Seagram Building skin, 1955, Plate 4.372 in Lambert, p.578.

¹⁰⁵ This was emphasized in Schulze's caveat of the delegation at the Barcelona Pavilion. See Schulze, pp. 152-153.

project,¹⁰⁶ The Engineering Research Building, employed Holabird and Root and Burgee as associate architects.¹⁰⁷ From that point, the majority of Mies's projects, other than private residential commissions, employed associate architects.¹⁰⁸ Such delegation is stressed by biographies as emphatically remaining within Mies's control. Opening with the statement that Mies 'relied to a great extent on those working with him', Sandra Honey's analysis of Mies's office nevertheless emphasized his personal control. 'Buildings were handed over to associate architects only for drafting and specification services,' Honey wrote - 'the design work was fully worked out, down to the last detail, by Mies's staff.'¹⁰⁹ Honey quoted Joe Fujikawa as noting that 'Mies came into the office every afternoon and went round discussing all the projects: 'he had control of it all then.'¹¹⁰ As the office grew in response to an increasing number and scale of commissions,¹¹¹ it put pressure on the ability of Mies to individually control every project. Honey described a re-organization when Gene Summers¹¹² took over from Joe Fujikawa:

¹⁰⁶ Mies's Chicago office's first commission, the 1943 Mineral & Metal Research Building at IIT, was listed by the office as built without associate architects. A file of 'COMPLETED BUILDINGS 1944-1954 Exhibit 5 – REVISED' lists the date, address, cost, client, and associate architects for each project in this period. Duckett Collection.

¹⁰⁷ Holabird and Root had been instrumental in bringing Mies to Chicago. A letter from John Holabird of Holabird & Root Architects Chicago was sent to Mies in Berlin on 20 March 1936. Holabird, acting as Chair of an advisory group of architects noted he was 'canvassing the situation' of securing a head for the Architectural School: 'The trustees and President of Armour Institute are very anxious to secure the best available head for the Architectural School with the idea of making it the finest school in this country.[...] I am, of course, a great admirer of your work and if we are to consider the best I would naturally turn to you first.' Library of Congress.

¹⁰⁸ Associate Architects on all IIT projects were listed in an office memo as: Holabird and Root and Burgee on the Engineering Research Building (55 West 34th Street, 1944), Alumni Memorial Hall (1946) and the Metallurgical and Chemical Engineering Building (1946); Friedman, Alschuler & Sincere on the Chemistry Building (1946), Association of American Railroads Administration Building (1950), Institute of Gas Technology Building (1950), the Mechanical Engineering Research Building (1952), the Mechanical Engineering Building for Association of American Railroads (1953) and the Commons Building (1953), and Pace Associates on Carmen Hall (1953). Sargent & Lundy are listed as mechanical engineers, and Frank J. Kornacker & Associates as structural engineers on the IIT Boiler Plant (1950). The IIT Minerals and Metals Research Building (1943) the Test Cell for Armour Research Foundation (1950), and the IIT Chapel (1952) are not listed here as engaging associate architects. 'COMPLETED BUILDINGS 1944-1954 Exhibit 5 - REVISED' Duckett Collection.

¹⁰⁹ Honey, p.48.

¹¹⁰ *Ibid.*, p.48.

¹¹¹ Sandra Honey noted that "Mies was reluctant to have a big office' but in response to a demand from Herbert Greenwald that his commissions be dealt with in-house, the staff was increased to over 30 people and moved to a larger 10,000 sq.ft. space. *Ibid.*, p. 48.

¹¹² Summers returned to the office in May 1955 after military service in Korea, and having returned from a New York trip with Mies for the design of the Seagram Building.

When Gene Summers was top man he was in control and in charge of special projects – the ones Mies was really interested in; Fujikawa was in charge of the rest. In Joe Fujikawa's time the office was very loosely organized: a number of very strong and talented men worked together and separately, sometimes in charge of a project, sometimes working under others – and Mies was in control.¹¹³

'Under Gene Summers', Honey continued, 'the character of the office changed: the hierarchy of control was distinct,' a description confirmed by Schulze.¹¹⁴ Honey noted that 'Mies encouraged those who worked for him to do what they really wanted' but this is underpinned by a substantial caveat - 'He communicated by suggestion or implication; his way of showing disapproval was to ignore the work concerned.'¹¹⁵ Freedom, but only within strict confines of Mies's personal approval, extended to employees who had trained under Mies's curriculum.¹¹⁶ This was, after all, an architect who had emphatically denounced the 'irresponsibility of opinion.'¹¹⁷

Honey identified the period 1945-55, during which time the Commons was completed, as Mies's 'most creative and productive', noting that Mies had fallen ill in 1955.¹¹⁸ During the design and construction of the Commons from 1952-1954, work had begun on the Seagram Building in New York. Schultz noted that 'even as he

¹¹³ Honey, p.48.

¹¹⁴ Schultz notes; Gene Summers meanwhile emerged in the late 1950s as Mies's most trusted office lieutenant [...] Before he left Mies, however, he imposed upon the office a methodical administrative discipline which Mies himself was much too much the European *Künstler* ever to have bothered with and which had not seemed necessary in the old days, when the staff was manageably small and Felix Bonnet's quixotic ways were equal to its business needs. Schultz, p.285.

¹¹⁵ Honey, p.48.

¹¹⁶ All architects listed as working on the Commons had trained under Mies: Gene Summers gained his Masters at IIT in 1951 where he had studied under Mies (see Blair Kamin, 'Gene Summers, 1928-2011 'Mies protégé helped design McCormick Place' *Chicago Tribune*, December 14, 2011); Joseph Fujikawa studied at IIT for a bachelor's in 1944 and a master's in 1953, (see Blair Kamin, 'Joseph Y. Fujikawa, 81 Disciple of Mies designed the Mercantile Exchange', *Chicago Tribune*, January 30, 2004); Myron Goldsmith studied under Mies at IIT, (See Blair Kamin 'Renowned Architect Myron Goldsmith' *Chicago Tribune*, July 17, 1996); David Haid 'came to Chicago in 1951 to study at the Illinois Institute of Technology, where Mies van der Rohe was head of the architecture department. That year, Mr. Haid joined Mies's office, where he worked for 9 years.' (see Jon Anderson, 'David Haid, Award-winning Architect' *Chicago Tribune*, March 13, 1993).

¹¹⁷ Mies van der Rohe, Inaugural address as Director of Architecture at Armour Institute of Technology, testimonial dinner at Palmer House, Chicago, 20 November 1938. Library of Congress.

¹¹⁸ Honey, p. 48. Kevin Harrington also noted in interview with the author that Mies's pencil drawings 'drop off dramatically' after around 1950; Schulze also references Mies's arthritis from the mid 50's onwards, Schulze, p.284.

[Mies] worked on the great skyscraper [Seagram], his office was busy with several dozen other commissions and was obliged to turn away more.¹¹⁹ The number and complexity of projects in the mid 1950s resulted in inevitable changes in the office:

His staff ballooned to thirty-five. He made a studious point of hiring IIT graduates, and he saw to it that all the design work on any given project was done by himself or his own people. Associate architects were taken on only for drafting or technical assistance.¹²⁰

Schultz emphasized Mies's personal control but acknowledged delegation of duties:

Even before the completion of Seagram's, Mies began to relax his commitment to other high-rise projects coming out of his office; a form universally applicable to the tall building had been found, after all, and true to his conviction that new architectures are not invented weekly, he was content to leave the Greenwald assignments more and more to Fujikawa.¹²¹

Once a typology had been refined, delegation to Mies's IIT trained colleagues could follow: projects such as the Commons to be defined by a precisely pre-determined system.¹²² Mies's work, however, famously deviated from standardized practices as well as from his own stated principles; deviations manifested at the IIT Navy Building,¹²³ Farnsworth House and the high rise apartments of 860-880 Lake Shore Drive.

¹¹⁹ Ibid., p.284.

¹²⁰ Ibid., p.284.

¹²¹ Ibid., p.285.

¹²² 'Certainly the growth of his own practice during the 1950s together with its increasing geographic range and the rapid spread of his global renown had diverted him from his academic duties at the South Side campus. Between his Promontory Apartments of 1949, the first building he put up in Chicago apart from IIT, and the openings of Seagram in 1958, the Mies office was occupied with over one hundred separate design commissions on three continents. Among these were most of the twenty-two buildings he finally realized at IIT, several of which, like the 1952 Chapel and the 1953 Commons, as well as Crown Hall, belong to his most memorable contributions to the master plan on which he began work in 1939. Nevertheless, the IIT administration chafed under what they perceived as Mies's distracted attention to the completion of that plan' Ibid., p.285-286.

¹²³ The 1946 Navy Building is now known as Alumni Memorial Hall.



Fig. 9.8 - Detail of Navy Building [Alumni Memorial Hall] at Illinois Institute of Technology in Chicago (1947) Hedrich-Blessing (photographer) © Chicago History Museum: HB-09969-A.

9. The precise control of deviation at the Commons



Fig. 9.9 - Farnsworth House, Plano, Illinois.



Fig. 9.10 - Apartment Buildings at 860-880 Lakeshore Drive, Chicago (1952), Hedrich-Blessing (photographer) © Chicago History Museum: HB-13809-T5.

9.5 Deviations in concept and construction

It is well documented that Mies was willing to supersede the certainty of strictly practical considerations in lieu of his stated aim of perfecting industrial methods to the level of mediaeval craftsmanship.' The 'classical'¹²⁴ corner typology of Mies's 1946 Navy Building [Fig. 9.8] was summarized thus by Myron Goldsmith:

Sometimes something has such a logic that it is a necessary form, although maybe in your heart of hearts you would like to make it simpler. Take the corner column, the corner of the campus buildings. A more complex situation is hard to imagine, the number of pieces of steel, and yet it's an outgrowth of way the mullions occur on the two sides. How do you solve it? I think the good Renaissance architects who worked with pilasters and stuff had that problem and solved it in various ways. That corner is a case in point, sitting on its little brick base...It was years before I could pass it without stopping.¹²⁵

The tension between the rational desire for a precisely functional, edited, practical detail - precision as exactitude - and a complex and ambiguous constructed reality, which could make you stop in your tracks, appeared throughout Mies's work. IIT historian Kevin Harrington described the complexities contained throughout the classic IIT brick wall, in which an English bond patterning demanded the internal cutting of header bricks in order to achieve a perfectly planar surface both internally and externally, despite the fact that doing this structurally weakened the wall and created a more complex construction sequence.¹²⁶ Michael Cadwell's detailed

¹²⁴ Lambert highlighted the Navy Building as pivotal in establishing the language at IIT and delineating the "Classical" corner, or two-way span for a square bay, with a symmetrical corner condition, as one of two key typologies at IIT: the other being the 'Gothic', or one-way span, with the end sliced for an asymmetrical corner revealing two different construction resolutions at the short end wall and the long wall. Lambert, 'Mies Immersion'.

¹²⁵ Ibid., p.310.

¹²⁶ Harrington notes that, "the story is told in terms of when they were actually started to construct one of these walls [...] they discovered that they had to make a decision, that they wanted the wall plane on the inside and the outside to be a plane, and Mies had specified how this was done. [...] they realize, as they started to lay the brick - so this implies that somebody has not made the complete drawing, or has sort of overlooked this - that if the outside wall was to be perfectly planar, the inside wall would have these little gaps, the surface of the wall, in section, would be like corduroy, because every other brick, to match the brick on the outside wall, would have to be moved in, [...] what Mies said, to have the face on each side be precise, is you can cut the brick in the middle, cut it, so that the end of the brick is seen to be in the plane of the wall, but that meant of course, that you are weakening the inside of the wall, so this was, and this was a decision, as the story is told, made essentially over the phone, when this was discovered when as the contractors, the masons are putting up the wall. Which I think illustrates that there is both this idea of perfection on Mies' part and then the recognition, the tolerance of what the appearance is

description of the momentous effort required to erase the many stages of handcrafted plug weld joints at Farnsworth House [Fig. 9.9] in order to achieve the appearance of a seamless joint highlights the gap between the projected ideal of prefabricated industrialized components, and the constructed reality of painstakingly handcrafted skill¹²⁷ assembled in precisely specified unique processes which specifically demanded 'Very precise Workmanship.'¹²⁸

Mies's colleagues rejected the steel mullion applied to the face of the corner fireproofed steel columns at 860-880 Lake Shore Drive [Fig. 9.10] on the grounds of objectivity: the placement of a steel mullion on a structural column was redundant, reducing its existence to an aesthetic decision.¹²⁹ In response, Mies noted that that the mullion had a practical purpose, providing stiffness for the column cover plate, and strength for the assembly when hoisted into place. This was not, Mies nevertheless stressed, the 'real reason' for its existence. The façade, Mies explained in an interview in *Architectural Forum*, did not look right without it:

actually outweighs the construction, even though, at the time, the way that Mies was treated in the architectural press, the way he presented himself in the architectural press, was that he was absolutely in control of the materials." Harrington interview.

¹²⁷ Cadwell wrote; Mies began with bolted connections at the Farnsworth House but discarded them. Welded connections offer more resistance to lateral loads and welding technology had matured in Chicago during the Second World War. Welding also circumvented Mies's injunction against a nostalgic return to handcraft, a nostalgia invoked by bolted connections that recall the physical act of turning a nut until it is secure. Mies favored welded connections in his IIT projects: the famous corner detail at Alumni Hall features continuous welds over twenty feet long. And here another problem must have become apparent. Welding also requires a high degree of skill and, exposed as it is at IIT, again recalls handcraft, although of an industrial sort. In any case, neither bolts nor welds are in evidence at the Farnsworth House.' Cadwell's critique of the construction processes of removing visible welds at Farnsworth as erasing, rather than glorifying, industrial process. Michael Cadwell, *Strange Details, Writing Architecture Series* (Cambridge, Massachusetts: London, England: The MIT Press, 2007), pp.113-115.

¹²⁸ 'Under Workmanship and Tolerances: 'Very precise workmanship will be required in the construction of this building. The standard of excellence will be the exposed steel work on the Alumni Memorial Hall of IIT. "Included were clauses: "Welding and grinding on exposed members will be such that corners are sharp and true:" "At splices in fascia channels no joint shall be visible on completion of painting." For Miscellaneous steel, under Workmanship, the standard of excellence was to be the metal sash of Alumni Memorial Hall and "particular attention paid to accuracy of profile, straightening of members, fitting joints and uniformity of finish.' Lambert, 'Mies Immersion' Footnote 6, p.508.

¹²⁹ At 860-880, a 'classical' corner solution presented a fireproofed structural column set behind a series of vertically continuous steel mullions, which served to support the glass structure between columns. As Lambert notes: 'The mullion functioned as support for the window frame and wind-bracing for the full height of the eight-foot, four-and-a-half-inch distance between floor and ceiling. However, on the column, the mullion had no such function, and Mies's office colleagues objected.' Lambert, 'Space and Structure', in *Mies in America*, ed. by Lambert, p.362.

He [Mies] says, "Now, first I am going to tell you the real reason, and then I am going to tell you a good reason by itself.

It was very important to preserve and extend the rhythm which the mullion set up on the rest of the building. We looked at it on the model without the steel section attached to the corner column and it did not look right. Now, the other reason is that this steel section was needed to stiffen the plate which covers the corner column so the plate would not ripple, and also we needed it for strength when the sections were hoisted into place. Now, of course, that's a very *good reason*," he laughs," but the other reason is the real reason."¹³⁰

On occasion, as at 860-880 Lakeshore Drive, the intuition of an architectural intent superseded strictly practical considerations. On other occasions, as Lambert notes, 'Mies's office collaborators often stressed the practicality he demonstrated in reducing design to a diagrammatic rendering of the facts, devoid of aesthetic judgment and leaving little room for poetry.'¹³¹ The proportions of curtain wall mullions at 860-880 Lake Shore Drive were thus described by Joe Fujikawa:

People think that Mies really studied the proportions of the curtain wall on 860-880 Lake Shore Drive but in reality, they were pretty much a consequence of the givens. [...] The columns were pretty much what Frank Kornacker's structural steel plus the concrete fireproofing ended up as...So they were practical considerations.¹³²

The proportions of the upper lights at Crown Hall, Kevin Harrington observed, are shorter than originally proposed, a consequence of complying with standardized sizes which would be more feasible to initially source and to replace in case of future breakages. Mies, Harrington suggests:

was perfectly willing to have this proportional relationship very carefully worked out, and then be quite willing to accept, in this case for budgetary reasons and for the longevity of the building too, modifications.¹³³

¹³⁰ 'Mies van der Rohe', *Architectural Forum* 97 (November 1952), 93-111 (p.99).

¹³¹ Lambert, 'Space and Structure', p.363.

¹³² *Ibid.*, p.363.

¹³³ Harrington noted, 'The original height - Crown Hall is now about 18' from floor to ceiling, so that the lower lights are about 8' tall, 7'8" or whatever it is, and the upper lights are about 10, in the original drawings they were about 10', and so, and Mies, of course, is famous for the beauty of his proportions, and Mies, as told, after all of this design work was done, that they, the design was then set out, and the glass supplier said, lights as big as the upper

These varied responses, from prioritizing architectural intent at the expense of objective and pragmatic considerations, to the contrasting willingness to prioritize pragmatic considerations over proportional aesthetic, highlight the complexities of individually determined decisions which shaped Mies's work in America, summarized by Nader Tehrani as 'the sophisticated tension and ambiguity in Mies's mischievous attitude toward construction.'¹³⁴ Deviations, tensions, and ambiguities between idealized projection and the realities of construction, evident in the first ten years of Mies's work in America, are similarly embedded throughout the detailing of the Commons, as a critical analysis led by Thomas Beeby highlighted.

Deviation and standardization

In 2000, Beeby published 'Towards a Technological Architecture? Case study of the Illinois Institute of Technology Commons Building.'¹³⁵ The result of a Yale teaching elective study of as-built detailing at the Commons,¹³⁶ Beeby's analysis highlighted structural and constructional inefficiencies, and considered the reasons underpinning these:

design decisions that are often interpreted by architectural critics and historians as having an artistic or intellectual basis are often direct responses to the relentless realities of the marketplace. In Mies's case, he had clearly formulated artistic and often philosophical ideas about architecture that were put to the ultimate test by the pragmatic and often philistine attitudes of a city that

lights, as tall as the upper lights, were not regularly made, and since these, you have to plan for these to break occasionally, a tree will fall, or whatever, if you wanted to do that big a light, it would first of all be more expensive to make each light, because we would have to set the factory up for a short run of an unusual size, and you probably want to buy a complete second set, so you would be able to replace them in the building if there was damage, but we do make one that is, so the story goes, 18-24" shorter, in its vertical dimension. And Mies said ok. So, and when people come to Crown Hall, I don't think they say, well, I really would like to have that extra 2'. I don't think most people even notice it. It's like the point that Palladio makes, that, while the ear might hear something being off a tone, by a very slight amount the ear can hear, the eye is not so sensitive. When he talked about his proportions, he was quick to acknowledge the perception of proportions. The eye is not so sharp as we sometimes think. And whenever we stop this idea, he was perfectly willing to have this proportional relationship very carefully worked out, and then be quite willing to accept, in this case for budgetary reasons, and for the longevity of the building too, modifications.' Harrington interview.

¹³⁴ Tehrani, p.x.

¹³⁵ Beeby's analysis, published two years after the selection of OMA's winning scheme for the MTCC and during debates over OMA's plans for the Commons, argued for the historical preservation of the Commons as illustrating 'not only the brilliance of Mies as an architect but the limitation of any singular way of thinking about architecture. Beeby, p.20.

¹³⁶ Beeby's research was undertaken in an elective graduate course he had run for twelve years at Yale University, 'Architecture as Building'.

pursues architecture with a passion seldom seen in this country while focusing its eye on the bottom line.¹³⁷

Declaring the Commons a 'failure' in detailing which 'significantly informed Mies's ongoing search for a 'personal architectural expression',¹³⁸ Beeby's analysis compared construction drawings with as-built details, concluding that the Commons demonstrates 'curious' construction detailing.¹³⁹ As well as the prioritization of aesthetic intent over practical concerns, challenges typical of mid-twentieth century architectural production were highlighted, such as layered communications within design teams¹⁴⁰ and economic restrictions imposed by trade union rates which, in principal, denied handwork and custom designed pieces. Wide flange steel columns and an exposed steel roof structure which appear as standard and simple constructions were instead described as structurally and economically inefficient to construct.¹⁴¹ Reviewing, for example, the use of square section 8WF31 wide-flange steel columns in lieu of more structurally efficient rectangular sections, Beeby wrote:

the specific structural characteristics of a square column this small makes the choice of column direction mathematically unclear. It is clear that in this building the expression of the exposed frame has

¹³⁷ Beeby, p.12.

¹³⁸ 'He [Mies] was a methodical designer and it is my contention that the successes and primarily the failures in detail observed at the Commons informed him in a profound way how to continue in his patient search for a personal architectural expression. Ibid., pp.11-12.

¹³⁹ Conceptually, Beeby argued, the pursuit of 'one grand space' had been compromised by programmatic complexity, acting instead as a testing ground for the subsequent manifestation of the grand space at Crown Hall: 'With this building, the emerging theme of one grand space was attempted and, in the end, failed due to program complexity. However, the poignancy of that failure lies in the fact that Crown Hall was tested here and many of the architectural problems not totally resolved in the Commons were fully realized in the artistic virtuosity of Mies's performance at Crown Hall. Ibid., p.20. Kevin Harrington also noted that the Commons tested the idea of the Pavilion: '[T]he building type that really dominated his thinking after 860-880, it seems to me, is the pavilion: Farnsworth, the Convention Hall, Crown Hall, Bacardi, Berlin Museum, Cullinan addition at Houston [...] there's this set of pavilion-like buildings that are really important to him.' Harrington interview.

¹⁴⁰ 'Lack of communication and conflicting intentions were always a possibility. Problems in the buildings of this period also occurred due to differences in the training received by draftsmen in the office of the associate architect and those in the office of Mies.' Beeby, pp.12-13.

¹⁴¹ '[S]maller structures cannot economically absorb the cost of custom designed pieces because of the lack of repetition involved. Handwork and elaborate finishes are prohibitive in small institutional work due to the scale of compensation demanded by union rates.' Beeby, p.12. Mies's office notes on budgets list The Commons at \$10.50 per sq.ft for 32,786 sq.ft; Farnsworth at \$20.20 per sq.ft for 3478 sq.ft; 860-880 Lake Shore Drive at \$10.75 per sq.ft for 400,000 sq ft; Crown Hall at \$13.50 per sq.ft. Duckett Collection.

more to do with the formal idea of the structure than the actual demands of wind and gravity.¹⁴²

Concluding that the column section had been selected for ‘consistent details and modular stability in relation to other parts and systems,’¹⁴³ Beeby observed similar inefficiencies in the roof structure. Exposed steel sections of differing heights were internally aligned at the bottom of the section, achieving a consistent internal ‘ceiling’ plane but deviating from a standard construction detail in which the top of varied steel sections are typically aligned. This deviation, Beeby noted, required ‘detailed architectural invention to overcome the dimensional discrepancy between major and minor beams’ in order to artificially build-up the roof plane above. Modifications to the structure for artistic reasons’, Beeby continued, ‘had changed this assembly from a prefabricated rational system to a hand-crafted façade expression.’¹⁴⁴ The individual ‘architectural inventions’ throughout the Commons’ detailing were variously described by Beeby as ‘a curious and expensive detail’,¹⁴⁵ ‘an idiosyncratic procedural detail’¹⁴⁶ and removed from ‘normative structural practice,’¹⁴⁷ yet Beeby maintained responsibility for decision-making in Mies’s hands, attributing the lack of systematised perfection to Mies’s changing interests:

Emanating from the Bauhaus and Gropius was the idea of the significance of prefabrication spurred by technical production. This was a primary ideal behind all of Mies's early work in America. [...] These ideas were slowly abandoned by Mies at the IIT campus as he realized the magnitude of production necessary to produce well designed components for fabrication. There is a sense also that he must have realized that the earlier campus buildings at IIT lacked the spatial invention and artistry of assembly that characterized his earlier European work. The Commons Building represents the moment when Mies chose to abandon his own cubic spatial system in order to pursue architectural notions other than systematic generalization of detail and uniformity of dimension for manufactured components.¹⁴⁸

¹⁴² Beeby, p.13.

¹⁴³ Ibid., p.13

¹⁴⁴ Ibid., p.13

¹⁴⁵ Ibid., p.14.

¹⁴⁶ Ibid., p.14.

¹⁴⁷ Ibid., p.14.

¹⁴⁸ Ibid., p.20.

Despite the idiosyncrasies and acrobatics identified in the as-built detailing of the Commons roof, the effect achieved was that of simplicity and rationality, as Peter Carter's review of the Commons demonstrated:

The fact that Chicago Building code allowed the steel skeleton to remain un-fireproofed permitted its form and welded assembly to be freely displayed. This in turn solicited a direct and unaffected approach to both structure and detailing - observe, for example, the manner in which roof deck, beam, and girder are brought together at the column head.¹⁴⁹

This 'direct, unaffected' detail, as Beeby's study demonstrated, deviated from normative, rational, economically efficient practice. The project correspondence between Mies's office, associate architects, engineers, client, contractor, subcontractors and suppliers which accompanied the development of one set of details - pressed steel window frames - highlights the challenges encountered when deviating from any standard material or method. Despite Mies's refutation of personal opinion through precise systematisation and the Commons's context as the sixteenth building to begin construction at IIT, the development of the windows at the Commons, I will now argue, remained subject to the ambiguities of multiple authors pursuing an ideal of industrial perfection through deviations from standard components.

¹⁴⁹ Peter Carter, *Mies van der Rohe at Work* (London: Phaidon, 1999), p.75.



Fig. 9.11 - Commons interior, showing the full height steel muntins referenced by Friedman's letter highlighting concerns raised by FAS's structural engineers [This image is titled 'apartment / dormitory buildings: Chicago, (Ill), referencing the Graduate Halls which are visible externally], Hedrich-Blessing (photographer) © Chicago History Museum: HB - 18783-C.

9. The precise control of deviation at the Commons



Figure 9.12 - Pressed steel windows at the Commons, IIT (photographed in 2015 by Jan Frohburg).

9. The precise control of deviation at the Commons

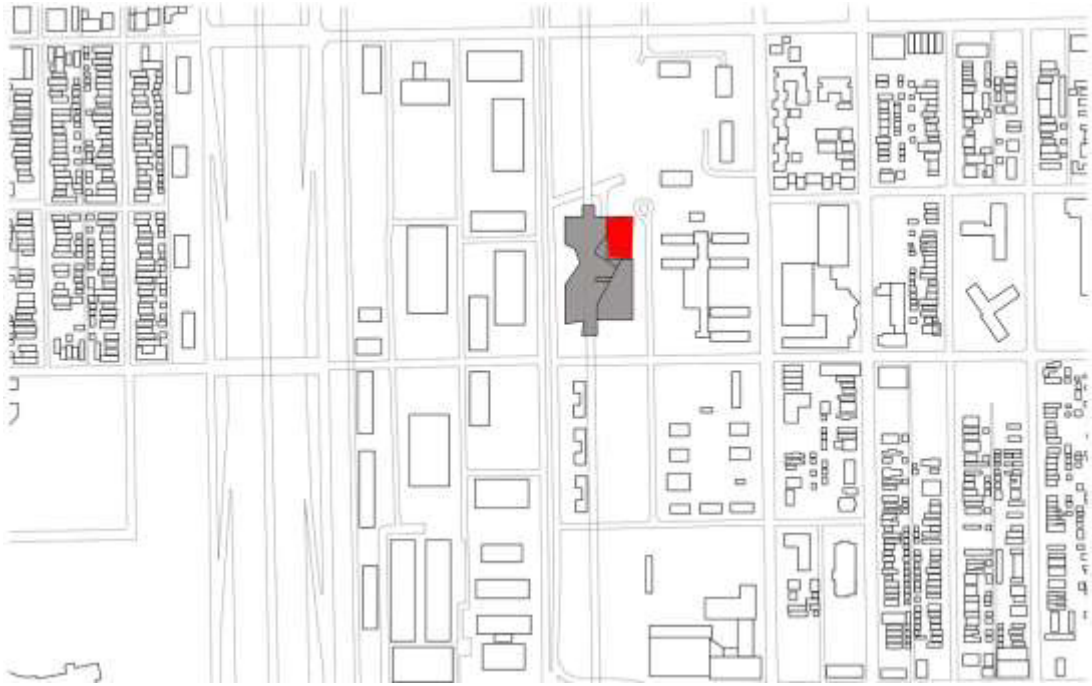


Fig. 9.13- Site location plan of the Commons and McCormick Tribune Campus Centre, IIT (2015 context). The Commons is highlighted in red (by author).



Fig. 9.14 - Exterior of the Commons Building at Illinois Institute of Technology, Chicago, (20 May 1954) William Engdahl (photographer) © Chicago History Museum: HB-17346-C.

9. The precise control of deviation at the Commons

Fig. 9.15 - The Commons, IIT, Office of Mies van der Rohe (20 May 1954) Hedrich-Blessing, (photographer) © Chicago History Museum: HB17346j.



Fig. 9.16 - The Commons, IIT, Office of Mies van der Rohe (20 May 1954) Hedrich-Blessing, (photographer) © Chicago History Museum: HB17346d.



Fig. 9.17 - The Commons, IIT, Office of Mies van der Rohe (20 May 1954) Hedrich-Blessing (photographer) © Chicago History Museum: HBt17346d.



9.6 The production of pressed steel windows

Employing a precisely controlled materials palette and detailing system iteratively developed at the IIT campus over the preceding twelve years, the 1956 IIT Commons Building by the Office of Mies van der Rohe could reasonably be expected to - and at a first glance, appears to - exemplify these promises. A one-story plus basement pavilion comprising shopping and student center facilities,¹⁵⁰ located at the southwest corners of 32nd Street and Wabash Avenue,¹⁵¹ [Fig. 9.13] construction on the Commons began in 1953, fourteen years after the office of Mies van der Rohe (Mies's office) started work on proposals for a scientifically planned campus on a 32' x 24' grid with a strictly repetitive materials palette.¹⁵² Commissioned in January 1953 according to a resolutely pragmatic brief¹⁵³ driven by economy and speed,¹⁵⁴ the Commons was developed at a time in which Mies's office was concurrently active in the design or construction of thirty projects in six USA states and two countries, and when Mies was physically absent for six

¹⁵⁰ A 5 October 1953 IIT Press Release noted: 'When completed, the commons will house a modern cafeteria which will provide permanent dining facilities for I.I.T.'s dormitory students. It will also contain a drugstore and snack bar for light refreshments, a grocery store for the convenience of married students and faculty members, the campus bookstore, a valet shop, barber shop, post office, currency exchange, dentist's and doctor's offices. There will be lounges in the lobby and basement. Recreational facilities, including bowling alleys and ping pong and billiard tables, will be located in the basement.' News Releases, Sept-Oct 1953, IIT Archives.

¹⁵¹ The site of the Commons was located in an area expanded from original campus plans. Mies's 1941 collage of the campus [Fig. 9.5] shows an area bounded by State Street to the east, the Rock Island Railroad to the west, 32nd Street to the North, and 34th street to the south, an area referred to in minutes of the Buildings and Grounds Committee on Dec 21 1943 as a 'key area'. At the same meeting, the Committee recommended the expansion of acquisition of land to an increased area bounded by the Rock Island Railroad to the west, Michigan Avenue to the east, 31st street to the north, and 35th street to the south, an expansion which included the site of the Commons. IIT Board of Trustees Building and Grounds Committee meeting, 21 December 1943. IIT Archives.

¹⁵² Lambert wrote, 'No documents have been found that would establish the exact date when Mies began to work on the AIT campus plan, but it can only have been the winter or early spring of 1939.' Lambert, 'Learning a language', p. 226. Construction on the Commons is dated in this thesis as starting with a ground-breaking ceremony on July 22, 1953, as announced in an IIT Press Release dated 17 July 1953. News Releases, June-Aug 1953, IIT Archives.

¹⁵³ The Commons brief included: 1. Provide building in accordance with long range plan [...] Provide shopping facilities. IIT Board of Trustees Building and Grounds Committee meeting, 28 January 1953. IIT Archives.

¹⁵⁴ Projected by Mies' office to cost \$350,000, or 75 cents per cubic foot. Art Institute of Chicago. By July of 1953, excavation had begun while Associate Architects Friedman, Alschuler & Sincere's construction drawings and final specifications were still in progress. IIT Board of Trustees Building and Grounds Committee meeting, July 24 1953. IIT Archives.

weeks.¹⁵⁵ The Commons passed through the hands of at least five architects in Mies's office, as well as a team of Associate architects, engineers and suppliers over an eighteen month period¹⁵⁶ in a context of professionalized practice which was rapidly becoming framed by the promises of industrial standardization and the certainties of professionalized organizational structures [Figs. 9.14-9.17].

Producing steel frame windows at the Commons

In what appears to be the first and only documented correspondence directly from Mies regarding the Commons, a January 23, 1953 letter to IIT housing manager Jack Guard,¹⁵⁷ Mies reinforced the repetitive nature of the Commons commission, submitting, in the earliest stages of design, detailed unit prices 'established first by a comparison with the unit process of other campus buildings and second by a rough material break down on the building.'¹⁵⁸ The promise of applying systematically defined detailing utilizing predetermined components appears obvious at the Commons. Here was a commission which could emerge from a decade's worth of

¹⁵⁵ Mies was in Europe from mid-June to end of July 1953, according to an IIT Press Release on June 19th 1953, which noted 'He is expected to remain in Europe for approximately six weeks' and '[o]n his current trip the architect arrived last week in the ancient city of Aachen, Germany' (News Releases June-August, 1953, archived in Paul V. Galvin Library, IIT). This would place his visit approximately mid-June - end July 1953. On the same date of June 19, 1953, a Building and grounds Committee Meeting noted of the Commons Building; 'The committee reviewed and approved the list of those invited to bid on this building, a copy of which is made part of these minutes. Final plans and specifications for the building were also reviewed. The lowest bids received totaled \$446,000 as compared with the budgeted estimate of \$330,000 for the building. Revisions have been sent out for quotation, and revised figures are to be ready for review by the committee by June 30. No action was taken pending receipt and review of the revised quotations. IIT Board of Trustees Building and Grounds Committee Meeting, Campus, June 19, 1953 (University Archives, IIT).

Shop drawings and alternates were received from Hope's Windows, Inc. to Myron Goldsmith on 17 June 1953, 24 June 1953, 29 June 1953, and 21 July 1953 Associate Architects Friedman Alschuler & Sincere accepted a revised contractor's proposal on July 23 1953. (All of the above correspondence is archived in Folders 112-117 (MoMA). The groundbreaking ceremony took place on July 22, and photos and related press releases do not appear to show or note Mies as being present (IIT archives). This suggests that the final stages processes of value-engineering and revising the proposals, including the framing of windows, took place during the period when Mies was in Europe.

¹⁵⁶ Project correspondence for the Commons is addressed to / from Mies (Jan 23 1953 – April 3 1953), to Gene Summers (May 13, 1953), Myron Goldsmith (June 17, 1953-June 29, 1953), Joseph Fujikawa (August 28, 1953) and David Haid (September 1, 1953- June 4, 1954). MoMA.

¹⁵⁷ This letter was the only archived office correspondence found by the author to be directly from Mies regarding the Commons, following searches in IIT, MOMA, Library of Congress, and Art Institute of Chicago. Letter from Mies van der Rohe to Mr Jack Guard, Manager of housing, IIT, on January 23 1953. MoMA.

¹⁵⁸ Ibid.

experience of constructed prototypes using the same materials, on the same structural grid, on the same urban campus, for the same client. A wider range of conceptual and constructed typologies within and external to IIT- including the Navy Building, Farnsworth House and 860-880 Lake Shore Drive - offered an extensive archive of detailing solutions. Mies's office was, by now, well experienced in Chicago's construction standards and regulations, and supported by associate architects and engineers who had partnered on numerous previous projects. In the case of the Commons, Mies was not physically present during key stages of its design. The ideal of a precisely defined systematic approach which could operate without deviation and deny the irresponsibility of individual opinion - which could maintain Mies's aims in his absence - can be tested against the Commons.

Analysing as-built window detailing at the Commons, Beeby noted:

The glass portions of the enclosure system are developed in as systematic a manner as possible following the methods developed in Mies's office to generalise the details wherever possible, opening the possibility for repetitive pieces and procedures while satisfying the demands of a minimal aesthetic. In the Commons Building, inexpensive bar stock in standard sizes was combined and assembled in an ornamental iron shop and either welded in place on the job site or bolted in place where possible. [...] The window details are made up from ready-made pieces of steel just as the structural frame is assembled. Uniformity of formal expression for each system is maintained through the use of assemblies that disguise or betray their constructional origins in order to appear visually consistent. The appearance of an apparent industrialized system that also coincidentally follows the formal tendencies of a minimal constructivist aesthetic has replaced the prefabricated, genuinely technologically superior system found in the earlier buildings at IIT.¹⁵⁹

The project correspondence - letters, notes, memos, sketches, product literature, construction drawings and shop drawings - following the development of a slender and tall steel window frame supporting a large sheet of glass presents a discourse over structural capabilities, budget constraints, time constraints, alignment with other prefabricated components and standard liabilities, all of which demanded dependency upon negotiations and interpretations between numerous individuals, as design on the Commons began. Mies's letter to IIT's Jack Guard outlined

¹⁵⁹ Beeby, pp.15-16.

approximate costs for a '4 x 7 bay building',¹⁶⁰ projecting a budget range from \$1.03 to \$0.80 per cubic feet for a volume of 278,681 cubic feet as dependent on standards of finish.¹⁶¹ These figures, Mies stated, 'were established first by a comparison of other campus buildings and second by a rough material break down on the building':¹⁶²

The figure of \$.80/cu.ft. is a good figure when you consider that the A.R.F. mechanics Research Building was \$.88/cu.ft. and the A.A.E. Shop Building approximately \$.87 / cu.ft. It should be pointed out however that the interior finish would not be of the quality of the Navy or Metallurgy Building.¹⁶³

A budget of \$0.90/cubic foot was agreed by IIT Board of Trustees and Grounds Committee five days later on January 28 1953, upgrading Mies's original estimates, for a 'Shopping Centre - Commons Building' defined by a practical brief:

1. provide building in accordance with long range plan
2. Provide by fall dining room facilities for men and women resident students.
3. Enable Institute of Design to be moved to campus by fall.
4. Provide shopping facilities for apartment residents.
5. Landscape and clean up center section of campus.¹⁶⁴

An IIT press release following on 2nd March 1953 allowed a marginally more evocative language to describe the proposals:

¹⁶⁰ These costs were noted as based on drawings dated December 31 1952. Letter from Mies to Guard.

¹⁶¹ \$287,000.00 at \$1.03 / cu.ft. for 278,681 cu.ft., allowing for a Terrazzo floor, Acoustical tile ceiling, Granite platform at front, and Moveable wood partitions; or \$223,000.00 at \$0.80 / cu.ft. for 278,681 cu.ft., allowing for a Cement finish floor, No acoustical treatment, No platform at front, and Glazed tile partitions. Letter from Mies to Guard.

¹⁶² 'It should be made clear', the letter continued, 'that these Figures are approximated and could vary either way.' A basement was recommended as a 'good idea', due to the need to excavate six to eight feet through rubble on the campus sites (a result of previous demolition of existing buildings on the site), suggesting basement space at '\$0.50 / cu.ft., assuming the use of cement finish floor and concrete block partitions.' Letter from Mies to Guard.

¹⁶³ Ibid.

¹⁶⁴ Mies's focus on the economics of the project and corresponding quality aligned with the Committee's demands for economy, speed and efficiency, as highlighted by minutes of the January 28th meeting: 'It was concluded that the committee would recommend to the Executive Committee that approximately \$375,000 be made available for the construction of this building in accordance with the proposal submitted, and that pending approval of the Executive Committee, plans and specifications should be completed with the objective of having this building ready for service at the opening of the fall semester if at all possible.' Illinois Institute of Technology Board of Trustee Buildings and Grounds Committee January 29, 1953, IIT/Building and Grounds Committee Minutes 1943-1955/1998.213, IIT Archives.

The shopping center-commons was designed by Ludwig Mies van der Rohe, internationally recognized as one of the greatest living architects. Friedman, Alschuler, and Sincere, architectural engineers, were associates in the design. [...] It will be a one-storey welded-steel frame structure with large glass panels, characteristic of Mies van der Rohe's work. It will have sections of buff brick and will harmonize with the 13 completed buildings and two others now under construction on the Institute's fast growing campus.¹⁶⁵

These descriptions defined client expectations of the Commons as being economical and quick to construct, while also expecting the building to represent 'one of the greatest living architects.' The task of delivering Mies's own aims - that of perfecting industrial methods to a level comparable with mediaeval craftsmanship - would be pursued within an organizational context of standardized prefabricated components and delegation to others.

¹⁶⁵ Illinois Institute of Technology New Bureau, Press Release date 3/2/53, News Releases Jan-March 1953, IIT Archives.

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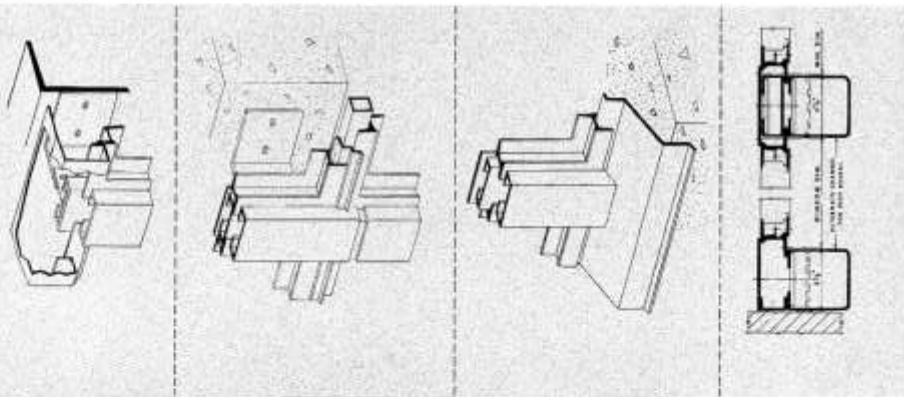
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9. The precise control of deviation at the Commons

9. The precise control of deviation at the Commons



Fig. 9.19 - Friedman, Alschuler & Sincere 1953 promotional brochure. Papers of Mies van der Rohe, Manuscript Division, Container Nos 1-64 Library of Congress.

9.7 Product catalogues and associate architects

Archives from Mies's office include product catalogues [Fig. 9.18] and correspondence following legal and regulatory requirements as evidence of the everyday activities of a mid-twentieth century architectural practice,¹⁶⁶ including a letter from Mies's office on July 30 1953 requesting Chicago's Municipal Reference Library to forward a copy of the "Zoning Code Book"; advertisements from the Speed-way Manufacturing Company, a Materials Service Corporation Redi-Mix Concrete promising 'Scientific Controls Guarantee'; an order form for Sweets Catalogue 1951¹⁶⁷ and a Christmas list noting twenty-eight cards the office had received from product manufacturers.¹⁶⁸ The promises of prefabricated products imbued everyday reality of Mies's architectural practice by the time work on the Commons began in 1953. The pragmatics of mid-twentieth century organization structures were captured, too, by the marketing brochures of the Associate Architects on the Commons, Friedman Alschuler and Sincere.

Mies's office's relationship with Friedman Alschuler & Sincere (FAS), the Associate Architects for the Commons, began with the 1946 Chemistry Building. An architecture and engineering practice, FAS's prior involvement with IIT campus had included an early proposal for masterplanning the campus in a Beaux-Arts style, a proposal which had predated Mies's appointment to IIT.¹⁶⁹ Formed in 1907, FAS, as

¹⁶⁶ The office archives noted here are filed at the Library of Congress.

¹⁶⁷ Sweet's is a cataloguing system which began publication in 1906 as a means to organize the 'several thousands' of catalogues which every architectural office by then received every year.' Shanken, *Sweet's Catalogue*, p.33.

¹⁶⁸ An internal office memo lists Christmas cards received in December 1953 from twenty-eight companies, including manufacturers such as The Kawneer Company, Johnson Fire Proof Door Co, Jalousie Doors, Crawford Door Sales Co. of Chicago, American Machine and Foundry Co, Rolscreen co. Library of Congress.

¹⁶⁹ A January 7, 1941 letter from the IIT President Heald notifies Mies that 'We are planning to announce our general programme for the campus development next Monday afternoon. In connection with the announcement some sketches of possible layouts will be used, and the Board of Trustees has decided out of respect to Mr Alschuler to use a sketch which he prepared shortly before his death. This sketch is not in any sense a final plan and details of the structures, of course, will not be developed for some time. I do not want you to feel that, before because the board is using Mr Alschuler's sketch, it represents any reflection on your work in connection with the program. It happens that he had prepared a sketch which shows a partial development of certain of the old buildings in use and which is not as comprehensive as the general programme on which you have been working, and the Board felt that at this time it would be best to show the picture in that way. As soon as an opportunity presents itself, I want to discuss with you certain factors with reference to the preparation of campus plans.' Library of Congress.

‘among the larger architectural and engineering firms operating on a national scale’ set out its philosophy in a 1958 promotional brochure [Fig. 9.19]:

TODAY, MORE THAN EVER, building is a matter of teamwork between architects, engineers, and the owner. When designers can work closely with the specialist to plan a structures’ mechanical and service features, there is a unified control of the result. They have maximum opportunity to produce a “successful building,” one which can be operated and maintained as efficiently and economically as it was built. [...]

Friedman, Alschuler & Sincere is dedicated to serving your needs and providing you with the most up-to-date solutions to building problems. They believe that when the American businessman builds, he’s primarily interested in good design to ensure excellent economy, flexibility, and long-range practicability.¹⁷⁰

The emphasis throughout the brochure, both in terms of working practices and of design itself, emphasized economy and efficiency, with no mention of the aims of art and spirituality which permeated Mies’s theoretical writings. FAS’s brochure, in contrast, highlighted ‘good design’ as a means towards the aim of ‘excellent economy, flexibility and long-range practicability.’¹⁷¹

The division of production tasks at the Commons reflected these contrasting philosophies. An IIT memo confirmed the relationship between Mies’s office as assigning ‘full responsibility for architectural services’ on a 2% fee to Mies’s office, and a 4% fee assigned to FAS to produce the bulk of construction drawings, [Fig. 9.20] in an economically and contractually defined division of design and production. Such archives narrate everyday bureaucracies as Mies’s office sought to uphold the aim of elevating industrial standards to the level of mediaeval craftsmanship amidst negotiations over structural challenges, costs, legal liabilities, and questions of responsibilities and control arising from the office’s use of details which deviated from standard components.

¹⁷⁰ FAS promotional brochure, filed with a cover letter to Mies from FAS on June 13, 1958. Library of Congress.

¹⁷¹ Ibid.

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Fig. 9.20 - The Commons, IIT. Blueprint drawing, Elevations (east, west, north, and south) and window sections. May 28, 1953. Mies van der Rohe, Architect / Friedman Alschuler & Sincere, Associate Architects and Engineers. Mies van der Rohe Archive, The Museum of Modern Art, New York. MR5203.80 © DACS 2015. © Photo SCALA, Florence 2015.

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Fig. 9.21 - Sketch of proposed alternate window mullion for the Commons, IIT, attached to a letter from Friedman Alschuler & Sincere, Associate Architects and Engineers, to Mr. L. Mies Van der Rohe, March 24, 1953. Mies van der Rohe Archive, The Museum of Modern Art, New York. IIT folder 113 © DACS 2015. © Photo SCALA, Florence 2015.

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Fig. 9.22 - Shop drawings for the Commons, IIT, from Hope's Windows, June 24, 1953, accompanying a letter from Hope's Windows to Myron Goldsmith, June 17, 1953. Mies van der Rohe Archive, The Museum of Modern Art, New York. IIT folder 114 © DACS 2015. © Photo SCALA, Florence 2015.

9.8 Alternates and customizations

A letter from FAS to Mies on March 24 1953 regarding steel muntins as proposed by the office of Mies van der Rohe outlined concerns expressed by FAS's structural engineer, Mr. Montgomery. The engineer, the letter conveyed, was 'greatly worried' over the section [Fig. 9.20, elevation of mullion denoted by author as 'A']:

the boys have developed for the muntin holding the large plates of glass [which] consists of a 1" x 2 1/2" plate with four 1/2" x 1 1/2" glass stops. These muntins are in some cases 15' long and are supported in these cases at the intermediate point by a horizontal section of the same size, which in turn is 12' long between supports.¹⁷²

The letter suggested that that unusual snow loads, unusual heat or cold, if the bearings are not ideal, or a strong wind, might cause glass breakage, and therefore they submit 'an alternate detail (copy of which is enclosed herewith) which we feel would eliminate this hazard.'¹⁷³ The alternate detail, [Fig. 9.21] a larger 1 3/4" x 5" steel channel with a flat bar welded to the channel to add additional stability, revealed a limitation of any standardized component - that it often permits only standardized design parameters. In this case, the structural capacity of standardized profiles were pushed to breaking point by a proposal for 15' long steel muntin. That steel sections were customized in order to maintain the appearance of an unusually tall and narrow profile given by Mies's office first highlights a process in which considerations other than the use of standard components and structural efficiencies were prioritized by those working on the project.

Other areas of window detailing were also challenged by economic efficiencies. On June 17th, 1953, a letter from Hope's Windows regarding the exterior operable sash windows [See Fig. 9.20, operable sash window elevation denoted 'B'], and directed to the attention of Mr. [Myron] Goldsmith, referenced a quote of \$5,395.00 for the manufacturing and delivery of:

sash and screens delivered in accordance with your detail and specification with the understanding that sash would be built into bar stock frames by the ornamental iron contractor. As cost of job

¹⁷² Letter from FAS to Mr. L. Mies Van der Rohe. Folder 114, MoMA.

¹⁷³ Ibid.

must be reduced we submit the following alternate for your consideration.¹⁷⁴

The letter described four alternate details, including one which suggested that 'If sash are made as per our detail our standard screen frame could be used in lieu of the tubular frame.'¹⁷⁵ [Fig. 9.22, presumed by author to be referencing plan detail 'G', which shows the screen frame profile] This letter referenced the Commons at a crucial stage of pre-contract bidding and negotiations. Written seven months into the project development, the letter proposed alternates for cost reductions, including this suggestion that the supplier's own standard details for operable window components be used in lieu of the custom profiles proposed by Mies's office.

An intense period of design development ensued between Mies's first costings in January 1953, and a drawing package deadline of May 11, 1953 for bidding¹⁷⁶ to take place in May-June 1953.¹⁷⁷ Blueprints note an issue date of May 28, 1953. [Fig. 9.20] In the beginning of June 1953, Mies left for a six-week trip to Europe.¹⁷⁸ From this point on, correspondence was directed to Mies's colleagues,¹⁷⁹ beginning with Gene Summers, and subsequently directed to Myron Goldsmith, Joseph Fujikawa,

¹⁷⁴ Letter from Hope's Windows to Miss [sic] Ludwig Van der Rohe, 17 June, 1953, ATTENTION: Mr Goldsmith. Folder 114, MoMA.

¹⁷⁵ The 'screen frame' referenced here is taken by the author to mean a frame to hold an insect screen, common in Chicago window detailing, primarily to prevent mosquitos, and usually removable as frame which clips into the fixed window frame.

¹⁷⁶ 'Bidding' is the term typically used in the USA for what the UK construction industry reference as 'tendering.'

¹⁷⁷ Following Mies's initial letter to Jack Guard on 23 January 1953, and the IIT Buildings and Grounds Committee minutes of 28 January 1953 approving construction of the Commons at a total budget of \$375,000. Early correspondence during the development phase included an internal FAS memo on 11 March, 1953, and a series of letters to Mies from FAS between March and April 1953, noting concerns from their Structural Engineer over Mies's office details for window mullions (25 March 1953), requesting drawings and details (3 April 1953), and requesting details of plumbing, heating, ventilation, and barber shop details (16 April 1953). General Conditions and Structural Steel Specifications and drawings were first issued on 27 April 1953, (later revised 13 May 1953) used in contract for the structural steel contractor, Hansell-Elcock (structural steel), and a final letter from FAS to Mies on 4 May 1953 requested drawings details by 11 May 1953 in order to complete by 2 June 1953.

¹⁷⁸ Evidence for these dates was discussed earlier in this chapter.

¹⁷⁹ From 13 May 1953, correspondence is no longer addressed to Mies alone, but directed to various colleagues in Mies's office. On May 13, 1953, FAS wrote directly to Gene R. Summers, sending Summers a copy of the structural drawings used for the contract with steel sub-contractors Hansell-Elcock. Bidding [tendering] took place between May and June 1953, with an AIA contract [between architect and client] dated 3 June 1953.

and finally David Haid, a twenty-five year old intern who had joined the office two years earlier.¹⁸⁰

Following their 17 June 1953 letter proposing alternates to align with standard details, Hope's forwarded 4 sheets of shop drawings to Myron Goldsmith on 23 June 1953, followed by another letter of 29 June 1953 which again discussed alternates for furnishing and erecting various components, with a basic sum of \$10,052.00 for:

furnishing and erecting 12 gauge pressed steel framing and imposts and heavy projected steel sash as shown on sketch sheet #1. [Clerestory windows] Screens are included freight allowed to be set by others.¹⁸¹

As negotiations between architect and windows supplier continued, an IIT Buildings and Grounds Committee meeting minutes reported on 19 June 1953 that the committee had 'reviewed and approved' the list of bidders and final plans and specifications. The Committee had received bids which exceeded the budget and set a deadline of 30 June 1953 for revised quotations: revisions, the Committee noted, had already been sent out. The pressure to reduce costs by a 30 June deadline was evident in Hope's 29 June letter, but negotiations continued beyond this point. It was not until 21 July 1953 that a proposal from Hope's to FAS outlined a sum of \$5,676.00 to:

Furnish and erect heavy section Projected windows as shown on attached print dated 6/10/53. Hope's to do all drilling and tapping for fixing screws and bed all sash in mastic cement.¹⁸²

This proposal included additional alternates to furnish and erect interior partitions, and excluded 'Glass, glazing, screen application nor field painting', introducing at least two more trades - glazers and painters - to the process of installing this detail. Bidding negotiations concluded on 24 July 1953 - with basement excavation

¹⁸⁰ 'Mr. Haid came to Chicago in 1951 to study at the Illinois Institute of Technology, where Mies van der Rohe was head of the architecture department. That year, Mr. Haid joined Mies's office, where he worked for 9 years' Anderson, 'David Haid'

¹⁸¹ Letter from Hope's Windows, Inc. to Miss [sic] Van der Rohe, Attention Mr. Goldsmith, RE: Commons Bldg, 29 June 1953. MoMA.

¹⁸² Letter from Hope's Windows to Friedman Alschuler & Sincere, Attention: Mr. Tom Friedman, RE: Commons Bldg. 21 July 1953. MoMA.

beginning the same date, prior to completion of final specifications¹⁸³ - with a ground breaking ceremony on 22 July 1953, at which Mies did not appear to be present.¹⁸⁴ The accepted bids from the General Contractor, Borg, had included over eighty cost reductions¹⁸⁵ and a cost-increase for exterior windows as detailed by Mies's office:

Exterior sash and screens to be as detailed in Mies Van Der Rohe's drawing as signed by Erik A. Borg Co. and Friedman, Alschuler & Sincere at this office. \$800.00 add.

Revision in window erection bid. \$400.00 add.¹⁸⁶

The Contract set out a finish date of 1 February 1954, with a clause including a penalty of \$1000 for not completing on time, a factor which would add further tensions to shop drawing reviews as the deadline approached. Revisions issued by FAS dated 7 August 1953, adding new sheets and revisions to the 28 May 1953 issue, highlighted that construction drawings were still in progress after excavation had begun.

In proposing unusually slender and tall steel window mullions which would achieve a slender aesthetic, but in doing so exceed the normal structural capacity of standardised steel channel sections, the detailing of the 15 foot tall muntins demanded a deviation from standardized components, as did the deviations in operable sash detailing which rejected the supplier, Hope's, own standardised

¹⁸³ 'Excavation for the basement of the Commons building was reported as having begun the day of the meeting. Subject to final revisions in contracts, and acceptance of final specifications, the committee approved and authorized contracts for construction of the building to the following firms at the approximate figures shown, totaling \$349,550. [...] To expedite construction, details of the commitments had been previously approved by the Executive Committee at its meeting on July 15 [...] The Commons building is scheduled to be completed and ready for occupancy about February 1, 1954. 24 July 1953, IIT/Buildings and Grounds Committee Minutes 1943-1955, Box 1998.213. IIT Archives.

¹⁸⁴ IIT Archives include a photograph of the Ground breaking ceremony, at which Mies does not appear to be present. Box SS-1, IIT Archives.

¹⁸⁵ 'A letter from FAS to the selected General Contractor, Erik A. Borg confirmed FAS's verbal acceptance of Borg's revised proposal for \$243,000.00 to 'complete all the general trades work for the construction of the new Commons Building' The letter referenced revisions which had taken place to reduce costs from a 'Revised Base Bid' of \$314,959.00, including; 'sash in basement to be commercially projected in lieu of as specified: [deduct] 6.00; Exterior sash and screens to be as detailed in Mies Van Der Rohe's drawing as signed by Erik. A. Borg and Friedman, Alschuler & Sincere at this office [deduct] 800.00; Revision in window erection bid [deduct] 400.00. Letter from FAS to Erik A. Borg Co. 23 July 1953. MoMA. A undated and unsigned typed document in MOMA Archives titled 'Re: Illinois Institute of Technology Commons Building contemplated Revisions' notes 80 contemplated revisions and associated cost adds / reductions.

¹⁸⁶ Letter from FAS to Borg 23 July 1953, MoMA.

details. Both sets of detailing eschewed standardised prefabricated curtain wall systems now available for purchase. [Fig. 9.18] The decision to avoid standardised prefabricated systems had already raised challenges: uncertainties regarding structural capacity, difficulties in aligning with other standardized components, pressures upon meeting budget constraints and time pressures in manufacturing and coordinating amongst several suppliers. As the project progressed, the additional constraint of liability requirements was highlighted by a letter from the IIT treasurer to Joseph Fujikawa on 28 August 1953 regarding interior door frames noted:

We have had our insurance company review the architectural drawings for the new Commons Building. They have made the following suggestions and raised the following questions.

1. The plans do not indicate using standard underwriters' laboratories listed frames, although the doors are so labeled. If we can use standard frames without additional expense, I hope that you will arrange for them. If not, let's leave the plans the way they are.¹⁸⁷

This letter highlighted the growing difficulty any architectural practice faced in specifying any non-standard component.¹⁸⁸ On 1 September 1953, David Haid replied to a letter from IIT Vice President and Treasurer Spaeth regarding further arrangements for an insurance company review of the Commons which had been addressed to Joe Fujikawa. Noting that Mr. Fujikawa had left for an extended vacation, Haid confirmed that he would now be looking after the project,¹⁸⁹ the fifth

¹⁸⁷ Letter from R.J. Spaeth, IIT Vice President and Treasurer, to Mr. Joseph Fujikawa, L. Mies van der Rohe, August 28, 1953. MoMA. An initial response from David Haid on 1 Sept 1953 redirected the query to Mr. Tom Friedman of FAS. A response from FAS on Sept 3 1953 assured Speath that 'Our specifications call for the labeled doors at the stairways in the basement to have labeled frames.' Letter from T. Friedman, Friedman Alschuler & Sincere, to Mr. R.J. Spaeth, 3 September 1953. MoMA.

¹⁸⁸ My own experiences as an architect in Chicago confirmed that many design detailing decisions in Chicago construction often deferred to Underwriters Laboratory catalogues of standard details, which had been tested and pre-approved to comply with City of Chicago Building Regulations for fire-ratings.

¹⁸⁹ [s]ince Mr. Fujikawa, of this office, has left for an extended vacation, I will be looking after this project. Please feel free to direct any questions regarding this work to me.' Letter from David Haid to Mr. Raymond J. Spaeth, 1 September 1953. MoMA.

member of Mies's office overseeing the Commons within a ten-month period while the practice was occupied with multiple commissions.¹⁹⁰

During September 1953, as foundations were being laid, negotiations were still taking place via shop drawings for interior metal mullions supplied by Hope's Windows, who had additionally proposed 'considerable changes from architects' details of large openings'¹⁹¹ recommending 6" deep mullions.¹⁹² An FAS cover letter to David Haid on 28 September 1953 enclosed letters from Hope's to General Contractors Erik Borg, and an inter-office memo from Hope's, which noted:

After careful study our engineering department has made some changes to the architect's details. These changes were based upon careful computations and we trust the architect will go along with our recommendations. Among other things please note that we show 7 gauge steel for the posts instead of 12 gauge. [...] Please let me know when your structural steel will be in place. If I can take actual site measurements it will save considerable time on erection by having the pieces cut to size at factory rather than hand fitting at the site.¹⁹³

¹⁹⁰ The July 24 1953 IIT Building and Ground Committee minutes detailed construction progress on a variety of other projects: the Association of American Railroads building was noted as virtually complete; Carmen Hall apartments were scheduled for the first family to move in on July 30 1953; work was progressing on extension of steam and electrical lines to Arcade and State street buildings, and organizational plans for campaign for funds for the Institute of Design-Architecture [Crown Hall] were proceeding. IIT Archives.

¹⁹¹ A 24 Sept 1953 letter from J.D. Graff of Hope's Windows to Eric A. Borg forwarded 3 sets of shop drawings 1A,2A,3A (interior partitions); 'After careful study our engineering department has made some changes to the architect's details.' An undated Hope's Inter-Office Correspondence from E. Olson, Engineering Department noted 'we have changed this considerable from the architect's details inasmuch as we feel that the hollow metal which is shown on his drawings is not sturdy enough for these large openings and we have computed that a vertical mullion at least 6" deep for the main mullion is necessary for these large openings and in order to keep the daylight size of these members down to a minimum and in keeping with the sizes on the architect's drawings we have set the glass directly into the mullions.' Both the Inter-office memo and the cover letter to Borgs were forwarded to Attention: Mr. David Haid, Mies van der Rohe by FAS on 28 September 1953, with the suggestion that 'we arrange a meeting with Graff of Hope if you are dissatisfied.' FAS cover letter to David Haid, 28 September 1953, enclosing 24 September 1953 Hope's letter to Erik A. Borg and undated Hope's Inter-Office Correspondence. MoMA.

¹⁹² Other pre-manufactured systems were also in shop drawing stage: shop drawings for Kawneer Company aluminum doors and finish hardware were forwarded by Harry U. Berg of Erik A. Borg Company to FAS on 21 October 1953; a quotation for Rolling doors was forwarded to David Haid by Cornell iron Works on 26 October 1953; and a contract from Modernfold Doors was forwarded to Mies's office on 2 November 1953. MoMA.

¹⁹³ FAS cover letter to David Haid, Mies van der Rohe, 28 September 1953, enclosing 24 September 1953 Hope's letter to Erik A. Borg and undated Hope's Inter-Office Correspondence. MoMA.

Buried within these numerous correspondences between numerous members of the design and construction team were indications of collaboration and the desire to match the intentions set out the by architect's drawings. An inter-office memo from Hope's Engineer noted:

we have changed this considerable from the architect's details inasmuch as we feel that the hollow metal which is shown on his drawings is not sturdy enough for these large openings and we have computed that a vertical mullion at least 6" deep for the main mullion is necessary for these large openings and in order to keep the daylight size of these members down to a minimum and in keeping with the sizes on the architect's drawings we have set the glass directly into the mullions.¹⁹⁴

The pressures of a tight schedule and negotiating numerous revisions to both the exterior and interior window frames were also apparent: Hope's inter-office correspondence concluded: 'We hope that you will urge the architect to give this matter his prompt attention because I believe they expect these frames to be shipped from our plant early this fall.'¹⁹⁵ Two weeks behind schedule,¹⁹⁶ and working to a relatively tight budget in comparison to other IIT projects,¹⁹⁷ any proposed revisions to time or construction from architect, builder, subcontractor or supplier were subject to close scrutiny as the contractual Feb 1st deadline and £1000 penalty approached.¹⁹⁸

¹⁹⁴ Ibid.

¹⁹⁵ Ibid.

¹⁹⁶ A 10 December 1953 IIT Building and Grounds Committee minutes reported that 'Construction on the Commons Building is progressing satisfactorily, although the work is approximately two weeks behind schedule. The roof is being installed, and masonry work is in final stages, so that work can continue over the winter months. It appears that the building will be ready for occupancy about March 1, 1954.' 10 December 1953, IIT/Buildings and Grounds Committee Minutes 1943-1955, Box 1998.213. IIT Archives.

¹⁹⁷ A number of internal Mies office documents archived in the Edward L. Duckett collection Art Institute of Chicago, compared cost data of the offices' buildings in this period. An undated and unsigned handwritten note compares the cost of the Commons Building as of 21 Jan 1953, noting 'Building about 21% completed at this time' with Carmen Hall as of 21 Jan 1953, 'building finished and occupied.' Total cost, unit price / sq.ft. and unit price/cubic ft were compared; with Commons noted at \$365,729.63 total; \$11.21/sq.ft; \$0.77/cu.ft as compared to \$981,622.59 total; \$13.23/sq.ft; \$1.37/cu.ft for Carmen Hall. An undated and unsigned typed note compares 'Cost Data' of Commons (\$11.00/sq.ft; 0.75c/cu.ft), 860-880 Lake Shore Drive (\$10.75/sq.ft; \$1.04/cu.ft.), AAR Mechanical Laboratory, IIT (\$16.70/sq.ft; \$0.85c / cu.ft) and 'Architecture Building [Crown Hall] (\$13.60/sq.ft / \$0.78c/cu.ft). 1986.2 Series 1 Box 1, Folders 1.10 and 1.11, Duckett Collection, Art Institute of Chicago.

¹⁹⁸ As set by the letter from FAS to Erik A. Borg Co. 23 July 1953.

A 7 January 1954 letter from FAS to Erik Borg responded to 'claims made in your letter of December 29th', which logged complaints regarding the timely review and return of Shop Drawings.¹⁹⁹ FAS responded:

Our records indicate that there have been delays in obtaining final approval in shop drawings. Our records also indicate that this was not due to the Architect's negligence. You have worked with similar architectural associations before and know that shop drawings have to go through two offices. Even with that situation, there was only one case where shop drawings were held in the Architect's office for two weeks. These were the shop drawings for the exterior sash frames.

Before these drawings were returned to you, your subcontractor reviewed these details with us, in order to get approval on pre-assembling these frames in the shop. Agreement was reached on the corrections to be made. In other words, the returning of the drawings to you was a matter of record as your subcontractor already had received marked up drawings.²⁰⁰

This letter highlights again the growing complexity of architectural practice and construction as approvals navigated several layers of organizational scrutiny. As disputes were raised and rebuked, the February deadline passed without completion: the Commons finally opened in May 1954.²⁰¹

'We have no control'

Before receiving an AIA Citation of Merit on 12 April 1955, the building received less favorable reviews from IIT, who complained that the windows leaked. A 14 May 1954 letter from FAS had acknowledged Spaeth's dissatisfaction 'with the action you were receiving in completing the above building', attaching a copy of a punchlist made by 'Merris Cryer, Hay and Haid, May 13 1954' and highlighting tensions between economy, speed and quality of work at the completion of the project:

¹⁹⁹ Clearly with the impending contractual 1 February 1954 deadline and the \$1000 penalty clause in mind.

²⁰⁰ Letter from Tom H. Friedman, FAS to Erik A. Borg, 7 January 7 1954. MoMA.

²⁰¹ A March 31 1954 Building and Grounds Committee meeting minutes, reported that 'the Commons Building is almost complete, and delivery of the building is expected by April 15.' The same minutes reported that construction was progressing on Cunningham and Bailey Halls, and '[t]he Institute Architect is continuing his preliminary specifications and drawings for [Crown Hall] building.' 31 March 1954, IIT/Buildings and Grounds Committee Minutes 1943-1955, Box 1998.213, IIT Archives.

As you know, we omitted the continuance of a full-time superintendent in the interest of economy and only have a part-time superintendent on this project. Our office personnel realizes that the Illinois Institute of technology received a priority in any expediting or “pushing” needed to complete the project. We, in attempting to complete any project, repeat to Owners and clients information received from the contractors, and in many instances make personal inspections of the manufacturers supplying certain items to determine the exact status. But, of course, we have no control over manufacturing schedules or disposition of labor.²⁰²

‘We have no control’, FAS’s letter stated, ‘over manufacturing schedules or disposition of labor.’ In lieu of the ‘mechanization in dizzying perfection’ which Mies had ascribed to Ford in the 1920s, details for steel muntins and steel operable sash frames for the Commons’ windows alone had now involved negotiations between five architects in Mies’s office, Associate Architects and their structural engineers; the General Contractor; the Ornamental Iron contractors; Hope’s Windows and their engineers; glazers; and painters, and had, as yet, been unable to control the processes. Locating the source of responsibility for a leak would now prove to be problematic, as a 4 June 1954 letter from Spaeth to David Haid referenced:

We do not seem to be getting much satisfaction through Friedman, Mr. Ray, or dealing directly with the contractors. There is a tendency to pass the responsibility from the contractors responsible for the masonry, window frames, and glazing.²⁰³

Spaeth’s complaint of the tendency to pass the responsibility between the various parties involved highlighted an ongoing condition of increasingly systematized architectural practice - that of a complex and often inscrutable network of contractors, sub-contractors and suppliers, supplying and installing a multitude of prefabricated components of varying origins. When something did, inevitably, go wrong, it could be almost impossible, as Spaeth noted, to pinpoint the source and the solution for the problem. It was not the materials themselves, but the joint between them which failed, creating physical and contractual challenges as all

²⁰² Letter from Edwin M. Sincere, FAS to Mr. R.J. Spaeth, 14 May 1953. MoMA.

²⁰³ Letter from R.J. Spaeth to Mr. David Haid. 4 June 1954. MoMA. On 7 June 1954, Haid confirmed in response that he had contacted the contractors, Borg, requesting immediate action; Borg in turn had contacted the ornamental iron sub-contractor, Gerber Ornamental Iron, to complete caulking around the frames. A subsequent June 9th letter from David Haid to Erik A. Borg complained of continued leaks and requested that Borg contact Gerber to correct: ‘Apparently Gerber Ornamental Iron Works corrected some of the caulking in these window frames, but failed to carry their caulking all around the frames.’ Letter from David Haid to Erik A. Borg, 9 July 1954, MoMA.

sought to locate the source of the leak and the source of responsibility. Spaeth's observation in 1953 captured a growing challenge for architectural practice and the construction industry: that of locating the source of responsibility where several components met, despite the promises of precise industrial standardization which had been in sight since the turn of the nineteenth century.²⁰⁴

Industrial standardisation had held the promise of abstracting decision making to a generic, universal, recurring certainty. The Commons, despite the apparent certainty of construction with the same design team, on the same campus, for the same client, with the same materials, in the same era, demonstrated that every project brought with it its own idiosyncrasies, its own actors, its own particularities of engineer's preference, architect's decision, and suppliers' preferred standards. Even a joint between two components, when it leaked, highlighted the individuality embedded in the project. Despite promises of industrial standardisation to override the 'irresponsibility of personal opinion', the importance attached to Mies's personal control was upheld not only by biographers, but by IIT itself in an office memo of 5 August 1958 following 'a luncheon meeting' between Joseph Fujikawa and IIT President, R.J. Spaeth. Summarizing reasons cited by IIT for awarding IIT commissions to architects other than Mies, Fujikawa listed:

1. Our office did not produce work fast enough.
2. Felt we no longer had any strong interest in campus:
 - a. Mies limited in attention to campus work
 - b. Felt they had to work with the "junior architect" rather than a senior.
3. Did not like the idea of Associate Architects on campus buildings and consequent "divided responsibilities".
4. "Always a battle" to get something which they considered practical and functional in design.²⁰⁵

²⁰⁴ An IIT press release in Nov 29 1955, a year after the completion of the Commons, announced a building technology conference to be held in the Commons, titled 'Doorways to Progress in Building.' With talks from Bruce Alonzo Godd, Mies, Douglass Haskell (editor of Architectural Forum), 200 architects contractors and engineers were expected to attend, and the program included a talk, 'Problems of jointing dissimilar materials' by Charles G. Rummel of Naess Murphy, Chicago, architects for the new Prudential Building.' News Releases, Oct-Dec 1955, IIT Archives.

²⁰⁵ Joe Fujikawa, 'Memorandum RE Luncheon Meeting with R.J. Spaeth on August 5th, 1958.' Library of Congress.

Several key challenges pertinent to any professional architectural practice in mid-twentieth century USA were captured in this memo highlighting conflicting demands imposed by client and by Mies himself.

Firstly, IIT communicated expectations that each project would be economically and expediently delivered, and receive Mies's personal attention. The perception that projects were delegated to junior and associate architects is borne out by Commons' correspondence, which tracks the project through five architects, partly during Mies's personal absence, finally led by the 25 year old David Haid.

Secondly, IIT's claim that it was 'always a battle to get something which they considered practical and function in design' reveals the extent to which Mies's interpretations of the promises of industrial standardization differed from his clients. Mies's writings had consistently tempered visions of industrial standardization with the critical caveat that industrialization remained the means, never the end. The end remained spiritual, an elevation of industrialized standards to the level of mediaeval craftsmanship, to an art. IIT's review as reported by Fujikawa's memo offered no recognition of this critical nature of Mies's work, nor of the international recognition his work had been accorded.²⁰⁶ The language employed to account for IIT's dissatisfaction highlighted the most pragmatic of matters: speed, economy, accountability, practicality, functionality.

Mies's pragmatic letter to Jack Guard in 1952 had conveyed an understanding of and respect for the motivations of a commercial client.²⁰⁷ 'These were', Mies recalled of the IIT campus buildings in a 1959 interview at the AA, 'the cheapest campus buildings anywhere in the States.'²⁰⁸ To open and maintain a professional practice in an unfamiliar architectural culture, balancing innovation, ambition, economy and efficiency and to operate a practice running thirty projects in six states

²⁰⁶ Spaeth said he personally could and would have worked with us but felt that it would entail a great deal of effort, "constant battle" and the school would end up with something which they felt did not completely meet their requirements. "The Architecture Building exposed the administrative offices upon entering building." Joe Fujikawa, 'Memorandum RE Luncheon Meeting with R.J. Spaeth on August 5th, 1958.' Library of Congress.

²⁰⁷ Kevin Harrington emphasized "how cheap Mies's buildings were [...] it's astonishing what he was able to produce for such a low amount of money. The line in Mies's office was[...] that, as an architect, he was obliged to do the best work for the client, regardless of what the fee was. If you took the commission, then you were obliged to do the best that you possibly could." Harrington interview.

²⁰⁸ Cadbury-Brown, p.35.

and two countries demanded some degree of delegation, which could, in theory, have been controlled by a precisely defined, tested, and refined architectural system overseeing all design decisions from Masterplan to window detail.

9.9 Permitting deviation

'Advancing technology', Mies stated in 1964:

provided the builder with new materials and more efficient methods which were often in glaring contrast to our traditional conception of architecture. I believed, nevertheless, that it would be possible to evolve an architecture with these means. I felt that it must be possible to harmonize the old and the new in our civilization. Each of my buildings was a statement of this idea and a further step in my search for clarity.²⁰⁹

As the sixteenth building to begin construction at IIT, the Commons could reasonably have been expected to manifest Mies's aims of industrialized perfection, promising a perfected standardized system on a modular masterplan with a repetitive palette of materials, under the control of an office in which every architect on the project had been trained at IIT under Mies's curriculum. Given these conditions, the processes involved in detailing a window at the Commons appear, as documented by project correspondence, to be surprisingly complex. That such negotiations were still in play on the IIT campus in 1953, following fourteen years of development, with fifteen constructed or in-construction precedents, on the same site, for the same client, using the same materials, with an overriding aim of perfecting industrial method, highlights the challenge which faces any attempt to elevate standards of architectural quality to the level of mediaeval craftsmanship.

While Werner Blaser identified the Commons as receiving 'special attention' and as being put together 'with more care and exactness'²¹⁰ than other campus buildings, Beeby's analysis of the Commons as differing from other earlier projects on the IIT campus had argued that as-built detailing presented 'the appearance of an apparent industrialized system' in contrast to 'the prefabricated, genuinely technologically superior system found in the earlier buildings at IIT.' Beeby ascribed this to a shift in

²⁰⁹ 'Mies van der Rohe: a personal statement by the architect, 1964', in Werner Blaser, *Mies van der Rohe* (London, Thames and Hudson, 1972), p.10.

²¹⁰ Werner Blaser, *Mies van der Rohe: IIT Campus, Illinois Institute of Technology, Chicago* (Basel; Boston; Berlin, Birkhäuser, 2002), p. 14.

Mies's attention from the pursuit of a systematised detailing dependent on generalised, uniformly dimensioned component.²¹¹ The Commons is thus designated by Beeby as the last of Mies's projects which attempted - and failed - to manifest the perfection of standardized industrial components.²¹²

Earlier predictions of industrialised standardisation had promised control over deviation, over the irresponsibility of individual opinion. The extraordinarily precise predictions which set out the vision for the IIT masterplan, conceptually controlled from urban to detailed scale by scientifically determined grid proportions, a limited palette and an ethos of truthful use of materiality. In pursuing the elevation of industrial methods to the level of mediaeval craftsmanship, the processes of detailing at the Commons - and throughout Mies's American work - challenged not only practicality, constructional or structural efficiency, or normative construction practices, but also conceptual canons Mies had expressed in earlier writings: the search for 'truthful expression';²¹³ 'the clarifying principle of order which leaves no room for deviation.'²¹⁴ The project correspondence, sketch drawings and shop drawings which accompanied the development of the steel window sash narrate a customized, lengthy, and at times contentious process, rather than a straightforward assembly of standard industrially produced components. Any deviation from standard construction processes and components demanded an extraordinary level of attention, negotiation and tenacity from several consecutive architects in Mies's office in upholding an architectural intent. Such efforts return us to the challenges identified by David Leatherbarrow in deviating from familiar products or acceptable solutions.²¹⁵

Put simply, standard section steel window components at The Commons would have appeared visually too heavy. Where standardized elements did not fulfill aesthetic priorities, they were rejected, adapted, or redesigned as customized components. Such deviations in detailing from standard practices and components,

²¹¹ Beeby, p.20.

²¹² Ibid., p.20.

²¹³ 'Step I is an investigation into the nature of materials and their truthful expression.' Letter from Mies van der Rohe, the University Club, 1 West 54th Street, New York City, to Mr Heald, 10 December 1937 [translation]. Library of Congress.

²¹⁴ 'For this reason I have undertaken to develop a curriculum which in itself incorporates this clarifying principle of order, which leaves no room for deviation and which through its systematic structure leads to an organic unfolding of spiritual and cultural relationships.' Ibid.

²¹⁵ Leatherbarrow, p.130.

and the resultant complexities, may have emerged in Mies's absence or lack of direct involvement - the project in the hands of multiple authors, including junior architects, at a time when Mies was either physically absent or occupied with other projects. Non-standardized components required negotiations between individuals who each oversaw a specific stage of the process at a different stage in time. A different window supplier might have brought a different alternative to the table; a different project architect might have agreed a different solution. In accepting deviation from standardized industrial components in pursuit of an architectural intention - that of achieving an exceptionally tall and slender window muntin profile which exceeded the structural capacity of the selected standardized profiles - the Commons was by no means an anomaly. Perhaps a similar review of earlier works at IIT might reveal a more streamlined process of technological perfection, although Navy Building, Farnsworth House and 860-880 Lakeshore Drive manifest similar ambiguities in detailing, despite Mies's personal attentions. Rather, as biographies and Mies himself highlighted, and as brick wall constructions at IIT, welded joints at Farnsworth House, 860-880 Lakeshore Drive and the Commons attested, Mies routinely deviated from his own declarations of truthfulness and clarity.

Neumeyer emphasized that '[t]he convergence of technology and art may be considered to be the essential theme of the architecture of Mies van der Rohe, rather than the achievement of technical perfection, as many a critic has suggested',²¹⁶ and elsewhere described the 'conceptual ambivalence that hid in the words "building art".²¹⁷ Hill highlighted Mies's dismissal of functionalism, and cited Tafuri's definition of 'the ambiguous object' in summarizing ambiguity as 'the ability to resist resolution and continually stimulate the imagination.'²¹⁸ Furthering analyses of Mies's precision as ambiguous in an evaluation of Mies's pursuit of 'clear construction', Detlef Mertins observed that Mies's design practices could not be 'distilled into a simple yes or no'. Over the past few decades, Mertins wrote:

Scholars have come to consider Mies's expression of structure a bit of a ruse. While he exposed structure in a literal way, he also took liberties with it for the sake of its expression. He manipulated engineering logic so that it would assume the appearance of structure, even if at times this appearance was not direct it was even misleading [...] Scholastic thought also helps to illuminate

²¹⁶ Neumeyer, 'Architecture and Technology', p.74

²¹⁷ Neumeyer, *The Artless Word*, p.196.

²¹⁸ Jonathan Hill, *Weather Architecture* (Abingdon, Oxon: Routledge, 2012), p.181.

this combination of functional truth and illusion. 'The flying buttress learned to talk, the rib learned to work, and both learned to proclaim what they were doing in language more circumstantial, explicit and ornate than was necessary for mere efficiency' [...] Panofsky tells us that the choice 'all is function – all is illusion' did not apply in twelfth and thirteenth-century architecture.²¹⁹

For Mies, Mertins continued, 'like the scholastically informed builders of Gothic cathedrals, achieving the visual logic of a building was not arbitrary artistry but rather central to the task of Baukunst, or what Peterhans called 'the beautiful appearance of appearance.'²²⁰ 'The manner in which Mies brings together steel, brick, and glass', Arthur Drexler summarized, 'is made to carry the full burden of the art of architecture.'²²¹

Industrialization, Mies had emphasized, was only a means, never an end. The pursuit of industrial standards to the level of mediaeval craftsmanship at the Commons emerged not from the certainties of precise systematisation, but from the ambiguities of precisely considered deviations from standards. Whether the Commons can be read as an anomaly or failure as a consequence of a lack of attention on Mies's part as it passed between five architects, or whether it embodies the actualities of elevating industrial production to an art by permitting customizations, manipulations and deviations necessary to elevate any 'standard', the Commons reveals, first, that no matter how standardised the system, construction will deviate from precise predictions. Second, the Commons narrates the lengths to which a mid-1950s USA architectural practice was required to go to in pursuing an extraordinary quality, in deviating from standardised materials and methods. Precision at the Commons was upheld not in terms of exact alignment with an objective of industrialised perfection, but in support of the ambiguities of elevating standard industrialised construction to an art. Fifty years later, OMA's McCormick Tribune Campus Centre, adjoining Mies's Commons, offered an emphatically ironic response to an architecture culture framed by competing desires for innovation and risk, efficiency and certainty.

²¹⁹ Detlef Mertins, *Mies* (London; New York: Phaidon, 2014), p.312, citing Panofsky, Erwin, *Gothic Architecture and Scholasticism: An Inquiry into the Analogy of the Arts, Philosophy and Religion in the Middle Ages* (New York: Penguin Books, 1951), 57-8.

²²⁰ Mertins, p.331.

²²¹ Arthur Drexler, *Ludwig Mies Van Der Rohe* (London: Mayflower, 1960), p.25.

10. A precisely crude ceiling at the MTCC



Fig. 10.1 - 'IIT' Green Board ceiling, McCormick Tribune Campus Centre, photographed 2010.

10.1 A 'crude' ceiling

The final detail I will consider in this group of four close readings is an exposed 5/8" Water-resistant Green Gypsum Board Ceiling¹ [Fig. 10.1], in the Office of Metropolitan Architecture's (OMA) 2003 McCormick Tribune Campus Centre (MTCC), a 10,609m² campus centre at the Illinois Institute of Technology (IIT), Chicago [Figs 10.2-10.7]. This project emerged from an international design competition which stated an aim of 'renewing the IIT Mies campus' and was perceived by Chicago architectural critics as an opportunity to 'light a creative spark in Chicago.'² This ceiling, referenced by OMA as the 'IIT ceiling', is read here in the context of *Chicago Tribune* architectural critic Blair Kamin's³ critique of OMA's 'crude' detailing, a claim underscored in a Chicago context by the MTCC's controversial relationship with Mies van der Rohe's Commons Building.

As explored in Ch.9, project correspondence for the Commons highlighted a process in which even the most precisely conceived standardised system was repeatedly superseded by an overriding aim of elevating industrial methods to craftsmanship: an aim which, at the Commons, permitted deviations from standardised construction processes and components. At the MTCC, project correspondence for the IIT ceiling follows a process in which a deviation from standard construction processes demanded extraordinarily precise attention and care, contrasting criticisms of crude detailing in OMA's work and highlighting the

¹ Research for this chapter has been published as Mhairi McVicar, 'God is in the details/'The detail is moot': A meeting Between Koolhaas and Mies' in Adam Sharr, (ed) *Reading Architecture and Culture: Researching Buildings, Spaces and Documents* (London: Routledge, 2012), pp. 165-178.

² 'The competition provides a chance to light a creative spark in Chicago, which has hardly set the world on fire of late [...] With a new building boom going on here, the example IIT sets is particularly important.' Blair Kamin, 'Beyond Mies: IIT pushes the architectural envelope again with its design contest for a new campus center. But to what end?' *Chicago Tribune*, 31 Aug 1997, Arts and Entertainment, p.1.

³ Blair Kamin has been architectural critic for the *Chicago Tribune* since 1992, and holds a Pulitzer prize. The *Chicago Tribune* is the highest circulated newspaper in the Chicago metropolitan area, followed by *Chicago Sun-Times*. Of interest to this thesis is the *Tribune's* central role in the controversies which surrounded the selection of OMA and the decision to subsume the Commons into the MTCC – John Vinci choosing to publish his letter of protest in the *Tribune*, to which Koolhaas directly responded with the essay 'Miesstakes' – and that Kamin challenged Koolhaas's stance on detailing in comparison to a Miesian stance, receiving a response from Koolhaas directly, and later adjusting his stance on the definition of success at the MTCC, as this chapter discusses. For Kamin's biography, see <http://www.chicagotribune.com/news/columnists/chinews-blair-kamin-20130507-staff.html> [accessed 2 August 2016].

ironical underpinnings of Koolhaas's statements on the absence of the architectural detail in contemporary architectural practice.

The question of precision in the production of the 'IIT ceiling' is explored through written specifications, sketches, construction drawings and interviews with project architects, again turning to what Yaneva referred to as the 'banality' of the concrete details of architectural practice.⁴ In addition to written and drawn documents from architectural practices involved with the project, conceptual statements by the design team and reviews by architectural critics highlight relationships between stated architectural intentions and interpretations of the constructed results. As with the previous studies, this chapter does not review the detail itself, but rather reflects upon what its production reveals about contemporary architectural practice.

The precise specification of a 'crude' ceiling is explored here as embodying and self-parodying observations made by Koolhaas in his writings 'Bigness'⁵ and 'Junkspace':⁶ that the detail is moot and absent. In actuality, this chapter argues, a 'crude' ceiling at the MTCC was extraordinary in the precision of its detailing, emphasising the challenges any contemporary architectural practice faces as they attempt to embrace risk and deviate in any way from the standardised specifications of prefabricated components. At the MTCC, Koolhaas's charge that the detail is now moot, apparently embodied, as critic Blair Kamin claimed, by a 'crude' and 'unfinished' plasterboard ceiling, is instead rhetorically manifested by an exceptionally precisely specified detail which embodies an ideological critique of an architecture created by the certainties of standardised products.

⁴ Yaneva, p.12.

⁵ Rem Koolhaas, 'Bigness or the problem of Large' in Koolhaas, *S,M,L,XL: small, medium, large, extra-large*, pp.495-516.

⁶ Rem Koolhaas, 'Junkspace', in Rem Koolhaas; Nobuyuki Yoshida; Office for Metropolitan Architecture, *OMA@work.a+u* (Tokyo: a+u Publishing, 2000), pp.16-24. Also published in Chuihua Judy Chung; Harvard University. Graduate School of Design. Harvard Design School guide to shopping (Köln: Taschen; Cambridge, Mass: Harvard Design School, 2001), 408-421, and *Obsolescence* 100 (Spring 2002) 175-190.

10. A precisely crude ceiling at the MTCC



Fig. 10.2 - McCormick Tribune Campus centre from 'El' tracks, photographed 2010.



Fig. 10.3 - McCormick Tribune Campus Centre from State Street, photographed 2010.



Fig. 10.4 - A meeting between OMA (left, MTCC, 2003) and Mies (right, the Commons, 1954), photographed 2010.

10. A precisely crude ceiling at the MTCC



Fig. 10.5 - Interior, McCormick Tribune Campus Centre, photographed 2010.



Fig. 10.6 - Interior, McCormick Tribune Campus Centre, photographed 2010.



Fig. 10.7 - Interior, McCormick Tribune Campus Centre, photographed 2010.

10.2 The Final Specification, Issued for Construction

The 'Final' Specification, Issued for Construction on 4 January 2003, for the 'exposed 5/8" Water-resistant Green Gypsum Board IIT MT Campus Centre Ceiling (a.k.a the 'IIT Ceiling')' is a six page written specification for an exposed green-board ceiling throughout the MTCC. One excerpt, the specification for the spackle - the exposed plaster covering a screw fastener hole or joint - over a screw hole reads:

Screw (fastener) holes:

All screw holes are to be spackled. Two (2) coats of joint compound are to be applied to each screw hole. The 2nd coat is to be applied with a 4" knife. Both coats shall be applied with a consistent right-hand sweep and with the final coat applied square to the orientation of the panel. The final coat should approximate a 4" x 4" square, see SK-X43. No sanding of the spackle or exposed green board should take place between and after coats. The spackled and exposed areas of green board should NOT be sanded.⁷

The specification here outlines, in addition to the materials themselves, the manner in which spackle coats are to be applied by the installers - a consistent right-hand sweep - and the tools to be used by the installer - a 4" knife. This specification for the exposed greenboard ceiling alone was developed over at least a 12 month period,⁸ requiring negotiation and dialogue between architects in OMA's New York office, Holabird & Root, Chicago, Studio Gang, Chicago, General contractors; ceiling subcontractors and product suppliers, as a response to a 'value engineering' exercise which had removed an apparently superfluous proposed layer of decorative plywood from the ceiling throughout the public spaces of the MTCC.

A Value Engineered ceiling

The 'IIT' ceiling at the MTCC began life as a precisely detailed plywood finish of 4'-0" x 8'-0" x 3/8" panels, applied over a layer of Type X taped greenboard (GPDW)⁹

⁷ Studio Gang / O'Donnell, 'FINAL Construction Specification / IIT MTCC, Issued for Construction. Specification for: The Exposed 5/8" Water-resistant F=Green Gypsum Board IIT MT Campus Center Ceiling (a.k.a. the 'IIT Ceiling'). 4 January 2003. Forwarded to author by Mark Schendel.

⁸ The written correspondence obtained by the author begins with an email from Anne Filson of OMA NY on 4 April 2002, which forwarded images of Prada NY as a precedent of exposed gypsum board.

⁹ Illinois Institute of Technology. Architect: Office for metropolitan Architecture with Holabird & Root, 'McCormick-Tribune Campus Center. Interior Details – Ceiling. Sheet No: A13-2. Drawn J.S. / J.J. Project No. 14048. 4-6-01 Issued for bids and permit. [April 06 2001] /

to meet City of Chicago building code flame spread ratings. When value-engineering¹⁰ required a 'big-ticket' item¹¹ to be removed from the scope of work to reduce costs,¹² the plywood was targeted as a superfluous layer, and consequently omitted, leaving only the greenboard layer in place.

For a building which was low and horizontal in form with an expansive and visually prominent ceiling, this was a decision which carried significant aesthetic and conceptual consequences. Rather than proposing a conventional paint finish over the greenboard layer, as per standard construction practice, the design team specified in October 2002 that the surface of the green gypsum board ceiling should be left unfinished, exposing taped and spackled joints and fastener heads¹³ referencing a detail which had appeared the previous year in OMA's Prada New York as a wall application.¹⁴ That the specification for this deviation from standard

Details 1/A13-2 and 15/A13.2. Unpublished construction drawing. Forwarded to author by Greg Grunloh.

¹⁰ Mark Schendel noted 'the budget pressure was immense' and that the university was 'just trying to get the project done without going enormously over budget, but they had severe problems with cost and the architecture team had, by this time, grown very weary of cost cutting, because they'd cut it several times. [...] After the structure was built, the finishes package, the interior package came in to be substantially still over. And so the question about changing details based on changing finishes is all about having had to cut, I think, it was in the order of 30% of the finishes budget out of that budget, and that's very tough to do at the end of the day, when you're down to the finishes of the building, to cut 30, a third of your finishes budget out, is very, is almost impossible to do.' Mark Schendel interview with author, 10 May 2010.

¹¹ Greg Grunloh, project Architect, Holabird & Root (Architects of Record) noted, 'the exposed gypsum board, just taped green board that's showing the spackle joints and so forth- that was all supposed to be wood ceiling, and, you know, as we were analysing the budget, we had to have the gypsum board Type X behind the wood ceiling anyway, in order to meet our flame spread for City of Chicago Code. So essentially we were building two ceilings, we were building the Gypsum Board ceiling and the wood ceiling. So, as we got into Value Engineering, it was an easy target, because the wood itself, for the whole building, was, like, a million dollars, so it was, you know, when you're doing it, it's easier to look for the big ticket items rather than death by a thousand cuts, sort of thing.' Grunloh interview.

¹² A 16 May 2002 *Chicago Tribune* article referenced delays in the construction schedule: "We're sprouting above ground, finally," said Donna Robertson, dean of the school's College of Architecture, alluding to the tangle of construction problems that have pushed back the scheduled completion of the campus center to spring 2003 from spring 2000', Blair Kamin, 'IIT's new groove tube ; Its campus is rated among the ugliest, but the school that Mies built is fighting back - with, what else, splashy architecture' *Chicago Tribune*, May 16 2002, Tempo, p.1.

¹³ Greg Grunloh interview with author, 13 May 2010.

¹⁴ OMA's Prada New York opened in December 2001. An email from OMA NY read: 'Specifications for the Prada NY green GWB, for which we had an 8'h x 12'w control sample; Gyproc Moisture Resistant (MR) Board by British Gypsum. 12.5mm thk. board w/ tapered edges (1200mm x 3000mm panel size). "A gypsum wallboard with silicone additive in the core encased in water repellent green coloured paper liners. Suitable as a base for ceramic tiling also as external soffits in sheltered positions. Tapered or square edge versions available." http://www.british-gypsum_bpb.co.uk. The wall panels were cut to equal widths per elevation and then taped and spackled. At least two coats of joint compound were applied to vertical edges only: 6" knife for flat joints and outside corners; 4" knife for inside

practice was derived from an extraordinarily precise specification¹⁵ for a newly constructed precedent¹⁶ did little to diminish concerns raised by the MTCC's contractors, sub-contractors and product suppliers, who cautioned that leaving the ceiling exposed would not align with standard product manufacturer recommendations.

Contrary to the manufacturer's recommendations

'The conflict,' a Request for Information (RFI) issued on 18 October 2002 by the contractors and ceiling subcontractor to Holabird & Root, 'is that the installation of this product' - exposed water resistant gypsum panels as a finish ceiling surface - 'is contrary to the manufacturer's recommendations. Please advise.'¹⁷ The subcontractors highlighted concerns over conflicts between design and application of the ceiling panels, referencing 'issues of aesthetics and practicality' such as 'Color variation of unfinished green-board will be out of our control' and raising concerns over how 'blemishes' in the surfaces would be touched up.¹⁸ Classified as 'Level 2' by the Gypsum Association, exposed gypsum board is specified for typical use 'in garages, warehouses and other places where appearance is not a primary concern.'¹⁹

corners. A right hand sweep was applied over vertical screw holes that were approximately 18" o.c.'. OMA NY 'Prada GWB specs for IIT', fax to Mark Schendel October 7 2002. Forwarded to author by Mark Schendel.

¹⁵ Albena Yaneva discusses the frequency of recycling of ideas which takes place in OMA's office: 'Going back and reusing an old, concept-bearing model is synonymous with efficiency. It reassures the architects that all the efforts and work invested will be rewarded, that the research that has been done and the ideas that emerged will not die, and that the sleepless nights spent in the company of a foam-cutter, a computer and a couple of fellow architects from the same bubble have not been in vain. They can be used for another project; they have a life.' Yaneva, p 89.

¹⁶ 'attached are photos of the exposed gwb at prada in nyc. oma's prada team detailed it with a custom aluminum extrusion that runs along the top and bottom of the boards - and with a similar aluminum edge along the jambs of openings. each board was cut to size to match the module of adjacent compact shelving units. the green board was imported, but the pink is domestic. the design team would very much like gilbane's suggestions for translating the prada example to the conditions at iit. [...] the prada tape and spackle pattern is more rigid than we would prefer (or expect) for iit. would a contractor agree on an application pattern that lies somewhere between a typical application that gets covered-up and what the prada images show?' Anne Filson, 'exposed GWB progress', fax, 1 April 2002. Forwarded to author by Greg Grunloh.

¹⁷ Request for Information # 0370, 10/18/2002 [October 18 2002] submitted to Greg Grunloh, Holabird & Root. Subject: 09A-Water Resistent Gypsum Panels on Ceilings. Forwarded to author by Mark Schendel.

¹⁸ Ibid.

¹⁹ GA-214-96 Recommended Levels of Gypsum Board Finish. (Association of the Wall and Ceiling Industries-International (AWCI), Ceiling & Interior Systems Construction Association (CISCA), Gypsum Association (GA), and Painting and Decorating Contractors of America (PDCA), 1990).

In this significant architectural project, the result of an international competition and adjacent to Mies's Commons, this 'unfinished' surface would be a primary concern to the client, the Chicago architectural community, global architectural critics and associate architects Holabird & Root. Despite charges of an ideology of 'crude' detailing, the MTCC ceiling specification encompassed the elevation of a standard unfinished surface to that of a finished one; a surface which embodied the ideologies and expectations of a global team of architects, builders, engineers, clients and consultants, as well as critics. Responding critically to a Miesian architectural legacy in Chicago, the ceiling as built challenged a construction context defined by standardisation, repetitiveness and predictability; challenges also highlighted by Leatherbarrow.

'Why improvise?'

In *Uncommon Ground*, David Leatherbarrow had highlighted the ubiquity of standardised products which promise certainty through well-established and pretested repetitiveness:

we choose the very things, the actual components, that builders will use on the construction site, the walls, windows, doors, and lamps they will *install* into the building, not the shapes or profiles their labor practices are meant to approximate, which was the case in the past. Yet we do this without seeing them; because the products are there in the trade literature, they are specified, then installed: all in all, a process largely untroubled by uncertainty.²⁰

To stray outside the product literature and its recommendations for use is to move into a realm where warranties are no longer valid, insurance is questionable, construction methods are unfamiliar: into uncertainty. 'Why improvise?' Leatherbarrow had challenged. 'Why allow any unevenness of performance and reliability? More important than why, when?'²¹ The precisely 'unfinished' ceiling at the MTCC embodies the challenges encountered in deviation from the standard, challenges which were also highlighted in a series of writings by Rem Koolhaas during same period in which the MTCC was under consideration, design and construction

²⁰ Leatherbarrow, p.122.

²¹ Ibid., p.129.

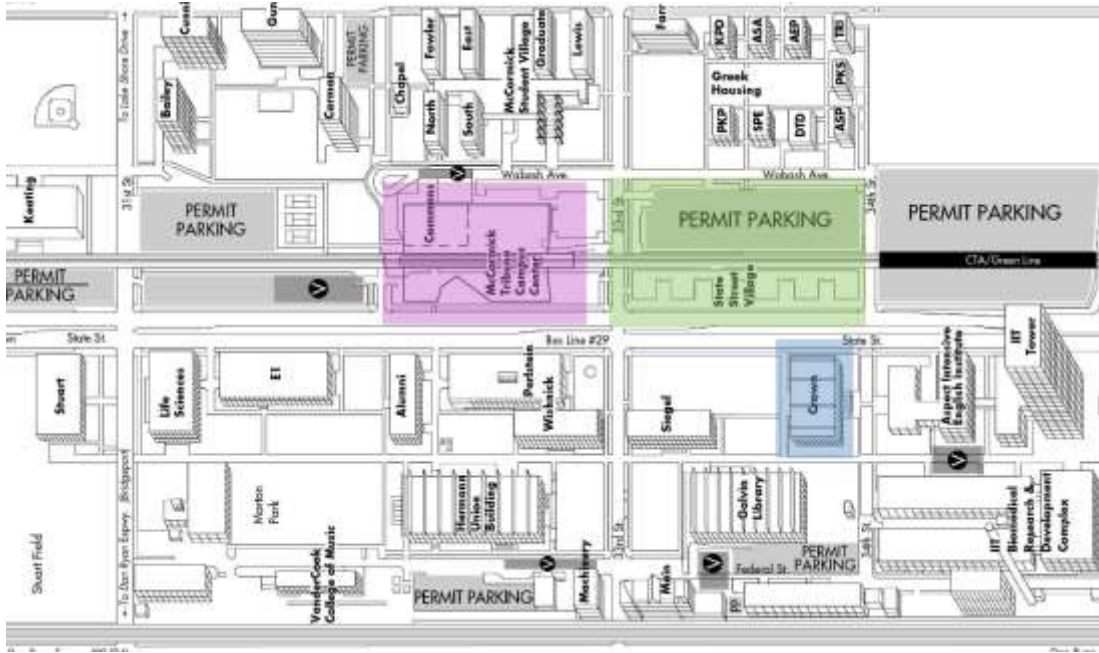


Fig. 10.8 - Slide 8 from a 2004-09-08 Holabird & Root Powerpoint presentation showing OMA's competition proposal for the MTCC.

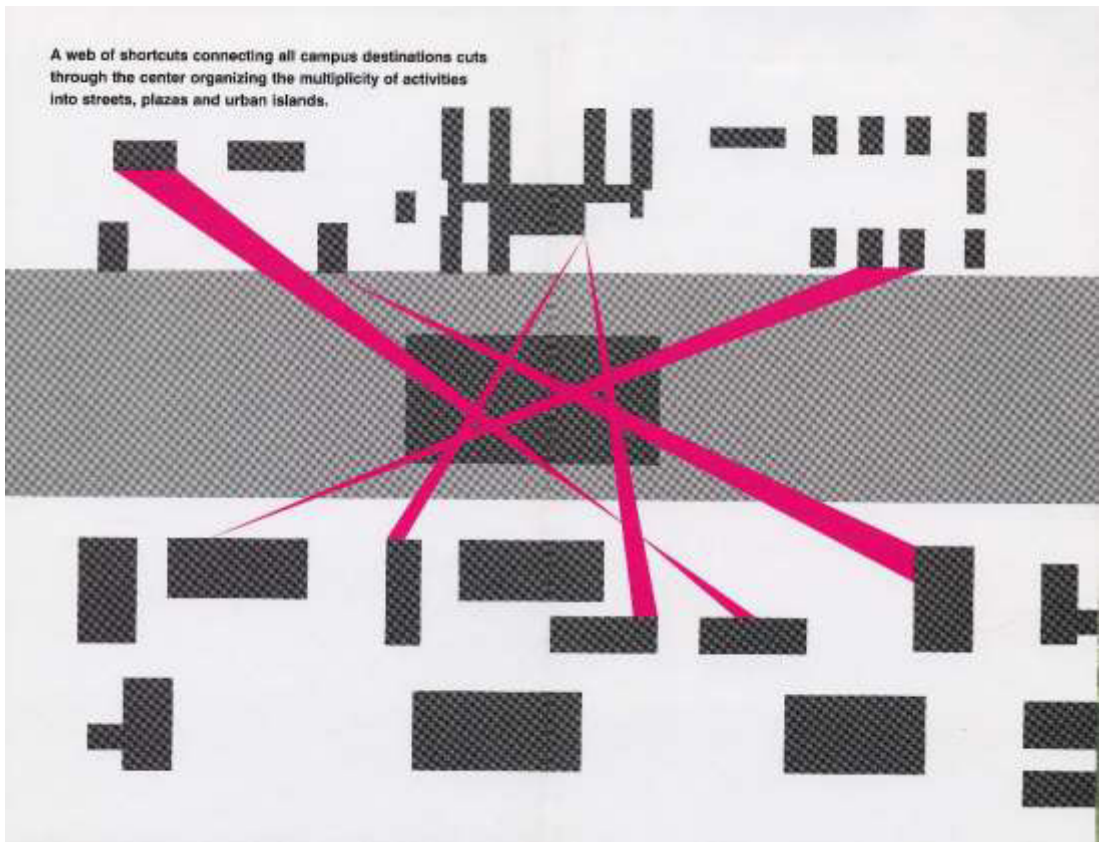


Fig. 10.9 - Slide 9 from a 2004-09-08 Holabird & Root Powerpoint presentation showing OMA's competition proposal for the MTCC.

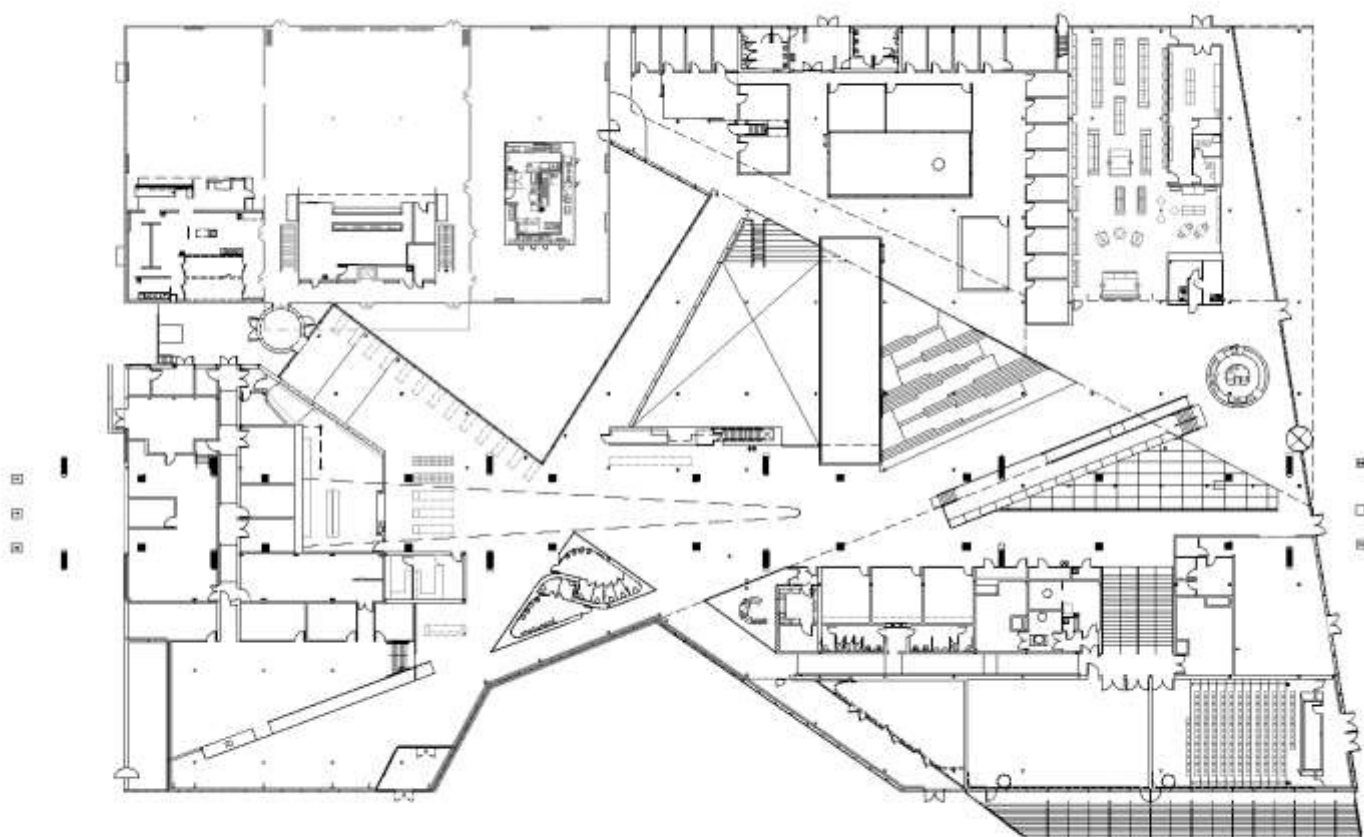


Fig. 10.10 - Slide 24 from a 2004-09-08 Holabird & Root Powerpoint presentation: plan of OMA's MTCC.

10.3 Renewing Mies: IIT, risk and a richer vocabulary.

In May 1994, a report titled *IIT's Quality Journey* critiqued the IIT campus as being in need of 'serious repair and modernisation', highlighting that student surveys perceived the Mies campus as 'boring.' The report concluded by raising the potential of relocating IIT to a new suburban location.²² Consultations held over the next two years with IIT students and staff confirmed such perceptions. A Nov 1996 report by Chicago architects Holabird & Root summarised:

The extensive glass and steel components of buildings create a sterile environment on campus. The students perceive the campus as dull [and] uninteresting. The overall campus lacks landscaping and [an] inviting atmosphere.²³

Consultations, Holabird & Root continued, had underscored a desire for 'a richer architectural vocabulary, as well as a variety of architectural styles and color on campus.'²⁴ Central to initiating a campus renewal which would permit IIT to renew its Miesian setting and thus remain on Chicago's south side was a proposal for an architectural competition to create a new Campus Center, envisioned by an IIT Campus Center Planning Committee not only as a 'stimulating gathering place' to 'attract and retain the best students', but as 'an internationally renowned structure to mark IIT's presence within Chicago and the world.'²⁵ This would, the competition brief challenged, be a 'quality building equal in stature to Mies van der Rohe's S.R. Crown Hall.'²⁶ More than raising the stature of IIT, the campus centre competition

²² The report noted that the main campus, 'revered as a monument to Mies van der Rohe and the modern school of architecture, is in serious need of repair and modernization.' Inadequate space, leaky roofs, poor heating and air conditioning, and the general 'marginal appearance of the campus' were cited as creating uncomfortable working and learning conditions and contributing to a perception that the campus was 'unsafe, even dangerous.' The report concluded with a radical suggestion: 'Would funding and enrolments be enhanced by refurbishing the existing campus, or by moving to a new suburban location?' *IIT's Quality Journey* The IIT/Nalco Partnership, The Center for Innovative Learning and Teaching, Quality Creativity, Ethics and Leadership, National Commission for Future of IIT; Issued by the Office of the provost, Illinois Institute of Technology, May 1994. 1998.037, IIT Archives, page 28. The IIT Board of Trustees established the National Commission for IIT in May, 1993 Chaired by Robert Galvin, Chairman of the Executive Committee of Motorola and former Chairman of the IIT Board of Trustees.

²³ 'Project Documentation / Commission No: 13908-11 Date: November 21 1996 / Holabird & Root / Meeting held at IIT on Nov 18 1996.' Acc. #2004.171 Folder 2, IIT Archives.

²⁴ Ibid.

²⁵ A vision and program was developed by the IIT Campus Center Planning Committee in November 1996, 'comprised of IIT students, faculty and staff, who worked with the architectural firm Holabird & Root to develop the architectural program.' Executive Summary, Campus Centre Planning Committee Supplemental program Report attached to Robertson memorandum, IIT / 2004.17. Folder 1, IIT Archives.

²⁶ 'We envision a quality building equal in stature to Mies van der Rohe's S.R. Crown Hall, participating in the spirit of our Mies campus and extending its values to be relevant for the

was additionally charged with lighting 'a creative spark in Chicago', which, *Chicago Tribune* architecture critic Blair Kamin had contended in an August 1997 article, 'has hardly set the world on fire of late.'²⁷ In meeting such expectations, any response would, of course, be expected to contend with the weighty legacy of Mies. 'He's staring you in the eye', Mack Scogin, chairing the 5-person competition jury, said of the competition brief's relationship to Mies.²⁸ The competition brief thus charged its respondents' with renewing Mies, renewing IIT, and renewing Chicago architecture itself, on a site loaded with challenges.

A bisected campus

The competition site for the IIT Campus Centre addressed a void in the heart of IIT: a strip of land spanning below the Elevated Tracks (the 'El') which bisects the IIT campus on its north-south axis. [Fig. 10.8] The educational body of the campus west of the 'El' was separated from the residential east side of the campus - student dorms, graduate flats, fraternity houses, Mies's IIT Chapel and Commons Building - by a no-man's land under the overhead 'El', parking lots, and the 4-lane vehicular artery of State Street.

Early masterplan proposals from Chicago architects Lohan Associates²⁹ had emphasised the core role of a student centre in revitalising the IIT campus, and had proposed stacked functions to accommodate the varied programmatic needs which the centre would address, from student gathering spaces, to student housing administration offices. In the competition brief, it was made clear that the full range of desired programmatic desires was beyond the scope and budget of the competition. The brief listed several functions as 'B' priority, offering the possibility that several functions would be accommodated elsewhere and not within the campus centre itself. The competition planning committee tempered an ambitious architectural vision with the pragmatics of economic constraints and their consequential impact on program and spatial possibilities, requesting all architects participating in the competition to 'consider all creative solutions' in addressing such limitations - the desire to fit more program than a budget would allow - while 'still holding to the program budget.'³⁰ In addition to 'creative solutions', *Chicago*

next century. Our goal is a budget of \$25 million for an approximately 100,000 sq.ft. Center.' Competition process and procedures, 15 July 1997. Acc. # 2004.17/Folder 1, IIT Archives.

²⁷ Kamin, 'Beyond Mies', p.1.

²⁸ Ibid.

²⁹ Grunloh interview.

³⁰ The Report gives details of budget and space limitations, namely:

Tribune architectural critic Blair Kamin specifically welcomed the possibility of this competition taking risks.

'Art and risk are inseparable'

The announcement in August 1997³¹ of five finalists³² - Rem Koolhaas, Zaha Hadid, Peter Eisenman, and the 'two-person teams' of Helmut Jahn and Werner Sobek and Kazuyo Sejima and Ryue Nishizawa³³ - from an original invited long list of fifty-six prompted Kamin to suggest that this selection represented a risky step for IIT. 'Art and risk are inseparable', Kamin wrote;

[...] IIT, which has set for itself the mission of exploring the future through teaching and research, ought to be commended for putting

'Holabird & Root counseled [sic] that the costs for building this facility should be estimated at roughly \$200-250 per square foot. The university administration had previously indicated that the project budget for the Center should be in the \$20-25 million range. The represented the amount of a planned capital campaign that could be designated for the facility. These two financial parameters provided the committee with the size of building that the university could afford to build, approximately 100,000 square feet.

With this information, it became clear that the budget for the Campus Center could not support all of the units and services that the community expressed interest in including in the building. Initially, the committee tried to look at all areas of the program to make reductions without eliminating major functions from consideration. [...] In the end a decision was made to remove most of the student service administrative office spaces from the program. [...] It became clear that the inclusion of the administrative offices at the expense of other spaces would significantly change the character of the facility.

Because the committee recognized the attractiveness of grouping student services together in one place, Holabird & Root drafted a preliminary program that demonstrated that nearly all of the administrative units included in the first draft of the Campus center program could be accommodated in the Commons Building. It should be noted, however, that the Commons program was simply an exercise to help guide the Campus Center program, and that no decisions have been made regarding the Commons.' 'As the committee attempted to bring the final product within estimated space limitations, it became clear that those limitations could not be met without significantly compromising the needs of the campus community and the overall quality of the building program. In the end, the committee designated three elements of the program as 'B' priority. The committee urges the architects in the design competition to consider all creative solutions that will allow these elements to remain in the Center program, while still holding to the program budget.'

Executive Summary, Campus Centre Planning Committee Supplemental program Report attached to Robertson memorandum, IIT / 2004.17. Folder 1, IIT Archives.

³¹ Blair Kamin, 'IIT plays it risky in finalists to design new center', *Chicago Tribune*, 22 August 1997, Metro, p.1.

³² Blair Kamin, 'IIT going worldwide for design of center 56 architects invited to coveted competition', *Chicago Tribune*, 17 July 1997, Metro Chicago, p.1.

³³ See 'Talking About Mies', *Catalyst University News*, Fall 1997, p.4. IIT archives. Almost all coverage of the IIT competition and MTCC refers to 'Rem Koolhaas' rather than OMA. In this quotation, the inclusion of the phrase 'two person teams' reinforces the suggestion that the competition work will be produced by one person – the 'star' architect – alone, a perception which is later raised as a risk by *Chicago Tribune* architectural critic Blair Kamin, in suggesting that Koolhaas's global movements may impact on the quality of the project, as a result of the lack of his personal presence in Chicago.

its money [...] where its mouth is. Underscoring the contest's experimental nature, the finalists were selected on the basis of philosophical statements and their portfolios rather than drawings and models of the campus center, which they now must prepare.³⁴

The next stage gave five months for the five finalists to submit designs. OMA responded with an analysis of the density and paths of student movement on the IIT campus, highlighting the disintegration of the urban context surrounding the campus, and on the campus itself, which now housed half the intended student population on double the area envisioned by Mies's campus masterplan.³⁵ To reintroduce urban density within the campus, OMA condensed programmatic, spatial, and material diversity within the MTCC, rejecting the 'stack' proposal once put forward by Lohan Associates in lieu of a horizontal mode as a recreation of a dense urban environment with all its inherent complexities and ambiguities, serving as a counterpoint to the order which Mies had once carved out of urban chaos.

Identifying key movement patterns as a 'web of shortcuts'³⁶ between the disjointed halves of the campus, OMA aligned the 'multiplicity'³⁷ of student programmatic activities along the colliding routes, contained within the retaining form of a rectangular plan. [Fig. 10.9] Most controversially, OMA expanded the competition site to subsume Mies's Commons as a student dining space [Fig.10.10]. This controversial move directly responded to the competition brief's instruction to think creatively about the need to accommodate additional programmatic functions; but, unsurprisingly, raised protest from Chicago architectural historians. When OMA's proposal won a unanimous selection from the competition jury,³⁸ the actuality of OMA working in close proximity to Mies prompted forewarnings from Chicago architectural critics that an architect whose only published critique of Mies was that

³⁴ Kamin, 'Beyond Mies'.

³⁵ A Holabird & Root Powerpoint presentation of the MTCC competition titled 2004-09-08 Presentation includes slides from OMA noting: 'Increasing territory – decreasing density. 1941: 6000 students / 57 acres. 1998: 3200 students / 120 acres. '2004-09-08 presentation', Holabird & Root Powerpoint.

³⁶ '2004-09-08 presentation', Holabird & Root Powerpoint.

³⁷ Ibid.

³⁸ Kamin wrote: 'The Illinois Institute of Technology opened a window onto the future of architecture Thursday--and the vision was not "less is more," in contrast to the stern, steel and glass buildings that master modernist Ludwig Mies van der Rohe designed at IIT a half-century ago. Culminating an international design competition for a blocklong campus center at the northeast corner of State and 33rd Streets, a four-member jury unanimously selected Rotterdam architect Rem Koolhaas, who in his writings and his buildings has championed the messy vitality of densely-packed city life. His buzzword for it is "the culture of congestion." [...] Literally building on Mies' legacy, Koolhaas even has proposed including the famous architect's IIT Commons Building, 3200 S. Wabash Ave., under the roof of his campus center.' Blair Kamin, 'Dutch architect wins IIT design contest', *Chicago Tribune*, 6 February 1998, Metro Chicago, p.1.

he was ‘fatally attracted by order’³⁹ might challenge and subvert traditional Chicagoan definitions of architectural success.

‘Success will be in the details’

‘IIT Center: Success will be in the details’⁴⁰ Blair Kamin declared in the *Chicago Tribune* in February 1998, in response to the news that OMA had been awarded the commission for the IIT campus centre. Of the five selected finalists, OMA’s proposal, as the only entry which had elected to subsume Mies’s Commons Building within their proposal, elevated the comparison which would inevitably be made between their work and that of Mies. The project, Kamin proposed, in taking on the Mies’s legacy, could only be judged on Mies’s terms. Although applauding the urbanity and vitality of OMA’s winning scheme - the ‘messy vitality’ of OMA’s ‘culture of congestion’ - Kamin argued that the project’s success would depend upon whether Koolhaas could ‘translate a brilliant idea into a finished building that upholds the Chicago tradition of elevating construction into art.’⁴¹ Reporting that OMA were known for ‘crude details’ rather than ‘jewel like precision’, Kamin argued that ‘Mies raised pragmatism and problem-solving to an art: he was the poet of practice.’⁴² Challenging Koolhaas to ‘heed the legacy’ of Mies so that ‘God is in *his* details’,⁴³ Kamin went as far as to suggest:

What Koolhaas might do, as other renowned out-of-town architects typically have done when working here, is to associate with a respected Chicago firm (A. Epstein & Sons International, Holabird & Root, and Perkins & Will all come to mind) that excels at producing solidly detailed buildings and will help him do the same. In the meantime, Koolhaas deserves a salute for a plan that promises to

³⁹ Discussing Mies, Kahn and the Smithsons as the ‘people who were read and whose books I bought’, Koolhaas observes - ‘my only critique is that they [Mies, Corbusier, Kahn] were fatally attracted by order and their apparent obligation to deal with it through architecture. I find it fascinating but unbelievable at the same time because some of their discourse is completely convincing, but the compulsion to deal, to articulate it in purely architectural terms is very unbelievable. And the same was true for the Smithsons when they investigated *dis-order*. I would say that projects like La Villette or the City Hall in The Hague were to some extent one-sided dialogues with the Smithsons. Specifically about dealing with *indeterminacy*. I tried to find, to resolve what they – or Team X – always left unresolved, namely how can you combine actual indeterminacy with architectural specificity.’ Alejandro Zaera, ‘Finding Freedoms: Conversations with Rem Koolhaas’ in ‘oma/ rem Koolhaas 1987 1993’ *El Croquis* 53 (1994), 6-31, p.16.

⁴⁰ Blair Kamin, ‘IIT Center: Success will be in the details’, *Chicago Tribune*, 15 February 1998, Arts & Entertainment, pp. 1, 8-9 (p.1).

⁴¹ Kamin, ‘Success will be in the details’, p.9.

⁴² *Ibid.*

⁴³ *Ibid.*

rekindle the flame of innovation in Chicago. Even so, it's only a promise. He still has to make good.⁴⁴

As well as suggesting that collaboration with a Chicago team would be key to meeting Chicagoan expectations of detailing, Kamin raised a concern that Rem Koolhaas, as a global architect, would not be personally present on site to control the project, a factor Kamin identified as a 'danger':

No one else so vividly personifies the globalization of the practice of architecture and, perhaps, the danger inherent in that phenomenon.

One day, Koolhaas is in Chicago. The next day, he is in Ann Arbor, Mich. Then he's in New York. Then Germany. Then Rotterdam. Reached at a German hotel for a midnight (European time) telephone interview, he is savvy enough to say of the IIT campus center: "I fully intend to be involved in this building myself and to make sure that it's not a kind of hit-and-run situation."⁴⁵

Challenges raised by both competition brief and architectural press included expectations of 'jewel like precision' to meet Chicagoan definitions of success, the suggestion that success would require collaboration with a local Chicago firm as well as Koolhaas's personal attention and physical presence, an ambitious brief curtailed by budget constraints; and expectations that this project would renew IIT and even Chicago architecture itself.⁴⁶ These expectations aligned with core themes regarding architectural practice which OMA's theoretical and built work had addressed since their inception in 1975.⁴⁷ Following observations of architecture's paradoxical mix of power and powerlessness',⁴⁸ Koolhaas's 'Bigness', published in *S,M,L,XL* in 1995,⁴⁹ forewarned of the challenges a precisely 'crude' ceiling at IIT would encounter as it negotiated the daily practicalities of architectural production.

⁴⁴ Ibid.

⁴⁵ Ibid., p.18.

⁴⁶ In dialogue in 2003 (as the MTCC was completing) with Masao Miyoshi, Koolhaas stated of architecture: 'If anything, it's purely ornamental and has nothing to do with any instrumentality. [...] you know architecture is in general only a very limited instrument to improve conditions.' Koolhaas and Miyoshi, p.18.

⁴⁷ Based in Rotterdam, Early OMA works included a number of competition entries - the 1978, first prize ex aequo, extension of the Dutch Parliament; a contribution to the 1980 Venice Biennale, a 1982 competition entry for Parc de la Villette (unbuilt), the first built work, a Police Station, Almere, Netherlands (1982); Checkpoint Charlie Apartments, Berlin (1981). Prior to MTCC, key projects included Villa dall'ava, Paris (1991); Euralille, Lille, France (1994), Breda Chasse Campus, Netherlands (2000); Hermitage Guggenheim Las Vegas (2001), Prada New York (2001) Netherlands Embassy Berlin Germany (2003).

⁴⁸ Zaera, p.6.

⁴⁹ George Baird identifies 1994 as significant in Koolhaas's writings as turning away from the neo-modernism of the 1980's 'in search for a form of architecture and urbanism that would - as you [Koolhaas] saw it- be more original and transformative.' George Baird, 'An open letter to Rem Koolhaas's', *Harvard Design Magazine*, 27 (Fall 2007/Winter 2008), 30-33 (p. 31).

10.4 Bigness: a '*chaotic adventure*'

'Architecture is a hazardous mixture of omnipotence and impotence', *S,M,L,XL* began:

Ostensibly involved in "shaping" the world, for their thoughts to be mobilized architects depend on the provocations of others – clients, individual or institutional. Therefore, incoherence, or more precisely, randomness, is the underlying structure of all architects' careers: they are confronted with an arbitrary sequence of demands, with parameters they did not establish, in countries they hardly know, about issues they are only dimly aware of, expected to deal with problems that have proved intractable to brains vastly superior to their own. Architecture is by definition a *chaotic adventure*.

Coherence imposed on an architect's work is either cosmetic or the result of self-censorship.⁵⁰

Prior to the announcement in 1997 that OMA had been invited to participate in the MTCC competition, Rem Koolhaas had visited Chicago to present excerpts of *S,M,L,XL*, jointly conceived by Koolhaas and Bruce Mau. Koolhaas's essay 'Bigness, or the problem of large' received particular attention from Kamin,⁵¹ who wrote that 'Koolhaas is a booster of bigness, believing it to be an inevitable by-product of contemporary life.' Foreshadowing his critique of proposals for the MTCC

⁵⁰ Koolhaas, *S,M,L,XL*, p.xix.

⁵¹ Other critiques of 'Bigness' include William S. Saunders's review: 'One of the weaker moments in *S,M,L,XL* is "Bigness." In that essay, Koolhaas is at his most abstract, apocalyptic, and megalomaniac, proclaiming the death of architecture, falling in too easily with the forces of hyperdevelopment (capitalism at its most rapacious), making absolutistic statements like "Bigness is ultimate architecture" (p. 495) and "Bigness is the last bastion of architecture" (p. 516).' William S. Saunders, 'Rem Koolhaas's Writing on Cities: Poetic Perception and Gnostic Fantasy', *Journal of Architectural Education* 51: 1 (September 1997), 61-71, (pp.63-64). George Baird described 'Bigness' as 'too tendentious and too complicit in the evident "lows of global capital" to be intellectually or ethically defensible.' It was as though that long standing obsession of yours with sheer professional "efficacy" – which I had attempted to articulate in my *Perspecta* text – had finally unmoored you altogether from the stubbornly independent integrity I associated with your early career.' Baird, p.30. Sanford Kwinter was more receptive to the claims of 'Bigness', writing: 'What then is Bigness? Though there is hardly anything subtle about Bigness, a proper understanding of it entails a rather subtle perception indeed: that it describes not simply a given magnitude of volumetric displacement (not just how inflated something is), but rather, a critical trigger point in the balance of forces within a shifting regime of values. Bigness - the term - summarizes the vast chain of linked processes that are unleashed once a certain threshold in the development of an architectural object is crossed, a threshold that bears at best a rough or indirect relationship to size alone, and a more precise, direct one to the object's complexity.' Sanford Kwinter, 'Politics and Pastoralism', *Assemblage*, 27: Tulane Papers: The Politics of Contemporary Architectural Discourse (August 1995), 25-32, (pp.28-29). I will later argue that Kwinter's interpretation of 'Bigness' as a 'vast chain of linked processes' can be applied at any scale in architectural practice: that the processes of Bigness are linked to the aims and parameters shaping decision making in a project, rather than scale alone.

- that OMA's built work would be marred by crude, rather than precise details - Kamin concluded his article by reporting that 'Koolhaas spoke of the factors leading to bigness - organizations and buildings that are relentlessly consolidating - but did little to address how the new behemoths could be built to a human scale.'⁵² In 'Bigness', a 'Big Building' is defined by Koolhaas as one '[b]eyond a certain critical mass', no longer controllable by a 'single architectural gesture, or even by any combination of architectural gestures.'⁵³ 'Through size alone', Koolhaas writes, 'such buildings enter an amoral domain, beyond good or bad. Their impact is independent of their quality',⁵⁴ a provocation in the context of the expectations of 'jewel-like precision' raised by Kamin.

Throughout *S,M,L,XL*, the ability of the architectural profession to control precise detailing, to control the quality of architecture, or to control the impact of architect is questioned and critiqued. The language throughout the publication raises questions of certainty and uncertainty, referencing chance, chaos⁵⁵, looseness,⁵⁶ randomness, incoherence, vagueness, instability, the unpredictable, control, freedom, teamwork, architecture's dependency⁵⁷ and architects' delegation below the apparent expertise

⁵² Blair Kamin, 'He's 'Mr. Big' in the architecture world', *Chicago Tribune*, 5 February 1996), *Tempo*, p.5.

⁵³ Koolhaas, 'Bigness' in *S,M,L,XL*, p.499.

⁵⁴ *Ibid.*, 501-502. Baird questions this statement regarding architectural quality: 'Were we really intended to imagine that OMA's own "big" projects were meant to demonstrate "architectural quality" only secondarily? This did not seem to us likely, nor did it seem to be the case for the projects as designed. It seemed to us instead that in this regard we needed to distinguish between this principle of "bigness" as an identified contemporary vernacular condition in the world and an enhanced one operative in the analogous work of OMA.' Baird, p.32.

⁵⁵ Zaera asking Koolhaas about his interest in chaos as a formalisation of reality: 'My conclusion is that chaos is one of those things that is intrinsically inaccessible to architects. You cannot aspire to it, you can only be an instrument of it. It is literally out of reach, like a pot of gold that when you are almost getting to it, will recede. The only relationship that architects can have with chaos is by taking their rightful place in the army of those committed to prevent it, and *fail*. And it is only in failure, by accident, that chaos happens.' Zaera, p.27.

⁵⁶ 'RK: I'm actually kind of proud that in spite of all the pressure to conform to expected behavior and to an expected identity, I've been able to show a lot of loose ends. And I think loose ends is an important category, because it means that you're not saying that this is compatible with this, with this, with this, and that everything fits. I'm saying that nothing fits, and I'm showing also that there are different aspects that refuse to unify into a single overall identity.' Koolhaas and Miyoshi, pp. 19-20.

⁵⁷ 'Yet Bigness is inclusive in a way that will certainly frighten many for "it *depends*," very strongly Koolhaas tells us, on an exteriority, on a panoply of roiling political, technological, and economic forces *in situ*; indeed, so enmeshed and autonomous is it, he says, that it checks out as neutral. I don't know if it really does check out as neutral - I frankly have my doubts - but I do know that this notion of dependency, which promotes a broad, almost ecological, collective understanding and always in terms of an active and ductile *exteriority*, is of considerable significance.' Kwinter, p. 28.

of those controlling Big Buildings.⁵⁸ In the *S,M,L,XL* essay 'Last Apples', Koolhaas wrote of the emergence of specialisms in the construction industry:

While other disciplines were gloating over their new freedoms - the hybrid, the local, the informal, chance, the singular, the irregular, the unique, architecture was stuck in the consistent, the repetitive, the regular, the gridded, the general, the overall, the formal, the predetermined. The work became a joint campaign to explore these freedoms for architecture and engineering.⁵⁹

Throughout *S,M,L,XL*, the certainty of precision was presented as a fallacy; the apparent certainty of the technological aspects of a building challenged; the actualities of negotiating briefs, clients, programs, site, construction summarised as 'chaotic adventures.' The idea of order, of control achieved through architecture's will, is presented as a constraint. A paradox of Bigness, Koolhaas asserts, 'is that in spite of the calculation that goes into its planning - in fact, through its very rigidities - it is the one architecture that engineers the unpredictable.'⁶⁰ Even as Bigness enters the stratosphere of architectural ambition - 'the pure chill of megalomania', Koolhaas wrote - 'it can be achieved only at the price of giving up control, of transmogrification.'⁶¹ Similarly brutal observations of the architectural profession are threaded throughout OMA and Koolhaas' earlier writings, interviews, publications, studies and built works.

⁵⁸ The running alphabetical series of quotations which line the margins of *S,M,L,XL*, from Koolhaas and others, offer isolated musings on these topics. 'ACCURACY: 'Two men and a woman are standing in a field. One man has a tape measure in his hand. He is going to measure off the plot of land which he has received for a wedding present. His bride is there to make certain that not a millimetre of land is miscalculated.' (p.xviii, citing Henry Miller, *The Colossus of Maroussi*, 1941); 'FRAGMENTS: [...] only fragments of a complete idea are ever executed.' (p.556, citing Paul Klee "On Modern Art", 1924, in *Modern Artists on Art*, ed. Robert L. Herbert (New York: Prentice Hall, 1964); 'FUZZY: Fuzzy Logic [...] enables programmers to use ambiguous input language – such as "a little," "about 50," "most" and "often" –in much the way that people process subjective information before making decisions.' (pp.573-574, citing Richard Ernsberger Jr with Yuriko Hashiai, 'Computers with Human Logic', *Newsweek*, April 2, 1990); and 'UNCERTAINTY': I believe in uncertainty' (p.1269). Koolhaas, *S,M,L,XL*.

⁵⁹ 'While other disciplines were gloating over their new freedoms - the hybrid, the local, the informal, chance, the singular, the irregular, the unique, architecture was stuck in the consistent, the repetitive, the regular, the gridded, the general, the overall, the formal, the predetermined. The work became a joint campaign to explore these freedoms for architecture and engineering.' Rem Koolhaas, 'Last Apples' in *S,M,L,XL*, pp. 662-668 (p.667).

⁶⁰ Koolhaas, 'Bigness', p.511.

⁶¹ *Ibid.*, p.513.

OMA early works

'Here in Holland', Rem Koolhaas observed in an *El Croquis* interview published in 1994:

our work is considered a complete failure. Critics say the detail of the projects is simply bad, and I say there is no detail. That is the quality of the building. No money, no detail, just pure concept.⁶²

Koolhaas described this as a 'kind of brutal attitude', borne from professional experience of work in the Netherlands, which he described as 'cheapness with the pretence of culture.' 'Only after a long experience with that attitude', Koolhaas continued, 'does one realise that there is 'no protection against it [...] it's only after that knowledge and that loss of any illusion that you can formulate these kinds of responses and strategies.'⁶³ In the same interview, Koolhaas offered a contradictory account⁶⁴ of an attitude towards detailing: our building in Karlsruhe, Koolhaas explained, 'is obviously very dependent on detail; without a detailed exploration it could turn into a nightmare.'⁶⁵ That Koolhaas spoke in the same interview of 'no detail' and dependency on detail is a contradiction embodied in the precise detailing of a ceiling at IIT, which simultaneously - ambiguously - embodies, accepts and works within the parameters defined by the essay 'Bigness' - 'the detail is moot' - and, at the same time, rejects, redefines, and steps outside the parameters of standardisation. At the scale of the precise detail, *S,M,L,XL* raised the question of the role of the architect in controlling work, in a context of globalisation, teamwork, dependency on others, the expertise of others, the parallel omnipotence and impotence of the architect.

OMA and the global team

Opening with a series of charts which statistically analyse OMA's workforce, income and expenditure, turnover, global workforce location, and travel behaviour in the period 1972-1994, *S,M,L,XL* offered a critique of the 'splendours and miseries'⁶⁶ of a

⁶² Zaera, p.10.

⁶³ Ibid.

⁶⁴ George Baird references Koolhaas's 'supposed propensity for contradiction' by suggesting this emerges from his method of writing: 'I speculate that your method of writing is one in which you are as influenced by the momentum of the prose gradually appearing on the paper or computer screen as the prose appearing there is influenced by you, its author.' Baird, p.32.

⁶⁵ Referencing the competition for the Zentrum für Kunst und Medientechnologie (ZKM) Germany, Karlsruhe, Germany 1992. Zaera, p.11.

⁶⁶ *S,M,L,XL* back cover.

contemporary global architectural practice. OMA combined speculative and analytical studies with built works on a global scale from their inception.⁶⁷ From the 1978 publication of *Delirious New York: A Retroactive Manifesto for Manhattan*⁶⁸, early OMA works included a number of speculative unbuilt competition entries - the 1978, first prize *ex aequo*, extension of the Dutch Parliament; a contribution to the 1980 Venice Biennale, a 1982 competition entry for Parc de la Villette. The speculative and ideological nature of OMA's work can be seen in the proportion of built and unbuilt work in the period from their inception to the construction of the MTCC (1978-2003), in which a total of 118 speculative or unbuilt studies were undertaken, compared to 32 built works. The first 'true building finished by OMA on their own', a Police Station in Almere-Haven, was given a qualified review by OMA on its own website:

Although representative of OMA's work and functions well, it is generally felt within the office that until the Netherlands Dance Theatre at The Hague is finished, it would be better to subdue the double page color spreads and keep the champagne bottles in reserve a little longer.⁶⁹

The complexities of converting ideological visions to constructed reality was further discussed by Koolhaas in a 1994 interview with Alejandro Zaera, just before the publication of *S,M,L,XL*:

The experience to build the Den Haag Dance Theater was crucial. It was like a black hole for years, completely exhilarating, nightmarish. Absolute lack of money and a client who at some point became completely overworked and in a period of six months divorced, fired the acoustical engineer, the structural engineer, the mechanical engineer, and finally our office in the middle of the building. For some months we were almost illegally leading the site work. Now we are friends, but at that moment...⁷⁰

Koolhaas described this period as the shift from a 'writer' into 'a building architect'. 'I simply had to learn a vast part of the profession', Koolhaas recalled in the same 1994 interview. 'It was ridiculous already being 'known' in the middle of such a

⁶⁷ Rem Koolhaas was born in Rotterdam in 1944. A journalist for the Haagse Post before studying at the Architectural Association School of Architecture (AA) in London from 1968-1972, Koolhaas received a Harkness fellowship for research in the United States in 1972, studying at Cornell University, Ithaca New York, and as a Visiting Fellow at the Institute for Architecture and Urban Studies in New York. Koolhaas published *Delirious New York: A Retroactive Manifesto for Manhattan* in 1978. OMA were founded in 1975 by Rem Koolhaas with Elia and Zoe Zenghelis and Madelon Vriesendorp.

⁶⁸ Rem Koolhaas, *Delirious New York: A Retroactive Manifesto for Manhattan* (New York: The Monacelli Press, Inc., 1994).

⁶⁹ <<http://www.oma.eu/projects/1982/police-station/>> [accessed 13 April, 2015]

⁷⁰ Zaera, p.8.

process, happening all in the public eye.⁷¹ This process of becoming a 'building architect' is reflected in *S,M,L,XL*, and in particular, in 'Bigness', which, when read not in terms of how it addresses scale, but in terms of how it addresses the processes of architectural practice, unequivocally reflects the challenges, frustrations and disappointments of many practicing architects in contemporary architectural practices.

Surrender to others

The makers of *Bigness*, Koolhaas wrote in *S,M,L,XL*, are:

a team (a word not mentioned in the last 40 years of architectural polemic).

Beyond signature, *Bigness* means surrender to technologies; to engineers, contractors, manufacturers; to politics; to others.⁷²

S,M,L,XL presented the act of technical concerns - which bring with them the seductive promise of certainty - taking over the uncertainty of architectural concerns: the uncertainty, unquantifiable desires of the architect - non technical concerns such as - composition, scale, the detail. The impotency of the architect is magnified amidst a technical team, most of whose members can speak with certainty of their needs. 'The architect's arguments are always opinions; Koolhaas proposes,' they cannot compete with the aura of objectivity that shields building technologies from critical probing.⁷³ *S,M,L,XL* describes the 'inaccessible zones' - the zones behind the ornamental façade - which are controlled by the 'expertise and autonomy' of the engineers: the architect, Koolhaas writes, confronts 'the sabotage of engineers, his supposed "teammates".⁷⁴ In 1994, Koolhaas spoke of the extent to which services and structure have gained precedence over architectural thought. 'It is unbelievable', Koolhaas pointed out:

how a component that amounts [to] one third of the section of a building and may represent 50% of the budget, is in a way inaccessible to the architect, not susceptible to architectural thought. We do not speculate about it: it is like accepting that between 30 and 40 percent of your building is simply not your domain and you have to swallow the ridiculous garbage that mechanical engineers install there.⁷⁵

⁷¹ Ibid., p.7.

⁷² Koolhaas, '*Bigness*', p.513-514.

⁷³ Koolhaas, 'Last Apples' in *S,M,L,XL*, p.665.

⁷⁴ Ibid., p.664.

⁷⁵ Zaera, p.13.

Such technologies gain precedence through the promise they convey of certainty; a promise which, Koolhaas argues, is unfounded in practice: the engineers provide:

tantalizingly vague (if not outright poetic) indications from what is supposedly the domain of pure science. Floors suddenly “have to be ...millimetres,” ducts “probably not less than ... in diameter,” beams “would be a lot safer at ... metres,” stability “*could* be achieved by ...” Additional disciplines claim major reservations in section and plan (nobody knows exactly what for) in a metaphysics of pragmatic precaution against “things” that “might” or “always” happen.⁷⁶

The work of the architect is reduced to an ornamental zone, a skin which wraps the domain of technology, of science, the supposed certainty of technical aspects. Such technologies, Koolhaas argues, gain control through their promise of certainty, yet, when scrutinized closely, are as vague, as poetic and as imprecise as any architectural proposal.

Omnipotence to impotence

S,M,L,XL presented ‘Bigness’ as a condition of scale, but its themes of control, uncertainty and dependency are applicable as a more generic condition of architectural practice at any scale. A small scale building with ambitions beyond an allocated budget, defined within a value framework of economy and efficiency, may be as susceptible to the critiques of ‘Bigness’ as a larger scale work. ‘Bigness’ highlights the inevitable conclusion of the recommendations which often frame the processes of architectural practice; predetermined certainty, cost control and efficiency; a cultural context defined first by the certainties of value engineering rather than the unquantifiable values of quality. The lack of control which Bigness describes; the dependency; the hierarchical promise of absolute certainty; the shift from architectural omnipotence to impotence which takes place as a grand conceptual vision is translated into the constructed reality of value-engineered

⁷⁶ Koolhaas, ‘Last Apples’ in *S,M,L,XL*, p.664. This aligns with the observations I made in Chapter 8 with regards to the recommendations provided by the product supplier Fosroc regarding a sealant, which included the phrase ‘the theoretical / minimum joint width knowing the expected maximum working movement of the joint’ amidst otherwise quantitative instructions, in Fosroc Nitro Seal MS100 Product Specification sheet 14 CI/SfB:YT4 (January 2006) p.195. Cuff’s *The Story of Practice* makes a similar observation: ‘Areas of expertise themselves are ambiguous: the engineer’s facts are contestable, acoustics is an imperfect science, the landscape architect may not know much about specific plant materials. Ambiguity of expertise is particularly evident for the architect. Although the architect’s education is primarily focused on design, in practice, the architect is variably a designer, businessperson, market analyst, psychologist, contractor, politician, and arbitrator.’ Cuff, p.85.

standardised and off-the shelf components; the devaluing of the 'art' of architecture in a brief / program driven by certainty, efficiency and economy - all can occur at any scale within the circumstances of most contemporary architectural projects.

S,M,L,XL has been interpreted here as a highly pragmatic document which unflinchingly described the daily experiences which most architectural practices encounter, to which few accounts of architectural theory will admit or consider. 'Bigness' in particular is read here as an account of architectural practice borne from the frustrations of converting architectural ideologies into the mundane experiences of everyday construction, and the realities of negotiating any architectural intention through an extended time of architects, associate architects, project managers, consultants, contractors and suppliers amidst the multiple economic and time pressures accompanying a global portfolio of speculative and built architectural projects, realities which set the context for the development of the MTCC and the critical speculations embedded in a ceiling which deviated from a standard.

10.5 OMA, Holabird & Root, and AMO

While the MTCC was in design and construction processes from 1997-2003, OMA were developing proposals and studies in 14 countries across 4 continents.⁷⁷ Built works were underway in the Netherlands, France, the USA and Germany⁷⁸ and studies, commissions and competitions ranged from Vietnam, Italy, Korea, the USA and China.⁷⁹ A history of OMA published in *Architecture and Urbanism* special issue

⁷⁷ 1997 (Netherlands, USA, Vietnam) 1998 (Mexico, Korea, Spain, Germany, Netherlands, Germany, France)] 1999(France, Netherlands, UK, Italy) 2000 (Canada, USA, Bahamas, Netherlands)] 2001 (Netherlands, Switzerland, USA, France, Spain, Canada) 2002 (Netherlands, Brussels, China, USA, Germany, Spain) 2003 (China, France, UK, Germany, Netherlands, Russia, Germany, USA) Overall: Netherlands, Germany, France, USA, Vietnam, Mexico, Korea, Spain, Canada, Bahamas, Switzerland, Belgium, China, Russia (blue= built projects) Analysis of data in <<http://www.oma.eu/projects/?Category=0>> [accessed 27 February 2015].

⁷⁸ Built works between 1997 and 2003 as presented in OMA's website: Netherlands (Educatorium 1997, Papendorp 1997, Breda Chasse Campus, Building and Parking 2000), France (Maison A Bordeaux 1998), USA (Hermitage Guggenheim 2001, Prada New York 2001, Lehmann Maupin Gallery 2001) Germany (Netherlands Embassy, Berlin 2003) Analysis of data in <http://www.oma.eu/projects/?Category=0> [accessed 27 February 2015].

⁷⁹ Studies, commissions, and competitions between 1997 and 2003 as presented in OMA's website: Hanoi New Town Masterplan in Vietnam (1997), Genoa Port competition, Italy 1997, Incheon-Song-Do new Town Korea (Commission 1998), the EU Barcode (AMO 2001), an issue of Conde Nast Wired (June 2003), The Whitney Museum extension (discontinued) 2001⁷⁹, and studies for CCTV Beijing China (2002). Analysis of data in <<http://www.oma.eu/projects/?Category=0>> [accessed 27 February 2015]. Also see Albená Yaneva. *The making of a building: a pragmatist approach to architecture* (Oxford; New York: Peter Lang, 2009) for an anthropological account of the design processes behind the Whitney Museum.

in 2000 emphasised the scale - almost 100 architects and designers - and multi-national nature of both the staff and the projects. In responding to the scale and spread of their commissions, *S,M,L,XL* presented the team as a core condition of contemporary global architectural practice, but one which brings with it challenges and dependencies, and the surrender of precise control to others. Central to Kamin's prediction of crude detailing posed by OMA had been the charge that the global spread of OMA and of Koolhaas' personal travels would create a risk, one which would be mitigated, Kamin's article proposed, both by Koolhaas' personal attention, and a collaboration with a respectable Chicago architectural practice.

The Feb 1998 announcement that OMA had been unanimously selected as the winners of the MTCC competition, and Kamin's call for 'jewel-like precision' through a combination of Koolhaas' personal attentions and a collaboration with a respected Chicago firm, was followed on May 31, 1998 with the announcement that the Chicago firm of Holabird & Root had been selected as Associate Architects.⁸⁰ Holabird & Root had a long and distinguished history in Chicago,⁸¹ having first formed in Chicago in 1880 as Holabird and Simonds amidst the boom of rebuilding following the Chicago Fire; their first significant commissions, the Tacoma Building (1889, demolished 1929) and the Marquette Building (1895), in which their offices are now located, contributed to the development of the Chicago frame. Key to this nineteenth century development was the fact that Holabird and Roche had an engineer as a partner, a critical element in supporting developers' ambitions to reduce costs and increase the speed of construction in 1880s Chicago.⁸²

Wood's research highlighted Holabird and Roche as representing a new phenomenon in the architectural profession as a large private entrepreneurial office, the scale of which contributed to the systematic organisation of USA architectural practices in the 1860s-70s; Holabird, an engineer, was eulogised as much for his success as a businessman as his buildings. William Holabird and Martin Roche, Woods wrote, 'built a reputation for solid commercial work ranging from office

⁸⁰ Blair Kamin, 'Assisting Koolhaas', *Chicago Tribune*, 31 May 1998, Arts & Entertainment, p.7.

⁸¹ Holabird & Root were founded in Chicago in 1880 as Holabird & Simonds by William Holabird and Ossian Cole Simonds, joined by a third partner Martin Roche in 1881. In 1883, Holabird, Simonds & Roche became Holabird & Roche when Simonds left. Their first major commissions included the Tacoma Building (built 1889, demolished 1929) and the Marquette Building (1895), part of the boom in ground breaking high rise construction taking place in Chicago as it rebuilt itself following the 1871 fire. In the 1920's, the firm was renamed Holabird & Root after the deaths of the founding partners, and partnership of John Augur Holabird and John Wellborn Root.

⁸² Addis, p.451.

buildings to electrical generating plants',⁸³ designing more than two hundred buildings in eighteen years.⁸⁴ They had had an equally distinguished relationship with IIT, John Holabird Senior having been instrumental in bringing Mies to IIT⁸⁵, as well as, according to Lambert, influencing the decision to adopt wide flange beams on Mies's first constructed work in the USA, the Minerals and Metals Building (1943), and acting as Associate Architects for the office of Mies van der Rohe on numerous IIT commissions.⁸⁶

Holabird & Root had been commissioned by IIT in 1996 to work in tandem with the Campus Centre Planning Committee - a group comprised of IIT students, faculty and staff - to produce the program for the centre and a 'vision that defined the purposes of the Center.'⁸⁷ Holabird & Root's preliminary program had identified the economic constraints which defined the project, namely that a budget of \$20-£25 million, with an estimated cost of \$200-250 per square foot, would permit a building of approximately 100,000 square feet, significantly less than the 185,976 square feet which included 'everything on the initial 'wish list' that the university had given Holabird & Root.' The report developed by Holabird & Root introduced the Commons into the discussions, demonstrating that 'nearly all of the administrative units included in the first draft of the Campus center program could be accommodated in the Commons Building' as an alternative: 'no decision has been

⁸³ Woods, p.126.

⁸⁴ Ibid., p.121.

⁸⁵ A letter from John A. Holabird of Holabird & Root Architects Chicago was sent to Mies in Berlin on March 20, 1936, in which Holabird, acting as Chair of an advisory group of architects 'who have canvassed the situation' of securing a head for the Architectural School. Holabird wrote: 'The trustees and President of Armour Institute are very anxious to secure the best available head for the Architectural School with the idea of making it the finest school in this country.' Holabird notes that he had recommended Mies: 'I am, of course, a great admirer of your work and if we are to consider the best I would naturally turn to you first.' Letter from John A. Holabird, Holabird & Root Architects, to Mr. Mies van der Rohe, 20 March 1936. Library of Congress.

⁸⁶ The Edward L. Duckett Collection includes a memo titled Completed Buildings 1944-1954 Exhibit #5- revised' and lists Building, Cost, Clients, and Associate Architects. In this memo, Holabird and Root and Burgee are listed as Associate Architects on; Engineering Research Building for Armour Research Foundation (1944) Alumni Memorial Hall) (1946); Metallurgical and Chemical and Engineering Building (1946). Duckett Collection.

⁸⁷ 'In the Fall of 1996, the university chose the architectural firm of Holabird & Root to work in tandem with the Campus Center Planning Committee to produce the program for the facility. To begin the process, Holabird & Root studied past proposals for HUB renovation, reviewed the current facilities, and researched trends on student union / campus center construction and renovation at other universities. The planning committee gave Holabird & Root a list of functions / offices to be considered for inclusion in the facility. The most significant step in the process was a series of user group / stakeholder meetings which explored the needs and wants of the various constituencies which would use the campus center. Members of the Campus Center Planning Committee assisted Holabird & Root in facilitating these group sessions.' Executive Summary, Campus Centre Planning Committee Supplemental program Report attached to Robertson memorandum, IIT / 2004.17. Folder 1, IIT Archives.

made regarding the Commons', the Executive summary cautioned.⁸⁸ Joining the OMA team shortly after competition stage, Holabird & Root quickly became embroiled in a bitter Chicago dispute over the fate of the Commons as it became clear that OMA's vision of subsuming the Commons into the MTCC would become a reality.

'Miestakes'

While design progressed on the MTCC towards creating the 'new architectural icon for the 21st century' the competition brief had demanded, in a context in which the Miesian IIT campus had just been ranked 'America's least beautiful',⁸⁹ a March 2000 article in the *Chicago Tribune* by architect and IIT Adjunct professor John Vinci expressed outrage at the plans to attach the MTCC to the Commons, calling them 'wanton defacement'. 'Are we so blinded', Vinci wrote, 'by the glamour of hiring outside celebrity architects that we accept his novel ideas at the expense of diluting the profound architectural contributions made by a towering figure of our time and city?'⁹⁰ Koolhaas responded with the essay 'Miestakes'⁹¹ which listed various defacements the Commons had endured, apparently bestowed by the service engineers which Koolhaas had written of in 'Bigness':

In the meantime, close scrutiny revealed that the Commons had undergone a shocking number of modifications without audible protest from the architectural community.

From 1953 to 1999, more than thirty interventions were undertaken in the "original" Commons: drain pipes, machinery plant room (on the roof) – an endless series of abuses.

The interior was completely unrecognizable. Glass had become sheetrock; a small symmetrical pavilion acquired asymmetrical bulk to function as a pizza parlour.⁹²

⁸⁸ Ibid.

⁸⁹ 'Apparently the new student center planned for the Illinois Institute of Technology can't be built fast enough. The Princeton Review of Colleges is out with its annual ratings, and for the second straight year, the South Side school is ranked as having "America's least beautiful" campus. Never mind that thousands visit every year just to view its Mies van der Rohe-designed buildings.' Judy Hevrdejs and Mike Conlin, 'College reviews' criticism of IIT all in eye of beholder', *Chicago Tribune*, 7 Sept 1998, News, p.2.

⁹⁰ Vinci, p.16.

⁹¹ Koolhaas, 'Miestakes' in *Mies in America*, p.737.

⁹² Ibid., p.737.

'Miestakes' highlighted the impotence of the architect, and the myth of the Master Architect controlling all. "Others" enjoy freedoms that are unavailable to the architect', Koolhaas commented:

As OMA was struggling with History, IIT left the food consultant free range to speculate about reconfiguring Mies as a contemporary food court.

Their sketches were breathtaking in their daring, energy, innocence. But they were unreadable on architects' radar. Only architects can define architecture.⁹³

Underlying Koolhaas' response was the argument that Mies was 'uninterested in the program',⁹⁴ having 'left the design to Gene Summers, the project architect.'⁹⁵ Value at the Commons depended, for preservationists, on the assertion that Mies had controlled all aspects of the project - that every detail represented the hand of the master architect. A decision by state preservation officials in July 2000 - three months after Koolhaas was awarded the Pritzker Prize - to uphold OMA's design, following guidance issued to IIT on how to achieve a compatible 'mating' between the MTCC and Commons. 'One way or another, the final burden may rest on the Chicago architectural firm of Holabird & Root. It is doing the detailing on Koolhaas' design',⁹⁶ Kamin had written in April 2000.

That the burden of expectations from the Chicago architectural community would fall on Holabird & Root was acknowledged by Holabird & Root's project architect Greg Grunloh, who noted that 'OMA could go away and we're still in Chicago.' Grunloh confirmed that 'detailing was one of the things that we [Holabird & Root] took great pride in', but questioned the perception that OMA's buildings weren't well detailed. 'We detailed as much or more on this building as any building we've ever done', Grunloh concluded of the project.⁹⁷ Considering persistent critiques of OMA's 'crude' detailing, and placing these in the context of the assertion in 'Bigness' that

⁹³ Ibid., p.731.

⁹⁴ Ibid., p.726.

⁹⁵ Ibid. Chapter 9 of this thesis also highlighted that there is little evidence of Mies' direct involvement with the Commons – only one letter, prior to the design phase, was found by the author to be directly from Mies. As discussed in the previous chapter, Mies was in Europe for a 6 week period during design development and value engineering phases prior to construction; and the project was variously passed to Gene Summers, Joe Fujikawa, Myron Goldsmith, and David Haid, who, as an architectural intern, was the key recipient and author of project correspondence during the final phases of construction.

⁹⁶ Blair Kamin, 'Tempest in an IIT spot plan to alter, more or less, a Miles [sic] van der Rohe building draws critical fire, with foes calling it a sacrilege', *Chicago Tribune*, 17 April 2000, Tempo, p.1.

⁹⁷ Grunloh interview.

'Issues of composition, scale, proportion, detail are now moot', how would the presence, the history, the responsibility of Holabird & Root negotiate Chicago's expectations of precision on this most sacred of sites? How would the ideological visions of OMA be converted into physical reality at IIT? The separation between ideological exploration and the pragmatics of daily practice, meanwhile, was to be explicitly manifested at OMA. At the time that detailed development of the MTCC was underway in 1999, OMA formed AMO, a research studio serving as the counterpart to OMA's architectural practice.

AMO

'While OMA remains dedicated to the realization of buildings and masterplans', OMA explain, 'AMO operates in areas beyond the traditional boundaries of architecture, including media, politics, sociology, renewable energy, technology, fashion, curating, publishing and graphic design.' By founding AMO, Koolhaas later explained:

we divide the entire field of architecture into two parts: one is actual building, mud, the huge effort of realizing a project; the other is virtual - everything related to concepts and 'pure' architectural thinking. The separation enables us to liberate architectural thinking from architectural practice. That inevitably leads to a further questioning of the need for architecture, but now our manner of questioning has changed: first we did it through buildings, now we can do it through intellectual activities parallel to building.⁹⁸

The split between theory and practice, emerging, as discussed earlier, out of the late Renaissance and sharply debated throughout the nineteenth century as architects sought to define their profession, was explicitly formalised here.⁹⁹ At the time of the MTCC design, OMA's work had been proportionally more speculative

⁹⁸ Citing Rem Koolhaas, Juan Antonio Cortes, 'Delirious & More & iii. Theory and practice' in 'oma/ rem Koolhaas 1996 2007' *El Croquis* 134/135 (2007) 5-19, (p.5).

⁹⁹ 'There's a strange prejudice', Koolhaas stated in 2005, 'that says you cannot both think and do architecture at the same time' 'Rem Koolhaas: Interview' *Perspecta, The Yale Architectural Journal*, 37: Famous (2005), 98-105 (p.99). In 1996, Koolhaas had observed; 'Architecture is a dangerous profession also because it is incredibly difficult and debilitating. In this Paris house there is a simple idea: that it might be nice to have an apartment that floats in the air. Our whole office of 35 people was intellectually engaged for over two years to make this simple idea a reality. In those two years, there was no possibility for us to also think. / Finally, architecture is a dangerous profession because it is a poisonous mixture of impotence and omnipotence, in the sense that the architect almost invariably harbours megalomaniacal dreams that depend upon others, and upon circumstances, to impose and to realise those fantasies and dreams' Rem Koolhaas, Sanford Kwinter, *Rem Koolhaas: Conversations with Students*, 2nd edn (Houston, Tex: Rice University, School of Architecture; New York Princeton Architectural Press, 1996), pp. 12-13.

than built.¹⁰⁰ Even when constructed, OMA's physical work has been described as 'tending towards insubstantiality', refusing gravity, solidity, stability, completeness. Aaron Betsky has described OMA's work as 'an architecture of information'¹⁰¹ and liberated 'from place, from its maker and even from materiality.'¹⁰² In an economic context which values efficiency, predictability and quantitative certainty, AMO delves into the quantitative world of data gathering, fact checking and statistical analysis, and declares even this quantitative world to be inconclusive, uncertain, subjective, evasive and contradictory.¹⁰³ Of this, Koolhaas states: 'I'd say that my profession ends where architectural thinking ends - architectural thinking in terms of thinking about programs and organizational structure.'¹⁰⁴ Critiquing a building culture which drives the separation of thinking and doing in architectural practice – in which economic, time and administrative pressures are often not conducive to thinking - OMA employ and re-imagine palettes of statistical data, standardised products and generic construction systems.

At the MTCC, a building culture which desired the certainties promised by generic standardisation was explicitly refuted by a precisely crafted ceiling wrested from a cheap standardised off-the-shelf product. As an embodiment of the challenges outlined in *S,M,L,XL*, the IIT ceiling is, in the next section, demonstrated by project documentation to be an obsessively detailed, highly researched, carefully crafted and extraordinarily precisely considered detail. Closely reading the 'concrete details'¹⁰⁵ of project documentation highlights, in the next section, the specific mechanisms by which an extended project team negotiated a deviation from a standard.

¹⁰⁰ Between their formation in 1978 and 2003, when the MTCC was completed, a total of 118 speculative studies, commissions, conceptual work, and studies had taken place compared to 32 built works and to some degree, speculative work had always been awarded some degree of independence of the processes of practice in OMA. AMO, Koolhaas noted, was borne out of OMA's Groszstadt Foundation, described in *El Croquis* as 'an independent structure controlling the <cultural> activities of the agency, such as exhibitions and publications. 'oma/ Rem Koolhaas 1987 1993' *El Croquis* 53 (1994), p 5.

¹⁰¹ Aaron Betsky, 'Rem Koolhaas: The Fire of Manhattanism inside the Iceberg of Modernism', in *Considering Rem Koolhaas and the Office for Metropolitan Architecture: What Is Oma* (Rotterdam: NAI Publishers, 2003), pp. 25-39 (p.36).

¹⁰² *Ibid.*, p.39.

¹⁰³ Betsky describes this as 'the obsessive gathering of statistical data in order to ground architecture not in form, but in analysis and prognosis [...] the cool realm of data, rationality and organisation that tends towards what Ludwig Mies van der Rohe called 'almost nothing.' *Ibid.*, p.28.

¹⁰⁴ Cortes, p.5.

¹⁰⁵ Yaneva, p.101.

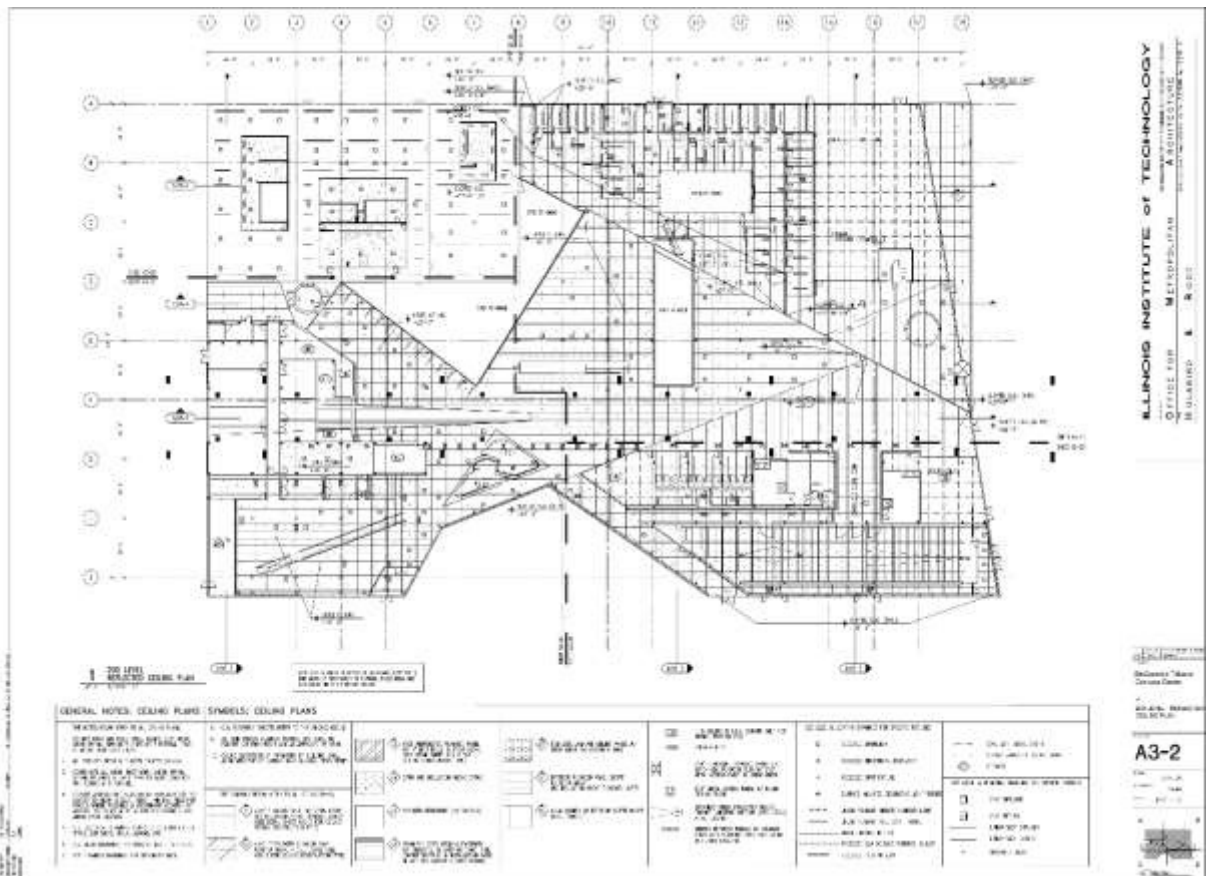
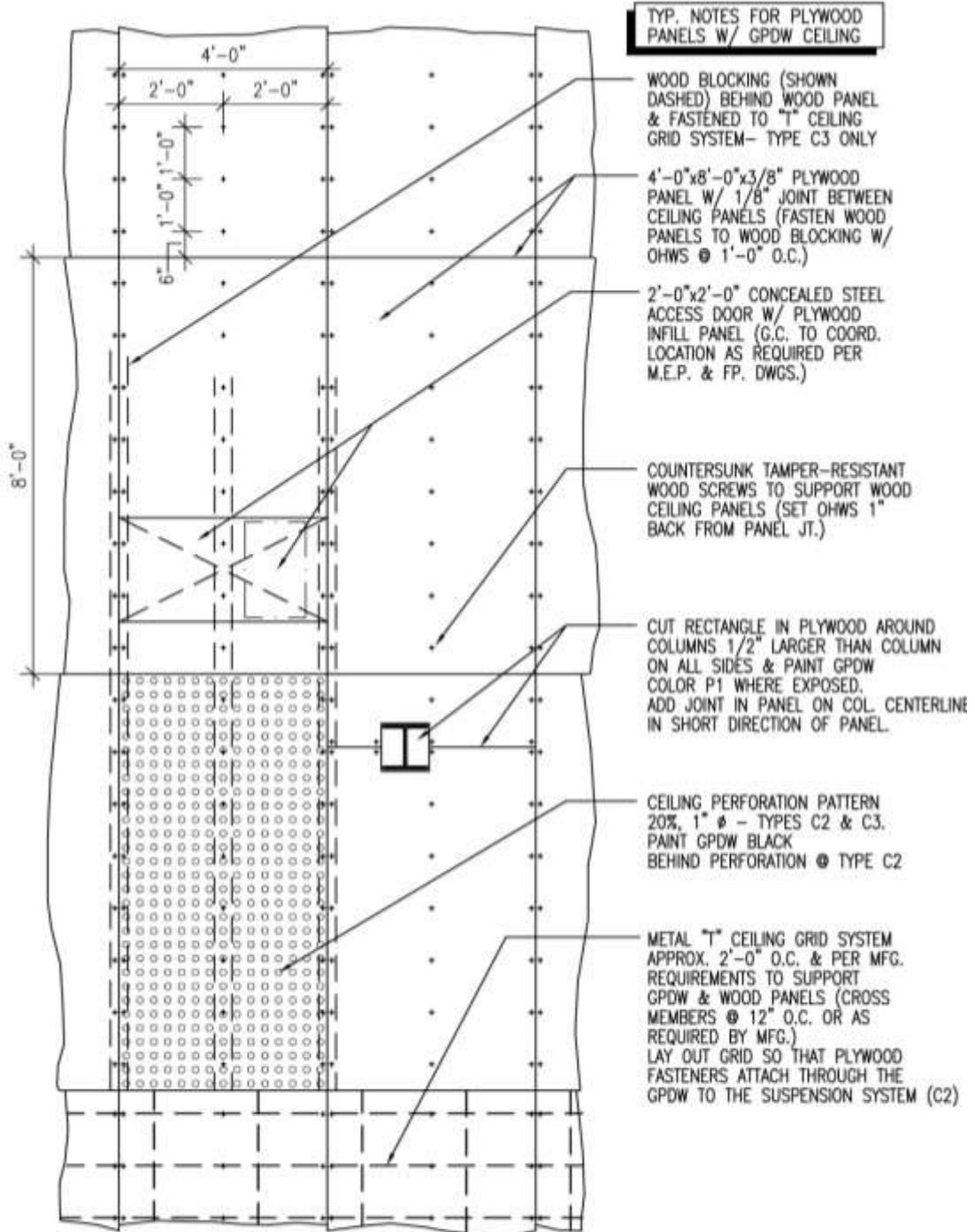


Fig. 10.11 - 200 Level - Reflected Ceiling Plan A3-2, Office of Metropolitan Architecture with Holbird & Root construction drawings of the McCormick-Tribune Campus Centre. Issued for bids and permit, 6 April 2001.



**15 ENLARGED PARTIAL CEILING PLAN
TYPICAL PLYWOOD PANELS**

A13-2 1/2"=1'-0"

Fig. 10.12 - Enlarged Partial Ceiling Plan Typical Plywood Panels 15/ A13-2, Office of Metropolitan Architecture with Holabird & Root construction drawings of the McCormick-Tribune Campus Centre. Issued for permit and bid, 6 April 2001.



Fig. 10.13 - Slide 52 from a 2004-09-08 Holabird & Root Powerpoint presentation showing proposal for the plywood ceiling at OMA's MTCC.

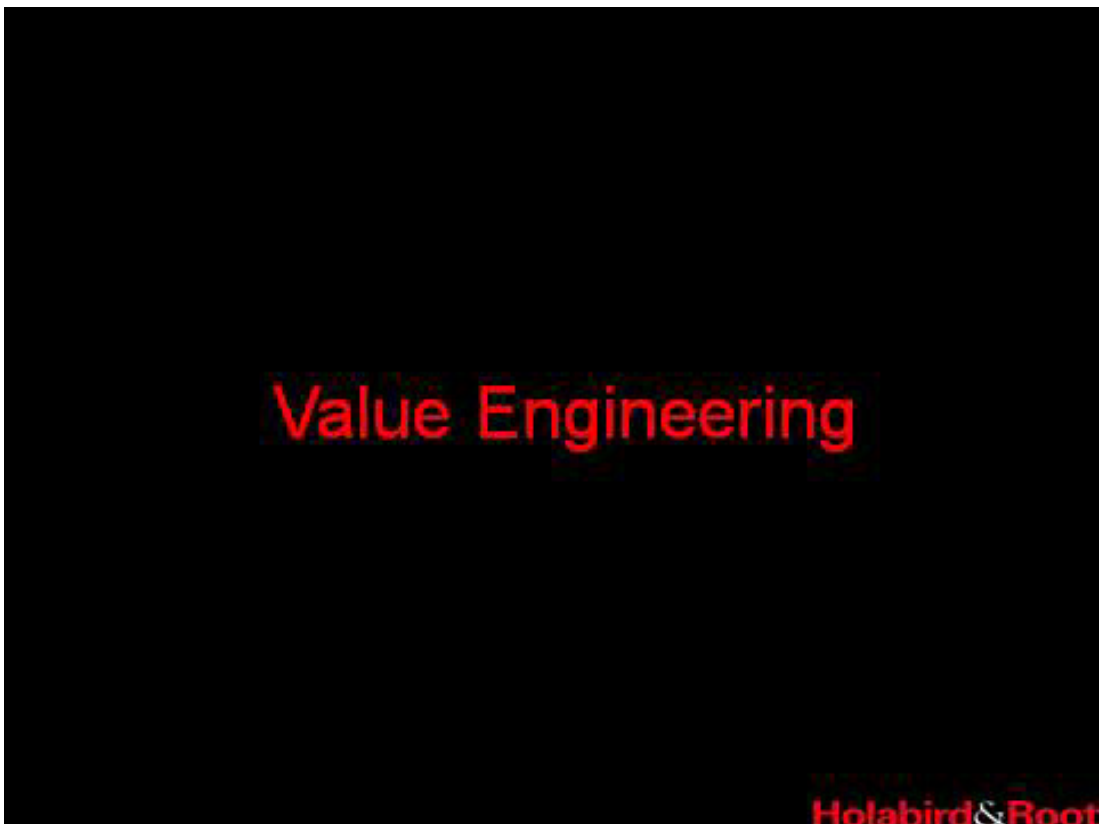


Fig. 10.14 - Slide 67 of a 2004-09-08 Holabird & Root Powerpoint presentation, opening a section of the presentation titled 'Value Engineering' which discusses the revisions from a plywood to a drywall ceiling at OMA's MTCC.

10. A precisely crude ceiling at the MTCC



Fig. 10.15 - Exposed Greenboard wall at Prada New York. Forwarded to Greg Grunloh by OMA NY on 1 January 2002.



Fig. 10.16- First mock-up of exposed greenboard and spackle at the MTCC, image emailed to OMA NY on 6 March 2002



Fig. 10.17- First mock-up of exposed greenboard and spackle at the MTCC, detail emailed to OMA NY on 6 March 2002

10.6 'Accuracy, neatness and concentration'¹⁰⁶

On April 6 2001, Holabird & Root issued a set of permit and bid drawings for the MTCC. Listing a core design team of twelve organisations spread across the USA and Europe,¹⁰⁷ the permit set of drawings included a detailed plywood ceiling¹⁰⁸ to extend across the majority of the public spaces [Figs.10.11-10.13]. The challenges which had beset the project were outlined in a *Chicago Tribune* article on 16 May 2002.¹⁰⁹ An initial completion date of 2000 had been pushed back to Spring 2003, largely due to a required redesign to meet CTA (Chicago Transport Authority) requirements for an acoustically insulating tube wrapping the EI (Elevated) tracks and a new supporting structure for the EI itself. These challenges were reflected in expanding costs for the MTCC. Following the permit and bid issue, the MTCC had entered several rounds of value engineering, [Fig. 10.14], requiring continuous changes in the detailing. Grunloh noted that 'one of the other strategies that OMA employed as they value engineered the building was to do, when things were removed, was to not replace them or to kind of let the building tell the story of the evolution of itself,'¹¹⁰ a strategy which narrated the principles of 'Bigness' - of a lack of control, of delegation of decisions to 'others' - at work.

The proposed plywood ceiling, placed over a Type X gypsum board to meet a flame spread rating for the City of Chicago building code, had, now, been targeted, as a superfluous ornamental layer, economically as a 'big ticket item.'¹¹¹ Its removal from the scope of work left behind a gypsum board ceiling: a generic, off-the-shelf, standard, cheap material, typically accompanied by full sets of precisely predefined manufacturers' components, specifications, details and components, giving a

¹⁰⁶ Header to Mark Schendel's bio page on Studio Gang's website.

<<http://www.studiogang.net/people/markschendel>> [accessed 5 April 2015].

¹⁰⁷ The title sheet of the permit and bid drawings lists: OMA (Rotterdam: Architect), Holabird & Root (Chicago: Architect of Record and Structural Engineer of Record); Ove Arup (London: Structural Engineer Consultant); SOM (Chicago: MEP Engineer of Record); Terra Engineering (Chicago: Civil Engineer); NBBJ (Seattle, WA: Lighting Consultant); TNO-TUE Centre for Building Research (Eindhoven, Netherlands: Acoustical Consultant); Kirkegaard (Chicago: Acoustical Consultant); 2x4 (New York: Graphics Design); McGinty (Boulder, CO: Graphics Consultant); Peter Lindsay Schaudt (Chicago: Landscape Design); Sako & Associates (Arlington Heights, IL: Security). G1-1 Index to Drawings: Vol I of II: Architectural and Structural. Office of Metropolitan Architecture with Holabird & Root, construction drawings of the McCormick-Tribune Campus Centre. Issued for permit and bid, 6 April 2001.

¹⁰⁸ Enlarged Partial Ceiling Plan Typical Plywood Panels Detail 15/ Sheet A13-2. Office of Metropolitan Architecture with Holabird & Root, construction drawings of the McCormick-Tribune Campus Centre. Issued for permit and bid, 6 April 2001.

¹⁰⁹ Kamin, 'IIT's new groove tube', p.1.

¹¹⁰ Grunloh interview.

¹¹¹ Ibid.

material system which in itself typically demanded little attention from architects. The MTCC design team's treatment of this generic material refused all such certainties, turning to OMA precedents for ways to elevate this generic material to a finish which would meet the architectural expectations for this centre. OMA's Prada New York Epicentre provided a precisely specified precedent.

Prada NY

On December 14, 2001,¹¹² OMA's Prada New York Epicentre opened,¹¹³ a 23,000 sq.ft 'boutique, public space, laboratory.' A physical manifestation of OMA/AMO's research, and Koolhaas' 'Project on the city' research studio at Harvard into shopping as 'the last remaining form of public activity', the project gained attention for what critic Carolyn Thomas de la Pena termed 'the sheer economic boldness of the project':

At a cost of roughly \$40 million, the store was the most prominent articulation of consumer confidence to appear in Manhattan in the months following September 11. Such factors certainly contributed to its critical and economic success in its opening season. [...] Prada mediates between global products and consumer bodies. The result is an experience of sublime urbanity, one that uses material objects to allay consumers' fears of postmodern conformity, obsolescence, and banality while affirming their privileged global citizenship.¹¹⁴

Prada was borne out of the theoretically and conceptually situated territories of AMO and Harvard. The economies of Prada as a client gave rise to 'considerable research into materials and textures,' in what Thomas de la Pena highlights as OMA's interest in the 'XS scale- the technical details and textures of materials and their decorative potential.' Products for purchase in Prada may be extraordinarily

¹¹² Carolyn Thomas de la Peña, 'Ready-to-Wear Globalism: Mediating Materials and Prada's GPS', *Winterthur Portfolio*, 38: 2/3 (Summer/Autumn 2003), 109-129 (p.109).

¹¹³ Prada NY was OMA's second constructed project in the USA, the Hermitage Guggenheim in Las Vegas being the first in 2001. Several unbuilt studies had previously taken place in the USA: Miami Performing Arts Center, Miami 1994; MCA Masterplan USA in LA, 1995; Universal Headquarters USA, LA, 1996; MoMA Charrette, NY, 1997; Astor Place Hotel commission, 1999; Prada San Francisco study, San Francisco, 2000; Taschen House commission, LA, 2000. Analysis of data in <<http://www.oma.eu/projects/?Category=0>> [accessed 27 February 2015].

¹¹⁴ Thomas de la Peña, p.111.

expensive;¹¹⁵ the budget for the interior itself reaching ‘stratospheric’¹¹⁶ levels, but the materials palette included cheap, standardised and off the shelf systems, including exposed gypsum drywall. ‘[P]ride in cheapness combined with the pretence of culture,’¹¹⁷ Koolhaas had offered in 1994 in response to critiques of crude OMA detailing. Materials research at Prada had manifested a simultaneous embodiment and refusal of such conditions, in which apparent cheapness involved an extraordinary amount of attention to detail. Gypsum board was imported from the UK, and treated as a finish material: exposed, with clean, regular squares of spackle over regularly spaced fixing screws. In the way an expensive material might be imported and beautifully handcrafted as a precious finish, here the most standardised, ubiquitous, generic of materials - British Gypsum board - was imported, custom cut, custom finished, and displayed as a unique, valuable, crafted product in the most elite of settings.¹¹⁸ Bearing in mind that the exposed gypsum board at IIT was borne out of a Value Engineering exercise, precedents from Prada NY offered the outcomes of meticulous research into the elevation of a standard material, uniquely adapted as a highly crafted finish. This elevation of standardisation, of a generic, cheap wall material would next be developed as the ‘IIT ceiling.’

Between typical and Prada

On 4 January 2002, an email from OMA NY sent photographs of the exposed greenboard at Prada NY to Grunloh, noting of attached images [Fig.10.15] images that:

oma's prada team detailed it with a custom aluminum extrusion that runs along the top and bottom of the boards - and with a similar aluminum edge along the jambs of openings. each board was cut

¹¹⁵ ‘Arguably, Prada Soho’s interior space, where materials for purchase are not only extraordinarily expensive but also sparsely displayed and not easily accessed [...] According to one store employee, at any one time roughly 70 percent of the customers at Prada are tourists who have no intention of making a purchase. Few of the store’s “shoppers” leave with materials in tow.’ Thomas de la Peña, p.111.

¹¹⁶ Blair Kamin, ‘Details mar the extraordinary in Koolhaas’ IIT campus center’, *Chicago Tribune*, Arts & Entertainment, 23 Sept 2003, p.1.

¹¹⁷ Zaera, p.10.

¹¹⁸ A fax from OMA NY to Mark Schendel on 8 October 2002 noted that ‘neither of us could find the spec. for the Prada NY green GWB, which was not included in the spec. book, but was probably issued as an addendum with sketches for the control sample. Because the green GWB was British Gyp (as opposed to American) it was treated as a ‘decorative wall board’ applied over fire-rated gypsum board.’ ‘Prada GWB Specs for IIT’, OMA NY Fax to Mark Schendel, 8 October 2002.

to size to match the module of adjacent compact shelving units. the green board was imported, but the pink is domestic.

the design team would very much like [the contractor's] suggestions for translating the prada example to the conditions at iit. we have some initial questions:

[...]

the prada team and the drywall contractor developed installation parameters with a mockup to define tape and spackle locations, etc. i presume we would do the same?

the prada tape and spackle pattern is more rigid than we would prefer (or expect) for iit. would a contractor agree on an application pattern that lies somewhere between a typical application that gets covered-up and what the prada images show?¹¹⁹

'We would do the same', the general contractors responded on 7 Jan 2002. 'I think we could get this worked out in the parameters worked out with the contractor.'¹²⁰ The expectations, for a precisely rough finish, between, as OMA-NY had proposed, the rigidity of Prada's precedent and the roughness of a 'typical' application for cover, would be hard to precisely specify. An email exchange between IIT and OMA NY on 6 March 2002 highlighted the challenges of achieving precise expectations for a normally rough finish. A drywall mock-up had been carried out at IIT, in preparation for OMA-NY's review in February 2002, and photos forwarded from IIT to OMA NY [Figs. 10.16, 10.17]:

Attached are two pictures of the exposed drywall ceiling mockup prepared for [OMA NY] review earlier in February. You will note that this mock-up differs from the spackle and sanding patterns shown in the "Bulletin 3" documents in that the spackle is not applied in a precise square at the screw joints as shown in the drawings, but instead is spread across several screws.

There will be a labor (i.e. price) difference between the method shown in the documents and the method provided in the mock-up. We need to have clarified which method is to be used.¹²¹

A return email from OMA NY the same day rejected the sample:

we never discussed the technique for applying mud over screws - but it cannot look like the images attached.

¹¹⁹ 'exposed GWB progress', email cc to Greg Grunloh, 4 January 2002. This quotation reproduces original capitalisation and punctuation.

¹²⁰ 'Re: exposed GWB progress' contractor response marked up to OMA NY email, 7 January 2002.

¹²¹ 'Green Board mock-up vs. Bulletin #3 dwgs'. Email to H&R from IIT, 6 March 2002.

oma would like two options to be bid - one where individual screws are spackled as shown in the drawing addendum the other where screws are spackled in a line. the latter must be approved by the architect in an on-site mockup.

[...] the demonstration with iit's installers [was] incredibly helpful, but it cannot take the place of an onsite mockup overseen by the project's contractor and witnessed by the entire team.¹²²

Here, a mock-up would be required to be witnessed by the entire team. This was not to be as simple as a 'crude' unfinished ceiling, but one which would require research, input and approval from the entire team, and the continuous on-site presence of an OMA representative.

Eyes on the site

From October 2002, correspondence appears from Mark Schendel, a Managing Principal of Chicago based firm Studio Gang (established in 1997 as Gang O'Donnell¹²³) and former senior project manager and lead designer for OMA in Rotterdam from 1989-1995, brought in to the MTCC as construction administrator, to be OMA's 'eyes on the site' and uphold OMA's 'conceptual underpinnings' through the pressurised process.¹²⁴ Schendel's biography on Studio Gang's website highlighted 'an exacting operations approach [Schendel] describes with the phrase, "Accuracy, Neatness and Concentration"'.¹²⁵ Schendel notes that he was brought in

¹²² 'Re: Green Board mock-up vs. Bulletin #3 dwgs.' Email from OMA-NY to IIT, 6 March 2002.

¹²³ Studio Gang's website notes: 'Founded by MacArthur Fellow Jeanne Gang in 1997, Studio Gang Architects is a collective of architects, designers, and thinkers whose work engages pressing contemporary issues and their impact on human experience.' <<http://www.studiogang.net/studio>> [accessed 5 April 2015].

¹²⁴ '[W]e were called in to help during the construction phase uniquely. I'd worked at OMA years earlier and had moved to Chicago and started our firm here, and they found it convenient, to call us, and all that. So, what I know is from the construction phase, and our efforts to negotiate the serious cost constraints that we had, that, at that late a date, with finishes, and how finishes met each other. So if there was any details that were ...that required a lot of effort, it was to continually track the change in the details, based on the change in finishes caused by cost cutting.' Mark Schendel interview with author, 10 May 2010. Schendel's cv [downloaded from <<http://www.studiogang.net/people/markschendel>> [accessed 5 April 2015] noted that Schendel was with OMA / Rem Koolhaas, Rotterdam from 1989-95 as Senior Project Manager and Lead Designer. Schendel noted in interview with the author on 10 May 2010 that the situation at the MTCC was unusual, in that normally an OMA employee would have overseen construction administration, but that the combination of no availability from OMA NY and budget pressures and value engineering processes meant that 'OMA wanted someone who knew the conceptual underpinning, someone who was familiar with, who had worked with the office before, and knew them, to be their eyes on the site,' in addition to the H&R team. Schendel interview.

¹²⁵ Schendel's website profile read: 'Through an exacting operations approach he describes with the phrase, "Accuracy, Neatness and Concentration," Mark ensures that each project remains on time and on budget by enforcing project deadlines, coordinating communications between all parties, and rigorously tracking finances. His hands-on involvement runs from

to represent OMA on site on a daily basis in the midst of immense budget pressures and multiple rounds of value engineering, which resulted in changes ‘in real time’ on the construction site, necessitating constant changes in detailing and specifications and requiring negotiations between a multitude of individuals on site. The biggest part of the job really’, Schendel noted:

was negotiating change, with everyone. When you're in construction, it is an act of communication with the client, with; for me, it was communication with the client, with Greg Grunloh and his team at Holabird & Root, to OMA in New York and Rotterdam, and the contractors, usually through the main GC [...] in actuality, you talk to them, you work it out, you work it out as best as you can. When things are running quickly on site, the GC will frequently ask that we speak to, directly with the trades, so that things can get settled quickly.¹²⁶

As Schendel joined the project on site, and began negotiations between OMA NY, Holabird & Root, IIT, Gilbane, and Chicago Ceiling & Partition Co, discussions regarding the proposed specifications for the ‘IIT ceiling’ took place during the same period in which Koolhaas’s ‘Junkspace’ was published, a text which paid particular theoretical attention to the realm of the sheetrock ceiling.

10.7 ‘Junkspace’: an absolute absence of detail

‘Junkspace’ toured through the ‘inaccessible spaces’ - the voids above ceilings and behind walls - of airports, hotels and shopping malls: spaces dominated by the precise certainties offered by systems beyond the architects’ control.

‘JunkSignature™’, Koolhaas wrote, ‘is the new architecture: the former megalomania of a profession contracted to manageable size, ‘Junkspace’ minus its saving vulgarity.’¹²⁷ The megalomania of a profession - the grand macro visions - are tempered by the demands of technology, of economy, of systematised and standardised products and processes, of others. The observations of ‘Bigness’ are magnified tenfold: it is no longer sufficient to state that the detail is moot.

‘Junkspace,’ rather, is generated by ‘an absolute absence of detail.’¹²⁸ As the physical conclusion of ‘Bigness’, ‘Junkspace’ is borne from values of economy, efficiency and certainty. ‘Junkspace seems an aberration,’ Koolhaas began, ‘but it is the essence, the main thing...the product of an encounter between escalator and

schematic design through completion of construction and post-occupancy.’ <<http://www.studiogang.net/people/markschendel>> [accessed 5 April 2015].

¹²⁶ Schendel interview.

¹²⁷ Koolhaas, ‘Junkspace’, p.182-3.

¹²⁸ Ibid., p.182.

air-conditioning, conceived in an incubator of Sheetrock (all three missing from the history books).¹²⁹ 'Junkspace' appears as the product of a building culture which focuses on certainty and efficiency, permitting the architect only a limited and prescribed palette of tools, off the shelf components: design, as Leatherbarrow observed, becomes a matter of assemblage of off the shelf components in some original fashion to achieve some kind of original effect,¹³⁰ albeit one which will not incur risk, or the loss of a standard warranty. 'Can the bland be amplified?' Koolhaas challenged: 'The featureless be exaggerated? Through height? Depth? Variation? Repetition?'¹³¹ The precise detail, 'moot' in 'Bigness', is demoted further in 'Junkspace'. In lieu of the precisely controlled modernist fetish of a shadow gap, the joint in 'Junkspace' is revealed to be defined by far cruder approaches:

The joint is no longer a problem, an intellectual issue: transitional moments are defined by stapling and taping, wrinkly brown bands barely maintain the illusion of an unbroken surface; verbs unknown and unthinkable in architectural history - clamp, stick, fold, dump, glue, shoot, double, fuse - have become indispensable.¹³²

'The ceiling received particular attention:

The ceiling is a crumpled plate like the Alps; grids of unstable tiles alternate with monogrammed sheets of black plastic, improbably punctured by grids of crystal chandeliers...Metal ducts are replaced by breathing textiles. Gaping joints reveal vast ceiling voids (former canyons of asbestos?), beams, ducting, rope, cable, insulation, fireproofing, string; tangled arrangements suddenly exposed to daylight. Impure, tortured and complex, they exist only because they were never consciously plotted.¹³³

When this critique is manifested as physical construction, OMA critically embody the conditions of "Junkspace." For George Baird, 'Junkspace' was 'bitter and disillusioned.'¹³⁴ An alternative interpretation, as of 'Bigness', is that of a brutally honest account of architectural production by a contemporary architectural practitioner. The IIT ceiling, engendered by a wall at Prada, accepts the condition of a standardised, generic product but, as a customised and unique application, rejects parameters which guarantee the certainty of predictable outcomes. The 'IIT ceiling' is 'Junkspace' ironically manifested, exemplified.

¹²⁹ Ibid., p.176.

¹³⁰ See in particular Ch. 4. 'The topographical horizon of dwelling equipment', Leatherbarrow, *Uncommon Ground*.

¹³¹ Koolhaas, 'Junkspace', p.182.

¹³² Ibid., p.182.

¹³³ Ibid., p.181.

¹³⁴ Baird, p.33.

'Premade products are the canon of our time'

In *Uncommon Ground*, Leatherbarrow highlighted that, despite the innumerable availability of premade systems which promise certainty, guarantees, warranties, a singular system designed in a vacuum will rarely meet our needs.¹³⁵ Leatherbarrow observed that, accepting the condition of usage of pre-existing products:

the business of planning what will get built has become a matter of choice and combination, at least largely so; choice and combination of elements that can be purchased but rarely invented. If originality is rare, the architect never finishes first; always ahead is the product designer. Premade products are the canon of our time.¹³⁶

The construction industry demands economy, maximum space for minimum cost, technical certainty: OMA's published rhetoric offers an architecture absent of detail: an architecture of off the shelf components, of cheap materials applied for maximum effect, even in the most expensive of situations. 'The shiniest surfaces in the history of mankind reflect humanity at its most casual. The more we inhabit the palatial, the more we seem to dress down,' Koolhaas stated.¹³⁷ A seemingly cheap, crude, non-detailed IIT ceiling of off-the-shelf standardised Gypsum Board, was derived straight from the 'stratospheric' budget of Prada, and, the next section will argue, was precisely detailed and obsessively controlled. The IIT ceiling, in denying standard construction practice, in refuting the certainty of manufacturer's recommendations, in foregoing warranties, would demand non-standard attention, craft, and care. As Koolhaas described in 'Junkspace':

At the exact moment that our culture has abandoned repetition and regularity as repressive, building materials have become more and more modular, unitary and standardised; substance now becomes predigitized...[...] With enormous difficulty – budget, argument, negotiation, deformation – irregularity and uniqueness are constructed from identical elements. Instead of trying to wrest order from chaos, the picturesque is now wrested from the homogenized, the singular liberated from the standardised...¹³⁸

'The picturesque is now wrested from the homogenized, the singular liberated from the standardised', Koolhaas wrote in 2001, as the specifications for a value-engineered exposed plasterboard ceiling at the MTCC were in development.

¹³⁵ Leatherbarrow, p.129.

¹³⁶ Ibid., p.126.

¹³⁷ Koolhaas, 'Junkspace', p.177.

¹³⁸ Ibid., p.178.



Fig. 10.18 - IIT Ceiling Sketch 01-03. Image sourced from Mark Schendel.



Fig. 10.19 - IIT Ceiling Sketch undated. Image sourced from Mark Schendel.

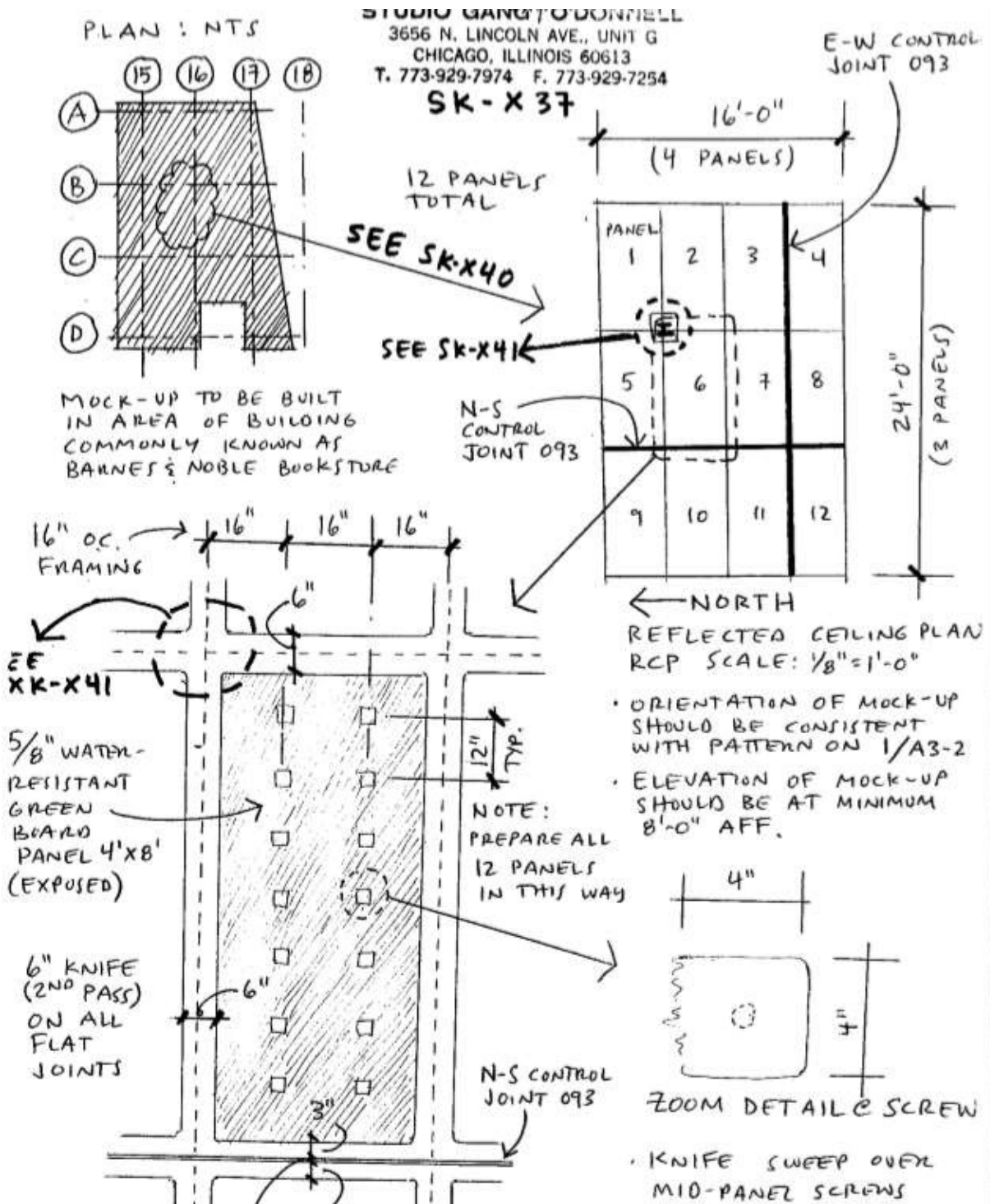


Fig. 10.20 - SK X-37 issued by Mark Schendel on 6 Nov 2002 accompanying specification for mock-up.

TYPICAL FRAMING GWB (GREEN BOARD)
CEILING @ IIT MT CAMPUS CENTER

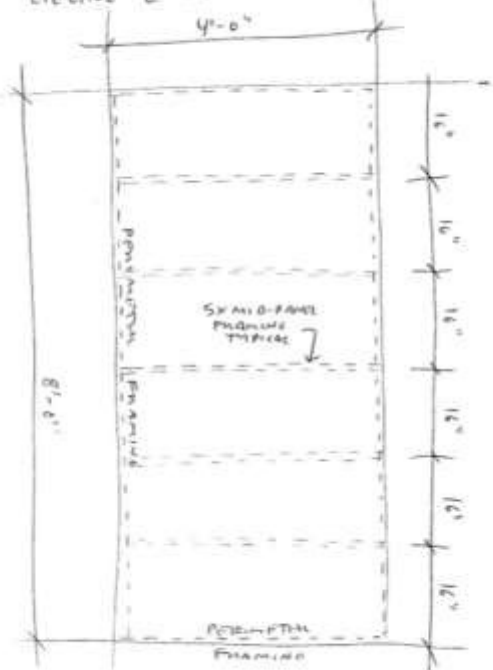


Fig. 10.21 – Ceiling framing sketch issued by Mark Schendel (undated)

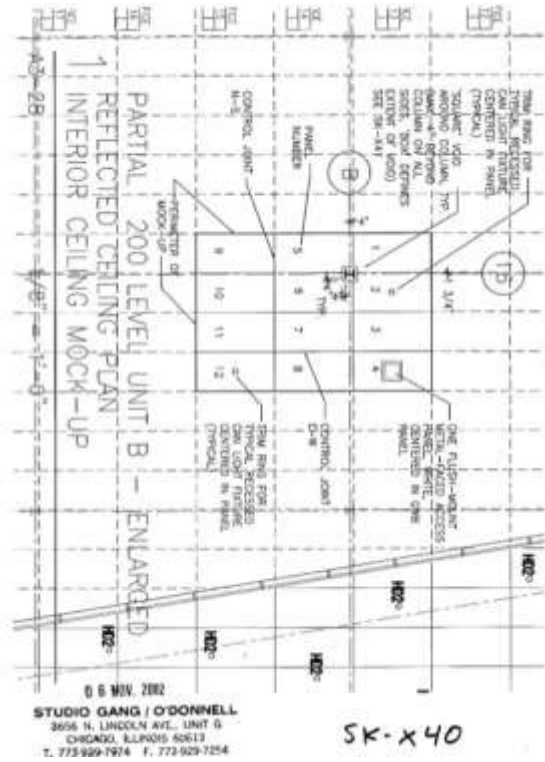


Fig. 10.22 - SK X-40 issued by Mark Schendel on 6 Nov 2002 accompanying specification for mock-up

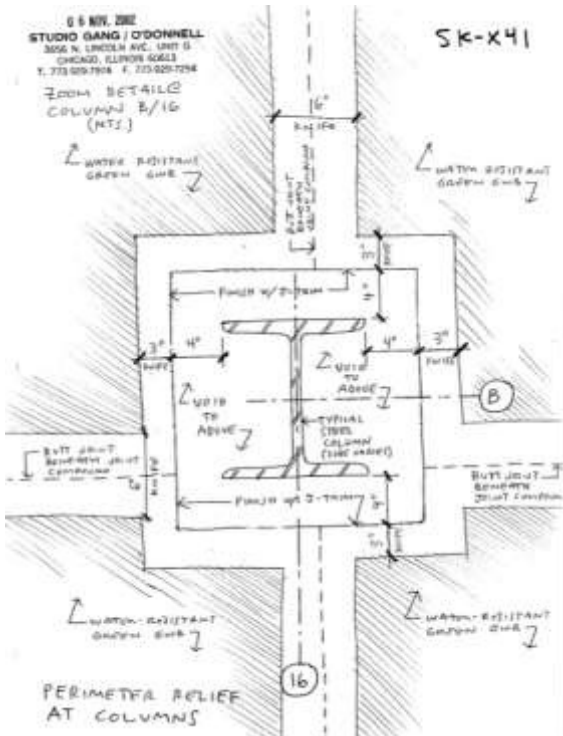


Fig. 10.23 - SK X-41 issued by Mark Schendel on 6 Nov 2002 accompanying specification for mock-up

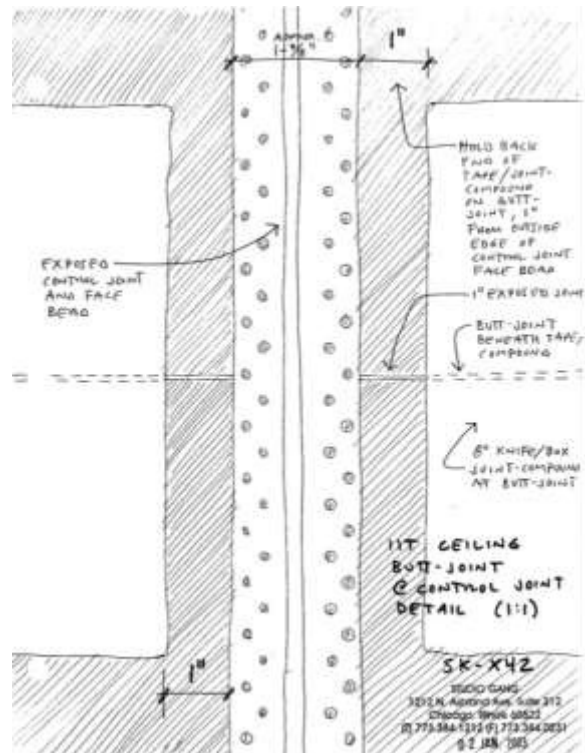


Fig. 10.24 - SK X-42 issued by Mark Schendel on 6 Nov 2002 accompanying specification for mock-up

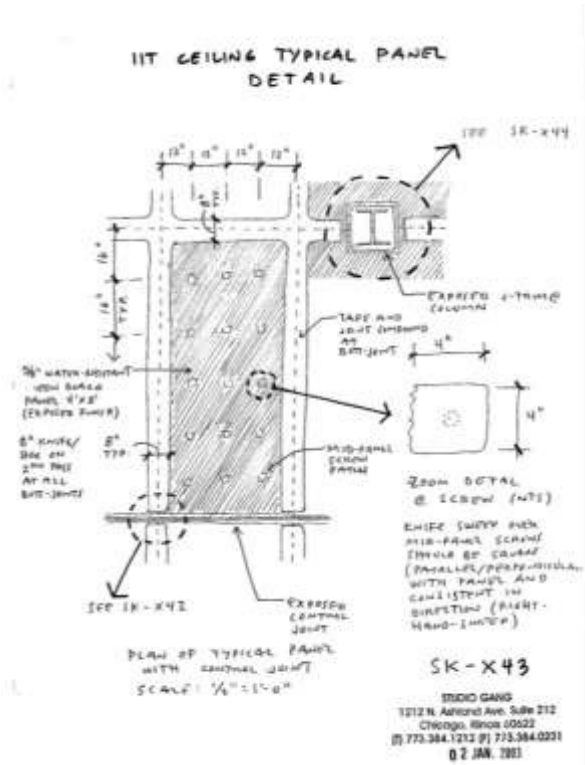


Fig. 10.25- SK X-43 issued by Mark Schendel on 6 Nov 2002 accompanying specification for mock up

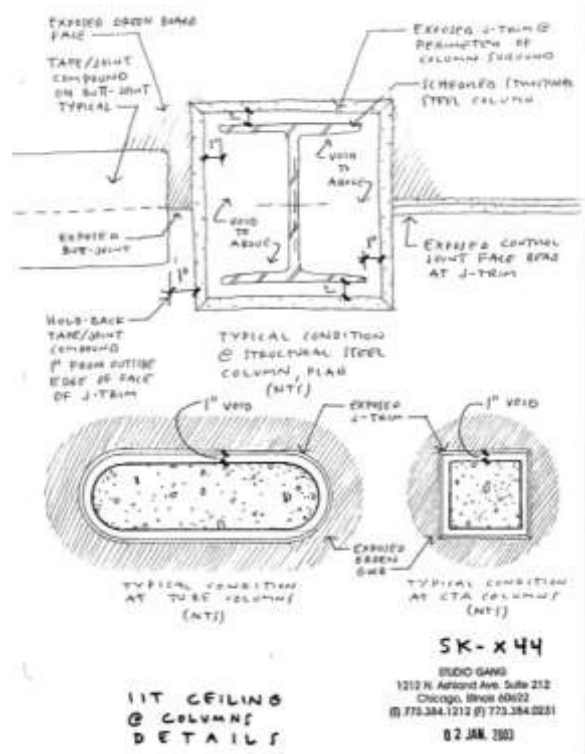


Fig. 10.26 - SK X-44 issued by Mark Schendel on 6 Nov 2002 accompanying specification for mock up

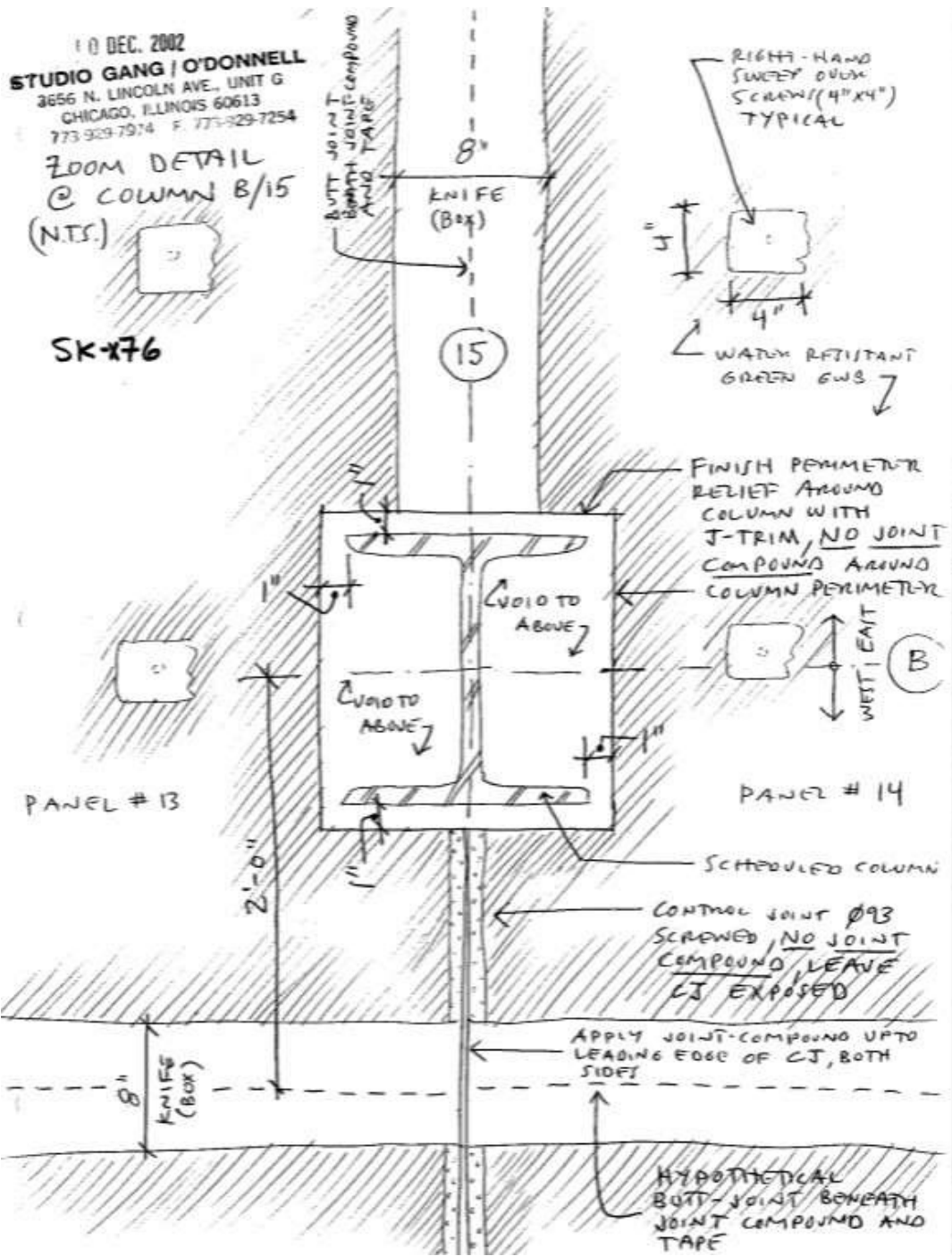


Fig. 10.28 - SK X-76 issued by Mark Schendel on 10 Dec 2002 accompanying specification for mock-up

10.8 Specifying the 'IIT ceiling'

On 9 Sept 2002, an email from OMA-NY titled 'Rem and Ceiling' noted that, following 'meeting Rem in spurts today', that 'Rem prefers the Prada-like exposed drywall over all other options'¹³⁹ [Figs. 10.18, 10.19]. An email from OMA-NY to Schendel on 7 Oct 2002 gave 'Specifications for the Prada NY green GWB' as 'Gyproc Moisture Resistant (MR) Board by British Gypsum', detailed thus:

The wall panels were cut to equal widths per elevation and then taped and spackled. At least two coats of joint compound were applied to vertical edges only: 6" knife for flat joints and outside corners; 4" knife for inside corners. A right hand sweep was applied over vertical screw holes that were approximately 18" c.c.¹⁴⁰

Here were the origins of the extraordinarily detailed specifications for the IIT ceiling: specifications which went as far as to specify tools and hand motions: specifications which attest to an observation by Juan Antonio Cortes that the Prada commissions gave rise to 'considerable research into materials and textures.'¹⁴¹ The Prada commission, constructed at approximately \$1739 per square foot - as opposed to the still relatively comfortable competition budget of \$250 per sq.ft. at IIT¹⁴² - appeared to permit the 'XS' craftsman-like approach to detailing Cortes had discussed. Far removed from a generic application, research at Prada had converted off-the-shelf components as uniquely handcrafted applications. That such research had previously taken place, and that constructed examples of the non-standard application of a standard material already existed, did not prevent concerns being raised by the MTCC's ceiling subcontractors regarding a proposal for a non-standard installation.'

Installation contrary to manufacturers' recommendations.

RFI (Request for Information) # 0370, issued by the general contractors on 18 October 2002 to Holabird & Root, attached information from the ceiling subcontractors, who in turn had enclosed guidance via correspondence from the

¹³⁹ 'Rem and Ceiling', email from OMA-NY to Gang O'Donnell and Holabird & Root, 9 September 2002.

¹⁴⁰ OMA-NY 'Prada GWB Specs for IIT', fax to Mark Schendel, 7 October 2002.

¹⁴¹ Cortes, p.19.

¹⁴² The Galinsky website reports Prada was constructed at approximately \$40 million for 23,000 square feet at \$1739 per sq.ft < <http://www.galinsky.com/buildings/prada/> > [accessed 11 April 2015] in comparison to a budget of \$25 million for 100,000 square feet at IIT, from a projected budget of \$250 per square foot Executive Summary, Campus Centre Planning Committee Supplemental program Report attached to Robertson memorandum, IIT / 2004.17. Folder 1, IIT Archives. p.2.

product manufacturers, United States Gypsum. 'The conflict', the RFI stated, as discussed at the opening of this chapter, 'is that the installation of this product is contrary to the manufacturer's recommendations. Please advise.'¹⁴³ In a cultural context of standardised premanufactured systems, everyone is guarded, as Leatherbarrow observed in *Uncommon Ground*, highlighting that the complexity of such systems is rarely fully understood, leading to excessive caution:

Nor would a professionally responsible architect be willing to approve an improvisation. The working of one component depends upon the working of others with which it is connected in the functioning of a system; which is itself often too complex for anyone on the site, or the architect, to understand.¹⁴⁴

Recommendations from manufacturers which guide professional architectural practice, typically advise against any alterations or improvisations, warning of negative consequences for performance or liability. This culture of caution was explicitly present in the discussion of the IIT ceiling, where several 'conflicts' between the design team's proposed installation and USG's recommendations were listed by the ceiling subcontractors, including the supporting framing spacing and related screw pattern, and the alignment, rather than staggering of butt-joints – for which 'No warranty for cracking along the entire length of the butt joints could be offered if installed as shown.(USG Gypsum Construction Handbook; page 110).'

Specifically highlighted was the fact that 'USG Sheetrock Brand Water-Resistant panels are not designed to be a finished product.'¹⁴⁵ In addition to conflicts regarding product installation issues, the ceiling subcontractors highlighted 'issues of aesthetics and practicality':

Color variation of unfinished green-board will be out of our control, there is no way to insure uniformity of color from one panel to the next.

How will blemishes in the surface be touched up? (Whether from normal manufacturing causes or from handling and installation). The rendering doesn't illustrate any skimmed gouges or filled holes that are a part of any normal installation.

If metal corner beads are used, some of the metal will be left exposed in normal conditions. What problems will this cause?

¹⁴³ RFI# 0370 Issued to Greg Grunloh, Holabird & Root. 18 Oct 2002.

¹⁴⁴ Leatherbarrow, p.125.

¹⁴⁵ RFI #0370 18 October 2002.

Refer to attached pages from USG Handbook and letters from USG and advise how to proceed.¹⁴⁶

An attached letter from USG responding to these concerns reiterated that:

USG Sheetrock Brand Water-Resistant panels are not designed to be a finished product. There may be slight variations in the color of green panels. In Addition, if any of these panels need to be replaced in the future for whatever reason, USG cannot guarantee that the new green face color will match the existing green face color.¹⁴⁷

Why improvise? Leatherbarrow had questioned.¹⁴⁸ 'Can the bland be amplified?' Koolhaas had challenged in 'Junkspace'; could the picturesque be wrested from the homogenized, the singular liberated from the standardised?¹⁴⁹

The specification of deviation

Deviations from standardised products by the office of Mies van der Rohe in 1953 had raised concerns from insurers in the midst of a year of negotiations amongst the design team, contractors, engineers and manufacturers. At the MTCC, the proposal to deviate from standardised products and applications raised similar fears, expressed in a language which referred to warranties, guarantees, control, problems and practicality, in an aversion to a micro scale risk which was a far cry from the positive portrayal of the macro scale 'risk' which Kamin had advocated in his initial review of the competition process. Deep into construction, despite the ambitions of the project, the spectre of risk pursued every decision, every deviation - no matter whether research had previously been done, whether precedents existed - every step away from the standard use of standard products. To use even standard products in a non-standard way would take an extraordinary amount of persuasion, dialogue, testing, research, specification, care and attention. The RFI triggered an extraordinarily detailed response in the form of a 7-page specification, which, unusually, accepted uncertainty and risk.

Specifications for a second mock-up of 12 USG Sheetrock Brand Water-Resistant (green board) panels, now accepted, in response to the RFI, that 'The design team accepts that there may be a variation of green color between panels.'¹⁵⁰ Deviating

¹⁴⁶ Ibid.

¹⁴⁷ RFI# 0370 18 October 2002.

¹⁴⁸ Leatherbarrow, p.129.

¹⁴⁹ Koolhaas, 'Junkspace', p.182.

¹⁵⁰ Exposed 5/8" Water-resistant Green Gypsum Board Ceiling Mock-up Specification, IIT MTCC, Revised 6 November 2002.

from USG guidance, the specifications maintained the instruction that 'The IIT ceiling is to be constructed with butt joints that are in-line in both directions (not staggered), (see SK-X37)' [Fig. 10.20] accepting that 'The design team waives warranty for cracking along the entire length of in-line butt joints.'¹⁵¹ This in itself must have required extraordinary negotiation amongst the design team: to waive a warranty placed all at risk. In addition to these instructions, the specifications carried on in significant detail, drawing from Prada NY but extending their instructions:

All screw holes are to be spackled. Two (2) coats of joint compound are to be applied to each screw hole. The 2" coat is to be applied with a 4" knife. Both coats shall be applied with a consistent right-hand sweep and with the final coat applied square to the orientation of the panel. The final coat should approximate a 4" x 4" square. No sanding of the spackle or exposed green board should take place between and after coats. The spackled and exposed areas of green board should NOT be sanded.¹⁵²

This specification highlights key conditions of architectural practice in the early twenty-first century. First, that a seven page specification and multiple drawings [Figs. 10.21-10.26] would be required for a ceiling panel alone highlights the amount of information which may be required in contemporary architectural practice, in contrast to the one page specification at the 1856 Iron Museum. Secondly, despite an expectation from the architectural community that this project would involve risk taking - 'art and risk are inseparable', Blair Kamin had observed of OMA's selection - that even this minor deviation from standardisation, and the 'risk' that involves would immediately raise fears over warranties, control, guarantees and practicalities reveals much about a culture of distrust and risk aversion in contemporary practice. In this culture, deviation from any standardisation requires both an enormous amount of research and acceptance of risk - here, supported by the budgets at Prada, the scale of OMA's practice, and the underlying ambition of the design team. That one instruction, critical to the finish of the ceiling, would be repeated, underlined, and highlighted throughout the specification speaks volumes about, at best, an initial absence of shared understandings, and at worst, of initial mistrust between architect and builder as the process of construction begins. In addition, even this extraordinarily precisely detailed specification, however, could not fully capture the design intention nor predict with certainty the outcomes as construction began.

¹⁵¹ Ibid.

¹⁵² Ibid.

A comment regarding the roughness

Following construction of a mock-up, Schendel requested comments on the mock up, receiving a request from OMA-NY for further mock-ups of exposed corner bead/trim. OMA-NY noted, 'Rem liked the idea of possibly exposing the metal edging. He would like to see it though.' The difficulty of specifying an apparently crude ceiling was highlighted by a member of the OMA-NY team, who:

had a comment regarding the roughness, in some areas, of the spackle. He thought that they should take more care to avoid the collection of excess spackle. Is this a ridiculous request now?¹⁵³

The difficulty in determining 'excess' in a 'rough' application again confirmed the limits of a precise specification in determining acceptable levels of deviation from a standard. An updated specification was issued on 10 Dec 2002 requesting a supplemental mock up by 16 Dec 2002, which reiterated the instructions of the original specification but added the exposure of control joints, as per discussions referenced with Koolhaas. [Figs. 10.27, 10.28] A final specification was issued on 4 January, 2003, as a 7 page specification, which extended further the instructions of the mock up and supplementary mock up:

Note: The design team accepts that there may be variation of green color between panels and between batches / shipments of panels. The design team acknowledges that there will be a random placement of ceiling panels and that any variation in the green color, panel-to-panel, will not be specifically controlled.¹⁵⁴

Further to that, instructions regarding sanding were extraordinarily precise:

There shall be NO sanding of the spackle or exposed green board. NO sanding of the spackle should take place between and after final coats. Do NOT sand spackle or exposed green board. The spackled and exposed areas of green board should NOT be sanded.¹⁵⁵

No matter how precise, the specifications were further developed in the field. Accustomed to constructing a rough underlay for cover with a final finish, the drywallers - described by Grunloh as 'the most incredible group of guys to work

¹⁵³ 'Re: Call for all GWB Ceiling Mock-Up comments'. Email from OMA-NY to Mark Schendel, 25 November 2002.

¹⁵⁴ 'Specification for; The Exposed 5/8" Water-resistant Green Gypsum Board IIT MT Campus Center Ceiling (a.k.a. the 'IIT Ceiling.' Final Construction Specification. 4 January 2003.

¹⁵⁵ Ibid.

with¹⁵⁶- were asked to redefine their processes as finish craftsmen in installing a precise finish. The precise specifications were later referenced by Grunloh as 'guidelines',¹⁵⁷ suggesting that the actual processes on site went still further in determining the final result. Grunloh noted that plumbers were verbally instructed not to pencil their customary notes and dimensions on the exposed greenboard, and asked to take care to avoid fingerprints on the delicate paper surface of this rough material. Greg Grunloh noted that the drywallers;

took tremendous pride in, perhaps for the first time ever, their work was going to be on display. And on display in a world class architectural building. They didn't for a minute take it lightly at all.¹⁵⁸

The IIT Ceiling, in deviating from standardisation, demanded that all thought carefully, that all could not go about their daily work in a distracted or generic manner, but were instead required to think through their processes, to collaborate, to take pride in elevating a rough finish to a finished one.

Despite this care, the deviation from a standard assembly opened the risk of unpredictable outcomes. An email from Schendel on 04 March 2003 noting that the 'Green board ceiling above the ramp stair has been sealed and (pending drying) looks good'¹⁵⁹ was followed by a final set of emails revealing one last set of 'problems':

PLEASE NOTE THE DIFFERENTIAL DRYING OF THE SEALER SPECIFICALLY ON THE MUD LINES. THE SEALER HAS SUCKED UP INTO THE MUD LEAVING SOME MATTE FINISH PATCHES AND THE REST SEMIGLOSS LIKE THE FINISH IS MEANT TO BE.

PLEASE ADVISE. This is visible in glare only. What do you think? GG had the idea to ask the paint contractor to pass over the mud one more time with a narrow roller. Then, in future, preroll the mud once and then roll the sealer over everything for a final coat.¹⁶⁰
[Figs.10.29, 10.30]

Every step in the construction of a deviation from a standard application required a precise response to the questions, challenges and unanticipated problems which arose as a result of deviation from a norm. Final emails from Schendel on 10 March 2003 sent photographs of the completed ceiling at the end of a year-long process of

¹⁵⁶ Ibid.

¹⁵⁷ Ibid.

¹⁵⁸ Grunloh interview.

¹⁵⁹ 'Photos 030303' email from Mark Schendel 4 March 2003.

¹⁶⁰ 'Photos 03/05/03 #1/2' email from Mark Schendel 6 March 2003.

dialogue, research, challenges, negotiations, risk-taking, warranty waiving, retraining and final agreement. Following the opening of the Centre, when a portion of the 'crude' ceiling was scraped and damaged, a specialist Italian plasterer was brought in to repaint a faux, 'crude' greenboard finish to conceal the damage.¹⁶¹ The precision, care and attention which had been bestowed on this non-standardised ceiling was not recognised by critics upon the MTCC's opening in September 2003.

Lacking 'Jewel-like precision': Critique and response

Leatherbarrow's query, 'Why Improvise?' seems a pertinent question, when Blair Kamin's review in the Chicago Tribune of the project as it opened in September 2003 headlined 'Details mar the extraordinary'. 'It is, as advertised, full of brilliant concepts', Kamin wrote. 'But it is not a brilliant work of architecture.'¹⁶² Kamin suggested that MTCC had travelled a 'rocky road from dazzling diagram to daunting reality', in which '[b]itter budget battles between architect and client have led to a series of aesthetic compromises.' Kamin highlighted the ceiling as the 'most glaring shortcoming' and as 'dull and unfinished':

some of the materials, such as ceilings done in a green drywall, are clearly low-budget replacements and look strangely unfinished. You wonder when the painters are going to show up.¹⁶³

Kamin maintained his criteria for judging the success of the MTCC on precise detailing, claiming that this building was more of a testament to 'Koolhaas the thinker' than 'Koolhaas the builder [...] The building is crude', Kamin wrote, 'lacking the jewel-like precision and the perfect proportions that are Mies's hallmarks.'¹⁶⁴ The fact that precise detailing was not achieved, according to Kamin's terms, could not

¹⁶¹ Grunloh interview.

¹⁶² 'The most glaring shortcoming is the use of a green, water-resistant drywall as a ceiling material that substitutes for plywood. This "greenboard," as contractors call it, blends well enough with the shiny green floors of the dining and recreation area, but it looks dull and unfinished elsewhere, especially in a crucial spot where ceiling cracks open and reveal the underside of the corrugated, steel tube.' Kamin, 'Details mar the extraordinary', p.1.

¹⁶³ Ibid.

¹⁶⁴ Ibid.

be forgiven as an economic issue¹⁶⁵ within a 'reasonably generous budget.'¹⁶⁶ Core to Kamin's critique was his perception that Koolhaas - Kamin repeatedly referenced Koolhaas personally, rather than the team - didn't elevate conceptual ideas into three dimensional art. 'High-flying concepts are well and good', Kamin summarised, 'but they're as worthless as Confederate money unless you can turn them into art - and do it on a budget.'¹⁶⁷ Further articles by Kamin initially upheld his critique of the detailing at the MTCC, although he would later print a revised critique in 2006, in which he stated:

I've come to think, in other words, that I was trapped by my own ideology, which was, in essence, Ludwig Mies van der Rohe's ideology: "God is in the details." [...] Since the opening, [Donna] Robertson and I have joked about "slacker details." This is a campus center, not a museum. If the details were too precise, you'd wind up with an uptight space [...] The messy vitality is built right in.¹⁶⁸

Earlier in Dec 2003, Kamin had applauded the 'university president who was willing to take risks', but had repeated his critique of the MTCC as 'Koolhaas' edgy campus center, which dazzles with its tube and brilliantly choreographed interior but disappoints with some materials that are cheap with a capital 'C.'¹⁶⁹ Kamin's promotion of architectural risk taking was repeated again in April 2004, in an article headlined 'after a dull decade, a new climate for risk-taking has the Windy City roaring back.'¹⁷⁰ The IIT ceiling detail embodies the daily challenges contemporary architectural practice faces in responding to ambitions of risk.

¹⁶⁵ Architectural historian Kevin Harrington, emeritus professor at IIT, made a similar point, suggesting 'Rem doesn't make cheap buildings, I mean, the MTCC is not a cheap building. So at the level of detail, his building is probably less refined than a strip mall. Because the demands of strip mall developers is so high that the offices that do that have actually got damn good at shopfronts, and coping and stuff. I mean, they have to be. And Rem is not concerned at, the kind of, he's not concerned with the kind of evolutionary refinement of the ordinary. And he isn't willing to address that as a problem that's worth his attention.' Kevin Harrington, 6 May 2010.

¹⁶⁶ 'Architects are supposed to be able to take design concepts and transform them, within the constraints of a budget, into three - dimensional works of art. Yet that didn't happen here, even with a budget that was reasonably generous, though it didn't approach the stratospheric levels of Koolhaas' year-old Prada store in lower Manhattan (an interior renovation).' Kamin, 'Details mar the extraordinary'.

¹⁶⁷ Ibid.

¹⁶⁸ Blair Kamin, 'Time alters perspective on Koolhaas; Critic admits his limited aesthetic', *Chicago Tribune*, 26 November 2006, Arts & Entertainment, p.9.

¹⁶⁹ Blair Kamin, 'Chicagoans of the year: ARCHITECTURE; Lew Collens: Extending a legacy of innovation with IIT buildings.' *Chicago Tribune*, 28 December 2003, Arts & Entertainment, p.7.

¹⁷⁰ Blair Kamin, 'CHICAGO'S BOLD REBIRTH ; After a dull decade, a new climate for risk-taking has the Windy City roaring back', *Chicago Tribune*, 18 April 2004, Arts & Entertainment, p.1.



Fig. 10.29 - Photos 03/05/03 #1/2 Image sent by Mark Schendel to highlight 'the differential drying of the sealer'



Fig. 10.30 - Image of MTCC ceiling near completion from Mark Schendel to H&R
10 April 2003



Fig. 10.31 - MTCC 'IIT ceiling', photographed 2010.



Fig. 10.32 - Junction at east façade of MTCC (left) and the Commons (right), photographed 2010.

Image permissions not available for open access online thesis. To view image, see <http://www.theguardian.com/artanddesign/architecture-design-blog/2014/jun/05/rem-koolhaas-architecture-biennale-venice-fundamentals>

Fig. 10.33 - 'Through the roof ... the 'ceiling' room in the central pavilion - part of Rem Koolhaas's Fundamentals at the Venice Architecture Biennale'. *The Guardian*, 5 June 2014 © David Levene /Guardian News & Media Ltd (2014).

10.9 Extraordinarily precise crudeness

Can this detail which took a year of research, precedents, negotiations, risks, on-site testing, precise specification - yet which appears, at first glance, to be deliberately crude, unfinished, imprecise, be said to meet the 'jewel-like precision' apparently demanded in Chicago? [Fig. 10.31] The project documentation confirms that although the end result was critiqued as 'crude', the processes underlying its making were extraordinarily precise. This precision arose from a deviation from a standardised process: that is, displaying exposed gypsum greenboard, intended to be an underlay for a paint finish, as a finish in itself.

Doing so necessitated risk: the risk of stepping outside standard warranties, which the design team itself took on; the risk of stepping outside pre-defined processes, which the design team navigated through the application of precedents of material research at Prada, and through continuous testing and responses on-site. This 'crude' finish required the re-training of installers, accustomed to their work being covered over, who now, for the first time, had their work on display; a fact which is described by the design team as creating pride. The end result is an embodiment of the challenges outlined in 'Junkspace': the 'enormous difficulty' of wresting the picturesque from the standardised, the 'singular from the liberated'.¹⁷¹

There are numerous critiques of this detail - Kamin dismissing it as 'crude', Harrington noting that despite a rhetoric of 'cheapness', this building was constructed on a reasonable budget,¹⁷² compared to the minimal budgets under which Mies's office constructed their work. It cannot, however, be claimed that this ceiling was the result of a lack of care. An extraordinary amount of care shaped the concept, the research, the detailing, the specification, the construction of this ceiling. Here, processes driven by precision revealed the challenges of 'Junkspace'. That it took this much effort to deviate in any way from an industry standard on a project projected to be 'world class' is extraordinary, and highlights how risk averse, and how standardised architectural practice has become.

¹⁷¹ Koolhaas, 'Junkspace', p.178.

¹⁷² Kevin Harrington interpreted Koolhaas's approach as: 'why do I have to get a millimetre from it- I can be perfectly happy at two feet from it, right? We solved the problem, add a little more caulk, or another piece of flashing or whatever, we keep the rain out, the heat in, it's just fine, and at a certain level it is, but I think Mies didn't buy into that, that kind of attitude, it's good enough and we can step away from it.' Harrington interview.

On the one hand, the idea of risk is applauded. It was called for in the competition brief and by critics looking for bold moves on a macro scale. On a day to day reality at the MTCC, any minor deviation from standardised products and processes were highlighted as a risk, raising concerns from a design team used to working under warranties and repetitive techniques, requiring the design team to accept liabilities for deviating from standard recommendations. The sheer willpower demanded in negotiating the acceptance of risk, and the fact that this ceiling was only possible due to a legacy of materials research from a budget as high as Prada NY, gives some indication of the lengths any practice has to go to, in order to deviate at all from any standardised norm.

Kamin's implication that details at the MTCC were deliberately crude and unfinished were invited by Koolhaas' own writings, stating 'no money, no detail', the detail is 'moot', and 'the absolute absence of detail'. Koolhaas is well known for contradiction, and elsewhere at the MTCC details exist which lend more weight to the cries of 'crude'- perhaps, most tellingly, at the junction between the MTCC and the Commons, [Fig. 10.32] the key junction any admirer of Mies will take care to examine upon arrival at the MTCC. Here, Harrington's description of the junction as 'a sloppy kiss' appears justified: is this a detail which escaped the attention of the team, or a carefully specified response to the outcry over the subsuming of the Commons?

It is clear, in any case, that the 'crude' ceiling is revealed by project correspondence to be extraordinarily detailed, carefully researched, collaboratively defined and highly crafted. The immediate implication might be that the Chicago context was at play: the influence of a 'respected' Chicago firm and the immediacy of Mies's legacy pushing OMA into a more detailed approach than they might normally take. Yet this detail was borne out of the materials research and constructed precedent of OMA's Prada NY. The author of the precise specification of the IIT ceiling, Mark Schendel, emerged from OMA Rotterdam. The final specification makes it abundantly clear that this was not envisioned as a crude detail, in the sense of being sloppy or not taking care. Interviews with project architects confirmed that even an extraordinarily detailed specification which went as far as outlining the tools to be used and the motion of the hand of the installer - instructions which went far beyond the scope of any normal specification - could not capture the depth of attention and the level of instructions which were given to this ceiling. That this ceiling required this much attention simply in order to deviate from a standardised norm attests again, as each

detail examined in this thesis has evidenced, to how much effort above and beyond what might be defined as 'fit for purpose' by definitions of quality standards is required.

The deviation from the standard can be seen as a means of regaining control – refuting the predefined outcomes which circumvent individual opinion, by forcing all involved to start with a *tabula rasa*, an unknown condition, with unpredictable outcomes. This detail, and the extraordinary pursuit of precision within the specification, offers a critique of the architectural profession itself: an insight into the processes of architectural practice is made, and the challenges it faces should it attempt any deviation from the industry norm of the generic and standardised, aspects of architecture which formed the foundation of Koolhaas' later curation of the 2014 Venice Biennale.

'Architecture today is little more than cardboard', Rem Koolhaas stated at the *Fundamentals* Exhibition in the 2014 Venice Biennale which he curated. 'Our influence has been reduced to a territory that is just 2cm thick.'¹⁷³ [Fig. 10.33] Following on from 'Junkspace', *Fundamentals* highlighted the territory of the ceiling through the installation of a low suspended ceiling, above which hovered a tangle of mechanical services and concealed structure, below an ornately frescoed dome. Presenting what Guardian critic Olly Wainwright summarised as 'the progressive eradication of the discipline of architecture itself', the zone of the suspended ceiling was summarised by Koolhaas as presenting what remains of the profession of architecture once 'others' - structural, mechanical, electrical engineers, project managers, quantity surveyors - have staked their claim. 'The ceiling used to be decorative, a symbolic plane, a place invested with intense iconography', Koolhaas stated at the Biennale:

Now, it has become an entire factory of equipment that enables us to exist, a space so deep that it begins to compete with the architecture. It is a domain over which architects have lost all control, a zone surrendered to other professions.¹⁷⁴

At the IIT ceiling, precision was methodically employed as a means of regaining architectural control, and can be read as both an embodiment of, and rebuttal to, the

¹⁷³ Quoting Rem Koolhaas at the Venice Biennale, Olly Wainwright, 'Rem Koolhaas blows the ceiling off the Venice Architecture Biennale', *The Guardian*, 5 June 2014 <<https://www.theguardian.com/artanddesign/architecture-design-blog/2014/jun/05/rem-koolhaas-architecture-biennale-venice-fundamentals>> [accessed 20 July 2016].

¹⁷⁴ Ibid.

observations of 'Bigness', 'Junkspace', and as a precursor to the later 'Fundamentals'. An architectural remit, some degree of control, is wrested from the surface of a generic, standardised, off-the-shelf systematised material - a suspended gypsum drywall ceiling. 'Risk' applauded by critics in the abstract, is fought for on a daily basis through the refusal of warranties when a standardised system is adapted as a finish surface. Elevating the standard to non-standard demanded a non-standard response in the level of care, attention and new skills from all involved, from designers, to suppliers, to installers. Simply deviating from the standard elevated the installers to crafts-persons, heightened the communications between architect and craftsperson.

In 'Ways about error', Sean Keller aligned OMA's rhetorically crude detailing to Ruskin's stance that the:

strict perfectionism of classicism was erroneous in its denial of human variation and imperfection, while the Gothic was correct in being formed out of this very imperfection. OMA's self-consciously unartful details - for example, the exposed taping of greenboard - stand as a post-humanist parallel to John Ruskin's personalized stonework.¹⁷⁵

The non-standardisation of the IIT ceiling forced all to consider it anew. Yet it remains contradictory: an extraordinarily detailed specification which controls even the hand gesture of those involved speaks of regaining control for the architect, but does little to repair the value of the installer / craftsperson. Yet even a specification this detailed could not control all aspects of the finished result, or predict all outcomes: the denial of the 'customary' pencil marks made by all contractors - plumbers, electricians, drywallers - on plasterboard is not noted in the 10-page specification, and required on-site supervision. The differential drying of the sealer had not been anticipated, a consequence of deviating from a norm. These efforts went unnoticed when a review of the ceiling dismissed it as 'crude' and 'unfinished.' That such extraordinary care and precision could result in a 'crude' detail - and one which cost more than the standardisation - appears to deliberately, knowingly, ironically narrate the predicament of architectural practice in the early twenty-first century, as it attempts to regain control and wrest quality, originality and risk, from the most generic and standardised of processes.

¹⁷⁵ Sean Keller, 'Ways about error' in *Perspecta* 46:Error, ed. by Joseph Clarke and Emma Jane Bloomfield (August 2013), 28-45 (p.39).

11. CONCLUSION: productive deviations from certainty



Fig. 11.1 - Sigurd Lewerentz vid byggarbetsplats, St Petri kyrka [Sigurd Lewerentz at the construction site, St. Petri Church] Karl-Erik Olsson-Snogeröd (photographer) Arkitektur-och designcentrum: ARKM.1986-106-LEW-22-16.

11.1 There should be no problems to resolve during construction

I want to return to Francis Hall's 1994 article in *The Architects' Journal* which opened the introductory narratives of this thesis. Hall stated:

the one certain opportunity available to an architect to set down a definitive and enforceable expression of standard and quality is by way of a properly drafted specification. If this is done, there is understanding and certainty all round. If it is not, there is often disagreement and disappointment.¹

This statement, cited throughout the thesis, proposed a means by which to define and enforce quality in architectural practice. 'The objective,' Hall had emphasised, 'must be certainty.'² Four years later, *Rethinking Construction*, also known as *The Egan Report* was published as a major review of the UK construction industry. Concluding that a 'radical change in the way we build' was required to 'achieve the dramatic increases in efficiency and quality that are both possible and necessary',³ the report recommended 'a change of 'style, culture and process'⁴ which included recommendations for research into product development methods, inspired by the automotive industry, as means of 'continuously developing a generic construction product, such as a house, a road or an office'.⁵ 'Project implementation', the report suggested, 'is about translating the generic product into a specific project on a specific site for a specific customer',⁶ arguing that the promises of 'greater predictability' offered by 'standardisation of processes and components' need not result in 'poor aesthetics or monotonous buildings.'⁷

The Egan Report envisioned collaborative partnership working, new digital technologies and greater use of standardised products and design as providing greater efficiencies, value for money, and, crucially, predictability. A more recent report, the *2015 National Construction Contracts and Law Survey*, referenced these

¹ Hall, p.38.

² Ibid.

³ Sir John Egan, *Rethinking Construction: The Report of the Construction Task Force*, (London: Department of Trade and Industry HMSO, 1998), p.37.

⁴ Ibid., p.37.

⁵ Ibid., p.20.

⁶ Ibid., p.20.

⁷ 'We have seen that, both in this country and abroad, the best architects are entirely capable of designing attractive buildings that use a high degree of standardization.' Ibid., p.28.

aims when highlighting ongoing problems of adversarial relationships and disputes in the construction industry:

the central themes remain consistent: the need for collaboration, the damaging effect of disputes and the often adversarial character of construction. These themes are now new: Egan [...] clearly described them more than twenty years ago. What is new is the assortment of ways in which, together, we can create, aggregate and analyse construction information. We now have innovative ways to address old problems.⁸

The 'innovate ways' mentioned above were in reference to collaborative working supported by 3D collaborative Building Information Modelling (BIM). 'Collaborative working, where responsibility, risk and reward are proportionately shared and collectively owned,' Richard Waterhouse's introduction to the report stated, 'is often a better way to deliver client requirements. It may serve to reduce or even eliminate disputes and the associated costs and disruption.'⁹ However, Waterhouse suggested, 'collaboration itself is often not clearly described; the most common form of collaboration is one of 'an ethos of mutual trust and understanding',¹⁰ clearly viewed as insufficiently defined by Waterhouse who looked to BIM (Building Information Modelling) to provide clarity:

The good news is that change is coming. By 2016 all government-funded construction projects will require 3D collaborative BIM, irrespective of project size. BIM allows for collaboration to be well described, for it to move beyond a shared project ethos, to a clear description of who is responsible for what, when, and how that responsibility integrates with the responsibilities of others in the construction team. BIM can, does, and will provide increasingly better descriptions of buildings, and the responsibilities for design and construction.¹¹

BIM, Roland Finch later emphasized in the same report, can 'warn users that it is incomplete or incorrect. It can be used to identify anomalies, compare scenarios,

⁸ Richard Waterhouse, 'Introduction', *National Construction Contracts and Law Survey 2015*, NBS, (RIBA Enterprises Ltd, 2015) p.3.

⁹ Ibid.

¹⁰ Ibid.

¹¹ Waterhouse, p.3. A 2016 article in the *RIBA Journal* also questioned 'whether the inclusion of 'ethos' in a contract is sufficient to delimit, maintain, and enforce collaboration through the life of a contract.' Adrian Malleson, 'Now for the fine print... collaborate, litigate, mitigate. How do architects use contracts?' *The RIBA Journal*, 123.3 (March 2016), 61-62.

and provide a means for fast data transfer that was impossible just a few years ago.¹² In principle, the report continued, with a caveat, this would reduce disputes:

If we accept that uncertainty is one of the major causes of disputes, then BIM should certainly reduce that aspect. It is worth noting, however, that the use of a BIM cannot in itself resolve the difference: it requires people to do that [...] Although there are lots of tools which will identify and highlight discrepancies in the model, it will be left to the contributors to decide between them which part needs to be changed in order to correct the discrepancy.¹³

Allowing for - perhaps - the uncertainties of input from people, the fact that BIM emerges from a single source platform as a shared collaborative tool was summarized thus by Finch:

It follows that the absence of conflict in the information given to the Contractors means that there should be no problems to resolve during construction.¹⁴

The long held objective of 'no problems to resolve during construction' - the core of Hall's assertion of 'the objective is certainty' - has, as this thesis has presented, deep historical roots. From Vitruvius's stipulation that 'the plans should be worked out carefully, and with the greatest attention, before the structures are begun'¹⁵, the objective of certainty through precise instructions has been specifically pursued from the moment the act of designing a building was first separated from the act of construction, identified under Brunelleschi, codified under Alberti, explicitly defined as rationalised scientific method from the seventeenth century, and formally implemented throughout professional practice from the nineteenth century onwards. The questionable presumption that reality may ever be described 'with absolute precision'¹⁶ continues to underpin contemporary recommendations, which continue to assert that ever-increasing precision in architectural communications is both attainable and desirable within ongoing ideological frameworks which define and pursue quality as 'fitness-for-purpose.'¹⁷ The readings of six constructed architectural projects within this thesis challenged these claims, and offer an alternative interpretation of the role of precision in architectural production.

¹² Roland Finch, 'Can BIM solve construction disputes?' *National Construction Contracts and Law Survey 2015*, NBS, (RIBA Enterprises Ltd, 2015) 32-33 (p.32).

¹³ *Ibid.*, p. 32.

¹⁴ *Ibid.*, p. 32.

¹⁵ Vitruvius, p. 282.

¹⁶ Pérez-Gómez and Pelletier, p.304.

¹⁷ *BS 4778-2:1991, Quality vocabulary*, p.3.

11.2 The ambiguity of deviations

The readings in this thesis of the documents which shaped six constructed projects explored the means by which precision was defined, approached, pursued, challenged and adapted in pursuit of architectural quality. Taken together, they suggest two key conclusions.

First, each reading demonstrated that, despite explicitly precise instructions in advance of construction, the architectural project deviated in unanticipated ways as it progressed from concept to construction.¹⁸ From the unanticipated challenges my detailed predictions encountered during a small and seemingly simple self-build in Orkney, to daily on-site negotiations superseding precise drawings at Lewerentz's St Peters; from the as-built dimensional deviations from precise specifications for the façade of Caruso St John's Museum of Childhood, the multiple customisations of seemingly standardised steel windows at Mies's Commons and the value-engineered revisions to the MTCC ceiling, each of these projects deviated from original predictions.

In each case, the predictions were notably precise, conforming to professionalised expectations. CAD drawings at Wheelingstone sought to quantify the most efficient use of every timber stud and concrete block. 1:20 drawings for St Peter's drew individual bricks and mortar joints. Caruso St John's specifications explicitly defined 4mm and 6mm joints. Mies's office could reference decades of systematically iterative testing with an extraordinarily refined and repetitive palette of materials and details. OMA's extraordinarily precise specifications included the instruction for the directional sweep of a hand and the size of a knife to apply spackle on a drywall ceiling. Each of these projects adhered to, exemplified, typical recommendations which guide contemporary architectural production. Yet, in each of these projects, certainty was denied: not only by deviations from original predictions, but also, critically, by deviations from standardised products and construction practices, raising the second key conclusion which these readings offer.

¹⁸ As opposed to quality as 'fitness of purpose' as defined by British Standards: 'in a 'fitness-of-purpose sense which related the evaluation of a product or service to its ability to satisfy a given need.' *BS 4778-2:1991 Quality vocabulary – Part 2: Quality concepts and related definitions*, British Standard Institute.

Recommendations which advocate certainty as a guarantor of quality seek the predictability of standardised products and processes, a point explicitly made in both the *Egan Report* and the *National Construction Standards* survey. These recommendations are notably at odds with critical narratives by architects and architectural writers explored in this thesis, who define architectural quality as quite distinct from the ‘fitness-of-purpose’ definition envisioned in the search for certainty. Lewerentz’s St Peter’s is described by architects as ‘irregular’, ‘not conventional’, ‘oblique’, ‘enigmatic’, ‘not as usual’, ‘new and unexpected’, ‘in the teeth of common-sense compromise.’¹⁹ Caruso St John described their non-standard specifications of mortar joints as ‘central to the architectural intent of the project.’²⁰ The detailing of Mies’s Commons was described by Beeby as structurally and economically inefficient, requiring ‘curious’ ‘idiosyncratic’ details removed from ‘normative structural practices.’²¹ OMA’s ‘IIT Ceiling’ deviated knowingly, obsessively, meticulously from the standardised application of a drywall ceiling, and in doing so, tested the certainties of manufacturer’s warranties. In straying from the boundaries of standardised products and processes, each detail accepted and exploited uncertainty and risk, yet each of these projects maintained a rigorous and methodological control over the project through the device of precision.

Precise instructions, in each of these cases, did not guarantee certainty or quality by ensuring an exact geometric alignment between predicted ideal and constructed reality. The precise alignment between architectural intent and constructed reality was, rather, pursued, in each case by negotiating and exploiting the uncertainties and ambiguities incurred by unplanned or planned deviations. To deviate from standard practices, and yet still control precisely, demands extraordinary attention and care. To deviate demands that the work cannot be constructed absent-mindedly, repetitively or thoughtlessly.

In each case, the deviation demanded something more from all involved. ‘Great fastidiousness and constant site-supervision’²² was observed of Lewerentz. Collaborative efforts and acceptance of trust was referenced as permitting the construction of exceptionally fine *in-situ* joints at the Museum of Childhood. The collaborative efforts of associate architects, engineers, window manufacturers and Mies’s office pursued an exceptionally slender steel mullion at the Commons. The

¹⁹ See Ch.3 for the source of each quotation.

²⁰ David Kohn, *176 / Museum of Childhood: Stone Cladding*, 27 September 2006.

²¹ *Ibid.*, p.14.

²² *Ibid.*, p.159

MTCC engendered the elevation, through on-site conversation and extraordinarily precise specifications, of a 'rough' trade of drywallers into a finish trade whose work would be on view for the first time as a precisely controlled finish product.

In this sense, the 1856 Iron Museum stands alone from the other readings. It was the only project which, in its brief, procurement and design, was predicated from the outset upon the canons of certainty, efficiency, economy and standardisation. That it failed to meet even the British Standards' current definition of quality as 'fitness-of-purpose' offers an extreme reading of the failings of pursuing architecture through frameworks defined only by concerns of predictability, cost and speed. Quality of a poetic, emotive, subjective, intuitive nature is less easy to guarantee, emerging instead in the other five readings from acceptances of risk, uncertainty, ambiguity.

Recommendations for architectural practice reject a particular definition of ambiguity: that of ambiguity as 'indistinct, obscure, not clearly defined, 'doubtful as regards classification; indeterminate' (early 17th century) and 'unreliable' (18th century).²³ These interpretations speak to fears of dispute, lack of trust, lack of certainty and predictability. Each of the details read in this thesis used extraordinarily precise specifications; yet even these contained ambiguities. Quality in the façade of the Museum of Childhood was ultimately defined by a reference to 'the architectural intent' at the Museum of Childhood. The team at the MTCC experienced the 'ridiculous' difficulty of determining at which point a 'rough' finish becomes excessive.²⁴ More than simply highlighting the inevitability of ambiguity in any instruction, following Empson's observation that any prose statement can be called ambiguous,²⁵ the attempt to render all communications of architectural production as unambiguous is not only doomed to failure - as Emmons demonstrated²⁶ - but more critically, threatens to create a built environment denied of richer, ambiguous, poetic meaning. 'Instrumental thinking', Vesely had observed, 'tends to impose its hegemony by creating a world that it can truly control.'²⁷

Just as the term 'precision' can be interpreted as carrying two meanings - exactitude on the one hand; a process of trimming off and editing, of losing something, on the

²³ *The New Shorter Oxford English Dictionary* (Oxford: Clarendon Press Rev. ed. 1993).

²⁴ 'Re: Call for all GWB Ceiling Mock-Up comments'. Email from OMA-NY to Mark Schendel, 25 November 2002.

²⁵ Empson, p.1.

²⁶ Emmons, 'Diagrammatic Practices', p.15.

²⁷ Dalibor Vesely 'Architecture and the Question of Technology' in *Architecture, ethics, and technology* ed. by Louise Pelletier and Alberto Perez Gomez (Montreal: McGill-Queen's University Press, 1994), pp. 28-49 (p.31).

other – definitions of ambiguity, too, offer an alternative reading. Ambiguity, as Empson explored, may also admit more than one interpretation or explanation, communicating the several meanings of any complex intent.²⁸ Rather than dismissing ambiguity as wholly undesirable, it might instead be understood first as inevitable, and then as productive.

The recommendations which guide professionalized practice do routinely admit the inevitability of ambiguity in the processes of architectural production. From Walter Rosenfeld's acceptance that no architect or specifier can realistically claim to produce perfect work, with contract documents being 'rarely without some omission, discrepancy, or some other flaw (alas)',²⁹ to Wakita and Linde's claim that 'Architects involved in quality work find that there is never enough information on a set of drawings nor enough details drawn'³⁰, the prevailing contractual context nevertheless continues to pinpoint 'poor specifications' as the underlying cause of disputes.³¹ Any admission of the inevitability of ambiguity is accompanied by a declaration of disappointment, followed by the ongoing search for certainty to be provided by ever-more precise instructions, new methods of production, or new instruments.

Recent claims for BIM assert, once again, the promise that it will guarantee certainty through a perfectly co-ordinated instructions from which no deviation need occur on site. That no set of documents has ever yet attained this suggests that claims focused on the promise of BIM to provide unassailable certainties may similarly be doomed to disappoint. Where BIM, or any mechanism for translating concept to construction, may hold greater promise is in the re-imagining of relationships between those who design and those who construct, and the reframing of inevitable ambiguities, which arise when human relationships are involved, as productive. In *The Death of Drawing*, David Ross Scheer critically analysed the promises and consequences of BIM. Noting first that his practice 'made fewer mistakes because the drawings were automatically co-ordinated',³² Scheer identified the greater promise and simultaneous challenge of BIM not in terms of its ability to reduce or eradicate mistakes, but rather in its methodological approach of simulation, which, in building a full model from the earliest stages of design, demands greater parts of

²⁸ Empson, pp.5-6.

²⁹ Rosenfeld, p.47.

³⁰ Wakita and Linde, p.vi.

³¹ <<http://www.thenbs.com/products/nbsBuilding/index.asp>> [accessed 8 May 2011]

³² David Ross Scheer, *The Death of Drawing: Architecture in the Age of Simulation* (London and New York: Routledge, 2014), p.2.]

the builder's knowledge to inform the instructions from the first stages of the design. This may promise, Scheer proposed, to blur distinctions between design and construction, and return design to a more collaborative endeavour. Scheer also, however, identified the underlying premise of a belief system in which aspects of the project that can be evaluated quantitatively are foregrounded, becoming 'the chief drivers of the design if the architect does not find a way to assert other values in a way the design team can accept'. Such belief systems limit BIM production within the narrow confines of the ongoing pursuit of certainty.

In *The Idea of Building*, Steven Groák had proposed that the inherently unstable nature of buildings, and gaps in knowledge should be understood as 'characteristics of buildings or building processes, the *condition* of the industry, at times to be relished.'³³ The idea of 'relishing' instability, uncertainty, gaps, ambiguities, so abhorred in most professional recommendations, appears again in alternative viewpoints: as Davis' recognition of Japanese building contracts based on good faith between all parties,³⁴ Pye's premise that any communication 'obviously falls far short of expressing the designer's full intention,'³⁵ Vesely's assertion that architectural practice is most often theoretical and Cuff's observations of the actualities of architectural practice as involving a 'high degree of indeterminacy,' contradictory forces, countless voices, professional uncertainty, perpetual discovery and surprise.³⁶ 'Why improvise?' David Leatherbarrow's challenge, cited throughout this thesis, critiqued the blind acceptance of the promises of standardised products in *Uncommon Ground*. The difficulties of deviating from any standard are amply demonstrated in each of the projects. 'Why allow any unevenness of performance and reliability? More important than why, when?'³⁷

The teams brought together by Sigurd Lewerentz, Caruso St John Architects, Mies van der Rohe and OMA each pursued architectural quality through the risks encountered by deviations from standard construction practices. Lewerentz's precisely controlled imprecise mortar joints; Caruso St John Architects' self-described resistance to off-the-peg construction; Mies's elevation of industrialised standards through adaptation and customisation; Koolhaas's challenge to amplify the bland: each refused the certainties of standardisation, demanding instead of the

³³ Groák, p.6.

³⁴ Davis, p. 344, Footnote 9.

³⁵ Pye, p.21.

³⁶ Cuff, p.96.

³⁷ Leatherbarrow, p.129.

design team that all involved - architects, builders, clients, subcontractors, consultants, suppliers - break from normative approaches, take risks, invent, collaborate and develop shared definitions of quality. Precision was employed carefully, obsessively, not to guarantee certainty or refute ambiguity, but to signify care and attention, and pursue quality through ongoing dialogues which extended far beyond the predictions and scope of precise documents.

11.3 In praise of ambiguity

As an architect educated under a Miesian curriculum at IIT, a technically-focused education in the UK, and having spent over a decade on construction sites of various scales, I have not, in this thesis, argued against precision in architectural production. I believe in working precisely, in being unable to draw a technical instruction unless I understand what it is and how it will work. I take pleasure from, as described at Wheelingstone, the pedantic pleasure of work on site aligning with instructions - the avoidance of unnecessary masonry cuts, the economic use of a full length of timber cut in half as individual timber studs, each aligning with masonry coursing. I agree with St John's advocacy of 'defining what you want, to achieve quality' and with Schendel's self-described aims of 'accuracy, neatness and concentration'. I have not, in this thesis, advocated ambiguity in the sense, as William Empson identified, of an indecision as to what you mean.³⁸ I have not argued for a lack of foresight or planning, nor for a lack of care or attention, nor for looseness or sloppiness.

Rather, what this thesis has investigated, and confirmed to me, is the flawed ideology of the long-held promise that any architectural intention may ever be precisely, comprehensively, accurately described in advance of construction; that there could or ever will be 'no problems to resolve during construction.' An ideology which views any deviation as an error, omission or problem fails not only to recognise the inevitability that deviations will occur but, more critically, fails to allow that accepting the inevitability of deviations may be productive in pursuing architectural quality. No project on which I have worked has ever been constructed without deviation from original specification, no matter how precise the instructions or production method. No architect with whom I have discussed such matters has ever refuted this observation. No matter how standardised the system, no matter how ordered the construction site, no matter how precise the prefabricated

³⁸ Empson, pp.5-6.

components, as each of the projects show, design and construction brings together numerous individuals involved in largely unpredictable processes involving decision making, craft, skill, care, attention, passion, experience, and intuition, each of which offer productive input in the pursuit of quality.

This thesis has argued against any claim that the pursuit of certainty through precise instructions can ever guarantee an extraordinary quality. Returning to the observation made by Timothy Ostler in *The Architects' Journal*, that Quality Assurance 'will not make a bad architect a good one, but will just make him more consistent in producing bad architecture,'³⁹ the objective of certainty, likewise, can aim to offer no more than the pursuit of quality as 'fit for purpose.' A quality which is extraordinary, by its very definition, is not ordinary; not standard; not predictable nor wholly definable. That each project reviewed in this thesis began with precise documentations in advance of construction, and that each project, with the exception of the Iron Museum, deviated from these precise predictions should be of no surprise to any practicing architect. Such discrepancies cannot be read as failures or disappointments, but as a normal condition of architectural production and a productive opportunity. In each case, precision, meticulously employed to deviate from standard construction norms, supported and celebrated the uncertainties and ambiguities inherently embedded throughout the production of any architectural project which seeks an extraordinary quality beyond an aim of fitness for purpose.

³⁹ Ostler, p.32.

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